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

October 1, 2004 – September 30, 2006

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Cover photo credits:
Hawaiian monk seal, salmon, killer whale, staghorn coral, and hawksbill sea turtle images courtesy of NOAA

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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 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 ninth 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, 2004, through September 30, 2006. It includes accounts of each species, its status, current threats, conservation actions undertaken during this timeframe, and priority actions needed in the next biennium. A species is defined in the ESA to include any distinct population segment (DPS) of any species of vertebrate, and NMFS defines a DPS of Pacific salmon as an evolutionarily significant unit (ESU). During the 2 years covered in this report, NMFS had jurisdiction over 56 domestic species (including DPSs and ESUs) of salmon, sturgeon, sawfish, sea grass, mollusks, sea turtles, and marine mammals, and eight foreign species, for a total of 64 species. The 56 domestic species addressed in this report include southern resident killer whales (*Orcinus orca*), which were listed as endangered in November 2005 (70 FR 69903); green sturgeon (*Acipenser medirostris*), listed as threatened in April 2006 (71 FR 17757); and elkhorn and staghorn coral (*Acropora palmata and A. cervicornis*), listed as threatened in May 2006 (71 FR 26852). In June 2005, NMFS listed Lower Columbia River coho salmon (*Oncorhynchus kisutch*) as threatened (70 FR 37159) and re-listed 15 ESUs of salmon with revised definitions of the populations to be included in the ESU. In January 2006, NMFS de-listed Oregon coast coho salmon (71 FR 3033), which was previously listed as threatened, and re-listed 10 DPSs of steelhead (71 FR 834).

Of the 56 domestic ESA-listed species under NMFS jurisdiction, 19 currently have completed final recovery plans (Table 1). Five species' recovery plans are in the process of being revised: Hawaiian monk seal, eastern and western DPSs of Steller sea lions, and loggerhead and Kemp's ridley turtles. Twenty-two recovery plans are currently under development, including those for 21 ESUs and DPSs of Pacific salmon and steelhead, respectively. In January 2007, the Puget Sound Salmon Recovery Plan was completed, which includes management strategies for the threatened Puget Sound Chinook salmon ESU. The northern right whale recovery plan was published in May 2005, and the Atlantic salmon recovery plan was published in December 2005. Twelve draft recovery plans (including three draft revisions) were completed in 2006, and are expected to be finalized in 2007.

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 white abalone, smalltooth sawfish, Kemp's ridley and loggerhead turtles, Hawaiian monk seal, and Steller sea lion. Additionally, two active take reduction teams, formed in accordance with Marine Mammal Protection Act, 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 way NMFS uses to meet this challenge is meaningful stakeholder involvement in recovery planning and implementation. All NMFS active recovery teams either have stakeholder representation on their teams (federal, state, and local government agencies; affected industries; conservation or other non-governmental organizations; or affected individuals), 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 these teams, actively participating in them, 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. The guidance currently is being field-tested in regional and field offices (see http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm).

In addition to recovery planning, implementation of recovery activities was active for all NMFS-listed species during the biennium covered in this report. Among ongoing conservation and research activities, two efforts are especially worth noting: (1) the Atlantic/Gulf of Mexico Sea Turtle Strategy (Sea Turtle Strategy) and (2) efforts to recover northern right whales, one of our most severely endangered species.

The Sea Turtle Strategy is a gear-based approach to evaluating and reducing sea turtle bycatch in state and federal waters of the Atlantic Ocean and Gulf of Mexico. To date, sea turtle bycatch has been addressed fishery by fishery, often on an emergency basis. Management efforts have primarily focused on federal fisheries that have been the subject of ESA section 7 consultations, and thus have largely neglected sea turtle bycatch in state and recreational fisheries. Recent management actions to help protect sea turtles include new gear requirements for the Virginia component of the Chesapeake Bay pound net fishery (71 FR 36024), and gear modifications to sea scallop dredges (71 FR 50361). In December 2006, NMFS proposed a regulation to place observers on vessels to learn more about sea turtle interactions with fishing operations, to evaluate existing measures to reduce sea turtle takes, and to determine whether additional measures may be necessary.

Efforts to recover North Atlantic right whales are proceeding on two paths. Steps are being taken to reduce serious injury and death due to entanglement in commercial fishing gear (primarily through fishing gear modifications and restrictions to reduce the likelihood of entanglement) under the Atlantic Large Whale Take Reduction Plan. NMFS is in the process of

rulemaking to implement additional measures to reduce bycatch. Because right whale deaths also result from collisions with large ships, NMFS has developed a North Atlantic Right Whale Ship Strike Reduction Strategy. This includes mariner education and outreach programs, modifications to ships' operations to reduce ship strikes via ESA section 7 consultations, negotiation of a right whale conservation agreement with Canada, and continuation of ongoing research and conservation activities. In June 2006, NOAA proposed a mandatory speed restriction for certain sized vessels during specific times in specific locations along the U.S. East Coast, to reduce the risk of collisions between ships and endangered North Atlantic right whales. In July 2006, NMFS published the Draft Environmental Impact Statement to Implement the Operational Measures of the North Atlantic Right Whale Ship Strike Reduction Strategy. Comments on the proposed rule and draft Environmental Impact Statement are currently being evaluated. To further reduce the likelihood of ship collisions in key right whale habitats, in November 2006 NOAA established a set of recommended vessel routes in four locations along the Atlantic coast.

Between October 1, 2004, and September 30, 2006, of the 56 domestic endangered or threatened species under NMFS jurisdiction, 23 (41 percent) were stabilized or improving; 12 (21 percent) were known to be declining; 20 (36 percent) were unknown or mixed in their status; and 1 (2 percent) are presumed extinct. These percentages reflect a minor variation from the previous 2002–2004 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
(301) 713-1401

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

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 (*Atlantic*) - Under Revision
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 Chinook ESU	3/24/1999; 6/28/2005[3]	Threatened	Increasing	1	Partial Draft Completed 02/2006 (*Washington)*; Under Development (*Oregon)*
-Lower Columbia River Coho ESU	6/28/2005[3]	Threatened	Declining	1	Under Development
-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	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	Increasing	1	Draft Completed 03/1995 (not adopted); Under Development
-Upper Columbia River, Spring Run Chinook ESU	3/24/1999; 6/28/2005[3]	Endangered	Increasing	1	Draft Completed 06/2006

-Upper Willamette River Chinook ESU	3/24/1999; 6/28/2005[3]	Threatened	Increasing	1	Under Development
-Columbia River chum ESU	3/25/1999; 6/28/2005[3]	Threatened	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	Draft Completed 08/2006
-Ozette Lake sockeye ESU	3/25/1999; 6/28/2005[3]	Threatened	Unknown	1	Under Development
-Snake River sockeye ESU	11/20/1991; 6/28/2005[3]	Endangered	Mixed	2	Draft Completed 03/1995 (not adopted); Under Development
-Lower Columbia River steelhead DPS	3/19/1998; 1/5/2006[3]	Threatened	Increasing	1	Partial Draft Completed 02/2006 (*Washington*); Under Development (*Oregon*)
-Middle Columbia River steelhead DPS	3/25/1999; 1/5/2006[3]	Threatened	Increasing	1	Draft Completed 05/2006
-Snake River Basin steelhead DPS	8/18/1997; 1/5/2006[3]	Threatened	Stable	1	Under Development
-Upper Columbia River steelhead DPS	8/18/1997; 1/5/2006[3]	Threatened	Increasing	1	Draft Completed 07/2006
-Upper Willamette River steelhead DPS	3/25/1999; 1/5/2006[3]	Threatened	Increasing	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
-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	8/4/1989; 11/5/1990; 1/4/1994[5]; 6/28/2005[3]	Endangered	Increasing	3	Draft Completed 08/1997; Under Development
-Central Valley Spring-run Chinook ESU	9/16/1999; 6/28/2005[3]	Threatened	Increasing	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	Draft Completed 08/2006
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	None
PLANTS					
Johnson's seagrass	9/14/1998	Threatened	Stable	7	Completed 09/2002
INVERTEBRATES					
White abalone	5/29/2001	Endangered	Declining	2	Draft Completed 10/2006
Elkhorn coral	5/9/2006	Threatened	Declining	7	None
Staghorn coral	5/9/2006	Threatened	Declining	7	None
SEALS AND SEA LIONS					
Caribbean monk seal	3/11/1967	Endangered	Presumed Extinct	12	None
Guadalupe fur seal	12/16/1985	Threatened	Increasing	10	None
Hawaiian monk seal	11/23/1976	Endangered	Mixed	1	Completed 03/1983; Draft Revision Completed 11/2006
Steller sea lion - *eastern DPS*	4/10/1990; 11/26/1990; 5/5/97[6]	Threatened	Increasing	10	Completed 12/1992; Draft Revision Completed 05/2006
Steller sea lion - *western DPS*	4/10/1990; 11/26/1990; 5/5/97[6]	Endangered	Declining	7	Completed 12/1992; Draft Revision Completed 05/2006

WHALES					
Blue whale	6/2/1970	Endangered	Unknown	7	Completed 07/1998
Bowhead whale	6/2/1970	Endangered	Increasing	9	None
Fin whale	6/2/1970	Endangered	Unknown	7	Draft Completed 06/2006
Humpback whale	6/2/1970	Endangered	Increasing	3	Completed 11/1991
Northern right whale	6/2/1970	Endangered	Unknown	1	Completed 05/2005 (*Atlantic*); Under Development (*Pacific*)
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	Increasing	3	Draft Completed 11/2006

NOTES FOR TABLE 1:

[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 B 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.

SEA TURTLE RECOVERY

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. Within these species, two regionally important distinct population segments (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.

Green Sea Turtle (*Chelonia mydas*)

Date Listed: July 28, 1978

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 breeding 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.[1] In the United States, the nesting populations in Hawaii (Figure 1) and Florida (Figure 2) have been documented as increasing over the past 10 to 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.

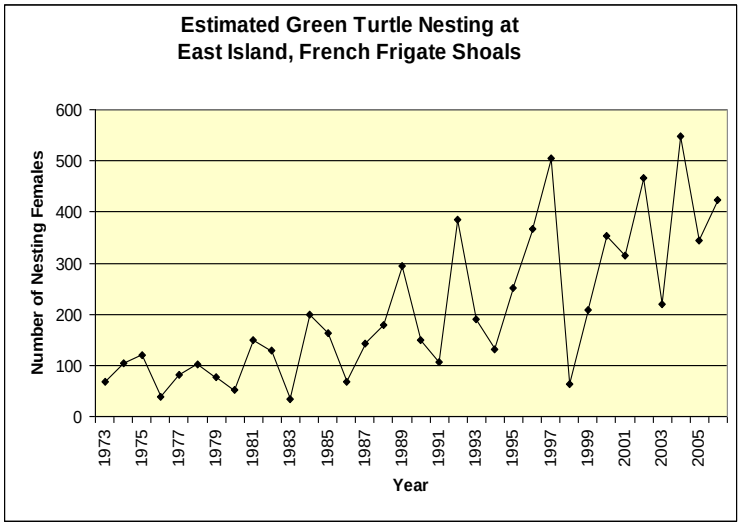


Figure 1. Estimated number of female green turtles nesting at East Island, French Frigate Shoals, Hawaiian Archipelago, 1973–2006.

[1] Seminoff, J.A. 2002. Global status of the green turtle (*Chelonia mydas*): A summary of the 2001 stock assessment for the World Conservation Union Red List Programme.

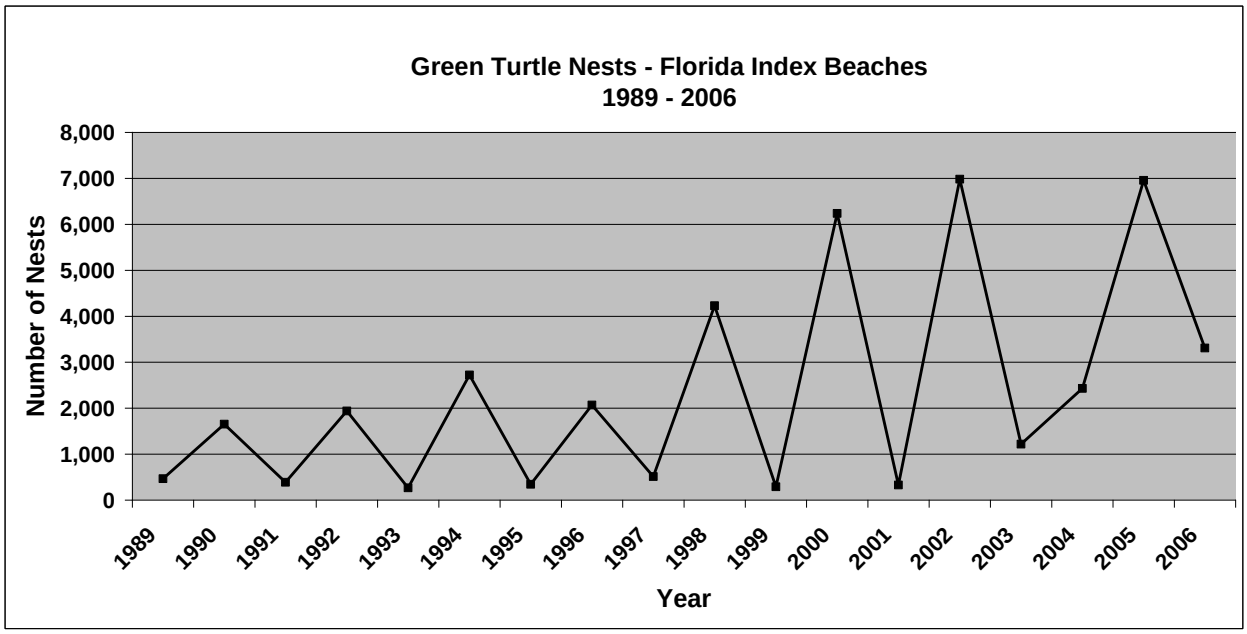


Figure 2. Number of green turtle nests documented on Florida core index beaches, 1989–2006.

Threats and Impacts in the Marine Environment:

Threats and impacts found 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. Some known direct harvest of immature turtles and adults is reported to occur in Australia (by Aboriginal and Torres Strait Islanders), Japan, Philippines, Indonesia, Solomon Islands, Vanuatu, Federated States of Micronesia, Marshall Islands, Palau, and the United States flagged areas of Guam, Commonwealth of the Northern Mariana Islands, and American Samoa. Direct harvest very likely occurs in many other areas within the green turtle's range, especially in the western and central Pacific (e.g., Malaysia).
- Incidental capture in commercial and artisanal fisheries – Fisheries known to interact with green turtles with varying degrees of impact include gillnet, longline, purse seine, pound net, trap/pot gear, dredge, and trawl fisheries.
- Incidental capture in "ghost" fishing gear.
- Parasites and diseases (e.g., fibropapillomatosis).
- 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, which can result in marine habitat destruction via both direct and indirect effects and hopper dredges can entrain and kill turtles.

- Destruction and degradation of nearshore foraging habitat from beach nourishment activities.
- 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.
- 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 in nesting beach habitat (e.g., shoreline erosion and beach temperature changes).

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

Pacific/Indian Ocean:

- Identified stock structure of nesting turtles using DNA analysis, flipper tagging, and satellite telemetry.
- Conducted population identification of turtles caught as bycatch in fisheries, foraging turtles, and stranded turtles, using DNA analysis, flipper tagging, and satellite telemetry.
- Supported a sea turtle data collection and skin sampling (for subsequent DNA analysis) project conducted by Women United Together in the Marshall Islands.
- Identified habitat requirements using stable isotope analysis.
- Identified trophic ecology of green turtles in the eastern Pacific.
- Performed a diet analysis of oceanic green turtles in the North Pacific.
- Conducted long-term monitoring and research of potential causes of and threats posed by fibropapillomatosis.
- Continued U.S. fishery observer programs to monitor, report, and estimate green turtle bycatch.
- Continued vital population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes.
- Supported marine debris cleanup efforts around the Hawaiian Islands.
- Evaluated green turtle population trends and designed and evaluated conservation strategies via stochastic simulation models.
- Monitored and tracked resident green turtles in south San Diego Bay, California; Galapagos Islands; Chile; Peru; and Pacific Mexico.
- Supported monitoring efforts of index areas in Baja California, Mexico to obtain information on abundance, mortality, and biology.
- Supported aerial surveys of foraging and nesting areas in Mexico.
- Supported Ecuador population assessment.
- Conducted long-term nesting beach monitoring in the northwest Hawaiian Islands.
- Conducted long-term, spatially extensive, capture-mark-recapture programs at six sites throughout Hawaiian archipelago.
- Supported capacity building of the American Samoa Department of Marine and Wildlife Resources for nesting beach and in-water monitoring.
- Conducted nesting beach and in-water monitoring in the Commonwealth of Northern Mariana Islands.

- Supported capacity building of the Guam Department of Agriculture, Division of Aquatic and Wildlife Resources for nesting beach monitoring.
- Supported nesting beach monitoring and tagging of nesting females on the outer islands of Yap State, Federated States of Micronesia.
- Supported capacity building for the Republic of Palau, Division of Marine Resources to establish a monitoring system and conduct baseline studies of turtles and their habitats.
- Supported monitoring and protection efforts of nesting beaches in Mexico, Galapagos Islands, and Costa Rica.
- Supported the Marshall Islands Sea Turtle-Fisheries Interaction Outreach Education project to build sea turtle conservation and management capacity of the Marshall Islands Marine Resources Authority, including training of observers in sea turtle–fishery interaction mitigation techniques.
- Supported an observer program in Peru to document the threat of shark and mahi mahi longline fisheries on green 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 regarding fishery mitigation techniques in Papua New Guinea, Marshall Islands, Indonesia, Vietnam, and New Caledonia.
- Supported surveys 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.
- Supported a capacity building project for the Federated States of Micronesia National Ocean Resources Management Authority and the tuna longline industry to provide training on handling fishery-sea turtle interactions and on providing a foundation for future management activities.
- Supported an observer program in the Chilean swordfish-directed longline fishery and provided circle hooks and technical support for experimental testing of modified gear.
- Collaborated with foreign partners to export technologies through education and outreach and fishing gear experiments in Ecuador, Mexico, Guatemala, Costa Rica, Peru, Brazil, Columbia, Chile, Korea, Thailand, Hawaii, Japan, Philippines, Spain, Vietnam, Indonesia, and the Mediterranean.
- Tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries in collaboration with Japan.
- 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.
- Conducted fishery mitigation experiments, including testing “stealth gear”, blue-dyed bait, deep day-time fishing, and new circle hook designs (barbless and whisker) in Hawaiian longline and shoreline fisheries, and longline fisheries in Costa Rica, Brazil, Guatemala, and the Azores.
- Conducted turtle behavior and physiology research to understand longline gear and bait interactions and gear mitigation options, including contracting the development of computer and physical models of the biomechanics of turtle biting to study hook ingestion and resulting injuries.

- Conducted comparative studies using satellite telemetry and oceanographic research techniques of foraging, migration, and pelagic habitat use of green turtles caught as bycatch in the Hawaii-based longline fishery versus turtles captured by other methods.
- Supported education and collaborative work with Mexican halibut set gillnet and bottom-set longline fisheries in Baja California to reduce turtle bycatch.
- Continued turtle excluder device (TED) outreach and training efforts with various foreign governments
- Supported the development of a Turtle Research Database System in collaboration with six international agencies.
- Participated in the Indian Ocean Memorandum of Understanding on the Conservation and Management of Marine Turtles of the Indian Ocean and Southeast Asia.
- Participated in the Inter-American Convention for the Protection and Conservation of Sea Turtles.

Atlantic Ocean:

- Identified stock structure of nesting turtles using DNA analysis, flipper tagging, and satellite telemetry.
- Conducted population identification of turtles caught as bycatch in fisheries, foraging turtles, 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.
- Identified habitat requirements using stable isotope analysis.
- Continued coordination and support of the Sea Turtle Stranding and Salvage Network in the Atlantic and Gulf of Mexico.
- Conducted long-term monitoring and research of potential causes of and threats posed by fibropapillomatosis.
- Continued U.S. longline fishery observer program to monitor, report, and estimate green turtle bycatch.
- Continued vital population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes, and expanded the Network's coverage on the eastern shore of Chesapeake Bay in Virginia.
- Performed fresh-dead necropsies and sample analyses for turtles stranded in Virginia
- Implemented a Sea Turtle Disentanglement Network in the Atlantic Northeast Region to address sea turtle entanglement in pot and other fishing gear.
- Developed and tested gear technologies to reduce sea turtle bycatch, including modifications to scallop dredges and pound net leaders.
- Required the use of chain mats on scallop dredges in the mid-Atlantic from May 1 to November 30 to reduce the severity of sea turtle interactions with this gear.
- Required modified pound net leaders in the Virginia pound net fishery from May 6 to July 15 to reduce bycatch.
- Supported sea turtle-pot fishery interaction study in Virginia waters.
- Supported in-water population studies in the Maryland portion of Chesapeake Bay.
- Supported a health assessment study on sea turtles incidentally captured in pound nets in Long Island, New York.
- 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.

- Developed a Geographic Information System for the Atlantic and Gulf of Mexico that includes data layers on sea turtle sightings, fishing effort, sea turtle bycatch, and oceanographic conditions.
- Conducted gear research to develop TEDs suitable for use in non-shrimp trawl fisheries, such as the flynet, whelk, and scallop trawl fisheries.
- Continued TED outreach and training efforts with various foreign governments.
- Participated in the Inter-American Convention for the Protection and Conservation of Sea Turtles.

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.
- 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 wherever the distribution of sea turtles overlaps with the use of trawling gear known to take turtles.
- Build capacity in foreign nations to establish and maintain conservation, research, and monitoring programs.
- Further identify stock structure of nesting populations in the South Pacific region using DNA analysis.

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 five. This represents a moderate magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

Hawksbill Sea Turtle (*Eretmochelys imbricata*)

Date Listed: June 2, 1970

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, St. Croix, the U.S. Virgin Islands), and a few have begun to improve (Mona Island, Puerto Rico) or stabilize 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 coral reef habitats that provide critically important foraging and resting areas.

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

- Direct take of all life stages (including eggs).
- 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, which can result in marine habitat destruction via both direct and indirect effects.
- Marine debris – 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 common.
- 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 polychlorinated biphenyls [PCBs]) in the marine environment have been detected in turtles and their eggs.

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

Pacific/Indian Ocean:

- Supported nesting beach monitoring in the main Hawaiian Islands.
- Controlled non-native predators of eggs and hatchlings in the main Hawaiian Islands
- Supported satellite and radio telemetry studies of post-nesting females in the main Hawaiian Islands.
- Supported capacity building of the American Samoa Department of Marine and Wildlife Resources for nesting beach and in-water monitoring.
- Conducted nesting beach and in-water monitoring in the Commonwealth of Northern Mariana Islands.
- Supported capacity building of the Guam Department of Agriculture, Division of Aquatic and Wildlife Resources for nesting beach monitoring.
- Supported nesting beach monitoring and tagging of nesting females on the outer islands of Yap State, Federated States of Micronesia.
- Supported capacity building for the Republic of Palau, Division of Marine Resources to establish a monitoring system and conduct baseline studies of turtles and their habitats.
- Supported the Marshall Islands Sea Turtle-Fisheries Interaction Outreach Education project to build sea turtle conservation and management capacity of the Marshall Islands Marine Resources Authority.
- 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-turtle interaction mitigation techniques in Papua New Guinea, Indonesia, Vietnam, Marshall Islands and New Caledonia.
- 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.
- Supported a sea turtle data collection and skin sampling (for subsequent DNA analysis) project conducted by Women United Together in the Marshall Islands.
- Convened the Annual Hawaii Hawksbill Turtle Recovery Implementation meeting in June 2006.
- 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.
- Participated in the Inter-American Convention for the Protection and Conservation of Sea Turtles.
- Participated in the Indian Ocean Memorandum of Understanding on the Conservation and Management of Marine Turtles of the Indian Ocean and Southeast Asia.

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).
- Identified population structure of nesting turtles in St. Croix, the U.S. Virgin Islands; Costa Rica; Nicaragua; and Guadeloupe using DNA analysis.
- Conducted population identification of foraging turtles from St. Croix, 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.

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 one. 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

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. A few Kemp's ridley nests are found along Texas beaches each year. 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 12,143 nests documented in 2006 (Figure 3). 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.

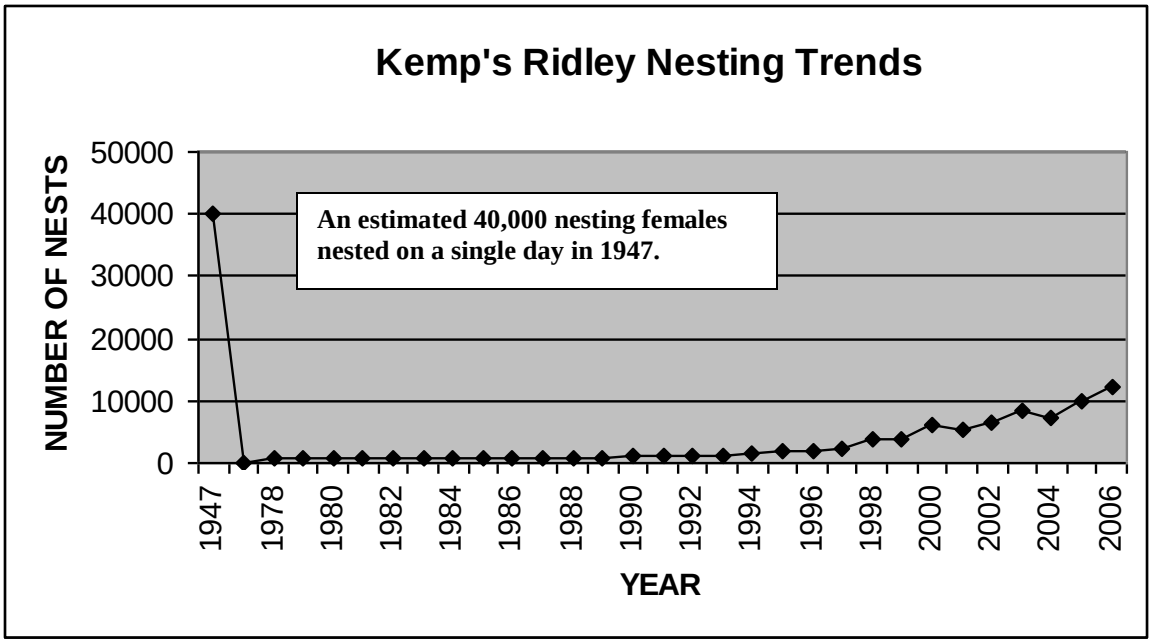


Figure 3. Kemp's ridley nesting trends in Mexico, 1978 - 2006. The 1947 point is a single reference point representing nesting females on a single day, the total nests over the entire 1947 nesting season is believed to be much higher.

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 – 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 common.
- Dredging, which 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 polychlorinated biphenyls (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 2004–2006 for recovery of the Kemp's ridley turtle include the following:

- Identified stock structure of nesting turtles at Padre Island, Texas and Rancho Nuevo, Mexico using DNA analysis.
- Supported infrastructure maintenance at nesting beach camps in Mexico.
- Supported research on relocated nests versus nest left in place to guide future conservation efforts.
- Supported surveys for stranded turtles in the state of Tamaulipas, Mexico and purchased tag readers and other equipment for researchers to identify and track nesting females and stranded turtles.
- Continued vital work through the Sea Turtle Stranding and Salvage Network, including collecting age samples for analysis at the National Sea Turtle Aging Laboratory.
- Implemented a Sea Turtle Disentanglement Network in the Northeast Region.
- Expanded stranding coverage on the eastern shore of Chesapeake Bay in Virginia.
- Performed fresh-dead necropsies and sample analyses for turtles stranded in Virginia.
- Supported the New England Aquarium and Wellfleet Audubon rescue and rehabilitation of cold stun turtles.

- Required the use of chain mats on scallop dredges in the mid-Atlantic from May 1 to November 30 to reduce the severity of sea turtle interactions with this gear.
- Required modified pound net leaders in the Virginia pound net fishery from May 6 to July 15 to reduce bycatch.
- Supported in-water population studies in the Maryland portion of Chesapeake Bay.
- Supported a health assessment study on sea turtles incidentally captured in pound nets in Long Island, New York.
- Supported sea turtle-pot fishery interaction study in Virginia waters.
- Conducted gear research to develop TEDs suitable for use in non-shrimp trawl fisheries such as the flynet, whelk, and scallop trawl fisheries.
- 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.
- Developed a Geographic Information System for the Atlantic and Gulf of Mexico that includes data layers on sea turtle sightings, fishing effort, sea turtle bycatch, and oceanographic conditions. This tool will enable NMFS to identify and focus efforts in areas where sea turtle bycatch is highest.
- Continued TED outreach and training efforts with various foreign governments.

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.

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

Leatherback Sea Turtle (*Dermochelys coriacea*)

Date Listed: June 2, 1970

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. Leatherbacks were extirpated from Malaysia in recent years, 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 in the Marine Environment:
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 common.
- Marine debris – Leatherbacks can ingest a wide variety of marine debris and effects include interference with metabolism as well as absorption of toxic by-products.
- Entanglement – Leatherbacks 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 2004–2006 for recovery of the leatherback turtle include the following:

Pacific/Indian Ocean:

- Conducted monitoring (aerial surveys) for foraging leatherbacks off central and northern California and the Pacific Northwest.
- Described the distribution and abundance of leatherback turtles within the coastal California ecosystem.
- Conducted capture/tagging/tracking of foraging leatherbacks off Monterey, California.
- Identified stock structure of nesting turtles using DNA analysis, flipper tagging, and satellite telemetry.
- Conducted population identification of turtles caught as bycatch in fisheries, foraging turtles, and stranded turtles, using DNA analysis, flipper tagging, and satellite telemetry.
- Completed a mixed stock analysis of leatherback turtles along the California coast.
- Continued vital population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes.
- Evaluated leatherback turtle population trends and designed and evaluated conservation strategies via stochastic simulation models.
- Supported monitoring and protection of leatherbacks nesting in Mexico and Costa Rica. Currently, all primary nesting beaches in Mexico are protected (although egg poaching still exists), and secondary nesting beaches are partially protected.
- Supported aerial surveys of leatherback nesting beaches in Mexico.
- Conducted aerial surveys to determine abundance of nesting leatherback turtles in Papua New Guinea, Indonesia, Solomon Islands, and Latin America.
- Conducted aerial surveys and ground monitoring of leatherback nesting beaches and provided technical and management support to the leatherback project in Papua New Guinea.
- Attached satellite tags to turtles in Papua New Guinea, Indonesia, Solomon Islands, and Latin America to gather information regarding migratory movements and pelagic habitat use.
- 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 an observer program in Chilean swordfish-directed longline fishery and provided circle hooks and technical support for experimental testing modified gear.
- Supported an observer program in Peru to document the threat of shark and mahi mahi longline fisheries on leatherback turtles and to document the direct harvest of leatherbacks.
- Investigated post-hooking survival of turtles caught as bycatch in longline fisheries in Hawaii, Costa Rica, and Brazil using satellite tagging.
- 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; requiring proper handling of hooked and entangled leatherbacks; and requiring use of disentangling and de-hooking equipment such as dip nets, line cutters, and de-hookers.

- Conducted fishery mitigation experiments including testing "stealth gear", blue-dyed bait, deep day-time fishing, and new circle hook designs (barbless and whisker) in Hawaiian longline and shoreline fisheries, and longline fisheries in Costa Rica, Brazil, Guatemala, and the Azores.
- Conducted turtle behavior and physiology research to understand longline gear and bait interactions and gear mitigation options, including contracting the development of computer and physical models of the biomechanics of turtle biting to study hook ingestion and resulting injuries.
- Supported a capacity building project for the Federated States of Micronesia National Ocean Resources Management Authority and the tuna longline industry to provide training on handling fishery-sea turtle interactions and on providing a foundation for future management activities.
- Promoted "best practice technologies" in the major longline fleets of the Pacific.
- 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.
- Tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries in collaboration with Japan.
- 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 a trial observer program in Indonesian longline and trawl fisheries.
- 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.
- Reduced turtle interaction rates in the U.S. California/Oregon drift gillnet fisheries for swordfish and thresher shark by implementing and enforcing a time/area closure in central and northern California in time/area of high leatherback concentrations.
- Supported the Marshall Islands Sea Turtle-Fisheries Interaction Outreach Education project to build sea turtle conservation and management capacity of the Marshall Islands Marine Resources Authority.
- Supported development of a collaborative framework between U.S. research institutions to combine aerial survey data to understand links between leatherback foraging ecology, their physical and biological environment, and climate processes.
- Supported development of a collaborative framework to combine North Pacific-wide telemetry data with independent oceanographic data sets to understand movements in relation to physical and biological environments and climate processes.
- Evaluated the cost-effectiveness of alternative conservation strategies for leatherback turtles with a focus on nesting site protection.
- Supported War-mon Nesting Beach Project in Papua Indonesia.
- Supported monitoring and protection of leatherback nesting beaches in the western Pacific, including education of local villagers on the importance of conservation of leatherbacks. Locations included Papua New Guinea ("no harvest" moratorium set up on Kamiali Beach in 2003; monitoring index beaches and tagging females), Indonesia (ongoing monitoring and protection, tagging, and telemetry), Solomon Islands (new

monitoring), and Vanuatu (monitoring and protection of known leatherback nesting beach; surveying for other possible leatherback nesting beaches).

- Supported work with Kei Islands villagers to reduce and/or eliminate direct harvest of adult leatherbacks in marine and coastal habitats (e.g., quantified socioeconomic parameters, established a harvest baseline, and addressed alternative means of livelihood)
- Conducted a socio-economic study and outreach and education for the Papua New Guinea leatherback project.
- Supported a resource economist to review current efforts to optimize sea turtle conservation and management efforts.
- Investigated costs of establishing an endowment for the long-term protection of the Arnavon Islands in the Solomon Islands.
- Worked cooperatively with Canada to identify and address threats to leatherback turtles in Canadian waters and contributed to the development of recovery plans for leatherback turtles in Canada.
- Supported research to identify sustainable land-based conservation activities for leatherback turtles in the Solomon Islands and Indonesia.
- 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.
- Participated in the Indian Ocean Memorandum of Understanding on the Conservation and Management of Marine Turtles of the Indian Ocean and Southeast Asia.
- Participated in preparatory meetings, signing meeting and provided comments on the text of the Tri-National Partnership on the Conservation and Management of Western Pacific Leatherback Turtles Memorandum of Understanding between Papua New Guinea, Solomon Islands and Indonesia.

Atlantic Ocean:

- Continued vital population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes.
- Assessed population status through data collection at nesting beaches.
- Identified stock structure of nesting turtles using DNA analysis, flipper tagging, and satellite telemetry.
- Conducted population identification of turtles caught as bycatch in fisheries, foraging turtles, and stranded turtles, using DNA analysis, flipper tagging, and satellite telemetry.
- Supported research and monitoring of one of the largest seasonal foraging populations of leatherbacks in the Atlantic, found in Canada.
- Worked cooperatively with Canada to identify and address threats to leatherback turtles in Canadian waters, and contributed to the development of recovery plans for leatherback turtles in Canada.
- Implemented a Sea Turtle Disentanglement Network in the Atlantic Northeast Region to address sea turtle entanglement in pot and other fishing gear.
- Developed and tested gear technologies to reduce sea turtle bycatch including modifications to scallop dredges and pound net leaders.
- Required the use of chain mats on scallop dredges in the mid-Atlantic from May 1 to November 30 to reduce the severity of sea turtle interactions with this gear.

- Required modified pound net leaders in the Virginia pound net fishery from May 6 to July 15 to reduce bycatch.
- Supported sea turtle-pot fishery interaction study in Virginia waters.
- Conducted gear research to develop TEDs suitable for use in non-shrimp trawl fisheries, such as the flynet, whelk, and scallop trawl fisheries.
- Convened a Leatherback Turtle Expert Working Group with national and international participants to gather and assess the latest, most complete data available on Atlantic leatherback nesting and population information.
- 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.
- Developed a Geographic Information System for the Atlantic and Gulf of Mexico that includes data layers on sea turtle sightings, fishing effort, sea turtle bycatch, and oceanographic conditions. This tool will enable NMFS to identify and focus efforts in areas where sea turtle bycatch is highest.
- Continued TED outreach and training efforts with various foreign governments.
- Participated in the Inter-American Convention for the Protection and Conservation of Sea Turtles.

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

- Reduce bycatch in commercial and artisanal fisheries.
- Support nations in monitoring and implementing management measures to reduce sea turtle interactions 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, especially estimates of population size and structure.
- Identify all key nesting beaches in Papua New Guinea, Solomon Islands, and Indonesia.
- Provide education/outreach to reduce harvest of eggs and turtles.
- Develop a strategy to document and address the critical problem of entanglement in fixed pot gear off New England, throughout the Gulf of Maine, and wherever else the use of pot gears overlaps with sea turtle distribution.
- Support nesting beach management/census programs to promote increased hatchling production.
- Support research to determine migration pathways and identify important foraging grounds in the Atlantic.
- Implement regulations in the United States requiring the use of TEDs wherever the distribution of sea turtles overlaps with the use of trawling gear known to take turtles.

Recovery Priority Number: 1
The recovery priority number for the leatherback sea turtle is one. 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

Legal Status: Threatened

Recovery Plan Status:
Pacific: A final recovery plan was approved on January 12, 1998.
Atlantic: A final recovery plan was approved on December 26, 1991. A revised plan is currently under development.

Species Status:
In the Pacific, loggerhead nesting populations are at best stable, if not declining, at the major nesting areas in Japan and Australia. No more than 2,000 females are estimated to nest annually in the Pacific (Table 2, Figure 4) (note: females deposit multiple nests within a nesting season). There is no loggerhead nesting in the U.S. Pacific. 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 U.S. 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 to 2,000 loggerhead nests have been documented annually in recent years, and nesting has been declining.

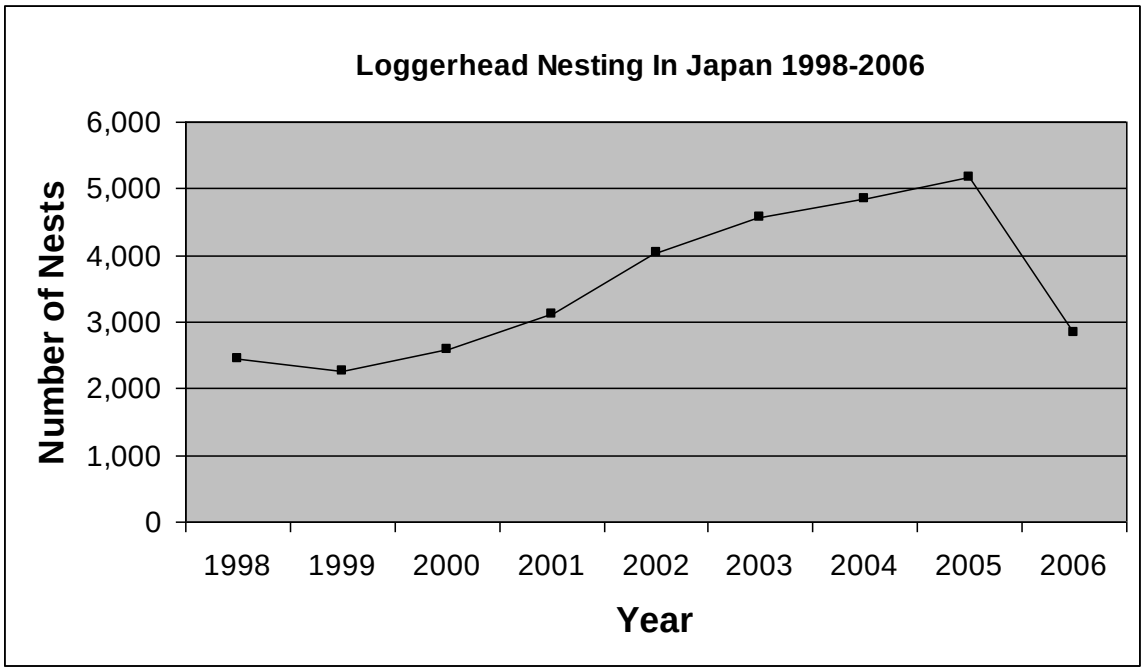


Figure 4. Annual loggerhead nests documented on Japanese beaches, 1988 - 2006.[2]

[2] Data from 1998-2002 are from Kinan (2006); data from 2003-2006 were presented at the Sea turtle Association of Japan's 17th Annual Sea turtle Symposium, Kumano, Japan, November 2006.

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

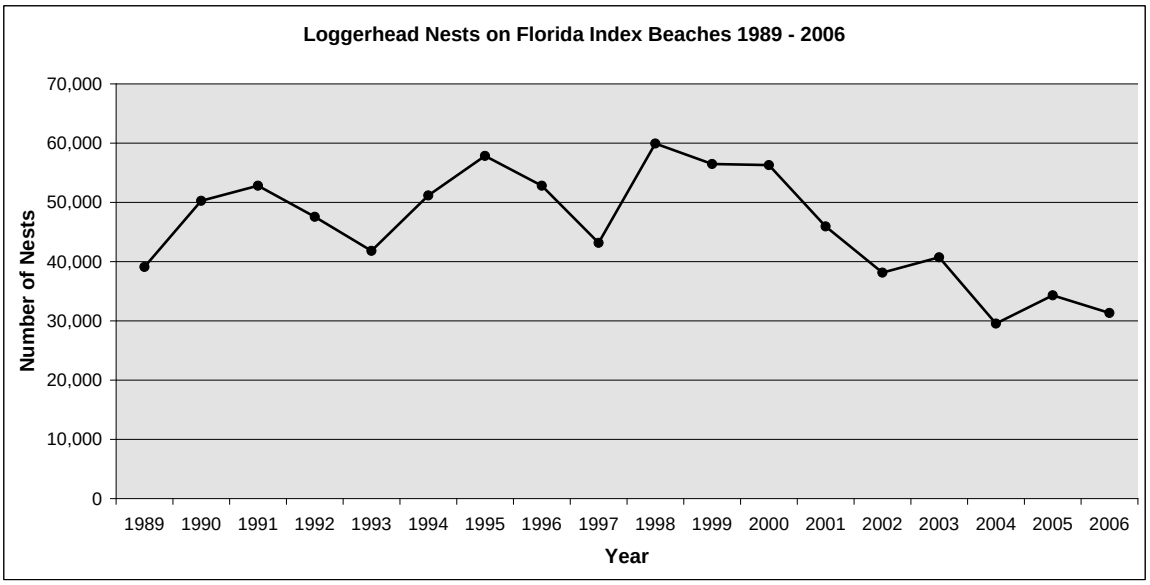


Figure 5. Number of loggerhead nests documented on Florida core index beaches, 1989 - 2006.

Threats and Impacts in the Marine Environment:

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

- Incidental catch in commercial and artisanal fisheries – Some fisheries known to interact with loggerheads include trawl, gillnet, longline, purse seine, pound net, dredge, and pot/trap fisheries.
- Directed take of immature loggerheads outside the U.S.
- Marine debris – Loggerheads can ingest a wide variety of marine debris and effects include interference with metabolism as well as absorption of toxic by-products.
- Entanglement - Loggerheads can become entangled in marine debris, such as "ghost" fishing gear and discarded shipping and packing materials.
- 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, many resulting in death, are common.

[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.

- Power plant entrainment and entrapment, primarily along the U.S. Atlantic coast.
- Limitation of prey – Overfishing may lead to reduction of key prey species for loggerheads.
- 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.
- Dredging, which can result in marine habitat destruction via both direct and indirect effects and hopper dredges can entrain and kill turtles.
- 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 loggerhead turtle include the following:

Pacific/Indian Ocean:

- Conducted aerial surveys to collect the distribution and abundance data necessary for population assessments of loggerheads.
- Performed aerial surveys in Baja California to quantify population density and habitat use of loggerhead turtles in off-shore waters of Baja.
- Identified stock home ranges and conducted population identification of foraging and stranded loggerheads and loggerheads caught as bycatch using DNA analysis.
- Reported on the feasibility of using photogrammetry to determine abundance, size, and sex of loggerheads in Baja California. Photogrammetry is the measurement of objects using photographs or electronically stored imagery.
- Supported monitoring and protection efforts of nesting beaches in Japan (Minabe-Senri and Hii-Horikiri beaches, and Maehama and Inakahama beaches on Yakushima Island).
- Supported loggerhead nesting beach management at five sites at Staj Beach, Japan.
- Estimated mortality from human activities in the Pacific ocean from NMFS observer data in the Hawaii-based longline fishery, California/Oregon drift gillnet fishery, and ongoing studies in Baja California, Mexico.
- Supported education and collaborative work with Mexican halibut set gillnet and bottom-set longline fisheries in Baja California to reduce take of turtles.
- Reduced 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 loggerheads; requiring the use of disentangling and de-hooking equipment such as dip nets, line cutters, and de-hookers; and implementing closures.
- Supported an observer program in the Chilean swordfish–directed longline fishery and provided circle hooks and technical support for experiments testing modified gear.
- Supported an observer program in Peru to document the threat of shark and mahi mahi longline fisheries on loggerhead turtles.
- Used satellite telemetry to conduct research to investigate post-hooking survival of turtles included in the bycatch of longline fisheries in Hawaii, Costa Rica, and Brazil.

- Conducted fishery mitigation experiments including testing "stealth gear," blue-dyed bait, deep day-time fishing, and new circle hook designs (barbless and whisker) in Hawaiian longline and shoreline fisheries, and longline fisheries in Costa Rica, Brazil, Guatemala, and the Azores.
- Conducted turtle behavior and physiology research to understand longline gear and bait interactions and gear mitigation options, including contracting the development of computer and physical models of the biomechanics of turtle biting to study hook ingestion and resulting injuries.
- Investigated migration routes and preferred oceanic habitats by attaching satellite transmitters and tracking loggerheads from nesting beaches in Japan, from post-release in U.S. longline gear, and from foraging grounds off Baja California (Mexico).
- Supported the development of a Turtle Research Database System in collaboration with six international agencies.
- Evaluated loggerhead turtle population trends and designed and evaluated conservation strategies via stochastic simulation models.
- Conducted comparative studies of loggerhead turtle foraging, migration, and pelagic habitat use of turtles caught in the Hawaii-based longline fishery versus turtles caught via other situations using satellite telemetry and oceanographic research.
- Tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries in collaboration with Japan.
- 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 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.
- Supported the Marshall Islands Sea Turtle-Fisheries Interaction Outreach Education project to build sea turtle conservation and management capacity of the Marshall Islands Marine Resources Authority.
- Continued vital population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes.
- Supported a loggerhead turtle cooperative research and management workshop in March 2005 to facilitate recovery of loggerhead turtles and guide conservation efforts in the Pacific Ocean.
- Participated in the Indian Ocean Memorandum of Understanding on the Conservation and Management of Marine Turtles of the Indian Ocean and Southeast Asia.
- Supported evaluation of the 2005 tsunami's effect on sea turtles in Thailand.
- Participated in the Inter-American Convention for the Protection and Conservation of Sea Turtles.
- Continued TED outreach and training efforts with various foreign governments.

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.

- Developed a Geographic Information System for the Atlantic and Gulf of Mexico that includes data layers on sea turtle sightings, fishing effort, sea turtle bycatch, and oceanographic conditions.
- Conducted gear research to develop TEDs suitable for use in non-shrimp trawl fisheries such as the flynet, whelk, and scallop trawl fisheries.
- Continued TED outreach and training efforts with various foreign governments.
- Developed gear technologies to reduce sea turtle bycatch including modifications to scallop dredges and pound net leaders.
- Required the use of chain mats on scallop dredges in the mid-Atlantic from May 1 to November 30 to reduce the severity of sea turtle interactions with this gear.
- Estimated bycatch of loggerheads in the Atlantic sea scallop dredge fishery.
- Required modified pound net leaders in the Virginia pound net fishery from May 6 to July 15 to reduce turtle bycatch.
- Supported in-water population studies in the Maryland portion of Chesapeake Bay.
- Supported a health assessment study on sea turtles incidentally captured in pound nets in Long Island, New York.
- Estimated loggerhead bycatch in the mid-Atlantic bottom otter trawl fishery, 1996-2004.
- Supported sea turtle-pot fishery interaction study in Virginia waters.
- Implemented a Sea Turtle Disentanglement Network in the Atlantic Northeast Region to address sea turtle entanglement in pot and other fishing gear.
- Continued vital population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes, and expanded the Network coverage on the eastern shore of Chesapeake Bay in Virginia.
- Performed fresh-dead necropsies and sample analyses for turtles stranded in Virginia.
- Supported a comprehensive investigation of a mass stranding event related to red tide in southwest Florida.
- Identified stock structure of nesting females using DNA analysis and flipper tagging.
- Conducted population identification of loggerheads using DNA analysis.
- Supported assessment, monitoring, and mitigation of hurricane impacts on sea turtles in Florida.
- Participated in the Inter-American Convention for the Protection and Conservation of Sea Turtles.

Priority Recovery Actions Needed:

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

- Reduce incidental capture of loggerheads in 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.
- Reduce bycatch of loggerheads in the Mexican halibut set gillnet fishery.
- Reduce threats to loggerhead population and foraging habitat from marine pollution.
- Improve and refine estimation techniques for takes of sea turtles to ensure recovery criteria are met.
- Improve and refine population estimates by implementing additional in-water studies to determine and monitor population trends.
- Promote best management practices for nesting beaches in Japan.

- Implement regulations in the United States requiring the use of TEDs wherever the distribution of loggerhead sea turtles overlaps with the use of trawling gear known to take turtles.
- Improve understanding of the effects of commercial fishery harvest of key loggerhead prey species.

Recovery Priority Number: 5
The recovery priority number for the loggerhead sea turtle is five. 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

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.

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[1]
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[2]
Indonesia	Scattered	Unknown
Malaysia	Scattered	Declining

[1] 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.
[2] 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* (mass nestings of turtles) have been documented in recent years.

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

- Direct harvest.
- Incidental take in commercial and artisanal fisheries – Fisheries known to interact with olive ridleys, include gillnets (Chilean artisanal driftnet fishery for swordfish, Taiwanese coastal set net and gillnet fishery), longline fisheries (U.S. longline fleet for

swordfish/tuna, Costa Rican longline fleet for mahi mahi), purse seine fisheries (U.S. and non-U.S. tuna purse seine fleet in the eastern tropical Pacific Ocean), trawl fisheries (Costa Rican Pacific shrimp trawl fishery, Indian coastal trawl fisheries), and Peruvian artisanal fisheries (gillnets and hook and line).

- 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.
- 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:

- Continued TED outreach and training efforts with various foreign governments.
- Conducted fishery mitigation experiments including testing "stealth gear", blue-dyed bait, deep day-time fishing, and new circle hook designs (barbless and whisker) in Hawaiian longline and shoreline fisheries, and longline fisheries in Costa Rica, Brazil, Guatemala, and the Azores.
- Conducted turtle behavior and physiology research to understand longline gear and bait interactions and gear mitigation options, including contracting the development of computer and physical models of the biomechanics of turtle biting to study hook ingestion and resulting injuries.
- Reduced interaction rates and mortality rates in U.S. Pacific swordfish-directed longline fleets by requiring large circle hooks combined with non-squid bait; requiring proper handling of hooked and entangled loggerheads; and requiring use of disentangling and de-hooking equipment such as dip nets, line cutters, and de-hookers.
- 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.
- In collaboration with Japan, tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries.
- 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 surveying 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.
- 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.
- Identified home ranges and conducted population identification of fisheries bycatch using DNA analysis.
- Surveyed population abundance and collected data on size, diet, and distribution of olive ridleys in the eastern tropical Pacific during NOAA research cruises.

- Analyzed results of abundance estimates of olive ridley turtles in the Eastern Tropical Pacific Ocean between 1992 and 2003 for peer reviewed publication.
- Prepared a proposal to characterize the effects of inter-annual and El Niño-Southern Oscillation-scale temporal variability on olive ridley prey distribution and abundance in the Eastern Tropical Pacific.
- Supported the Marshall Islands Sea Turtle-Fisheries Interaction Outreach Education project to build sea turtle conservation and management capacity of the Marshall Islands Marine Resources Authority.
- Participated in the Indian Ocean Memorandum of Understanding on the Conservation and Management of Marine Turtles of the Indian Ocean and Southeast Asia.
- Participated in the Inter-American Convention for the Protection and Conservation of Sea Turtles.
- Supported the development of a Turtle Research Database System in collaboration with six international agencies.

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

- 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.
- Build capacity of foreign nations to monitor and reduce bycatch in pelagic and coastal fisheries.

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 five. This represents a moderate magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

PACIFIC SALMON RECOVERY

Overview for 2004–2006

Evolutionarily Significant Units Listed Under the ESA

Twenty six "species" – distinct population segments (DPS) or evolutionarily significant units (ESU)[4] – of Pacific salmon and steelhead are currently protected under the ESA (see "Listing Actions" below). Of these 26 species, five are listed as endangered and 21 as threatened. Sixteen 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). In addition, on March 29, 2006, NMFS proposed to list the Puget Sound steelhead DPS as threatened.

Table 4. ESA Listing Status of 16 Pacific Salmon ESUs and 11 West Coast Steelhead DPSs.

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	*Proposed 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	*Threatened*
	Middle Columbia River steelhead	*Threatened*
	Snake River Basin steelhead	*Threatened*
	Snake River sockeye	*Endangered*
S. Oregon/N. California Coast	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*

[4] 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 the U.S. Fish and Wildlife Service. The two forms delineate separate DPSs, and NMFS has listed the anadromous DPSs specified above as endangered or threatened pursuant to the ESA.

Figures 6 and 7 show the distribution of all Pacific Chinook, sockeye, chum and coho salmon ESUs and steelhead DPSs. Although Figure 6 and Figure 7 include all Pacific salmon ESUs and steelhead DPSs, this report discusses only those that are listed under the ESA.

Recovery Planning Efforts for Pacific Salmon and Steelhead

Recovery planning is active for every listed species of Pacific salmon. 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. The agency has established a recovery planning process to include local involvement and capitalize on these ongoing efforts to the extent practicable.[5]

To develop recovery plans meeting ESA statutory requirements as well as goals for local involvement, NMFS organized the 26 listed species into eight recovery areas or "domains." Recovery domains in the Northwest Region are the Puget Sound, Willamette/Lower Columbia, Interior Columbia, and Southern Oregon/Northern California Coast; 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 8). 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; provide scientific support to local and regional recovery planning efforts; and provide scientific evaluations and peer review of recovery plans. In the Northwest Region, the TRTs have developed either draft or final viability criteria for all listed species except SONCC coho.

In all of the Northwest Region's recovery domains except Idaho, local stakeholder 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 that is 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, assess limiting factors, and prioritize and sequence actions to address the limiting factors. Table 5 summarizes the status of local and species-level ESA recovery plans and TRT products.

In January 2007, the Puget Sound Salmon Recovery Plan was completed, which includes management strategies for the threatened Puget Sound Chinook salmon ESU.

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

Figure 6. Distribution of Pacific Chinook Salmon ESUs and Steelhead DPSs.

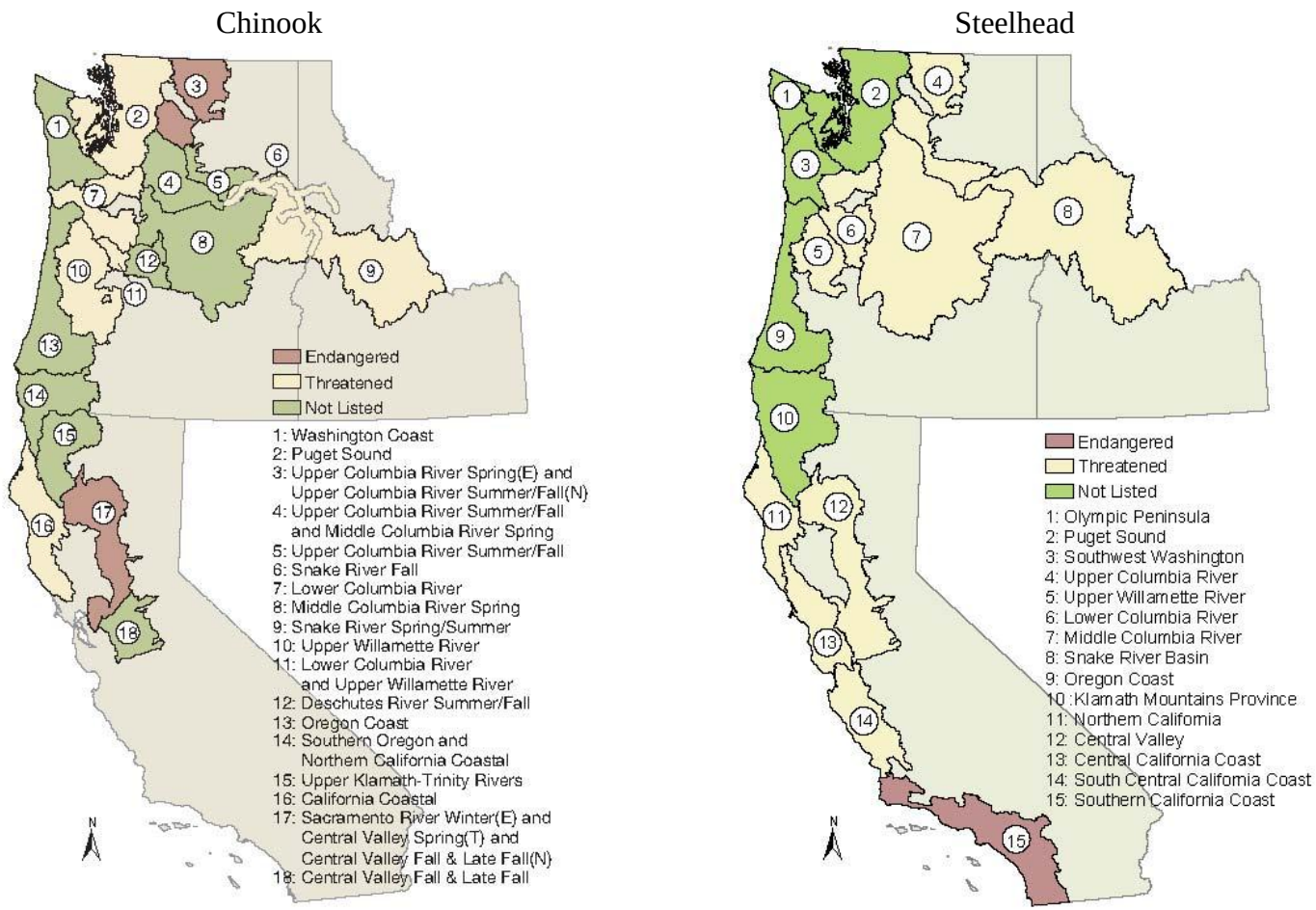


Figure 7. Distribution of Pacific Sockeye, Chum, and Coho Salmon ESUs.

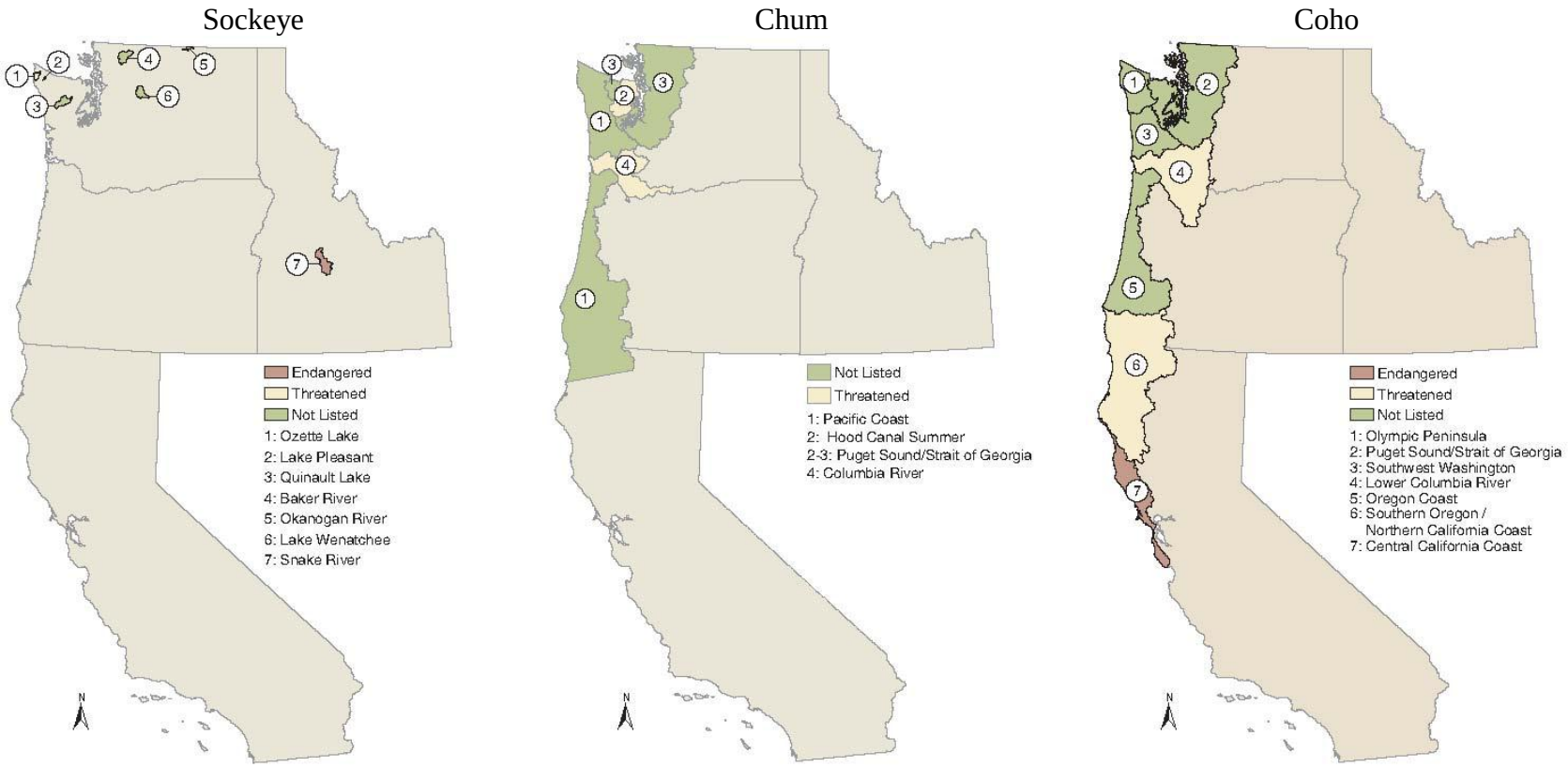
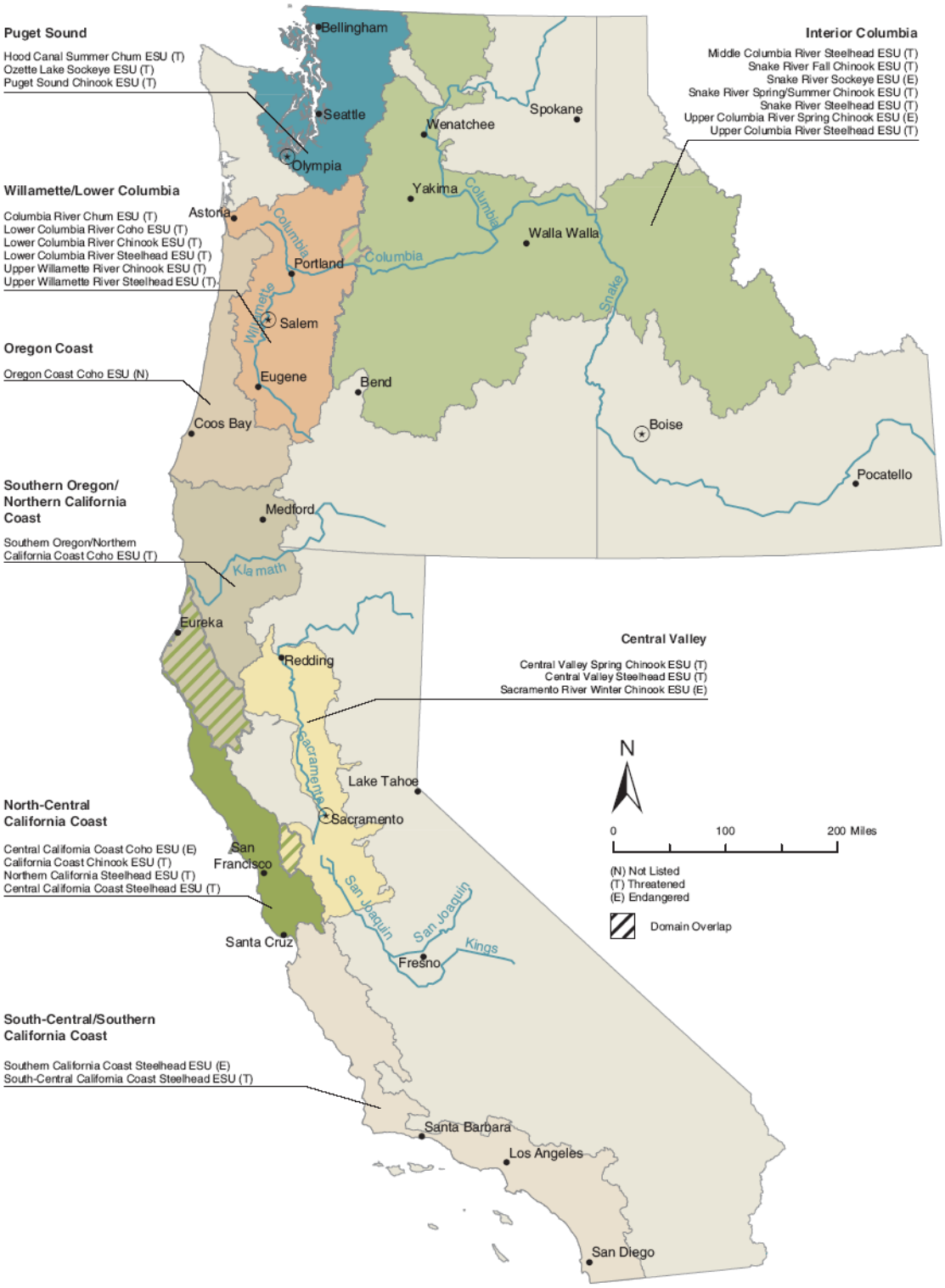


Figure 8. Recovery Domains in the Northwest Region and Southwest Region.



Listing Actions

On June 28, 2005, NMFS issued final ESA listing determinations for 16 West Coast salmon ESUs (70 FR 37160). On January 5, 2006, NMFS issued final listing determinations for 10 DPSs of West Coast steelhead (71 FR 834), and on January 19, 2006, determined that the Oregon Coast coho ESU, previously listed as threatened, does not warrant listing under the ESA (71 FR 3033). All ESUs and DPSs listed above were previously listed; the review and issuance of these determinations was precipitated by a 2001 court ruling involving Oregon Coast coho salmon (*Alsea Valley Alliance* v. *Evans*), which concluded NMFS had improperly implemented the provisions of the ESA by listing only part of an ESU (i.e., NMFS had included hatchery stocks in the ESU/DPS but had not listed them). Although this ruling applied directly only to Oregon Coast coho salmon, the same circumstances (i.e., hatchery stocks not listed but still considered part of the listed species) also applied to nearly all of NMFS' previous listing determinations. Informed by the court's ruling in *Alsea*, hatchery programs considered part of an ESU or DPS were included in the 2005 and 2006 updated listing determinations. Fish from approximately 140 hatchery programs are included in the listings of the Northwest Region ESUs and DPSs, and approximately 20 are included in the listings of the Southwest Region ESUs and DPSs. As part of the updated listing determinations for West Coast salmon and steelhead, NMFS also issued protective regulations for the threatened ESUs and DPSs that make it legal to take marked hatchery salmon without violating the ESA. Doing so is consistent with current salmon management practices and allows hatchery-based fisheries to continue while conserving depleted natural populations of salmon.

In addition to these final listing decisions, on March 29, 2006, the Northwest Region proposed to list the Puget Sound steelhead DPS as a threatened species (71 FR 15666). Table 4 (above) provides a complete roster of West Coast salmon and steelhead currently listed or proposed for listing under the ESA.

Critical Habitat

NMFS is responsible for designating critical habitat for threatened and endangered salmon and steelhead. As a result of a challenge to its previous designations (*National Association of Homebuilders v. Evans*), in particular the economic impacts of designation, NMFS formally withdrew existing designations for 19 species of salmon/steelhead in September 2003. Critical habitat designations remained in place for four Northwest Region ESUs not subject to the consent decree (Snake River sockeye, Southern Oregon/Northern California Coast coho, Snake River spring/summer Chinook, and Snake River fall Chinook) and for three Southwest Region ESUs (Sacramento River winter-run Chinook, Central California Coast coho, and SONCC coho).

On September 2, 2005, NMFS published separate final rules to designate critical habitat for 12 ESUs and DPSs in the Northwest Region and 7 ESUs and DPSs in the Southwest Region.[6] The specific areas designated in the Northwest Region include approximately 20,630 miles (33,201 km) of lake, riverine, and estuarine habitat in the three northwestern states, as well as approximately 2,312 miles (3,721 km) of marine nearshore habitat in Puget Sound, Washington. The specific areas designated as critical habitat in the Southwest Region include approximately 8,935 miles (14,296 km) of riverine habitat and 470 square miles (1,212 sq km) of estuarine habitat within the geographic areas occupied by the listed species.

[6] See 70 FR 52630 (September 2, 2005) and 70 FR 52488 (September 2, 2005).

The final rules for both NMFS Regions include an analysis of the economic and other impacts of the designations and identify areas that were excluded from the final critical habitat designations, including Department of Defense sites, tribal lands, areas covered by specific Habitat Conservation Plans, and areas where the economic benefits of exclusion outweigh the benefits of designation. Other areas originally considered for exclusion, such as federal lands managed under the Northwest Forest Plan, were included in the final critical habitat designations. In the final rules, NMFS stated that it would continue to analyze whether these and other lands warrant exclusion from critical habitat designation based on a thorough evaluation of the associated land planning and management framework.

Species Status for Pacific Salmon

NMFS completed its most recent formal assessment of salmon and steelhead status in 2005 (based on data through 2001 or 2002, depending on the species). Consistent with statutory obligations, NMFS will complete the next status review in 2010. At that time, recovery plans and criteria should be in place for all listed species, and the recovery criteria will guide evaluation of ESU/DPS status.

In general, NMFS evaluates a species' status by assessing the abundance, productivity, spatial structure, and genetic diversity of its component populations. NMFS also evaluates the threats facing each population and synthesizes that information at the species scale.

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.[7] Recent abundance estimates are based on the most recent five years of available data. Estimates of recent trends (i.e., is an ESU increasing, decreasing, or remaining stable in abundance over time) are based on the most recent 12 years of available data. Also, the reported trends in abundance may reflect the influence of hatchery fish that spawn in the wild and thus do not necessarily indicate trends in the natural production upon which recovery goals are based. Thus, the trend is a useful but incomplete indicator of ESU status and will be placed in the context of additional indicators at the time of a formal status assessment.

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

[7] 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 twentieth century conditions) and they may have a considerable margin of error. These estimates were developed by NMFS using available information and professional judgment. Note that these estimates differ from historical abundance estimates in previous biennial reports, which were based on sources that varied considerably among ESUs and in terms of the timeframes they represented. Recent abundance estimates represent a 5-year geometric mean based on 2001-2005 or 2000-2004 ESU-level abundance estimates as compiled by NMFS. The sources of current abundance data also vary among and within ESUs, and the totals presented represent only rough estimates. Trends were estimated by calculating the median population growth rate (lambda) based on the most recent available12 years of ESU-level abundance estimates.

extraction, and other land uses), as well as timber harvest practices, hatchery practices,[8] 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.

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) "take" prohibitions (16 U.S.C. 1538(a)(1)(B)) apply to all species listed as endangered. ESA section 4(d) leaves it to the Secretary's discretion whether and to what extent to extend the statutory 9(a) take prohibitions to species listed as threatened, and directs the agency to issue regulations it considers necessary and advisable for the conservation of the species. These 9(a) prohibitions and 4(d) regulations apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. Under section 4(d), NMFS has tailored specific "limits" or exemptions from the take prohibitions applicable to threatened Pacific salmonids to authorize certain activities to proceed, provided that they are consistent with conservation and recovery needs..

Since 1997, NMFS has promulgated a total of 29 limits to the ESA Section 9(a) take prohibitions for 19 threatened salmon and steelhead ESUs (62 FR 38479, July 18, 1997; 65 FR 42422, July 10, 2000; 65 FR 42485, July 10, 2000; 67 FR 1116, January 9, 2002). The Northwest and Southwest Regions have approved hundreds of programs and activities under the 4(d) rule, ensuring that hatchery and harvest management plans, resource management plans, road maintenance activities, and tribal resource management plans benefit threatened West Coast salmonids. Although the 4(d) protective regulations promulgated between 1997 and 2002 were effective at protecting threatened salmonids and efficiently authorizing certain activities, several of the limits described therein were redundant, outdated, located disjunctively in the Code of Federal Regulations, or did not apply equally to all threatened salmonids. The resulting complexity of the 4(d) regulations unnecessarily increased the administrative and regulatory burden of managing protective regulations and generated confusion regarding activities eligible for exemptions from the take prohibitions under 4(d).

On June 28, 2005, as part of the final listing determinations for 16 West Coast salmon ESUs,

[8] Potential negative aspects of hatchery-bred fish include competition for food and altered genetic diversity of natural populations. 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 populations to support harvest and meet tribal treaty fishing rights.

NMFS amended and streamlined the previously promulgated 4(d) protective regulations for threatened salmon and steelhead (70 FR 37160, June 28, 2005). First, NMFS consolidated all of the previously promulgated 4(d) limits and applied the same set of 4(d) protective regulations to all threatened West Coast salmonids. Additionally, NMFS finalized an amendment whereby the 4(d) protective regulations apply to natural and hatchery fish with an intact adipose fin only, but do not apply to listed hatchery fish that have had their adipose fin removed prior to release into the wild. This change was necessary to ensure that fisheries and hatchery programs are managed consistent with the conservation needs of threatened salmonids. The 2005 amendments to the section 4(d) regulations for threatened salmonids ensure that they can be more efficiently and effectively accessed and interpreted by all affected parties, and provide certainty to non-federal parties conducting activities beneficial to listed salmonids that they are in compliance with the ESA.

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 2005 and FY 2006, the Northwest Region conducted 1,299 section 7 consultations, and the Southwest Region conducted 706. These consultations ensure federal actions are conducted in ways that are not likely 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 incidental 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. In FY 2005 and FY 2006, the Northwest Region approved, implemented, or provided technical assistance on 32 habitat conservation plans under ESA section 10 and issued one section 10(a)(1)(B) permit. The Southwest Region collaborated on 37 habitat conservation plans at various stages of development, review, or negotiation during the biennium and issued one permit during this time. Additionally, the Northwest Region issued 115 new and modified permits for scientific research and enhancement activities under section 10; the Southwest Region issued 27 such permits.

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, so the long-term goal of salmon recovery can be achieved. Since the program's inception in FY 2000, Congress has appropriated approximately $63 million per year for restoration projects in Washington, Oregon, California, and Idaho. The states have provided over 50 percent matching funds to these federal funds. Since FY 2000, over 6,400 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. The 2007 PCSRF Annual Report to Congress reports on the actions of the PCSRF from FY 2000 to November 30, 2006. The 2007 PCSRF report is currently under review, and will be available in late March or early April 2007. For additional information, please see the 2006 PCSRF Report to Congress, which is available online at http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm.

Salmon Recovery in the Northwest

Lower Columbia River Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: March 24, 1999; reaffirmed June 28, 2005

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 the plan for the Oregon portion of the ESU, which is under development. A draft plan for the full ESU is expected in mid-2007.

Technical Recovery Team Products:
The Willamette/Lower Columbia Technical Recovery Team has identified independent populations and completed population viability criteria and ESU recovery goals for this ESU.

Species Status:
The estimated historical abundance (circa 1900) of the Lower Columbia Chinook ESU is 430,000 – 560,000. Based on the most recent five years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 48,800, and recent mean natural abundance is estimated to be approximately 24,400. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had remained unchanged. 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 fish) for the ESU.

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 impacts.
- Harvest impacts to fall Chinook salmon.

Conservation Actions:
Major accomplishments for this ESU in 2004–2006 include the following:

- Hydropower operational changes and agreements for dam removal. NMFS continued implementation of the Cowlitz River Settlement Agreement, under Federal Energy Regulatory Commission re-licensing, and completed the Lewis River Settlement

Agreement and Clackamas River Hydroelectric Project Settlement Agreement. These agreements included reintroduction efforts into previously blocked habitat, improved flow releases, dam passage survival studies, plans for passage improvements, and habitat improvements. NMFS also began implementation of the Settlement Agreement for the Powerdale Hydroelectric Project, which will improve fish passage conditions in the Hood River and result in the removal of Powerdale Dam in 2010; and implementation of the Settlement Agreement for the Bull Run Hydroelectric Project, which will result in the removal of Marmot Dam in 2007 and restoration of unimpeded passage in the Sandy River.

- 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. The Northwest Forest Plan Aquatic Conservation Strategy continued in 2004–2006. The strategy is designed to conserve and restore salmon and steelhead habitat and to provide an anchor for federal lands' contribution to salmon recovery. NMFS also approved the Forest Practices Habitat Conservation Plan, covering 9.3 million acres of private timber lands in Washington, and has formally recognized the conservation value of state forest practice rules to the recovery of listed salmonids.
- Hatchery reforms. The Hatchery Scientific Review Group (HSRG) began evaluating hatchery programs to identify additional reforms needed to ensure that hatcheries benefit conservation efforts and reduce risks to the ESU.
- Harvest reforms and implementation of Fisheries Management and Evaluation Plans. Marking of hatchery spring Chinook has permitted selective commercial and recreational fisheries for hatchery spring Chinook, reducing impacts to wild spring Chinook salmon from 65 percent to 22 percent, and has allowed identification of hatchery and wild fish at weirs and traps, on the spawning grounds, and during broodstock collection.

Priority Recovery Actions Needed:

Priority recovery actions needed for this ESU include the following:

- 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 and Sandy basins, dam removal.
- 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 implementing final HSRG 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).

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 one. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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. Taken together, these three factors correspond to a recovery priority number of one.

Lower Columbia River Coho (*Oncorhynchus kisutch*)

Date Listed: June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
Recovery planning is underway in both Oregon and Washington portions of this ESU, with draft recovery plans expected in the spring of 2007.

Technical Recovery Team Products:
The Willamette/Lower Columbia Technical Recovery Team has identified independent populations and completed the population viability criteria and ESU recovery goals.

Species Status:
The estimated historical abundance (circa 1900) of the Lower Columbia River Coho ESU is 850,000 to 1,100,000. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 240,300, and recent mean natural abundance is estimated to be approximately 24,000. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had decreased. Information was not available for estimating the most recent 12-year trend for this ESU.

Limiting Factors and Threats:
Threats and impacts 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 impacts.
- Harvest impacts.

Conservation Actions:
Major accomplishments since the 2005 listing of this ESU include the following:

- Hydropower operational changes and agreements for dam removal. NMFS continued implementation of the Cowlitz River Settlement Agreement, under Federal Energy Regulatory Commission relicensing, and completed the Lewis River Settlement Agreement and Clackamas River Hydroelectric Project Settlement Agreement. These agreements included reintroduction efforts into previously blocked habitat, improved flow releases, dam passage survival studies, plans for passage improvements, and habitat improvements. NMFS also began implementation of the Settlement Agreement for the Powerdale Hydroelectric Project, which will improve fish passage conditions in the Hood River and result in the removal of Powerdale Dam in 2010; and implementation of the Settlement Agreement for the Bull Run Hydroelectric Project, which will result in the removal of Marmot Dam in 2007 and restoration of unimpeded passage in the Sandy River.

- 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 2004–2006. The strategy is designed to conserve and restore salmon and steelhead habitat and to provide an anchor for federal lands' contribution to salmon recovery. NMFS also approved the Forest Practices Habitat Conservation Plan, covering 9.3 million acres of private timber lands in Washington, and has formally recognized the conservation value of state forest practice rules to the recovery of listed salmonids.
- Hatchery reforms. Some coho hatchery programs have been integrated with local natural-origin populations to increase abundance and reduce adverse impacts of hatcheries. Hatchery fish continue to be externally marked for fisheries to 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 (HSRG) is also evaluating hatchery programs to identify additional operational reforms needed to ensure that hatcheries benefit conservation efforts and reduce risks to the ESU.
- Harvest reforms. The marking of hatchery coho salmon has permitted implementation of selective commercial and recreational fisheries for coho salmon, reducing impacts to wild coho salmon from 85 percent to 18 percent.

Priority Recovery Actions Needed:
Priority recovery actions needed for this ESU 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 and Sandy basins, dam removal.
- 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 provide better broodstock collection and hatchery adult management so that hatchery reforms can be implemented.
- Completion of ocean and in-river harvest management actions, including Fisheries Management and Evaluation Plans for coho salmon, to further reduce 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 one. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if

recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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. Taken together, these three factors correspond to a recovery priority number of one.

Puget Sound Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: March 24, 1999; reaffirmed June 28, 2005

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 was completed in January 2007.

Technical Recovery Team Products:
The Puget Sound Technical Recovery Team produced an independent population identification report, draft ESU and population viability recommendations, review notes for watershed recovery plan reviews, and technical guidance for local recovery planners.

Species Status:
The estimated historical abundance (circa 1900) of the Puget Sound Chinook ESU is 600,000 – 800,000. Based on the most recent five years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 55,200, and recent mean natural abundance is estimated to be approximately 35,900. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had remained unchanged. 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 the ESU.

Limiting Factors and Threats:
Limiting factors and threats to the Puget Sound Chinook 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 have 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:
Major accomplishments in 2004–2006 for this ESU include the following:

- Completed Puget Sound Salmon Recovery Plan and implemented near-term priority habitat protection and restoration projects. In 2006, the Shared Strategy for Puget

Sound (a coalition of tribes, governments, and stakeholders) agreed upon an investment and funds allocation strategy focusing on the highest priority actions within and across the 14 watersheds in Puget Sound.

- The City of Everett, the Tulalip Tribe, the Port of Everett, and a coalition of interested groups continued working to protect and restore 1,500 acres of estuary.
- Removed a pipeline barrier to upstream migration passage for several anadromous fish populations in the White River watershed – The pipeline was removed by the Tacoma Public Utilities District.
- Improved forest management practices on 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.
- 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 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.
- Implemented all-H integration steps in key Puget Sound watersheds, in keeping with the Puget Sound Technical Recovery Team's guidance to integrate actions between hatchery, harvest, and habitat sectors to ensure that they work together synergistically and that management activities do not work at cross purposes. Local watershed harvest, hatchery, and habitat managers and scientists in six watersheds are conducting technical and policy analyses to make adjustments if needed to their recovery strategies and actions in accordance with those findings.
- Completing a Verification and Accountability (V&A) system as part of the adaptive management and monitoring program. The V&A system will be user-friendly and accessible to policy decision makers at all levels of government, to those implementing actions, and to the lay public and stakeholders. It will track monitoring data and results over time, hold people accountable for and reward them for completing their commitments, and enable the public and decision makers to make adjustments in response to data. It is scheduled to come online by the end of 2007.
- 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.

- Implemented hatchery management modifications – The implementation of hatchery reform recommendations developed independently by the Hatchery Scientific Review Group has led to operational changes that are expected to benefit natural Chinook populations. Specific threat reduction measures for hatcheries to benefit natural populations are provided in two co-manager Puget Sound hatchery resource management plans and 115 Hatchery and Genetic Management Plans submitted to NMFS for evaluation and determination through National Environmental Policy Act and ESA processes.

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.
- Curtail nearshore habitat loss and restore nearshore habitat quality.
- Restore natural hydrologic processes and improve flow management.
- Continue to reduce the effects of hatchery and harvest management activities.

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 one. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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 affect the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU. Taken together, these three factors correspond to a recovery priority number of one.

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

Date Listed: April 22, 1992; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
A draft recovery plan for this ESU was developed in March of 1995, but was not adopted. No recovery plan has been completed for this ESU, but recovery planning is underway. A draft recovery plan for this ESU is expected by March 2007.

Technical Recovery Team Products:
The Interior Columbia Technical Recovery Team identified independent populations and completed the population viability criteria and ESU recovery goals.

Species Status:
The estimated historical abundance (circa 1900) of the Snake River Fall-Run Chinook ESU is 400,000 – 500,000. Based on the most recent five years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 12,300, with recent mean natural abundance estimated to be approximately 4,900. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had improved. 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 fish) for the ESU.

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

- Degraded estuarine and nearshore habitat.
- 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 impacts.
- Mainstem Columbia River hydropower impacts.

Conservation Actions:
Major accomplishments in 2004–2006 for this ESU include the following:

- Continued structural and operational modification to hydropower system.
- 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 Environmental Protection Agency and the States.
- 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 (PCSRF), 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
- Reduced overall harvest rates.
- Conducted conservation efforts at hatcheries – The Lyons Ferry egg bank, started in the 1970s, is an ongoing program that helps preserve diversity within the ESU. The population had declined to less than 100 fish in 1990, but broodstock has been building over time. In 2004, all facilities reached a capacity of 5 million smolts for the first time.

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

- Improve survival in the migration corridor. Restoring the migration corridor, including the estuary, to a more normative ecological function would increase salmon survival above the current 9.85–23.6 percent survival rate for juvenile in-river migrants.
- 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 rivers flows to benefit this population.
- Continue to reduce mortality from harvest activities, which is currently 35 to 40 percent of the run.
- Continue work to control predation.

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 one. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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. Taken together, these three factors correspond to a recovery priority number of one.

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

Date Listed: April 22, 1992; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
A draft recovery plan for this ESU was developed in March 1995, but was not adopted. No recovery plan has been completed for this ESU, but recovery planning is underway. A draft recovery plan for this ESU is expected by March 2007.

Technical Recovery Team Products:
The Interior Columbia Technical Recovery Team identified independent populations and completed the population viability criteria and ESU recovery goals.

Species Status:
The estimated historical abundance (circa 1900) of the Snake River Spring/Summer Chinook ESU is 1.75 million to 2.25 million. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 89,800, and recent mean natural abundance is estimated to be approximately 18,000. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had improved. 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 fish) for the ESU.

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.

Conservation Actions:
Major accomplishments in 2004–2006 for this ESU include the following:

- Accomplished structural and operational modification to hydropower system.
- Improved 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.
- Improved water quality, working with the Environmental Protection Agency and the States.
- 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.
- 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 Idaho and the Nez Perce Tribe in 2005.
- Equipped irrigation diversions with fish screens.
- Reduced overall harvest rates.
- Conducted conservation efforts at hatcheries.

Priority Recovery Actions Needed:
Priority recovery actions needed for this ESU include:
- Continue to improve survival in the migration corridor. Restoring the migration corridor, including the estuary, to a more normative ecological function.
- 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.
- Continue to increase instream flows.
- Further reduce mortality from harvest activities.
- Continue work aimed at controlling predation.

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 one. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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. Taken together, these three factors correspond to a recovery priority number of one.

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

Date Listed: March 24, 1999; reaffirmed on June 28, 2005.

Legal Status: Endangered

Recovery Plan Status:
A draft ESA recovery plan was completed and approved by both the Upper Columbia Salmon Recovery Board and NMFS in July 2006. A Federal Register Notice of Availability of the proposed recovery plan was released on September 29, 2006 (71 FR 57472), for a 60-day review period, and extended for an additional 60 days on November 28, 2006. A final ESA recovery plan for this ESU is expected by July 2007.

Technical Recovery Team Products:
The Interior Columbia Technical Recovery Team identified independent populations and recommended population viability criteria and ESU recovery goals.

Species Status:
The estimated historical abundance (circa 1900) of the Upper Columbia Spring-Run Chinook ESU is 25,000 to 35,000. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 3,600, and recent mean natural abundance is estimated to be approximately 1,800. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had improved. 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 fish) for the ESU.

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 impacts.

Conservation Actions:
Major accomplishments in 2004–2006 for this ESU include the following:

- Accomplished hydropower operational changes.
- 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 more than two dozen irrigation diversion withdrawals with screens, leading to greater productivity and abundance.
- Conducted complex negotiations each season through *U.S.* v. *Oregon* to direct Columbia River harvest rates and fishery structure for the protection of listed Chinook salmon.
- 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.
- Hatchery facility modifications and operational changes were made to benefit salmon conservation by lowering risk to natural populations.

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.

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 one. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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. Taken together, these three factors correspond to a recovery priority number of one.

Upper Willamette River Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: March 24, 1999; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
The Willamette/Lower Columbia Technical Recovery Team has identified independent populations and completed the population viability criteria and ESU recovery goals for this ESU. Recovery planning is underway, and a draft recovery plan for the ESU is expected in the fall of 2007.

Species Status:
The estimated historical abundance (circa 1900) of the Upper Willamette River Chinook ESU is 260,000 – 340,000. Based on the most recent five years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 85,300, and recent mean natural abundance is estimated to be approximately 17,100. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had remained unchanged. 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 fish) for the ESU.

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

- 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.
- Reduced access to spawning and rearing habitat because of tributary dams.
- Hatchery impacts.

Conservation Actions:
Major accomplishments in 2004–2006 for this ESU include the following:

- Improved tributary and mainstem flows – The U.S. Army Corps of Engineers has modified releases from its 13 multipurpose dams and reservoirs to benefit salmon. The relicensing settlement agreement for the Clackamas Hydroelectric Project, completed in 2006, also included provisions for improved tributary flows.
- Improved fish passage at tributary and mainstem dams – As a result of Federal Energy Regulatory Commission re-licensing settlements, new licenses, and Clean Water Act section 404 permits, new or improved upstream and downstream fish passage facilities have been constructed at Willamette Falls, Albany/Lebanon Dam, and Upper Bennett Dam, and are underway in the Clackamas Basin.
- Habitat restoration projects – Hundreds of projects during 2004–2006 have improved riparian areas, fish passage at culvert barriers, and stream and floodplain function.

- Improved forest management practices on federal lands – The Northwest Forest Plan Aquatic Conservation Strategy continued in 2004-2006. The strategy is designed to conserve and restore salmon and steelhead habitat, and to provide an anchor for federal lands' contribution to salmon recovery.
- Hatchery reforms – Recent changes have 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.
- Harvest reforms – Selective fisheries have reduced impacts to wild fish by more than 75 percent while still allowing recreational and commercial fisheries.

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

- ESA section 7 consultation with the U.S. Army Corps of Engineers on operation of 13 multipurpose dams in the Willamette Basin. Issues to be addressed include fish passage (the dams block access to most historical spawning habitat for this ESU), retrofitting of dams to provide more normative temperature regimes, and flow management to ensure safe migration, rearing, spawning, and incubation.
- 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 are particularly important in lowland floodplain stream reaches where channel complexity and floodplain connectivity are severely degraded.
- Reduced point and non-point sources of thermal and toxic pollution and continued clean up efforts for contaminated stream reaches.
- Establishment of minimum instream flows in tributaries with water withdrawals that limit water availability and therefore affect salmon migration and reproduction.
- Continued improvements in hatchery management, especially by improving hatchery collection facilities that currently injure, delay, and kill listed fish. Consider using hatchery fish to reestablish naturally self-sustaining Chinook populations above federal dams.

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 one. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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. Taken together, these three factors correspond to a recovery priority number of one.

Columbia River Chum ESU (*Oncorhynchus keta*)

Date Listed: March 25, 1999; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
The Willamette/Lower Columbia Technical Recovery Team identified independent populations and completed population viability criteria and ESU recovery goals for this ESU. 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 the plan for the Oregon portion of the ESU, which is in process. A draft plan for the full ESU is expected in mid-2007.

Species Status:
The estimated historical abundance (circa 1900) of the Columbia River Chum ESU is 1.2 million to 1.6 million. Based on the most recent five years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 8,500, and recent mean natural abundance is estimated to be approximately 8,500. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had improved. 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 fish) for the ESU.

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:
Major accomplishments for this ESU in 2004–2006 include the following:

- Maintained mainstem Columbia River hydropower operational changes established in 2000 – Federal hydrosystem flow operations continued to be managed to optimize mainstem Columbia River chum habitat through the fall and winter spawning and incubation periods, while conserving water to support spring and summer juvenile migrants from other ESUs.
- 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 – The Northwest Forest Plan Aquatic Conservation Strategy continued in 2004–2006. The strategy is designed to conserve and restore salmon and steelhead habitat and to provide an anchor for federal lands' contribution to salmon recovery. NMFS also approved the Forest Practices Habitat Conservation Plan, covering 9.3 million acres of private timber lands in Washington and has formally recognized the conservation value of state forest practice rules to the recovery of listed salmonids.
- 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.

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

- Implement interim regional 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 flood plains.
- Monitoring of locations of historical production and restoration of populations in lower Columbia River tributaries where there is currently no known spawning activity.
- Restoration projects to increase shallow water rearing habitat in the lower Columbia River, and monitoring and evaluation to determine needs for additional restoration.
- Land and water use practices that avoid continued degradation and loss of chum spawning and rearing 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 one. 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), and the fact that this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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. Taken together, these three factors correspond to a recovery priority number of one.

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

Date Listed: March 25, 1999; reaffirmed June 28, 2005

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. NMFS published a Notice of Availability of the proposed recovery plan for the Hood Canal Summer Chum ESU in the Federal Register in August 2006 (71 FR 47180). NMFS completed the Final Supplement to the Hood Canal Summer Chum Recovery Plan in December 2006. The final ESA recovery plan will publish in the Federal Register in early 2007.

Technical Recovery Team Products:
The Puget Sound TRT identified independent populations of Hood Canal Summer Chum and established draft population and ESU viability criteria in May 2006.

Species Status:
The estimated historical abundance (circa 1900) of the Hood Canal Summer-Run Chum ESU is 60,000 to 80,000. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 30,600, and recent mean natural abundance is estimated to be approximately 19,900. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this ESU had improved. 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 fish) for the 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 have 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:
Major accomplishments in 2004–2006 for this ESU include the following:

- Reduced impacts from harvest activities.
- 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 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.
- Implemented 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.
- 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.
- Completed several sections of a draft salmon recovery plan – The Hood Canal Coordinating Council completed these sections of the 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 large woody debris recruitment.
- 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 one. 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), and the fact that this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if the implementation of recovery actions is temporarily held off, although there is a continuing population decline or threat to its habitat). Delaying recovery for 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 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 affect the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU. Taken together, these three factors correspond to a recovery priority number of one.

Ozette Lake Sockeye ESU (*Oncorhynchus nerka*)

Date Listed: March 25, 1999; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
No recovery plan has been completed, but recovery planning is under way.

- The Puget Sound Technical Recovery Team has identified independent populations and drafted population viability criteria and ESU recovery goals.
- Recovery planning has been initiated for this ESU.
- A draft recovery plan for this ESU is expected by early 2007.

Species Status:
The estimated historical abundance (circa 1900) of the Ozette Lake Sockeye ESU is 15,000 – 20,000. Based on the most recent five years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the ESU is approximately 4,200, and recent mean natural abundance is estimated to be approximately 2,100. The last formal review of ESU status, based on data previous to 2003, indicated that since the time of listing or first review, the status of abundance and productivity of this ESU was uncertain. However, 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 fish) for the ESU.

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, and stream substrate have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Predation.

Conservation Actions:
Major accomplishments in 2004–2006 for this ESU include the following:

- Conducted monthly multi-stakeholder Steering Committee meetings to develop the draft Lake Ozette sockeye recovery plan.
- 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.
- 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.
- 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, and develop implementation and research/monitoring plans.
- Restore natural sediment routing processes.
- Restore large woody debris recruitment and riparian habitat.
- Restore degraded tributary and river habitat structure.
- Control pinniped and mammal predation.
- Restore natural river and lake hydrologic processes.

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 one. 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), and the fact that this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 affect the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU. Taken together, these three factors correspond to a recovery priority number of one.

Snake River Sockeye ESU (*Oncorhynchus nerka*)

Date Listed: November 20, 1991; reaffirmed June 28, 2005

Legal Status: Endangered

Recovery Plan Status:
A draft plan was developed in March 1995, but was not adopted. No recovery plan has been completed, but recovery planning is under way.

- Interior Columbia Technical Recovery Team identified independent populations and completed the population viability criteria and ESU recovery goals.
- A draft recovery plan for this ESU is expected by early 2007.

Species Status:
The estimated historical abundance (circa 1900) of the Snake River Sockeye ESU is 40,000 to 57,000. Based on the most recent 5 years of available data, the estimated mean abundance (of hatchery-origin fish) in this ESU is approximately 40, and there are no natural-origin fish.

Limiting Factors and Threats:
Limiting factors and threats to the Snake River Sockeye ESU are from Mainstem Columbia River Hydropower impacts and predation.

Conservation Actions:
Major accomplishments in 2002–2004 for this ESU include the following:

- Accomplished structural and operational modification to hydropower system.
- Improved 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.
- Improved water quality, working with the Environmental Protection Agency.
- 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.
- Equipped irrigation diversions with fish screens.
- 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 expected by Idaho and the Nez Perce Tribe in 2005.
- Conducted conservation efforts at hatcheries. The captive broodstock program produces 200,000 embryos annually.

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

- Improve survival in the migration corridor.
- 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 three. 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), and because this ESU faces a strong extinction risk in the foreseeable future. This ESU does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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. Taken together, these three factors correspond to a recovery priority number of three.

Lower Columbia River Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: March 19, 1998; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
The Interior Columbia Technical Recovery Team has identified independent populations and completed population viability criteria and recovery goals for this DPS. 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 (71 FR 13094). 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 mid-2007.

Species Status:
The estimated historical abundance (circa 1900) of the Lower Columbia River Steelhead DPS is 220,000 to 280,000. Based on the most recent five years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the DPS is approximately 8,600, and recent mean natural abundance is estimated to be approximately 6,000. The last formal review of DPS status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this DPS had improved. 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 fish) for the DPS.

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:
Major accomplishments for this DPS in 2004–2006 include the following:

- Hydropower operational changes and agreements for dam removal – NMFS continued implementation of the Cowlitz River Settlement Agreement, under Federal Energy Regulatory Commission re-licensing, and completed the Lewis River Settlement Agreement and Clackamas River Hydroelectric Project Settlement Agreement. These agreements included reintroduction efforts into previously blocked habitat, improved flow releases, dam passage survival studies, plans for passage improvements, and habitat improvements. NMFS also began implementation of the Settlement Agreement for the Powerdale Hydroelectric Project, which will improve fish passage conditions in the Hood River and result in the removal of Powerdale Dam in 2010; and implementation of the Settlement Agreement for the Bull Run Hydroelectric Project, which will result in the

removal of Marmot Dam in 2007 and restoration of unimpeded passage in the Sandy River.

- 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 – The Northwest Forest Plan Aquatic Conservation Strategy continued in 2004–2006. The strategy is designed to conserve and restore salmon and steelhead habitat and to provide an anchor for federal lands' contribution to salmon recovery. NMFS also approved the Forest Practices Habitat Conservation Plan, covering 9.3 million acres of private timber lands in Washington and has formally recognized the conservation value of state forest practice rules to the recovery of listed salmonids.
- Hatchery reforms – The Hatchery Scientific Review Group (HSRG) began evaluating hatchery programs to identify additional reforms needed to ensure that hatcheries benefit conservation efforts and reduce risks to the ESU.
- Improved management of in-river fisheries through the implementation of Fisheries Management and Evaluation Plans designed to minimize impacts from fisheries on wild steelhead – Recent improvements include reductions in impacts to juvenile steelhead from resident trout fisheries; harvest impacts on wild steelhead have been reduced from a historical high of 75 percent to an overall impact of 8.5 percent.

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 and Sandy basins, 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 one. 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), and because this DPS faces a strong extinction risk in the foreseeable future. This DPS does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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 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. Taken together, these three factors correspond to a recovery priority number of one.

Middle Columbia River Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: March 25, 1999; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
A draft ESA recovery plan has been developed with a final recovery plan anticipated by July 2007. The draft ESA recovery plan summarizes draft locally developed (management unit) recovery plans for the Columbia Gorge and Oregon management units and proposed locally developed (management unit) recovery plans for the Lower Snake and Yakima management units. Notices of Availability for the draft interim regional recovery plans for the Yakima subbasin and the Lower Snake management unit were published in the Federal Register in 2006 (71 FR 27052 and 71 FR 13014, respectively).

Technical Recovery Team Products:
The Interior Columbia Technical Recovery Team identified independent populations and recommended population viability criteria and DPS recovery goals.

Species Status:
The estimated historical abundance (circa 1900) of the Middle Columbia River Steelhead DPS is 90,000 to 115,000. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the DPS is approximately 29,100, and recent mean natural abundance is estimated to be approximately 20,400. The last formal review of DPS status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this DPS had improved. 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 fish) for the DPS.

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.
- Hatchery impacts.
- Harvest impacts.
- Mainstem Columbia River Hydropower-related adverse effects.

Conservation Actions:
Major accomplishments in 2004–2006 for this DPS include the following:

- Accomplished hydropower operational changes.
- Conducted local habitat restoration projects, including reconnecting streams and side channels (e.g., Wilson Creek, Yakima River and Castile Falls, and Klickitat 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).
- 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. Used Columbia Basin Fish and Wildlife Program and Bureau of Reclamation funds to retire a long-standing large (28 cubic feet per second) diversion on a major Yakima Basin tributary, reestablishing access to more than 20 miles of historically productive steelhead habitat.
- 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.

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 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 one. 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), and because this DPS faces a strong extinction risk in the foreseeable future. This DPS does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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 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. Taken together, these three factors correspond to a recovery priority number of one.

Snake River Basin Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: August 18, 1997; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
A draft recovery plan for this DPS is expected by March 2007.

Technical Recovery Team Products:
The Interior Columbia Technical Recovery Team identified independent populations and completed the population viability criteria and DPS recovery goals.

Species Status:
The estimated historical abundance (circa 1900) of the Snake River Basin Steelhead DPS is 275,000 to 375,000. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the DPS is approximately 189,300, and recent mean natural abundance is estimated to be approximately 28,400. The last formal review of DPS status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this DPS had remained unchanged. 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 fish) for the DPS.

Limiting Factors and Threats:
Limiting factors and threats to the Snake River basin Steelhead DPS 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.
- Reduced access to spawning and rearing habitat.
- Predation.

Conservation Actions:
Major accomplishments in 2004–2006 for this DPS include the following:

- Accomplished structural and operational modification to hydropower system.
- Improved 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.
- Improved water quality permitting procedures, working with the Environmental Protection Agency.
- Conducted local habitat restoration and restoration of stream flows. This 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, who have funded numerous projects to improve habitat conditions.
- Equipped hundreds of irrigation diversions with fish screens.
- Reduced overall harvest rates.

- Conducted conservation efforts at hatcheries.
- 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 Idaho and the Nez Perce Tribe in 2005.

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

- Continue to improve survival in the migration corridor by restoring the migration corridor, including the estuary, to a more normative ecological function.
- Continue structural and operational modifications to hydropower dams to improve survival in the migration corridor.
- Continue to protect high-quality habitats.
- Continue to conduct habitat restoration.
- Continue to increase instream flows.
- Further reduce mortality from harvest activities.
- Continue to reduce 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 one. 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), and because this DPS faces a strong extinction risk in the foreseeable future. This DPS does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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 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. Taken together, these three factors correspond to a recovery priority number of one.

Upper Columbia River Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: Listed as endangered on August 18, 1997, and upgraded and reclassified from endangered ESU to threatened DPS on January 5, 2006.

Legal Status: Threatened

Recovery Plan Status:
A draft ESA recovery plan was completed and approved by both the Upper Columbia Salmon Recovery Board and NMFS in July 2006. NMFS published a Federal Register Notice of Availability of a proposed recovery plan on September 29, 2006 (71 FR 57472), for a 60-day review period, and extended for an additional 60 days on November 28, 2006. A final ESA recovery plan for this DPS is expected by July 2007.

Technical Recovery Team Products:
The Interior Columbia Technical Recovery Team identified independent populations and recommended the population viability criteria and DPS recovery goals.

Species Status:
The estimated historical abundance (circa 1900) of the Upper Columbia River Steelhead DPS is 17,000 to 22,000. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the DPS is approximately 15,300, and recent mean natural abundance is estimated to be approximately 3,100. The last formal review of DPS status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this DPS had improved. 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 fish) for the DPS.

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 impacts.
- Harvest impacts.

Conservation Actions:
Major accomplishments in 2004–2006 for this DPS include the following:

- Accomplished hydropower operational changes.
- 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 more than 2 dozen 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.
- Hatchery program operational changes were made to benefit listed steelhead by reducing risks of hatchery reared steelhead.
- 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.

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.

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 one. 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), and because this DPS faces a strong extinction risk in the foreseeable future. This DPS does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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 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. Taken together, these three factors correspond to a recovery priority number of one.

Upper Willamette River Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: March 25, 1999; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
Recovery planning is underway, and a draft recovery plan for the DPS is expected in the fall of 2007.

Technical Recovery Team Products:
The Willamette/Lower Columbia Technical Recovery Team has identified independent populations and completed the population viability criteria and DPS recovery goals for this DPS.

Species Status:
The estimated historical abundance (circa 1900) of the Upper Willamette River Steelhead DPS is 175,000 to 225,000. Based on the most recent 5 years of available data, the estimated mean total abundance (natural and hatchery-origin fish) of the DPS is approximately 10,400, and recent mean natural abundance is estimated to be approximately 7,800. The last formal review of DPS status, based on data previous to 2003, indicated that since the time of listing or first review, abundance and productivity of this DPS had improved. 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 fish) for the DPS.

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 tributary dams
- Hatchery impacts.

Conservation Actions:
Major accomplishments in 2004–2006 for this DPS include the following:

- Improved tributary and mainstem flows. The U.S. Army Corps of Engineers has modified releases from its 13 multipurpose dams and reservoirs to benefit steelhead.
- Improved fish passage at tributary and mainstem dams. As a result of Federal Energy Regulatory Commission re-licensing settlements, new licenses, and Clean Water Act section 404 permits, new or improved upstream and downstream fish passage facilities have been constructed at Willamette Falls hydro, Albany/Lebanon Dam, and Bennett Dam.
- Habitat restoration projects. Hundreds of projects during 2004–2006 have improved riparian areas, fish passage at barriers, and stream function.

- Improved forest management practices on federal lands. The Northwest Forest Plan Aquatic Conservation Strategy continued during the biennium and is designed to conserve and restore salmon and steelhead habitat and provide an anchor for federal lands' contribution to salmon recovery.
- Hatchery reforms. Hatchery programs have been modified to reduce the effects of non-native summer steelhead hatchery fish on native, naturally produced winter steelhead populations.
- Harvest reforms. Catch-and-release fisheries have substantially reduced harvest impacts to steelhead.

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

- ESA section 7 consultation with the U.S. Army Corps of Engineers on operation of 13 multipurpose dams in the Willamette Basin. Issues to be addressed include fish passage (the dams block access to much historical spawning habitat for this DPS), retrofitting of dams to provide more normative temperature regimes, and flow management to ensure safe migration, rearing, spawning, and incubation.
- 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 are particularly important in lowland floodplain stream reaches where channel complexity and floodplain connectivity are severely degraded.
- Reduced point and non-point sources of thermal and toxic pollution and continued clean up efforts for contaminated stream reaches.
- Continued improvement in management of non-native summer steelhead hatchery fish, especially by improving hatchery collection facilities that currently injure, delay, and kill ESA-listed fish.

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 one. 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), and because this DPS faces a strong extinction risk in the foreseeable future. This DPS does not meet the criteria for a moderate magnitude of threat (which stipulate that the species will not face extinction if recovery is temporarily held off, although there is a continuing population decline or threat to its habitat). 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 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 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. Taken together, these three factors correspond to a recovery priority number of one.

Salmon Recovery Overlapping the Northwest and Southwest

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

Date Listed: May 6, 1997; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
Recovery planning is underway. In 2002, NMFS began Phase I recovery planning for the Southern Oregon/Northern California Coast (SONCC) through a Technical Recovery Team (TRT). The first phase of the NMFS Southwest Region's recovery planning efforts has been carried out by the SONCC TRT developing technical information for all coho salmon populations (e.g., population structure, population viability criteria, ESU viability criteria, research needs, and monitoring requirements). In June 2006, the SONCC TRT released its historic population structure report for the SONCC coho salmon ESU.

The SONCC TRT has preliminarily identified 62 historical populations of Southern Oregon/Northern California Coast coho salmon, of which 27 are considered functionally independent and potentially independent, with all other coho populations dependent on others within the ESU. Additionally, the SONCC TRT released a draft of its SONCC coho population viability criteria report for public review and comment in January 2007. This technical information will serve as the scientific foundation for the SONCC coho salmon recovery plan.

The NMFS Southwest Region has started the final phase of its ongoing effort to prepare recovery plans for all salmon and steelhead populations listed under the ESA in California, including the SONCC coho salmon ESU. The final phase is drafting the recovery plan. NMFS' Southwest Region is currently working with various agencies from both Oregon and California to compile necessary data for conducting a detailed assessment across the ESU to identify limiting factors and threats for each population within the SONCC Coho salmon ESU. This assessment, coupled with the species' historic population structure and viability requirements described above will provide the basis for identifying specific measures, and their costs, that must be considered to recover SONCC coho salmon to the point that listing under the ESA is no longer warranted. Associated with this is the necessary monitoring to ensure that the goals and objectives of the plan are being accomplished. A draft recovery plan is expected to be released in December 2007 with a final plan in March 2008.

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), 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. Currently, indications of weak 2006 coho salmon returns in several California 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 Trinity, Klamath, and Rogue River systems. The high hatchery production in these systems 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 has remained unchanged, and population abundance has remained unchanged.

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 agriculture, 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 are recognized as a primary cause of habitat degradation throughout the range of this ESU. Most of the primary coho 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 U.S. Environmental Protection Agency in the 1990s.

The following sources of limiting factors are prevalent throughout the range of this ESU and affect most populations. These limiting factors include:

- Agricultural operations:
    - Artificial barriers.
    - Conditions severing surface/subsurface hydrologic connection of stream channel and wetlands.
    - Dams.
    - Erosion-control structures.
    - Flood-control structures.
    - Pits from gravel mining.
    - Road crossings (e.g., bridges, culverts, and low-water fords).
- Forestry operations.

- Gravel extraction.
- Illegal harvest.
- Streambed alteration.
- Substandard fish screens on diversions.
- Suction (hydraulic) dredging.
- Unscreened water diversions.
- Urbanization.
- Water demand exceeding availability.
- Water pollution.

The following limiting factors, and their level of threat to the SONCC Coho ESU, were identified in the 2006 Pacific Coastal Salmon Recovery Fund Report to Congress:

Degraded Habitat-Estuarine and near shore Marine: Moderate Threat
Degraded Habitat-Floodplain Connectivity and Function: High Threat
Degraded Habitat-Channel Structure and Complexity: Moderate to High Threat
Degraded Habitat-Riparian Areas and Large Woody Debris Recruitment: High 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: Moderate Threat
Hatchery-related Adverse Effects: Very Low Threat
Harvest-related Adverse Effects: Low Threat
Predation/Competition/ Disease: Moderate to High Threat

Conservation Actions:
Numerous conservation actions were conducted from 2004–2006 for Southern Oregon/Northern California ESU recovery and are detailed below.

Agricultural Land Management Practices

- Collaborated proactively with counties on General Plan Updates, Grading Ordinances, and Riparian Ordinances.
- 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.
- Contributed to the State of California Coho Recovery Plan – The State of California listed two California coho populations (from San Francisco Bay to the Oregon border) under the California Endangered Species Act in 2003.

ESA Section 7 Consultations

- Conducted over 200 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.

- Worked closely in 2005–2006 with the Yurok Tribe in its development of an ESA section 4(d) rule covering their Tribal Resource Management Plan for Chinook and coho salmon.

Gravel Mining

- Applied the NMFS Southwest Region (SWR) Gravel Mining Guidelines entitled "Sediment Removal from Freshwater Salmonid Habitat: Guidelines to NMFS Staff for the Evaluation of Sediment Removal Actions from California Streams."
- Continued collaboration with Humboldt, Del Norte, and Mendocino Counties on the Humboldt, Del Norte and Mendocino Gravel Plans.
- In addition to applying the SWR Gravel Mining Guidelines, applied the interagency developed guidelines entitled "Sediment Removal from Active Stream Channels in Oregon: Considerations for Federal Agencies for the Evaluation of Sediment Removal Actions from Oregon Streams" and the 2005 NMFS National Gravel Extraction Guidance in streams of southern Oregon.

Municipal and Agricultural Water Diversions

- 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.
- Applied the Water Drafting Specifications, Guidelines for Salmonid Passage at Stream Crossings, Fish Screening Criteria for Anadromous Salmonids, and the Addendum to Fish Screening Criteria for Pumped Water Intakes.
- Continued working with the Bureau of Reclamation on the Klamath Project 10-Year Biological Opinion to ensure its Klamath Project operations and programs are consistent with the reasonable and prudent alternative.
- Continued working with the Bureau of Reclamation on the Rogue River Basin Project Biological Opinion to develop a reasonable and prudent alternative that stabilizes flows in the Bear Creek watershed, formalizes a ramping requirement for the Emigrant Dam operations, and reemphasizes fish passage improvement activities.
- Continued working with the Bureau of Reclamation on the Savage Rapids Dam removal and irrigation pump installation work by completing a Biological Opinion and participating in the interagency implementation team. Also continued work with the Grants Pass Irrigation District by assisting the District in applying for an extension on their incidental take permit for the interim operations of Savage Rapids Dam until the irrigation pumps are constructed.
- 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.

Summer Dams

- Developed a database of summer dams and commenced proactive efforts to engage with landowners to minimize the effects of such dams.
- Implemented staff guidelines entitled "The Effects of Summer Dams on Salmon and Steelhead in California Coastal Watersheds & Recommendations for Mitigating Their Impacts."

Timberland Management and Forest Conversions

- Engaged in on-site reviews of timber operations, and implemented the "Salmonid Guidelines for Forest Practices" when evaluating non-federal timber harvest operations.
- Implemented the Stewardship Non-Industrial Timber Management Plan program in negotiation with the State Board of Forestry to encourage participation by and minimize regulatory burdens on small forest landowners operating under a stewardship philosophy.
- Worked on the Pacific Lumber Company Habitat Conservation Plan (PALCO HCP) – The PALCO 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.
- Green Diamond Resource Company submitted a final Habitat Conservation Plan and EIS in October 2006, for much of its industrial timber lands. Final issuance of the permit is anticipated in the spring of 2007.
- Continued to work with the USDA Forest Service and Bureau of Land Management on federal land management issues regarding fire fuels treatments throughout the Rogue Basin.

Urbanization/Channelization

- Conducted ESA section 7 consultations with the Army Corps of Engineers to minimize the effects of flood control projects, levee setbacks, and floodplain management on the ESU.
- Collaborated with Humboldt Bay Municipal Water District on the development of a habitat conservation plan 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.

Restoration

- Continued to provide annual grants to the State of California to assist recovery efforts in coastal watersheds as part of the Pacific Coastal Salmon Recovery Fund program.
- Participated as a member of the Trinity River Restoration Program Task Force – NMFS provided technical input during the preparation of the Trinity River flow study and habitat restoration plan, which includes flow allocations and direct in-channel actions, as well as continued watershed restoration activities, replacement of bridges and structures in the flood plain, monitoring, and adaptive management.
- Continued efforts as a member of the 16-member Klamath Conservation Program Task Force, which provides technical and scientific input to restoration programs and projects throughout the Klamath River Basin.
- Consulted under ESA section 7 with the San Francisco District of the Army Corps of Engineers regarding their issuance of a Regional General Permit to the California Department of Fish and Game (CDFG) – The Permit is for restoration activities pursuant to CDFG's "California Salmonid Stream Habitat Restoration Manual" and the resulting effects on ESA-listed salmon north of San Francisco to the Oregon border. The Permit authorizes CDFG (and the agents contracted, funded, and/or supervised by CDFG) to carry out fisheries habitat restoration program projects compliant with the manual. To date, more than 1,000 projects have been implemented, with hundreds of miles of Pacific salmon habitat being restored and available for use by juvenile and adult Pacific salmon.

- Continued working closely with Resource Conservation Districts and the Natural Resource Conservation Service to help identify potential impacts to ESA species, to help develop measures to address the impacts, and to help obtain regulatory relief under the ESA.
- Continued working with the California Resource Agency and numerous state, local, and regional agencies; non-profit and stakeholder groups; and consultants as part of the State of California's Fish Passage Forum – The Forum addresses man-made barriers to adult and juvenile salmon passage throughout California's coastal rivers and streams.
- Continued prohibition on recreational fishing for coho salmon throughout the central California coast.
- Streamlined programs through programmatic strategies and developed best management practices for federal, state, county, or city governments and private landowners for the benefit of salmon habitat – Some programmatic strategies and actions have been completed and others are currently under way. These include the following:
    - State of California Road Maintenance Manual.
    - Bank Stabilization Guidelines.
    - Gravel Mining Guidelines (completed in 2004).
    - Ground Water Management Guidelines.
    - Water Development and Rights Policies.
    - Minimum Flow Policies for dry seasons to ensure appropriate water temperatures and conditions (under way).
    - Desalination Management Policy and Timber Harvest Guidelines (completed in January 2005).
- Worked with five northern California counties (Siskiyou, Trinity, Del Norte, Humboldt, and Mendocino) to develop a Memorandum of Understanding regarding the Five Counties Road Program. NMFS has developed an Environmental Assessment and is currently drafting a Section 7 Biological Opinion for this plan.
- Commenced collaboration with CDFG in the development of Hatchery and Genetics Management Plans (HGMPs) for the Trinity River and Mad River Hatcheries located in northern California – It is anticipated that upon completion of these plans, programs will qualify for the ESA 4(d) rule exemption from ESA take violations.
- Adopted the standards established in the Oregon Coho Plan for the Rogue River coho salmon HGMP, whose goal is to limit hatchery spawners to less than 10 percent of the spawning population.

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

- Complete the recovery plan and begin to implement recovery actions.
- Research and monitor distribution, status, and trends of salmon.
- Complete and fund a population-monitoring plan.
- Promote operations of current recovery hatcheries and develop HGMPs to minimize negative influences of hatcheries.
- Improve freshwater habitat quantity and quality.

- 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), 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: **1**

Ranking for the Southern Oregon/Northern California Coast coho ESU 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 (BRT), conducting an updated status review in 2004, determined 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, and Trinity 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 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.

Salmon Recovery in the Southwest

Northern California Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: June 7, 2000; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
No recovery plan has been completed for this DPS. Current progress includes development of a recovery outline, a recovery plan template, recovery plan chapters and an assessment of threats applying The Nature Conservancy protocols. A draft recovery plan is expected in June 2007, with a final plan to be completed in December 2007.

Species Status:
The Northern California (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.

Data analyzed for the 2005 status review showed the overall trend in adult returns for the Middle Fork Eel River portion of the NC steelhead DPS was slightly downward. Similarly, return data for summer-run steelhead in the Mad River showed a downward trend. Data collected of juvenile abundance for 10 independent populations within the NC steelhead DPS showed both upward and downward trends.

The two artificial propagation programs that are part of the NC steelhead DPS are thought to decrease the risk of extinction 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 DPS remain likely to become endangered in the foreseeable future.

Threats and Impacts:
Limiting threats and impacts to this DPS include the following:

- Agricultural operations.
- Artificial barriers to fish passage:

    - Canal and pipeline crossings.
    - Conditions severing surface/subsurface hydrologic connection of stream channel and wetlands.
    - Dams.
    - Erosion-control structures.
    - Flood-control structures.
    - Pits from gravel mining.
    - Road crossings (e.g., bridges, culverts, and low-water fords).
- Forestry operations.
- Gravel extraction.
- Illegal harvest.
- Streambed alteration.
- Substandard fish screens on diversions.
- Suction dredging.
- Unscreened water diversions.
- Urbanization.
- Water demand exceeding availability.
- Water pollution.
- Potential genetic modification in hatchery stocks resulting from domestication selection.
- Incidental mortality from catch-and-release hooking.
- Climatic variation leading to drought, flooding, and variable ocean conditions.
- Predation.
- Non-federal timber harvest operations are identified in the final listing notice as a critical threat to this DPS.

The following limiting factors, and their level of threat to this DPS, were identified in the 2006 Pacific Coastal Salmon Recovery Fund Report to Congress:

Degraded Habitat-Estuarine and Nearshore Marine: Moderate to 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 Large Woody Debris 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

Conservation Actions:
Accomplishments in 2004–2006 for this DPS include the following:

- Preliminary scoping is underway between California and NMFS regarding a California State Forestry Habitat Conservation Plan.
- 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.
- Collaborating with 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.
- Improved section 7 consultations.

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 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
A priority number of five was assigned to the NC steelhead DPS in accordance with the Recovery Priority Guidelines (55 FR 24296, Section B) and indicates the priority of the species for recovery plan development and implementation. Ranking for NC steelhead 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 Biological Review Team (BRT) which 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 (Good et al. 2005). 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; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
No recovery plan has been completed for Central Valley steelhead, but a draft multi-species recovery plan including this DPS is anticipated in summer 2007, with a final plan in December 2007.

Species Status:
The Central Valley (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. Anadromous steelhead spawning above Red Bluff Diversion Dam have a small population size and exhibit strongly negative trends in abundance and population growth rate. No escapement estimates have been made for the area above Red Bluff Diversion Dam since the mid-1990s. A rough approximation of numbers of out-migrating juvenile steelhead from 1998-2000 determined that, on average, 181,000 juvenile steelhead were naturally produced each year in the Central Valley by approximately 3,600 spawning female steelhead. Prior to 1850, there were 1 to 2 million spawners, and in the 1960s about 40,000 spawners. The Biological Review Team (BRT) reported that recent spawner surveys of small Sacramento River tributaries (Mill, Deer, Antelope, Clear, and Beegum Creeks) and incidental captures of juvenile steelhead via monitoring on the Calaveras, Cosumnes, Stanislaus, Tuolumne, and Merced Rivers confirmed that steelhead are distributed throughout accessible streams and rivers.

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. Coastal steelhead are widely distributed in the Central Valley basin, with approximately half of the available habitat upstream of impassable dams. At higher elevations, habitat appears to support high densities of steelhead. It is not evident how CV steelhead and resident populations interacted before these dams were built. Steelhead produced from hatcheries have been widely stocked throughout the CV, Sierra Nevada, and southern Cascades. Stocking may have deleterious effects on native wild populations. There are reports of stocking hatchery steelhead or trout into some areas containing native wild CV steelhead populations. Identification of particular resident populations that may be part of the CV DPS has not been possible due to the lack of sufficient status and trends data**.**

Two artificial propagation programs are considered to be part of the CV steelhead DPS; 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.

Informed by the BRT's findings and NMFS' assessment of the effects of artificial propagation programs on the viability of the DPS, the Artificial Propagation Evaluation Workshop concluded that the California CV steelhead DPS altogether is "in danger of extinction."

Threats and Impacts:
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. Where steelhead are still extant, natural populations are subject to habitat degradation and various impacts from water development activities and land use activities. This DPS requires cool water found at higher elevations, now largely located above impassable dams. The lack of monitoring of steelhead populations has limited our ability to adequately determine the abundance, trends and distribution of this DPS and our ability to determine how steelhead populations may have interacted before the dams were built. The geographically wide stocking of hatchery trout may have deleterious effects on native wild CV steelhead populations, but this cannot be assessed. Many of the threats that affect Chinook salmon may also negatively impact steelhead, such as inadequately screened water diversions, excessively high water temperatures, and predation by non-native species on the native fish.

Conservation Actions:
During 2004–2006, 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 Central Valley Project section 7 consultation with the Bureau of Reclamation likely contributed to habitat improvements benefiting the CV steelhead DPS, such as flow and temperature improvements.

In addition, two large, comprehensive conservation programs in the Central Valley provide a wide range of ecosystem and species-specific protective efforts that benefit steelhead – the CALFED Bay-Delta Program and the Central Valley Project Improvement Act (CVPIA). CALFED works with local communities to improve water quality and reliability for California's water supplies, and to restore the San Francisco Bay-Delta ecosystem. Although not fully implemented, CALFED's Ecosystem Restoration Program has funded projects involving habitat restoration; floodplain restoration and/or protection; instream habitat restoration; riparian habitat restoration/protection; fish screening and passage projects, research on and eradication of non-native species, as well as on contaminants; research and monitoring of fishery resources; and watershed stewardship and outreach. The Environmental Water Account is used to offset losses of juvenile fish at the Delta pumps, and to provide higher instream flows in the Yuba, Stanislaus, American, and Merced Rivers to benefit salmonids.

The CVPIA balances the priorities of fish and wildlife protection, restoration, and mitigation with irrigation, domestic water use, fish and wildlife enhancement, and power augmentation. The CVPIA has conducted studies/investigations 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, screening of water diversions, and habitat restoration.

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.

Ongoing measures to protect steelhead in the State of 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.

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. Recently, the CALFED program identified a proposal for development (but not implementation) of a CV steelhead monitoring program for directed action funding. Development and implementation of a monitoring and assessment program for CV steelhead is critical for assessing population viability and responses to extensive habitat restoration efforts funded by CALFED and CVPIA.

CALFED's Battle Creek Restoration Project is a priority action that has already restored many stream reaches in the 42 miles of Upper Battle Creek suitable for steelhead. The upper reach will be fully restored under an agreement between Pacific Gas and Electric (which operates nine hydroelectric dams in this reach) and several resource agencies. The intent is to remove five of the dams and dedicate the water rights to the environment. The remaining dams will have increased instream flows, thereby increasing habitat by 500 to 800 percent. The remaining dam structures would be modified with optimally designed fish ladders and screens, and meander belt and riparian forest would be restored. Continued funding and implementation of CALFED's Ecosystem Restoration Program and the CVPIA remain an overall priority for continuation of 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.

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). Conflict was determined to exist 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*)

Date Listed: August 18, 1997; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
No recovery plan has been completed for this DPS. The Recovery Outline will be completed by March 2007. Current progress includes development of a recovery plan template, recovery plan chapters and an assessment of threats applying The Nature Conservancy protocols. A draft recovery plan is expected in June 2007, with a final plan to be completed in December 2007.

Species Status:
The Central California Coast (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 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.[9] 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 numbers from 603,000 in the early 1960s, down 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: the 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. Small populations of steelhead occur in watersheds throughout the DPS, however, impassible dams have cut off substantial portions of habitat in some basins, generating concern

[9] Much of the information provided here is from Good, T. P., R. S. Waples & P. B. Adams. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-NWFSC-66. 598 pp.

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 upstream of, or 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:
Limiting threats and impacts to this DPS include the following:

- Agricultural operations.
- Artificial barriers to fish passage:
    - Canal and pipeline crossings.
    - Conditions severing surface/subsurface hydrologic connection of stream channel and wetlands.
    - Dams.
    - Erosion-control structures.
    - Flood-control structures.
    - Pits from gravel mining.
    - Road crossings (e.g., bridges, culverts, and low-water fords).
- Forestry operations.
- Gravel extraction.
- Illegal harvest.
- Streambed alteration.
- Substandard fish screens on diversions.
- Suction (hydraulic) dredging.
- Unscreened water diversions.
- Urbanization.
- Water demand exceeding availability.
- Water pollution.
- Potential genetic modification in hatchery stocks resulting from domestication selection
- Incidental mortality from catch-and-release hooking.
- Climatic variation leading to drought, flooding, and variable ocean conditions.
- Predation.

The following limiting factors, and their level of threat to this DPS, were identified in the 2006 Pacific Coastal Salmon Recovery Fund Report to Congress:

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 Large Woody Debris 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

Conservation Actions:
Accomplishments in 2004–2006 for this DPS include the following:

- Preliminary scoping underway between State and NMFS regarding California State Forestry Habitat Conservation Plan.
- 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.
- Collaborating with 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.
- Improved section 7 consultations.

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

- Research and monitor distribution, status, and trends of steelhead.
- Promote operations of current recovery hatcheries and develop Hatchery and Genetics Management Plan 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/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).
- 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 by local municipalities, in order to improve channel and estuarine habitats.

Recovery Priority: 3
A priority number of three was assigned to the CCC steelhead DPS in accordance with the Recovery Priority Guidelines (55 FR 24296, Section B) and indicates the priority of the species for recovery plan development and implementation. 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 which 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 in the foreseeable future. This determination was made based on the following factors: (1) the largest run for the DPS (the 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; reclassified as a DPS January 5, 2006

Legal Status: Threatened

Recovery Plan Status:
No recovery plan has been completed for the South-Central California steelhead DPS, but recovery planning is underway. A Technical Recovery Team (TRT) has been convened and is nearing completion of the Phase I recovery planning process. The TRT has published two Technical Memoranda on the historic populations and over-summering habitat of steelhead, and is preparing reports on the viability criteria and research monitoring needs for the South-Central/Southern California Coast Recovery Domain. In addition, the NMFS Southwest Fisheries Science Center has prepared reports on the current regional distribution of steelhead and the population structure and ancestry of steelhead, based on a genetic analysis, for the South-Central/Southern California Coast Recovery Domain. It is anticipated that Phase I planning will be completed by early 2007.

Phase II of the recovery planning process was initiated in 2006. As a precursor to development of the Recovery Plan, NMFS staff will produce a Recovery Outline based upon the Technical Recovery Team products and will identify the basic strategy for recovering the listed steelhead populations in the South-Central California Steelhead DPS. This Recovery Plan Outline was completed by the end of 2006.

The target date for publishing the final Recovery Plan is December 2007.

Species Status:
The steelhead population within the South-Central California coast steelhead DPS has declined dramatically from estimated historic annual runs totaling 25,000 adults to less than 500 returning adult fish. Of the 36 watersheds historically supporting steelhead runs approximately 90 percent continue to support runs, though run sizes have been sharply reduced in most watersheds. All of 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 which 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, the Pajaro, Salinas, Nacimiento/Arroyo Seco, and the Carmel Rivers. 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 (Santa Rosa, San Simeon, San Luis Obispo, and Arroyo Grande Creek) in the southern portion of the DPS 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 floodplains has altered the natural fluvial processes which 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 resulted in accelerated erosion and sedimentation of river and stream channels. The continued spread and propagation of invasive plants and aquatic species have 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 by local municipalities have reduced the suitability of these habitats for rearing, and acclimation. Finally, the introduction of exotic fish, and the stocking of non-native steelhead to support recreational fishing have occurred in many coastal rivers and streams and have also contributed to the decline of native steelhead and related resident trout populations, though this 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. Funding for these projects was provided by the Carmel River Steelheaders, and the CalAm Water Company. 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 retro-fitting such structures. Funding for these projects was provided through the Pacific Coastal Salmon Recovery Fund. Planning for the potential removal of San Clemente Dam in the Carmel River has advanced. Funding for this project has been provided by the CalAm Water Agency and the California Department of Water Resources.

Angling regulations for sport fishing for native steelhead have been changed to regulate recreational angling in virtually all coastal rivers and streams in the South-Central California steelhead DPS which 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 California Department of Fish and Game 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 South-Central California steelhead DPS that fund, carry-out, or regulate projects such as flood protection, road construction, water diversion, and gravel mining.

Priority Recovery Actions Needed:
Recovery planning will require further investigation of life-history of the species, including utilization of estuarine habitat, juvenile growth and smolting patterns, distribution of residualized populations above impassable artificial barriers, and the relationship between putative resident and migratory forms of steelhead to refine population viability and delisting criteria for this species.

Re-establishing access to upper watersheds in both small coastal streams and several of the larger river systems within the biogeographic region identified by the TRT is one of the highest priorities in the South-Central California steelhead DPS. Major remaining recovery actions include completion of the planning for the disposition of San Clemente Dam on the Carmel River. The re-establishment of adequate flow regimes for the Salinas and Nacimiento Rivers are also high priorities. Further investigations of potential recovery actions south of San Simeon are necessary to recover the threatened steelhead of South-Central California.

Establishing a robust monitoring system for this DPS is essential for tracking population trends, the efficacy of recovery actions, and the attainment of viability and delisting criteria.

Recovery Priority Number: **3**
Ranking for the South-Central California steelhead DPS was determined in accordance with the Recovery Priority Guidelines (55 FR 24296) and was 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 Biological Review Team (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 sandbars by local municipalities between estuaries and the ocean, during periods when the estuaries are normally separated from the ocean by the sandbar. It is believed 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 in both the smaller and larger watersheds.

Southern California Steelhead DPS *(Oncorhynchus mykiss)*

Date Listed: August 18, 1997; Southern Range Extension May 1, 2002; reclassified as a DPS January 5, 2006

Legal Status: Endangered

Recovery Plan Status:
No recovery plan has been completed for the South-Central California steelhead Distinct Population Segment (DPS), but recovery planning is underway. A Technical Recovery Team (TRT) has been convened and is nearing completion of the Phase I recovery planning process. The TRT has published two Technical Memoranda on the historic populations and over-summering habitat of steelhead, and is preparing reports on the viability criteria and research monitoring needs for the South-Central/Southern California Coast Recovery Domain. In addition, the NMFS Southwest Fisheries Science Center has prepared reports on the current regional distribution of steelhead and the population structure and ancestry of steelhead, based on a genetic analysis, for the South-Central/Southern California steelhead Recovery Planning Domain. It is anticipated that Phase I planning will be completed by early 2007.

Phase II of the recovery planning process was initiated in 2006. As a precursor to the development of a Recovery Plan, NMFS staff will produce a Recovery Outline based upon the TRT products and will identify the basic strategy for recovering the listed steelhead populations in the Southern California Steelhead DPS. This Recovery Plan Outline is expected to be completed by March 2007.

The target date for publishing the final Recovery Plan is December 2007.

Species Status:
The steelhead populations within the Southern California steelhead DPS have declined dramatically from estimated historic annual runs totaling 55,000 adults to current totals of 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 (Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers) in the northern portion of the DPS have experienced declines in run sizes of 90 percent or more. In the southern range extension (from Malibu to the U.S.-Mexico border), adult steelhead have been documented in only three watersheds since the original listing of the Southern California Steelhead DPS. 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 Southern California Steelhead 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 the four major river systems, the northern portion of the DPS (Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers). Each of these watersheds is heavily impacted by water infrastructure 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 (San Gabriel, Santa Ana, San Juan, Santa Margarita, and Sweetwater Rivers) in the southern portion of the DPS may 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 which block or impede migration of adult steelhead to headwater spawning and rearing tributaries, as well as restrict the emigration of juveniles to the ocean. Development of the floodplains has altered the natural fluvial processes which 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 resulted in accelerated erosion and sedimentation of river and stream channels, and the remaining estuarine habitat.

The continued spread and propagation of invasive plants and aquatic species have 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 sandbars by local municipalities has further 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 in many coastal rivers and streams also contributed to the decline of native steelhead and related resident trout populations through competition for food and other resources, though the latter practice has declined since the listing of the species.

Conservation Actions:
Inventories of impediments have been be conducted on major watersheds (Santa Maria/Sisquoc, Santa Ynez, Santa Ynez Mountain complex, Ventura, Santa Clara, and Santa Monica Mountains complex). Fish passage facilities have been constructed on Hilton Creek (Santa Ynez River); San Ysidro Creek (Santa Ynez Mountains);Ventura River at the Robles Diversion Dam; Santa Paula Creek at the Harvey Dam; and Santa Paula Creek Flood Control Channel. Funding for these projects was provided by the California Coastal Conservancy, the California Wildlife Conservation Board, and the Pacific Coastal Salmon Restoration 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 retro-fitting (or in some cases eliminating) such structures (Horse Creek on the Sisquoc River). Funding for these projects was provided through the Pacific Coastal Salmon Restoration Fund 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 Southern California steelhead DPS which are accessible to adult steelhead migrating up from the ocean. Additionally, the California Department of Fish and Game (CDFG) has curtailed its stocking of hatchery reared trout and steelhead, limiting stockings to reservoirs, or stream reaches above impassible barriers. In at least one case CDFG has begun stocking sterile (triploid) fish to prevent the inter-breeding of hatchery reared fish with native steelhead.

NMFS has formulated recommendations (in conjunction with the California Department of Fish and Game, the United Water Conservation District, and local stakeholders) regarding fish passage and migration flows at Pyramid and Santa Felicia Dams on Piru Creek (a tributary to the Santa Clara River) as part of Federal Energy Regulatory Commission re-licensing actions. 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 South-Central California Steelhead DPS that fund, carry-out, or regulate projects such as flood protection, road construction, water diversion, and gravel mining.

Priority Recovery Actions Needed:
Recovery planning will require investigation of 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-establishing access to upper watersheds in both small coastal streams and several of the larger river systems within each biogeographic region identified by the TRT is one of the highest priorities in the Southern California steelhead DPS. Major remaining recovery actions, include completion of the planning for the removal of Matilija Dam on the Ventura River and Rindge Dam on Malibu Creek. The re-establishment of adequate flow regimes for the Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers are also high priorities. Further investigation of 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, are necessary to recover the endangered steelhead of Southern California.

Establishing a robust monitoring system for this DPS is essential for tracking population trends, the efficacy of recovery actions, and the attainment of viability and delisting criteria.

Recovery Priority Number: 3
Ranking for the Southern California Steelhead DPS was determined in accordance with the Recovery Priority Guidelines (55 FR 24296) and was 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 Biological Review Team that was

formed to conduct an updated status review in 2005 reiterated the conclusions reached from 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. It is believed 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 for both the smaller and larger watersheds.

Central California Coast Coho Salmon ESU (*Oncorhynchus kisutch*)

Date Listed: Listed as threatened on October 31, 1996; reclassified as a DPS January 5, 2006

Legal Status: Endangered

Recovery Plan Status:
No recovery plan has been completed for this ESU. A recovery outline was completed and signed by Regional Headquarters in October 2005. Current progress includes development of a recovery plan template, recovery plan chapters and an assessment of threats applying The Nature Conservancy protocols. A draft recovery plan is expected in June 2007, with a final plan to be completed in December 2007.

Species Status:
The Central California Coast coho salmon ESU (CCC coho) 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.[10] The artificially propagated stocks were found to be no more than moderately divergent genetically from the natural populations.

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 exists 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. Trends data for this ESU show a continuing decline in abundance.

Threats and Impacts:
Limiting threats and impacts to this ESU include the following:

- Agricultural operations.
- Artificial barriers
    - Canal and pipeline crossings.
    - Conditions severing surface/subsurface hydrologic connection of stream channel and wetlands.
    - Dams.
    - Erosion-control structures.
    - Flood-control structures.

[10] The artificial propagation programs are: 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.

    - Pits from gravel mining.
    - Road crossings (e.g., bridges, culverts, and low-water fords).
- Forestry operations.
- Gravel extraction.
- Illegal harvest.
- Streambed alteration.
- Substandard fish screens on diversions.
- Suction (hydraulic) dredging.
- Unscreened water diversions.
- Urbanization.
- Water demand exceeding availability.
- Water pollution.
- Potential genetic modification in hatchery stocks resulting from domestication selection.
- Incidental mortality from catch-and-release hooking.
- Climatic variation leading to drought, flooding, and variable ocean conditions.
- Predation.

The following limiting factors, and their level of threat to this ESU, were identified in the 2006 Pacific Coastal Salmon Recovery Fund Report to Congress:

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 Large Woody Debris 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: Moderate to High Threat
Hatchery-related Adverse Effects: Moderate Threat
Harvest-related Adverse Effects: High Threat
Predation/Competition/ Disease: High Threat

Conservation Actions:
Accomplishments in 2004–2006 for this ESU include the following:

- Preliminary scoping underway between State and NMFS regarding California State Forestry Habitat Conservation Plan.
- 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.
- Collaborating with 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.
- Improved section 7 consultations.

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

- Research and monitor distribution, status, and trends of coho.
- 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 by local municipalities, to improve channel and estuarine habitats.

Recovery Priority Number: 1
A priority number of one was assigned to the CCC coho DPS in accordance with the Recovery Priority Guidelines (55 FR 24296, Section B), and indicates the priority of the species for recovery plan development and implementation. 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 Biological Review Team 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% of coho streams no longer have spawning runs), 2) long-term trends clearly downward, 3) degraded habitats, 4) threats to genetic integrity due to stocking of hatchery fish, and 5) recent droughts and change in ocean productivity. It is believed 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, and forestry is the predominant land use. However, land use conversions from forestry and agriculture to urban sprawl are leading to additional adverse impacts to the salmon. Imminent land use changes are anticipated to conflict with the conservation needs of CCC coho salmon.

California Coast Chinook Salmon ESU (*Oncorhynchus tshawytscha*)

Date Listed: September 16, 1999; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
No recovery plan has been completed for this ESU. The Recovery Outline will be completed by March 2007. Current progress includes development of a recovery plan template, recovery plan chapters and an assessment of threats applying The Nature Conservancy protocols. A draft recovery plan is expected in June 2007, with a final plan to be completed in December 2007.

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.

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 if these hatcheries are a benefit or detriment to the naturally spawning portion of the ESU.

Threats and Impacts:
Limiting threats and impacts to this ESU include the following:

- Agricultural operations.
- Artificial barriers to fish passage.
    - Canal and pipeline crossings.
    - Conditions severing surface/subsurface hydrologic connection of stream channel and wetlands.
    - Dams.
    - Erosion-control structures.

    - Flood-control structures.
    - Pits from gravel mining.
    - Road crossings (e.g., bridges, culverts, and low-water fords).
- Forestry operations.
- Gravel extraction.
- Illegal harvest.
- Streambed alteration.
- Substandard fish screens on diversions.
- Suction (hydraulic) dredging.
- Unscreened water diversions.
- Urbanization.
- Water demand exceeding availability.
- Water pollution.
- Potential genetic modification in hatchery stocks resulting from domestication selection.
- Incidental mortality from catch-and-release hooking.
- Climatic variation leading to drought, flooding, and variable ocean conditions.
- Predation.
- Non-federal timber harvest operations are identified in the final listing notice as a critical threat to this ESU.

The following limiting factors, and their level of threat to this ESU, were identified in the 2006 Pacific Coastal Salmon Recovery Fund Report to Congress:

Degraded Habitat-Estuarine and Nearshore Marine: Moderate Threat
Degraded Habitat-Floodplain Connectivity and Function: High Threat
Degraded Habitat-Channel Structure and Complexity: Moderate Threat
Degraded Habitat-Riparian Areas and Large Woody Debris 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: Moderate to High Threat

Conservation Actions:
Accomplishments in 2004–2006 for this ESU include the following:

- Preliminary scoping underway between State and NMFS regarding California State Forestry Habitat Conservation Plan.
- 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.
- Collaborating proactively with counties on General Plan Updates, Grading Ordinances, and Riparian Ordinances.
- Implementing white papers and policies for instream flow, gravel mining, summer dams.

- Collaborating with 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.
- Improved section 7 consultations.

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

- Research and monitor distribution, status, and trends of Chinook.
- 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 salmon 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: 3
A Priority Number of three was assigned to the CC Chinook salmon ESU in accordance with the Recovery Priority Guidelines (55 FR 24296, Section B) and indicates the priority of the species for recovery plan development and implementation. Ranking for the CC Chinook salmon ESU 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)*

Date Listed: November 5, 1990; reclassified from threatened to endangered on January 4, 1994; reaffirmed June 28, 2005

Legal Status: Endangered

Recovery Plan Status:
A draft recovery plan for the Sacramento winter-run Chinook salmon ESU was issued in August 1997. A draft multi-species recovery plan, that includes updated information for this ESU, is under development and is expected to be completed June 2007, with a final plan expected in December of 2007.

Species Status:
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. The productivity and abundance of the naturally spawning component of this ESU have exhibited marked improvement in recent years, compared to years of relatively low abundance in the 1980s and early 1990s. The Biological Review Team (BRT) noted that the recent measure of mean abundance obtained from data collected from 2000 to 2004, is only 3 percent of the peak mean (post-1967), and the BRT is particularly concerned about risks to the diversity and spatial structure of the ESU. Construction of Shasta Dam merged at least four independent populations into a single population, resulting in a substantial loss of genetic diversity, life-history variability, and local adaptation. Critically low salmon abundance (particularly in the early 1990s) imposed "bottlenecks" for the single remaining population, which further reduced genetic diversity. For this ESU, the BRT found extremely high risk for abundance, productivity, spatial structure, and diversity, with the highest concern for spatial structure and diversity, and significant concern for abundance and productivity. While encouraged by somewhat recent increases in abundance of the single population, the majority opinion of the BRT believe that the naturally spawned component of the Sacramento River winter-run ESU is still "likely to become extinct within the foreseeable future."

Two artificial propagation programs are also part of the Sacramento River winter-run Chinook ESU. An artificial propagation program is continuing, and a captive broodstock program for winter-run Chinook was carried out, both at the Livingston-Stone National Fish Hatchery on the mainstem Sacramento River above Keswick Dam. A captive broodstock program was also maintained at the University of California's Bodega Marine Laboratory. These programs (operated for conservation purposes since the early 1990s) were identified as high-priority recovery actions in the 1997 Draft Recovery Plan for this ESU. Because of increased escapement over the past several years, the captive broodstock programs have been terminated. An assessment of the effects of these artificial propagation programs on the viability of the ESU in total 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. A second naturally spawning population is considered critical to the long-term viability of this ESU, and plans are under way (but not yet implemented) to attempt establishment of a second population in the upper Battle Creek watershed, using the artificial propagation program as a source for fish. 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. In addition, the artificial propagation and captive broodstock programs have contributed to preserving the genome of this ESU.

Threats and Impacts:
As winter-run Chinook salmon historically were dependent on access to spring-fed tributaries to the upper Sacramento River that remained cool during summer and early fall, the most obvious impact to this ESU was the construction of Shasta Dam. The dam blocked access to the ESU's entire historic spawning habitat. With cold-water releases from Shasta creating conditions suitable for winter-run Chinook salmon 100 feet below the dam, this species was able to survive habitat alteration, but experienced significant impacts. Presumably, there were several independent populations of winter-run Chinook salmon in the Pitt, McCloud, and Little Sacramento Rivers, and in various tributaries to these rivers, such as Hat Creek and the Fall River. These populations merged to form the current single population. Any populations that may have existed in Battle Creek and the Calaveras River have since been extirpated. This ESU continues to be threatened by having only one extant population, low population size (compared to historic levels), vulnerability to drought, inadequately screened or unscreened water diversions, predation at artificial structures and by non-native species, pollution (e.g., Iron Mountain Mine), adverse flow conditions, high summer water temperatures, unsustainable harvest rates, and passage problems at various structures.

Conservation Actions:
Numerous conservation actions were conducted from 2004–2006 for the Sacramento River winter-run Chinook ESU.

The Central Valley Project section 7 consultations with the Bureau of Reclamation likely contributed to habitat improvements benefiting the Sacramento River winter-run Chinook salmon ESU. Implementation of the 1992 reasonable and prudent alternative has provided substantial benefits to this ESU by improving habitat and fish passage conditions in the Sacramento River and Delta. Such improvement likely has contributed to increases in abundance and productivity over the past decade through actions such as maintenance of minimum water flows during fall and winter months, establishment of temperature criteria to support spawning and rearing upstream of Red Bluff Diversion Dam (coupled with water releases from Shasta Dam), operation of the Red Bluff Diversion Dam gates for improved adult and juvenile fish passage, and constraints on Delta water exports to reduce impacts on juvenile outmigrants.

In addition, two large, ongoing comprehensive conservation programs in the Central Valley provide a wide range of ecosystem and species-specific protective efforts benefiting Chinook salmon – CALFED and the Central Valley Project Improvement Act (CVPIA). CALFED 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. Though not fully implemented, CALFED's Ecosystem Restoration 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. CALFED established the Environmental Water Account to offset losses of juvenile fish at the Delta pumps and to provide higher instream flows in the Yuba, Stanislaus, American, and Merced Rivers to benefit native fish, including salmon.

The CVPIA 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 the U.S. Fish and Wildlife Service 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).

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).

Priority Recovery Actions Needed:
The primary priority remaining for the winter-run Chinook salmon ESU is the establishment of an additional population or populations within the ESU. With only one population, the effects of other remaining threats (e.g., population size, unscreened water diversions**,** adverse water flow and temperature conditions**,** passage problems at various structures, and risk from drought conditions) are exacerbated. Reduction of all threats contributes to fulfillment of the Viable Salmon Population criteria for a viable ESU. CALFED's Battle Creek Restoration Project is another priority action to address limiting factors. This project has already restored stream reaches in the 42 miles of Upper Battle Creek suitable for winter-run Chinook salmon. The upper reach is to be fully restored under an agreement between Pacific Gas and Electric (which operates nine hydroelectric dams in this reach) and the resource agencies. The intent is to remove five of the dams and dedicate the water rights to the environment. The remaining dams will have increased instream flows, resulting in a habitat increase of 500 to 800 percent of linear miles of stream reopened for fish access. In addition, remaining dam structures would be modified with optimally designed fish ladders and screens, and the meander belt and riparian forest would be restored. Continued funding and implementation of CALFED's Ecosystem

Restoration Program and the CVPIA remain a priority overall 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.

Recovery Priority Number: 3

The recovery priority number for the Sacramento River winter-run Chinook salmon ESU was 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*)

Date Listed: September 16, 1999; reaffirmed June 28, 2005

Legal Status: Threatened

Recovery Plan Status:
No recovery plan has been completed for this ESU. A draft multi-species recovery plan, that includes updated information for this ESU, is under development and is expected to be completed June 2007, with a final plan expected in December of 2007.

Species Status:
The Central Valley (CV) spring-run Chinook salmon ESU has been reduced from an estimated 17 historical populations to only three extant natural populations with consistent spawning runs (on Mill, Deer, and Butte Creeks, which are tributaries to the Sacramento River). These remaining natural populations reached low abundance levels during the late 1980s (67 to 243 spawners compared to a historic peak of about 700,000 spawners), and are within close geographic proximity, making them vulnerable to disease and catastrophic events. CV spring-run Chinook require cool water while they mature in freshwater over the summer. Summer water temperatures in the CV are suitable for Chinook salmon only above the 150 to 500 meter elevation above mean sea level. Most such habitat in the CV is now upstream of impassable dams. The upper Sacramento River supports a small spring-run population, but its status is poorly documented and the degree of hybridization with fall-run Chinook salmon is unknown. Of numerous Sierra Nevada stream populations only two remain – the Feather River and the Yuba River populations. The Feather River population is dependent on Feather River Hatchery (FRH) production (which is considered part of the ESU), but may have hybridized with fall-run Chinook. The status of the Yuba River population is largely unknown, other than appearing to be small. An overall loss of diversity has resulted from the extirpation of spring-run populations in most of the CV, including all the San Joaquin tributaries. The Biological Review Team (BRT) views the FRH as a major threat to the genetic integrity of the remaining wild spring-run comprising this ESU.

The recent 5-year mean abundance for the three naturally spawning populations remains relatively small (500 to over 4,500 spawners); however, short and long-term productivity trends are positive and population sizes have shown continued increases over the abundance levels of the 1980s. The BRT has noted moderately high risk for abundance, spatial structure, and diversity criteria, but a lower risk for productivity (reflecting the recent positive trends). Based upon this risk assessment, the strong majority opinion of the BRT is that the CV spring-run Chinook salmon ESU is "likely to become endangered within the foreseeable future." No artificially propagated populations of spring-run Chinook in this ESU mitigate the BRT assessment.

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 habitat, 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.

Conservation Actions:
During 2004–2006, progress was made in addressing some of the limiting factors and threats to this ESU, largely through ESA section 7 consultations and other ESA-related conservation efforts in the Central Valley. The Central Valley Project section 7 consultation with the Bureau of Reclamation has likely contributed to habitat improvements benefiting the CV spring-run Chinook salmon ESU, such as flow and temperature improvements.

In addition, two large, comprehensive conservation programs in the Central Valley provide a wide range of ecosystem and species-specific protective efforts benefiting spring-run Chinook salmon – CALFED and the Central Valley Project Improvement Act (CVPIA). CALFED 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, while making efforts to restore the San Francisco Bay-Delta. Though not fully implemented, CALFED's Ecosystem Restoration Program has funded projects involving habitat restoration, floodplain restoration and protection, instream and riparian habitat restoration and protection, fish screening and passage projects, research on non-native species and contaminants, research and monitoring of fishery resources, and watershed stewardship and outreach. CALFED established the Environmental Water Account to offset losses of juvenile fish at the Delta pumps, and to provide higher instream flows in the Yuba, Stanislaus, American, and Merced Rivers to benefit salmon.

The CVPIA balances the priorities of fish and wildlife protection, restoration, and mitigation with those of irrigation, domestic water use, fish and wildlife enhancement, and power augmentation. The Bureau of Reclamation and the U.S. Fish and Wildlife Service 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, particularly for spring-run Chinook salmon and steelhead. 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).

The Delta Pumping Plant Fish Protection Agreement and the Tracy Fish Collection Mitigation Agreement mitigate for State Water Project and pumping plant impacts through screening of unscreened water diversions, enhanced law enforcement efforts to reduce illegal fish harvest, installation of seasonal barriers to guide fish away from undesirable spawning habitat or migration corridors, salmon habitat restoration, and through removal of four dams to improve fish passage on Butte Creek for Chinook and steelhead. Approximately one-third of the approved funding for salmon projects specifically targets spring-run Chinook salmon and steelhead in the upper Sacramento River tributaries.

Harvest protective measures benefiting spring-run Chinook salmon include seasonal constraints on sport and commercial fisheries south of Point Arena. In addition, the State has listed spring-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., fishing method restrictions, gear restrictions, bait limitations, seasonal closures, and zero bag limits), particularly in primary tributaries such as Deer, Big Chico, Mill, and Butte Creeks, which support spring-run Chinook salmon. The California Department of Fish and Game has implemented enhanced enforcement efforts in spring-run tributaries and adult holding areas, which have significantly reduced illegal harvest.

Priority Recovery Actions Needed:
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. Reduction of all these threats contributes to fulfillment of the Viable Salmon Population criteria for a viable ESU.

CALFED's Battle Creek Restoration Project is a priority action. This project has already restored stream reaches in the 42 miles of Upper Battle Creek suitable for spring-run Chinook salmon. This upper reach is to be fully 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 the water rights to the environment. The remaining dams will have minimum instream flows increased, resulting in a habitat increase of 500 to 800 percent of linear miles of stream reopened for fish access. Remaining dam structures would be modified with optimally designed fish ladders and screens, and the meander belt and riparian forest would be restored. Continued funding and implementation of CALFED's Ecosystem Restoration Program and the CVPIA remain a priority overall 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.

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 (*Salmo salar*) – Gulf of Maine DPS

Date Listed: November 17, 2000, listed jointly by NMFS and the U.S. Fish and Wildlife Service (FWS)

Legal Status: Endangered

Recovery Plan Status:
The Final Recovery Plan for the Gulf of Maine DPS of Atlantic Salmon was published in November 2005 by NMFS and FWS. The Recovery Plan was prepared jointly by NMFS, FWS, and the Maine Atlantic Salmon Commission (ASC).

The recovery plan builds on and expands recovery actions identified in the State of Maine's Atlantic Salmon Conservation Plan for Seven Maine Rivers (MASCP). NMFS and FWS (the Services) intend to maintain and expand ongoing collaborative recovery efforts in cooperation with the State of Maine. The Services reviewed and considered the recommendations of the 2004 National Research Council (NRC) report on Atlantic Salmon in Maine, and the recovery plan incorporates the recommendations of the NRC Report as appropriate.

Species Status:
The Gulf of Maine DPS of Atlantic salmon has declined to critically low levels. Adult returns, juvenile abundance estimates, and survival have continued to decline since the DPS was listed. In 2005, a total of 71 (90 percent confidence interval = 44 – 110) adult Atlantic salmon were estimated to return to DPS rivers.

Threats and Impacts:
As part of the recovery planning process, the Services assembled a team of technical experts from the Maine ASC, NMFS, and FWS to conduct a structured threats analysis. This evaluation of the geographic extent and life stages of Atlantic salmon affected by threats, and the severity of these effects, resulted in the following threats being identified as high priority for action to reverse the decline of Atlantic salmon populations in the Gulf of Maine DPS:

- Acidified water and associated aluminum toxicity which decrease juvenile survival.
- Aquaculture practices, which pose ecological and genetic risks.
- Avian predation.
- Changing land use patterns (e.g., development, agriculture, forestry).
- Climate change.
- Depleted diadromous fish communities.
- Incidental capture of adults and parr by recreational fishermen.
- Introduced fish species that compete or prey on Atlantic salmon.
- Low marine survival.
- Poaching of adults in DPS rivers
- Recovery hatchery program (potential for artificial selection/domestication)
- Sedimentation
- Water extraction

Conservation Actions:
During 2004–2006, the NMFS Northeast Regional Office (NERO) and Northeast Fisheries Science Center (NEFSC) – in cooperation with the Maine ASC, 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 implemented during 2004–2006 included the following:

- Prepared and published a final recovery plan.
- Established a Recovery Team comprised of technical experts with knowledge of Atlantic salmon and the issues/threats they face, to advise the Services in coordinating and prioritizing recovery actions for the DPS.
- Participated in international management of Atlantic salmon through the North Atlantic Salmon Conservation Organization (NASCO). Participation in NASCO has led to the development of multi-year regulatory measures for high seas Atlantic salmon fisheries, as well as international guidelines for salmon stocking and mitigation of threats from aquaculture practices.
- Continued monitoring and assessment of the status of wild salmon populations. Electrofishing surveys were conducted on most of the rivers in Maine with wild or stocked populations of Atlantic salmon to estimate density or relative abundance of juvenile salmon, and rotary screw trapping was used to estimate smolt populations, sample smolts, and to determine age and origin of emigrating smolts. In addition, telemetry studies were conducted on several rivers during this period to assess smolt survivorship and behavior by monitoring their movement.
- Conducted an experimental study over two years to determine the potential for predator (double-crested cormorants) deterrence to increase survival rates of juvenile Atlantic salmon. This was done in conjunction with the telemetry work described above.
- Conducted several experimental studies to determine the potential for mitigating impacts on the DPS from low pH due to acid rain. As part of this work, extensive water quality monitoring was conducted throughout the State of Maine.
- Provided substantial support to the Maine ASC for assessment and management activities
- Continued the Penobscot Bay Postsmolt Trawl Survey. This survey was designed to identify and quantify factors affecting nearshore survival of Atlantic salmon.
- Conducted annual sampling of the Atlantic salmon fishery in West Greenland. From this sampling, biological information related to the Greenlandic local-use catch was used in support of international Atlantic salmon stock assessments and to determine salmon continent-of-origin.
- Continued to monitor annual Atlantic salmon returns to Maine's rivers through the use of traps, weirs, and redd counts
- Worked with stakeholders on a variety of habitat restoration and protection projects.
- Worked with the aquaculture industry to implement measures protective of the DPS, including containment measures for aquaculture facilities and fish marking strategies to identify escaped farmed salmon.
- Led the efforts of a biological review team to review the relationship of other Maine river systems and salmon populations to the Gulf of Maine DPS. The biological review team completed this status review in early 2006.

- Organized a workshop to evaluate the effectiveness of the FWS-managed conservation hatchery program for Atlantic salmon in Maine. This workshop led to the initiation of a formal peer review of the hatchery program, which will be completed in 2007.

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

- Protect and restore freshwater and estuarine habitat.
- Minimize potential for take in freshwater, estuarine and marine fisheries.
- Reduce predation and competition on all life stages of Atlantic salmon.
- Reduce risks from commercial aquaculture operations.
- Supplement wild populations with hatchery-reared DPS salmon.
- 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.

The Recovery Plan identifies fifty-five specific "Priority 1" recovery actions that need to occur to recover the Gulf of Maine DPS of Atlantic Salmon. The Recovery Team, which was established in 2005, is ranking the recovery actions identified in the Recovery Plan, and will be submitting a report to the Services that identifies those recovery actions that should be of highest priority for implementation, based on several factors including recovery impact and feasibility of success. The report from the Recovery Team was submitted to the Services in January 2007, and is currently under review.

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 population decline 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. Taken together, these rankings correspond to a recovery priority number of one.

NON-SALMONID FISH RECOVERY

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

Date Listed: April 1, 2003

Legal Status: Endangered

Recovery Plan Status:
The Draft Smalltooth Sawfish Recovery Plan published on August 23, 2006.

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 south Florida between the Caloosahatchee River and the Florida Keys. 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.

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.

Conservation Actions:
Conservation actions conducted in 2004–2006 include the following:

- Studied the effects from Hurricane Charley (August 2004) on smalltooth sawfish habitats.
- Supported mangrove habitat restoration efforts on the J.N. Ding Darling National Wildlife Refuge.
- Supported a population viability analysis.
- Supported the National Smalltooth Sawfish Encounter Database.
- Supported a satellite tagging study of adult smalltooth sawfish.

Priority Recovery Actions Needed:
Priority actions needed to recover the species include the following:

- Implement strategies to reduce bycatch, mortality, and injury, in specific fisheries to ensure the species' viability.
- Develop, distribute, and implement 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.

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

Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

Date Listed: September 30, 1991, listed jointly by NMFS and the U.S. Fish and Wildlife Service (FWS)

Legal Status: Threatened

Recovery Plan Status:
The final recovery plan for the Gulf sturgeon was published in September 1995.

Species Status:
The Gulf sturgeon is an anadromous fish whose present range extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east to the Suwannee River in Florida. Gulf sturgeon adults spawn in freshwater, then migrate to feed and grow in estuarine/marine habitats.

While the overall status of Gulf sturgeon is considered stable, the exact status remains unclear. No estimates of the historical population size of Gulf sturgeon or its subpopulations are available, although some commercial landing statistics are available from 1887 to 1985. Estimated population sizes for known Gulf sturgeon spawning rivers are shown in Table 6; notably all estimates are pre-Hurricane Katrina (August 2005) and some, particularly Pearl River, are likely to be reduced once new surveys are completed. As resources permit, NMFS is continuing to fund research to study and monitor Gulf sturgeon.

Threats and Impacts:
Population-limiting factors for the Gulf sturgeon are thought to include barriers to historical spawning habitat (e.g., dams), habitat loss and degradation, and poor water quality (including contaminants, which may also limit recovery of the species). Recreational and subsistence fisheries for this species contributed to population declines in the past, but this threat was eliminated in 1984, when the State of Florida enacted protective measures and in 1991, when the species was listed under the ESA. Currently, Gulf sturgeon are likely taken in limited numbers as bycatch in shrimp trawl fisheries in state waters.

Table 5. Estimated spawning population sizes for known Gulf sturgeon spawning rivers.

Known Spawning Rivers	Estimated Population Size
Pearl River	430
Pascagoula River	234
Escambia/Conech Rivers	506-687
Yellow River	319–1,550[11]
Choctawhatchee River	2000-3000
Apalachicola River	62–218
Suwannee River	7,650[12]

[11] Includes only fish>100 cm total length.
[12] Based on fish about 2 or more years old (>60 cm total length).

Conservation Actions:
During 2004–2006, NMFS continued to work with federal agencies on reducing the impacts of actions that may affect Gulf sturgeon or its designated critical habitat through ESA section 7 consultations. Specifically, NMFS conducted many emergency consultations resulting from direct and indirect impacts from Hurricanes Katrina and Rita, and has hired a biologist dedicated to the northern Gulf of Mexico. In 2006 NMFS, along with U.S. Geological Society, organized and lead the annual Gulf sturgeon workshop for researchers and managers. The information exchanged at the meeting allows the Gulf sturgeon science and conservation community to provide updates on the latest scientific and other developments with respect to the implementation of the Gulf sturgeon recovery plan.

NMFS continues to fund a number of research projects to improve our understanding of Gulf sturgeon's movements and use of habitat.[13] NMFS continues to relocate tagged fishes during the winter months along the coastal Gulf shores. We continue to examine timing and habitat use of migrating Gulf sturgeon through the estuarine environment following months of fasting, and have initiated a study with the U.S. Army Engineer Research and Development Center to specifically determine areas of designated critical habitat that provide valuable foraging areas by coupling environmental and substrate characteristics.

Priority Recovery Actions Needed:
Priority recovery actions needed for the Gulf sturgeon include the following:

- Conduct a 5-year status review of the Gulf sturgeon with FWS.
- Update, identify, initiate, and expand partnerships with state and federal agencies to identify and implement conservation activities and actions to reduce the cumulative effects to both the Gulf sturgeon and, in particular, its designated critical habitat (ESA sections 6 and 7).
- Continue to improve ESA section 7 consultation coordination.
- Nurture the established partnership between NMFS and FWS to continue joint research activities and management, and to expand coordination and consistency of consultations conducted by the two agencies.
- Identify and initiate ESA section 6 agreements with Gulf Coast states, and subsequently coordinate Gulf sturgeon recovery plan implementation proposals for funding.
- Update the 1995 Gulf sturgeon recovery plan. The plan – a product of NOAA, FWS, and the Gulf States Marine Fishery Commission – synthesizes information collected on individual genetically distinct subpopulations to assess status of the species. The 1995 recovery plan outlined the most important actions required for recovery of the species, including: (1) a better understanding of the ecosystem and essential habitats of the species; (2) an assessment of riverine population sizes; and (3) a refinement of life history investigations in each river system to locate important spawning, foraging, and developmental habitats. Other recovery actions listed in the 1995 document include: (1) to conduct life history studies on the biological and ecological requirements of little-known or inadequately sampled life stages; (2) to survey, monitor, and model riverine populations; and (3) to continue the culture of Gulf sturgeon.

[13] ESA section 6 funds are not currently available for Gulf sturgeon research, as no Gulf Coast state has a section 6 agreement with NMFS that includes Gulf sturgeon.

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 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 classification, which is used by FWS but not by NMFS in designating recovery priority numbers.

Shortnose Sturgeon (*Acipenser brevirostrum*)

Date Listed: March 11, 1967[14]

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 Saint Johns River in Florida. Its life history includes strong fidelity to the natal river resulting in substantial reproductive isolation and a significant degree of genetic distinctiveness between 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. However, NMFS has not formally listed distinct population segments (DPS) of shortnose sturgeon under the ESA, and consequently, shortnose sturgeon remain listed as an endangered species range-wide. The demographic status of the species is mixed as trends of abundance for discrete populations vary across its range. There are no estimates available for historical population sizes of shortnose sturgeon, although accounts indicate sturgeon were abundant in many river systems along the East Coast.

The status of many of the shortnose sturgeon populations remains undetermined, or estimates are dated. NMFS is able to conduct statistically sound, quantitative population estimates for, at most, two of the 19 populations every 2 to 3 years. As resources allow, NMFS continues to investigate status and life history of individual shortnose sturgeon populations. Generally, populations in the north are healthier than those in the south. The Hudson River population has shown the most dramatic improvement and may be hailed as a clear metric of ESA success: this population increased by more than 400 percent since the 1970s, with an estimated abundance of about 60,000 fish dominated by adults. The Kennebec Complex formed by the Sheepscot, Kennebec and Androscoggin Rivers in Maine, has also shown signs of recovery: between the late 1980s and 1990s, the population grew from 7,222 to nearly 10,000 fish. At least two of the northern populations have remained relatively stable over several decades. Recent research on the Delaware River estimates approximately 12,047 adults and research conducted in the 1980s estimated 12,796 adults. Since the mid 1970s, and until recently, the Connecticut River shortnose sturgeon population appeared to be static, with about 1,000 adults total in the lower and upper portions of the river. Recent research suggests that numbers in the lower portion of the river may be slowly increasing. Some populations previously thought to be extirpated (locally extinct) still exist. For example, prior to 1996, NMFS and other scientists thought shortnose sturgeon were extirpated from the Chesapeake Bay. Since 1996, 73 shortnose sturgeon have been documented in the Bay and its tributaries, including ten in the Potomac River. Similarly, recent Atlantic sturgeon work funded by NMFS on the Penobscot River

[14] 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.

incidentally caught 62 shortnose sturgeon; these were the first confirmed catches of shortnose sturgeon in the Penobscot since 1978.

In the South there are population estimates for the Cooper River, South Carolina (301 adult fish in 1998); Altamaha River, Georgia (6,320 fish in 2006); Ogeechee River, Georgia (147 fish in 2000); Savannah River, Georgia (3,000 fish in 1999); and the Cape Fear River, North Carolina (50 fish in 1995).

NMFS continues to support surveys in other southern rivers to determine if shortnose sturgeon are present. In North Carolina, despite focused surveying, no shortnose were found in the Neuse River, NC, however we did receive an unconfirmed report of two shortnose sturgeon in 2006. In South Carolina we have confirmed that shortnose sturgeon are present in the following systems: Savannah, Ashepoo, Edisto, Cooper, Santee, Congaree, Sampit, Great and Little Pee Dee, Black and Waccamaw (M. Collins SCDNR, Pers. Comm.).

Threats and Impacts:
Many threats to the species are range-wide, while others are specific to the Southeast. Range-wide, 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. Threats have been reduced in some rivers to allow shortnose sturgeon populations to grow or stabilize. In other rivers, particularly in the Southeast, sturgeon population size remains low or the status is unknown.

Recent studies indicate that shortnose sturgeon, particularly in early life stages, are sensitive to low dissolved oxygen levels at high water temperatures. During summer, such hypoxic and anoxic areas are common, occurring annually in southern rivers and in portions of the Chesapeake Bay. These events present adverse environmental conditions that pose a significant threat to shortnose sturgeon recovery.

In addition, bycatch, predominantly in shad gillnet fisheries, also likely adversely impact the recovery of some shortnose sturgeon populations. The extent of shortnose sturgeon bycatch is not currently known.

Conservation Actions:
NMFS has initiated a status review of the shortnose sturgeon to determine if the current listing classification is accurate. An important first step of the review will be to determine population structure and evaluate if DPSs should be designated.

Pursuant to ESA section 7, NMFS continues to consult with federal agencies on actions that may affect shortnose sturgeon. Through these consultations, NMFS has worked effectively with federal agencies to ensure they carry out their actions in a manner that will not jeopardize the continued existence of shortnose sturgeon. Since 2004, NMFS has consulted on over 260 actions taking place in the NMFS Southeast Region and Northeast Region. These consultations have

been completed on a range of activities, including dredging of navigation channels and private facilities, water quality standards and regulations, bridge construction and various other actions.

NMFS participated in negotiating a Settlement Agreement with the Federal Energy Regulatory Commission and other parties on the effects of the continued operation of the Holyoke hydroelectric facility on the Connecticut River. The terms of the Settlement ensure that shortnose sturgeon will have a safe and effective means of passage above and below the facility's dam. NMFS has also completed consultation on the continued operation of the Lockwood hydroelectric project on the Kennebec River and on the effects of the construction and operation of a liquefied natural gas facility on the Delaware River. These consultations will ensure that effects to shortnose sturgeon from these projects are minimized and that sufficient habitat remains for this species.

NMFS is continuing to work with the State of Maryland to develop a conservation plan to minimize and mitigate effects of Chesapeake Bay commercial fishing on shortnose sturgeon. This plan may serve as a model for other states, to work with NMFS to develop similar plans.

In the South, NMFS is continuing coordination with Federal Energy Regulatory Commission for the re-licensing of the Santee Cooper Hydroelectric Project, as the Project's dams impede passage to spawning habitat. We are also continuing coordination with Georgia Ports for the Savannah Harbor Expansion Plan, as that action directly impacts critical over-wintering and foraging habitat.

NMFS currently supports research activities to improve our understanding of shortnose sturgeon behavior, abundance, health, habitats and genetic identification. However, these projects are limited by a lack of funding. In the north, research is continuing on the Delaware River to monitor the movements and habitat use of juvenile shortnose sturgeon. A 2006 ESA Section 6 funded project will be conducted by the state of New Jersey to investigate early life stages of shortnose sturgeon on the Delaware. The State of Maryland received ESA Section 6 Funds (2005 and 2004) in support of the conservation plan noted above to investigate distribution, movements and health of shortnose sturgeon. Together with the National Park Service, NMFS has provided funding for ongoing research for status, behavior and genetics work on shortnose sturgeon in the Potomac. The movements of Penobscot River fish in Maine are being tracked ultrasonically to discover important habitats in the river, especially spawning areas. Also, NMFS is supporting a larger Penobscot study that will result in an additional year of mark and recapture data for shortnose sturgeon in 2007, and an estimate of abundance for shortnose sturgeon. Lastly, several small contracts were funded by NMFS for genetic and contaminant analysis and to evaluate the effectiveness of side scan sonar technologies to detect shortnose sturgeon in the wild.

In the South, Section 6 funding has recently been awarded to: support surveys to determine population dynamics and critical habitat of shortnose in the Ogeechee River; investigate habitat use and inter-basin transfer on the Santee-Cooper Rivers; and conduct aging and genetic work in both the Savannah and Santee-Cooper Systems. In addition, we have utilized regional funding to survey the Altamaha and Savannah Rivers.

Priority Recovery Actions Needed:
Priority recovery actions needed for shortnose sturgeon include the following:

- Continue to gather information pertaining to individual riverine populations including population size, and spawning and foraging habitats – particularly those in the Chesapeake Bay, Penobscot, Cape Fear, Ogeechee, Savannah, Satilla and St. Marys rivers.
- Conduct studies to assess the sensitivity of shortnose sturgeon life stages to various contaminants and water quality issues (primarily low dissolved oxygen coupled with high temperature).
- Work with federal, state, and private partners to ensure adequate water flows and quality, and improve access to important habitats.
- Explore habitat restoration options (e.g., creation of spawning habitat, restoration of access to historical habitat, restoration of foraging habitat).
- Determine the extent and impact of bycatch on shortnose sturgeon populations and implement methods to reduce this bycatch.
- Complete the shortnose sturgeon status review initiated in 2006.
- Following the completed status review, convene a meeting of the shortnose sturgeon recovery team to review any new recommendations for recovery made in the status review. The team should evaluate progress made toward completing each of the recovery/research tasks identified in the status review and in the implementation schedule of the 1998 recovery plan. The recovery plan recognizes that range-wide and river-specific differences exist in recovery and research priorities. Therefore, two regional implementation teams may be needed to address shortnose sturgeon recovery and research priorities on a regional basis. A regional meeting for each implementation team is necessary to determine priorities for each individual population.

Recovery Priority Number: 5
The recovery priority number for shortnose sturgeon is five. This determination is based on the following rationale: 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; and 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. Taken together, these rankings correspond to a recovery priority number of five.

Green Sturgeon (*Acipenser medirostris*) – Southern DPS

Date Listed: April 7, 2006

Legal Status: Threatened

Recovery Plan Status:
No Recovery Plan has been developed for this species. Rulemaking for critical habitat designation and ESA take prohibitions are currently underway and expected to be proposed in the next 12 months. After that time, a recovery planning schedule will be developed.

Species Status:
Acoustic tagging studies investigating oceanic migration and behavior patterns of Northern (north of and including the Eel River in California) and Southern DPS (south of the Eel River) green sturgeon 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).

The Sacramento River contains the only known spawning population of green sturgeon within the boundaries of the Southern DPS. There has likely been a substantial loss of spawning habitat above the Keswick and Shasta Dams which has rendered the single remaining main-stem population particularly vulnerable to threats. Although there is currently no evidence of spawning in the Feather River, it is likely that spawning occurred there historically and that spawning habitat has been lost behind the Oroville Dam.

There is no direct evidence that demonstrates a clear decline in abundance of Southern DPS green sturgeon. There are two pieces of indirect evidence that suggest a downward trend in abundance of the Southern DPS of green sturgeon. The first is the most recent abundance estimates for legal-size white sturgeon (117–183 cm FL) in San Pablo Bay generated by the California Department of Fish and Game (CDFG), indicating an approximate 10-fold 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 that was 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 3½ 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 (Table 7). 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 by 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 United States waters by recent efforts as described in the next section ("Conservation Actions").

Table 6. Threats assessment by river system within the Southern DPS. The specific effects of each threat on the Southern DPS and its habitat, the times of year when the Southern DPS encounters each threat, and the life stages vulnerable to each threat are listed. L=larvae; J=juvenile; and A=adult.

River	Threats	Specific Effect	Timing of Exposure	Life Stage
Sacramento	Impassible barriers (Keswick and Shasta Dams)	Block/prevent access to spawning habitat	Late-spring-early summer	A
	Adult migration barriers	Upstream migration barrier	Late spring-early fall	A
	Insufficient flow	Altered hydrology	Low flow years	L, J, A
	Increased temperatures	Developmental abnormalities (reduced swimming performance)	Low flow years	L, J, A
	Water diversion	Increased likelihood of stress, physical injury, harassment	All months	L, J, A
	Non-native species (e.g., striped bass)	Trophic alterations	All months	L, J, A
	Poaching	Removal of Fish	Unknown	J, A
	Pesticides and heavy metals	Contamination	All months	L, J, A
	Local fishing	Removal of Fish	January-May	J, A
Feather	Impassible barriers (Oroville Dam)	Block/prevent access to spawning habitat	Late-spring-early summer	A
	Extreme low flow rates	Altered hydrology	Low flow years	L, J, A
	Increased temperatures	Developmental abnormalities (reduced swimming performance)	Low flow years	L, J, A
	Non-native species (e.g., striped bass)	Trophic alterations	All months	L, J, A
	Poaching	Removal of Fish	Unknown	J, A
	Pesticides and heavy metals	Contamination	All months	L, J, A
	Local fishing	Removal of Fish	January-May	J, A

Conservation Actions:

Major accomplishments in 2004–2006 for the Southern DPS green sturgeon include the following:

- Fishing regulations: The California Department of Fish and Game (CDFG) Commission approved the CDFG's proposed recreational fishing regulation changes for sturgeon on December 8, 2006. The regulations, effective March 1, 2007, provide that there will be no retention of green sturgeon, set a changed slot (size) limit and a bag limit of 3 for white sturgeon, and require implementation of a sturgeon report card system. These regulations offer additional protection to green sturgeon. On December 14, 2006, the Washington Department of Fish and Wildlife and the Oregon Department of Fish and Wildlife voted to prohibit the retention of green sturgeon in the Columbia River recreational fishery from Bonneville Dam, downstream to the mouth of the Columbia River. This prohibition

became effective on January 1, 2007. The Washington Fish and Wildlife Commission adopted a permanent rule to prohibit retention of green sturgeon in recreational fisheries statewide, effective May 1, 2007. The retention of green sturgeon in Washington commercial fisheries has been prohibited statewide by permanent rule since January 26, 2007. The retention of green sturgeon in Oregon and Washington Columbia River commercial fisheries has been prohibited by emergency rule since July 2006.

- Salvage of green sturgeon at the Tracy Fish Collection Facility and the Skinner Delta Fish Protective Facility in the South Delta is ongoing.
- Green sturgeon-focused research, including fish passage and genetics studies by University of California, Davis and acoustic tagging and tracking studies by NOAA to better understand the distribution and migration of green sturgeon is ongoing.
- Activities and projects were conducted under the Central Valley Project Improvement Act 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:

Priority recovery actions needed for the Southern DPS green sturgeon include the following:

- 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 m 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 m 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 of green sturgeon is five. This 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, in particular spawning and rearing habitat, are carefully monitored and limited. There is conflict between the recovery of the Southern DPS of green sturgeon and economic interests. Central Valley agriculture, other sources of water resource use, and commercial and recreational fishing, are among some of the industries that will be affected by efforts to recover the Southern DPS of green sturgeon.

PLANT RECOVERY

Johnson's Seagrass (*Halophila johnsonii*)

Date Listed: September 14, 1998

Legal Status: Threatened

Recovery Plan Status:
A recovery plan for Johnson's seagrass was completed in September 2002.

Species Status:
Johnson's seagrass is only found along approximately 200 km of coastline in southeastern Florida. Results from surveys indicate the species' geographic range appears stable. A 5-year review will be initiated in October 2006.

Threats and Impacts:
Johnson's seagrass is threatened by several human and natural perturbations, including dredge and fill activities, construction of overwater structures, prop scarring, altered water quality, siltation, and storms. None of the threats identified at listing have been curtailed or eliminated. Cumulative impacts are a concern for the species.

Conservation Actions:
Conservation actions completed during 2004–2006 include the following:

- Supported projects to determine the effects from Hurricanes Jeanne (September 2004) and Frances (September 2004) on the distribution of Johnson's seagrass.
- Supported the development of a population model to predict population growth rates.
- Supported the establishment of permanent monitoring sites with the species' range.

Priority Recovery Actions Needed:
Priority recovery actions needed for Johnson's seagrass include:

- Determine the mechanism for recruitment of patches and maximum dispersal distance of vegetative fragments.
- Determine the precise northern and southern distributional limits of the species and monitor the temporal variation in these limits.
- Determine whether patch size, abundance, or spacing vary from north to south and identify if there are presently any large distribution gaps.
- Establish permanent monitoring plots within the range of the species.

Species Recovery Priority: 7
Johnson's seagrass is assigned a recovery priority of seven, based on a moderate magnitude of threat, a low-moderate recovery potential, and the potential for economic conflict.

INVERTEBRATE RECOVERY

White Abalone (*Haliotis sorenseni*)

Date Listed: May 29, 2001

Legal Status: Endangered

Recovery Plan Status:
A draft recovery plan for white abalone was completed in October 2006.

Species Status:
Overfishing has driven white abalone densities to such low levels, that despite fishery closure in 1996, adults do not occur in high enough densities to successfully reproduce. Surviving white abalone may die in the near future without leaving younger animals to take their place. Wild populations are likely to go extinct unless supplementation of wild populations through disease-free captive breeding can be achieved.

Commercial and recreational exploitation of white abalone has occurred over the last 50 years in California, and landings data indicate that catches reached a peak from 1972-1974, and declined to near zero in just five years (Figure 9). 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 today (densities of less than 20 per hectare). While the most recent estimates of total population size in three Southern California locations (Table 8) 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) and small individuals (< 9 cm) are absent in extant populations. Although commercial fishing for white abalone in Mexico is not occurring, preliminary data from surveys conducted in October of 2006 suggest that populations in Mexico have also declined dramatically in recent years.

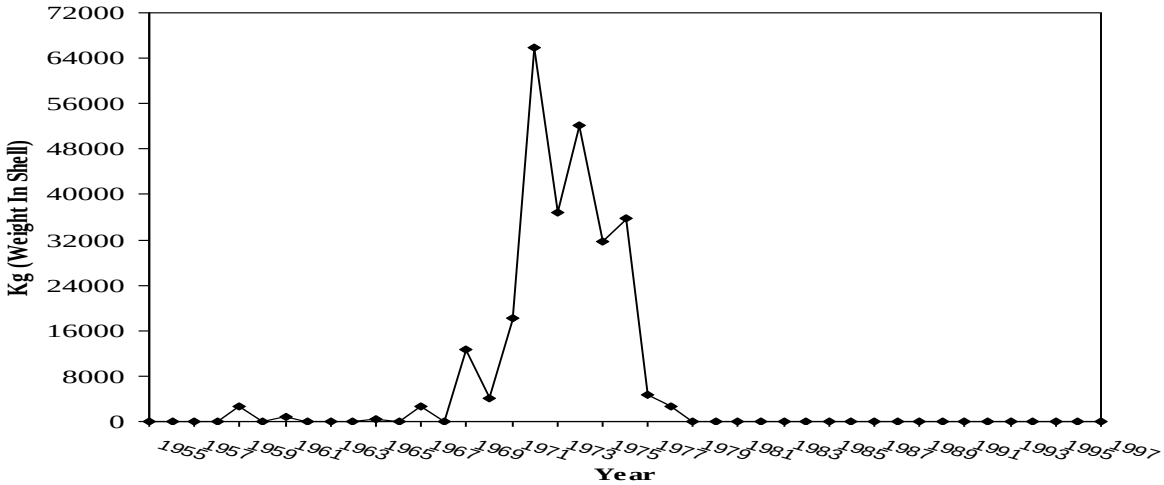


Figure 9. California commercial catch (weight in shell) of white abalone reported in California Department of Fish and Game bulletins for the period 1955-1997.

Threats and Impacts:
Threats and impacts to white abalone include the following:

- 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.
- Reduced genetic diversity resulting in lower reproductive potential and fitness of wild populations.
- Spread of disease through supplementation.
- Illegal harvesting.
- Habitat modification through human activities.
- Habitat modification through environmental/climate change.

Table 7. Estimates of white abalone population size based on density estimates, area surveyed and habitat area by depth for Tanner Bank, Cortes Bank and San Clemente Island during underwater remotely operated vehicle (ROV) and multi-beam sonar surveys conducted from 2002–2004.

Depth	Tanner Bank 2002	Tanner Bank 2004	Cortes Bank 2003	San Clemente Island 2004
30-40	1592.5±514.5	710.5±465.5	2853.6±2041.6	1215.2±1097.6
40-50	8415.0±1827.5	2210.0±722.5	2580.3±1184.4	722.8±500.4
50-60	2811.1±1240.2	2962.7±2135.9	1932.0±2114.1	0
Total	**12818.6±3582.2**	**5883.2±3323.9**	**7365.9±5340.1**	**1938.0±1598.0**

Conservation Actions:
Conservation actions conducted in 2004–2006 for recovery of white abalone include the following:

- Assessment and monitoring of historic and current white abalone populations at the Northern and Southern Channel Islands (2005–2006), and Baja California, Mexico (2006) by NMFS, the National Park Service, the Channel Islands Marine Resources Institute, and the California Department of Fish and Game.
- Assessment and monitoring of white abalone habitat in the Northern and Southern Channel Islands (2005–2006) using high resolution acoustic remote sensing technology by NMFS, in cooperation with the United States Geological Survey and the California State University Monterey Bay.
- Continued development of captive breeding and propagation program at the Channel Islands Marine Resources Institute (2004–present).
- 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 (2004–present).
- Examination and assessment of future outplanting sites and methodologies by NMFS, the Channel Islands Marine Resources Institute, the National Park Service, the California Department of Fish and Game, and the Channel Islands National Marine Sanctuary (2005–2006). Outplanting is the release into the wild of the progeny of captive breeding programs.
- Examination of existing genetic structure of wild population in order to maintain genetic integrity of captively propagated abalone by the Scripps Institution of Oceanography (2004–2005).

- 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 (2005-present).

Priority Recovery Actions Needed:
Priority recovery actions needed for white abalone include the following:

- 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.
- Secure financial support for white abalone recovery.

Recovery Priority Number: 2
The recovery priority number for the white abalone is two. This 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 could die 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. There is little conflict between the recovery of white abalone and economic interests. Commercial and recreational fishing for the species is closed and, because of the species' remoteness (extant populations occur in deep water, primarily >100 feet deep, and on offshore islands and banks), there is minimal conflict with anthropogenic activities.

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

Date Listed: May 9, 2006

Legal Status: Threatened

Recovery Plan Status:
No recovery plan currently exists for elkhorn and staghorn corals.

Species Status:
Elkhorn and staghorn corals are branching corals found in shallow (<30m) 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 species that are ubiquitous. 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, and physical damage from hurricanes. These threats are severe, ongoing, synergistic, and have displayed an increasing trend in the recent past. Disease is widespread, episodic, unpredictable in its occurrence, and results in high amounts of mortality. Any rise in sea-surface temperature 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, boating), which degrade coral condition and increase synergistic stress effects (e.g. bleaching).

Conservation Actions:
Support was provided in 2006 for monitoring ecological performance of elkhorn coral by genotyping the individual colonies, and for ongoing research and monitoring of both elkhorn and staghorn corals at NMFS' Southeast Fisheries Science Center.

The NOAA Damage Assessment and Restoration Centers responded to a major ship grounding off the southern coast of Puerto Rico, which impacted a surprisingly healthy and dense staghorn coral reef. Emergency restoration resulted in the reattachment of approximately 800 fragments of staghorn coral and additional restoration will be completed as part of the case settlement.

During the 2006 elkhorn and staghorn coral spawn, several scientists collected gametes to fertilize and rear in the lab. The work aims at identifying biological, chemical and physical requirements for fertilization, settlement, and recruitment. Additionally, some of the reared colonies will be re-located to the reefs from which they were collected.

Priority Recovery Actions Needed:
The focus of the initial phase of recovery will be the protection of the current species distribution, protection of their habitat, and finding additional populations. This will be accomplished by using a range of protection tools available and will be based on the ecological requirements of the species and what is needed to fully protect its habitat. 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:

- Identify the specific areas used by the species requiring habitat conservation and assign priorities to each of them.
- 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 should be assigned a recovery priority of seven, based on a moderate magnitude of threat, low-moderate recovery potential, and the potential for economic conflict.

MARINE MAMMAL RECOVERY

Seals and Sea Lions

Caribbean Monk Seal (*Monachus tropicalis*)

Date Listed: March 11, 1967

Legal Status: Endangered

Recovery Plan Status:
No recovery plan exists for the Caribbean monk seal.

Species Status:
This species is presumed extinct. Historically, the Caribbean monk seal ranged throughout the Caribbean region, but population numbers were greatly reduced by sealers in the 1800s. This species has been known to occur in Florida, Puerto Rico, and the U.S. Virgin Islands; however, no known populations currently exist in the wild. There have been no confirmed sightings since 1952, despite extensive surveys.

Threats and Impacts:
A significant factor in the reduction of Caribbean monk seal numbers was overharvesting by sealers in the 1800s. It is possible that disturbance of breeding areas by humans may have also played a role. Pups' tame behavior may have increased vulnerability to harvesting.

Conservation Actions:
No conservation actions were conducted during 2004–2006.

Priority Recovery Actions Needed:
Because this species is presumed extirpated or extinct, no priority recovery actions are needed at this time.

Recovery Priority Number: 12
Because this species is likely extirpated throughout its range, the recovery priority number for the Caribbean monk seal is 12. This represents a low magnitude of threat as a rare population, a low recovery potential, and the absence of conflict with economic activity.

Guadalupe Fur Seal (*Arctocephalus townsendi*)

Date Listed: December 16, 1985

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 2004–2006 timeframe.

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, and the absence of significant conflict with economic projects.

Hawaiian Monk Seal (*Monachus schauinslandi*)

Date Listed: November 23, 1976

Legal Status*:* Endangered

Recovery Plan Status:
The first Recovery Plan for the Hawaiian Monk Seal was completed in 1983. A revised draft was released on November 28, 2006 (71 FR 68801). The public comment period for the plan began on that date and closed on January 29, 2007.

Species Status:
The current population of Hawaiian monk seals is approximately 1,247 individuals, which is assumed to be well below its optimum sustainable population. The majority of the population occurs in the Northwestern Hawaiian Islands (NWHI). The total abundance estimate of six NWHI subpopulations in 2005 was 1,072 seals (including 163 pups) (Figure 10). The six subpopulations exhibit differing trends, most likely reflecting varying factors influencing population growth at each site. The species is found in lower numbers in the Main Hawaiian Islands (MHI) where population numbers and range both appear to be expanding. The current best minimum abundance estimate for the MHI is 77. Births have been documented on most of the major islands and annual births in the MHI are believed to have increased since the mid-1990s. Monk seals also occur at Necker and Nihoa Islands, where the mean (±SD) of all counts (excluding pups) conducted between 2001 and 2005 was 14.4 (±4.3) at Necker Island, and 17.7 (±8.3) at Nihoa Island.

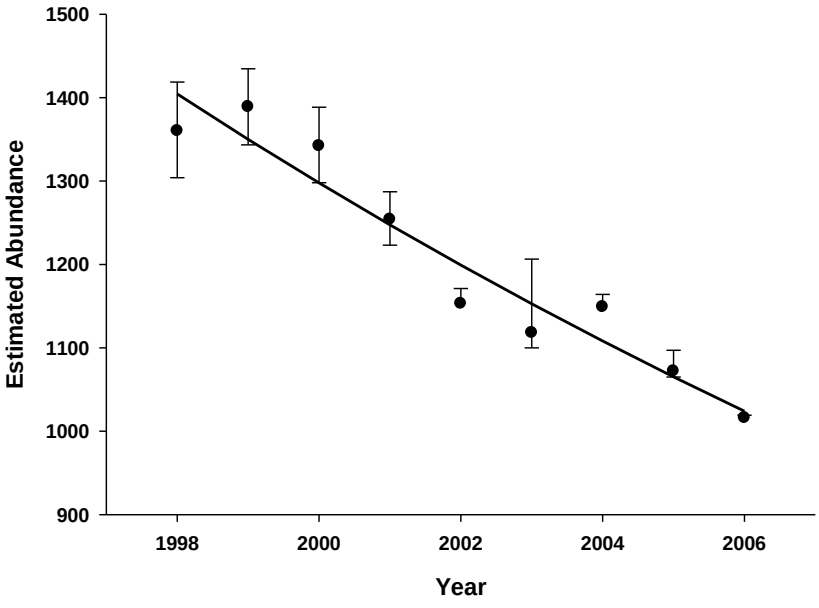


Figure 10. Estimated abundance of Hawaiian monk seals at the six main NWHI subpopulations. Error bars indicate ± 2 se (or known minimum abundance).

Threats and Impacts:
Food Limitation – A critical threat to population growth in the NWHI is food limitation. Low juvenile survival, in part due to food limitation, has been evident at all NWHI subpopulations. Juvenile survival has declined most dramatically at French Frigate Shoals, with significantly smaller pup and juvenile sizes, consistent with signs of food limitation. 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, this threat is of highest concern.

Marine Debris/Entanglement – 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 the NWHI. This is a serious concern because the number of monk seals found entangled is not decreasing nor has there been a reduction in the accumulation rates of marine debris in the NWHI.

Shark Predation – There has been a significant increase in shark predation on monk seal pups born 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.

Infectious diseases – Monk seal deaths in the NWHI and the MHI have led to concern about the presence of pathogens. The lack of antibodies in monk seals to various viruses makes them extremely vulnerable to infection from pathogens that they have not previously encountered, such as leptospirosis, toxoplasmosis, and West Nile virus, a pathogen that has not yet been identified in Hawaii but is present in 47 other states.

Habitat Loss – The loss of terrestrial habitat is a significant issue of concern in the NWHI, especially habitat loss due to environmental factors such as storms and sea level rise. Some habitat loss (e.g., the subsidence of Whaleskate Island at French Frigate Shoals) has already been observed. With the increased number of pups born in the MHI, there is the potential for human disturbance at popular beaches.

Fishery Interactions – Interactions with fisheries have been documented for Hawaiian monk seals, including interactions with active fishing gear, consumption of fishing discards, and entanglement in derelict fishery debris. Hawaiian monk seals in the MHI have been observed with embedded hooks from recreational fishing, particularly the nearshore *ulua* fishery, and seal have been found entangled in gillnets.

Male Aggression – During the 1980s and early 1990s, the primary identified cause of adult and juvenile female mortality affecting the recovery potential in the monk seal population was injury and death caused by multiple male aggression, especially at Laysan and Lisianski Islands. Individual males have attacked weaned pups of both sexes.

Human Interaction – Monk seals are generally intolerant of human interaction, and this type of disturbance has lead to abandonment of haulout sites. However, monk seals have been pupping on populated MHI beaches, presenting major management challenges.

Biotoxins – In 1978, a significant number of Hawaiian monk seals died on Laysan Island, and high levels of ciguatoxin and maitotoxin were detected in the livers of two seals. Subsequent satellite remote sensing in Hawaiian monk seal habitat has indicated the potential impact for dangerous algal blooms which could contain harmful toxins.

Vessel groundings – Monk seals may be injured or killed by vessel groundings that release hazardous materials (including oil or fuel), rotting bait, lost gear that could entangle seals, and human disturbance after the grounding incident. Vessel groundings that damage coral reef communities may lead to outbreaks of ciguatera, which may then accumulate in monk seal prey.

Contaminants – Hawaiian monk seals are exposed to various contaminants, including organochlorines such as polychlorinated biphenyls (PCBs). The effects of these compounds on monk seals are not known. The levels observed in monk seals are not elevated when compared with other North Pacific pinnipeds.

Climate and Oceanographic Conditions – Changes in climate and oceanographic conditions may affect monk seals by changing the availability of their prey, and may result in changes in the number or distribution of monk seal predators. A recent publication demonstrated that sea-level rise may significantly impact monk seals in the NWHI by reducing available terrestrial habitat for monk seals, especially in the low-lying NWHI. Further research has been proposed to better characterize the threat of habitat loss with improved mapping and modeling techniques and to explore mitigation measures.

Conservation Actions:
Although numerous conservation efforts over the past several decades have not halted the decline in monk seal population numbers, these efforts have slowed the decline, which in turn has provided more time to recover the species. The following conservation actions were undertaken for Hawaiian monk seal recovery in 2004–2006:

- In September 2005, Hawaii designated the NWHI as a state refuge, eliminating all commercial and recreational fishing in state waters, which extend 3 nautical miles from shore. On June 15, 2006, the NWHI Marine National Monument (71 FR 51134, August 29, 2006) was established by Presidential Proclamation 8031. The boundary of the Monument includes approximately 140,000 square miles of emergent and submerged lands and waters of the NWHI, providing the highest form of national, marine environmental protection for the Hawaiian monk seals' NWHI marine habitat. Protections include fishing prohibitions and regulations, with commercial fishing within the Monument being phased-out over the ensuing five years.
- Planning and training has been undertaken for high risk events such as morbillivirus outbreak, leptospirosis infections, oil spills, and biotoxin exposure.
- Shark predation mitigation – In response to pup woundings or disappearances, pups have been translocated from Trig Island to other, low risk sites as soon as possible after weaning. Shark removal operations have also been initiated.
- The Midway Atoll Captive Care Program has been providing nutritional support for undersized female juvenile seals in the field.
- Human impact mitigation – Pupping sites in popular areas of human activity have been monitored to minimize human impact, primarily through the training and use of

volunteers, and pups have been successfully translocated to avoid human disturbance and other risk associated with human activities.

- Mitigation of entanglement – Hawaiian monk seal researchers regularly disentangle seals caught in marine debris, especially in the NWHI, thereby reducing mortality to individual seals. A multi-agency Marine Debris Removal Program removed 18 tons of derelict fishing gear from around the U.S. Pacific Islands in 2006, and has removed 560 metric tons since 1999. In December 2006, Congress passed and the President signed into law a bill to establish programs within NOAA and the U.S. Coast Guard to help identify, determine sources of, assess, reduce, and prevent marine debris and its adverse impacts on the marine environment, in coordination with non-federal entities (Public Law 109-449).
- State of Hawaii Section 6 Agreement – On August 29, 2006, NMFS entered into a cooperative agreement under section 6 of the ESA with the State of Hawaii Department of Land and Natural Resources to conserve the Hawaiian monk seal, humpback whale, green sea turtle, and hawksbill sea turtle. After completing this agreement, the State submitted an application under the Protected Species Cooperative Conservation grant program for funding to support conservation activities for these species. The State of Hawaii is now the 12th state to enter into a cooperative agreement with NMFS under section 6 of the ESA.

Priority Recovery Actions Needed:

- Improve the survivorship of females, particularly juveniles, in subpopulations of the NWHI by:
    a. maintaining and enhancing existing protection and conservation of habitat and prey base,
    b. targeting research to better understand the factors that result in poor juvenile survival,
    c. intervening where appropriate to ensure higher survival of juvenile and adult females, and
    d. continuing actions to protect females from individual and multiple male aggression and to prevent excessive shark predation.
- Maintain or expand existing field efforts. The extensive field presence that has been maintained during the breeding season in the NWHI is critical not just to the research efforts, but also to the active management and conservation of Hawaiian monk seal sub-populations in these areas.
- Ensure the continued natural recovery of the Hawaiian monk seal in the MHI. This must include better coordination of activities between and among all parties interested in and affected by the increased population of monk seals in the MHI.
- Reduce the probability of the inadvertent introduction of infectious diseases into the Hawaiian monk seal population.

Recovery Priority Number: 1

The Hawaiian monk seal has a recovery priority number of one, based on criteria in the Recovery Priority Guidelines (55 FR 24296, June 15, 1990), that describes a high magnitude of threat, high recovery potential, and the potential for economic conflict while implementing recovery actions. The magnitude of threat is considered to be high based on the rapid 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, especially if an inter-island, high-speed ferry is introduced.

Steller Sea Lion (*Eumetopias jubatus*) – Eastern and Western DPSs

Date Listed:
April 10, 1990 (listed as one threatened species)
May 5, 1997 (split into eastern and western DPSs at Cape Suckling, Alaska [144°W longitude] and reclassified)

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

Recovery Plan Status:
A draft recovery plan for both populations of Steller sea lion was completed in May 2006.

Species Status:
The Steller sea lion was listed as a threatened species under the ESA on April 5, 1990, due to substantial declines in the western portion of the range. In contrast, the eastern portion of the range (in southeastern Alaska and Canada) was increasing at 3 percent per year. Critical habitat was designated on August 27, 1993, based on the location of terrestrial rookery and haulout sites, spatial extent of foraging trips, and availability of prey items. In 1997, the Steller sea lion population was split into a western DPS and an eastern DPS based on demographic and genetic dissimilarities. Due to the persistent decline, the western DPS was reclassified as endangered, while the increasing eastern DPS remained classified as threatened.

Through the 1990s, the western DPS continued to decline at about 5 percent per year. However, the western population has shown an increase of approximately 3 percent per year between 2000 and 2004. This was the first recorded increase in the population since the 1970s. Based on recent counts, the western DPS is currently about 44,800 animals and may be increasing due to higher juvenile and adult survival. However, it remains unclear whether Steller sea lion reproduction has also improved and whether the observed 3 percent annual population growth will continue. In general, the western Aleutian Islands area continues to decline while the core of the range (central and eastern Aleutian Islands and western Gulf of Alaska) appears to be stable.

The threatened eastern DPS is currently between 45,000 and 51,000 animals, and has been increasing at 3 percent per year for nearly 30 years.

Threats and Impacts:
Minor threats to the western DPS include: (1) Alaska Native subsistence harvest, (2) illegal shooting, (3) entanglement in marine debris, (4) disease, and (5) disturbance from vessel traffic and scientific research. Although much has been learned about Steller sea lions and the North Pacific ecosystem, considerable uncertainty remains about the magnitude and likelihood of the following potential threats to recovery of the western DPS (relative impacts in parenthesis): competition with fisheries (potentially high), environmental variability (potentially high), killer whale predation (potentially high), incidental take by fisheries (medium), and toxic substances (medium).

In contrast, no threats have been identified for the eastern DPS. Although several factors affecting the western DPS also affect the eastern DPS, these impacts do not appear to be limiting recovery given the long term sustained growth of the population.

Conservation Actions:
Much of the conservation effort has been focused on eliminating the most direct, and likely, causes of the decline (e.g., shooting and incidental take). These efforts include 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 provide management with options for recovery actions.
- Substantial reduction in the potential for competitive interactions between commercial fisheries for pollock, Atka mackerel, and Pacific cod in Alaska (rookeries are protected by fishery closures and no-transit zones, no pollock fishing is allowed within 10–20 nautical miles of 75 haulouts, and fishing is controlled in part of the sea lion critical habitat).

Priority Recovery Actions Needed:
Priorities for the recovery of the Steller sea lion continue to be: (1) conducting an annual, range-wide population census to monitor population trends; (2) assessing survival and reproductive rates through long-term marking programs of the western and eastern DPSs for development of population growth models; and (3) assessing the spatial and temporal distribution and availability of prey throughout the range. Additional recovery actions highlighted in the draft revised recovery plan include: (1) implement an adaptive management plan; (2) maintain fishery conservation measures; and (3) reduce the uncertainty around the magnitude of the key threats (fisheries, killer whale predation, and environmental change).

Recovery Priority Number: 7 (*western DPS*); 10 (*eastern DPS*)
The recovery priority number for the western DPS of Steller sea lion is seven, due to a moderate magnitude of threat, a moderate recovery potential, and the presence of conflict activity.

The recovery priority number for the eastern DPS of Steller sea lion is 10, due to a low magnitude of threat, high recovery potential, and no significant conflict with economic activity presenting a risk to recovery.

Whales

Blue Whale (*Balaenoptera musculus*)

Date Listed: June 2, 1970

Legal Status: Endangered

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

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 from 400 to 1,400 whales. In the North Pacific, pre-exploitation population size is speculated to be approximately 4,900 blue whales and the current population estimate is a minimum of 3,300 blue 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, and 100 to 555 whales for current population size.[15]

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 current 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. The current minimum population estimate for this stock is 1,744 whales; it is unclear whether the population is increasing, decreasing, or stable.[16]

[15] International Whaling Commission statistics – www.iwcoffice.orgs.
[16] Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M.S. Lowry. 2006. U.S. Pacific Marine Mammal Stock Assessments: 2006. NOAA-TM-NMFS-SWFSC-388.

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 ship strike is unknown. Ship strikes are also implicated in the deaths of four blue whales off California since 1980. The detected blue whale mortality from ship strikes off California from 1991–1995 averaged 0.2 per year. Further mortalities of this nature probably have occurred without being reported. 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 a potential for bycatch of blue whales in drift gillnet fisheries for swordfish and sharks. Observer coverage in such fisheries was relatively low in the past but increased to 10–18 percent during 1991–1995. In the observed fisheries, no blue whale mortalities were documented; however, entanglement rates may be underestimated, as blue whales may break through or carry away fishing gear, perhaps suffering unrecorded subsequent mortalities. While impacts are unknown, the increasing levels of anthropogenic noise in the oceans may be an additional concern for blue whales.

Conservation Actions:
Conservation actions for the blue whale during 2004–2006 are on-going, and include the following:

- Monitoring the status of the California/Oregon/Washington stock of blue whales via shipboard surveys, conducted every 3 years with Marine Mammal Protection Act (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*)

Date listed: June 2, 1970

Legal status: Endangered

Recovery Plan status:
No recovery plan has been completed for the bowhead whale.

Species status:
Bowhead whales are distributed in seasonally ice-covered waters of the Arctic and near Arctic, with five stocks currently recognized by the International Whaling Commission. Four small stocks occur in the Sea of Okhotsk, Davis Strait, Hudson Bay, and the offshore waters of Spitsbergen; these small bowhead stocks are comprised of only a few tens to a few hundreds of individuals. The only stock found within U.S. waters is the western Arctic stock, which comprises the largest population of this species. The western Arctic stock migrates annually from wintering areas in the northern Bering Sea, through the Chukchi Sea in the spring, and to the Beaufort Sea, where it spends much of the summer before returning to the Bering Sea in the fall.

The most current abundance estimate for western Arctic bowhead whales (from ice-based counts in the spring of 2001) is 10,545 whales, and data indicated the population is increased at 3.4 percent per year for the period 1978–2001. Pre-exploitation population levels are estimated at 10,400 to 23,000 whales.[17] A status review for this species will be conducted in 2007, with a possibility of changing the ESA listing status of bowhead whales.

Threats and Impacts:
Threats and impacts to the bowhead whale population include oil and gas exploration, development, and leasing within waters of the State of Alaska and on the Outer Continental Shelf. Most of the year, bowhead whales are closely associated with sea ice. During the summer, this population occurs in relatively ice-free waters in the southern Beaufort Sea – an area often exposed to industrial activity related to petroleum exploration and extraction. Increasing oil and gas development in the Arctic will lead to an increased risk of various forms of pollution to bowhead whale habitat, including oil spills, toxic and nontoxic waste, and noise due to higher levels of traffic as well as exploration and drilling operations. However, the area of disturbance is localized. Since the western Arctic bowhead whale population is approaching its pre-exploitation population size and has been increasing at a roughly constant rate for over 20 years, the impacts of the oil and gas industry on individual survival and reproduction are likely to be minor.

Another element of concern is the potential for climate change, which will probably affect high northern latitudes more than other locations. Evidence gathered over the past 10–15 years indicates a shift in regional weather patterns in the Arctic region. Ice-associated animals, such as

[17] Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M.S. Lowry. 2006. U.S. Pacific Marine Mammal Stock Assessments: 2006. NOAA-TM-NMFS-SWFSC-388.

the bowhead whale, may be sensitive to changes in Arctic weather, sea-surface temperatures, ice extent, and associated effects on prey availability. There are insufficient data to make reliable predictions of the effects of any Arctic climate change on bowhead whales.

A minor additional concern for bowhead whales is the possibility of fishing gear interactions and entanglements. The latest stock assessment report for bowhead whales documents 11 cases of rope or net entanglement since 1978, through the documentation of entanglement scars and/or rope on animals taken during subsistence hunts. Re-examination of bowhead harvest records indicates that this number might be higher. Two of these reported cases involved bowhead whale entanglement in crab pot gear, one in 1993 and one in 1999; the average rate of entanglement in crab pot gear for 1999–2003 is 0.2.

Conservation Actions:
Conservation actions for the bowhead whale during 2004–2006 include the following:

- Time and area restrictions for indirect take of whales due to commercial activities.
- Mitigation of oil and gas activities through section 7 consultations under the ESA.
- Mitigation of oil and gas activities under section 101(a)(5) of the Marine Mammal Protection Act (MMPA).
- International Whaling Commission (IWC) actions.
- Section 119 co-management agreements under the MMPA.

In addition, several papers on bowhead whale stock structure were presented at the 2004 IWC Scientific Committee (IWC SC) Meeting, from which a team of United States researchers developed a provisional plan for studying the stock structure of bowhead whales. This provisional plan underwent review at a workshop hosted by the NMFS Alaska Fisheries Science Center, and a summary report was submitted to the Bowhead-Right-Gray Subcommittee at the 2005 IWC SC Meeting.

Priority Recovery Actions Needed:
Continue current conservation actions.

Recovery Priority Number: 9
This priority number reflects a low magnitude of threat (due to increasing population numbers), high recovery potential, and presence of conflict.

Fin Whale (*Balaenoptera physalus*)

Date Listed: June 2, 1970

Legal Status: Endangered

Recovery Plan Status:
A draft recovery plan for the fin whale was completed in June 2006.

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 whales and the most current population estimate (1979) for fin whales in the southern oceans is 85,200 whales. In the North Pacific, the total pre-exploitation population size of fin whales is estimated at 42,000 to 45,000 whales. The most recent abundance estimate (early 1970s) for fin whales in the entire North Pacific basin is between 14,620 and 18,630 whales. In the North Atlantic, the pre-exploitation population size for fin whales is estimated at 30,000 to 50,000 whales; the current estimate of fin whale abundance for the entire North Atlantic is 30,000 whales, with a 95 percent confidence limit of 23,000 to 39,000 whales.[18]

The Marine Mammal Protection Act (MMPA) stock assessment reports for the fin whale recognize one stock of fin whales in the U.S. North Atlantic Ocean: the western North Atlantic stock and three stocks of fin whales in the U.S. North Pacific: the California/Oregon/ Washington stock, the Hawaii stock, and the 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 U.S., and are occasionally injured or killed by ship strikes off the U.S. East Coast. NMFS' records on this stock from 1999 through 2003 yield an average of 1.4 human-caused mortalities per year – 0.4 per year resulting from fishery interactions or entanglements (0.2 in U.S. waters, 0.2 in Canadian waters), and 1.0 due to collisions with vessels (U.S. waters). Fin whales are also among the main attractions of whale watching enterprises in eastern Canada and the northeastern U.S. and, as a result, these whales 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 mortalities in 1999 and an average of 0.6 mortalities over the 1999–2003 time period. Ship strikes have been implicated in the deaths of one fin whale in 1997 and one in 2001. 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. The average observed annual mortality due to ship strikes is 0.4 fin whales per year for the period 1997–2001.

[18] International Whaling Commission statistics – www.iwcoffice.org

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 Marine Mammal Protection Act. NOAA, the National Ocean Service, and the U.S. Coast Guard submitted a proposal to the International Maritime Organization to shift the Boston Traffic Separation Scheme to reduce the overlap between sightings of large whales, including fin whales, and vessel traffic by 80%.

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 from 2004-2006 are on-going, 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

Legal Status: Endangered

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

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.[19] Recent abundance estimates for the humpback whale south of 60°S in summer (i.e., incomplete) range from 5,900 to 16,800 whales.[20] 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 that 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 if estimates were for the entire North Pacific or just the eastern North Pacific. There are no reliable estimates for current humpback whale abundance in the entire North Pacific. 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, and eastern North Pacific stocks in the Pacific Ocean.

Estimating abundance for the Gulf of Maine stock has proved problematic. Several approaches have been investigated, including mark-recapture estimates, minimum population size, and line-transect estimates. The best estimate of abundance for Gulf of Maine humpback whales provides a minimum population estimate of 647 humpback whales, with these data suggesting that the Gulf of Maine humpback whale stock is steadily increasing in size.

The western North Pacific stock of humpback whales is estimated at 394 animals, based on data collected by nine independent research groups and photographs taken between 1991 and 1993. More recent photo-identification effort has occurred, but because of uncertainty in assigning animals to a stock, this information was not used to calculate revised abundance estimates. No population trend has been calculated for this stock.

The central North Pacific stock of humpback whales is estimated at 4,005 individuals, based on data collected by nine independent research groups and photographs taken between 1991 and 1993. Data support an increasing population size for the entire central stock; however, the limited nature of the data does not support a trend estimate at this time.

[19] Gambell, R. 1976. World whale stocks. Mammal Rev. 6(1):41-53
[20] International Whaling Commission statistics – www.iwcoffice.org

The minimum population estimate for the eastern North Pacific humpback whale stock is 681 individuals. Mark-recapture population estimates increased steadily from the period 1988–1990 to the period 1997–1998, at about 8 percent per year. The stock appears to have decreased in abundance between 1998 and 1999, but the most recent mark-recapture estimate shows the eastern North Pacific stock appears to be increasing in abundance.

Threats and Impacts:
One threat to humpback whales is entanglement in commercial fishing gear. Due to their large size, humpback whales are capable of becoming entangled and swimming away with parts of the fixed fishing gear which can cause the animal to pick up more gear. From 1999 through 2003, seven mortalities and 12 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 and possibly drag an extensive amount of gear. Longline gear, crab pots, and other non-fishery-related lines have been implicated in humpback whale entanglements in Hawaii.

Another threat to humpback whales is mortality or serious injury from ship strikes. From 1999 through 2003, six humpback whale mortalities (including three from the Gulf of Maine stock) were attributed to collisions with vessels.

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 efforts in New England from the late spring to early fall in the Gulf of Maine, 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 exerts pressure in localized geographic areas of southeast Alaska.

Habitat loss and degradation may also impact humpback whales. Landfills, harbors, shipping channels, fisheries, and aquaculture (fish farms) may all occupy or destroy areas needed by humpbacks for resting and breeding. Recreational use of marine areas, including resort development and increased boat traffic (thrill craft), may displace whales that would normally use an area. The growth of the whale watching industry is a concern as preferred habitats may be abandoned if disturbance levels are too high. In Hawaii, acoustic impacts from vessel operation, oceanographic research using active sonar, and military operations are also of increasing concern.

Conservation Actions:
The following section describes conservation actions undertaken during 2004–2006 for the recovery of humpback whales:

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, with Marine Mammal Protection Act (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 all calls to NOAA 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 ship 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.
- Installing 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. This project took place from 2004-2006, and involved research conducted in many different regions frequented by the North Pacific stocks of humpback whales. Preliminary results of the research are expected to be published late in 2007.

- The Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) released the results of a research project describing the distribution and composition of humpbacks off the west coast of the Big Island of Hawaii.[21]
- The HIHWNMS staff has continued to build partnerships to conduct marine mammal surveys, concentrating on humpback whales, in the waters surrounding American Samoa.

Priority Recovery Actions Needed:
A status review for the species needs to be conducted once research results are available.

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).

[21] Trends in Relative Distribution, *Megaptera novaeangliae*, in Kawaihae Bay, Island of Hawaii 1988 – 2003. Researchers: C.M. Gabriele, S.H. Rickards, S.E. Yin, and A.S. Frankel. Affiliation: Hawaii Marine Mammal Consortium.

Northern Right Whale (*Eubalaena glacialis)*

Date Listed: June 2, 1970

Legal Status: Endangered

Recovery Plan Status:
A recovery plan for the North Atlantic right whale was completed in May 2005. A recovery plan addressing the North Pacific population of the northern right whale is currently under development, pending taxonomic and listing decisions.[22]

Species Status:
The pre-exploitation distribution of the northern right whale in the North Atlantic probably included coastal and continental shelf waters in temperate to subarctic latitudes. Post-exploitation distribution is much more limited. It remains unclear whether the present North Atlantic right whale population abundance is static or in decline. In the eastern North Atlantic, the northern right whale population probably numbers only in the low tens of animals at best, and based on the rarity of sightings and the current distribution and migration patterns (which remain unknown), the eastern North Atlantic population is not considered a functioning extant unit and may be considered a "relict" population(s). In the western North Atlantic, the northern right whale minimum population estimate was 291 individuals in 1998, based on a census of individual whales identified using photo-identification techniques. However, because of heterogeneity of capture probabilities (relating to either distribution of individuals and/or of sighting effort), it is difficult to calculate an unbiased point estimate of abundance for this population; furthermore, measures of survival are considered to be more important than absolute abundance estimates. The size of the stock is considered extremely low relative to its estimated optimal sustainable population (OSP) level.

Very little information exists on the northern right whale population in the North Pacific. The pre-exploitation size of this stock probably exceeded 11,000 animals, but whaling from 1835 to 1971 severely reduced the population. The photographic recapture rate and preliminary genetic data from animal biopsies taken in 2004 suggest a very small population size. In the western North Pacific, the population is thought to be in the hundreds, but no reliable estimate is available. The size of both eastern and western North Pacific populations is extremely low relative to the OSP.

[22] Since the listing of the right whale in 1970, NMFS has interpreted right whale taxonomy as consisting of two separate species – northern right whale (*Eubalaena glacialis*) in the Northern Hemisphere, and southern right whale (*Eubalaena australis*) in the Southern Hemisphere – which was consistent with the view of most taxonomists at the time of listing. On April 10, 2003, NMFS published a final rule (68 FR 17560) that split the single species "northern right whale" (*Eubalaena glacialis*) into two separate species – the North Atlantic right whale (*Eubalaena glacialis*) and the North Pacific right whale (*Eubalaena japonica*). However, NMFS has determined that this technical change was procedurally and substantively flawed, and on January 11, 2005 (70 FR 1830), published a final rule removing the technical revision and reinstating the designation of one endangered right whale species in the Northern Hemisphere – *Eubalaena glacialis*. NMFS has now completed it status review of the northern right whale, and proposed listings for both the North Pacific and North Atlantic right whale populations as separate endangered species on December 26, 2006 (NPRW, 71 FR 77694; NARW, 71 FR 77704).

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. Other potential threats to this population are habitat degradation, noise, contaminants, military activities, and climate and ecosystem change. The total level of human-caused mortality and serious injury is unknown, but the estimate for 1999–2003 is a minimum of 2.6 per year, with reported incidental fishery interactions at 1.6 per year and ship strike records at 1.0 per year. Given that the potential biological removal rate is set at zero, any mortality or serious injury for this stock can be considered significant.

In the North Atlantic from 1999 through 2003, five right whale mortalities were attributed to collisions with vessels. North Atlantic right whales are impacted by entanglement in commercial fishing gear, including trap/pot and gillnet gear. From 1999 through 2003, three mortalities and five serious injuries of North Atlantic right whales were attributed to entanglement. Due to their large size, right whales are capable of becoming entangled and swimming away with parts of the fixed fishing gear which can cause the animal to pick up more gear. In addition, it becomes difficult to determine exactly where an entanglement occurred and to describe the nature of the entanglement.

The threats and impacts to right whales in the North Pacific are currently unknown because the distribution of these animals is not well understood. Entanglement in gear could be a threat; however, the extent of this problem is not well defined. 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 scars have been observed on some animals. Any mortality incidental to commercial fisheries would be considered significant. It is possible that right whales in the North Pacific are vulnerable to mortality from ship strikes and entanglements in fishing gear, as these are significant sources of right whale mortality in the North Atlantic. However, due to the rare occurrence of North Pacific right whales and their scattered distribution, it is impossible to assess the threat of ship strikes or entanglement to the North Pacific stock of right whales at this time.

Conservation Actions:
The following conservation actions were undertaken from 2004-2006 for the North Atlantic right whale:

The NMFS Northeast Region (NER) has drafted a comprehensive management plan (the Atlantic Large Whale Take Reduction Plan) that addresses interactions between fisheries and the North Atlantic right whale population. The strategy identifies the shortfalls of NMFS' management scheme and NER's ongoing and future actions designed to rectify these shortfalls. The foundation of the strategy focuses on fishing regulations, gear research, outreach and education, enforcement, cooperative efforts with states, whale research, disentanglement, monitoring and evaluation, coordination with Canada, and critical habitat. The following activities undertaken by NER illustrate the steps taken by NMFS to reduce entanglement and serious injury as a result of entanglement:

Education and outreach

- Conducted dockside outreach meetings in Maine, Massachusetts, Rhode Island, New Jersey, Delaware, Maryland, Virginia, North Carolina, and Florida.
- Collaborated with fishing associations throughout the Northeast and Mid-Atlantic on Atlantic Large Whale Take Reduction Plan (ALWTRP) issues.
- Provided Level 1 disentanglement training for fishermen, the U.S. Coast Guard (USCG), and Marine Patrol.
- Expanded weak link (gear designed to break if entangled) photo workbook.
- Improved ALWTRP outreach by creating a Dynamic Area Management (DAM) Zone Outreach Supplement for each DAM zone.
- Updated and expanded NER Right Whale Funding Opportunities website and provided presentations on the right whale funding programs at the New York Marine Endangered Species Workshop and annual meeting of the North Atlantic Right Whale Consortium.

Incidental take reduction

- Developed a comprehensive management plan that addresses interactions between fisheries and the North Atlantic right whale.
- Conducted the NMFS Mid-Atlantic Gear Buyback and Recycling Program in January 2006 with gear pick-up locations in New Jersey, Maryland, and Virginia for the collection of actively fished floating groundline from commercial trap/pot fishermen in exchange for a voucher to be used toward the purchase of sinking or neutrally buoyant groundline. Nearly 100,000 pounds of floating groundline was collected, totaling approximately 541 miles of floating groundline that was removed from the water column.
- 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.
- Conducted investigations on gear removed from entangled whales.
- Organized an enforcement effort in Massachusetts Bay in March 2006, using aerial and vessel resources to check for compliance with the ALWTRP. Two vessels were boarded (one lobster and one gillnet) and eight surface systems were checked for compliance. One warning and two violations were issued.
- Continued coordination with Brunswick Naval Air Station to provide supplementary aerial survey coverage prior to ordnance exercises when NOAA resources were available and provide advance notification to the Navy for any Gulf of Maine DAMs that might overlap with Navy exercise areas.
- Coordinated gear research with fishermen and placed load cells on lobster, gillnet, shark, black sea bass, and conch fisheries throughout the mid-Atlantic and Southeast regions.

Ship strike coordination

- Worked with the National Ocean Service (NOS) and the USCG to submit a proposal to the International Maritime Organization to shift the Boston Traffic Separation Scheme to achieve an 80 percent reduction in the overlap between whale sightings and vessel traffic.
- Worked with the USCG and NOS to develop and chart recommended routes that route vessels through areas with fewer right whale sightings in Cape Cod Bay and the southeastern calving grounds.

- Developed a Ship Strike/Whale Avoidance web page, and maintained and expanded the Ship Strike/Whale Avoidance distribution list.
- Added speed recommendation of 10–12 knots to right whale information outlets such as NOAA Weather Radio, U.S. Coast Pilots, and Sighting Advisory System emails and faxes.
- Worked with Holland America Line to create an "Avoiding Whale Strikes" training program for the cruise industry, which has been distributed to cruise lines worldwide through the International Council of Cruise Lines.
- Investigated and researched possible ship strikes of right whales in the Great South Channel.

Grant Programs

- Conducted three annual competitions (2004-2006) of the NER Right Whale Funding Programs for gear research and testing.
- Conducted three annual competitions (2004-2006) of the NER Atlantic Coast States Cooperative Planning for Right Whale Recovery Program, a cooperative conservation program to enhance state and federal management efforts in the recovery of right whales.

Priority Recovery Actions Needed:
For right whales in the western North Atlantic, NMFS will continue its efforts to address human-caused mortality and serious injury of right whales associated with gear and vessel interactions. Additional work is required to complete the development and implementation of the right whale Ship Strike Strategy. Although substantial work has already been conducted 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 regarding the endlines (buoy lines) of fixed gear, and to better understand right whale behavior once whales become entangled.

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. 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 the recovery plan.

Recovery Priority Number: 1
The species recovery priority is based on three criteria. The first criterion is the magnitude of threat, which is high due to extremely low population numbers and continuing threats to recovery. The second criterion is recovery potential: the main sources of right whale mortalities and serious injuries, particularly in the North Atlantic—fishing gear and vessel interactions—are human-induced and the potential to address these issues is high. The third criterion is conflict: any regulatory action taken would likely involve restrictions on commercial fishing and shipping and the economic impacts would potentially create significant conflict.

Sei Whale (*Balaenoptera borealis*)

Date Listed: June 2, 1970

Legal Status: Endangered

Recovery Plan Status:
No recovery plan currently exists for the sei whale.

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.[23] Current estimates for sei whale abundance in the southern oceans range from 9,718 to 12,000 whales.[24] In the North Pacific, the pre-exploitation population estimate for sei whales is 42,000 whales and the most current population estimate for sei whales in the entire North Pacific (from 1977) is 9,110 whales.[25] 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. In the North Pacific, there is one stock of sei whales in U.S. waters – the eastern North Pacific stock, found east of 180° W longitude.

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 1999 through 2003 yield an average of 0.4 human-caused mortalities of sei whales per year as a result of two ship strikes. The carcass of a 13-meter female was recovered on May 2, 2001, in New York Harbor after it slid off the bow of an arriving ship. The second record within the period was an 11-meter male discovered February 19, 2003, outside of Norfolk Naval Base in Norfolk, Virginia. The only other NMFS record of human-caused sei whale mortality was from November 17, 1994, when a sei whale carcass was observed on the bow of a container ship as it docked in Boston, Massachusetts.

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 of California

[23] Includes: International Whaling Commission. 1980. Report of special meeting on Southern Hemisphere sei whales. Rep. Int. Whal. Comm. 30: 493-511.
[24] Includes: IWC (1980); International Whaling Commission. 1996. Report of the sub-committee on Southern Hemisphere baleen whales, Annex E. Rep. Int. Whal. Comm. 46:117-131.
[25] Tillman, M.F. 1977. Estimates of population size for the North Pacific sei whale. Rep. Int. Whal. Comm., Spec. Iss. 1:98–106.

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, with Marine Mammal Protection Act (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

Legal Status: Endangered

Recovery Plan Status:
A draft recovery plan for the sperm whale was completed in June 2006.

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, the northern Gulf of Mexico stock, the Hawaiian stock, the California/Oregon/Washington stock, and the 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.[26] 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.

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 between 1800 and the 1980s took at least 436,000 sperm whales from the entire North Pacific Ocean.

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. Based on abundance estimates from 1993–1998, the current minimum population estimate for this stock is 43 sperm whales. This includes only areas within approximately 25 nautical miles of the main Hawaiian Islands, and does not include

[26] Waring, G.T., E. Josephson, C.P. Fairfield, and K. Maze-Foley (Eds.). 2006. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2005. U.S. Dept. Commerce, NOAA Tech. Mem. NMFS-NE-194, 346 pp.

animals that were diving and unable to be seen. 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. Based on 1996–2001 summer/fall ship surveys off California, Oregon, and Washington, the current minimum population estimate for this stock is approximately 885 whales. Sperm whale abundance appears to have been rather variable off California and does not show any apparent trend at this time.

Sperm whales in the North Pacific stock are found in Alaskan waters (Gulf of Alaska, Bering Sea, and Aleutian Islands) and have a northern boundary extending from Cape Navarin (62°N) to the Pribilof Islands. The number of sperm whales of the North Pacific occurring within Alaskan waters is unknown, and at this time it is not possible to produce a reliable estimate of minimum abundance for this stock. Reliable information on population trends in abundance for this stock is currently unavailable.

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 the 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:
Conservation actions for the recovery of the sperm whale from 2004–2006 are on-going, and include the following:

- Monitoring the status of the California/Oregon/Washington stock of sperm whales via shipboard surveys, which are conducted every 3 years, with Marine Mammal Protection Act (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.

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

Date Listed: November 18, 2005

Legal Status: Endangered

Recovery Plan Status:
A proposed recovery plan for the Southern Resident killer whale was completed in November 2006.

Species Status:
In the 1980s and early 1990s, the Southern Resident population increased following live captures for public display in the 1960s and 1970s (Figure 11). From 1996–2001, the population declined by almost 20 percent, prompting a petition to list them under the ESA. Since 2001, the population has increased, and as of the 2006 census there were 90 whales.

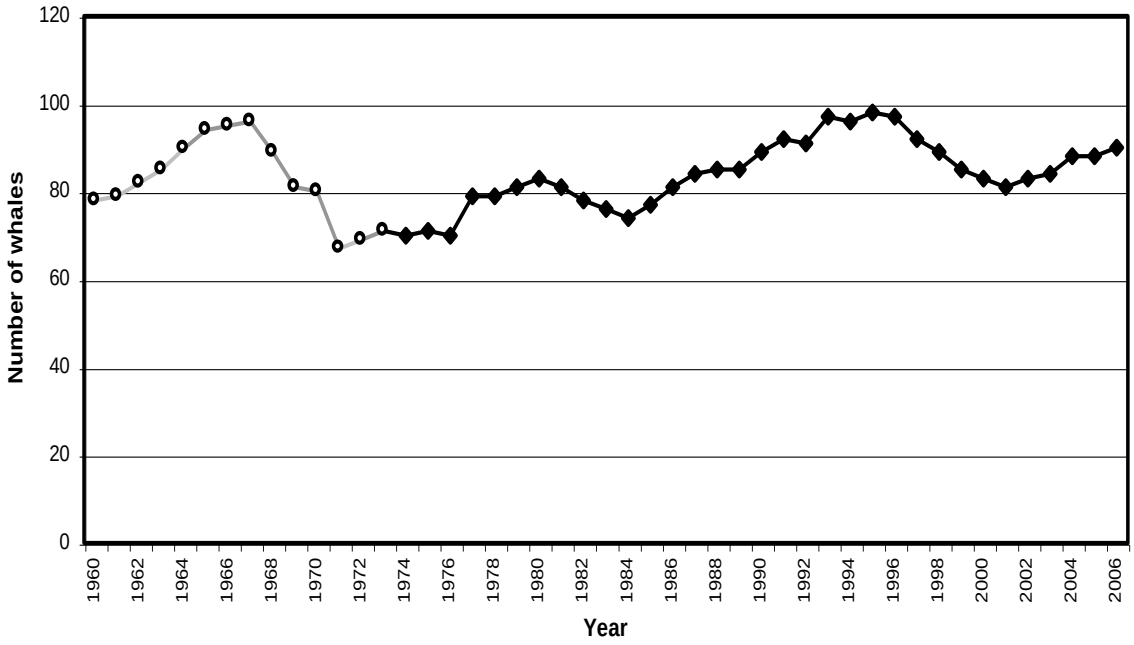


Figure 11. Population size and trend of Southern Resident killer whales, 1960-2006. Data from 1960-1973 (open circles) are number projections from the matrix model of Olesiuk et al. (1990). Data from 1974-2006 (closed diamonds) were obtained through photo-identification surveys of the three pods (J, K, and L) in this community and were provided by the Center for Whale Research (unpubl. data). Data for these years represent the number of whales present at the end of each calendar year except for 2006, when data extend only through September.

Limiting Factors and Threats:
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, the presence of reproductive age females that are not having calves, and the 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 2004–2006, specific funding for research and conservation efforts for Southern Resident killer whales was available. Research programs funded include projects on taxonomy, vessel interactions, prey associations, health assessments, population monitoring, winter distribution, research planning, and coordination.

In addition to research projects, continuing recovery planning and implementation of conservation actions include:

- Development of a recovery plan, including stakeholder workshops.
- Designation of critical habitat contained within the proposed recovery plan, published on November 29, 2006 (71 FR 69101).
- Completion of an economic analysis.
- Education and outreach programs, including continued promotion of the "Be Whale Wise" campaign, partnering with the Seattle Aquarium, support of "Killer Whale Tales" classroom program, and ads in fishing regulation pamphlet and marina maps.
- Increased on-water stewardship and vessel monitoring, including reports on vessel activities in the vicinity of whales.
- Increased enforcement presence on the water.
- Mapping of whale sightings and contaminated sediments.
- Increased capability to respond to killer whale strandings.
- Continued coordination with Washington State and Canada.

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. The recovery actions needed 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 actions they can participate in to conserve killer whales, and improve reporting of southern resident killer whale sightings and strandings.
Respond to sick, stranded, 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 (1) a high magnitude of threat due to low population numbers and continuing threats to recovery, (2) a moderate recovery potential based on uncertainty regarding most important threats, and (3) presence of conflict because regulatory actions taken could involve restrictions on commercial fishing, contaminant discharge, and vessels.

Appendix. NMFS Recovery Priority Number Guidelines