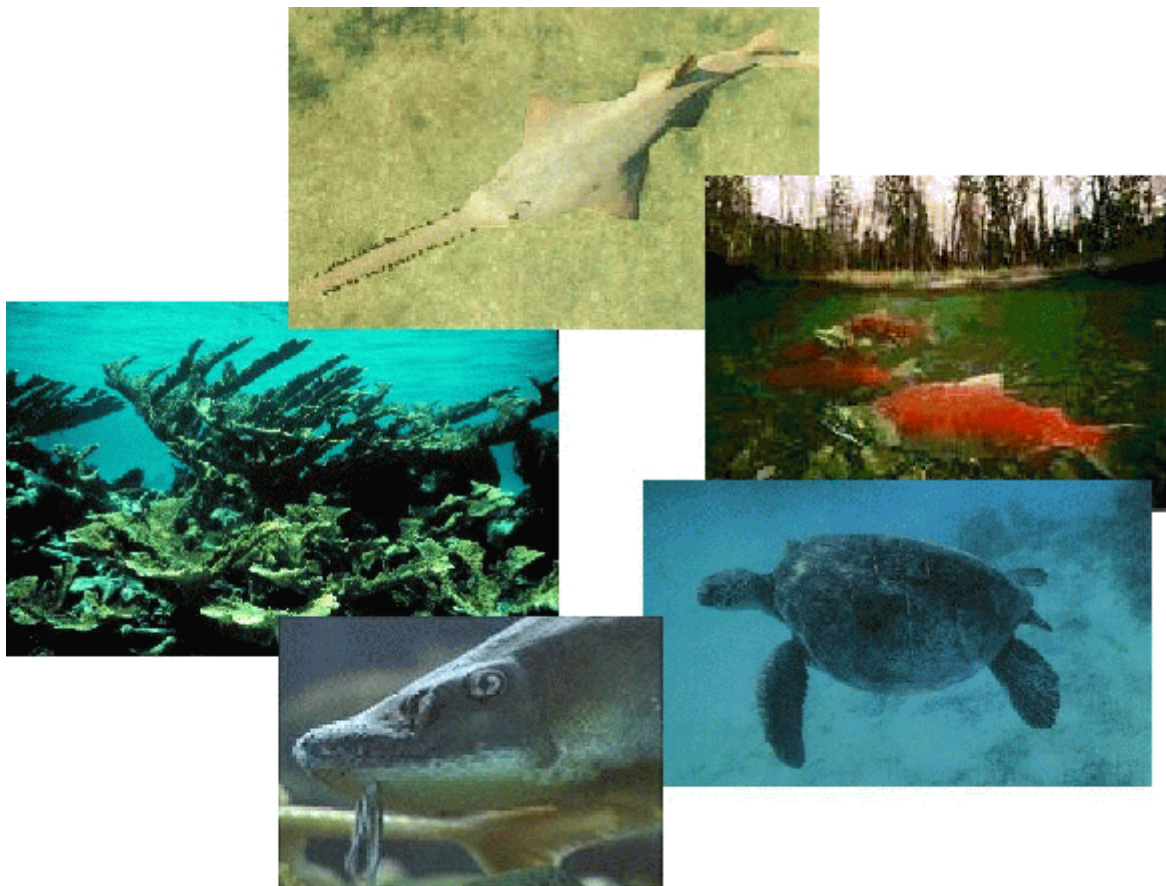




Endangered Species Act Biennial Report to Congress

October 1, 1998 - September 30, 2000



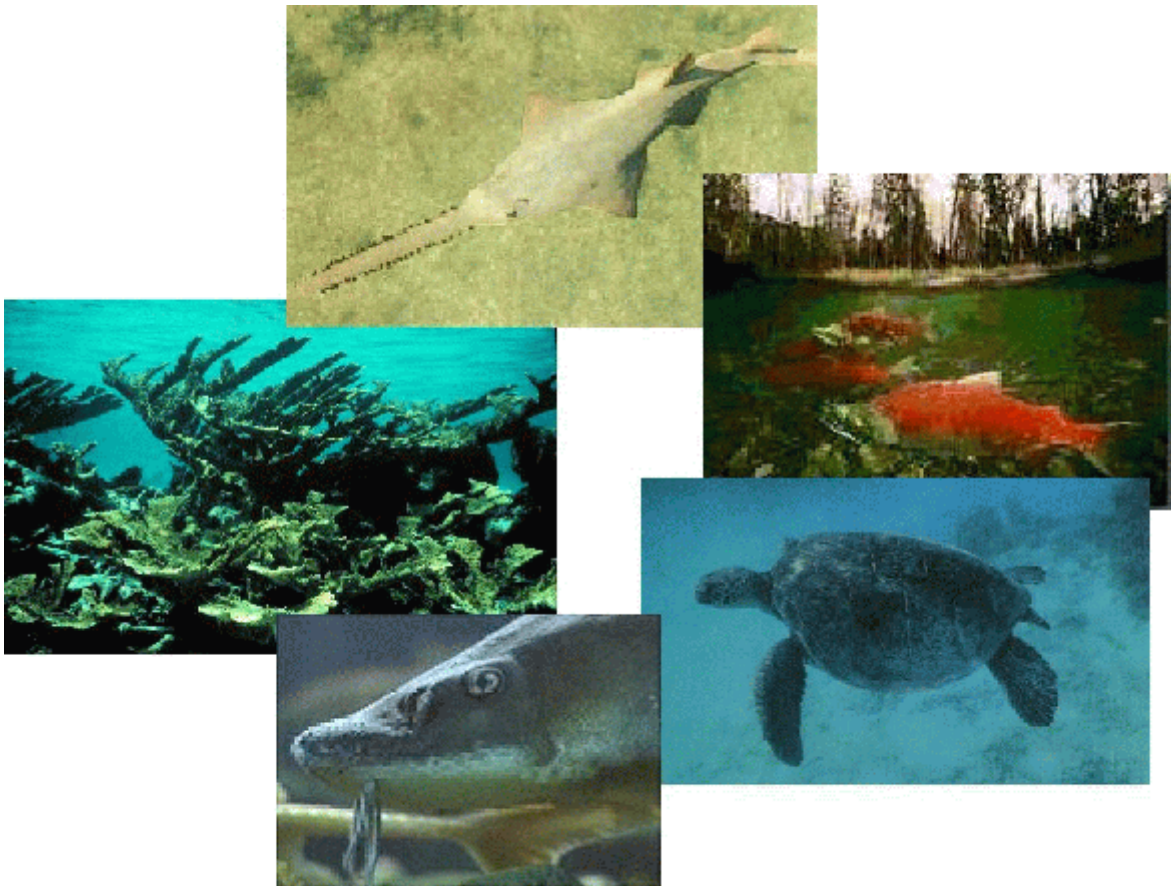
Prepared by:
U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources





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Recovery plans can be obtained by writing to:

Endangered Species Division - Recovery Plans
Office of Protected Resources - F/PR3
National Marine Fisheries Service
1315 East-West Highway, 13th Floor
Silver Spring, MD 20910-3226

This report is available on-line via the NOAA Fisheries-Office of Protected Resources Website at:
http://www.nmfs.noaa.gov/prot_res/readingrm/ESABiennial/2000bien.pdf.

Recovery plans are also available electronically at:
http://www.nmfs.noaa.gov/prot_res/PR3/recovery.html.

Introduction

Under the Endangered Species Act of 1973 (ESA), the National Marine Fisheries Service (NOAA Fisheries) is responsible for conserving marine species listed according to the ESA as threatened or endangered. NOAA Fisheries shares jurisdiction for some species (e.g., sea turtles) with the U.S. Fish and Wildlife Service (FWS). A 1988 amendment to the ESA requires the Services to submit a biennial report to the Congress “on the status of efforts to develop and implement recovery plans for all species listed pursuant to this section and on the status of all species for which such plans have been developed.”

This report summarizes efforts to recover species under NOAA Fisheries’ jurisdiction from October 1, 1998 through September 30, 2000. Along with recovery activities are accounts of the most recent status and trends of these species. Accounts for marine mammals under NOAA Fisheries’ jurisdiction (whales, dolphins, porpoise, seals and sea lions) are not included in this report. Instead, they are included in a separate annual report to Congress on the implementation of the Marine Mammal Protection Act of 1972. The report includes tables of recent listing and critical habitat determinations, as well as a list and description of species on NOAA Fisheries’ list of candidate species.

NOAA Fisheries is responsible for over 50 species including salmon, sturgeon, other fish, sea grass, mollusks, sea turtles, and marine mammals. We have developed recovery plans for all populations of sea turtles, several of the great whales, Steller sea lions, and gulf and shortnose sturgeon. Although we have draft plans for some Pacific salmon populations (i.e., winter-run chinook and Snake River salmon), we have recently embarked on an ambitious effort to develop recovery plans for all listed stocks of Pacific salmon based on seven geographic areas. Although the ESA does not differentiate between domestic and foreign species, management actions are often not feasible for species whose range is either totally or primarily outside of U.S. jurisdiction. Therefore, NOAA Fisheries focuses much of its recovery efforts on species that are primarily under U.S. jurisdiction. However, for some species, such as sea turtles or whales that spend much of their life cycle in areas outside U.S. jurisdiction, we reach out to other nations to support our recovery efforts.

Partnerships between Federal, state, tribal, local authorities, and private entities, have the greatest chance of ensuring the recovery of listed species. Therefore, NOAA Fisheries has increased efforts to include our partners in recovery planning and implementation.

Summary of Listing/Critical Habitat Actions

Proposed Listing Actions: 1998-2000

<i>Common Name</i>	<i>Status</i>	<i>Date</i>	<i>FR Notice</i>
Atlantic Salmon	Proposed Endangered	11/17/1999	64 FR 62627
White Abalone	Endangered	5/05/2000	65 FR 26167

Final Listing Actions: 1998-2000

Chinook Salmon			
Lower Columbia River	Threatened	3/24/1999	64 FR 14308
Puget Sound	Threatened	3/24/1999	64 FR 14308
Upper Columbia River, spring-run	Endangered	3/24/1999	64 FR 14308
Upper Willamette River	Threatened	3/24/1999	64 FR 14308
Central Valley California, spring-run ¹	Threatened	9/16/1999	64 FR 50394
Central Valley California, fall/late-fall run ²	Candidate	9/16/1999	64 FR 50394
California Coastal ³	Threatened	9/16/1999	64 FR 50394
Snake River fall-run	Threatened - (extension- Not Warranted)	9/16/1999	64 FR 50394
Chum salmon			

¹The Central Valley California spring-run ESU was proposed as endangered on March 9, 1998, but was designated as a threatened species on September 16, 1999, due to new information received during the public comment period.

²The Central Valley California, fall/late fall-run were proposed as threatened on March 9, 1998, but was retained as a candidate species on September 16, 1999, due to new biological information received during the public comment period.

³The Southern Oregon & California Coast ESU was proposed on March 9, 1998, but was subsequently split into 2 separate ESUs due to new information received during the public comment period (California coastal and Southern Oregon ESU listed as threatened and the Northern California Coastal ESU determined not warranted for listing).

Columbia River	Threatened	3/25/1999	64 FR 14508
Hood Canal summer-run	Threatened	3/25/1999	64 FR 14508
Sockeye Salmon			
Ozette Lake	Threatened	3/10/1999	65 FR 14528
Cutthroat Trout⁴			
Umpqua River	Endangered-delisted	4/19/2000	65 FR 20915
Steelhead Trout			
Upper Willamette	Threatened	3/25/1999	64 FR 14517
Middle Columbia River	Threatened	3/25/1999	64 FR 14517
Northern California	Threatened	6/7/2000	65 FR 36074

Final Critical Habitat Determinations : 1998-2000

<i>Common Name</i>	<i>Date</i>	<i>FR Notice</i>	<i>CH Status</i>
Johnson's Seagrass	4/5/2000	65 FR 17786	Final
Chinook Salmon Lower Columbia River	2/16/2000	65 FR 7764	Designated
Puget Sound	2/16/2000	65 FR 7764	Designated
Upper Columbia River, spring-run	2/16/2000	65 FR 7764	Designated
Upper Willamette River	2/16/2000	65 FR 7764	Designated
Central Valley California, spring-run	2/16/2000	65 FR 7764	Designated
Central Valley California, fall/late-fall run	3/9/1998	63 FR 11481	Not warranted
California Coastal	2/16/2000	65 FR 7764	Designated
Snake River fall-run (range extension)	10/25/1999	64 FR 57399	Revision-Not warranted
Chum Salmon			

⁴Originally NOAA Fisheries and the FWS shared jurisdiction for Cutthroat Trout, however, on November 22, 1999, jurisdiction was given solely to FWS. On April 19, 2000 Umpqua cutthroat trout was delisted.

Columbia River	2/16/2000	65 FR 7764	Designated
Hood Canal summer-run	2/16/2000	65 FR 7764	Designated
Sockeye Salmon			
Ozette Lake	2/16/2000	65 FR 7764	Designated
Coho Salmon			
Central California Coast	5/5/1999	64 FR 24049	Designated
Southern Oregon-Northern California Coast	5/5/1999	64 FR 24049	Designated
Oregon Coast	2/16/2000	65 FR 7764	Designated
Steelhead Trout			
Southern California	2/16/2000	65 FR 7764	Designated
South-Central California Coast	2/16/2000	65 FR 7764	Designated
Central California Coast	2/16/2000	65 FR 7764	Designated
Central Valley	2/16/2000	65 FR 7764	Designated
Upper Columbia River	2/16/2000	65 FR 7764	Designated
Snake River Basin	2/16/2000	65 FR 7764	Designated
Lower Columbia River	2/16/2000	65 FR 7764	Designated
Upper Willamette	2/16/2000	65 FR 7764	Designated
Middle Columbia River	2/16/2000	65 FR 7764	Designated

Update

Recovery Plan Actions



A Sea Turtle Successfully Escapes from a Fishing Net via a Turtle Excluder Device

Plan Title: Green Turtle - Atlantic Population

Planning Stage:	Final
Plan Approval Date:	10/29/91

Species Covered

Scientific Name	Common Name	Population (if applicable)	NOAA Fisheries Status
<i>Chelonia mydas</i>	Green Turtle	Florida breeding population	Endangered
		All other U.S. Atlantic populations	Threatened

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for green turtles in the Atlantic Ocean in 1991. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

The Atlantic population of the green turtle in the United States can be considered for de-listing if, over a period of 25 years, all of the following conditions are met:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.
- At least 25% (105km) of all available nesting beaches (420 km) is in public ownership and encompasses greater than 50% of the nesting activity.
- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.
- All Priority #1 tasks have been successfully implemented.

Major Recovery Actions Needed

- Provide long-term protection to important nesting beaches.
- Ensure at least 60% hatch success on major nesting beaches.
- Implement effective lighting ordinances or lighting plans on nesting beaches.
- Determine distribution and seasonal movements for all life stages in marine environment
- Minimize mortality from commercial fisheries.

- Reduce threats to population and foraging habitat from marine pollution.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis for the Biennial Reporting Period)

Plan Task 121 - Identify Important Marine Habitat - Priority 2

- NOAA Fisheries provided funding support for a multi-year study to investigate the importance of Atlantic Slope Waters near the Gulf Stream to post-hatchling turtles entering the marine habitat from nesting beaches along the Florida coast.
- NOAA Fisheries conducted independent studies and funded non-agency studies to identify marine habitats through the use of remote sensing instruments such as satellite transmitters (see Plan Task 2212).

Plan Task 2211 - Determine Seasonal Distribution, Abundance, Population Characteristics, and Status in Bays, Sounds and Other Important Nearshore Habitats- Priority 1

- NOAA Fisheries provided funding support for in-water population studies of marine turtles in the marine habitats of east-central Florida in the Indian River Lagoon and nearshore reefs, Puerto Rico, and the U.S. Virgin Islands and conducted studies in Albemarle and Pamlico Sound, North Carolina and Florida Bay, Florida to learn more about this species and its marine environment to enhance recovery efforts.
- NOAA Fisheries provided funding and participated in a workshop to review existing methodologies for in-water research and make recommendations to improve estimates of sea turtle abundance.

Plan Task 2212 - Determine Adult Navigation Mechanisms, Migratory Pathways, Distribution and Movements Between Nesting Seasons - Priority 2

- Progress continued to be made in the study of migratory movements of adult green turtles to elucidate routes of travel and identify resident foraging grounds away from nesting beaches. NOAA Fisheries scientists have conducted successful satellite telemetry studies with post-nesting Florida green turtles and adult male green turtles, identifying critical foraging habitats in the Florida Keys and off the southwest Florida coast.
- NOAA Fisheries provided funding and technical support for a study of the migratory movements of post-nesting green turtles from the largest nesting assemblage in the western hemisphere, Tortuguero, Costa Rica.

Plan Task 2213 - Determine Present or Potential Threats to Green Turtles along Migratory Routes and on Foraging Grounds - Priority 2

See Plan Task 2212 and 2224.

Plan Task 2214 - Determine Breeding Population Origins for U.S. Juvenile and Subadult Populations - Priority 2

- NOAA Fisheries established a national sea turtle genetics laboratory at the NOAA Fisheries LaJolla Laboratory in LaJolla, California. The primary functions of the laboratory include collecting, analyzing, and archiving tissue samples of sea turtles to identify nesting assemblages and to determine breeding population origins of foraging populations. These data are critical to population assessments.
- NOAA Fisheries has provided significant funding, logistical support, and technical advice to researchers working to identify the stock structure of the Atlantic green turtle. Numerous scientific publications have resulted from this work and the population genetic structure of the Atlantic green turtle is well understood. Funding support to numerous in-water studies has facilitated the collection of genetic material and the identification of breeding population origins of important foraging populations in U.S. and foreign waters.
- NOAA Fisheries convened an International Workshop on Sea Turtle Conservation Genetics bringing together leading researchers in the field to present scientific results and to discuss state-of-the-art techniques.

Plan Task 2215 - Determine Growth Rates, Age of Sexual Maturity and Survivorship Rates of Hatchlings, Juveniles, and Adults - Priority 2

- NOAA Fisheries Beaufort Laboratory scientists refined aging estimation techniques for sea turtles from growth layers in the bone. Age estimation techniques provide demographic information that can be incorporated into population models used to assess population status and trends.

Plan Task 2221 - Implement and Enforce Ted Regulations in United States Waters - Priority 1

- To address the impact of incidental capture in the shrimp trawl fishery, TEDs were developed and, in 1992, were required in all shrimp trawlers (with a few exceptions) from North Carolina through Texas.
- To address the impact of incidental capture in the summer flounder fishery, TEDs were developed and, in 1996, were required in all summer flounder trawlers (with a seasonal exception) operating south of Cape Charles, VA, to the North Carolina/South Carolina border.
- Enforcement of TED regulations continues. NOAA Fisheries created Protected Resource Enforcement Teams (PRET teams) specifically to enforce ESA and MMPA regulations, these teams have been particularly active with regard to TED enforcement, including special details deployed in critical areas when needs arise.
- NOAA Fisheries gear specialists have provided important support to law enforcement agents during TED enforcement details.

Plan Task 2222 - Provide Technology Transfer for Installation and Use of TEDS - Priority 3

- The NOAA Fisheries Pascagoula Laboratory has continued to provide extensive outreach, including development and widespread dissemination of training materials in multiple languages, to ensure proper construction, installation, and use of TEDs.

- NOAA Fisheries, in coordination with the Department of State, has implemented a far-reaching program to introduce, train, and inspect TED use in other nations that employ shrimp trawl gear that poses a threat to sea turtles.
- NOAA Fisheries has developed a TED for use in non-shrimp flynet trawls and is currently seeking to implement its use.

Plan Task 2224 - Identify and Monitor Fisheries That May Be Causing Significant Mortality - Priority 2

- NOAA Fisheries continued to carry out fishery observer programs to evaluate and monitor incidental bycatch of sea turtles. During this reporting period the following actions were accomplished:
 - New England and mid-Atlantic gillnet fisheries NOAA Fisheries observer program
 - Shark drift gillnet NOAA Fisheries observer program for east Florida
 - Southeastern shrimp trawl fishery NOAA Fisheries observer program
 - Atlantic pelagic longline NOAA Fisheries observer program
 - Funding support for observer training and standardization of monitoring in North Carolina fisheries
- NOAA Fisheries participated in the development of and funded a landmark experiment to evaluate the effects of hook type on sea turtle bycatch in an important longline fishery in the eastern Atlantic known to capture significant numbers of sea turtles. This work is part of a broad effort to seek gear and fishing method modifications to reduce and eliminate the bycatch of sea turtles while preserving the longline fishery.
- Several workshops involving industry, academia, and non-governmental organizations were held to formulate and prioritize actions needed to reduce incidental capture in longline fisheries. In related research, satellite transmitters have been deployed on turtles hooked incidentally in the longline fishery to better understand post-hooking effects of turtles that survive the encounter.

Plan Task 2225 - Promulgate Regulations to Reduce Fishery Related Mortalities - Priority 2

NOAA Fisheries promulgated regulations during this reporting period to reduce fishery related mortality and address conservation management needs, including:

- Temporary rules (7) to address clogging of TEDs in the Atlantic Ocean and Gulf of Mexico through the implementation of reduced tow times, thus helping fishermen and turtles (63 FR 55053 October 14, 1998; 63 FR 57620 October 28, 1998; 63 FR 62959 November 10, 1998; 63 FR 66766 December 3, 1998; 64 FR 55858 October 15, 1999; 64 FR 57397 October 25, 1999; and 65 FR 52348 August 29, 2000).
- Temporary 30-day rule closing an area to large-mesh gill net fisheries along eastern North Carolina and Virginia during sea turtle northern migration (65 FR 31500 May 18, 2000).
- Temporary 30-day rule closing waters of Pamlico Sound, North Carolina to fishing with large mesh gillnets (64 FR 70196 December 16, 1999).

- Interim final rule requiring small mesh in the webbing material used for installing TEDs in flounder trawls in waters off Virginia and North Carolina (64 FR 55860 October 15, 1999) to prevent entanglement of sea turtles.
- Interim final rule to extend for one additional year the approved use of the Parker soft TED (64 FR 55434 October 13, 1999).

Plan Task 2223 - Maintain Sea Turtle Stranding Network - Priority 2

- NOAA Fisheries continued to fund and coordinate a national sea turtle stranding program, operating from Maine through Texas. Network participants respond to dead or injured sea turtles, including mass stranding events, and collect critical biological data. The program provides important information on anthropogenic and natural mortality factors. An average of 2,000-3,000 sea turtles wash ashore dead or injured each year along the U.S. Atlantic and Gulf of Mexico coasts.
- NOAA Fisheries provided funding to our NOAA partner NOS to convene a Workshop on Sea Turtle Health Assessment to identify and prioritize health issues important to sea turtle conservation and recovery.

Plan Task 223 - Monitor and Reduce Mortality from Dredging Activities - Priority 3

The U.S. Army Corps of Engineers (COE) is largely responsible for implementing this plan task as well as Plan Task 125 - Prevent Destruction of Habitat From Dredging Activities - Priority 3.

The COE consults with NOAA Fisheries under ESA section 7 on their proposed dredging activities. These consultations have resulted in the following monitoring and conservation actions:

- Development and required use of a sea turtle deflector device on hopper dredges to prevent impingement of turtles into the drag arm.
- Seasonal restrictions on the use of hopper dredges in certain areas and times when turtles are abundant.
- One hundred percent observer coverage on hopper dredges in certain areas and times when turtles are abundant.
- Requirement for sea turtle abundance surveys or relocation trawling in certain areas and times when turtles are abundant.
- Requirement for 100% inflow and/or overflow screening on dredges to monitor incidental take in certain areas and times when turtles are abundant.
- Slow speed when turtles are sighted to prevent vessel strikes.

Plan Task 224 - Monitor and Prevent Adverse Impacts from Oil and Gas Activities - Priority 2 & 3 and Plan Task 124 - Prevent Destruction of Marine Habitat From Oil and Gas Activities - Priority 3

The Mineral Management Service (MMS) is largely responsible for implementing these plan tasks. The MMS consults with NOAA Fisheries under ESA Section 7 on their proposed oil and gas activities. These consultations have resulted in the following monitoring and conservation actions:

- NOAA Fisheries held a health assessment workshop to develop an interagency research and monitoring program that will address biota health and environmental contaminants as well as establish protocols for collecting, storing and analyzing specimens. An interagency research

and monitoring program is necessary to evaluate the effects of chronic exposure of sea turtles to petrochemical and other contaminants associated with the oil and gas industry.

- For blasting activities related to oil and gas platform removal, observers and aerial surveys are required prior to detonation. If sea turtles are observed within 2,000 yards of the charge, blasting must be delayed.

Plan Task 227 - Assess Mortality and Determine Etiology of Fibropapillomatosis - Priority 1

NOAA Fisheries conducted and provided significant funding and research expertise/effort toward a multi-disciplinary research program studying the cause and effects of this debilitating and often fatal disease. Research has been initiated on the possible etiologies of the disease, including viruses, biotoxins, and environmental pollutants. In addition to field and laboratory research, statistical analyses and modeling studies are continuing to evaluate fibropapilloma incidence and severity to key aspects of green turtle population dynamics and assess impacts of the disease on population recovery.

Plan Task 228 - Centralize Administration and Coordination of Tagging Programs - Priority 3

NOAA Fisheries consolidated its turtle tag dissemination and data archival program with that of the Archie Carr Center for Sea Turtle Research (ACCSTR), a world-renowned center housed at the University of Florida. Annual funding provided to our conservation partner, ACCSTR, supports purchase of tags, dissemination to research projects, archival of data, and retrieval of recapture data.

Plan Task 3 - Develop Public Education Materials and Provide Public Outreach - Priority 3

NOAA Fisheries education and public outreach efforts have included:

- NOAA Fisheries provided funding and technical expertise for the guide “Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico.”
- NOAA Fisheries produced and disseminated informational stickers for recreational fishers with guidelines to avoid interacting with sea turtles and what to do if an interaction occurs.
- NOAA Fisheries produced handling guidelines for turtles incidentally captured in longline fisheries.
- NOAA Fisheries Protected Resources website provides the public with detailed information on sea turtles (http://www.nmfs.noaa.gov/prot_res/prot_res.html).
- NOAA Fisheries partnered with the Caribbean Conservation Corporation in a highly successful program to educate the public on the movements of turtles tagged with satellite tags, through the world wide web (<http://cccturtle.org/sat1.htm>).
- NOAA Fisheries provided funding support to the Marine Turtle Newsletter, a global publication disseminating sea turtle information. This type of communication is essential in facilitating recovery efforts for sea turtles.
- NOAA Fisheries provided funding support for the Caribbean Center for Marine Studies for a sea turtle education and rehabilitation program.

Plan Task 41 - Develop International Agreements to Ensure Protection of Life Stages Which Occur in Foreign Waters - Priority 2

- NOAA Fisheries continued to work to develop international agreements for the conservation of sea turtles, which are highly migratory species. During this reporting period, NOAA Fisheries worked in collaboration with the U.S. Department of State to conclude the first multi-lateral

agreement devoted solely to the conservation of sea turtles. This treaty, the Inter-American Convention for the Protection and Conservation of Sea Turtles, was ratified by the United States and came into force in 2001. The treaty aims to promote cooperation and coordination between countries of the western hemisphere region to recover sea turtles.

- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region, the agreement was concluded in 2001.
- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested in foreign nations with commercial fishing technology which may adversely affect sea turtles. The Department of State is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Central and South America, Africa, and Asia.
- NOAA Fisheries provided funding support for the establishment of sea turtle conservation networks in Honduras, Costa Rica, Guatemala, Colombia, and Nicaragua, through the efforts of WIDECAST (Wider Caribbean Sea Turtle Network).

Plan Title: Green Turtle - Pacific Population

Planning Stage:	Final
Plan Approval Date:	1/12/98

Species Covered

Scientific Name	Common Name	Population(if applicable)	ESA Status
<i>Chelonia mydas</i>	Green Turtle	U.S. Pacific Population	Threatened

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for green turtles in the Pacific Ocean in 1998. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

To consider de-listing, all of the following criteria must be met:

- All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
- Each stock must average 5,000 (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) females estimated to nest annually (FENA) over six years.
- Nesting populations at "source beaches" are either stable or increasing over a 25-year monitoring period.
- Existing foraging areas are maintained as healthy environments.
- Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
- All Priority #1 tasks have been implemented.
- A management plan to maintain sustained populations of turtles is in place.
- International agreements are in place to protect shared stocks.

Major Recovery Actions Needed (not in order of priority)*

- Stop the direct harvest of green turtles and their eggs, through education and law enforcement actions.

- Eliminate the threat of fibropapillomas to green turtle populations.
- Reduce incidental harvest of green turtles by commercial and artisanal fisheries.
- Determine population size and status through regular nesting beach and in-water censuses.
- Identify stock home ranges using DNA analysis.
- Support conservation and biologically viable management of green turtle populations in countries that share U.S. green turtle stocks.
- Identify and protect primary nesting and foraging areas for the species
- Eliminate adverse effects of development on green turtle nesting and foraging habitats.
- Control non-native predators of eggs and hatchlings, e.g., mongoose, feral cats, and pigs, in the Hawaiian population.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis for the Biennial Reporting Period)

Plan Task 2121 - Determine Distribution and Abundance of Post-Hatchlings, Juveniles and Adults - Priority 1

- NOAA Fisheries continued long-term population studies of the Hawaiian green turtle.
- NOAA Fisheries provided funding and technical assistance (information transfer and cooperation) for marine turtle investigations in the coastal waters of Guam, Western Pacific.

Plan Task 2122 - Determine Adult Migration Routes and Inter-Nesting Movements - Priority 2

Progress continued to be made in the study of migratory movements of post-nesting green turtles, including collaborative work throughout much of the Pacific, to elucidate routes of travel and identify resident foraging grounds.

Plan Task 2123 - Determine Growth Rates and Survivorship of Hatchlings, Juveniles, and Adults, and Age at Sexual Maturity - Priority 1

- NOAA Fisheries continued long-term population studies of the Hawaiian green turtle.

Plan Task 214 - Monitor and Reduce Incidental Mortality in Commercial and Recreational Fisheries - Priority 1

- NOAA Fisheries maintained observer programs to monitor incidental mortality of sea turtles in the Hawaii pelagic longline fishery and the California/Oregon drift gillnet fishery.
- NOAA Fisheries supported efforts to address the incidental bycatch in fisheries. This included developing measures to reduce mortality, including the use of resuscitation techniques to reduce mortality and promoting the use of line cutting gear to disentangle captured turtles.
- NOAA Fisheries worked internationally with Chilean counterparts on quantifying and reducing turtle bycatch in commercial and artisanal fisheries.
- NOAA Fisheries promulgated rules to assist in the reduction of incidental mortality in commercial fisheries, including the following:

- Promulgation of a fishing closure rule to reduce bycatch of olive ridleys in the Hawaii-based longline fishery (FR Vol. 65, No. 166, August 25, 2000).
- Promulgation of a final rule implementing gear requirement measures to minimize the mortality of, and injury to, sea turtles hooked or entangled by longline fishing gear (Hawaii longline fishery) (FR Vol. 65, No. 60, March 28, 2000).
- Promulgation of emergency rule to implement court-ordered closure and reduce adverse impacts to sea turtles by the Hawaiian longline fishery while an environmental impact statement was prepared (FR Vol. 64, No. 247, December 27, 1999).
- Workshops have been held to formulate research techniques to assess longline hooking and entanglement and to identify ways to reduce or mitigate incidental capture. In related research, satellite transmitters have been deployed on turtles hooked incidentally in the longline fishery to track post-release movements to better understand the long-term effects of hooking. Linkages between turtle movements and oceanographic processes are also being studied.

Plan Task 216 - Study the Impact of Disease on Turtles - Priority 1.3

- NOAA Fisheries provided funding support for a health assessment workshop to address health issues important to sea turtle conservation and recovery.
- A multi-disciplinary research program continues to study the cause and effects of the disease fibropapillomatosis (FP). Research has been initiated on the possible etiologies of the disease, including viruses, parasites, and environmental pollutants. In addition to field and laboratory research, statistical analyses and modeling studies continue to work to link fibropapilloma incidence and severity to key aspects of green turtle population dynamics and assess impacts of the disease on population recovery.

Plan Task 217 - Maintain/Develop Carcass Stranding Network - Priority 2

- NOAA Fisheries continued to oversee a national sea turtle stranding program of state and Federal biologists and private citizens who respond when a sea turtle strands injured or dead on coastal beaches. The program continues to increase our knowledge of turtle biology and the human-related impacts to the turtle populations. Part of this work involves working with the state of Hawaii, NOAA Humpback Whale Sanctuary, University of Hawaii, and the Marine Option Program.
- NOAA Fisheries provided funding and staff support during the period to provide urgent veterinary treatment and essential captive care of live stranded Pacific green turtles in the Hawaiian Islands. Minimizing the mortality of sea turtles is important to ensuring their recovery.

Plan Task 41 - Support Existing International Agreements and Conventions to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters - Priority 1

- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested with commercial fishing technology which may adversely affect sea turtles. The import ban does not apply to nations that have adopted comparable sea turtle protection programs (i.e., require the use of TEDs) to that of the United States or those nations whose fishing environment does not pose a threat of incidental take of sea turtles. The Department of

State (DOS) is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Latin America, Africa and Asia.

Plan Task 42 - Encourage Ratification of the CITES for All Non-Member Pacific Countries, Compliance with CITES Requirements, and Removal of Sea Turtle Trade Reservations Held by Member Nations - Priority 1

- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.

Plan Task 43 - Develop New International Agreements to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters - Priority 1

- NOAA Fisheries continued to work to develop international agreements important sea turtle conservation. The migratory nature of sea turtles makes these agreements critical to sea turtle recovery. During this reporting period, NOAA Fisheries worked with the U.S. Department of State on the Inter-American Convention for the Protection and Conservation of Sea Turtles. This is the first international agreement devoted solely to the protection of sea turtles and aims to foster cooperation and coordination between countries of the region to recover sea turtles.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region.

Plan Title: Green Turtle - East Pacific Population

Planning Stage:	Final
Plan Approval Date:	1/12/98

Species Covered

Scientific Name	Common Name	Population(if applicable)	ESA Status
<i>Chelonia mydas</i>	Green Turtle	Mexican breeding population	Endangered

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for U.S. populations of the east Pacific green turtle in 1998. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

To consider de-listing, all of the following criteria must be met:

- All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
- Each stock must average 5,000 (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) females estimated to nest annually (FENA) over six years.
- Nesting populations at "source beaches" are either stable or increasing over a 25-year monitoring period.
- Existing foraging areas are maintained as healthy environments.
- Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
- All priority #1 tasks have been implemented.
- A management plan to maintain sustained populations of turtles is in place.
- International agreements are in place to protect shared stocks.

Major Recovery Actions Needed (not in order of priority)*

- Minimize boat collision mortalities, particularly within San Diego County, California.
- Minimize incidental mortalities of turtles by commercial fishing operations.
- Support the efforts of Mexico and the countries of Central America to census and protect nesting east Pacific green turtles, their eggs and nesting beaches.

- Determine population size and status in U.S. waters through regular surveys.
- Identify stock home range(s) using DNA analysis.
- Identify and protect primary foraging areas in U.S. jurisdiction.

Major Recovery Accomplishments (with focus on reporting period)

Plan Task 211 - Eliminate Directed Take of Turtle - Priority 1

- NOAA Fisheries has worked closely with USFWS and scientists working to curb the directed harvest of east Pacific green turtles in Baja California.

Plan Task 2121 - Determine Distribution and Abundance of Post-Hatchlings, Juveniles and Adults - Priority 1

NOAA Fisheries has conducted population studies of east Pacific green turtles in selected California and Mexico waters.

Plan Task 214 - Monitor and Reduce Incidental Mortality in the Commercial and Recreational Fisheries - Priority 1

- NOAA Fisheries maintained observer programs to monitor incidental mortality of sea turtles in the Hawaii pelagic longline fishery and the California/Oregon drift gillnet fishery.
- NOAA Fisheries supported efforts to address the incidental bycatch in fisheries. This included developing measures to reduce mortality, including the use of resuscitation techniques to reduce mortality and promoting the use of line cutting gear to disentangle captured turtles.
- NOAA Fisheries worked internationally with Chilean counterparts on quantifying and reducing turtle bycatch in commercial and artisanal fisheries.
- NOAA Fisheries promulgated rules to assist in the reduction of incidental mortality in commercial fisheries, including the following:
 - Promulgation of a fishing closure rule to reduce bycatch of olive ridleys in the Hawaii-based longline fishery (FR Vol. 65, No. 166, August 25, 2000).
 - Promulgation of a final rule implementing gear requirement measures to minimize the mortality of, and injury to, sea turtles hooked or entangled by longline fishing gear (Hawaii longline fishery) (FR Vol. 65, No. 60, March 28, 2000).
 - Promulgation of emergency rule to implement court-ordered closure and reduce adverse impacts to sea turtles by the Hawaiian longline fishery while an environmental impact statement was prepared (FR Vol. 64, No. 247, December 27, 1999).
- Workshops have been held to formulate research techniques to assess longline hooking and entanglement and to identify ways to reduce or mitigate incidental capture. In related research, satellite transmitters have been deployed on turtles hooked incidentally in the longline fishery to track post-release movements to better understand the long-term effects of hooking. Linkages between turtle movements and oceanographic processes are also being studied.

Plan Task 216 - Study the Impact of Disease on Turtles - Priority 1,3

- NOAA Fisheries provided funding support for a health assessment workshop to address health issues important to sea turtle conservation and recovery.

- A multi-disciplinary research program continues to study the cause and effects of the disease fibropapillomatosis (FP). Research has been initiated on the possible etiologies of the disease, including viruses, parasites, and environmental pollutants. In addition to field and laboratory research, statistical analyses and modeling studies continue to work to link fibropapilloma incidence and severity to key aspects of green turtle population dynamics and assess impacts of the disease on population recovery.

Plan Task 41 - Support Existing International Agreements and Conventions to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters - Priority 1

- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested with commercial fishing technology which may adversely affect sea turtles. The import ban does not apply to nations that have adopted comparable sea turtle protection programs (i.e., require the use of TEDs) to that of the United States or those nations whose fishing environment does not pose a threat of incidental take of sea turtles. The Department of State (DOS) is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Latin America, Africa and Asia.

Plan Task 42 - Encourage Ratification of the CITES for All Non-Member Pacific Countries, Compliance with CITES Requirements, and Removal of Sea Turtle Trade Reservations Held by Member Nations - Priority 1

- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.

Plan Task 43 - Develop New International Agreements to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters - Priority 1

- NOAA Fisheries continued to work to develop international agreements important sea turtle conservation. The migratory nature of sea turtles makes these agreements critical to sea turtle recovery. During this reporting period, NOAA Fisheries worked with the U.S. Department of State on the Inter-American Convention for the Protection and Conservation of Sea Turtles. This is the first international agreement devoted solely to the protection of sea turtles and aims to foster cooperation and coordination between countries of the region to recover sea turtles.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region.

Plan Title: Hawksbill Turtle - Atlantic Population

Planning Stage:	Final
Plan Approval Date:	11/24/93

Species Covered

Scientific Name	Common Name	Population (if applicable)	ESA Status
<i>Eretmochelys imbricata</i>	Hawksbill	Atlantic populations	Endangered

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for hawksbill turtles in the Atlantic Ocean in 1991. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

The U.S. populations of hawksbill turtles can be considered for de-listing if, over a period of 25 years, all the following conditions are met:

- The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests on at least five index beaches, including Mona Island and Buck Island Reef National Monument.
- Habitat for at least 50 percent of the nesting activity that occurs in the U.S. Virgin Islands (USVI) and Puerto Rico is protected in perpetuity.
- Numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, USVI, and Florida.
- All Priority #1 tasks have been successfully implemented.

Major Recovery Actions Needed

- Provide long-term protection to important nesting beaches.
- Ensure at least 75 percent hatching success rate on major nesting beaches.
- Determine distribution and seasonal movements of turtles in all life stages in the marine environment.
- Minimize threat from illegal exploitation.
- End international trade in hawksbill products.
- Ensure long-term protection of important foraging habitats.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis for the Biennial Reporting Period)

Plan Task 121 - Identify Important Marine Habitat - Priority 2

- NOAA Fisheries conducted collaborative studies to identify marine habitats through the use of remote sensing instruments such as satellite transmitters (see Plan Task 221).

Plan Tasks 122 through 129 - Protection of Marine Habitats - Priority 1, 2, 3

- NOAA Fisheries designated critical habitat for the hawksbill turtle at Mona and Monito Islands, Puerto Rico in all waters surrounding the islands, from the mean high water line seaward to 3 nautical miles.
- NOAA has developed *A National Coral Reef Action Strategy* (Strategy) in cooperation with the U.S. Coral Reef Task Force, to fulfill the requirements of the Coral Reef Conservation Act of 2000 (CRCA) (P.L. 106-562; 16 U.S.C. 6401 *et seq.*) and implement the National Action Plan to Conserve Coral Reefs. Collectively these actions will serve to improve the health of coral reef habitats upon which hawksbills depend.

Plan Task 212 - Evaluate Nest Success and Implement Appropriate Nest-Protection Measures on Important Nesting Beaches - Priority 1

- NOAA Fisheries, through the National Fish and Wildlife Foundation, provided funding to support an important nesting beach project in Nicaragua to monitor nesting trends, nest success, and enhance nest protection.

Plan Task 216 - Determine the Genetic Relationships Among Caribbean Hawksbill Nesting Populations - Priority 2

- NOAA Fisheries has provided extensive support to researchers to elucidate the genetic relationships among Caribbean hawksbill populations, including the identification of nesting beach haplotypes and mixed stock analysis on foraging grounds.

Plan Task 221 - Determine Distribution, Abundance, and Status in the Marine Environment - Priority 2

- NOAA Fisheries completed a landmark Caribbean-wide collaborative project to identify the migratory routes and resident foraging grounds by satellite tracking post-nesting hawksbills in Barbados, Jamaica, Antigua, U.S. Virgin Islands, Puerto Rico, Costa Rica, Nicaragua, and Mexico.

Plan Task 222 - Monitor and Reduce Incidental Mortality in the Commercial and Recreational Fisheries - Priority 3

NOAA Fisheries continued to carry out fishery observer programs to evaluate and monitor incidental bycatch of sea turtles. During this reporting period the following actions were accomplished:

- New England and mid-Atlantic gillnet fisheries NOAA Fisheries observer program
- Shark drift gillnet NOAA Fisheries observer program for east Florida
- Southeastern shrimp trawl fishery NOAA Fisheries observer program
- Atlantic pelagic longline NOAA Fisheries observer program

- Funding support for observer training and standardization of monitoring in North Carolina fisheries
- NOAA Fisheries participated in the development of and funded a landmark experiment to evaluate the effects of hook type on sea turtle bycatch in an important longline fishery in the eastern Atlantic known to capture significant numbers of sea turtles. This work is part of a broad effort to seek gear and fishing method modifications to reduce and eliminate the bycatch of sea turtles while preserving the longline fishery.
- Several workshops involving industry, academia, and non-governmental organizations were held to formulate and prioritize actions needed to reduce incidental capture in longline fisheries.
- To address the impact of incidental capture in the shrimp trawl fishery, TEDs were developed and, in 1992, were required in all shrimp trawlers (with a few exceptions) from North Carolina through Texas.

Plan Task 224 - Maintain Carcass Stranding Network - Priority 2

- NOAA Fisheries continued to fund and coordinate a national sea turtle stranding program, operating from Maine through Texas. Network participants respond to dead or injured sea turtles, including mass stranding events, and collect critical biological data. The program provides important information on anthropogenic and natural mortality factors. A total of 2,600-3,600 sea turtles wash ashore dead or injured each year along the U.S. Atlantic and Gulf of Mexico coasts, approximately 50 of these strandings annually are hawksbills.
- NOAA Fisheries provided funding to our NOAA partner NOS to convene a Workshop on Sea Turtle Health Assessment to identify and prioritize health issues important to sea turtle conservation and recovery.

Plan Task 226 - Centralize Administration and Coordination of Tagging Programs - Priority 3

NOAA Fisheries consolidated its turtle tag dissemination and data archival program with that of the Archie Carr Center for Sea Turtle Research (ACCSTR), a world-renowned center housed at the University of Florida. Annual funding provided to our conservation partner, ACCSTR, supports purchase of tags, dissemination to research projects, archival of data, and retrieval of recapture data.

Plan Task 31 - Provide Education Materials and Public Outreach - Priority 2

NOAA Fisheries education and public outreach efforts have included:

- NOAA Fisheries provided funding and technical expertise for the guide “Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico.”
- NOAA Fisheries produced and disseminated informational stickers for recreational fishers with guidelines to avoid interacting with sea turtles and what to do if an interaction occurs.
- NOAA Fisheries produced handling guidelines for turtles incidentally captured in longline fisheries.
- NOAA Fisheries Protected Resources website provides the public with detailed information on sea turtles (http://www.nmfs.noaa.gov/prot_res/prot_res.html).
- NOAA Fisheries partnered with the Caribbean Conservation Corporation in a highly successful program to educate the public on the movements of Caribbean hawksbill turtles tagged with satellite tags, through the world wide web (<http://cccturtle.org/sat1.htm>).

- NOAA Fisheries provided funding support to the Marine Turtle Newsletter, a global publication disseminating sea turtle information. This type of communication is essential in facilitating recovery efforts for sea turtles.
- NOAA Fisheries provided funding support for the Caribbean Center for Marine Studies for a sea turtle education and rehabilitation program.

Plan Task 42 - Foster CITES Memberships of All Non-Member Caribbean Countries, Compliance with CITES Requirements, and Removal of Sea Turtle Trade Reservations of Member Nations

- NOAA Fisheries has worked extensively to support efforts to conserve and recover hawksbill turtles through CITES. This is of particular relevance to the hawksbill due the significant role the trade of its shell has had in the decline of this species.

Plan Task 43 - Develop International Agreements to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters

- NOAA Fisheries continued to work to develop international agreements for the conservation of sea turtles, which are highly migratory species. During this reporting period, NOAA Fisheries worked in collaboration with the U.S. Department of State to conclude the first multi-lateral agreement devoted solely to the conservation of sea turtles. This treaty, the Inter-American Convention for the Protection and Conservation of Sea Turtles, was ratified by the United States and came into force in 2001. The treaty aims to promote cooperation and coordination between countries of the western hemisphere region to recover sea turtles.
- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.
- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested in foreign nations with commercial fishing technology which may adversely affect sea turtles. The Department of State is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Central and South America, Africa, and Asia.
- NOAA Fisheries provided funding support for the establishment of sea turtle conservation networks in Honduras, Costa Rica, Guatemala, Colombia, and Nicaragua, through the efforts of WIDECAST (Wider Caribbean Sea Turtle Network).

Plan Title: **Hawksbill Turtle - Pacific Population**

Planning Stage:	Final
Plan Approval Date:	1/12/98

Species Covered

Scientific Name	Common Name	Population (if applicable)	ESA Status
<i>Eretmochelys imbricata</i>	Hawksbill	All populations	Endangered

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for U.S. populations of the hawksbill in the Pacific Ocean in 1998. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

To consider de-listing, all of the following criteria must be met:

- All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
- Each stock must average 1,000 females estimated to nest annually (FENA) (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) over six years.
- All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for 25 years.
- Existing foraging areas are maintained as healthy environments.
- Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
- All Priority #1 tasks have been implemented.
- A management plan designed to maintain sustained populations of turtles is in place.
- Ensure formal cooperative relationship with regional sea turtle management programs (South Pacific Regional Environment Program [SPREP]).
- International agreements are in place to protect shared stocks.

Major Recovery Actions Needed (not in order of priority)*

- Stop the direct harvest of hawksbill turtles and eggs, through education and law enforcement actions.
- Reduce incidental mortalities of hawksbills by commercial and artisanal fisheries.
- Determine population size, status and trends through long-term regular nesting beach and in-water censuses.
- Identify stock home ranges using DNA analysis.
- Support conservation and biologically viable management of hawksbill populations in countries that share U.S. hawksbill stocks.
- Identify and protect primary nesting and foraging areas for the species.
- 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.

Major Recovery Accomplishments (with focus on this reporting period)

Plan Task 212 - Determine Distribution, Abundance, and Status in the Marine Environment - Priority 1

- NOAA Fisheries conducted a multi-national program to study the migrations of post-nesting hawksbill turtles in the western Pacific. These studies will help elucidate adult migratory movements and resident foraging habitats.

Plan Task 214 - Monitor and Reduce Incidental Mortality in the Commercial and Recreational Fisheries - Priority 2

- NOAA Fisheries promulgated rules to assist in the reduction of incidental mortality in commercial fisheries, including the following:
 - Promulgation of a fishing closure rule to reduce bycatch of olive ridleys in the Hawaii-based longline fishery (FR Vol. 65, No. 166, August 25, 2000).
 - Promulgation of a final rule implementing gear requirement measures to minimize the mortality of, and injury to, sea turtles hooked or entangled by longline fishing gear (Hawaii longline fishery) (FR Vol. 65, No. 60, March 28, 2000).
 - Promulgation of emergency rule to implement court-ordered closure and reduce adverse impacts to sea turtles by the Hawaiian longline fishery while an environmental impact statement was prepared (FR Vol. 64, No. 247, December 27, 1999).

Plan Task 216 - Study the Impact of Disease on Turtles - Priority 3

- NOAA Fisheries provided funding to our NOAA partner NOS to convene a Workshop on Sea Turtle Health Assessment to identify and prioritize health issues important to sea turtle conservation and recovery.

Plan Task 41 - Support Existing International Agreements and Conventions to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters - Priority 1

U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested with commercial fishing technology which may adversely affect sea turtles. The import ban does not apply to nations that have adopted comparable sea turtle protection programs (i.e., require the use of TEDs) to that of the United States or those nations whose fishing environment does not pose a threat of incidental take of sea turtles. The Department of State (DOS) is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to provide training in the installation and use of TEDs to many countries in Latin America, Africa and Asia.

Plan Task 42 - Encourage Ratification of the CITES for All Non-Member Pacific Countries, Compliance with CITES Requirements, and Removal of Sea Turtle Trade Reservations Held by Member Nations - Priority 1

- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.

Plan Task 43 - Develop New International Agreements to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters - Priority 1

- NOAA Fisheries continued to work to develop international agreements important sea turtle conservation. The migratory nature of sea turtles makes these agreements critical to sea turtle recovery. During this reporting period, NOAA Fisheries worked with the U.S. Department of State on the Inter-American Convention for the Protection and Conservation of Sea Turtles. This is the first international agreement devoted solely to the protection of sea turtles and aims to foster cooperation and coordination between countries of the region to recover sea turtles.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region.

Plan Title: Kemp's Ridley Turtle

Planning Stage:	Final
Plan Approval Date:	8/21/92

Species Covered

Scientific Name	Common Name	Population (if applicable)	ESA Status
<i>Lepidochelys kempii</i>	Kemp's ridley	Range-wide	Endangered

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for Kemp's ridley in 1992. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

To consider de-listing, all of the following criteria must be met:

- Continue complete and active protection of the known nesting habitat, and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continue the bi-national protection project.
- Eliminate mortality from incidental catch in commercial shrimping in the United States and Mexico through use of Turtle Excluder Devices (TEDs) and achieve full compliance with the regulations requiring TED use.
- Attain a population of at least 10,000 nesting females in a season.
- Successfully implement all Priority #1 recovery tasks.

Major Recovery Actions Needed

- Assist Mexico to ensure long-term protection of the major nesting beach and its environs, including the protection of adult breeding stock and enhanced production/survival of hatchling turtles.
- Continue TED regulation enforcement in U.S. waters, expanding the areas and seasonality of required TED use to reflect the distribution of the species. Encourage and assist Mexico to incorporate TEDs in their Gulf of Mexico shrimp fleet.
- Fill in gaps in knowledge of Kemp's ridley life history that will result in better management. In order to minimize threats and maximize recruitment we should: determine distribution and

habitat use for all life stages, determine critical mating/reproductive behaviors and physiology, determine survivorship and recruitment.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis for the Biennial Reporting Period)

Plan Tasks 11 & 21 - Protect and Manage Nesting Populations and Habitat in the state of Tamaulipas, Mexico - Priority 1 & 2

NOAA Fisheries joined the cooperative conservation effort for Kemp's ridley turtle at Rancho Nuevo in 1996 and has provided financial and logistical support primarily for infrastructure improvements, resulting in upgrading of the existing turtle camps and establishment of new camps to enable expanded coverage north and south of the main camp. NOAA Fisheries has also funded and collaborated on several important research endeavors at Rancho Nuevo including studies of the migratory movements of adult male turtles, internal tagging of hatchlings, and research into hatchling sex ratios. The objective of this program is to ensure the protection of nesting females at Rancho Nuevo, ensure high hatchling production, facilitate research efforts to enumerate and identify nesting females, and collect data critical to population modeling.

Plan Task 221 - Determine Distribution and Abundance - Priority 1

- NOAA Fisheries provided funding support for in-water population studies of marine turtles in the Albemarle and Pamlico Sound in North Carolina and Cedar Key, Florida, to learn more about this species and its marine environment to enhance recovery management efforts.
- NOAA Fisheries provided funding and participated in a workshop to review existing methodologies for in-water research and make recommendations to improve estimates of sea turtle distribution and abundance.

Plan Task 222 - Monitor and Reduce Mortality from Fisheries - Priority 1

- NOAA Fisheries continued to carry out fishery observer programs to evaluate and monitor incidental bycatch of sea turtles. During this reporting period the following actions were accomplished:
 - New England and mid-Atlantic gillnet fisheries NOAA Fisheries observer program
 - Shark drift gillnet NOAA Fisheries observer program for east Florida
 - Southeastern shrimp trawl fishery NOAA Fisheries observer program
 - Atlantic pelagic longline NOAA Fisheries observer program
 - Funding support for observer training and standardization of monitoring in North Carolina fisheries
- NOAA Fisheries promulgated regulations during this reporting period to reduce fishery related mortality and address conservation management needs, including:
 - Temporary rules (7) to address clogging of TEDs in the Atlantic Ocean and Gulf of Mexico through the implementation of reduced tow times, thus helping fishermen and turtles (FR Vol. 63, No. 198, October 14, 1998, FR Vol. 63, No. 208, October 28, 1998, FR Vol. 63, No. 217, November 10, 1998, FR Vol. 63, No. 232, December 3, 1998, FR Vol. 64, No. 199, October 15, 1999, FR Vol. 64, No. 205, October 25, 1999, and FR Vol. 65, No. 168, August 29, 2000).

- Temporary 30-day rule closing an area to large-mesh gill net fisheries along eastern North Carolina and Virginia during sea turtle northern migration (FR Vol. 65, No. 97, May 18, 2000).
- Temporary 30-day rule closing waters of Pamlico Sound, North Carolina to fishing with large mesh gillnets (FR Vol.64, No. 241, December 16, 1999).
- Interim final rule requiring small mesh in the webbing material used for installing TEDs in flounder trawls in waters off Virginia and North Carolina (FR Vol. 64, No. 199, October 15, 1999) to prevent entanglement of sea turtles.
- Interim final rule to extend for one additional year the approved use of the Parker soft TED (FR Vol. 64, No. 197, October 13, 1999).

Plan Task 2221 - Enforce and Expand the Use of TEDs - Priority 1

- To address the impact of incidental capture in the shrimp trawl fishery, TEDs were developed and, in 1992, were required in all shrimp trawlers (with a few exceptions) from North Carolina through Texas.
- To address the impact of incidental capture in the summer flounder fishery, TEDs were developed and, in 1996, were required in all summer flounder trawlers (with a seasonal exception) operating south of Cape Charles, VA, to the North Carolina/South Carolina boarder.
- The NOAA Fisheries Laboratory developed a prototype TED for use in non-shrimp flynet trawls.
- Enforcement of TED regulations continues. NOAA Fisheries created Protected Resource Enforcement Teams (PRET teams) specifically to enforce ESA and MMPA regulations, these teams have been particularly active with regard to TED enforcement, including special details deployed in critical areas when needs arise.
- NOAA Fisheries gear specialists have provided important support to law enforcement agents during TED enforcement details.

Plan Task 2223 - Provide Technology Transfer to Mexico for Installation and Use of TEDS -Priority 1

- The NOAA Fisheries Pascagoula Laboratory has continued to provide extensive outreach, including development and widespread dissemination of training materials in multiple languages, to ensure proper construction, installation, and use of TEDs.
- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested in foreign nations with commercial fishing technology which may adversely affect sea turtles. The Department of State is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries including Mexico.

Plan Task 2224 - Maintain Sea Turtle Stranding Network - Priority 3

- NOAA Fisheries continued to fund and coordinate a national sea turtle stranding program, operating from Maine through Texas. Network participants respond to dead or injured sea turtles, including mass stranding events, and collect critical biological data. The program provides important information on anthropogenic and natural mortality factors. A total of

2,000-3,000 sea turtles wash ashore dead or injured each year along the U.S. Atlantic and Gulf of Mexico coasts.

Plan Task 223 - Monitor and Prevent Adverse Impacts from Oil and Gas Activities - Priority 2

- The Mineral Management Service (MMS) is largely responsible for implementing this plan task. The MMS consults with NOAA Fisheries under ESA section 7 on their proposed oil and gas activities. These consultations have resulted in the following monitoring and conservation actions:
- NOAA Fisheries held a health assessment workshop to develop an interagency research and monitoring program that will address biota health and environmental contaminants as well as establish protocols for collecting, storing and analyzing specimens. An interagency research and monitoring program is necessary to evaluate the effects of chronic exposure of sea turtles to petrochemical and other contaminants associated with the oil and gas industry.
- For blasting activities related to oil and gas platform removal, observers and aerial surveys are required prior to detonation. If sea turtles are observed within 2,000 yards of the charge, blasting must be delayed.

Plan Task 224 - Monitor and Reduce Mortality from Dredging Activities - Priority 2

The U.S. Army Corps of Engineers (COE) is largely responsible for implementing this plan task. The COE consults with NOAA Fisheries under ESA section 7 on their proposed dredging activities. These consultations have resulted in the following monitoring and conservation actions:

- Development and required use of a sea turtle deflector device on hopper dredges to prevent impingement of turtles into the drag arm.
- Seasonal restrictions on the use of hopper dredges in certain areas where turtles are abundant.
- One hundred percent observer coverage on hopper dredges in certain areas and times when turtles are abundant.
- Slow speed when turtles or whales are sighted to prevent vessel strikes.

Plan Task 3 - Increase Education Programs - Priority 2

NOAA Fisheries education and public outreach efforts have included:

- Funding and technical support for the guide “Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico.”
- Production of informational stickers for recreational fishers with guidelines to avoid interacting with sea turtles and what to do if an interaction occurs.
- Development of a NOAA Fisheries Protected Resources website to provide the public with detailed information on sea turtles (http://www.nmfs.noaa.gov/prot_res/prot_res.html).
- Participation in a highly successful program to educate the public on the movements of satellite-tracked turtles, through the world wide web (<http://cccturtle.org/sat1.htm>).
- NOAA Fisheries provided funding support to the Marine Turtle Newsletter, a global publication disseminating sea turtle information. This type of communication is essential in facilitating recovery efforts for sea turtles.
- NOAA Fisheries provided funding support for the Caribbean Center for Marine Studies for an a sea turtle education and rehabilitation program..

Plan Title: **Leatherback Turtle - Atlantic Population**

Planning Stage:	Final
Plan Approval Date:	4/6/92

Species Covered

Scientific Name	Common Name	Population (if applicable)	ESA Status
<i>Dermochelys coriacea</i>	Leatherback	Atlantic populations	Endangered

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for leatherback turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico in 1992. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

Leatherback populations in the United States can be considered for de-listing if all of the following conditions are met:

- The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico; St. Croix, USVI; and along the east coast of Florida.
- Nesting habitat encompassing at least 75% of nesting activity in the U.S. Virgin Islands, Puerto Rico and Florida is in public ownership.
- All Priority #1 tasks have been successfully implemented.

Major Recovery Actions Needed

- Provide long-term habitat protection for important nesting beaches.
- Ensure at least 60 percent hatch success on major nesting beaches.
- Determine distribution and seasonal movements for all life stages in marine environment.
- Reduce threat from marine pollution.
- Reduce incidental capture by commercial fisheries.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis on the Biennial Reporting Period)

Plan Task 121 - Identify Important Marine Habitats - Priority 1

- NOAA Fisheries funded non-agency studies to identify marine habitats through the use of remote sensing instruments such as satellite transmitters (see Plan Task 2212).

Plan Task 219 - Determine Genetic Relationship of U.S. Caribbean Populations to Other Major Nesting Populations - Priority 2

- NOAA Fisheries established a national sea turtle genetics laboratory at the NOAA Fisheries LaJolla Laboratory in LaJolla, California. The primary functions of the laboratory include collecting, analyzing, and archiving tissue samples of sea turtles to identify nesting assemblages and to determine breeding population origins of foraging populations. These data are critical to population assessments.
- NOAA Fisheries scientists have been at the forefront of identifying the stock structure of the Atlantic leatherback turtle and significant progress has been made in this regard. NOAA Fisheries provided funding through the Sea Turtle Stranding and Salvage Network to support the collection of genetic material from stranded leatherbacks to determine their natal origin and NOAA Fisheries is also working to collect tissue samples from leatherback turtles incidentally captured in commercial fishing operations.
- NOAA Fisheries convened an International Workshop on Sea Turtle Conservation Genetics bringing together leading researchers in the field to present scientific results and to discuss state-of-the-art techniques.

Plan Task 221 - Determine Seasonal Distribution, Abundance, and Status in the Marine Environment - Priority 2

- NOAA Fisheries provided funding and participated in a workshop to review existing methodologies for in-water research and make recommendations to improve estimates of sea turtle abundance.
- NOAA Fisheries conducted a pilot aerial survey for leatherback turtles in the coastal waters of the Mid-Atlantic in July 2000, to investigate whether line transect methodology can be used to produce precise estimates of leatherback abundance. These data are undergoing analyses.

Plan Task 2211 - Determine Hatchling Dispersal Patterns, Juvenile Distribution, and Abundance - Priority 2

- NOAA Fisheries contracted for a global analysis of records of juvenile leatherbacks to increase our understanding of the distribution of this rarely observed life history stage.

Plan Task 2212 - Determine Migratory Pathways, Distribution, and Internesting Movements -Priority 2

- NOAA Fisheries provided funding support for investigations of the post-nesting migratory movements of Florida leatherbacks.
- NOAA Fisheries provided funding support for investigations of the migratory movements of leatherback turtles captured in North Atlantic waters.

Plan Task 2221 - Implement and Enforce Ted Regulations in United States Waters - Priority 1

- To address the impact of incidental capture in the shrimp trawl fishery, TEDs were developed and, in 1992, were required in all shrimp trawlers (with a few exceptions) from North Carolina through Texas.
- To address the impact of incidental capture in the summer flounder fishery, TEDs were developed and, in 1996, were required in all summer flounder trawlers (with a seasonal exception) operating south of Cape Charles, VA, to the North Carolina/South Carolina border.
- NOAA Fisheries promulgated regulations during this reporting period to reduce shrimp fishery related mortality and address conservation management needs, including:
 - Temporary rules (8) to require shrimp fishermen fishing in certain areas of the Atlantic and Gulf of Mexico to use a TED with an opening which excludes leatherbacks (64 FR 24460 May 12, 1999; 64 FR 27206 May 19, 1999; 64 FR 28761 May 27, 1999; 64 FR 29805 June 3, 1999; 64 FR 69416 December 13, 1999; 65 FR 24132 March 25, 2000; 65 FR 25670 May 3, 2000; 65 FR 33779 May 25, 2000).
 - Temporary rules (7) to address clogging of TEDs in the Atlantic Ocean and Gulf of Mexico through the implementation of reduced tow times, thus helping fishermen and turtles (63 FR 55053 October 14, 1998; 63 FR 57620 October 28, 1998; 63 FR 62959 November 10, 1998; 63 FR 66766 December 3, 1998; 64 FR 55858 October 15, 1999; 64 FR 57397 October 25, 1999; and 65 FR 52348 August 29, 2000).
 - Interim final rule requiring small mesh in the webbing material used for installing TEDs in flounder trawls in waters off Virginia and North Carolina (64 FR 55860 October 15, 1999) to prevent entanglement of sea turtles.

Plan Task 2222 - Evaluate the Extent of Incidental Catch due to Hook and Line, Driftnet, Gill Netting, and Other Fisheries Related Mortality - Priority 2.

- NOAA Fisheries continued to carry out fishery observer programs to evaluate and monitor incidental bycatch of sea turtles. During this reporting period the following actions were accomplished:
 - New England and mid-Atlantic gillnet fisheries NOAA Fisheries observer program
 - Shark drift gillnet NOAA Fisheries observer program for east Florida
 - Southeastern shrimp trawl fishery NOAA Fisheries observer program
 - Atlantic pelagic longline NOAA Fisheries observer program
 - Funding support for observer training and standardization of monitoring in North Carolina fisheries
- NOAA Fisheries participated in the development of and funded a landmark experiment to evaluate the effects of hook type on sea turtle bycatch in an important longline fishery in the eastern Atlantic known to capture significant numbers of sea turtles. This work is part of a broad effort to seek gear and fishing method modifications to reduce and eliminate the bycatch of sea turtles while preserving the longline fishery.
- Several workshops involving industry, academia, and non-governmental organizations were held to formulate and prioritize actions needed to reduce incidental capture in longline fisheries.

Plan Task 2223 - Promulgate Regulations to Reduce Hook and Line, Driftnet, Gill Netting, and Other Fisheries Related Mortalities - Priority 2

- NOAA Fisheries promulgated a 30-day rule closing an area to large-mesh gill net fisheries along eastern North Carolina and Virginia during sea turtle northern migration (65 FR 31500 May 18, 2000).
- NOAA Fisheries promulgated a 30-day rule closing an area offshore the mid-central Florida east coast to drift gillnets (66 FR 15045 March 15, 2001)
- NOAA Fisheries promulgated a 180-day closure of the Grand Banks to U.S. longline fishing to reduce the incidental capture of sea turtles (65 FR 60889 October 13, 2000).

Plan Task 2224 - Maintain Sea Turtle Stranding Network - Priority 3

- NOAA Fisheries continued to fund and coordinate a national sea turtle stranding program, operating from Maine through Texas. Network participants respond to dead or injured sea turtles, including mass stranding events, and collect critical biological data. The program provides important information on anthropogenic and natural mortality factors. A total of 2,600-3,600 sea turtles wash ashore dead or injured each year along the U.S. Atlantic and Gulf of Mexico coasts, approximately 100 of these strandings annually are leatherbacks.
- NOAA Fisheries provided funding to our NOAA partner NOS to convene a Workshop on Sea Turtle Health Assessment to identify and prioritize health issues important to sea turtle conservation and recovery.

Plan Task 223 - Monitor and Prevent Adverse Impacts from Oil and Gas Activities - Priority 2

The Mineral Management Service (MMS) is largely responsible for implementing this plan task and consults with NOAA Fisheries under ESA section 7 on their proposed oil and gas activities. These consultations have resulted in the following monitoring and conservation actions:

- NOAA Fisheries held a health assessment workshop to develop an interagency research and monitoring program that will include addressing health effects of environmental contaminants as well as establish protocols for collecting, storing and analyzing specimens. An interagency research and monitoring program is necessary to evaluate the effects of chronic and acute exposure of sea turtles to petrochemical and other contaminants associated with the oil and gas industry.
- For blasting activities related to oil and gas platform removal, observers and aerial surveys are required prior to detonation. If sea turtles are observed within 2,000 yards of the charge, blasting must be delayed.

Plan Task 225 - Centralize Administration and Coordination of Tagging Programs - Priority 3

NOAA Fisheries consolidated its turtle tag dissemination and data archival program with that of the Archie Carr Center for Sea Turtle Research (ACCSTR), a world-renowned center housed at the University of Florida. Annual funding provided to our conservation partner, ACCSTR, supports purchase of tags, dissemination to research projects, archival of data, and retrieval of recapture data.

Plan Task 3 - Develop Public Education Materials and Provide Public Outreach - Priority 2 & 3

NOAA Fisheries education and public outreach efforts have included:

- NOAA Fisheries provided funding and technical support for the guide “Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico.”
- NOAA Fisheries produced informational stickers for recreational fishers with guidelines to avoid interacting with sea turtles and what to do if an interaction occurs.
- NOAA Fisheries produced handling guidelines for turtles incidentally captured in longline fisheries.
- NOAA Fisheries Protected Resources website provides the public with detailed information on sea turtles (http://www.nmfs.noaa.gov/prot_res/prot_res.html).
- NOAA Fisheries provided funding support to the Marine Turtle Newsletter, a global publication disseminating sea turtle information. This type of communication is essential in facilitating recovery efforts for sea turtles.

Plan Task 41 - Develop International Agreements to Ensure Protection of Life Stages Which Occur in Foreign Waters - Priority 2

- NOAA Fisheries continued to work to develop international agreements for the conservation of sea turtles, which are highly migratory species. During this reporting period, NOAA Fisheries worked in collaboration with the U.S. Department of State to conclude the first multi-lateral agreement devoted solely to the conservation of sea turtles. This treaty, the Inter-American Convention for the Protection and Conservation of Sea Turtles, was ratified by the United States and came into force in 2001. The treaty aims to promote cooperation and coordination between countries of the western hemisphere region to recover sea turtles.
- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region, the Agreement was concluded in 2001.
- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested in foreign nations with commercial fishing technology which may adversely affect sea turtles. The Department of State is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Central and South America, Africa, and Asia.
- NOAA Fisheries provided funding support for the establishment of sea turtle conservation networks in Honduras, Costa Rica, Guatemala, Colombia, and Nicaragua, through the efforts of WIDECAST (Wider Caribbean Sea Turtle Network).

Plan Title: **Leatherback Turtle - Pacific Population**

Planning Stage:	Final
Plan Approval Date:	1/12/98

Species Covered

Scientific Name	Common Name	Population (if applicable)	ESA Status
<i>Dermochelys coriacea</i>	Leatherback	All populations	Endangered

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for U.S. Pacific populations of the leatherback turtle in 1998. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

To consider de-listing, all of the following criteria must be met:

- All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
- Each stock must average 5,000 (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) females estimated to nest annually (FENA) over six years.
- Nesting populations at "source beaches" are either stable or increasing over a 25-year monitoring period.
- Existing foraging areas are maintained as healthy environments.
- Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
- All Priority #1 tasks have been implemented.
- A management plan designed to maintain sustained populations of turtles is in place.

Major Recovery Actions Needed (not in order of priority)*

- Eliminate incidental take of leatherbacks in U.S. and international commercial fisheries.
- Support the efforts of Mexico and the countries of Central America to census and protect nesting leatherbacks, their eggs, and nesting beaches.

- Determine movement patterns, habitat needs and primary foraging areas for the species throughout its range.
- Determine population size and status in U.S. waters through regular aerial or on-water surveys.
- Identify stock home ranges using DNA analysis.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis on the Biennial Reporting Period)

Plan Task 11 - Protect and Manage Turtles on Nesting Beaches - Priority 1

- NOAA Fisheries continues to provide funding and technical support to nesting beach projects in the eastern Pacific, especially along the Mexican coast to evaluate monitor nesting, reduce mortality of nesting females, and reduce poaching of eggs.

Plan Task 1153 - Define Stock Boundaries - Priority 1

- NOAA Fisheries established a national sea turtle genetics laboratory at the NOAA Fisheries LaJolla Laboratory in LaJolla, California. The primary functions of the laboratory include collecting, analyzing, and archiving tissue samples of sea turtles to identify nesting assemblages and to determine breeding population origins of foraging populations. These data are critical to population assessments.
- NOAA Fisheries scientists have been at the forefront of identifying the stock structure of the leatherback turtle and significant progress has been made in this regard.
- NOAA Fisheries convened an International Workshop on Sea Turtle Conservation Genetics bringing together leading researchers in the field to present scientific results and to discuss state-of-the-art techniques.

Plan Task 211 - Eliminate Directed Take of Turtles - Priority 1

- NOAA Fisheries efforts at enhanced nesting beach monitoring have resulted in increased conservation presence on key nesting beaches, this has resulted in decreased poaching of nesting females and their eggs.

Plan Task 212 - Determine Distribution, Abundance, and Status in the Marine Environment - Priority 1

- Satellite telemetry studies have been supported or conducted by NOAA Fisheries to elucidate the post-nesting movements of adult females in order identify key migratory routes and foraging habitats. Results of these and other migration studies have revealed important information about the movements of Pacific leatherbacks.

Plan Task 2141 - Monitor Incidental Mortality in the Commercial and Recreational Fisheries -Priority 1

- NOAA Fisheries maintained observer programs to monitor incidental mortality of sea turtles in the Hawaii pelagic longline fishery and the California/Oregon drift gillnet fishery.

Plan Task 2142 - Reduce Incidental Mortality in the Commercial and Recreational Fisheries -Priority 1

- NOAA Fisheries supported efforts to address the incidental bycatch in fisheries. This included developing measures to reduce mortality, including the use of resuscitation techniques to reduce mortality and promoting the use of line cutting gear to disentangle captured turtles.
- NOAA Fisheries promulgated rules to assist in the reduction of incidental mortality in commercial fisheries, including the following:
 - Promulgation of a fishing closure rule to address negative impacts (by-catch) of the Hawaii-based longline fishery upon sea turtles (FR Vol. 65, No. 166, August 25, 2000).
 - Promulgation of a final rule implementing gear requirement measures to minimize the mortality of, and injury to, sea turtles hooked or entangled by longline fishing gear (Hawaii longline fishery) (FR Vol. 65, No. 60, March 28, 2000).
 - Promulgation of emergency rule to implement court-ordered closure and reduce adverse impacts to sea turtles by curtailing activities of the Hawaiian longline fishery while an environmental impact statement was prepared (FR Vol. 64, No. 247, December 27, 1999).
- Workshops have been held to formulate research techniques to assess longline hooking and entanglement and to identify ways to reduce or mitigate incidental capture. In related research, satellite transmitters have been deployed on turtles hooked incidentally in the longline fishery to track post-release movements to better understand the long-term effects of hooking. Linkages between turtle movements and oceanographic processes are also being studied.

Plan Task 216 - Study the Impact of Diseases on Turtles - Priority 3

- NOAA Fisheries provided funding to our NOAA partner NOS to convene a Workshop on Sea Turtle Health Assessment to identify and prioritize health issues important to sea turtle conservation and recovery.

Plan Task 218 - Centralize Administration and Coordination of Tagging Programs - Priority 2

NOAA Fisheries worked to standardize the use of PIT tags in leatherbacks throughout the Atlantic and Pacific and has provided PIT tags and readers to researchers around the Pacific Ocean basin.

Plan Task 221 - Identify Important Marine Habitats - Priority 1

See Plan Task 212

Plan Task 41 - Support Existing International Agreements and Conventions to Ensure that Turtles in all Life-Stages are Protected in Foreign Waters - Priority 1

U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested with commercial fishing technology which may adversely affect sea turtles. The import ban does not apply to nations that have adopted comparable sea turtle protection programs (i.e., require the use of TEDs) to that of the United States or those nations whose fishing environment does not pose a threat of incidental take of sea turtles. The Department of State (DOS) is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to provide training in the installation and use of TEDs to many countries in Latin America, Africa and Asia.

Plan Task 42 - Encourage Ratification of CITES for all Non-Member Pacific Countries, Compliance with CITES Requirements, and Removal of Sea Turtle Trade Reservations held by Member Nations - Priority 1

- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.

Plan Task 43 - Develop New International Agreements to Ensure that Turtles in all Life-Stages are Protected in Foreign Waters - Priority 1

- NOAA Fisheries continued to work to develop international agreements important sea turtle conservation. The migratory nature of sea turtles makes these agreements critical to sea turtle recovery. During this reporting period, NOAA Fisheries worked with the U.S. Department of Department on the Inter-American Convention for the Protection and Conservation of Sea Turtles. This is the first international agreement devoted solely to the protection of sea turtles and aims to foster cooperation and coordination between countries of the region to recover sea turtles.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region.

Plan Title: Loggerhead Turtle - Atlantic Population

Planning Stage:	Final
Plan Approval Date:	12/26/91

Species Covered

Scientific Name	Common Name	Population(if applicable)	ESA Status
<i>Caretta caretta</i>	Loggerhead	U.S. Atlantic Population	Threatened

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for loggerhead turtles in the Atlantic Ocean in 1991. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

The southeastern United States population of the loggerhead turtle can be de-listed if, over a period of 25 years, all the following conditions are met:

- The adult female population in Florida is increasing and in North Carolina, South Carolina and Georgia, it has returned to pre-listing nesting levels (NC = 800 nests/season; SC = 10,000 nests per season; GA = 2,000 nests/season).
- At least 25 percent (560 km) of all available nesting beaches (2240 km) is in public ownership, is distributed over the entire nesting range and encompasses greater than 50 percent of the nesting activity.
- All Priority #1 tasks have been successfully implemented.

Major Recovery Actions Needed

- Provide long-term protection to important nesting beaches.
- Ensure at least 60 percent hatch success on major nesting beaches.
- Implement effective lighting ordinances or lighting plans on all major nesting beaches within each State.
- Determine distribution and seasonal movements for all life stages in marine environment.
- Minimize mortality from commercial fisheries.
- Reduce threat from marine pollution.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis for the Biennial Reporting Period)

Plan Task 121 - Identify Important Marine Habitat - Priority 2

- NOAA Fisheries provided funding support for a multi-year study to investigate the importance of Atlantic Slope Waters near the Gulf Stream to post-hatchling turtles entering the marine habitat from nesting beaches along the Florida coast.
- NOAA Fisheries conducted independent studies and funded non-agency studies to identify marine habitats through the use of remote sensing instruments such as satellite transmitters (see Plan Task 2212).

Plan Task 2211 - Determine Seasonal Distribution, Abundance, Population Characteristics, and Status in Bays, Sounds and Other Important Nearshore Habitats- Priority 1

- NOAA Fisheries provided funding support for in-water population studies of marine turtles in the marine habitats of east-central Florida in the Indian River Lagoon and nearshore reefs and Albemarle and Pamlico Sound in North Carolina to learn more about this species and its marine environment to enhance recovery management efforts.
- NOAA Fisheries provided funding and participated in a workshop to review existing methodologies for in-water research and make recommendations to improve estimates of sea turtle abundance.
- NOAA Fisheries conducted a pilot aerial survey for loggerhead and leatherback turtles in the coastal waters of the Mid-Atlantic in July 2000, to investigate whether line transect methodology can be used to produce precise estimates of marine turtle abundance. This data is still being analyzed.

Plan Task 2212 - Determine Adult Navigation Mechanisms, Migratory Pathways, Distribution and Movements Between Nesting Seasons - Priority 2

- NOAA Fisheries provided funding support for studies in the Gulf of Mexico and the Bahamas to satellite track female loggerheads to determine routes of travel and identify resident foraging grounds away from nesting beaches.

Plan Task 2213 - Determine Present or Potential Threats to Loggerhead Turtles along Migratory Routes and on Foraging Grounds - Priority 2

See Plan Task 2212 and 2226.

Plan Task 2214 - Determine Breeding Population Origins for U.S. Juvenile and Subadult Populations - Priority 3

- NOAA Fisheries established a national sea turtle genetics laboratory at the NOAA Fisheries LaJolla Laboratory in LaJolla, California. The primary functions of the laboratory include collecting, analyzing, and archiving tissue samples of sea turtles to identify nesting assemblages and to determine breeding population origins of foraging populations. These data are critical to population assessment.
- NOAA Fisheries has provided significant funding, logistical support, and technical advice to researchers working to identify the stock structure of the Atlantic loggerhead turtle. Numerous

scientific publications have resulted from this work and the population genetic structure of the Atlantic loggerhead is well understood. Funding support to numerous in-water studies has facilitated the collection of genetic material and the identification of breeding population origins of important foraging populations in U.S. and foreign waters. NOAA Fisheries also provided funding support the collection of genetic material from stranded loggerheads to determine their natal origin.

- NOAA Fisheries convened an International Workshop on Sea Turtle Conservation Genetics bringing together leading researchers in the field to present scientific results and to discuss state-of-the-art techniques.

Plan Task 2215 - Determine Growth Rates, Age of Sexual Maturity and Survivorship Rates of Hatchlings, Juveniles, and Adults - Priority 2

- NOAA Fisheries refined supported studies on aging estimation techniques for sea turtles from growth layers in the bone. A change in diet occurs when turtles leave the pelagic environment and recruit to coastal foraging habitats. Stable isotope ratio analyses of the bone layer can detect this change in diet and provide an estimate of the years that have lapsed since the turtle recruited to the coastal habitat. Age estimation techniques provide demographic information that can be incorporated into population models used to assess population status and trends.

Plan Task 2221 - Implement and Enforce Ted Regulations in United States Waters - Priority 1

- To address the impact of incidental capture in the shrimp trawl fishery, TEDs were developed and, in 1992, were required in all shrimp trawlers (with a few exceptions) from North Carolina through Texas.
- To address the impact of incidental capture in the summer flounder fishery, TEDs were developed and, in 1996, were required in all summer flounder trawlers (with a seasonal exception) operating south of Cape Charles, VA, to the North Carolina/South Carolina border.
- Enforcement of TED regulations continues. NOAA Fisheries created Protected Resource Enforcement Teams (PRET teams) specifically to enforce ESA and MMPA regulations, these teams have been particularly active with regard to TED enforcement, including special details deployed in critical areas when needs arise.
- NOAA Fisheries gear specialists have provided important support to law enforcement agents during TED enforcement details.

Plan Task 2222 - Provide Technology Transfer for Installation and Use of TEDS - Priority 3

- The NOAA Fisheries Pascagoula Laboratory has continued to provide extensive outreach, including development and widespread dissemination of training materials in multiple languages, to ensure proper construction, installation, and use of TEDs.
- NOAA Fisheries developed a prototype TED for use in non-shrimp flynet trawls.

Plan Task 2223 - Maintain Sea Turtle Stranding Network - Priority 2

- NOAA Fisheries continued to fund and coordinate a national sea turtle stranding program, operating from Maine through Texas. Network participants respond to dead or injured sea turtles, including mass stranding events, and collect critical biological data. The program

provides important information on anthropogenic and natural mortality factors. A total of 2,000-3,000 sea turtles wash ashore dead or injured each year along the U.S. Atlantic and Gulf of Mexico coasts.

- NOAA Fisheries provided funding to our NOAA partner NOS to convene a Workshop on Sea Turtle Health Assessment to identify and prioritize health issues important to sea turtle conservation and recovery.

Plan Task 2226 - Identify and Monitor Fisheries That May Be Causing Significant Mortality - Priority 2

- NOAA Fisheries continued to carry out fishery observer programs to evaluate and monitor incidental bycatch of sea turtles. During this reporting period the following actions were accomplished:
 - New England and mid-Atlantic gillnet fisheries NOAA Fisheries observer program
 - Shark drift gillnet NOAA Fisheries observer program for east Florida
 - Southeastern shrimp trawl fishery NOAA Fisheries observer program
 - Atlantic pelagic longline NOAA Fisheries observer program
 - Funding support for observer training and standardization of monitoring in North Carolina fisheries
- NOAA Fisheries participated in the development of and funded a landmark experiment to evaluate the effects of hook type on sea turtle bycatch in an important longline fishery in the eastern Atlantic known to capture significant numbers of sea turtles. This work is part of a broad effort to seek gear and fishing method modifications to reduce and eliminate the bycatch of sea turtles while preserving the longline fishery.
- Several workshops involving industry, academia, and non-governmental organizations were held to formulate and prioritize actions needed to reduce incidental capture in longline fisheries. In related research, satellite transmitters have been deployed on turtles hooked incidentally in the longline fishery to better understand post-hooking effects of turtles that survive the encounter.

Plan Task 2227 - Promulgate Regulations to Reduce Fishery Related Mortalities - Priority 2

NOAA Fisheries promulgated regulations during this reporting period to reduce fishery related mortality and address conservation management needs, including:

- Temporary rules (7) to address clogging of TEDs in the Atlantic Ocean and Gulf of Mexico through the implementation of reduced tow times, thus helping fishermen and turtles (63 FR 55053 October 14, 1998; 63 FR 57620 October 28, 1998; 63 FR 62959 November 10, 1998; 63 FR 66766 December 3, 1998; 64 FR 55858 October 15, 1999; 64 FR 57397 October 25, 1999; and 65 FR 52348 August 29, 2000).
- Temporary 30-day rule closing an area to large-mesh gill net fisheries along eastern North Carolina and Virginia during sea turtle northern migration (65 FR 31500 May 18, 2000).
- Temporary 30-day rule closing waters of Pamlico Sound, North Carolina to fishing with large mesh gillnets (64 FR 70196 December 16, 1999).
- Interim final rule requiring small mesh in the webbing material used for installing TEDs in flounder trawls in waters off Virginia and North Carolina (64 FR 55860 October 15, 1999) to prevent entanglement of sea turtles.

- Interim final rule to extend for one additional year the approved use of the Parker soft TED (64 FR 55434 October 13, 1999).

Plan Task 223 - Monitor and Reduce Mortality from Dredging Activities - Priority 2

The U.S. Army Corps of Engineers (COE) is largely responsible for implementing this plan task as well as Plan Task 125 - Prevent Destruction of Habitat From Dredging Activities - Priority 3. The COE consults with NOAA Fisheries under ESA section 7 on their proposed dredging activities. These consultations have resulted in the following monitoring and conservation actions:

- Development and required use of a sea turtle deflector device on hopper dredges to prevent impingement of turtles into the drag arm.
- Seasonal restrictions on the use of hopper dredges in certain areas where turtles are abundant.
- One hundred percent observer coverage on hopper dredges in certain areas and times when turtles are abundant.
- Slow speed when turtles or whales are sighted to prevent vessel strikes.

Plan Task 224 - Monitor and Prevent Adverse Impacts from Oil and Gas Activities - Priority 2 & 3

The Mineral Management Service (MMS) is largely responsible for implementing this plan task as well as Plan Task 124 - Prevent Destruction of Marine Habitat From Oil and Gas Activities - Priority 3. The MMS consults with NOAA Fisheries under ESA section 7 on their proposed oil and gas activities. These consultations have resulted in the following monitoring and conservation actions:

- NOAA Fisheries held a health assessment workshop to develop an interagency research and monitoring program that will address biota health and environmental contaminants as well as establish protocols for collecting, storing and analyzing specimens. An interagency research and monitoring program is necessary to evaluate the effects of chronic exposure of sea turtles to petrochemical and other contaminants associated with the oil and gas industry.
- For blasting activities related to oil and gas platform removal, observers and aerial surveys are required prior to detonation. If sea turtles are observed within 2,000 yards of the charge, blasting must be delayed.

Plan Task 228 - Centralize Administration and Coordination of Tagging Programs - Priority 3

NOAA Fisheries consolidated its turtle tag dissemination and data archival program with that of the Archie Carr Center for Sea Turtle Research (ACCSTR), a world-renowned center housed at the University of Florida. Annual funding provided to our conservation partner, ACCSTR, supports purchase of tags, dissemination to research projects, archival of data, and retrieval of recapture data.

Plan Task 3 - Develop Public Education Materials and Provide Public Outreach - Priority 3

NOAA Fisheries education and public outreach efforts have included:

- NOAA Fisheries provided funding and technical expertise for the guide “Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico.”
- Production of informational stickers for recreational fishers with guidelines to avoid interacting with sea turtles and what to do if an interaction occurs.

- Production of handling guidelines for turtles incidentally captured in longline fisheries.
- Development of a NOAA Fisheries Protected Resources website to provide the public with detailed information on sea turtles (http://www.nmfs.noaa.gov/prot_res/prot_res.html).
- Participation in a highly successful program to educate the public on the movements of satellite-tracked turtles, through the world wide web (<http://cccturtle.org/sat1.htm>).
- NOAA Fisheries provided funding support to the Marine Turtle Newsletter, a global publication disseminating sea turtle information. This type of communication is essential in facilitating recovery efforts for sea turtles.
- NOAA Fisheries provided funding support for the Caribbean Center for Marine Studies for an a sea turtle education and rehabilitation program.

Plan Task 41 - Develop International Agreements to Ensure Protection of Life Stages Which Occur in Foreign Waters - Priority 2

- NOAA Fisheries continued to work to develop international agreements for the conservation of sea turtles, which are highly migratory species. During this reporting period, NOAA Fisheries worked in collaboration with the U.S. Department of State to conclude the first multi-lateral agreement devoted solely to the conservation of sea turtles. This treaty, the Inter-American Convention for the Protection and Conservation of Sea Turtles, was ratified by the United States and came into force in 2001. The treaty aims to promote cooperation and coordination between countries of the western hemisphere region to recover sea turtles.
- NOAA Fisheries continued it's co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region.
- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested in foreign nations with commercial fishing technology which may adversely affect sea turtles. The Department of State is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Central and South America, Africa, and Asia.
- NOAA Fisheries provided funding support for the establishment of sea turtle conservation networks in Honduras, Costa Rica, Guatemala, Colombia, and Nicaragua, through the efforts of WIDECAS (Wider Caribbean Sea Turtle Network).

Plan Title: **Loggerhead Turtle - Pacific Population**

Planning Stage:	Final
Plan Approval Date:	1/12/98

Species Covered

Scientific Name	Common Name	Population(if applicable)	ESA Status
<i>Caretta caretta</i>	Loggerhead	U.S. Pacific Population	Threatened

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for green turtles in the Pacific Ocean in 1998. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

To consider de-listing, all of the following criteria must be met:

- To the best extent possible, reduce the take in international waters (have and enforce agreements).
- All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
- All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for over 25 years.
- Each stock must average 5,000 FENA (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) over six years.
- Existing foraging areas are maintained as healthy environments.
- Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
- All Priority #1 tasks have been implemented.
- A management plan designed to maintain stable or increasing populations of turtles is in place.
- Ensure formal cooperative relationship with a regional sea turtle management program (SPREP).
- International agreements are in place to protect shared stocks (e.g., Mexico and Japan).

Major Recovery Actions Needed (not in order of priority)*

- Reduce incidental capture of loggerheads by coastal and high seas commercial fishing operations.
- Establish bilateral agreements with Japan and Mexico to support their efforts to census and monitor loggerhead populations and to minimize impacts of coastal development and fisheries on loggerhead stocks.
- Identify stock home ranges using DNA analysis.
- Determine population size and status (in U.S. jurisdiction) through regular aerial or on-water surveys.
- Identify and protect primary foraging areas for the species.

Major Recovery Accomplishments Linked to Recovery Plan Stepdown Outline (Emphasis for the Biennial Reporting Period)

Plan Task 212 - Determine Distribution, Abundance, and Status in the Marine Environment - Priority 1

- NOAA Fisheries provided funding support for and collaborated with genetic stock assessment work to better understand origins and relationships of loggerhead populations.
- NOAA Fisheries provided funding support for a Symposium on the Biology and Conservation of the Loggerhead to facilitate communication and sharing of data to enhance conservation efforts relating to this species.

Plan Task 2141 - Monitor Incidental Mortality in the Commercial and Recreational Fisheries -Priority 1

NOAA Fisheries worked to monitor incidental mortality of sea turtles through the NOAA Fisheries Hawaii longline observer program and the NOAA Fisheries California/Oregon drift gillnet observer program.

Plan Task 2142 - Reduce Incidental Mortality in the Commercial and Recreational Fisheries -Priority 1

- NOAA Fisheries maintained observer programs to monitor incidental mortality of sea turtles in the Hawaii pelagic longline fishery and the California/Oregon drift gillnet fishery.
- NOAA Fisheries supported efforts to address the incidental bycatch in fisheries. This included developing measures to reduce mortality, including the use of resuscitation techniques to reduce mortality and promoting the use of line cutting gear to disentangle captured turtles.
- NOAA Fisheries worked internationally with Chilean counterparts on quantifying and reducing turtle bycatch in commercial and artisanal fisheries.
- NOAA Fisheries promulgated rules to assist in the reduction of incidental mortality in commercial fisheries, including the following:
 - Promulgation of a fishing closure rule to reduce bycatch of olive ridleys in the Hawaii-based longline fishery (FR Vol. 65, No. 166, August 25, 2000).
 - Promulgation of a final rule implementing gear requirement measures to minimize the mortality of, and injury to, sea turtles hooked or entangled by longline fishing gear (Hawaii longline fishery) (FR Vol. 65, No. 60, March 28, 2000).

- Promulgation of emergency rule to implement court-ordered closure and reduce adverse impacts to sea turtles by the Hawaiian longline fishery while an environmental impact statement was prepared (FR Vol. 64, No. 247, December 27, 1999).
- Workshops have been held to formulate research techniques to assess longline hooking and entanglement and to identify ways to reduce or mitigate incidental capture. In related research, satellite transmitters have been deployed on turtles hooked incidentally in the longline fishery to track post-release movements to better understand the long-term effects of hooking. Linkages between turtle movements and oceanographic processes are also being studied.

Plan Task 216 - Study the Impact of Diseases on Turtles - Priority 3

- NOAA Fisheries provided funding support for a health assessment workshop relating to sea turtles.
- A NOAA Fisheries multi-disciplinary research program continued to study the cause and effects of the disease fibropapillomatosis (FP). Research has been initiated on the possible etiologies of the disease, including viruses, parasites, and environmental pollutants. In addition to field and laboratory research, statistical analyses and modeling studies continue to work to link fibropapilloma incidence and severity to key aspects of green turtle population dynamics and assess impacts of the disease on population recovery.

Plan Task 41 - Support Existing International Agreements and Conventions to Ensure that Turtles in All Life stages are Protected in Foreign Waters - Priority 1

- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested with commercial fishing technology which may adversely affect sea turtles. The import ban does not apply to nations that have adopted comparable sea turtle protection programs (i.e., require the use of TEDs) to that of the United States or those nations whose fishing environment does not pose a threat of incidental take of sea turtles. The Department of State (DOS) is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Latin America, Africa and Asia.

Plan Task 42 - Encourage Ratification of CITES for all Non-Member Pacific Countries, Compliance with CITES Requirements, and Removal of Sea Turtle Trade Reservations Held by Member Nations - Priority 1

- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.

Plan Task 43 - Develop New International Agreements to Ensure that Turtles in All Life-Stages are Protected in Foreign Waters - Priority 1

- NOAA Fisheries continued to work to develop international agreements important sea turtle conservation. The migratory nature of sea turtles makes these agreements critical to sea turtle recovery. During this reporting period, NOAA Fisheries worked with the U.S. Department of

Department on the Inter-American Convention for the Protection and Conservation of Sea Turtles. This is the first international agreement devoted solely to the protection of sea turtles and aims to foster cooperation and coordination between countries of the region to recover sea turtles.

- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region.

Plan Title: Olive Ridley Turtle - Pacific Population

Planning Stage:	Final
Plan Approval Date:	1/12/98

Species Covered

Scientific Name	Common Name	Population (if applicable)	NOAA Fisheries Status
<i>Lepidochelys olivacea</i>	Olive Ridley	Mexican breeding population	Endangered
		All other populations	Threatened

Plan Status

NOAA Fisheries and the FWS approved and distributed a joint agency final recovery plan for U.S. populations of the olive ridley in the Pacific Ocean in 1998. NOAA Fisheries and the USFWS share responsibilities for the research, management, and recovery of listed sea turtles. Although both agencies work closely together on many marine turtle recovery activities, NOAA Fisheries is primarily responsible for recovery actions in the marine environment and the USFWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches).

Recovery Criteria

To consider de-listing all of the following recovery criteria must be met:

- All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
- Foraging populations are statistically significantly increasing at several key foraging grounds within each stock region.
- All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for over 10 years.
- A management plan based on maintaining sustained populations for turtles is in effect.
- International agreements are in place to protect shared stocks.

Major Recovery Actions Needed (not in order of priority)*

- Minimize incidental mortalities of turtles by commercial fishing operations.
- Support the efforts of Mexico and the countries of Central America to census and protect nesting olive ridleys, their eggs and nesting beaches.
- Identify stock home ranges using DNA analysis.

Major Recovery Accomplishments

Plan Task 212 - Determine Distribution, Abundance, and Status in the Marine Environment - Priority 1

- NOAA Fisheries established a national sea turtle genetics laboratory at the NOAA Fisheries LaJolla Laboratory in LaJolla, California. The primary functions of the laboratory include collecting, analyzing, and archiving tissue samples of sea turtles to identify nesting assemblages and to determine breeding population origins of foraging populations. These data are critical to population assessments.
- NOAA Fisheries monitored movements of olive ridleys in the central north Pacific Ocean through the use of satellite telemetry.

Plan Task 214 - Monitor and Reduce Incidental Mortality in the Commercial and Recreational Fisheries - Priority 1

- NOAA Fisheries maintained observer programs to monitor incidental mortality of sea turtles in the Hawaii pelagic longline fishery and the California/Oregon drift gillnet fishery.
- NOAA Fisheries supported efforts to address the incidental bycatch in fisheries. This included developing measures to reduce mortality, including the use of resuscitation techniques to reduce mortality and promoting the use of line cutting gear to disentangle captured turtles.
- NOAA Fisheries worked internationally with Chilean counterparts on quantifying and reducing turtle bycatch in commercial and artisanal fisheries.
- NOAA Fisheries promulgated rules to assist in the reduction of incidental mortality in commercial fisheries, including the following:
 - Promulgation of a fishing closure rule to reduce bycatch of olive ridleys in the Hawaii-based longline fishery (FR Vol. 65, No. 166, August 25, 2000).
 - Promulgation of a final rule implementing gear requirement measures to minimize the mortality of, and injury to, sea turtles hooked or entangled by longline fishing gear (Hawaii longline fishery) (FR Vol. 65, No. 60, March 28, 2000).
 - Promulgation of emergency rule to implement court-ordered closure and reduce adverse impacts to sea turtles by the Hawaiian longline fishery while an environmental impact statement was prepared (FR Vol. 64, No. 247, December 27, 1999).
- Workshops have been held to formulate research techniques to assess longline hooking and entanglement and to identify ways to reduce or mitigate incidental capture. In related research, satellite transmitters have been deployed on turtles hooked incidentally in the longline fishery to track post-release movements to better understand the long-term effects of hooking. Linkages between turtle movements and oceanographic processes are also being studied.

Plan Task 216 - Study the Impact of Diseases on Turtles - Priority 3

- NOAA Fisheries provided funding to our NOAA partner NOS to convene a Workshop on Sea Turtle Health Assessment to identify and prioritize health issues important to sea turtle conservation and recovery.
- A NOAA Fisheries multi-disciplinary research program continued to study the cause and effects of the disease fibropapillomatosis (FP). Research has been initiated on the possible etiologies of the disease, including viruses, parasites, and environmental pollutants. In addition

to field and laboratory research, statistical analyses and modeling studies continue to assess fibropapilloma incidence and severity to key aspects of green turtle population dynamics and the impacts of the disease on population recovery.

Plan Task 217 - Maintain Carcass Stranding Network - Priority 2

- NOAA Fisheries continued to oversee a national sea turtle stranding program. This program consists of state and Federal biologists and private citizens who respond when a sea turtle strands injured or dead on coastal beaches. The program continues to increase our knowledge of turtle biology and the human-related impacts to the turtle populations. Part of this work involves working with the state of Hawaii, NOAA Humpback Whale Sanctuary, University of Hawaii, and the Marine Option Program.
- NOAA Fisheries provided funding and staff support to provide urgent veterinary treatment and essential captive care of live stranded pacific olive ridley turtles in the Hawaiian Islands.

Plan Task 218 - Centralize Administration and Coordination of Tagging Programs - Priority 2

NOAA Fisheries consolidated its turtle tag dissemination and data archival program with that of the Archie Carr Center for Sea Turtle Research (ACCSTR), a world-renowned center housed at the University of Florida. Annual funding provided to our conservation partner, ACCSTR, supports purchase of tags, dissemination to research projects, archival of data, and retrieval of recapture data.

Plan Task 41 - Support Existing International Agreements and Conventions to Ensure that Turtles in all Life-Stages are Protected in Foreign Waters - Priority 1

- U.S. Public Law 101-162, Section 609 requires the United States to embargo shrimp harvested with commercial fishing technology which may adversely affect sea turtles. The import ban does not apply to nations that have adopted comparable sea turtle protection programs (i.e., require the use of TEDs) to that of the United States or those nations whose fishing environment does not pose a threat of incidental take of sea turtles. The Department of State (DOS) is the principal implementing agency of this law, with NOAA Fisheries serving as technical advisor. NOAA Fisheries continued to play a key role during TED inspections and provided technical training in the installation and use of TEDs to many countries in Latin America, Africa and Asia.

Plan Task 42 - Encourage Ratification of the CITES for all Non-Member Pacific Countries, Compliance with CITES requirements, and Removal of Sea Turtle Trade Reservations - Priority 1

- NOAA Fisheries continued its co-leadership role with USFWS in all sea turtle matters arising in relation to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This international agreement is an important tool in the control of international trade in listed species.

Plan Task 43 - Develop New International Agreements to Ensure that Turtles in all Life-Stages are Protected in Foreign Waters - Priority 1

- NOAA Fisheries continued to work to develop international agreements important sea turtle conservation. The migratory nature of sea turtles makes these agreements critical to sea turtle recovery. During this reporting period, NOAA Fisheries worked with the U.S. Department of Department on the Inter-American Convention for the Protection and Conservation of Sea Turtles. This is the first international agreement devoted solely to the protection of sea turtles and aims to foster cooperation and coordination between countries of the region to recover sea turtles.
- NOAA Fisheries worked closely with the Department of State to initiate the development of a multi-lateral agreement for the conservation of sea turtles in the Indian Ocean region.

Plan Title: Gulf Sturgeon

Planning Stage:	Final
Plan Approval Date:	9/22/95

Species Covered

Common Name	Population Name	NOAA Fisheries Status
Sturgeon, Gulf	Range-wide	Threatened

Plan Status

Increased interest in Gulf sturgeon by government and non-government agencies and institutions have accomplished much toward its recovery. Genetic analyses of Gulf sturgeon indicate the population is divided into five genetically distinct stocks, each occupying a unique watershed or geographical unit. Also, Gulf sturgeon spawning and resting habitat have been documented and characterized in three river systems. Population surveys and freshwater and marine movement and migratory behavior have been studied in six watersheds. In addition, Gulf sturgeon outreach activities have contributed much toward public education.

Recovery Criteria

Short-term: The primary short-term recovery objective is to prevent further reduction of existing wild populations of Gulf sturgeon within the subspecies` range.

- Management units will be defined using an ecosystem approach based on river drainages. This approach may also incorporate genetic affinities among populations in different river drainages.
- A baseline population index for each management unit will be determined by fishery independent catch-per-unit-effort (CPUE) levels.
- Change from the baseline level will be determined by fishery independent CPUE over a three to five year period. This time frame will be sufficient to detect a problem and to provide trend information. The data will be assessed annually.
- The short-term objective will be considered achieved for a management unit when the CPUE is not declining (within statistically valid limits) from the baseline level.

Long-term: The long-term recovery objective is to establish population levels that would allow delisting of the Gulf sturgeon in discrete management units. Delisting could be considered by 2023, if recovery criteria are met.

- The time frame for delisting is based on known life history characteristics including longevity, late maturation, and spawning periodicity.
- A self-sustaining population is one in which the average rate of natural recruitment is at least equal to the average mortality rate over a 12-year period (which is the approximate age at maturity for a female Gulf sturgeon).

- This objective will be considered achieved for a management unit when the population is demonstrated to be self-sustaining and efforts are underway to restore lost or degraded habitat.

Recovery Actions

NOAA Fisheries, U.S. Fish & Wildlife Service and the Gulf Coast Fishery management Council published a recovery plan for the Gulf sturgeon. The major actions recommended in the plan are:

- Conduct and refine field investigations to locate important habitats.
- Characterize riverine, estuaries, and neritic essential habitat. Develop and implement population sampling and monitoring techniques.
- Eliminate potential for introductions of non-native stock or other sturgeon.
- Conduct life history studies on the requirements of little-known life stages.
- Identify potential harmful chemical and water quantity and quality changes associated with surface water restrictions.
- Identify and eliminate point and non-point sources of chemical contaminants.
- Seek resolution of conflict between authorized projects and restoration of fish populations.
- Reduce or eliminate incidental mortality.
- Restore natural riverine habitats. Utilize existing authorities to protect habitat, and where inadequate, enact new laws and regulations.
- Identify dam and lock sites which offer the greatest flexibility for successful restoration of essential habitats.
- Modify specific navigation projects which alter riverine habitats or modify thermal or substrate characteristics of those habitats.
- Implement projects or actions which will achieve recovery plan objectives. Increase effectiveness and enforcement of state and federal take prohibitions.
- Seek funding for recovery actions. Identify and eliminate known and potential impacts to water quantity and quality associated with existing and proposed uses and water diversions. Assess the relationship between groundwater pumping and reduction of groundwater flows and quantify loss of riverine habitat related to reduced groundwater in-flows.

Plan Title: Shortnose Sturgeon

Planning Stage:	Final
Plan Approval Date:	December, 1998

Species Covered

Common Name	Population Name	NOAA Fisheries Status
Sturgeon, Shortnose	Range-wide	Endangered

Plan Status

In December 1998, the Final Recovery Plan for the Shortnose Sturgeon was published, emphasizing the need to protect shortnose sturgeon by populations. In May 2000, NOAA Fisheries published “A Protocol for use of Shortnose and Atlantic Sturgeons.” This protocol set guidelines for the handling and sampling of sturgeons for their protection and to facilitate standardization of methodologies used by sturgeon researchers. A sampling protocol was needed to establish whether sturgeon are present in systems where their status is unknown. In July 2000, NOAA Fisheries and FWS held a joint workshop, the "Recovery and Restoration of East Coast Sturgeons in the Neuse and St. John's River Systems." The purpose of the workshop was to discuss and refine appropriate recovery plan strategies for work with sturgeon in the two river systems.

Recovery Criteria

NOAA Fisheries’ goal is to recover shortnose sturgeon populations throughout their range to levels of abundance at which they no longer require protection under the ESA. For each population segment, the minimum population size will be large enough to maintain genetic diversity and avoid extinction. This minimum population size for each population segment has not yet been determined. Therefore, establishing endangered and threatened population size thresholds is a priority 1 recovery task.

Recovery Actions

Establish Listing Criteria for Shortnose Sturgeon Population Segments

- Determine the size of shortnose sturgeon population segments for listing and evaluate trends in recruitment.
- Determine minimum habitat for shortnose sturgeon population segments.
- Determine maximum allowable mortality for shortnose sturgeon population segments.

Protect Shortnose Sturgeon and their Habitats

- Ensure agency compliance with the ESA.
- Reduce bycatch of shortnose sturgeon
- Determine if critical habitat designations are prudent for shortnose sturgeon population segments

- Mitigate/eliminate impact of adverse anthropogenic actions on shortnose sturgeon population segments
- Formulate a public education program to increase awareness of shortnose sturgeon and their status
- Coordinate federal, state, and private efforts to implement recovery tasks

Rehabilitate Shortnose Sturgeon Populations and Habitats

- Restore habitats and their functions in the life histories of each population segment
- Develop a breeding and stocking protocol for shortnose sturgeon
- Reintroduce shortnose sturgeon into river ecosystems where they have been extirpated (Use the standardized sampling protocol (Task 1.1E) to determine whether reintroductions may be needed)
- Assess the need for augmentation

There is evidence that some population segments are already starting to recover, particularly in northern river systems. Delisting of all population segments could be initiated by 2024, if all recovery criteria are met.

Other Actions

In February 2000, the Federal Highway Administration (FHWA) began consultation with NOAA Fisheries under Section 7 of the ESA on the effects of the Woodrow Wilson Bridge Project on shortnose sturgeon. The FHWA modified the Project to incorporate NOAA Fisheries' recommended measures to reduce the potential for "take." Shortnose sturgeon are known to have occurred historically in most large rivers on the east coast of North America from the St. John River in New Brunswick, Canada, to the St. Johns River, Florida. However, up until March 2000 when the FHWA revised its biological assessment, only two specimens of shortnose sturgeon had been collected recently in the Potomac River, one in 1996 and one in 1998. Both of these fish were caught further downstream than the area affected by the Woodrow Wilson Bridge Project. In October, 2000, the National Wilderness Institute filed a 60-day notice of intent to sue, claiming that the Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and NOAA Fisheries did not consider the full impact of the operations of the Washington Aqueduct on shortnose sturgeon.

Recovery Goals

NOAA Fisheries' goal is to recover shortnose sturgeon populations throughout their range to levels of abundance at which they no longer require protection under the ESA. For each population segment, the minimum population size will be large enough to maintain genetic diversity and avoid extinction.

Plan Title: Sacramento River Winter-Run Chinook Salmon

Planning Stage:	Draft
Notice of Availability Date:	8/7/97

Species Covered

Common Name	Population Name	NOAA Fisheries Status
Salmon, Chinook	Sacramento River Winter-run	Endangered

Plan Status

The Sacramento River winter-run chinook salmon was listed as threatened on an emergency basis on August 4, 1989, and was listed as threatened on November 30, 1990. In response to a petition received in June 1991, NOAA Fisheries reclassified this species as endangered in January 1994. A recovery team has been appointed to prepare a recovery plan. A draft recovery plan was made available for public review and comment on August 7, 1997 (62 FR 42508). Most of the recovery actions for the winter-run chinook salmon involve the control of water diversion in the Sacramento River and delta. This species depends on an adequate flow of water at a specific temperature as well as suitable habitat for migration, spawning and rearing. Recovery actions identified in this draft recovery plan are under review by the California Central Valley Technical Recovery Team (TRT) and may be integrated into the overall recovery planning process for listed salmonids in California's central valley (see CALFED under Pacific Salmon Recovery and Recovery Planning).

Plan Title: Snake River Salmon

Planning Stage:	Draft
Notice of Availability Date:	1995

Species Covered

Common Name	Population Name	NOAA Fisheries Status
Salmon, Chinook	Snake River Spring/Summer Run	Threatened
	Snake River Fall Run	Threatened
Salmon, Sockeye	Snake River	Endangered

Plan Status

A Snake River Salmon Recovery Team was formed in 1991; it submitted recommendations for a NOAA Fisheries recovery plan in June of 1994. NOAA Fisheries reviewed and re-worked these recommendations and in March of 1995 a draft recovery plan was released for public comment. Many of the ongoing recovery actions being taken in the Columbia River basin are based upon the recommendations made in that draft Plan. A working draft of what was intended to be the Final Recovery Plan was released in August of 1997, but by that time, broad-based recovery efforts underway in other venues had made redundant the NOAA Fisheries-driven recovery planning process in the Snake and Columbia River basins. Recovery actions identified in this draft recovery plan are under review by the Snake River Basin TRT and may be integrated into the overall recovery planning process for listed salmonids (see Basin-wide salmon Recovery Strategy under Pacific Salmon Recovery and Recovery Planning).

Pacific Salmon Recovery Program

The conservation of salmon requires the restoration of ecological functions and processes to reestablish healthy watersheds. Recovery will occur only by improving survival in every segment of the salmon's life history in an integrated way. Ongoing recovery efforts address the effects of a broad range of activities on many of the region's ecological components including the fresh water, estuaries, and ocean environments. When Federal and individual state and local restoration efforts are added to basinwide forums a mechanism for bringing about the recovery of the ecosystem as a whole emerges. This is vastly preferable to concentrating on limited numbers of actions in geographically disparate areas. In recovering salmon, the basin managers will have gone a long way toward restoring the resources upon which they depend. Moreover, managers will have taken a major step toward bringing back many of the region's other depleted species.

In the fall of 2000, NOAA Fisheries completed status reviews, listings, special rules (see 4(d) rules below), and critical habitat designations for all ESUs of coho, chinook, chum, sockeye and steelhead in Oregon, Washington, Idaho, and California. At that time, the major agency emphasis shifted from listing to the development of recovery plans, HCPs (habitat conservation plans), and state/local/tribal-initiated restoration efforts. NOAA Fisheries promotes the development of 4(d) rules (see 4(d) Rules below) that allow state and tribal co-managers to maintain a lead role in salmon management, while still maintaining a strong oversight role. Below is a discussion of NOAA Fisheries' activities utilizing all tools provided by Congress and the ESA that when added to regional activities will aid in the recovery of Pacific salmonids.

ESA Regulatory Program

Regulations (excluding listing and critical habitat designations)

Harm: Habitat modification and degradation has been one of the chief factors for the decline of listed salmonids and suitable habitat remains a limiting factor in their recovery. To help draw greater public attention to the consequences to species of habitat modification and degradation, NOAA Fisheries issued a regulation to clarify the term "harm" in the definition of "take" in the ESA (November 8, 1999, 64 FR 60727). NOAA Fisheries' definition of harm includes "significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding and sheltering." This rulemaking codified NOAA Fisheries' position that habitat modification can result in a take under the ESA and clarifies that NOAA Fisheries' interpretation of harm is consistent with that of the FWS to apply to fish as well as wildlife.

4(d) Rules

Section 4(d) of the ESA requires NOAA Fisheries to adopt such regulations as it "deems necessary and advisable to provide for the conservation of" threatened species. Those regulations may include any or all of the prohibitions provided in section 9(a)(1) of the ESA, which specifically prohibits take of any endangered species. There are now 21 separate ESUs of west coast salmonids listed as threatened, covering a large percentage of the land base in California, Oregon, Washington and Idaho.

The first 4 salmonid species listed by NOAA Fisheries as threatened were protected by imposing virtually all of the section 9 take prohibitions. On July 10, 2000 (65 FR 42422), NOAA Fisheries issued a final rule (July 2000 rule) which makes section 9 prohibitions generally applicable to fourteen of those threatened ESUs except in thirteen programs and circumstances that contribute to the conservation of, or are being conducted in a way that adequately limits impacts on, listed salmonids. This allows NOAA Fisheries to better work with States in the conservation of threatened species.

The 2000 July rule invoked the section 9 take prohibitions but did not extend the prohibitions to the following thirteen programs and activities when they are conducted according to the criteria in the 4(d) rule: (1) activities conducted in accord with ESA incidental take authorization; (2) ongoing scientific research activities, for a period of 6 months from the publication of this final rule; (3) emergency actions related to injured, stranded, or dead salmonids; (4) fishery management activities; (5) hatchery and genetic management programs; (6) activities in compliance with joint tribal/state plans developed within United States (U.S.) v. Washington or U.S. v. Oregon; (7) scientific research activities permitted or conducted by the states; (8) state, local, and private habitat restoration activities; (9) properly screened water diversion devices; (10) routine road maintenance activities; (11) certain park pest management activities; (12) certain municipal, residential, commercial, and industrial development and redevelopment activities; and (13) forest management activities on state and private lands within the State of Washington.

Tribal 4(d) Rule:

The inability of tribal members to take threatened salmonid species, for ceremonial or subsistence purposes because of the application of ESA Section 9 take prohibitions, has been problematic since the first salmonid listing. Also on July 10, 2000 (65 FR 42481), NOAA Fisheries issued a rule that attempted to harmonize the ESA with U.S. trust responsibilities and allow a limited take of threatened salmonids for tribes with treaty reserved fishing rights. The tribal rule was developed after extensive coordination with and review by the Northwest Indian Fisheries Commission and tribal representatives from NOAA Fisheries' Northwest and Southwest Regions. The rule provides a limit to the application of section 9 take prohibitions for actions under a tribal resource management plan (forest, land use, or other types of plans as those for fish harvest or artificial propagation) in which the Secretary has determined will not appreciably reduce the likelihood of survival and recovery of the species (jeopardy standard).

Section 10 Activities:

The authorization provided (10)(a)(1)(A) and (10)(a)(1)(B) permits exempts the permit holder from the prohibitions of ESA section 9, in particular those dealing with takes. Take is defined by the ESA as: "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." NOAA Fisheries may include in the permit any conditions as necessary to mitigate and monitor the impact of the proposed activities.

Section 10(a)(1)(A) - Permits for Research/Enhancement: These permits provide an exemption to the ESA Section 9 take prohibitions against taking listed species for scientific purposes or to enhance the propagation or survival of listed species, including establishing and maintaining experimental

populations. This exemption applies to Federal or non-federal entities conducting research that involves an intentional take of listed species. Activities under these permits include evaluating the timing and abundance of juvenile anadromous salmonids emigrating to the ocean and transportation evaluation studies (trucking/barging juveniles around dams) to artificial propagation programs initiated to compensate for lost production and productivity caused by the construction and operation of private and Federal hydroelectric facilities. Between October 1998 and September 2000 NOAA Fisheries issued 37 new permits for scientific research and enhancement activities.

Section 10(a)(1)(B) - Habitat Conservation Plans (HCPs) and Permits for Incidental Take:

These permits provide an exemption to the ESA Section 9 prohibitions against taking listed species if the taking is incidental to, and not the purpose of, an otherwise lawful activity. This exemption applies only to non-Federal entities such as private landowners, states, regional or local governments.

At the end of 2000, NOAA Fisheries Northwest and Southwest Regions was working on about 50 large-scale, long-term incidental take permits. Many of these concern management of large tracts of timber in the Pacific Northwest and Northern California. However, some are water-related activities such as hydropower or other water-related activities such as irrigation, or water supply.

1. NOAA Fisheries' Southwest Region issued an incidental take permit on March 1, 1999, to the Pacific Lumber Corporation (PALCO). In return for the Federal government and the State of California purchasing one of the last stands of old-growth Redwood Forests in Humboldt County from PALCO, the company was required to develop an HCP and obtain an incidental take permit for timber activity on the remainder of its lands in northern California. NOAA Fisheries has agreed to funding two staff persons to monitor implementation of the permit and the Implementing Agreement.

2. Two HCPs have been issued during FY99-FY00, including the City of Seattle issued in April 2000 for activities in the Cedar River Municipal Watershed including drinking water supply operations, management of land and forest resources, hydroelectric power generation and fishery mitigation. In March 1999, NOAA Fisheries issued the PALCO-Headwaters HCP for Northern California.

3. For the Northwest Region, the most highly visible HCPs under development at the end of the 2000 fiscal year included (1) the Mid Columbia Public Utility Districts which concerns the operation of hydroelectric projects; (2) Oregon Dept. of Forestry which concerns management of 615,000 acres in northwest Oregon; and (3) Simpson Timber Company which concerns management of 215,000 acres in southwest Washington.

4. As of September 30, 2000, NOAA Fisheries have issued five HCPs.

Multispecies Recovery Actions

CALFED

The CALFED (California-Federal Bay-Delta Program) was established in May 1995. CALFED is a consortium of eight state and ten federal agencies with management and regulatory responsibilities in the Bay-Delta estuary.

In September 2000, CALFED's Record of Decision (ROD) was signed by the Department of the Interior, the Environmental Protection Agency (EPA), the Army Corps of Engineers, the Department of Agriculture, the Department of Commerce, the Resources Agency of California, the California EPA, the California State Water Resources Control Board, the California Department of Food and Agriculture and the Delta Protection Commission. This action moved the CALFED program from the planning stage to the implementation phase.

CALFED grew out of the 1994 Bay-Delta Accord, a landmark agreement that sought to resolve long-standing conflicts over management of Sacramento-San Joaquin Bay-Delta water resources. The program is a cooperative, interagency effort involving state and federal agencies with management and regulatory responsibilities in the San Francisco-San Joaquin Bay-Delta. Its purpose is to develop and implement a long-term, comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. CALFED addresses ecosystem health, water quality, water supply reliability, and levee system integrity.

Key CALFED components including the Ecosystem Restoration Program, Water Quality Program, and the Environmental Water Account benefit Central Valley salmon and steelhead populations, including fall-run chinook salmon, endangered winter-run chinook salmon, and threatened Central Valley steelhead. Other key CALFED features include development of a governance structure; watershed management; improved water storage and conveyance facilities; improved water supply reliability; levee maintenance; water transfers and water conservation; and an extensive scientific monitoring program.

California taxpayers, stakeholders, and the federal government will be called upon to invest billions of dollars over the next decade on CALFED implementation. Expenditure of funds will be based upon accountability and measurable progress being made on all elements of the program. CALFED will continue to incorporate a high level of stakeholder participation and science-based decision-making.

Interior Columbia Basin Ecosystem Management Project: At the direction of the President in July 1993, the Interior Columbia Basin Ecosystem Management Project (ICBEMP) was begun for the Forest Service (USFS) and the Bureau of Land Management (BLM). This plan would be a new, "outcome based" process for developing and approving projects on federal lands east of the Cascade Mountain Range.

States included are Washington, Oregon, Idaho, Montana, and small pieces of Nevada, Utah and Wyoming. ICBEMP would define how federal lands in the Northwest would be managed to allow for the survival and recovery of ESA species, as well as to comply with the Clean Water Act and other applicable resource laws. Two Draft Environmental Impact Statements (DEIS), one for the East Side of the Cascades and one for the Upper Columbia River Basin, were issued in May 1997 and an economic report was issued in March of 1998.

USFS and BLM developed a supplemental EIS that addressed the concerns raised by the public in response to the original EISs. NOAA Fisheries was directly involved in the development of the supplemental document. It is hoped that continuing interagency negotiations will successfully lead to the development of an aquatic strategy that NOAA Fisheries will find contributes to the recovery of listed species prior to publication of a final EIS and Record of Decision. Work continued on the supplemental EIS at the end of 2000.

Federal Columbia River Power System Operations (FCRPS):

Efforts to rebuild salmon in the Columbia-Snake River Basin began as early as 1877 with construction of the first hatchery. As dams were built over the next century, attempts were made to minimize their harm by including structures such as fish ladders to help salmon migrate upriver. They have been supplemented in recent years by improved river flows, spill to pass fish over dams, and barges to move salmon around the dams.

In 1980, the Northwest Power Act created a requirement for a state-directed Columbia basin fish and wildlife program to protect and restore salmon and other fish and wildlife in the basin. In 1985, the United States and Canada signed the Pacific Salmon Treaty (see Pacific Salmon Treaty below) limiting ocean harvest of salmon. The federal government has established other harvest limits to address over-fishing. Around the same time, state, local, and tribal efforts began to address habitat restoration through watershed plans. Intensified restoration activities began in the 1990s after three Snake River runs were declared threatened or endangered.

Strong political leadership will be critical to developing a regional consensus on the salmon “solution”. Much of the recent debate has focused on whether Snake River hydropower dams must be removed in order to conserve and restore listed Snake River salmon populations. In 1994, the National Marine Fisheries Service’s (NOAA Fisheries’) biological opinion requiring changes in hydropower operations to aid the protected species was challenged in court and deemed inadequate. A new biological opinion issued in 1995 established stronger protections, including increased flows and measures to improve water quality and temperature. It set a goal of adopting a revised biological opinion by the end of 1999. It also committed the U.S. Army Corps of Engineers (Corps) to prepare an Environmental Impact Statement which would evaluate various infrastructure, operation, and management alternatives and the costs and benefits associated with the alternatives for the hydropower system ranging from continuing the status quo up to and including breaching of the 4 dams on the Snake River to reverse the decline of protected species in the Columbia and Snake Rivers. The Appendix included several critical uncertainties that must be resolved relating to the mortality of juvenile and adult salmon in the Columbia

and Snake River systems, including the interaction of the ocean estuary and climate on juvenile smolts, the effects of hatcheries on salmon recovery, the impact of predators such as Caspian terns and marine mammals on juvenile salmon survival, and delayed mortality. The Corps issued the DEIS in December 1999.

The Federal Caucus is the name given the organization comprised when the nine Federal regional agencies that have natural resource responsibilities under the Endangered Species Act meet to plan coordinated actions. These agencies have differing authorities and jurisdictions for salmon recovery:

- NOAA Fisheries - Endangered Species Act (ESA) jurisdiction over anadromous fish; it also has a role regulating fisheries.
- US Fish and Wildlife Service (USFWS) - ESA jurisdiction over plants, wildlife and resident fish and also operates and administers hatchery programs and national wildlife refuges.
- Bonneville Power Administration (BPA) - markets electricity from federal dams; it also has a key role funding fish and wildlife mitigation.
- US Army Corps of Engineers (USACE) - operates federal dams and locks for multiple uses.
- US Bureau of Reclamation (USBR) - operates federal dams for multiple uses.
- Environmental Protection Agency (EPA) - implements and enforces the Clean Water Act.
- US Forest Service (USFS) - manages the national forest system.
- Bureau of Land Management (BLM) - manages 16,233,739 acres of public lands in Oregon and 370,110 acres in Washington for wildlife, recreation, timber harvest, livestock grazing, mineral extraction and other public uses.
- Bureau of Indian Affairs (BIA) - trustee for tribal and individual Indian lands and resources held in trust.

The Basin-wide Salmon Recovery Strategy, or "All-H" Strategy", is designed to restore ESA-listed fish throughout the Columbia-Snake River Basin. This strategy outlines specific actions needed in habitat, harvest, hatcheries and hydropower, which together are expected to prevent extinction of 12 ESA-listed salmonid populations and ultimately lead to their recovery. The strategy is based on the best available science, extensive public input, and broad discussions and consultations with tribal, state and local authorities.

In December 1999, NOAA Fisheries, in conjunction with the eight other agencies that make up the Federal Caucus, released a draft of the Conceptual Recovery Plan ("the All-H Paper") outlining the choices the region faces in recovering listed species.

On July 27, 2000, the Federal Caucus released another draft of the "Draft Basin-Wide Salmon Recovery Strategy" to states and tribes for a 60-day technical review. The Federal Caucus is released the "Final Basinwide Salmon Recovery Strategy," and NOAA Fisheries issued its final biological opinion on long term operations of the Federal Columbia River Power System, including the issue of Snake River dam configuration in December 2000. Dam removal was not recommended. Instead, an aggressive non-breach strategy was proposed, featuring off-site litigation to offset hydro-system salmon mortality.

Pacific Salmon Recovery Funding

Status reviews by NOAA Fisheries scientists resulted in the ESA listing of 26 Pacific salmonid populations as threatened or endangered throughout the west coast. These listings encompass 159,000 square miles (roughly the size of California) in Washington, Oregon, Idaho and California .

Recovering Pacific Salmon is one of NOAA's greatest ESA challenge. The scope of the ESA listings, the complexity of the salmon life-cycle, and the vast land and marine areas through which salmon migrate have resulted in a huge ESA workload. NOAA Fisheries is faced with dealing with thousands of human activities that affect salmonids and their habitats -- these include timber harvest, farming, irrigation and water development, hydropower, road building, urbanization, mining, dredging and shipping, fishing, and fish hatcheries. NOAA Fisheries also has to have a solid science foundation upon which salmon conservation and recovery plans are based.

The "Endangered Species Act Recovery Plan" line item in the NOAA budget provides the bulk of the NOAA Fisheries funding to conserve and recover Pacific salmonids. Of the \$43.5M appropriated for this line item in FY2000, about \$30M was used for Pacific salmon.

Pacific Coastal Salmon Recovery Fund

In FY2000, the President submitted a new initiative to Congress for a \$100M fund for grants to the states of California, Oregon, Washington and Alaska, and to Pacific coastal Indian tribes in WA, OR and CA to assist them in the conservation of Pacific coastal salmon runs. The initiative responded to the need to directly involve State, local and tribal governments in efforts to save Pacific salmon and their important habitats. The initiative was also developed in response to salmon harvest reductions called for by the U.S./Canada Pacific Salmon Treaty.

The primary goal of salmon conservation is the restoration of healthy populations of naturally spawning wild salmon populations and the habitats upon which they depend across a wide range of environmental conditions which will provide harvestable surpluses to support treaty and non-treaty fishing opportunities consistent with existing law.

In FY00, a total of \$58M was appropriated for this program with \$50M to the 4 States, \$6M for Pacific coastal tribes, and \$2M for lower Columbia River treaty tribes. The Conference report

stipulated that the funds were to be allocated \$18M to Washington, \$9M to Oregon, \$9M to California and \$14M to Alaska. The Administration requested \$100M for the fund in FY2001.

Pacific Salmon Treaty

In FY2000, a new Pacific Salmon Treaty Agreement was adopted by the U.S. and Canadian governments to resolve long-standing disputes about Pacific salmon conservation. The new agreement establishes abundance-based fishing regimes for the major intercepting salmon fisheries in the U.S. and Canada for a ten-year period. This agreement also established a bilaterally managed northern and a southern fund that is to be invested by the Pacific Salmon Commission into interest bearing accounts with the proceeds used to improve fisheries management and help the countries recover and rebuild depressed salmon stocks. The U.S. government committed to provide \$75M for the northern fund, \$65M for the southern fund, and \$30M for a Washington State vessel permit buyback program commencing in FY2000 with full funding achieved in FY2003. The FY2000 appropriations for Commerce, State and Interior included \$10M for the northern (State Dept.), \$10M for the southern fund (Commerce/NOAA) and \$5M for the vessel permit buyback (Interior).

NOAA Fisheries is responsible for implementing the Pacific Salmon Treaty between the U.S. and Canada. The treaty addresses both countries' salmon conservation needs, and establishes harvest arrangements for salmon shared by Canadian and U.S. fishers.

The NOAA budget for NOAA Fisheries has a Pacific Salmon Treaty Program line item under "Information Collection and Analysis" that has been used since passage of the Treaty in 1985 to fund implementation including grant funds to the States of Alaska, Washington, Oregon and Idaho for stock identification (tagging and marking) and monitoring, and technical and administrative support. This line item also includes funding for a 1996 chinook abundance agreement between the countries which provides technical and fieldwork support to the States and tribes.

Pacific Salmonid Recovery Planning

Since the first Pacific salmon listing in 1991, NOAA Fisheries has worked with all key agencies and stakeholders to conserve and restore salmon and their habitat. There is broad consensus that major improvements need to be made to management of the "Four Hs"- habitat, including estuary and ocean conditions, harvest, hatcheries, and hydropower. Key tools include partnerships with states, tribes, and other stakeholders, ESA regulatory programs, ESA recovery planning, and scientific monitoring and research conducted by NOAA Fisheries Northwest and Southwest Science Centers. Salmon restoration will require major changes to water flows and water quality, hydropower facilities and operations, hatchery practices, harvest (both domestic and international) and habitat management on federal, state, and private lands. This affects stakeholder groups such as the hydropower, timber, grazing, commercial and recreational fishing and dredging industries, but also affects all citizens of Washington, Idaho, Oregon, and California. However, it has been difficult to develop and implement comprehensive salmon restoration strategies across the landscape since so many stakeholders

are affected. While NOAA Fisheries' Northwest and Southwest regions can claim many success stories in individual watersheds or for individual projects, comprehensive recovery implementation in key watersheds such as the Columbia-Snake and California Central Valley has been slow.

All of the ESA programs and other tools that Congress has provided as discussed above provide important protections for listed salmonids but add up only to a piecemeal approach to recovery. Comprehensive recovery plans are needed to provide a framework for addressing problems across entire ESUs and among all of the activities that threaten salmon, and for prioritizing actions necessary for recovery.

The ESA requires that recovery plans contain (1) objective, measurable goals for delisting; (2) a comprehensive list of the actions necessary to achieve the delisting goals; and (3) an estimate of the cost and time required to carry out those actions. In addition, NOAA Recovery Planning Guidelines suggest that recovery plans include an assessment of the factors that led to population declines and/or which are impeding recovery. Finally, it is important that the plans include a comprehensive monitoring and evaluation program for gauging the effectiveness of recovery measures and overall progress toward recovery.

Recovery plans will address all salmonid species within a series of discrete geographic areas, or domains. (Formal ESA recovery efforts that are already underway for listed Snake River and Sacramento River populations may eventually be integrated into this process.) Tentatively identified recovery planning domains, and the currently listed ESUs they contain, are:

Puget Sound and the Olympic Peninsula

Puget Sound Chinook, Hood Canal Chum, Ozette Lake Sockeye.

Willamette and Lower Columbia River Basins and Southwest Washington Coast

Lower Columbia River Chinook, Upper Willamette River Chinook, Columbia River Chum, Lower Columbia River Steelhead, Upper Willamette River Steelhead.

Mid and Upper Columbia River Basins

Upper Columbia River Spring Chinook, Upper Columbia River Steelhead, Mid Columbia River Steelhead.

Snake River Basin

Snake River Fall Chinook, Snake River Spring/Summer Chinook, Snake River Sockeye, Snake River Steelhead.

Oregon Coast (Columbia River to Cape Blanco)

Oregon Coast Coho.

Southern Oregon/Northern California Coast

Southern Oregon/Northern California Coast Coho.

North-central California Coast

Central California Coast Coho, Central California Coast Steelhead, California Coast Chinook., Northern California Steelhead.

South-central California Coast

South-central California Steelhead, Southern California

California Central Valley

Central Valley Steelhead, Central Valley Spring Chinook, Sacramento River Winter Chinook.

As mentioned above, NOAA Fisheries plans to appoint a TRT for each domain. In the spring of 2000, TRTs were appointed for the Puget Sound and Willamette/Lower Columbia/SW Washington domains. We anticipate appointing additional TRTs later in 2000 and in 2001, as resources permit.

In addition, NOAA Fisheries has established a Recovery Science Review Panel ("Panel") to guide the recovery planning process throughout the four-state area. The Panel will (1) review core principles and elements of the recovery planning process NOAA Fisheries is developing; (2) ensure that well-accepted and consistent ecological and evolutionary principles form the basis for all recovery efforts; (3) review processes and products of all TRTs for scientific credibility and consistency; and (4) oversee a recovery plan peer review process.

In some areas, state and tribal managers and others have already begun the work of establishing recovery goals, and where this work has already occurred, NOAA Fisheries intends that the TRTs will consider this work. There will be considerable opportunity for public involvement throughout the entire process, and TRT work products will be peer-reviewed and distributed for public comment.

**Status Discussions for Species Listed
under the Endangered Species Act of
1973.**



Spawning Sockeye salmon

Listed Species Status

Green Turtle

Chelonia mydas

Listing Date: July 28, 1978



The green turtle was listed under the U.S. Endangered Species Act (ESA) on July 28, 1978. The species is listed as threatened throughout its range except for the Florida and Pacific Mexico breeding populations which are listed as endangered⁵. The International Union for the Conservation of Nature (IUCN) Red List classified the green turtle as Endangered (assigned to taxon that are not critically endangered but are facing a very high risk of extinction in the near future) except for the Mediterranean population which is classified as Critically Endangered (assigned to taxon that are facing an extremely high risk of extinction in the wild in the immediate future). With the exception of Hawaii, green turtles are thought to be declining throughout the Pacific Ocean, as a direct consequence of overexploitation and habitat loss. In the western Atlantic, nesting populations in Florida and Costa Rica have shown increasing trends in recent years. Historically, green turtles were highly prized for their flesh, fat, eggs, and shell, and fisheries in the United States and other parts of the world contributed significantly to the decline of the species. Directed take of green turtles for local consumption and for commercial purposes is still a major threat in some areas of their range.

Species Biology:

As adults, green turtles are the largest of the hard-shelled sea turtles. Among the major green turtle rookeries, average carapace length and mass of nesting females range from 92 cm (36 in) to 109 cm (43 in) and 110 kg (240 lb) to over 182 kg (400 lb), respectively. The carapace is smooth and has 4 pairs of costal (lateral) scutes. The carapace changes in color from solid dark grey/black at hatching to a variety of shades of grey, green, brown, and black in starburst or irregular patterns. The plastron is yellowish white. Green turtles are easily distinguished from other sea turtle species by the presence of a single pair of large prefrontal scales between the eyes, and a strongly serrated lower jaw. An adult male can be differentiated from an adult female by the male's thick prehensile tail that extends far beyond the posterior margin of its carapace. Green turtle hatchlings weigh approximately 25 g (0.06 lb) and measure approximately 50 mm (2 in) in length. The hatchling carapace is colored blue-black and the

⁵ Although only one species of *Chelonia* is recognized, in 1998 NOAA Fisheries and USFWS issued a separate recovery plan in the Pacific for the melanistic form -- the eastern Pacific green turtle (referred to by some as "black turtle," *C. mydas agassizii*), which ranges (including nesting) from Baja California south to Peru and west to the Galapagos Islands.

plastron is creamy-white. The common name “green turtle” specifically refers to the color of the animal’s fat.

After entering the sea, hatchling green turtles swim actively to the pelagic developmental habitat where they are believed to associate with the floating ecological community comprised predominately of Sargassum (a macroalgae). After several years, and when they have grown to approximately a dinner plate size, they recruit to coastal developmental habitats. After recruitment to benthic habitats, green turtles are herbivores, primarily feeding on macroalgae and sea grasses. Green turtles living in the wild exhibit slow growth and delayed sexual maturity. Age at sexual maturity is estimated at 25-60 years.

Distribution and Abundance:

In the southeastern United States, green turtles are found in waters around the U.S. Virgin Islands, Puerto Rico, and the continental U.S. from Texas to Massachusetts. Important feeding grounds in Florida include the Indian River Lagoon, the Southeast Florida coastline, the Florida Keys, Florida Bay, Homosassa, Crystal River and Cedar Key. North of Florida, the Pamlico-Albemarle estuaries complex provides important foraging habitat and green turtles are not uncommon in Long Island Sound during warmer months. In Texas, Laguna Madre once supported a significant green turtle population which was heavily exploited in the late 19th and early 20th centuries. The primary nesting beaches in the U.S. are along the east coast and southwest coasts of Florida, additional limited nesting occurs in the U.S. Virgin Islands and Puerto Rico.

In the Pacific, green turtles are found throughout the North Pacific, occasionally ranging as far north as Eliza Harbor, Admiralty Island, Alaska, and Ucluelet, British Columbia. On the U.S. continental west coast, a resident population of green turtles occurs in San Diego Bay. In the central Pacific, green turtles can be found at most tropical islands. In U.S. Hawaiian waters, green turtles are found around most of the islands in the Hawaiian Archipelago. The primary nesting site is at French Frigate Shoals in the northwestern Hawaiian island chain.

Total population size for the green turtle is not known, and trends are particularly difficult to assess because of wide year-to-year fluctuations in numbers of nesting females, difficulties of conducting research on early life stages, and long generation times. Present estimates of females nesting each year in the U.S. average approximately 700 in Florida and 1,000 in Hawaii. Nesting in Florida is likely reduced from historical levels however, recent data indicate that nesting may now be stable or increasing. In Hawaii, nesting numbers are lower than historical levels but have shown a gradual increase. However, the green turtle population in Hawaii and Florida is afflicted with a tumor disease, known as fibropapillomatosis, which is of an unknown etiology and often fatal. Fibropapillomatosis is considered an inhibiting factor to the full recovery of the Hawaiian green turtle population and threatens the recovery of the Florida population as well.

Major Impacts/Threats in the Nesting Environment (not in priority order):

- In the U.S. poaching of eggs and turtles is infrequent. However, in other parts of the species range, egg poaching and direct harvest of immature and adult turtles are serious threats.
- Artificial lighting is a significant threat and causes disorientation of both adults and hatchlings. Green turtle hatchlings are attracted to artificial light, which disrupts their natural sea-finding behavior and can result in increased predation and mortality. In addition, adult females appear to avoid nesting in highly developed areas with intense artificial lighting.
- Beach armoring (seawalls, revetments, riprap, sandbags and sand fences) to protect property from erosion can cause the loss of dry nesting beach and/or interfere with access to suitable nesting sites. Natural processes of beach erosion on undeveloped beaches are not generally a significant threat.
- Beach nourishment results in heavy machinery, pipelines, increased human activity and artificial lighting on a project beach, and can cause the burial of nests and disturbance of nesting turtles if not regulated properly to occur outside the nesting season. Beach nourishment can result in alteration of beach or sand characteristics which can affect nesting, nest success, and hatchling fitness.
- Human disturbance of nesting females is a serious concern. Efforts to properly permit organized turtle watches during the nesting season in the southeast U.S. has helped to educate the public and control disturbance on important nesting beaches.
- The placement of physical obstacles (e.g. beach chairs, recreational beach equipment) on a beach can hamper or deter nesting attempts as well as interfere with the incubation of eggs, the emergence of hatchlings, and the ability of hatchlings to enter the sea.
- The use of vehicles on beaches is a serious problem in certain areas. It may result in decreased hatchling success due to sand compaction, or directly kill hatchlings and adults. Tire ruts may also interfere with the ability of hatchlings to get to the ocean. The use of vehicles at night on nesting beaches can deter nesting females and disorient hatchlings.

Major Impacts/Threats in the Marine Environment (not in priority order):

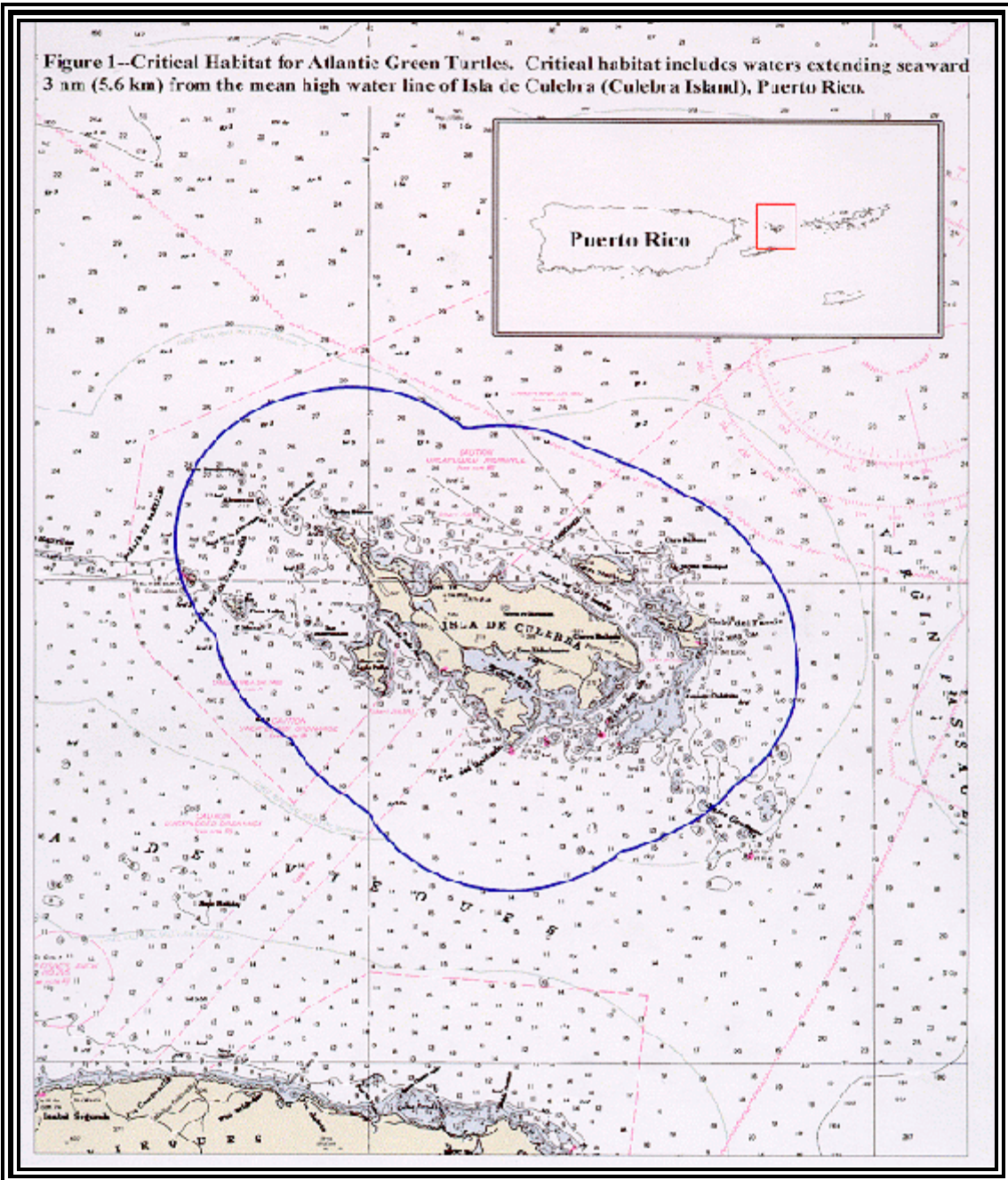
- A disease, known as fibropapillomatosis (FP), originally identified in green turtles, but now affecting loggerhead, Kemp's ridley, and olive ridley turtles as well, has emerged as a serious threat to sea turtle recovery. In the U.S., the disease is most notably present in green turtles of Hawaii, Florida, and the Caribbean, but is found at other sites around the world as well. FP is expressed as tumors which occur primarily on the skin and eyes, and the disease can be fatal. The cause of the disease remains unknown, however, a viral etiology is suspected. The expression of the disease has been systematically monitored in several locales in Hawaii. At a study site on southern Molokai, for example, where tumors were virtually unknown before 1988, the prevalence of tumored turtles ranged from 42-56% during the 1995-1997 surveys. In

Florida, up to 50% of the juvenile green turtles captured in the Indian River Lagoon are infected, and there are similar reports from other sites in Florida, including Florida Bay, as well as from Puerto Rico, and the U.S. Virgin Islands. Fibropapillomatosis is considered the primary impediment to the full recovery of the Hawaii green turtle population and the disease may hinder the recovery of green turtle populations elsewhere as well. Research to determine the cause of this disease is a high priority and is underway at federal, state, and private institutions.

- The requirement to use TEDs in the commercial shrimp fleet of the U.S. and Mexico has greatly reduced the mortality of green turtles in shrimp trawls. Green turtles are also accidentally captured in non-shrimp trawls and efforts to reduce incidental capture in these fisheries are needed to enhance recovery.
- Several thousand commercial vessels and an extensive recreational fishery are involved in hook and line fishing for various coastal species. The capture of green turtles in these fisheries is not uncommon, but the magnitude of the take is not known.
- Throughout the late 1980's and early 1990's, significant numbers of green turtles were killed by gill and trammel net fisheries off the east coast of central Florida. These takes were significantly reduced with the prohibition of gillnets in Florida waters in the mid-1990's. Gill nets fished in other areas of the species range remain a serious threat.
- Pound net fisheries are primarily a problem in Virginia waters, where turtles become entangled in the gear and can drown. In North Carolina and New York green turtles are usually released alive from pound nets.
- Green turtles are incidentally taken by the U.S. pelagic longline fisheries in the eastern Pacific and Hawaii when they are hooked and/or become entangled with the mainline or buoy line. While some turtles are released alive, others are dead when recovered and a percentage of those released alive will die from their injuries.
- Traps, commonly used to capture crabs, whelk, lobster and reef fish result in incidental takes of green turtles when they become entangled in the traps or trap lines and drown. The impact of trap line gear on green turtle populations has not been quantified.
- Green turtles can consume a wide variety of marine debris such as plastic and styrofoam pieces, tar balls, balloons, plastic bags, and plastic pellets. Effects of consumption include interference in metabolism or gut function, even at low levels of ingestion, as well as absorption of toxic byproducts. Discarded monofilament fishing line and abandoned netting can entangle turtles, causing injury and/or death and is a growing concern for the Hawaiian green turtle population.
- Green turtles are incidentally taken by scallop dredge gear in the mid-Atlantic when they become crushed or impinged by the dredge. The population-level impact of this mortality factor has not been quantified.
- Illegal harvesting of green turtles is uncommon in the mainland U.S. Illegal take of green turtles in the Caribbean, particularly near Puerto Rico, is a more significant problem; however, no estimates of take exist. Legislation and treaties to protect and conserve green turtles are more extensive than they have been in the past, although laws are often poorly enforced, especially among developing nations and smaller islands

where resources and geography limit implementation.

- Green turtles are at risk when encountering marine pollution such as oil spills. Respiration, skin, blood chemistry and salt gland functions are affected. Pesticides, heavy metals, and PCB's have been detected in turtles and eggs, but the effects are unknown.
- Dredging can result in habitat destruction by degrading nesting sites and/or foraging grounds. Hopper dredges can also kill turtles caught in dragheads. NOAA Fisheries has implemented restrictions on hopper dredging activities in the Gulf and Atlantic to reduce the likelihood of dredges encountering turtles.
- In areas where recreational boating, commercial fishing, and ship traffic are intense, propeller and collision injuries are common and likely play a significant role in hampering recovery. This is a particularly difficult issue to address, given the number of registered vessels and their wide-ranging activities.
- Marina and dock construction result in the degradation and/or destruction of green turtle foraging habitat. This development also leads to increased boat traffic, increasing the risk of propeller and vessel collision injuries.
- Coastal power plants which draw their cooling water from nearshore and estuaries waters can entrain sea turtles and cause mortality. Measures have been put in place at some plants to reduce the risk to sea turtles.



Designated Critical Habitat for Atlantic Green Turtles

Listed Species Status

Hawksbill Turtle

Eretmochelys imbricata



Listing Date: June 2, 1970

The hawksbill turtle was listed as endangered under the ESA throughout its range in 1970 and its status has not changed. The International Union for the Conservation of Nature (IUCN) Red List has listed the hawksbill as Critically Endangered which is indicative of a species that is facing an extremely high risk of extinction in the near future. As a result of decades of intensive harvest of hawksbills, the species is severely depleted throughout its range. Today, most nesting populations continue to decline, a few appear stable, and a few have begun to improve as a result of years of intensive conservation efforts. Major causes of the continued decline of the hawksbill turtle 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 areas.

Species Biology:

The hawksbill is a small to medium-sized sea turtle. Nesting females average between 62-94cm (24-37 in) in straight carapace length and weight is typically 51-80 kg (112-176 lb). Hatchlings average about 42 mm (1.7 in) straight carapace length and range in weight from 13.5-19.5 g (0.03-0.04 lb). The following characteristics distinguish the hawksbill from other sea turtles: two pairs of prefrontal scales; thick, posteriorly overlapping scutes on the carapace; four pairs of coastal scutes; and a beak-like mouth. The carapace is heart-shaped in very young turtles, and becomes more elongate with maturity. The posterior marginals are sharply serrated in all but very old individuals. The epidermal scutes that overlay the bones of the shell are often richly patterned with irregularly radiating streaks of brown or black on an amber background.

Hawksbills utilize different habitats at different stages of their life cycle. Post-hatchlings occupy the pelagic environment, taking shelter in weedlines that accumulate at convergence points.

After several years in the pelagic habitat, hawksbills re-enter coastal waters when they reach approximately 20-25 cm carapace length. Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. The ledges and caves of the reef provide shelter for resting during the day and night. Hawksbills are also found around rocky outcrops and high energy shoals, which are also optimum sites for sponge growth. Hawksbills are also known to inhabit mangrove-fringed bays and estuaries, particularly along the eastern shore of continents where coral reefs are absent. In Texas, juvenile hawksbills have been documented to forage on stone jetties.

Nesting hawksbills utilize both low- and high-energy beaches in tropical oceans of the world. Both insular and mainland nesting sites are known. Hawksbills will nest on small pocket beaches, and, because of their small body size and great agility, can traverse fringing reefs that limit access by other species. They exhibit a wide tolerance for nesting substrate ranging from sand to gravel. The condition of the substrate appears to be a less important factor for successful nesting than vegetative cover. Nests are typically placed under vegetation. Clutch size varies site to site but is generally greater than 130 eggs, and surveys at various locations have documented that a single female may lay 3 to 6 nests each season. Age at sexual maturity is not known, however the hawksbill exhibits slow growth and age at sexual maturity is likely to be measured in decades.

Distribution and Abundance:

The hawksbill occurs in tropical and subtropical seas of the Atlantic, Pacific and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the western Gulf of Mexico (especially Texas); in the Greater and Lesser Antilles; and along the Central American mainland south to Brazil. Within the United States, hawksbills are most common in Puerto Rico and its associated islands, in the U.S. Virgin Islands and in Hawaii. In the continental United States, the species is recorded from all the states in the Gulf of Mexico and from the eastern seaboard as far north as Massachusetts, with the exception of Connecticut, but sightings north of Florida are rare. Hawksbills are observed in Florida with some regularity on the reefs off Palm Beach County, where the warm Gulf Stream current passes close to shore, and in the Florida Keys. Texas is the only other continental state where hawksbills are sighted with any regularity and most of these sightings involve post-hatchlings and juveniles believed to originate from nesting beaches in Mexico. Nesting within the southeastern United States occurs principally in Puerto Rico and the U.S. Virgin Islands, the most important sites being Mona Island and Buck Island. Nesting also occurs on other beaches of St. Croix, and on Culebra Island, Vieques Island, mainland Puerto Rico, St. John and St. Thomas. Within the continental United States, nesting is restricted to the southeast coast of Florida and the Florida Keys.

In the Hawaiian Islands, nesting occurs on the main islands, primarily on several small sand beaches on the Islands of Hawaii and Molokai. Two of these sites are at a remote location in the Hawaii Volcanos National Park. Along the Pacific coast of the U.S. nesting of hawksbills has not been documented but the species does occur in the Gulf of California as far north as 29°N, throughout the northwestern states of Mexico, and south along the Central and South American coasts to Columbia and Ecuador.

Major Impacts/Threats in the Nesting Environment (not in priority order):

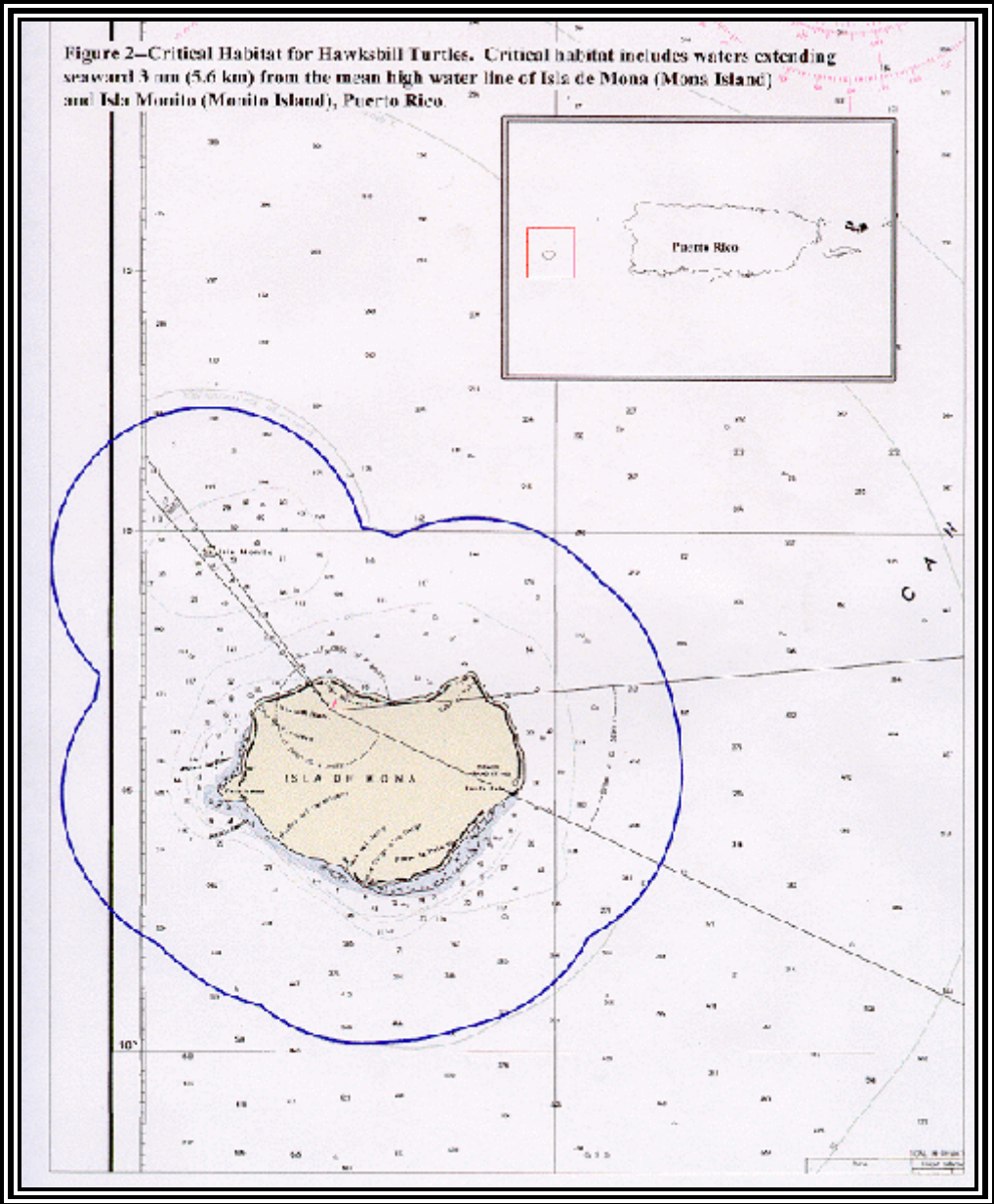
- Poaching of hawksbill eggs continues to occur on nesting beaches throughout the species range, including Puerto Rico, and at lower levels in St. Thomas and St. Croix. Adult females are still butchered for their tortoiseshell, but the practice is decreasing with better enforcement. Outside the U.S., directed harvest of hawksbills continues to occur legally and illegally, and individuals belonging to U.S. nesting populations are being impacted.
- Removal of sand for construction aggregate or renourishment of other beaches is a serious threat throughout the Caribbean. Sand removed from above the tide line is replaced very slowly from subtidal areas, a process which can take decades.
- Most nesting beaches are in private hands, and many of these have been developed. Development and landscaping of these nesting beaches can create impediments for nesting turtles.
- Artificial lighting can cause disorientation or mis-orientation of both adults and hatchlings. Turtle hatchlings are attracted to light, ignoring or coming out of the ocean to go towards a light source, increasing their chances of death or injury. Nesting females are documented to avoid areas with intense lighting. Highly developed areas may cause problems for turtles trying to nest.
- Beach armoring (seawalls, revetments, riprap, sandbags and sand fences) to protect property from erosion can cause the loss of dry nesting beach and/or interfere with access to suitable nesting sites. Natural processes of beach erosion on undeveloped beaches are not generally a significant threat.
- Mechanical raking can result in heavy machinery repeatedly moving across a nest and compacting sand as well as causing tire ruts which may hinder or trap hatchlings. Rakes can penetrate the surface and disturb or uncover a nest.
- Human activities on beaches, particularly the use of off-road vehicles, may disturb nesting females and result in lowered hatchling success due to sand compaction. Vehicles driven on the beach may directly kill hatchlings that have emerged from their nest and tire ruts may also interfere with the ability of hatchlings to get to the ocean.

- A variety of introduced predators or domestic animals (such as hogs, mongooses, dogs) prey on hawksbill eggs and hatchlings.

Major Impacts/Threats in the Marine Environment (not in priority order):

- International commerce in hawksbill shell (bekko) is an important factor endangering hawksbill populations around the world. Japanese imports of raw bekko between 1970 and 1989 totaled 713,850 kg, representing more than 670,000 turtles; more than half the imports originated in the Caribbean and Latin America. While hawksbills are protected under CITES, trade continues as a result of weak enforcement of laws within a number of countries and several proposals to downlist certain segments of the Caribbean hawksbill turtle population have been submitted to the CITES Conference of the Parties. To date, these proposals have not been adopted, and there remain serious concerns regarding the re-opening of international trade in this critically endangered species.
- The hawksbill's dependence on coral reefs for shelter and food link its well-being to the condition of reefs. Destruction of reefs from vessels anchoring, striking or grounding is a growing problem. Cruise ships and yachts are destroying portions of coral reefs with their anchors and anchor chains in the US Virgin Islands, Puerto Rico, the British Virgin Islands, Belize and elsewhere. There is also damage from recreational, diving and fishing boats anchoring indiscriminately on reefs.
- The extent to which hawksbills are killed or debilitated after becoming entangled in marine debris are unknown, but it is believed to be a serious and growing problem. Hawksbills have been reported entangled in discarded monofilament gill nets, "fish nets," fishing line and rope.
- Hawksbill turtles eat a wide variety of debris such as plastic bags, plastic and styrofoam pieces, tar balls, balloons and plastic pellets. Effects of consumption include interference in metabolism or gut function, even at low levels of ingestion, as well as absorption of toxic byproducts.
- Incidental catch during fishing operations has not been quantified but is a potential significant source of mortality in certain areas. In particular, gill nets, trap fisheries, and hook and line fisheries should be closely evaluated. In Puerto Rico, hawksbills are captured by a variety of fishing gear, including driftnets, gillnets, seines and spearguns. Gillnets and seines are widely deployed and are a particularly serious problem; these nets are sometimes set specifically for turtles.
- In areas where recreational boating and ship traffic is intense, propeller and collision injuries are common and likely play a significant role in hampering recovery. This is a particularly difficult issue to address, given the number of registered vessels and their wide-ranging activities.

- In Puerto Rico, damage to coral reefs and other shallow water benthic systems from sedimentation and siltation has not been fully assessed, but is known to be a serious problem in some areas, with some coral reefs completely destroyed by siltation.
- Pesticides, heavy metals and PCB's have been detected in turtles and eggs, but their effect is unknown.
- Marine turtles are at risk when encountering an oil spill. Respiration, skin, blood chemistry and salt gland functions are affected.
- Illegal use of explosives for fishing is a concern throughout the species range.



Designated Critical Habitat for Atlantic Hawksbill Turtles

Listed Species Status

Kemp's Ridley Turtle

Lepidochelys kempii

Listing Date: December 2, 1970



The Kemp's ridley was listed as endangered throughout its range on December 2, 1970, and its status has remained unchanged. The International Union for the Conservation of Nature (IUCN) Red List has classified the Kemp's ridley as Critically Endangered which is indicative of a species that is facing an extremely high risk of extinction in the wild in the near future. The Kemp's ridley population declined precipitously through the 1900's. Film footage taken in 1947 revealed an estimated 42,000 females nesting in one day, but, by the mid 1980's fewer than 1,000 females were estimated to nest during an entire season. The decline of this species resulted from two primary causes: collection of eggs and harvest of nesting females and accidental capture and drowning of Kemp's ridleys of all ages in shrimp trawls. Today, under strict protection, and as a result of extraordinary bi-lateral efforts by Mexico and the United States, the population appears to be in the earliest stages of recovery. The increase can be attributed to two primary factors: full protection of nesting females and their nests in Mexico, and the requirement to use turtle excluder devices (TEDs) in shrimp trawls in the United States and in Mexico.

Species Biology:

The Kemp's ridley and olive ridley are the smallest of all extant sea turtles, the weight of an adult is generally less than 45 kg (99 lb) and the straight carapace length is approximately 65 cm (26 in). The carapace (top shell) is round, and the width is often greater than the length. Coloration changes significantly as the turtle matures, from the grey-black carapace and plastron (bottom shell) of hatchlings to the lighter grey-olive carapace and cream-white or yellowish plastron of adults. There are two pairs of prefrontal scales on the head, five vertebral scutes, five pairs of coastal scutes and generally twelve pairs of marginals on the carapace. In each bridge joining the plastron to the carapace, there are four scutes, each of which is perforated by a pore. This is the external opening of Rathke's gland which secretes a substance of unknown function (possibly a pheromone). Males resemble the females in size and coloration. Secondary sexual characteristics of male sea turtles include long tails, a more distal vent, recurved claws, and, during breeding, a softened mid-plastron. Eggs are 34-45 mm (1.3-1.8 in) in diameter and 24-40 g (0.05-0.09 lb) in weight. Hatchlings range from 42-48 mm

(1.6-1.9 in) in straight carapace length, 32-44 mm (1.2 -1.7 in) in width and 15-20 g (0.03 - 0.04 lb) in weight.

Post-hatchling Kemp's ridleys are believed to inhabit pelagic waters of the Gulf of Mexico and north Atlantic Ocean and feed on the fauna associated with Sargassum (a drift algae). After one or more years, the ridley moves to relatively shallow, nearshore waters and is largely a crab-eater, with a preference for portunid crabs. Age at sexual maturity is estimated at approximately 7-15 years.

Distribution and Abundance:

The species occurs mainly in coastal areas of the Gulf of Mexico and all along the east coast of the United States as far north as Cape Cod Bay. The principal nesting beaches for Kemp's ridley are found along the northeastern coast of Mexico, primarily in the state of Tamaulipas. In the U.S. a few Kemp's ridleys nest each year in south Texas. The Mexican nesting grounds of Kemp's ridley were only discovered in 1947, and, at that time, the adult female population was estimated to be in excess of 40,000 individuals. By the early 1970s only about 2,000 adult females remained in the population. The population declined further through the mid-1980's to a low of just under 600 adult females. Since then, the estimated adult female population has grown and is currently estimated to be almost 4,700 individuals. It is important to note however that the area surveyed for ridley nests in Mexico was expanded in 1990 and it is unknown exactly how the expanded beach coverage affects the observed rate of increase. Continuing conservation efforts are necessary to ensure recovery and to meet the de-listing goals identified in the Kemp's Ridley Recovery Plan.

Major Impacts/Threats in the Nesting Environment (not in priority order):

- Threats to the nesting beaches in Mexico are presently few, but efforts must be maintained to continue the conservation program and to ensure long-term protection of these critical areas. Proposed dredging of the Gulf Intercoastal Waterway from Brownsville, Texas to Barra del Tordo (in the south part of the nesting range) is alarming because of the assuredly detrimental and possibly disastrous effects that this habitat alteration and associated development could have on the nesting population if completed.
- Nest management practices need to be continually evaluated as the population increases, and modified as necessary, to ensure that nest success is not compromised.

Major Impacts/Threats in the Marine Environment (not in priority order):

- The requirement to use TEDs in the commercial shrimp fleet of the U.S. and Mexico has greatly reduced the mortality of Kemp's ridley in trawls. However, despite stringent regulations, data indicate that problems remain in certain areas and at certain times of the year. Recent regulations closing certain nearshore waters to shrimp trawlers, enacted by the state of Texas, may reduce mortality further.
- In addition to shrimp trawls, Kemp's ridleys are accidentally captured in pound nets, non-shrimp trawls, gill nets, hook and line, crab traps, scallop dredges, fish traps, and longlines. Efforts to reduce incidental capture and mortality of ridleys in these fisheries are urgently needed to enhance recovery.
- The Gulf of Mexico is an area of high density offshore oil extraction with chronic low-level spills and occasional massive spills. The two primary feeding grounds for adult Kemp's ridley turtles in the northern and southern Gulf of Mexico are both near major areas of near shore and offshore oil exploration and production. These areas are also critically important to other life history stages as well. The nesting beach at Rancho Nuevo is also vulnerable and has been affected by oil spills. Proposals to dramatically increase oil exploration and production in the eastern Gulf of Mexico must be carefully considered in light of their potential to negatively affect Kemp's ridleys inhabiting those areas.
- The vast amount of floating debris in the Gulf of Mexico constitutes a threat to all life history stages. Plastics, monofilament, discarded netting and many other waste items can be ingested, causing digestive and/or physiological disorders that may lead to death. Kemp's ridleys encountering debris can die or become severely debilitated from entanglement in such things as discarded netting, ropes, and strapping bands.
- In areas where recreational boating, commercial fishing, and/or ship traffic are intense, propeller and collision injuries are common and likely play a significant role in hampering recovery. This is a particularly difficult issue to address, given the number of registered vessels and their wide-ranging activities.
- Coastal power plants which draw their cooling water from nearshore and estuaries waters can entrain sea turtles and cause mortality. Measures have been put in place at some plants to reduce the risk to sea turtles.
- Channel and harbor dredging operations affect Kemp's ridley turtles through incidental take and by degrading their habitat. Channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through spoil dumping, degraded water quality/clarity and altered current flow, all of which can affect prey distribution and abundance.

Listed Species Status

Leatherback Turtle

Dermochelys coriacea



Listing Date: June 2, 1970

The leatherback turtle was listed as Endangered throughout its range on June 2, 1970. The International Union for the Conservation of Nature (IUCN) Red List classified the leatherback as “critically endangered” due to “an observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer.” Sustained increases in the number of nesting females have been documented following intense conservation efforts at a few sites *in the Atlantic* such as the U.S. Virgin Islands, Puerto Rico, and South Africa. However, the long-term trends of the largest rookeries of the western Atlantic along the Guyanas are unclear, and there is serious concern that this population may be declining recently. In the eastern Atlantic recent discovery of a series of potentially large rookeries along the west African coast, is encouraging news. Throughout the Pacific the situation is grim, with the demise of once large populations, such as in Malaysia, Mexico, and Costa Rica, leading some researchers to conclude that the leatherback is on the verge of extinction in the Pacific Ocean. Incidental capture in commercial fisheries and the harvest of eggs and nesting females are the greatest threats to the survival and recovery of the leatherback.

Species Biology:

The leatherback is the largest living turtle, and is so distinctive as to be placed in a separate taxonomic family, Dermochelyidae. The carapace is distinguished by a smooth leathery integument, with pronounced keels extending from anterior to posterior. A mosaic of tiny bones held together by tough, oil-saturated connective tissue comprise the carapace. No sharp angle is formed between the carapace and the plastron, resulting in the animal being somewhat barrel-shaped. The plastron is mottled pinkish-white and black. The front flippers are proportionally longer than in any other sea turtle, and may span 270 cm (106 in) from tip to tip in an adult. Typical carapace length of adult leatherbacks ranges from 130-180 cm (51-71 in) and weight ranges from 200-700 kg (440-1,500 lb). Hatchlings are dorsally mostly black and rows of white scales appear as stripes along the length of the back. The flippers are dark gray to black, with white margins. Hatchlings are 50-65 mm (2.0-2.6 in) long and weigh 32-55 g

(0.07-0.12 lb). In both adults and hatchlings, the front of the upper jaw bears two tooth-like projections.

Leatherbacks feed on cnidarians (jellyfish and siphonophores) and tunicates (pyrosomas and salps). The distribution and movements of the leatherback are thought to be closely tied to its search for these prey items. Adult leatherbacks are highly pelagic, and are capable of making extraordinary migrations crisscrossing entire oceans, however, they also utilize shallower coastal waters for migrating and foraging. The species is capable of maintaining its body temperature higher than the water it inhabits, this physiological trait enables leatherbacks to exploit resources in cold water at the northern and southern extension of its range.

Nesting females prefer dynamic beaches with deep, unobstructed access. Females will lay as few as 1 and as many as 11 clutches per season, at approximately 9 to 12 day intervals. Clutch size varies geographically, ranging from a little over 60 to over 100 eggs. Females nest approximately every 2-3 years. Age at sexual maturity has been estimated to be at around 14 years, with 9 years as a likely minimum age.

Distribution and Abundance:

Leatherbacks are capable of tolerating a wide range of water temperatures and are widely distributed. In the north Atlantic Ocean and Gulf of Mexico, leatherbacks have been recorded along the entire continental coast as far north as Newfoundland and south to Puerto Rico and the U.S. Virgin Islands. In the U.S. Pacific, they are found along the continental west coast including Alaska and in the central Pacific north and south of Hawaii, as well as in waters surrounding the unincorporated territories of Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa. Leatherbacks undertake extensive migrations throughout the Atlantic, Pacific, and Indian Oceans.

The three primary nesting beaches in the U.S. are St. Croix (U.S. Virgin Islands), Culebra Island (Puerto Rico), and along the southeast Florida coast. Nesting does not occur on beaches under U.S. jurisdiction in the Pacific. Globally, nesting populations have declined in Mexico, Costa Rica, Malaysia, India, Sri Lanka, Thailand, Suriname, Trinidad, Tobago, and Papua New Guinea. The Malaysian nesting population, once one of the largest in the Pacific numbering several thousand nesters annually, is essentially extinct, with only two or three turtles now nesting each year. Nesting along the Pacific coast of Mexico declined at an annual rate of 22% over the last 12 years, with similar alarming declines in Pacific Costa Rica. Data collected on some of the smaller nesting colonies in the Atlantic, such as those of the USVI, Puerto Rico, and southeast Florida, clearly indicate increasing numbers of nests for the past 20 years. However, nesting at the largest rookeries of the Atlantic, along the Guyanas, appears to be

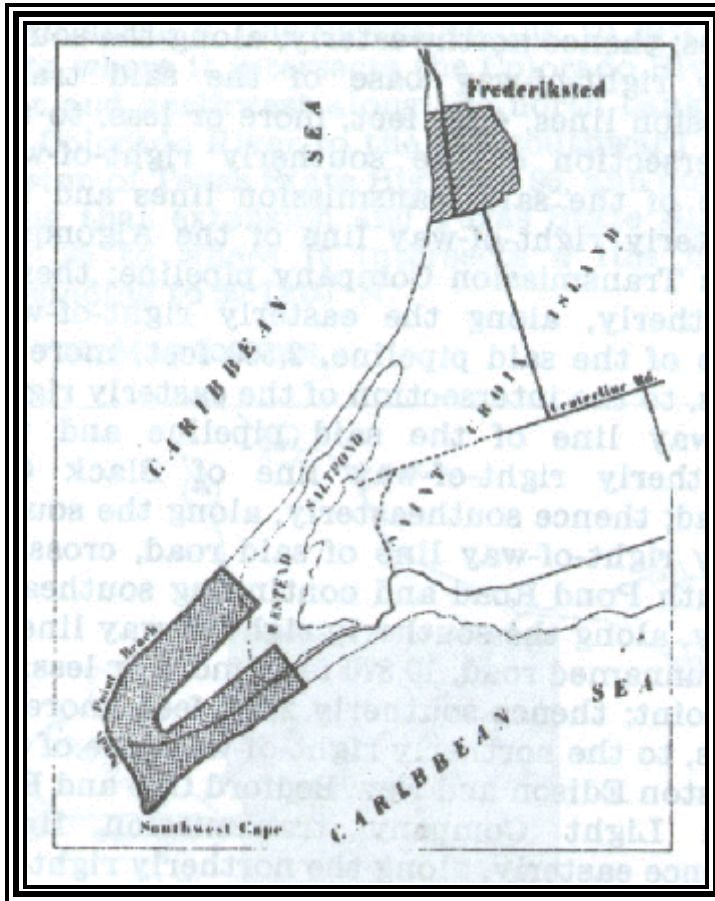
declining over the last decade. Other areas in Trinidad, Venezuela, Atlantic Costa Rica and Colombia have only recently begun to be monitored, and trends have not yet been determined. New census work underway along the West African coast indicates that significant numbers of leatherbacks are nesting there, and these populations will contribute to the overall population estimate for the Atlantic.

Major Impacts/Threats in the Nesting Environment:

- Harvest of nesting females for oil and meat is a continuing threat worldwide. In the U.S., adults are occasionally taken in Puerto Rico. Egg harvest at many nesting beaches remains a serious threat to recovery. In the U.S., poaching of eggs continues at low levels in the U.S. Virgin Islands and in Puerto Rico.
- Destruction of eggs by introduced predators is a major threat at some nesting beaches. In the Pacific, depredation of eggs by feral pigs remains a serious threat.
- Beach armoring (seawalls, revetments, riprap, sandbags and sand fences) to protect property from erosion can cause the loss of dry nesting beach and/or interfere with access to suitable nesting sites.
- Removal of sand for construction aggregate or renourishment of other beaches is a serious threat throughout the Caribbean. Sand removed from above the tide line is replaced very slowly from subtidal areas, a process which can take decades.
- Beach nourishment results in heavy machinery, pipelines, increased human activity and artificial lighting on a project beach, and can cause the burial of nests and disturbance of nesting turtles if not regulated properly to occur outside the nesting season. Beach nourishment can result in alteration of beach or sand characteristics which can affect nesting, nest success, and hatchling fitness.
- Artificial lighting on developed beaches is a significant threat and causes disorientation of both adults and hatchlings. Leatherback hatchlings are attracted to artificial light, which disrupts their natural sea-finding behavior and can result in increased predation and mortality. In addition, adult females appear to avoid nesting in highly developed areas with intense artificial lighting.
- The use of vehicles on beaches is a serious problem in certain areas. It may result in decreased hatchling success due to sand compaction, or directly kill hatchlings and adults. Tire ruts may also interfere with the ability of hatchlings to get to the ocean. The use of vehicles at night on nesting beaches can deter nesting females and disorient hatchlings.
- The placement of physical obstacles on a beach can hamper or deter nesting attempts as well as interfere with incubating eggs and the movement of hatchlings to the sea.

Major Impacts/Threats in the Marine Environment:

- A variety of fisheries use gear that pose threats to leatherbacks. Gillnets, longlines, trawls, and fixed lobster, whelk, and crab pot gear are of greatest concern. Entanglement in these gears can lead to serious injuries and/or death. Globally, incidental capture in various fisheries represent the most serious threat to leatherbacks documented in the marine environment.
- Despite TED requirements in the U.S. shrimp fishery, current TEDs are generally not capable of excluding adult leatherbacks through the exit opening. To address this problem, NOAA Fisheries established a Leatherback Conservation Zone in 1995 to restrict shrimp trawl activities from the coast of Cape Canaveral, Florida, to the North Carolina/Virginia border, during periods of high leatherback abundance. NOAA Fisheries has proposed permanent changes to the TED requirements that would require a larger escape opening to exclude leatherbacks turtles.
- Leatherbacks may accidentally ingest marine debris such as plastic bags, plastic and styrofoam pieces, tar balls, balloons and plastic pellets. Effects of consumption include interference in metabolism or gut function, even at low levels of ingestion, as well as absorption of toxic byproducts.
- In areas where recreational boating, commercial fishing, and ship traffic are intense, propeller and collision injuries are common and likely play a significant role in hampering recovery. This is a particularly difficult issue to address, given the number of registered commercial and recreational vessels and their wide-ranging activities.



*Designated Critical Habitat for Atlantic Leatherback
Turtles*

Listed Species Status

Loggerhead Turtle

Caretta caretta



Listing Date: July 28, 1978

The loggerhead turtle was listed as threatened throughout its range on July 28, 1978, and its status has not changed. The International Union for the Conservation of Nature (IUCN) Red List lists the loggerhead as Endangered which is assigned to taxon that are not critically endangered but are facing a very high risk of extinction in the near future. Most recent evidence suggests that the number of nesting females in Georgia, South Carolina and North Carolina is at best stable but may be declining, while the number of nesting females in the south Florida nesting assemblage appears to be increasing. In the Pacific, there are no records of loggerhead nesting on beaches under U.S. jurisdiction. Rather, nesting in the Pacific basin is restricted to the western region, primarily Japan and Australia where marked declines in the nesting populations have been recorded. The most significant threats to the loggerhead are incidental capture in various commercial fisheries and coastal development of nesting beaches.

Species Biology:

Adults and sub-adult loggerheads have a reddish-brown carapace, scales on the top and sides of the head and top of the flippers are also reddish- to orange-brown, but have yellow borders. The plastron (bottom shell) is yellow to cream colored. There are five pairs of costal scutes and five vertebral scutes. The average straight carapace length of adults is 90-95 cm (35-37 in) and average weight is 100-150 kg (220-330 lb). Average size at hatching is 45 mm (1.8 in) long and average weight is approximately 20 g (0.04 lb). Hatchlings are light to dark brown dorsally and dull yellowish tan ventrally with three pronounced keels on the carapace that gradually disappear as the turtle grows.

Sexual maturity is reached at between 20-38 years. Loggerheads are distributed in the temperate and tropical waters of both hemispheres. Nesting is concentrated in the north and south temperate zones and tropics. As a general rule, high energy beaches are preferred for nesting. At least in the Atlantic, hatchlings leaving the beach swim directly offshore and eventually become primarily associated with *Sargassum* (a macroalgae) in pelagic drift lines

that result from convergences. They spend several years as part of the pelagic environment, until reaching a size of approximately 40-50 cm (15-20 in) in the Atlantic (the pelagic phase appears to be longer in the Pacific) when they take up residence in near-shore and estuarine waters along continental margins. Once recruited to these benthic habitats, loggerheads typically prey on invertebrates, primarily molluscs.

Distribution and Abundance:

Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters of the Atlantic, Pacific, and Indian Oceans and are the most abundant species of sea turtle occurring in U.S. waters. Loggerheads concentrate their nesting in the north and south temperate zones and subtropics, but generally avoid nesting in tropical areas of Central America, northern South America, and the Old World. The two largest known nesting aggregations of loggerheads occur on Masirah and Kuria Muria Islands in Oman and along the southeast U.S. The primary U.S. nesting sites are along the east coast of Florida, with additional sites in Georgia, the Carolinas, and the Gulf Coast of Florida. Five nesting subpopulations of loggerheads in the western North Atlantic have been identified based on genetic research: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29 ° N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29 ° N on the east coast to Sarasota on the west coast (approximately 83,400 nests in 1998); (3) a Florida panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida (approximately 1,200 nests in 1998); (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (approximately 1,000 nests in 1998); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (approximately 200 nests per year). Immature loggerheads are common from Texas through New England, occasionally reported from as far north as Nova Scotia, and inhabit inshore bays, sounds, and lagoons as well as offshore the U.S. Gulf and Atlantic coasts. Important assemblages of adult male loggerheads have been described from the east coast of Florida and Florida Bay.

In the eastern Pacific, loggerheads regularly occur from southern California south through Baja California. A few records of loggerheads as far north as Alaska and as far south as Chile exist, however, these extremes may not be part of the normal range of the species. In the U.S., most records are of immatures off the coast of California. Nesting occurs primarily in Australia and Japan. It is thought that between 1,000 to 3,000 female loggerheads may nest annually in all of Japan and as few as 300 in Queensland, Australia.

Major Impacts/Threats in the Nesting Environment (not in priority order):

- In the United States, direct killing of nesting loggerheads is extremely rare. Egg poaching is a limited problem but does not hamper recovery efforts.
- Beach armoring (seawalls, revetments, riprap, sandbags and sand fences) to protect property from erosion can cause the loss of dry nesting beach and/or interfere with access to suitable nesting sites. Coastal armoring represents the most significant nesting environment threat to the loggerhead turtle in the U.S. Natural processes of beach erosion on undeveloped beaches are not generally a significant threat.
- Beach nourishment results in heavy machinery, pipelines, increased human activity and artificial lighting on a project beach, and can cause the burial of nests and disturbance of nesting turtles if not regulated properly to occur outside the nesting season. Beach nourishment can result in alteration of beach or sand characteristics which can affect nesting, nest success, and hatchling fitness.
- Artificial lighting is a significant threat and causes disorientation of both adults and hatchlings. Loggerhead hatchlings are attracted to artificial light, which disrupts their natural sea-finding behavior and can result in increased predation and mortality. In addition, adult females appear to avoid nesting in highly developed areas with intense artificial lighting.
- Human disturbance of nesting females is a serious concern. Efforts to properly permit organized turtle watches during the nesting season in the southeast U.S. has helped to educate the public and control disturbance on important nesting beaches.
- The placement of physical obstacles (e.g. beach chairs, recreational beach equipment) on a beach can hamper or deter nesting attempts as well as interfere with the incubation of eggs, the emergence of hatchlings, and the ability of hatchlings to enter the sea.
- The use of vehicles on beaches is a serious problem in certain areas. It may result in decreased hatchling success due to sand compaction, or directly kill hatchlings and adults. Tire ruts may also interfere with the ability of hatchlings to get to the ocean. The use of vehicles at night on nesting beaches can deter nesting females and disorient hatchlings.

Major Impacts/Threats in the Marine Environment (not in priority order):

- The requirement to use TEDs in the commercial shrimp fleet of the U.S. and Mexico has greatly reduced the mortality of loggerhead turtles in shrimp trawls, however concerns remain regarding the ability of large subadult and adults to escape through currently authorized TEDs. NOAA Fisheries has proposed new regulations to address this problem. Loggerheads are also accidentally captured in non-shrimp trawls and efforts to reduce incidental capture in these fisheries are needed to enhance recovery.

- Loggerheads are taken by gillnet fisheries in the Atlantic, Gulf of Mexico, and Pacific. The exact number is not known, but is believed to be cumulatively significant and represents a serious threat to recovery.
- Several thousand commercial vessels and an extensive recreational fishery are involved in hook and line fishing for various coastal species. The capture of loggerheads in these fisheries is not uncommon, but the magnitude of the take is not known.
- The incidental capture of loggerheads in longline fishing operations has been documented and is considered a major threat to the species, worldwide. The U.S. longline fleets of the Atlantic and Pacific are known to incidentally capture hundreds of loggerheads annually. Foreign fleets operating in international waters and in their respective EEZ's collectively capture thousands more. Developing solutions to reduce and eliminate this threat is critically important to the survival of the species.
- Pound net fisheries are primarily a problem in Virginia waters, where turtles become entangled in the gear and can drown. In North Carolina and New York, loggerheads are usually released alive from pound nets.
- Traps, commonly used to capture crabs, whelks, lobster and reef fish result in incidental capture of loggerheads when they become entangled in the trap lines and/or traps and drown. The impact of trap gear on loggerhead populations has not been quantified. Scallop dredges pose an additional threat and also result in incidental capture and mortality.
- In areas where recreational boating, commercial fishing, and ship traffic are intense, propeller and collision injuries are common and likely play a significant role in hampering recovery. This is a particularly difficult issue to address, given the number of registered vessels and their wide-ranging activities.
- A disease, known as fibropapillomatosis (FP), originally identified in green turtles, but now affecting loggerhead, Kemp's ridley, and olive ridley turtles as well, has emerged as a serious threat to sea turtle recovery. FP is expressed as tumors which occur primarily on the skin and eyes, and the disease can be fatal. The cause of the disease remains unknown, however, a viral etiology is suspected. The disease has been documented in loggerheads from Florida and is of concern in Australian loggerheads as well. Research to determine the cause of this disease is a high priority and is underway at federal, state, and private institutions.
- Dredging can result in habitat destruction by degrading nesting sites and/or foraging grounds. Certain types of dredges are more likely to directly kill turtles. NOAA Fisheries has implemented restrictions on hopper dredging activities in the Gulf and Atlantic to reduce the likelihood of dredges encountering turtles.
- Loggerheads can consume a wide variety of marine debris such as plastic and styrofoam pieces, tar balls, balloons, plastic bags, and plastic pellets. Effects of

consumption include interference in metabolism or gut function, even at low levels of ingestion, as well as absorption of toxic byproducts. Discarded monofilament fishing line and abandoned netting can entangle turtles, causing injury and/or death.

- The Gulf of Mexico is an area of high density offshore oil extraction with chronic low-level spills and occasional massive spills. Important foraging grounds for loggerheads exist throughout the Gulf of Mexico and these sites are near major areas of near shore and offshore oil exploration and production. Important nesting beaches along the Gulf coast of Florida are also vulnerable and have been affected by oil spills. Proposals to dramatically increase oil exploration and production in the eastern Gulf of Mexico must be carefully considered in light of their potential to negatively affect loggerhead turtles.
- Coastal power plants which draw their cooling water from nearshore and estuaries waters can entrain sea turtles and cause mortality. Measures have been put in place at some plants to reduce the risk to sea turtles.
- Pesticides, heavy metals and PCB's have been detected in turtles and eggs, but the population level effects are unknown at this time.

Listed Species Status

Olive Ridley Turtle

Lepidochelys olivacea

Listing Date: 07/28/78



The olive ridley is listed as threatened throughout its range, except for the breeding populations on the Pacific coast of Mexico, which are listed as endangered. The International Union for the Conservation of Nature (IUCN) Red List has classified the species as “Endangered” which is assigned to taxon that are not critically endangered but are facing a very high risk of extinction in the near future. Since listing, there has been a decline in abundance, and it has been recommended that the olive ridley for the Western Atlantic be reclassified as endangered. The need for this classification is based on continued direct and incidental take, particularly in shrimp trawl nets. The western North Atlantic (Surinam and adjacent areas) nesting population has declined more than 80 percent since 1967. Declines are also documented for Playa Nancite, Costa Rica, however other nesting populations along the Pacific coast of Mexico and Costa Rica appear stable or increasing. In the Indian Ocean, Gahirmatha located in the Bhitarkanika Wildlife Sanctuary, India, supports perhaps the largest nesting population. During 1999-2000, over 700,000 olive ridleys nested at Nasi islands and Babubali island, in the Gahirmatha coast. This population continues to be threatened by nearshore trawl fisheries and, annually, thousands of dead olive ridleys are documented as strandings on coastal beaches.

Direct harvest of adults and eggs, incidental capture in commercial fisheries and loss of nesting habitat are main concerns regarding the recovery of the olive ridley. Major threats/impacts affecting this species are discussed further below.

Species Biology:

The olive ridley is the smallest living sea turtle, with an adult carapace length usually between 60-70 cm (24-28 in). They rarely weigh over 50 kg (110 lb). Olive ridleys are unique among extant turtles in having a variable, often asymmetrical, lateral scute count, ranging from five to nine plates on each side, but with six to eight being the most common. Adults are olive or grayish green above and creamy yellow below. Hatchlings are very dark gray to black.

Hatchlings and juveniles have serrated posterior marginals; these become smooth with age and the adult has a rounded carapace. Hatchlings weigh from 12.0 - 22.3 g (0.03 - 0.05 lb).

Olive ridleys nest in assemblages known as "arribadas". Although not every nesting female participates in these arribadas, the vast majority of them do. Arribadas may be precipitated by such climatic events as a strong offshore wind, or by certain phases of the moon and tide, but there is a major element of unpredictability at all arribada sites. Arribadas may be precipitated by such climatic events as a strong offshore wind, or by certain phases of the moon and tide, but there is a major element of unpredictability at all arribada sites. This unpredictability, and the apparent ability of gravid females to wait for weeks while holding fully-shelled eggs, may be an important aspect of the survival advantage of arribada-formation, a phenomenon usually interpreted as one that evolved as a predator-saturation device. Individual olive ridleys nest 1-3 three times per season, typically producing 100-110 eggs on each occasion. Sexual maturity is estimated to be reached between 8 and 10 years of age. The species leads a primarily pelagic existence and the diet includes crabs, shrimp, rock lobsters, jellyfish, and tunicates.

Distribution and Abundance:

In the Pacific, the range of the olive ridley is essentially tropical but surprisingly little is known of their oceanic distribution and critical foraging areas, despite being the most abundant of north Pacific sea turtles. Recent studies indicate that olive ridleys reside in oceanic habitats of the eastern Pacific Ocean during the non-reproductive portion of their life cycle. The post-nesting migration routes of olive ridleys, tracked via satellite from Costa Rica, traversed thousands of kilometers of deep oceanic waters ranging from Mexico to Peru and more than 3,000 kilometers out into the central Pacific. The species diet includes crabs, shrimp, rock lobsters, jellyfish, and tunicates. In some parts of the world, it has been reported that the principal food is algae.

Significant nesting assemblages were once found along the Pacific coast of Mexico, but in recent years the Mexican arribadas have been largely restricted to one site, La Escobilla in the state of Oaxaca. In Costa Rica, a major nesting aggregation is found at Ostional and smaller arribadas also occur in Nicaragua and at several localities in Panama. The olive ridley has been recorded occasionally from Galapagos waters, but it is essentially very rare throughout the islands of the Pacific, and indeed even in the western Pacific it is scarce, although widespread low-density nesting occurs. In the Indian Ocean, four arribada sites have been reported in the Indian State of Orissa, the most important being Gahirmatha Beach. Minor nesting occurs in Sri Lanka, Pakistan, Mozambique, Madagascar, peninsular Malaysia, and various other localities.

In the Atlantic Ocean, the olive ridley occurs widely, but probably not in great abundance, in waters of West Africa, from about Mauritania southward at least to the Congo. In the western Atlantic, nesting formerly occurred abundantly in eastern Surinam, as well as in western French Guiana and northwestern Guyana. Non-nesting individuals occur regularly as far west as Isla Margarita and Trinidad, but they rarely penetrate any further into the Caribbean. The species occurs in Brazil, and nests in the states of Bahia and Sergipe, but it seems to be rare.

Because of the continued existence of several large nesting populations in the Pacific and Indian Ocean, it is probable that the olive ridley is, in terms of absolute numbers of adult individuals in existence, the most abundant sea turtle species in the world. In the eastern Pacific, there is evidence of downward trends at several arribada beaches however, other nesting populations along the Pacific coast of Mexico and Costa Rica appear stable or increasing. In the Indian Ocean, Gahirmatha supports perhaps the largest nesting population however, the population continues to be threatened by incidental capture in by nearshore trawl fisheries. In the western Atlantic, there has been a decline in abundance of the nesting females (more than 80 percent since 1967), and this population may warrant reclassification as endangered.

Major Impacts/Threats in the Nesting Environment

- Uncontrolled harvest of adult females or their eggs for domestic or commercial use constitutes a widespread threat to the species.
- Directed harvest of olive ridleys on their foraging grounds is also a continuing threat.
- A variety of introduced predators or domestic animals (such as feral hogs and dogs) prey on olive ridley eggs and hatchlings.
- Increased human use of nesting beaches, the loss of nesting habitat to human activities (e.g. pig pens on beaches, beach camping and fires, an increase in litter and other refuse), constitute a continuing threat to recovery.
- Coastal construction can result in a loss of sea turtle nesting areas. This includes the construction of buildings and roads on and near the beach, sea walls and jetties (which can result in exacerbated beach erosion), clearing stabilizing beach vegetation, and the use of heavy construction equipment on the beach, which can cause sand compaction or beach erosion.
- Artificial lighting is a significant threat and causes disorientation of hatchlings and can also misorient or deter females from nesting. Artificial lighting interferes with the natural sea-finding behavior of hatchlings and can result in increased predation and mortality.

- Removal of sand for construction aggregate or renourishment of other beaches interferes with natural beach processes and can render nesting beaches unsuitable for nesting.

Major Impacts/Threats in the Marine Environment

- Directed take of olive ridleys for domestic or commercial use constitutes a widespread threat to this species in the Pacific Ocean.
- Olive ridleys are taken as bycatch in various fisheries. These include bottom trawls commonly used by shrimp vessels in the Gulf of California, and gillnets, traps, pound nets, haul seines and beach seines commonly used in inshore and coastal waters of Baja California.
- Longlines, trawls, purse seines, hook and line, and driftnets pose threats for olive ridleys in different areas of the Pacific. The use of trawls near nesting beaches is particularly problematic, when thousands of females converge to nest.
- The destruction or degradation of marine habitat is a threat to the recovery of all depleted sea turtle stocks.
- The entanglement in and ingestion of persistent marine debris is a threat to the species throughout its range.

Listed Species Status

Gulf Sturgeon:

Acipenser oxyrinchus

Listing Date: 09/30/91

NOAA Fisheries and US Fish and Wildlife Service (FWS) listed the Gulf sturgeon as a threatened species on September 30, 1991. NOAA Fisheries and FWS share jurisdiction for this species under the Endangered Species Act.

Species Biology:

The Gulf sturgeon, also known as the Gulf of Mexico sturgeon, is a subspecies of the Atlantic sturgeon. It is a large fish with an extended snout, vertical mouth, chin barbels, and with the upper lobe of the tail longer than the lower. Adults are 180 to 240 cm (71-95 inches) in length, with adult females larger than adult males. The skin is scaleless, brown dorsally and pale ventrally and imbedded with 5 rows of bony plates.

Adult fish are bottom feeders, eating primarily invertebrates, including brachiopods, insect larvae, mollusks, worms and crustaceans. Gulf sturgeon are anadromous, with reproduction occurring in fresh water. Most adult feeding takes place in the Gulf of Mexico and its estuaries. The fish return to breed in the river system in which they hatched. Spawning is believed to occur in areas of deep water with clean (rock and rubble) bottoms. The eggs are sticky and adhere in clumps to snags, outcroppings, or other clean surfaces. Sexual maturity is reached between the ages of 8 and 12 years for females and 7 and 10 years for males.

Distribution and Abundance:

Historically, the Gulf sturgeon occurred from the Mississippi River to Charlotte Harbor, Florida. It still occurs, at least occasionally, throughout this range, but in greatly reduced numbers. The fish is essentially confined to the Gulf of Mexico. River systems where the Gulf sturgeon are known to be viable today include the Mississippi, Pearl, Escambia, Yellow, Choctawhatchee, Appalachicola and Suwannee rivers.

Major Threats and Impacts:

As with sturgeon worldwide, dams have been a significant factor in the decline of the Gulf sturgeon. Three major rivers (the Pearl in Mississippi, the Alabama in Alabama, and the Apalachicola in Florida) within the range of the Gulf sturgeon have been dammed, preventing use of upstream areas for spawning. The Gulf sturgeon are unable to pass through dam and lock systems.

In addition to the structures preventing Gulf sturgeon from reaching spawning areas, dredging, desnagging, and spoil deposition carried out in connection with channel improvement and maintenance represent a threat to the Gulf sturgeon. Although exact spawning areas are not known for all river systems the Gulf sturgeon inhabit, indications are that submerged rock ledges and clean rock surfaces are important for spawning. Modification of such features, especially in rivers in which upstream migration is limited by dams, could further jeopardize the reduced stocks of the Gulf sturgeon.

Conservation and Recovery Efforts:

A Recovery and Management Plan for Gulf sturgeon was completed in September 1995. Genetic analyses of Gulf sturgeon indicate the population is divided into five genetically distinct stocks, each occupying a unique watershed or geographical unit. In November, 1998, FWS published a special rule to protect Gulf sturgeon. The rule includes prohibiting take and possession of the species. Also, Gulf sturgeon spawning and resting habitat have been documented and characterized in three river systems. Population surveys and freshwater and marine movement and migratory behavior have been studied in six watersheds. In addition, Gulf sturgeon outreach activities have contributed much toward public education.

Listed Species Status

Shortnose Sturgeon

Acipenser brevirostrum



Listing Date: 03/11/67

The shortnose sturgeon was listed as endangered throughout its range on March 11, 1967. It is an anadromous fish that spawns in the coastal rivers along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida. It prefers the nearshore marine, estuaries and riverine habitat of large river systems. Shortnose sturgeon, unlike other anadromous species in the region such as shad or salmon, do not appear to make long distance offshore migrations.

No estimate of the historical population size of shortnose sturgeon is available. While the shortnose sturgeon was rarely the target of a commercial fishery, it often was taken incidentally in the commercial fishery for Atlantic sturgeon. In the 1950s, sturgeon fisheries declined on the east coast which resulted in a lack of records of shortnose sturgeon. This led the Fish and Wildlife Service (FWS) to conclude that the fish had been eliminated from the rivers in its historic range (except the Hudson River) and was in danger of extinction. FWS believed the population level of the shortnose sturgeon had declined because of pollution and overfishing, both directly and incidentally in shad gillnets.

Species Biology:

The sturgeon family is among the most primitive of the bony fishes. The shortnose sturgeon shares the same general external morphology of all sturgeon. Its elongated fusiform body is moderately depressed, and its protractable subterminal mouth with barbels is well suited for bottom feeding and a generally benthic existence. The body surface contains five rows of bony plates or scutes. Shortnose sturgeon are large, long-lived fish that inhabit a great diversity of riverine habitat. Shortnose sturgeon are found from the fast-moving freshwater riverine environment downstream and, into the offshore marine environment of the continental shelf.

The shortnose sturgeon is the smallest of the three sturgeon species that occur in eastern North America, having a maximum known total length of 143 cm and weight of 23 kg. Growth rate and maximum size vary with latitude, with the fastest growth occurring among southern populations. Maximum known age is 67 years for females, but males seldom exceed 30 years

of age. Sex ratio among young adults is 1:1 but changes to a predominance of females (4:1) for fish larger than 90 cm fork length.

Males and females mature at the same length (45 to 55 cm fork length) throughout their range. However, age of maturation varies from north to south due to a slower growth rate in the north. Males may mature at 2 to 3 years of age in Georgia, at age 3 to 5 from South Carolina to New York, and at age 10 to 11 in the St. John River, Canada. Females exhibit a similar trend and mature at age 6 or younger in Georgia, at age 6 to 7 from South Carolina to New York, and at age 13 in the St. John River. Age of first spawning in males occurs 1 to 2 years after maturity, but among females is delayed for up to 5 years. Approximate age of a female at first spawning is 15 years in the St. John River, 11 years in the Hudson and Delaware Rivers, 7 to 14 years in the South Carolina rivers, and 6 years or less in the Altamaha River, Georgia. Generally, females spawn every three years, although males may spawn every year.

Shortnose sturgeon are benthic feeders. Juveniles are believed to feed on benthic insects and crustaceans. Molluscs and large crustaceans are the primary food of adult shortnose sturgeon.

Distribution and Abundance:

The shortnose sturgeon is anadromous, living mainly in the slower moving riverine waters or nearshore marine waters, and migrating periodically into faster moving fresh water areas to spawn. One partially landlocked population is known in the Holyoke Pool, Connecticut River, and another landlocked group may exist in Lake Marion on the Santee River in South Carolina.

Shortnose sturgeon occur in most major river systems along the eastern seaboard of the United States. In the southern portion of the range, they are found in the St. Johns River in Florida; the Altamaha, Ogeechee, and Savannah Rivers in Georgia; and, in South Carolina, the river systems that empty into Winyah Bay and the Santee/Cooper River complex that forms Lake Marion. Data are lacking for the rivers of North Carolina. In the northern portion of the range, shortnose sturgeon are found in the Chesapeake Bay system, Delaware River from Philadelphia, Pennsylvania to Trenton, New Jersey; the Hudson River in New York; the Connecticut River; the lower Merrimack River in Massachusetts and the Piscataqua River in New Hampshire; the Kennebec River in Maine; and the St. John River in New Brunswick, Canada.

Major Threats and Impacts:

Construction of dams and pollution of many large northeastern river systems during the period of industrial growth in the late 1800's and early 1900's may have 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.

Commercial exploitation of shortnose sturgeon occurred throughout its range starting in colonial times and continued periodically into the 1950's.

Conservation and Recovery Activities:

Placing the species on the endangered species list resulted in a great deal of research on the species in the northern river systems. NOAA Fisheries published a recovery plan in December 1998 outlining actions that need to be taken in order to recover the species including: a rangewide genetic assessment; determination of endangered and threatened population size thresholds; status reviews for each of the individual rivers that shortnose sturgeon inhabit and ensuring that actions taken by Federal agency do not jeopardize the survival of shortnose sturgeon.

Listed Species Status

White Abalone

Haliotes sorenseni

Proposed Endangered

Date: May 5, 2000



The white abalone is the only mollusk currently on the NOAA Fisheries candidate species list. It was added in 1997 for the California region south to Baja California, Mexico.

Species Biology:

The white abalone is a herbivorous, marine, rocky benthic, broadcast spawning gastropod. The epipodium is tan and looks pebbly. The bottom of its foot is orange. The shell is oval-shaped, very thin and deep. They can be up to 254 mm (10 in), but are usually 127-203.2 mm (5-8 in). If fertilized, the eggs hatch after only one day, but high concentrations of sperm are required in order for an egg to be fertilized. Therefore, aggregations of adults are necessary for successful fertilization to occur. Young abalone feed on benthic diatoms, bacterial films, and single cell algae on coralline algal substrate (Cox, 1962). When the abalone reach 75-100 mm (3.0-3.9 in), they emerge to feed on drifting algae and brown algae.

Distribution & Abundance:

The white abalone dwells in deep waters - 24.38 to over 60.96 m (80-200 ft) from Point Conception (southern California) southward to Baja California. Because of its depth range, this abalone was only described scientifically in 1940. It lives on rocky substratum such as pinnacles, rock piles, and deep reefs. Once occurring in numbers as high as 1 per square meter of suitable habitat, they now can be found only occasionally. Recent surveys found that densities average 1 per hectare in the Channel Islands of southern California. The population is estimated to be less than 2,600.

Major Threats and Impacts:

A short lived commercial fishery began in the early 1970s, peaked mid-decade and collapsed in the 1980s. Only occasional landings occurred after that time. It was also sought after by recreational divers, but actual landings are unknown. Recent studies suggest that this species has likely suffered reproductive failure resulting from severe over-harvest. Regulations on harvesting of abalone were instated in the 1970s, including establishing minimum size limits, limiting harvest during the spawning season, and increasing diver fees. However, these regulations proved inadequate to stop the decline of the white abalone population, so the fishery was closed in 1996. White abalone is highly valued in both domestic and foreign markets, and poaching remains a significant threat to the survival of the species.

Currently, the white abalone are frequently found alone, and have little chance for successful fertilization. Because populations are only small fractions of former numbers, recovery may be complicated by low genetic diversity within the species. Abalones are also vulnerable to various infections and diseases, particularly withering syndrome which affects the digestive glands. Other problems include bleeding to death because their blood is unable to clot, and fouling of their gills with sediments which suffocates them. Recent El Nino events have resulted in reduced food supply for white abalone, so competition for food may also have contributed to the species decline.

Conservation & Recovery Efforts:

In August 1998, NOAA Fisheries initiated a status review of the biological status of white abalone. A petition from the Center for Biological Diversity to list the white abalone as endangered and designate critical habitat was received on April 29, 1999 and a subsequent petition from the Marine Conservation Biology Institute was received on May 15, 1999. A finding that the petition action is warranted was published in the Federal Register on September 24, 1999 (64 FR 51725). NOAA Fisheries completed its status review of the species in March of 2000, and that document is available from our website. NOAA Fisheries published a proposed rule to list the white abalone as endangered on May 5, 2000 (65 FR 26167). Comments were accepted until July 5, 2000.

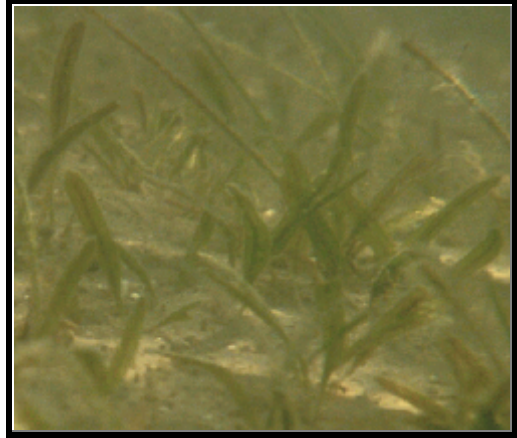
Aside from NOAA Fisheries' proactive conservation activities, there are numerous groups, both in the United States and internationally, doing work to gather more information and build programs to help save the white abalone. Some of these active groups include the Channel Islands National Park Service and the California Department of Fish and Game. These groups assess abalone populations and conduct research into the basic biology, disease pathology and ecology of abalones. If the white abalone is eventually listed under the ESA, NOAA Fisheries will assemble a recovery team to develop a recovery plan for this species.

Listed Species Status

Johnson's Sea Grass

Halophila johnsonii

Listing Date: September 14, 1998



Johnson's seagrass has a very limited distribution and it is one of the least abundant seagrasses within its range. The species is only known to reproduce asexually and may be limited in distribution because of this characteristic. It plays a major role in the viability of benthic resources and has been documented as a food source for endangered West Indian manatees and threatened green turtles. NOAA Fisheries is continuing to conduct ecological research on the species to better understand its life history and to use in conservation decisions affecting the seagrass ecosystems.

Species Biology:

Identifying characteristics of Johnson's seagrass include smooth marginated, spatulate foliage leaves in pairs 0.5-2.5 cm long, a creeping rhizome with petioles, sessile (attached to their bases) female flowers, and longnecked fruits. The male flowers are unknown. Outstanding differences between Johnson's seagrass and other similar species are its distinct asexual reproductive characteristics and leaf morphology.

Distribution and Abundance:

Johnson's seagrass is found in disjunct and patchy distribution along the east coast of Florida from central Biscayne Bay to Sebastian Inlet. The largest patches have been documented inside Lake Worth Inlet. The southernmost distribution is reported to be in the vicinity of Virginia Key in Biscayne Bay. The species has been found in coarse sand and muddy substrates and in areas of turbid waters and high tidal currents.

Major Threats and Impacts:

Johnson's seagrass is the rarest species of its genus, has limited distributional characteristics, restricted reproductive capacity (being asexual), and is dependent on substrate stability. Potential for continued existence and recovery may be limited due to habitat alteration by a number of human and natural perturbations. Such perturbations include (1) prop scoring, (2) dredging, (3) storm action, (4) siltation and (5) altered water quality.

Alteration and subsequent destruction of the benthic community due to boating activities, propeller scoring and anchor mooring has been observed in Johnson's seagrass sites. Such activities result in breaking root systems, severing rhizomes and significantly reducing the physical stability of this ecosystem. Dredging redistributes sediments, buries plants and destroys bottom topography. Some abundant populations are located in close proximity to inlets, and are likely to experience erosional forces and siltation associated with severe storms. During hurricanes, storm surge may scour and redistribute sediments, thereby eroding or burying existing populations.

Siltation due to human disturbance and increased land-use can also threaten viability of the species. Degradation of water quality due to human impact is also a threat to the viability of ecologically important seagrass communities. Nutrient over enrichment, caused by inorganic and organic nitrogen and phosphorus loading via urban and agricultural land run-off, can stimulate increased algal growth that may smother Johnson's seagrass by shading rooted vegetation and diminishing the oxygen content of the water.

Conservation and Recovery Efforts:

Designation of critical habitat was initially proposed on August 4, 1994 (59 FR 39716). A public hearing on both the proposed listing and critical habitat designation was held in September, 1994, and the public comment period was reopened. In December, 1999, NOAA Fisheries published a revised proposed critical habitat designation in the Federal Register. The final critical habitat designation was published on April 5, 2000. On June 26, 2000 (65 FR 39369), NOAA Fisheries published a notice of availability for the draft recovery plan for Johnson's seagrass. The final recovery plan is expected to be published soon.

Listed Species Status

Atlantic Salmon

Salmo salar



Proposed Endangered

Listing Date: November 17, 1999

NOAA Fisheries and the U.S. Fish and Wildlife Services (the Services) identified eight rivers in the state of Maine as home to a distinct population segment (DPS) of Atlantic salmon (Gulf of Maine DPS of Atlantic salmon). The Services published a proposed rule to list the DPS as endangered under the Endangered Species Act (ESA) on November 17, 1999. A final determination is expected in late 2000. The proposed listing has been controversial, with significant public support as well as opposition.

The Gulf of Maine DPS comprises Atlantic salmon spawning naturally in the Sheepscot, Ducktrap, Narraguagus, Pleasant, Machias, East Machias, and Dennys rivers and Cove Brook, a tributary to the Penobscot River. If other naturally reproducing salmon with historical, river specific characteristics are identified, the Services may add them to this DPS after a rulemaking process. The area within which populations meeting these criteria for addition to the DPS would most likely be found is from the Kennebec River north to, but not including, the St. Croix River.

The Services had previously proposed listing Atlantic salmon in Maine as threatened under the ESA on September 29, 1995. In December 1997 the Services withdrew the proposed rule to list, in part because of the state of Maine's Conservation Plan for Atlantic Salmon in Maine. In early 1999, the state of Maine submitted its Annual Report of the implementation of the Conservation Plan, and the Services provided comments on it, highlighting some areas that could be improved. The state submitted the final report to the Services. In July 1999, the Biological Review Team (BRT) updated the Atlantic Salmon status review, noting accomplishments and protected measures that are in place, but also considering all other available information. The updated Status Review contained the statement "The fact remains, however, that under current circumstances, it is the opinion of the BRT that the Gulf of Maine DPS of Atlantic salmon is in danger of extinction." Subsequent changes in the level of threats

posed to salmon (notably the discovery of new and potentially lethal disease threats) and the state's failure to fully fund and support risk mitigation measures in its conservation plan led to an updated status review. There were greater concerns regarding freshwater survival and smolt outmigration, habitat degradation (including water withdrawal and sedimentation), and aquaculture than were known and analyzed in the 1995 Status Review. As a result, the Services published a proposed rule to list the DPS as endangered on November 17, 1999.

The Services were sued by Defenders of Wildlife, et al. and Trout Unlimited, et al. Both complaints had two claims: 1) the Services' withdrawal of the listing proposal in 1997 was arbitrary and capricious and in violation of the ESA; and 2) the Services' refusal to list the DPS as endangered on an emergency basis is arbitrary and capricious and in violation of the ESA.

The Governor of Maine opposed the listing of Atlantic salmon, criticizing the genetic data used by the Services as part of the information supporting the delineation of the Gulf of Maine DPS. Regardless of whether the state challenges the listing determination, the Services have committed to review the findings of the National Academy of Sciences' study when available, and make appropriate changes to the listing determination.

If the Gulf of Maine DPS is listed under the ESA, the Services would write a federal recovery plan. The Services would use the State of Maine's Conservation Plan as a basis for the recovery plan, adding other tasks that are deemed necessary for recovery.

Maine is a leader in production and sales of aquacultured Atlantic salmon. In addition to contesting the listing, the State has criticized the efforts of NOAA Fisheries to work with it and the industry on environmentally sound aquaculture practices. The Services are continuing to work with the industry and have made some progress.

Species Biology:

Anadromous Atlantic salmon have a relatively complex life history that extends from spawning and juvenile rearing in freshwater rivers to extensive feeding migration in the high seas. Adult Atlantic salmon ascend the rivers of New England beginning in spring, a migration that peaks in June and continues into the fall. Juvenile salmon feed and grow in the rivers from one to three years before undergoing smoltification and migrating to the ocean. Atlantic salmon of U.S. origin are highly migratory, undertaking long marine migrations between the mouths of U.S. rivers and the northwest Atlantic Ocean where they are widely distributed seasonally over much of the region. Most Atlantic salmon of U.S. origin spend two winters in the ocean before returning to freshwater to spawn. Those that return after only one year are called grilse.

Species Determination

The Services published a policy on the definition of a distinct population segment in April 1996. The policy states that a vertebrate population can be considered a species under the ESA if it is discrete and significant. The Services determined that Atlantic salmon populations in these eight rivers are, as a group, reproductively isolated from those in Canada and from southern U.S. populations, and are therefore discrete. A critical factor in determining the significance of the river populations of U.S. Atlantic salmon was the continuous persistence of a substantial component of native stock reproduction. The continuous presence of U.S. Atlantic salmon in indigenous habitat provides evidence that important local adaptations have persisted.

Distribution and Abundance:

The populations of anadromous Atlantic salmon present in the Gulf of Maine Distinct Population Segment represent the last wild remnant of U.S. Atlantic salmon. Restoration efforts for Atlantic salmon are ongoing in other watersheds where the locally-adapted stocks have been extirpated.

The original range of Atlantic salmon in the United States was from the Housatonic River in Connecticut, north to U.S. tributaries of the St. John River in New Brunswick, Canada. The historic Atlantic salmon run in the United States has been estimated to have approached 500,000 fish. The species began to disappear from U.S. rivers 150 years ago and currently, only remnant populations occur in a limited number of rivers in Maine. Throughout the past 24 years, the Dennys and Narraguagus rivers have had returns that averaged 20 percent of the escapement goal, and the Pleasant, Sheepscot, and Manchias rivers have had returns that averaged between 10 and 12 percent of the escapement goals. However, recent downward trends in abundance have put most of these seven rivers at less than 10 percent of their respective escapement goals.

Major Threats and Impacts:

The construction of hydropower dams with either inefficient or non-existent fishways was a major cause for the decline of U.S. Atlantic salmon. Dams adversely impact Atlantic salmon by impeding both their upstream and downstream migration, increasing predation, altering the chemistry and flow pattern of rivers, increasing water temperature, and reducing available flow downstream. Currently there are no hydropower dams on the seven rivers that have the potential to adversely impact the species. Beaver and debris dams have been documented on these rivers and may partially obstruct passage.

One of the predominant land uses of the central and northern coastal Maine watersheds is the growth and harvest of forest products. Forest management practices can cause numerous short- and long-term negative impacts to Atlantic salmon, including siltation, shade reduction, and increased water temperature. Another significant land use in eastern Maine watersheds is lowbush blueberry agriculture. In addition, interest in cranberry cultivation is increasing . These agricultural activities can impact Atlantic salmon through water extractions and diversions and pesticide application. Currently regulatory mechanisms are in place such that forest practices and agricultural practices are not considered a major threat to Atlantic salmon.

Historically, the marine exploitation of U.S. origin Atlantic salmon occurred primarily in foreign fisheries. U.S. origin Atlantic salmon have been documented in the harvests of West Greenland, New Brunswick, Nova Scotia, Newfoundland, and Labrador. The United States is a party to the North Atlantic Salmon Conservation Organization (NASCO) which was formed for the purpose of managing salmon through a cooperative program of conservation, restoration and enhancement of North Atlantic stocks. Since 1987 there has been a Fishery Management Plan in place which prohibits the possession of Atlantic salmon in the Exclusive Economic Zone. The state of Maine has closed the recreational fishery for Atlantic salmon in all Maine rivers accessible to anadromous salmon.

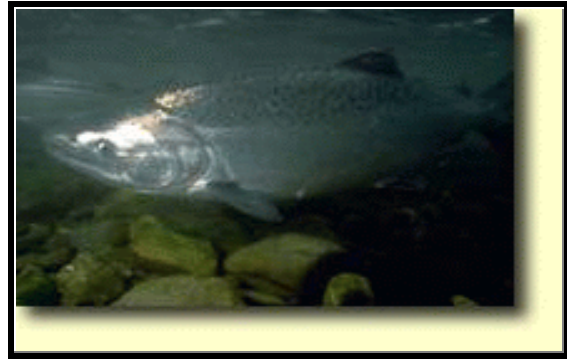
Aquaculture facilities raising Atlantic salmon in net pens are located within 20 km of the mouths of five of the rivers within the DPS. Atlantic salmon that have escaped from aquaculture pens are known to have entered some of these rivers. The escape of fish from Atlantic salmon aquaculture operations could pose a threat to the genetic integrity of Atlantic salmon within the DPS. In addition, concentrations of aquaculture salmon could increase the vulnerability of wild stocks to disease.

Scientific evidence suggests that low natural survival in the marine environment is a major factor contributing to the decline of Atlantic salmon throughout North America. It appears that survival of the North American stock complex of Atlantic salmon is at least partly explained by sea surface water temperature during the period when Atlantic salmon are concentrated in winter months in habitat at the mouth of the Labrador Sea and east of Greenland.

Listed Species Status

Chinook Salmon

Oncorhynchus tshawytscha



Along the U.S. West Coast, there are 17 distinct groups, or Evolutionarily Significant Units (ESUs), of chinook salmon, from southern California to the Canadian border and east to the Rocky Mountains. An ESU is a distinctive group or a "distinct population segment" as defined under the ESA (56 FR 58612; November 20, 1991). Snake River spring/summer chinook and Snake River fall chinook were listed as threatened species in 1992. In 1994, Sacramento River winter-run chinook were listed as endangered. In March 1999, 3 ESUs were listed as threatened, 1 ESU were listed as endangered, and the Snake River fall-run ESU ranged extension along with 2 other ESU listing determinations were extended for 6 months due to scientific uncertainty regarding their status. In September 1999, 2 ESUs were listed as threatened and the range extension was found not warranted. Details about these ESUs are summarized below.

Species Biology:

Chinook salmon belong to the family Salmonidae and are one of eight species of Pacific salmonids in the genus *Oncorhynchus*. Chinook salmon are easily the largest of any salmon, with adults often exceeding 40 pounds; individuals over 120 pounds have been reported. Chinook salmon are very similar to coho salmon in appearance while at sea (blue-green back with silver flanks), except for their large size, small black spots on both lobes of the tail, and black pigment along the base of the teeth. Chinook salmon are anadromous (adults migrate from a marine environment into the fresh water streams and rivers of their birth) and semelparous (spawn only once and then die).

Chinook salmon stocks exhibit considerable variability in size and age of maturation, and at least some portion of this variation is genetically determined. The relationship between size and length of migration may also reflect the earlier timing of river entry and the cessation of feeding for chinook salmon stocks that migrate to the upper reaches of river systems. Body size, which is correlated with age, may be an important factor in migration and redd construction success. Roni and Quinn (1995) reported that under high density conditions on the spawning ground, natural selection may produce stocks with exceptionally large-sized returning adults.

There are different seasonal “runs” (i.e., spring, summer, fall, or winter) or modes in the migration of chinook salmon from the ocean to freshwater. These runs have been identified on the basis of when adult chinook salmon enter freshwater to begin their spawning migration. However, distinct runs also differ in the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and their actual time of spawning. Freshwater entry and spawning timing are believed to be related to local temperature and water flow regimes.

Adult female chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth and velocity. The adult female chinook may deposit eggs in 4 to 5 “nesting pockets” within a single redd. After laying eggs in a redd, adult chinook will guard the redd from 4 to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Eggs are deposited at a time to ensure that young salmon fry emerge during the following spring when the river or estuary productivity is sufficient for juvenile survival and growth. Juvenile chinook may spend from 3 months to 2 years in freshwater after emergence and before migrating to estuaries areas as smolts, and then into the ocean to feed and mature. Coastwide, chinook salmon remain at sea for 1 to 6 years (more commonly 2 to 4 years), with the exception of a small proportion of yearling males (called jack salmon) which mature in freshwater or return after 2 or 3 months in salt water.

Among chinook salmon, two distinct races have evolved. One race, described as a “stream-type” chinook, is found most commonly in headwater streams. Stream-type chinook salmon have a longer freshwater residency, and perform extensive offshore migrations before returning to their natal streams in the spring or summer months. Stream-type juveniles are much more dependent on freshwater stream ecosystems because of their extended residence in these areas. A stream-type life history may be adapted to areas that are more consistently productive and less susceptible to dramatic changes in water flow. At the time of saltwater entry, stream-type (yearling) smolts are much larger, averaging 73-134 mm depending on the river system, than their ocean-type (subyearling) counterparts and are therefore able to move offshore relatively quickly. Stream-type chinook salmon are found migrating far from the coast in the central North Pacific.

The second race is called the “ocean-type” chinook, which is commonly found in coastal streams in North America. Ocean-type chinook typically migrate to sea within the first three months of emergence, but they may spend up to a year in freshwater prior to emigration. They also spend their ocean life in coastal waters. Ocean-type chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate. Ocean-type chinook salmon tend to utilize estuaries and coastal areas more extensively for juvenile rearing. The development of the ocean-type life history strategy may have been a response to the limited carrying capacity of smaller stream systems and unproductive watersheds, or a means of avoiding the impact of

seasonal floods. Ocean-type chinook salmon tend to migrate along the coast. Populations of chinook salmon south of the Columbia River drainage appear to consist predominantly of ocean-type fish.

Distribution and Abundance:

Chinook salmon are found from the Bering Strait south to Southern California. Historically, they ranged as far south as the Ventura River, California.

Major Threats and Impacts:

See section entitled "Major Threats and Impacts to Pacific Salmonids" as well as more specific information under each ESU summary.

ESU Status

ESU Name	Status	Listing Date	Historical Abundance	Current Natural Abundance	Critical Habitat
Central Valley California, spring-run	Threatened⁶	9/1999	~39,000 in 1940's	~11,000 in 2000	Designated
Snake River fall- run	Threatened⁷	4/1992	~72,000 in 1940s	~570 in 2000	Designated
Sacramento River Winter-run	Endangered	1/1994	~86,500 in 1960s	~5,500 expected in 2001	Designated
Snake River Spring/Summer- run	Threatened	4/1992	~125,000 in 1950s	~3,300 in 1999	Designated

⁶ The Central Valley California spring-run ESU was proposed as endangered on March 9, 1998, but was designated as a threatened species on September 16, 1999, due to new information on abundance received during the public comment period.

⁷ In March 1998 a range extension was proposed for threatened Snake River fall-run ESU. The determination for the range extension was extended for 6 months due to scientific uncertainty regarding the population to be included in the fall-run ESU. In September 1999 the range extension was found not warranted.

Central Valley, fall/late fall-run	Candidate⁸	9/1999	300,000 in 1960s	200,000	N/A
California Coastal	Threatened⁹	9/1999	73,000 in 1960s	probably <5000	Designated
Puget Sound	Threatened	3/1999	670,000 in 1908	36,000 in 2000	Designated
Lower Columbia River	Threatened	3/1999	~75,000 in 1950s	<10,000	Designated
Upper Willamette River	Threatened	3/1999	~300,000 in 1920s	~1,500 in 1999	Designated
Upper Columbia River, Spring-run	Endangered	3/1999	~2,000 in 1930s	~500 (1994-1998 estimate)	Designated

⁸ The Central Valley California, fall/late fall-run were proposed as threatened on March 9, 1998, but was retained as a candidate species on September 16, 1999, due to new information received during the public comment period .

⁹ The Southern Oregon & California Coast ESU was proposed on March 9, 1998, but was subsequently split into 2 separate ESUs due to new information received during the public comment period (California coastal and Southern Oregon ESU listed as threatened and the Northern California Coastal ESU determined not warranted for listing).

Population Name: *Central Valley, California, Spring-run*

Species Status: Threatened

Trend: Declining

Estimate: Historical abundance: 39,000 in 1940s. Current abundance: 11,000 in 2000.

ESU Distribution/Description:

This ESU encompasses all naturally spawned populations of spring-run chinook salmon in the Sacramento River Basin, and its tributaries in California. This ESU includes chinook salmon entering the Sacramento River from March to July and spawning from late August through early October, with a peak in September. Spring-run fish in the Sacramento River exhibit an ocean-type life history, emigrating as fry, subyearlings, and yearlings.

Critical Habitat:

Critical habitat was designated for this ESU in March 2000. Critical habitat includes all river reaches accessible to chinook salmon in the Sacramento River and its tributaries in California, all river reaches and estuaries areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

Habitat problems are the most important source of ongoing risk to this ESU. Spring-run fish cannot access most of their historical spawning and rearing habitat in the Sacramento and San Joaquin River Basins (which is now above impassable dams), and current spawning is restricted to the mainstem and a few river tributaries in the Sacramento River. The remaining spawning habitat accessible to fish is severely degraded. Collectively, these habitat problems greatly reduce the resiliency of this ESU to respond to additional stresses in the future. The general degradation of conditions in the Sacramento River Basin (including elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, entrainment of migrating fish into unscreened or poorly screened diversions, and the poor quality and quantity of remaining habitat) has severely impacted important juvenile rearing habitat and migration corridors.

There is also serious concern for threats to genetic integrity posed by hatchery programs in the Central Valley. Most of the spring-run chinook salmon production in the Central Valley is of hatchery origin, and naturally spawning populations may be interbreeding with both fall/late fall- and spring-run hatchery fish. In addition, hatchery strays are considered to be an increasing problem due to the management practice of releasing a larger proportion of fish into the Sacramento River delta and San Francisco Bay to avoid adverse river conditions.

Population Name: *Central Valley, California, fall/late fall-run*

Species Status: Candidate

Trend: Mixed; long term trends generally stable

Estimate: Historical abundance: 300,000 in 1960s. Current abundance: Average recent natural escapement above 200,000

ESU Distribution/Description:

This ESU encompasses all naturally spawned populations of chinook salmon in the Sacramento and San Joaquin River Basins and their tributaries, east of Carquinez Strait, California. Fall and late-fall chinook salmon enter the Sacramento and San Joaquin Rivers from July through April and spawn from October through February. Both runs are ocean-type chinook salmon, emigrating predominantly as fry and subyearlings and remaining off the California coast during their ocean migration.

Critical Habitat:

Critical habitat was proposed for this ESU in March 1998, but was not designated because this ESU was retained as a candidate species.

Major Impacts:

A large proportion of the historic range of this ESU is severely degraded. Since most of fall/late fall-run spawning habitat is below dams, habitat blockage is not as severe for fall/late fall-run chinook as it is for winter- and spring-run chinook salmon in this region. However, there has been a severe degradation of the remaining habitat, especially due to agricultural and municipal water use activities in the Central Valley (which result in point and non-point pollution, elevated water temperatures, diminished flows, and smolt and adult entrainment into poorly screened or unscreened diversions). Additionally, stray rates are high because many hatchery fish are released into the Sacramento River delta and San Francisco Bay to avoid adverse river conditions, resulting in a much larger proportion of hatchery chinook salmon present in the natural spawning population.

A mitigating factor for the overall risk to the ESU is that a few of the Sacramento and San Joaquin River Basin tributaries have shown recent, short-term increases in abundance. Total population abundance in this ESU is relatively high, perhaps near historical levels, however, the streams supporting natural runs considered to be the least influenced by hatchery fish have the lowest abundance and the most consistently negative trends of all populations in the ESU. In general, high hatchery production combined with infrequent monitoring of natural production make assessing the sustainability of natural production problematic, resulting in substantial uncertainty in assessing the status of this ESU.

Another concern facing chinook salmon in this ESU is the high ocean and freshwater harvest rates in recent years, which may be higher than is sustainable by natural populations given the productivity of the ESU under present habitat conditions. The mixed stock ocean salmon fisheries off California are managed to achieve certain spawning escapement goals for two main indicator stocks: Sacramento River fall chinook and Klamath River fall chinook. Since 1993, the need to address Indian fishing rights in the Klamath River Basin has required significant reductions in the ocean harvest rate on Klamath River fall chinook. The ocean harvest rates are currently 71-79 percent and recent freshwater harvest is 25 percent.

Population Name: *California Coastal*

Species Status: Threatened

Trend: No Trend data

Estimate: Historical abundance approximately 73,000 in 1960s. Current abundance: probably <5,000

ESU Distribution/Description:

This ESU includes all naturally spawned populations of chinook salmon from Redwood Creek (Humboldt County, California) through the Russian River (Sonoma County, California).

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches and estuaries areas accessible to listed chinook salmon from Redwood Creek (Humboldt County, California) to the Russian River (Sonoma County, California), inclusive. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

Habitat loss and/or degradation is widespread throughout the range of the ESU. Habitat blockages and fragmentation, logging and agricultural activities, urbanization, and water withdrawals are reported as the most predominant problems for anadromous salmonids in California's coastal basins. Such problems also occur in Oregon streams within the ESU. The Rogue River Basin, in particular, has been affected by mining activities and unscreened irrigation diversions in addition to the problems resulting from logging and dam construction. Approximately one-third of spring chinook salmon spawning habitat in the Rogue River was inaccessible following the construction of Lost Creek Dam - River Kilometer (Rkm) 253 in 1977. Recent major flood events (February 1996 and January 1997) have probably affected habitat quality and survival of juveniles within this ESU.

Artificial propagation programs in this ESU are less extensive than those in other ESUs.- Current hatchery contribution to overall abundance is relatively low except for the Rogue River spring-run. The hatchery-to-total run ratio of Rogue River spring chinook salmon, as measured at Gold Ray Dam (Rkm 201), has exceeded 60% in some years.

Population Name: *Sacramento winter-run*

Species Status: Endangered

Trend: Declining

Estimate: Historical abundance: approximately 86,500 in 1960s. Current abundance: approximately 5,500 expected in 2001.

ESU Distribution/Description:

This ESU includes populations of winter-run chinook salmon in the Sacramento River and its tributaries in California.

Critical Habitat:

Critical habitat was designated on June 16, 1993. Critical habitat is designated to include the Sacramento River from Keswick Dam, Shasta County (River Mile 302) to Chipps Island (River Mile 0) at the westward margin of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 9,329 square miles in California. The following counties lie partially or wholly within these basins: Butte, Colusa, Contra Costa, Glenn, Napa, Nevada, Placer, Plumas, Sacramento, Shasta, Solano, Sutter, Tehama, Trinity, Yolo, and Yuba.

Major Impacts:

Historically the winter run was abundant and comprised populations in the McCloud, Pit, Little Sacramento, and Calaveras Rivers. Construction of Shasta Dam in the 1940s eliminated access to all of the historic spawning habitat for winter-run chinook salmon in the Sacramento River Basin. Since then, the ESU has been reduced to a single spawning population confined to the mainstem Sacramento River below Keswick Dam. The fact that this ESU is comprised of a single population with very limited spawning and rearing habitat increases risk of extinction due to local catastrophe or poor environmental conditions. There are no other natural populations in the ESU to buffer it from natural fluctuations.

Population Name: *Puget Sound*

Species Status: Threatened

Trend: Mixed

Estimate: Historical abundance: 670,000 in 1908. Current abundance: 36,000 in 2000.

ESU Distribution/Description:

This ESU encompasses all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. Chinook salmon in this area all exhibit an ocean-type life history.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all marine, estuaries and river reaches accessible to listed chinook salmon in Puget Sound. Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait, and the Strait of Juan De Fuca to a straight line extending north from the west end of Freshwater Bay, inclusive. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

Habitat throughout the ESU has been blocked or degraded. In general, upper tributaries have been impacted by forest practices and lower tributaries and mainstem rivers have been impacted by agriculture and/or urbanization. Diking for flood control, draining and filling of freshwater and estuaries wetlands, and sedimentation due to forest practices and urban development are problems throughout the ESU. Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in several basins.

Nearly 2 billion fish have been released into Puget Sound tributaries since the 1950s. The preponderance of hatchery production throughout the ESU may mask trends in natural populations and makes it difficult to determine whether they are self-sustaining. This difficulty is compounded by the dearth of data pertaining to proportion of naturally-spawning fish that are of hatchery origin.

Harvest impacts on Puget Sound chinook salmon stocks are quite high. Ocean exploitation rates on natural stocks averaged 56-59%; overall harvest rates average 68-83% (1982-89). Total exploitation rates on some stocks have exceeded 90%.

Population Name: *Lower Columbia River*

Species Status: Threatened

Trend: No trend data

Estimate: Historical abundance: 75,000 in 1950s. Current abundance: probably <10,000.

ESU Distribution/Description:

This ESU encompasses all naturally spawned populations of chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon exclusive of spring-run chinook salmon in the Clackamas River. Populations in this ESU are considered ocean type.

Critical Habitat:

Critical habitat was designated for this ESU in February 2000. Critical habitat is designated to include all river reaches accessible to listed chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are river reaches and estuaries areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Dalles Dam. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

All basins are affected (to varying degrees) by habitat degradation. Major habitat problems are primarily related to blockages, forest practices, urbanization in the Portland and Vancouver areas, and agriculture in floodplains and low-gradient tributaries.

Hatchery programs to enhance chinook salmon fisheries abundance in the lower Columbia River began in the 1870s, expanded rapidly, and have continued throughout this century. Although the majority of the stocks have come from within this ESU, over 200 million fish from outside the ESU have been released since 1930. The large numbers of hatchery fish in this ESU make it difficult to determine the proportion of naturally produced fish.

Harvest rates on fall-run stocks are moderately high; recent average total harvest rate was 65 percent (1982-89 brood years). The average ocean exploitation rate for this period was 46 percent, while the freshwater harvest rate on the fall run has averaged 20 percent. Harvest rates are somewhat lower for spring run stocks.

Population Name: *Upper Willamette River*

Species Status: Threatened

Trend: Declining

Estimate: Historical abundance: approximately 300,000 in 1920s. Current abundance: approximately 1,500 in 1999.

ESU Distribution/Description:

This ESU includes all naturally spawned populations of spring-run chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon. The ocean distribution is consistent with an ocean-type life history, and recoveries occur in considerable numbers in the Alaskan and British Columbian coastal fisheries.

Critical Habitat:

Critical habitat was designated for this ESU in February 2000. Critical habitat is designated to include all river reaches accessible to listed chinook salmon in the Clackamas River and the Willamette River and its tributaries above Willamette Falls. Also included are river reaches and estuaries areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to, and including, the Willamette River in Oregon. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

While the abundance of Willamette River spring chinook salmon has been relatively stable over the long term, and there is evidence of some natural production, it is apparent that at present production and harvest levels the natural population is not replacing itself. With natural production accounting for only 1/3 of the natural spawning escapement, it is questionable whether natural spawners would be capable of replacing themselves even in the absence of fisheries. While hatchery programs in the Willamette River Basin have maintained broodlines that are relatively free of genetic influences from outside the Willamette basin, they may have homogenized the population structure within the ESU. The introduction of fall-run chinook salmon into the basin and laddering of Willamette Falls have increased the potential for genetic introgression between wild spring-and hatchery fall-run chinook salmon, but there is no direct evidence of hybridization (other than an overlap in spawning times and spawning location) between these two runs. Prolonged artificial propagation of the majority of the production from this ESU may also have had deleterious effects on the ability of Willamette River spring chinook salmon to reproduce successfully in the wild.

Habitat blockage and degradation are significant problems in this ESU. Available habitat has been reduced by construction of dams in the Santiam, McKenzie, and Middle Fork Willamette River Basins, and these dams have probably adversely affected remaining production via thermal effects. Agricultural development and urbanization are the main activities that have adversely affected habitat throughout the basin.

Another concern for this ESU is that commercial and recreational harvests are high relative to the apparent productivity of natural populations. The average total harvest mortality rate was estimated to be 72 percent in 1982-89, with a corresponding ocean exploitation rate of 24 percent. This estimate does not fully account for escapement, and Oregon Department of Fish and Wildlife is in the process of revising harvest rate estimates for this stock; revised estimates may average 57 percent total harvest rate, with 16 percent ocean and 48 percent freshwater components. The inriver recreational harvest rate (Willamette River sport catch/estimated run size) for the period from 1991 through 1995 was 33 percent.

Population Name: *Upper Columbia River, spring-run*

Species Status: Endangered

Trend: Declining

Estimate: Historical abundance: approximately 2,000 in late 1930s. Current abundance: approximately 500 from 1994-1998 estimate, but expected to increase in 2000.

ESU Distribution/Description:

This ESU includes all naturally spawned populations of chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington, and the Chiwawa River (spring run), Methow River (spring run), Twisp River (spring run), Chewuch River (spring run), White River (spring run), and Nason Creek (spring run) hatchery stocks (and their progeny). These upper Columbia River populations exhibit classical stream-type life-history strategies.

Critical Habitat:

Critical habitat was designated for this ESU in February 2000. Critical habitat is designated to include all river reaches accessible to listed chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Also included are river reaches and estuaries areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

Access to a substantial portion of historical habitat was blocked by Chief Joseph and Grand Coulee Dams. There are local habitat problems related to irrigation diversions and hydroelectric development, as well as degraded riparian and instream habitat from urbanization and livestock grazing. Mainstem Columbia River hydroelectric development has resulted in a major disruption of migration corridors and affected flow regimes and estuaries habitat. Some populations in this ESU must migrate through nine mainstem dams.

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU, either through hatchery-based enhancement or the extensive trapping and transportation activities. It is probable that the majority of returning spring-run adults trapped at Rock Island Dam for use in hatchery-based enhancement were probably not native to the Wenatchee, Entiat, and Methow Rivers. Naturally spawning populations in tributaries upstream of hatchery release sites have apparently undergone limited introgression by hatchery stocks. Artificial propagation efforts have recently focused on supplementing naturally spawning populations in this ESU, although it should be emphasized that these naturally spawning populations were probably founded by the same homogenized stock. Furthermore, the potential for hatchery-derived non-native stocks to genetically impact naturally spawning populations exists, especially given the recent low numbers of fish returning to rivers in this ESU. Risks associated with interactions between wild and hatchery chinook salmon are a concern.

Harvest rates are low for this ESU, with very low ocean and moderate instream harvest. Harvest rates have been declining recently.

Population Name: *Snake River* Spring/Summer run

Species Status: Threatened

Trend: Declining

Estimate: Historical abundance: approximately 1.5 million in 1800s, declining to approximately 125,000 in 1950s. Current natural abundance: approximately 3,300 in 1999.

ESU Distribution/Description:

This ESU includes all natural populations of spring/summer-run chinook salmon in the mainstem Snake River and any of the following subbasins: Tucannon River, Grande Ronde River, Imnaha River, and Salmon River.

Critical Habitat:

Critical habitat was designated on December 28, 1993, and revised October 25, 1999. Critical habitat is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River spring/summer chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuaries areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 22,390 square miles in Idaho, Oregon and Washington. The following counties lie partially or wholly within these basins: Idaho - Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley; Oregon - Baker, Umatilla, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

Major Impacts:

Mainstem Columbia and Snake River hydroelectric development has resulted in a major disruption of migration corridors and affected flow regimes and estuaries habitat. There is habitat degradation in many areas related to forest, grazing, and mining practices, with significant factors being lack of pools, high temperatures, low flows, poor overwintering conditions, and high sediment loads. Substantial portions of the Salmon River subbasin are protected in wilderness areas.

Summer- and spring-run chinook salmon are propagated in a number of artificial propagation facilities throughout the Snake River Basin. On average, 61% of the total escapement is hatchery derived. Historically, releases originating from outside of the ESU have constituted a small proportion, 7%, of

the total releases. Since 1986, approximately 75% of the naturally spawning escapement in the Grande Ronde River has consisted of hatchery strays or returns from outplants of non-native stocks. Finally, the high incidence of BKD in many Snake River hatcheries poses much risk to this ESU.

Harvest on these populations is low, with very low ocean harvest and moderate instream harvest. Inriver harvest has been substantially restricted since 1991. At present, only tribal fisheries are permitted in the Snake River. The average harvest rate from 1986-90 was estimated to be 10.7%, and the 1995 and 1996 harvests were estimated to be 6.1 and 5.5%, respectively.

Population Name: *Snake River fall*

Species Status: Threatened

Trend: Declining

Estimate: Historical abundance: approximately 72,000 in 1940s. Current abundance: approximately 570 in 2000.

ESU Distribution/Description:

This ESU includes all natural population(s) of fall chinook in the mainstem Snake River and any of the following subbasins: Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River. Snake River fall chinook salmon spawn in October and November in the mainstem Snake River from the upper limit of the Lower Granite Dam Reservoir to Hells Canyon Dam and the lower reaches of the Imnaha, Grande Ronde, Clearwater, and Tucannon Rivers or the lower parts of tributaries in October and November. This ESU includes ocon-type fish.

Critical Habitat:

Critical habitat was designated for this ESU in December 1993. Critical habitat includes the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty Washington side) and including all Columbia River estuaries areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Critical habitat also includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells canyon Dams) to snake River fall chinook salmon in the following hydrologic units; Clearwater, Hells Canyon, Imnaha, Lower Grand Rhonde, Lower North For Clearwater, Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, and Palouse.

Major Impacts:

Almost all historical Snake River fall-run chinook salmon spawning habitat in the Snake River Basin was blocked by the Hells Canyon Dam complex; other habitat blockages have also occurred in Columbia River tributaries. Hydroelectric development on the mainstem Columbia and Snake Rivers continues to affect juvenile and adult migration. Remaining habitat has been reduced by inundation in the mainstem Snake and Columbia Rivers, and the ESU's range has also been affected by agricultural water withdrawals, grazing, and vegetation management.

The continued straying by non-native hatchery fish into natural production areas is an additional source of risk to the Snake River chinook salmon.

Management changes have significantly reduced ocean harvest rates in the last six years.

Listed Species Status

Chum Salmon

Oncorhynchus keta



Along the U.S. West Coast, there are 4 distinct groups, or evolutionarily significant units (ESUs), of chum salmon. Two of these ESUs, Hood Canal summer-run and Columbia River, were listed as threatened species under the ESA in March 1999. Details about these ESUs are summarized below.

Species Biology:

Chum salmon belong to the family Salmonidae and are one of eight species of Pacific salmonids in the genus *Oncorhynchus*. Chum salmon are anadromous (adults migrate from a marine environment into the fresh water streams and rivers of their birth), semelparous (spawn only once and then die), and spawn primarily in fresh water. Chum salmon grow to be among the largest of Pacific salmon, second only to chinook salmon in adult size, with individuals reported up to 108.9 cm in length and 20.8 kg in weight. Average size for the species is around 3.6 to 6.8 kg. The species is best known for the enormous canine-like fangs and striking body color (a calico pattern, with the anterior two-thirds of the flank marked by a bold, jagged, reddish line and the posterior third by a jagged black line) of spawning males. Females are less flamboyantly colored and lack the extreme dentition of the males. Chum salmon may historically have been the most abundant of all salmonids.

Chum salmon spawn in the lowermost reaches of rivers and streams, typically within 100 km of the ocean. They migrate almost immediately after hatching to estuaries and ocean waters, in contrast to coho, chinook, sockeye and pink salmon, and steelhead and cutthroat trout, which migrate to sea after months or even years in fresh water. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions (unlike stream-type salmonids which depend heavily on freshwater habitats) than on favorable estuaries and marine conditions. Another behavioral difference between chum salmon and most species that rear extensively in fresh water is that chum salmon form schools, presumably to reduce predation. Age at maturity appears to follow a latitudinal trend in which a greater number of older fish occur in the northern portion of the species' range. Most chum salmon mature between 3 and 5 years of age, with 60 to 90 percent of the fish maturing at 4 years of age. The species has only a single form (sea-run) and does not reside in fresh water.

Distribution and Abundance:

The species has the widest natural geographic and spawning distribution of any Pacific salmonid, primarily because its range extends farther along the shores of the Arctic Ocean than that of the other salmonids. Historically, chum salmon were distributed throughout the coastal regions of western Canada and the United States, as far south as Monterey, California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast.

Major Threats and Impacts:

See section entitled "Major Threats and Impacts to Pacific Salmonids" as well as more specific information under each population summary.

ESU Status

ESU Name	Status	Listing Date	Historical Abundance	Current Natural Abundance	Critical Habitat
Columbia River	Threatened	3/1999	~500,000 in 1942	~1,200 in 1998	Designated
Hood Canal Summer-run	Threatened	3/1999	~40,000 in 1968	~4,000 in 1999	Designated

Population Name: *Columbia River*

Status: Threatened

Trend: Stable

Estimate: Historical abundance: approximately 500,000 in 1942. Current abundance: 1200 in 1998.

ESU Distribution/Description:

All naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon. Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (over 500 km inland); at least one ESU of chum salmon occurred in the Columbia River. Today only remnant chum salmon populations exist, all in the lower Columbia River. They are few in number, low in abundance, and of uncertain stocking history.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat includes all river reaches accessible to listed chum salmon (including estuaries areas and tributaries) in the Columbia River downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens. Excluded are areas above specific dams identified in Table 14 to this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

The Columbia River historically contained large runs of chum salmon that supported a substantial commercial fishery in the first half of this century. Current abundance is probably less than 1 percent of historical levels, and the ESU has undoubtedly lost some of its original genetic diversity. Many spill dams and other small hydropower facilities have been constructed in lower river areas, and Bonneville Dam presumably continues to impede recovery of upriver populations. Substantial habitat loss in the Columbia River estuary and associated areas presumably was an important factor in the decline and also represents a significant continuing risk for this ESU.

Population Name: *Hood Canal Summer-run*

Status: Threatened

Trend: Mixed

Estimate: Historical abundance: approximately 40,000 in 1968. Current abundance: approximately 4,000 in 1999.

ESU Distribution/Description:

This ESU includes all naturally spawned populations of summer-run chum salmon in Hood Canal and its tributaries as well as populations in Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed chum salmon (including estuaries areas and tributaries) draining into Hood Canal as well as Olympic Peninsula rivers between and including Hood Canal and Dungeness Bay, Washington. Also included are estuaries/marine areas of Hood Canal, Admiralty Inlet, and the Straits of Juan De Fuca to the international boundary and as far west as a straight line extending north from Dungeness Bay. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

Hood Canal summer-run chum salmon have disappeared from several streams, and many other streams have experienced severe declines over the past twenty years. Historically, summer chum salmon have not been a primary fishery target in Hood Canal, as harvests have focused on other salmonids. However, summer chum salmon have a run timing that overlaps with those of chinook and coho salmon, and they have been incidentally harvested in fisheries directed at those species. Exploitation rates on summer-run chum salmon in Hood Canal have been greatly reduced since 1991 as a result of closures of the coho salmon fishery and of efforts to reduce the harvest of summer chum salmon. Threats to this population include degradation of spawning habitat, low water flows, and incidental harvest in salmon fisheries in the Strait of Juan de Fuca and coho salmon fisheries in Hood Canal. In addition, summer chum salmon populations have shown a great deal of variability in productivity and run size in recent years, and this extreme variability can itself be a significant risk factor.

Listed Species Status

Coho Salmon

Oncorhynchus kisutch



Along the U.S. West Coast, there are 6 distinct groups, or evolutionarily significant units (ESUs), of chum salmon. Three of these ESUs, Central California, Southern Oregon/Northern California Coasts, and Oregon Coasts, were listed as threatened under the ESA in October 1996, May 1997, and August 1998, respectively. Details about these ESUs are summarized below.

Species Biology:

Coho salmon belong to the family Salmonidae and are one of eight species of Pacific salmonids in the genus *Oncorhynchus*. Coho salmon are anadromous (adults migrate from a marine environment into the fresh water streams and rivers of their birth) and semelparous (spawn only once and then die). Coho spend approximately the first half of their life cycle rearing in streams and small freshwater tributaries. The remainder of the life cycle is spent foraging in estuaries and marine waters of the Pacific Ocean prior to returning to their stream of origin to spawn and die. Most adults are three-year old fish, however, some precocious males known as "jacks" return as two-year old spawners. A returning adult may measure more than two feet in length and weigh an average of eight pounds.

Distribution and Abundance:

The species was historically distributed throughout the North Pacific Ocean from central California to Point Hope, Alaska, through the Aleutian Islands, and from the Anadyr River, Russia, south to Hokkaido, Japan. Historically, this species probably inhabited most coastal streams in Washington, Oregon, and central and northern California. Some populations, now considered extinct, are believed to have migrated hundreds of miles inland to spawn in tributaries of the upper Columbia river in Washington, and the Snake river in Idaho.

Major Threats and Impacts:

See section entitled "Major Threats and Impacts to Pacific Salmonids" as well as more specific information under each population summary.

ESU Status

ESU Name	Status	Listing Date	Historical Abundance	Current Natural Abundance	Critical Habitat
Oregon Coast	Threatened	8/1998	~1.4 million in the early 1900s, declining to ~350,000 in 1950s	65,400 in 2000	Designated
Southern Oregon/Northern California Coast	Threatened	5/1997	50,000 in Rogue River in early 1900s	~11,000 in Rogue River in 2000	Designated
Central California Coast	Threatened	10/1996	~200,000-500,000 statewide in 1940s	Unknown, probably <6,000	Designated
Puget Sound/Straights of Georgia	Candidate	7/1995	1.0 - 2.5 million ¹⁰	~479,000	N/A
Lower Columbia River/ SW Washington	Candidate	7/1995	~1 million fish in the early 1900s	Total abundance unknown. Clackamas River late run less than 4,000.	N/A

¹⁰ Estimated commercial landings of coho salmon in Washington, Oregon, and California from 1882 to 1982 (Shepard et al. 1985). Shepard, M. P., C. D. Shepard, and A. W. Argue. 1985. Historic statistics of salmon production around the Pacific Rim. Can. Manusc. Rep., Fish. and Aquat. Sci. 1819, 297 p.

Population Name: *Central California Coast*

Status: Threatened

Trend: Declining

Estimate: Historical abundance: 50,000 to 125,000 in 1940s. Current abundance: <6,000

ESU Distribution/Description:

The ESU consists of all coho salmon naturally reproduced in streams between Punta Gorda, Humboldt County, California and the San Lorenzo River, Santa Cruz County, California. In the 1940s, estimated abundance of coho salmon in the Central California Coast ESU ranged from. Today, it is estimated that there are probably less than 6,000 naturally-reproducing coho salmon, and the vast majority of these fish are considered to be of non-native origin (either hatchery fish or from streams stocked with hatchery fish).

Critical Habitat:

Critical habitat was designated in May 1999. Critical habitat is designated to include all river reaches accessible to listed coho salmon from Punta Gorda in northern California south to the San Lorenzo River in central California, including Mill Valley (Arroyo Corte Madera Del Presidio) and Corte Madera Creeks, tributaries to San Francisco Bay. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Major Impacts:

The present depressed condition is the result of several human caused factors such as habitat degradation, harvest, water diversions, and artificial propagation that exacerbate the adverse effects of natural environmental variability from drought and poor ocean conditions.

Population Name: *Oregon Coast*

Status: Threatened

Trend: Declining

Estimate: Historical abundance: 1.4 million in early 1900s. Current abundance: 65,400 in 2000. Natural production approximately 5-10% of historical levels, near 50% of current capacity.

ESU Distribution/Description:

The ESU includes all naturally spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed coho salmon in Oregon coastal rivers between the Columbia River and Cape Blanco. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in

existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 10,606 square miles in Oregon.

Major Impacts:

The current abundance of coho salmon in this ESU is substantially less than it was historically. Population levels for Oregon coast coho have declined to approximately 5-10% of historic levels. In addition, habitat degradation and inadequate regulatory mechanisms have posed continued threats to this species' survival.

Population Name: *Southern Oregon/Northern California Coast*

Status: Threatened

Trend: Declining

Estimate: Historical abundance: approximately 50,000 in Rogue River in early 1900s. Current abundance: approximately 11,000 in Rogue River in 2000.

ESU Distribution/Description:

The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California.

Critical Habitat:

Critical habitat was designated in May 1999. Critical habitat is designated to include all river reaches accessible to listed coho salmon between Cape Blanco and Punta Gorda. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 18,090 square miles in California and Oregon, including major river basins such as the Rogue River in Oregon and Klamath/Trinity Rivers in California.

Major Impacts:

Population levels of Southern Oregon/Northern California coast coho are substantially below historical levels. In the California portion of this ESU, about 36% of coho streams no longer have spawning runs. There has been widespread habitat degradation, and much of the remaining populations are hatchery-derived populations which may be genetically divergent from native strains.

Population Name: *Puget Sound/Strait of Georgia*

Status: Candidate

Trend: stable

Estimate: Historic abundance: 1.0 and 2.5 million fish.

ESU Distribution/Description:

The ESU includes all naturally spawned populations of coho salmon from drainages of Puget Sound and Hood Canal, the eastern Olympic Peninsula (east of Salt Creek), and the Strait of Georgia from the eastern side of Vancouver Island and the British Columbia mainland (north to and including the Campbell and Powell Rivers), excluding the upper Fraser River above Hope. Major U.S. river basins containing spawning and rearing habitat for this ESU comprise approximately 13,821 square miles in Washington.

Critical Habitat:

N/A

Major Threats:

Coho salmon within this ESU are abundant and, with some exceptions, run sizes and natural spawning escapements have been generally stable. However, artificial propagation of coho salmon appears to have had a substantial impact on native, natural coho salmon populations, to the point that it is difficult to identify self-sustaining, native stocks within this region. In addition, continuing loss of habitat, extremely high harvest rates, and a severe recent decline in average size of spawners indicate that there are substantial risks to whatever native production remains.

Population Name: Lower Columbia River/ SW Washington

Status: Candidate

Trend: stable

Estimate: Historical abundance: approximately 1 million fish in the early 1900s. Current abundance: Total abundance unknown. Clackamas River late run less than 4,000.

ESU Distribution/Description:

This ESU includes all naturally spawned populations of coho salmon from Columbia River tributaries below the Klickitat River on the Washington side and below the Deschutes River on the Oregon side (including the Willamette River as far upriver as Willamette Falls), as well as coastal drainages in southwest Washington between the Columbia River and Point Grenville. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 10,418 square miles in Oregon and Washington.

Critical Habitat:

N/A

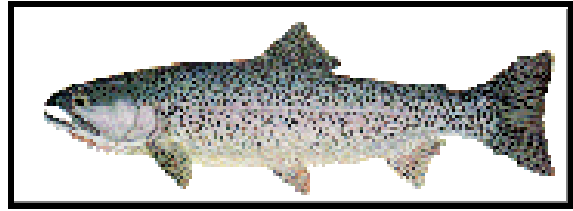
Major Threats:

The Clackamas River late-run coho salmon population is relatively stable under present conditions, but depressed and vulnerable to overharvest. Its small geographic range and low abundance make it particularly vulnerable to environmental fluctuations and catastrophes, so this population may be at risk of extinction despite relatively stable spawning escapements in the recent past.

Listed Species Status

Coastal Cutthroat Trout

Oncorhynchus clarki clarki



Umpqua cutthroat trout was delisted on April 19, 2000, because they were determined to be part of a larger ESU that did not warrant listing. Originally NOAA Fisheries and the FWS shared jurisdiction for cutthroat trout, however, on November 22, 1999, jurisdiction was given solely to FWS.

Species Biology:

Coastal cutthroat trout differ from all other trout by their profusion of small to medium-size spots of irregular shape. In addition, they do not develop the brilliant colors associated with inland cutthroat trout (a separate subspecies). In the sea-run (anadromous) form of the coastal cutthroat trout, spots and colors are further obscured by the silvery skin deposit common to anadromous salmonids. Non-anadromous (resident) fish tend to be darker, with a "coppery or brassy" sheen.

The life history of this subspecies is probably the most complex and flexible of any Pacific salmonid. Unlike other anadromous salmonids, sea-run forms of the coastal cutthroat trout do not overwinter in the ocean and only rarely make long extended migrations across large bodies of water. They migrate in the nearshore marine habitat and usually remain within 10 km of land. While most anadromous cutthroat trout enter seawater as 2- or 3- year olds, some may remain in fresh water up to 5 years before entering the sea. Other cutthroat trout may never outmigrate at all, but remain as residents of small headwater tributaries. Still other cutthroat trout may migrate only into rivers and lakes, even when they have access to the ocean. In the Umpqua River, anadromous, resident, and potamodromous (river-migrating) life-history forms have been reported. Details of the coastal cutthroat trout life history and ecology, including aspects particular to the various life forms, can be found in published reviews.

Abundance and Distribution:

The Umpqua River cutthroat trout is an ESU of the coastal cutthroat trout (*Oncorhynchus clarki clarki*). The coastal cutthroat trout subspecies is native to western North America and is found in the coastal temperate rainforests from southeast Alaska to northern California. The Umpqua River cutthroat trout ESU inhabits a large coastal basin (drainage area over 12,200 square km) in the southwestern Oregon coast. Spawning sites are located in the North and South Umpqua Rivers and their tributaries, of which

Smith River and Calapooya, Elk, and Scholfield Creeks are major tributaries. The estuary of the Umpqua River is one of the largest on the Oregon coast.

Major Threats and Impacts:

See section entitled "Major Threats and Impacts to Pacific Salmonids" as well as more specific information under each population summary.

ESU Status

ESU Name	Status	Listing Date	Historical Abundance	Current Natural Abundance	Critical Habitat
Umpqua River	Endangered¹¹	8/1996	N/A	N/A	N/A

¹¹ Originally NOAA Fisheries and the FWS shared jurisdiction for Cutthroat Trout, however, on November 22, 1999, jurisdiction was given solely to FWS. On April 19, 2000, Umpqua cutthroat trout was delisted because they were determined to be part of a larger ESU that did not warrant listing.

Listed Species Status

Sockeye Salmon

Oncorhynchus nerka



Along the U.S. West Coast, there are 7 distinct groups, or evolutionarily significant units (ESUs), of sockeye salmon. One of these ESUs, Snake River, was listed as endangered in November 1991. In March 1999, the Ozette Lake ESU was listed as threatened. In 1998 the Baker River ESU was proposed as a candidate species, but in 1999 the ESU was found not warranted for candidate status. Details about the ESUs are summarized below.

Species Biology:

Sockeye salmon belong to the family Salmonidae and are one of seven species of Pacific salmonids in the genus *Oncorhynchus*. Sockeye salmon are anadromous, meaning they migrate from the ocean to spawn in fresh water. They are the third most abundant of the seven species of Pacific salmon, after pink and chum salmon. Unique in their appearance, the adult spawners typically turn bright red, with a green head, hence "red" salmon, as commonly called in Alaska. During the ocean and adult migratory phase sockeye often have a bluish back and silver sides, giving rise to another common name, "bluebacks." The name "sockeye" is thought to have been a corruption of the various Indian tribes' word "sukkai."

Sockeye salmon exhibit a wide variety of life history patterns that reflect varying dependency on the fresh water environment. With the exception of certain river-type and sea-type populations, the vast majority of sockeye salmon spawn in or near lakes, where the juveniles rear for 1 to 3 years prior to migrating to sea. For this reason, the major distribution and abundance of large sockeye salmon stocks are closely related to the location of rivers that have accessible lakes in their watersheds for juvenile rearing. There are also *O. nerka* life forms that are non-anadromous, meaning that most members of the form spend their entire lives in freshwater. Non-anadromous *O. nerka* in the Pacific Northwest are known as kokanee. Occasionally, a proportion of the juveniles in an anadromous sockeye salmon population will remain in their rearing lake environment throughout life and will be observed on the

spawning grounds together with their anadromous siblings. Taxonomically, the kokanee and sockeye salmon do not differ.

Distribution and Abundance:

On the Pacific coast, sockeye salmon inhabit riverine, marine, and lake environments from the Columbia River and its tributaries north and west to the Kuskokwim River in western Alaska .

Major Threats and Impacts:

See section entitled "Major Threats and Impacts to Pacific Salmonids" as well as more specific information under each population summary.

ESU Status

ESU Name	Status	Listing Date	Historical Abundance	Current Natural Abundance	Critical Habitat
Snake River	Endangered	11/1991	~4,400 in Redfish Lake in 1950s	0-10 annually since 1991	Designated
Ozette Lake	Threatened	3/1999	~18,000 in 1940s	~2,000 expected in 2001	Designated
Baker River	Not warranted ¹²	N/A	Escapement was 20,000 in 1895.	Average 1994-1998 escapement was 7,600	N/A

¹² In 1998 the Baker River ESU was proposed as a candidate species, but in 1999 the ESU was found not warranted for candidate status.

Population Name: *Ozette Lake*

Species Status: Threatened

Trend: Declining

Estimate: Historical Abundance: approximately 18,000 in 1940s. Current abundance: approximately 2000 expected in 2001.

ESU Distribution/Description:

The ESU includes all naturally spawned populations of sockeye salmon in Ozette Lake and streams and tributaries flowing into Ozette Lake, Washington. This ESU consists of sockeye salmon that return to Ozette Lake through the Ozette River and currently spawn primarily in lakeshore upwelling areas in Ozette Lake (particularly at Allen's Bay and Olsen's Beach). Minor spawning may occur below Ozette Lake in the Ozette River or in Coal Creek, a tributary of the Ozette River. Sockeye salmon do not presently spawn in tributary streams to Ozette Lake, although they may have spawned there historically.

Kokanee are very numerous in Ozette Lake and spawn in inlet tributaries, whereas sockeye salmon spawn on lakeshore upwelling beaches. Sockeye have not been observed on the inlet spawning grounds of kokanee in Ozette Lake, although there are no physical barriers to prevent their entry into these tributaries. On the other hand, kokanee-sized *O. nerka* are observed together with sockeye salmon on the sockeye salmon spawning beaches at Allen's Bay and Olsen's Beach.

Based on the very large genetic difference between Ozette Lake kokanee that spawn in tributaries and Ozette Lake sockeye salmon that spawn on shoreline beaches, Ozette Lake kokanee are not included in this sockeye salmon ESU. However, if "kokanee-sized" *O. nerka* observed spawning with sockeye salmon on sockeye salmon spawning beaches in Ozette Lake are identified as resident sockeye salmon, they are to be considered as part of the Ozette Lake sockeye salmon ESU.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all lake areas and river reaches (including adjacent riparian zones) accessible to listed sockeye salmon in Ozette Lake, located in Clallam County, Washington. Excluded are areas above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) as well as tribal lands. Watersheds containing spawning and rearing habitat for this ESU comprise approximately 88 square miles in Washington.

Major Impacts:

The ESU is presently near the lower end of its historical abundance range. Current escapements averaging below 1,000 adults per year imply a moderate degree of risk from small-population genetic and demographic variability, with little room for further declines before abundances would be critically low. Other concerns include siltation of beach spawning habitat, very low abundance compared to harvest in the 1950s, and potential genetic effects of present hatchery production and past interbreeding with genetically dissimilar kokanee.

Population Name: *Baker River*

Species Status: Not warranted

Trend: Stable

Estimate: Historical abundance: Escapement was 20,000 in 1895. Current abundance: Average 1994-1998 escapement was 7,600 which is the highest for any 5-year period.

ESU Distribution/Description:

This ESU consists of sockeye salmon that return to the barrier dam and fish trap on the lower Baker River after migrating through the Skagit River. They are trucked to one of three artificial spawning beaches above either one or two dams on the Baker River and are held in these enclosures until spawning. Watersheds containing spawning and rearing habitat for this ESU comprise approximately 299 square miles in Washington. The watersheds lie partially or wholly within the following counties: Skagit, and Whatcom.

Major Impacts:

Concerns are focused on high fluctuations in abundance, lack of natural spawning habitat, and the vulnerability of spawning beaches to water quality problems.

Population Name: *Snake River*

Species Status: Endangered

Trend: Declining

Estimate: Historical abundance: approximately 4,400 in Redfish lake. Current abundance: approximately 0-10 annually since 1991.

ESU Distribution/Description:

The ESU includes populations of sockeye salmon from the Snake River Basin, Idaho (extant populations occur in the Stanley River subbasin).

Critical Habitat:

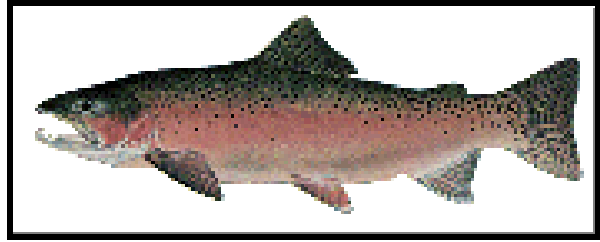
Critical habitat was designated in 1993. Critical habitat is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River sockeye salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuaries areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Watersheds containing spawning and rearing habitat for this ESU comprise approximately 510 square miles in Idaho. The watersheds lie partially or wholly within the following counties: Blaine and Custer.

Major Impacts:

Redfish Lake sockeye salmon represent the last anadromous forms of *O. nerka* in the entire Snake River system. The nearest extant sockeye salmon populations are in the Wenatchee and Okanogan river/lake systems in the upper Columbia River, over 700 river miles away.

The Snake River sockeye salmon has declined to extremely low numbers. Current production is limited to Redfish Lake in the Salmon River Basin in Idaho. Hydropower development, water withdrawal and diversions, water storage, commercial harvest, and inadequate regulatory mechanisms are factors contributing to the decline and represent a continued threat to the Snake River sockeye salmon's existence.

Listed Species Status



Steelhead Trout

Oncorhynchus mykiss

Along the West Coast, there are 15 distinct groups, or evolutionarily significant units (ESUs), of steelhead trout. To date three of these ESUs were found not warranted for listing, two ESUs are candidates for listing, two ESUs are listed as endangered and eight ESUs are listed as threatened. Details about these ESUs are summarized below.

Species Biology:

Steelhead has the greatest diversity of life history patterns of any Pacific salmonid species, including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations. Within the range of west coast steelhead, spawning migrations occur throughout the year, with seasonal peaks of activity. In any given river basin there may be one or more peaks of migration activity; since these *runs* are generally named for the season in which they occur, some rivers may have runs known as winter, spring, summer, or fall steelhead. For example, large rivers such as the Columbia, Rogue, and Klamath have migrating adult steelhead at all times of year. Through time, the names of seasonal runs have generally been simplified- in the Pacific Northwest, winter and summer steelhead runs are commonly identified. In northern California, some biologists have retained the terms spring and fall steelhead to name what others would call summer steelhead.

North American steelhead commonly spend 2 years in the ocean before entering freshwater to spawn. Summer steelhead enter fresh water up to a year prior to spawning. Steelhead may spawn more than once. In some cases, the separation between anadromous steelhead and resident rainbow or redband trout is obscure (i.e., they look and behave similarly in freshwater).

Distribution and Abundance:

West coast steelhead are presently distributed across about 15 degrees of latitude, from approximately 49°N at the U.S.-Canada border south to 34°N at the mouth of Malibu Creek, California. In some years steelhead may be found as far south as the Santa Margarita River in San Diego County. Climatic and geological features vary greatly across this area.

Major Threats and Impacts:

Hydropower development; water withdrawal, conveyance, storage, and flood control; land use activities such as logging, road construction, urban development, grazing, mining, agriculture; loss of large woody debris, riparian habitat, and increased sedimentation; commercial, recreational, and tribal harvest; ocean conditions; and artificial propagation activities are all factors for the decline of steelhead throughout its range. See section entitled "Major Threats and Impacts to Pacific Salmonids" as well as more specific information under each population summary.

ESU Status

ESU Name	Status	Listing Date	Historical Abundance	Current Natural Abundance	Critical Habitat
Snake River	Threatened	8/1997	~58,300 in 1964	~20,000 in 2000	Designated
Upper Columbia River	Endangered	8/1997	~4,100 in 1930s	~6,400 expected in 2001	Designated
Southern California	Endangered	8/1997	~more than 20,000 in 1960s	Unknown, probably <1,500 in 1990s	Designated
Middle Columbia River	Threatened	3/1999	~300,000+ pre-1960s	~23,400 in 2000	Designated
Lower Columbia River	Threatened	3/1998	Unknown, probably >50,000	Unknown, probably <10,000 in 1990s	Designated
Upper Willamette River	Threatened	3/1999	~15,000 in early 1970s	~3,000 in 1998	Designated
Oregon Coast	Candidate	3/1999	Unknown	79,000 winter and 29,000 summer steelhead in early 1980s¹³	N/A

¹³ Light, J. T. 1987. Coastwide abundance of North American steelhead trout. (Document submitted to the annual meeting of the Int. North Pac. Fish. Comm., 1987.) Fisheries Research Institute Report FRI-UW-8710. Univ. Washington, Seattle, 18 p.

Klamath Mountains Province	Candidate	3/1998	Average adult steelhead runs in the early 1970s: California, 400,000 ¹⁴ Oregon, 357,200	Several basins have natural runs below 1,000 adults per year	N/A
Northern California	Threatened	6/2000	~198,000 in 1960s	Unknown, probably 100's-1,000's	Designated
South Central California Coast	Threatened	8/1997	~27,800 in 1960s	Unknown, probably in 100's	
California Central Valley	Threatened	3/1998	~198,000 in 1960's	Unknown, probably <10,000	
Central California Coast	Threatened	8/1997	~94,000 in 1960's	~3,000-8,000 in 1990s	

¹⁴ Sheppard, D. 1972. The present status of the steelhead trout stocks along the Pacific coast. In D. H. Rosenberg (editor),

A review of the oceanography and renewable resources of the northern Gulf of Alaska, p. 519-556. IMS Report R72-23, Sea Grant Report 73-3. Institute of Marine Science, University of Alaska, Fairbanks. Estimates of abundance pre-1970s were based on historical commercial or sport catch records.

Population Name: *Snake River*

Species Status: Threatened

Trend: Decreasing

Estimate: Historical abundance: approximately 58,300 in 1964. Current abundance: approximately 20,000 in 2000.

ESU Distribution/Description:

The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. Snake River Basin steelhead are summer steelhead (as are most inland steelhead) and comprise 2 groups, A-run and B-run, based on migration timing, ocean-age, and adult size. Snake River Basin steelhead enter fresh water from June to October and spawn the following spring from March to May. A-run steelhead are thought to have a predominately 1-year ocean residence (1-ocean), while B-run steelhead are thought to have a 2-year ocean residence (2-ocean) (IDFG, 1994). Snake River Basin steelhead usually smolt at age-2 or -3 years (Whitt, 1954; BPA, 1992; Hassemer, 1992).

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed steelhead in the Snake River and its tributaries in Idaho, Oregon, and Washington. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence with the Snake River. Excluded are tribal lands and areas above specific dams identified or above longstanding, naturally impassable barriers (i.e., Napias Creek Falls and other natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 29,282 square miles in Idaho, Oregon, and Washington.

Major Threats:

While total runs size (hatchery plus natural) has increased since the mid-1970s, there has been a severe decline in natural run size. Downward trends and low parr densities indicate severe problems for “B-run” steelhead, the loss of which would substantially reduce life history diversity within the ESU. Genetic introgression from hatcheries is a major concern hatchery fish comprising as much as 86% of spawners. Degradation of freshwater habitat from grazing, irrigation diversions, and hydroelectric dams is also a major concern.

Population Name: *Upper Columbia River*

Species Status: Endangered

Trend: Decreasing

Estimate: Historical abundance: approximately 4,100 in late 1930s. Current abundance: <1,000.

ESU Distribution/Description:

This inland steelhead ESU occupies the Columbia River Basin upstream from the Yakima River, WA, to the United States/Canada Border. Wells Hatchery stock steelhead are also part of the listed ESU.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 9,545 square miles in Washington.

Major Threats:

Although total abundance of these populations have been relatively stable or even increasing, this is due to major hatchery supplementation programs. Hatchery fish make up 65% and 81% of spawning escapement in the Wenatchee and Methow/Okanogan Rivers, respectively. Ongoing impacts include habitat degradation from grazing, irrigation diversions, and hydroelectric dams; high harvest rates on steelhead smolts in rainbow trout fisheries; and genetic introgression from hatchery production.

In 1939, the construction of Grand Coulee Dam on the Columbia River (RKm 956) blocked anadromous fish access to over 1,800 km of river (Mullan et al., 1992). In an effort to preserve fish runs affected by Grand Coulee Dam, all anadromous fish migrating upstream were trapped at Rock Island Dam (RKm 729) from 1939 through 1943 and either released to spawn in tributaries between Rock Island and Grand Coulee Dams or spawned in hatcheries and the offspring released in that area (Peven, 1990; Mullan et al., 1992; Chapman et al., 1994). Through this process, stocks of all anadromous salmonids, including steelhead, which historically were native to several separate subbasins above Rock Island Dam, were randomly redistributed among tributaries in the Rock Island-Grand Coulee reach. Exactly how this has affected stock composition of steelhead is unknown.

Population Name: *Southern California*

Species Status: Endangered

Trend: Declining

Estimate: Historical abundance: approximately 20,000+ in 1960s. Current abundance: unknown probably >1,500 in 1990s.

ESU Distribution/Description:

The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River to Malibu Creek, California (inclusive).

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Santa Maria River to Malibu Creek, California (inclusive). Also included are adjacent riparian zones. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 3,967 square miles in California

Major Threats:

Steelhead have been extirpated from much of their historical range, primarily due to widespread degradation, destruction, and blockage of freshwater habitat from flood control, water development, land use, road-building, and other activities. Water allocation and habitat destruction continues in many areas, and there may be harmful genetic impacts from widespread stocking of rainbow trout.

Migration and life history patterns of southern California steelhead depend more strongly on rainfall and streamflow than is the case for steelhead populations farther north (Moore, 1980; Titus et al., in press). River entry ranges from early November through June, with peaks in January and February. Spawning primarily begins in January and continues through early June, with peak spawning in February and March. Average rainfall is substantially lower and more variable in this ESU than regions to the north, resulting in increased duration of sand berms across the mouths of streams and rivers and, in some cases, complete dewatering of the marginal habitats. Remaining questions regarding this ESU are the distribution and abundance of steelhead south of Malibu Creek. For example, in years of substantial rainfall there have been reports of steelhead in some coastal streams as far south as the Santa Margarita River, San Diego County.

Population Name: *Middle Columbia River*

Species Status: Threatened

Trend: Decreasing

Estimate: Historical abundance: approximately 300,000+ pre- 1960s. Current abundance: approximately 23,400 in 2000.

ESU Distribution/Description:

This inland steelhead ESU occupies the Columbia River Basin and tributaries from above (and excluding) the Wind River in Washington and the Hood River in Oregon, upstream to, and including, the Yakima River, in Washington. Steelhead of the Snake River Basin are excluded.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River in Washington (inclusive). Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Yakima River in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 26,739 square miles in Oregon and Washington.

Major Threats:

Total steelhead abundance in the ESU appears to have been increasing recently, but the majority of natural stocks for which data is available have been declining, including those in the John Day River, which is the largest producer of wild, natural steelhead. There is pervasive opportunity for genetic introgression from hatchery stocks. Habitat degradation due to grazing and water diversions has been documented throughout the ESU. The status of populations in the Yakima River and winter steelhead are of particular concern.

Population Name: *Lower Columbia River*

Species Status: Threatened

Trend: Decreasing

Estimate: Unknown, probably <10,000 in 1990s

ESU Distribution/Description:

This coastal steelhead ESU occupies tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls, and steelhead from the Little and Big White Salmon Rivers in Washington.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Hood River in Oregon. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 5,017 square miles in Oregon and Washington.

Major Threats:

This ESU is composed of winter steelhead and summer steelhead. The majority of populations for which data is available have been declining in the recent past, although some populations have shown increases. However, the strongest upward trends are for non-native stocks (Lower Willamette and Clackamas River summer steelhead) or stocks that are recovering from major habitat disruption and are still at low abundance (mainstem and North Fork Toutle River). There is pervasive opportunity for genetic introgression from hatchery stocks- there is widespread hatchery production, and several stocks have more than 50% hatchery fish in natural escapement. Concerns about hatchery influence are particularly great for summer steelhead and Oregon winter steelhead stocks, where there appears to be substantial overlap in spawning among hatchery and natural fish.

Population Name: *Upper Willamette River*

Species Status: Threatened

Trend: Decreasing

Estimate: Historical abundance: 15,000 in early 1970s. Current abundance: approximately 3,000 in 1998.

ESU Distribution/Description:

The ESU includes all naturally spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River, inclusive.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls upstream to, and including, the Calapooia River. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to, and including, the Willamette River in Oregon. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,872 square miles in Oregon.

Major Threats:

Historically, spawning by Upper Willamette River steelhead was concentrated in the North and Middle Santiam River Basins (Fulton, 1970). These areas are now largely blocked to fish passage by dams, and steelhead spawning is now distributed throughout more of the Upper Willamette River Basin than in the past (Fulton, 1970). Native winter steelhead within this ESU have been declining since 1971, and have exhibited large fluctuations in abundance. The main production of native (late-run) winter steelhead is in the North Fork Santiam River, where estimates of hatchery proportion in natural spawning range from 14% to 54%. There is strong potential for genetic and ecological impacts from widespread production of hatchery steelhead within the range of this ESU, predominantly of non-native summer and early-run winter steelhead. Due to introductions of non-native steelhead stocks and transplantation of native stocks within the basin, it is difficult to formulate a clear picture of the present distribution of native Upper Willamette River steelhead, and their relationship to nonanadromous and possibly residualized *O. mykiss* within the basin.

Population Name: *Oregon Coast*

Species Status: Candidate

Trend: Increasing

Estimate: Historical abundance: No estimates of historical (pre-1960s) abundance specific to this ESU are available. Current abundance: early 1980s were given by Light (1987) as approximately 255,000 winter steelhead and 75,000 summer steelhead. Light estimated that 69% of winter and 61% of summer steelhead were of hatchery origin, resulting in naturally produced run sizes of 79,000 winter and 29,000 summer steelhead.

ESU Distribution/Description:

The ESU includes steelhead from Oregon coastal rivers between the Columbia River and Cape Blanco. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 10,604 square miles in Oregon

Critical Habitat:

N/A

Major Threats:

Most steelhead populations in this ESU have been declining in the recent past, with increasing trends restricted to the southernmost portion of the ESU, south of Siuslaw Bay. There is strong potential for adverse genetic and ecological impacts from extensive and widespread hatchery production, largely based on out-of-basin stocks. Approximately half the streams are estimated to have more than 50% hatchery fish in natural spawning escapements.

Population Name: *Klamath Mountains Province*

Species Status: Candidate

Trend: Decreasing

Estimate: Historical abundance: total regional average adult steelhead runs in the early 1970s: California, 400,000; Oregon, 357,200; Washington, 606,400; Idaho, 42,500; British Columbia, 112,000; total, 1,528,000. Current abundance: Several basins within the region have natural runs below 1,000 adults per year, even though total abundance of adult steelhead remains fairly large (above 10,000 individuals) in several river basins.

ESU Distribution/Description:

This coastal steelhead ESU includes steelhead from the Elk River in Oregon to the Klamath and Trinity Rivers in California, inclusive. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,011 square miles in California and Oregon.

Critical Habitat:

N/A

Major Threats:

Although historical abundance trends are not clearly known, there has been substantial replacement of naturally-produced fish with hatchery fish. While absolute abundance remains fairly high since about 1970, trends in abundance have been downward in most steelhead populations for which data is available. Declines in summer steelhead populations are of particular concern. After accounting for the contribution of hatchery fish, NOAA Fisheries is unable to identify any remaining populations that are naturally self-sustaining. Floods, the construction and operation of dams, diversions and hydroelectric projects, past mining, timber harvest practices, and roadbuilding have all contributed to sedimentation, reduced flows, and degraded water quality which has significantly reduced the anadromous fish habitat in the Klamath-Trinity River System.

Population Name: *Northern California*

Species Status: Threatened

Trend: No trend data

Estimate: Historical abundance: approximately 198,000 in 1960s. Current abundance: unknown, probably 100s-1,000s.

ESU Distribution/Description:

This coastal steelhead ESU includes steelhead in California coastal river basins from RedwoodCreek south to the Gualala River, inclusive. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 6,672 square miles in California.

Critical Habitat:

Critical habitat for this ESU has not yet been proposed.

Population Name: *South Central California Coast*

Species Status: Threatened

Trend: No trend data

Estimate: Historical abundance: approximately 27,800 in the 1960s. Current abundance: unknown, probably in 100s.

ESU Distribution/Description:

This coastal steelhead ESU includes all naturally spawned populations of steelhead (and their progeny) in streams from the Pajaro River (inclusive) to, but not including the Santa Maria River, California.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat includes all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Pajaro River (inclusive) to, but not including, the Santa Maria River, California. Also included are adjacent riparian zones. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 7,246 square miles in California.

Major Threats:

Total abundance of steelhead in this ESU is extremely low, and most stocks for which data is available show recent downward trends. Habitat degradation from water development, poor land use practices, and floods are of particular concern. There is also concern about genetic effects of widespread stocking of rainbow trout.

The relationship between anadromous and nonanadromous *O. mykiss*, including possibly residualized fish upstream from dams, is unclear, but likely to be important.

Population Name: *Central California Coast*

Species Status: Threatened

Trend: No trend data

Estimate: Historical abundance: approximately 94,000 in 1960s. Current abundance: approximately 3,000-8,000 in 1990s.

ESU Distribution/Description:

This coastal steelhead ESU includes all naturally spawned populations of steelhead (and their progeny) in California streams from the Russian River to Aptos Creek, and the drainages of San Francisco and San Pablo Bays eastward to the Napa River (inclusive), excluding the Sacramento-San Joaquin River Basin.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Russian River to Aptos Creek, California (inclusive), and the drainages of San Francisco and San Pablo Bays. Also included are adjacent riparian zones, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay from San Pablo Bay to the Golden Gate Bridge. Excluded is the Sacramento-San Joaquin River Basin of the California Central Valley, as well as tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 6,516 square miles in California.

Major Threats:

There is a lack of information on steelhead run sizes throughout the ESU. Widespread habitat degradation and the few estimates of abundance and stock trends in the region makes this ESU susceptible to extinction.

Population Name: *California Central Valley*

Species Status: Threatened

Trend: Declining

Estimate: Historical abundance: Current abundance:

ESU Distribution/Description:

This ESU includes all naturally spawned populations of steelhead (and their progeny) in the Sacramento and San Joaquin Rivers and their tributaries. Excluded are steelhead from San Francisco and San Pablo Bays and their tributaries.

Critical Habitat:

Critical habitat was designated in February 2000. Critical habitat is designated to include all river reaches accessible to listed steelhead in the Sacramento and San Joaquin Rivers and their tributaries in California. Also included are adjacent riparian zones, as well as river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas of the San Joaquin River upstream of the Merced River confluence, tribal lands, and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,096 square miles in California.

Major Threats:

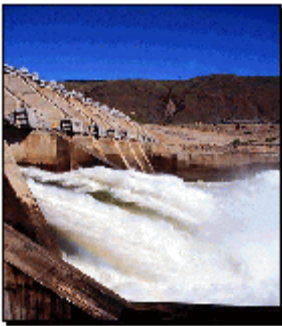
Habitat concerns are principally the widespread degradation, destruction, and blockage of freshwater habitat, and the potential impacts of continuing habitat destruction and water diversion. There is also the potential for genetic impacts from hatchery steelhead production within the area of the ESU.

Steelhead ranged throughout the tributaries and headwaters of the Sacramento and San Joaquin Rivers prior to dam construction, water development, and watershed perturbations of the 19th and 20th centuries. Present steelhead distribution in the central valley drainages has been greatly reduced, particularly in the San Joaquin basin.

Major Threats and Impacts to Pacific Salmonids

Salmonid species on the west coast of the United States have experienced dramatic declines in abundance during the past several decades as a result of human-induced and natural factors. There is no single factor solely responsible for this decline. Given the complexity of the salmon species life history and the ecosystem in which they reside, it is difficult to precisely quantify the relative contribution of any one factor to the decline of a given species. Rather, given the available data, it is only possible to highlight factors which have significantly affected the status of a particular species.

Water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic, and



hydropower purposes have greatly reduced or eliminated historically accessible habitat and/or resulted in direct entrainment mortality of juvenile salmonids. Modification of natural flow regimes have resulted in increased water temperatures, changes in fish community structures, depleted flows necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, gravel recruitment and transport of large woody debris. Physical features of dams, such as turbines and sluiceways, have resulted in increased mortality of both adults and juvenile salmonids. Attempts to mitigate adverse impacts of these structures have to date met with limited success.

Natural resource use and extraction leading to habitat modification can have significant direct and indirect impacts to salmon populations. Land use activities associated with logging, road construction, urban development, mining, agriculture, and recreation have significantly altered fish habitat quantity and quality.

Associated impacts of these activities include: alteration of streambanks and channel morphology; alteration of ambient stream water temperatures; degradation of water quality; reduction in available food supply; elimination of spawning and rearing habitat; fragmentation of available habitats; elimination of downstream recruitment



of spawning gravels and large woody debris; removal of riparian vegetation resulting in increased stream bank erosion; and increased sedimentation input into spawning and rearing areas resulting in the loss of channel complexity, pool habitat, suitable gravel substrate, and large woody debris. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated. Further, it has been estimated that during the last 200 years, the lower 48 United States have lost approximately 53 percent of all wetlands. Washington and Oregon's wetlands have been

estimated to have been diminished by one third, while it is estimated that California has experienced a 91 percent loss of its wetland habitat.

The degree of spatial and temporal connectivity between and within watersheds is an important consideration for maintaining aquatic riparian ecosystem functions. Loss of this connectivity and complexity, such as the loss of deep pool habitats, has contributed to the decline of salmon. In Washington, the number of large, deep pools in National Forest streams has decreased by as much as 58 percent due to sedimentation and loss of pool-forming structures such as boulders and large wood. Similarly, in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent.

Salmon have been, and continue to be, an important target species for recreational fisheries throughout their range. During periods of decreased habitat availability, the impacts of recreational fishing on native anadromous stocks may be heightened. Commercial fishing on unlisted, healthier stocks has caused adverse impacts to weaker stocks of salmon, and illegal high seas driftnet fishing in past years may have also been partially responsible for declines in salmon abundance. However, such fisheries cannot account for the total declines in salmon abundance in North America.



Introduction of non-native species and modification of habitat have resulted in increased predator populations and salmonid predation in numerous river and estuarine systems. Piscivorous birds such as terns and cormorants, and pinnipeds such as sea lions and harbor seals are examples of potential salmon predators. Marine predation is also of concern in areas of dwindling salmon run-size. In general, predation rates on salmon are considered by most investigators to be an insignificant contribution to the large declines observed in west coast populations. However, predation may significantly influence salmonid abundance in some local populations when other prey are absent and physical conditions, such as narrow river mouths or human-made barriers such as fishing locks, lead to the concentration of adult and juvenile salmonids.

Natural environmental conditions have served to exacerbate the problems associated with degraded and altered riverine and estuarine habitats. Recent floods and persistent drought conditions have reduced already limited spawning, rearing, and migration habitat. Furthermore, climatic shifts over a decadal time scale appear to have resulted in decreased ocean productivity which may exacerbate degraded freshwater habitat conditions to some degree. Environmental conditions such as these have gone largely unnoticed until recently, when salmonid populations have reached critical low levels.

In an attempt to mitigate for lost habitat and reduced fisheries, extensive hatchery programs have been implemented throughout the range of salmon on the west coast. While some of these programs have been successful in providing fishing opportunities, the impacts of these programs on wild stocks are not well understood. Competition, genetic introgression, and disease transmission resulting from hatchery introductions may significantly impact the production and survival of wild salmon. Commercial and recreational fisheries targeting stronger stocks supported by hatchery production may inadvertently result in adverse impacts to weaker, wild stocks. Furthermore, collection and utilization of wild fish for broodstock purposes may result in additional negative impacts to small or dwindling natural populations.