NATIONAL MARINE FISHERIES SERVICE

HABITAT CONSERVATION PROGRAM

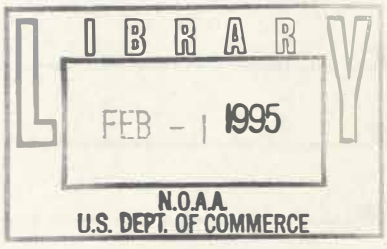
BIENNIAL REPORT FOR FY 1986/1987

JUNE 1988

THE HABITAT CONSERVATION PROGRAM OF THE NATIONAL MARINE FISHERIES SERVICE FOR FISCAL YEARS 1986 and 1987

Prepared by the
Office of Protected Resources and Habitat Conservation,
National Marine Fisheries Service,
Washington DC, 20235

June 1988



U.S. Department of Commerce
C. William Verity, Secretary

National Oceanic and Atmospheric Administration
William E. Evans, Under Secretary

National Marine Fisheries Service
James W. Brennan, Assistant Administrator

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

AUG 30 1988

Dear Colleague:

I am pleased to present a report on the National Marine Fisheries Service's Habitat Conservation Program for fiscal years 1986 and 1987.

We hope you find this account of our program useful, and we welcome your comments or suggestions for future editions. Additional copies of the report are available from the Office of Protected Resources and Habitat Conservation, National Marine Fisheries Service, Washington, D.C. 20235.

Sincerely,

James W. Brennan

James W. Brennan
Assistant Administrator
for Fisheries

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Sandy Hook, N.J. salt marsh showing severe abrasion caused by marine flotsam from decaying docks and platforms in the New York-New Jersey metropolitan area.

COVER: Gloucester, MA. seawall repaired in 1987, yet already topped by waves.

INTRODUCTION

The National Marine Fisheries Service (NMFS), an agency of the National Oceanic and Atmospheric Administration (NOAA), is responsible for the conservation, management, and the development of certain living marine resources and the protection of marine mammals and endangered marine species. The agency's mission is to achieve continued optimum use of living marine resources. The purpose of NMFS' Habitat Conservation Program is to conserve and protect the habitats and associated biological communities necessary to sustain these living marine resources. This is accomplished primarily through review of licensing, permitting, legislative, and administative activities that affect living marine resources and habitats, coordination with Regional Fisheries Management Councils on fisheries management plans, and the conduct of habitat-related research.

This report documents marine habitat issues of national as well as regional importance, and summarizes the accomplishments and activities of the agency's Habitat Conservation Program. The report has been designed to replace two NMFS documents. Therefore, an executive summary has been included to provide an overview of our Habitat Conservation Program, followed by a more detailed discussion of our accomplishments framed around the twelve implementation strategies of the NMFS Habitat Conservation Policy. This report is available from the Office of Protected Resources and Habitat Conservation, National Marine Fisheries Service, Washington, D.C. 20235 .

Habitats Under NMFS Jurisdiction

Although NMFS is responsible for managing living marine resources and their habitats in the U.S. Exclusive Economic Zone (EEZ), which includes an area 3 to 200 miles offshore, its responsibilities also include other geographical areas.

Coastal and estuarine habitats are important to maintaining healthy fish stocks. Estuaries are particulary important to many species. Over two-thirds of commercially important fish species on the Atlantic and Gulf coasts depend on wetlands at some time during their life. Estuaries and wetlands are used for spawning, protection, and food. In addition, these habitats serve as efficient filters for contaminants from upland discharges and urban runoff; they help to maintain water quality in many coastal estuaries. Such areas are especially important because they are so productive and so close to shore. About one-half of all domestic fish are caught within 3 miles of shore. Also, because salmon and other anadromous fish migrate from the ocean to spawn in the rivers where they were born, up river spawning and migrating habitats should not be blocked or disrupted by construction, damming, and logging activities.

However, important fishery habitats are being lost due to both man-made and natural factors. About half of the original 11.7 million acres of coastal wetlands in the United States (except Alaska and Hawaii) were lost in the period from 1780 to 1978. From the 1950's to the 70's, over 372,000 acres of estuarine wetlands disappeared. Of these, 55 percent of the loss was due to coastal erosion and 45 percent to urban development. According to the U.S. Fish and Wildlife Service in its 1983 report on wetlands, much of this loss took place in coastal Louisiana due to a gradual rise in sea level, extensive canal dredging, and upland flood control levees on the Mississippi River which prevent the normal flow of sediments to the coastal marshes. In many areas, wetlands have been filled or diked to accommodate new development. Also, discharges from numerous coastal and upland sources have greatly affected the quality of many remaining coastal and estuarine habitats. In 1974, about one-forth of the shellfish beds in the United States were closed to harvesting because sewage disposal contaminated the beds. Many bays and coastal waters have been contaminated with heavy metals, petroleum compounds, and other chemical wastes. Upland activities such as logging, mining, and hydroelectric power development can also seriously affect the quality and quantity of habitat for living marine resources.

Living Marine Resources Under NMFS Jurisdiction

The coastal and estuarine waters of the United States represent one of our most valuable natural resources and one that is also renewable. Fishing, as a livelihood and a sport, represents one of the most important uses of this resource. In 1987, the U.S. commercial fishing industry caught over 6.9 billion pounds of seafood valued at $ 3.1 billion. Catches by U.S. fishermen which were loaded directly aboard foreign vessels ammounted to an additional 3.5 billion pounds. This industry employs over 345,000 people and contributes $ 17 billion to the economy each year. Directed Foreign fishing in U.S. waters removed an additional catch of 328 million pounds. Over 40 percent of the total U.S. volume of fish landed came from the Gulf of Mexico and the South Atlantic; the Pacific accounted for an additional 29 percent.

Marine recreational fishing contributes about $13.5 billion dollars annually to the U.S. economy according to the Sport Fishing Institute. Over 17 million people in the United States are marine recreational anglers; this includes those using sophisticated charterboats for ocean fishing to individuals fishing along piers in many of our cities. Of the overall finfish harvest used for food, about 35 percent is caught by marine recreational fishermen.

NATIONAL MARINE FISHERIES SERVICE
HABITAT CONSERVATION PROGRAM

EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) Habitat Conservation Program activities are carried out nationwide as part of the overall NMFS fisheries research and management program. Facilities involved in these activities include NMFS Centers and Laboratories (which conduct fisheries research), Regional Headquarters (which manage the Regional field activities), and field stations (which are responsible for on-site inspections and analysis of proposed actions). The NMFS Habitat Conservation Program Central Office in Washington, D.C. provides policy guidance for the NMFS Regional and Center programs. The location map shows the location of the various NMFS facilities which carry out habitat activities. Habitat programs are organized and administered in each area to respond effectively to unique regional issues and geographic constraints.

All regional habitat conservation programs are a reflection of three important considerations: the pressures on the living marine resource habitats in a region, the size of the area managed, and the commercial and recreational value of the species. The NMFS Habitat Conservation Program is directed by several Federal laws and its National Habitat Conservation Policy which was published in 1983. Implementation of this policy is facilitated by 12 strategies targeting: research and management coordination, habitat research, interaction with the eight Regional Fishery Management Councils and specific Fishery Management Plans, strengthening NMFS involvement under the Fish and Wildlife Coordination Act, assisting states with marine habitat issues, initiating and strengthening interagency agreements, protecting anadromous fish, increasing preapplication planning, integrating habitat consideration across NMFS programs, increasing intra-NOAA cooperation, providing necessary and appropriate regulatory relief, and communication of habitat information to NMFS constituents.

In the sections that follow, the major accomplishments related to these considerations in each of the five NMFS Regions are summarized.

ALASKA REGION

Marine Habitat Rating Index Study

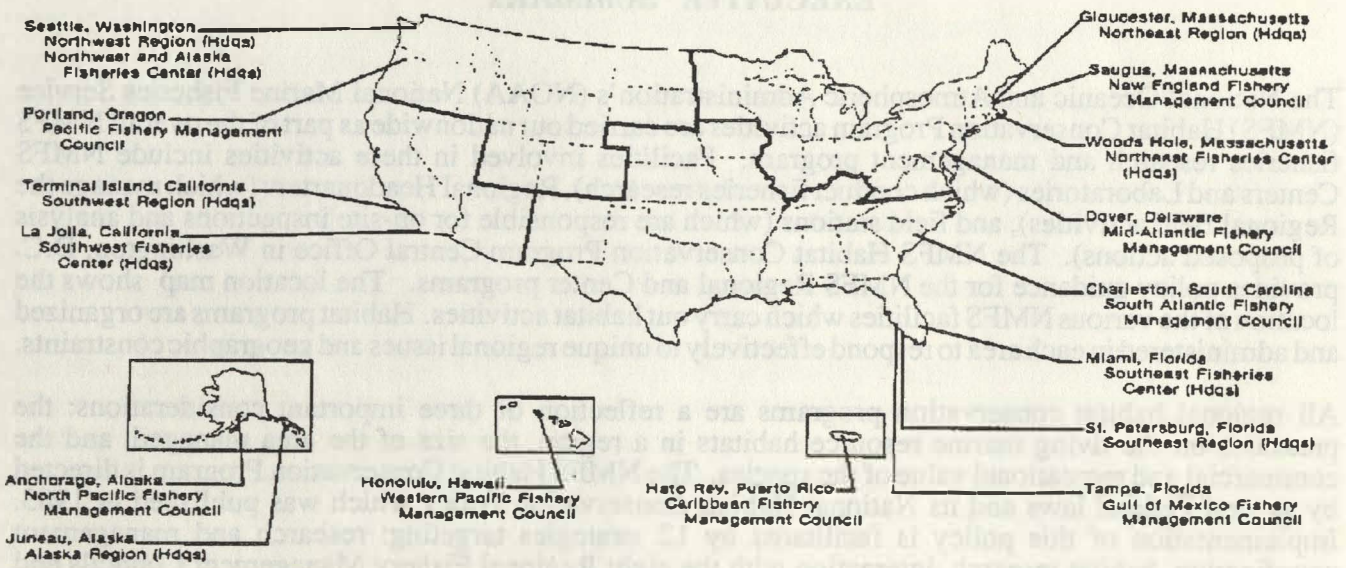
Alaska Regional Staff assisted researchers from the NMFS Auke Bay Laboratory with field work on a marine habitat rating index study. This research examined the possibility of formulating a rating index for intertidal and subtidal habitats. Vegetative cover, level of biotic heterogeneity, and commercial fish species' use of benthic habitat at proposed marine development locations were included in the rating index.

Chukchi Sea Oil Lease Sale

NMFS concluded that the leasing and exploration phases involved in Outer Continental Shelf Lease Sale 109 in the Chukchi Sea was not likely to jeopardize the continued existence of any endangered or threatened marine cetaceans. Regional staff, however, pointed out that if oil and gas development and production activities affected the spring lead systems used by bowhead whales for their migration, it would likely jeopardize the population. Included in NMFS's comments were reasonable and prudent alternatives designed to avoid such jeopardy.

Mitigation Measures To Offset Project Impacts

Alaska's Department of Transportation and Public Facilities requested cooperation in assessing the environmental effects of four proposed highway projects and the expansion of three airports. Mitigation



LOCATION MAP

measures recommended to offset the impact of these projects ranged from timing stipulations to protect critical life stages of aquatic resources to the elimination of specific parts of the projects.

Action Plan Developed For Glacier Advance

An action plan was developed in response to the anticipated advance of the Hubbard Glacier near Yakutat, Alaska. The plan included sections on the probable effects on fish and wildlife resources, proposed projects that will provide needed information on the amount of losses or gains in habitat and species, and potential mitigative measures for maintaining fish and wildlife populations.

Cooperative Research

NMFS continues to be an active participant on the Alaska Working Group on Cooperative Fisheries-Forestry Research and has helped identify studies whose results can be used by timber managers and resource agencies. Regional staff are also cooperating with the Corps of Engineers in developing a monitoring program for possible impacts of the seven mile long Endicott causeway (located in Prudhoe Bay, Alaska) on the migration of anadromous fish.

Evaluation of Hydroelectric Projects

Two proposed hydroelectric projects with probable adverse impacts on pink, chum, and coho salmon were evaluated. A consultation on a minor license application for dam rehabilitation on Pelican Creek in Southeast Alaska was completed and an application was appealed for Exemption from Licensing from Federal Energy Regulatory Commission for a small hydroelectric project on Bell Island, near Ketchikan. Additionally, a Petition to Intervene was filed for the Reynolds Creek hydroelectric power project in southeast Alaska. The project, as planned, would divert water from a river which supports important runs of pink, chum, and coho salmon.

Habitat Information Uses

The Alaska Region continues to identify highly productive habitat early in permit activities. Information from such surveys is used by the Corps of Engineers permit program staff and for preparing of environmental assessments and environmental impact statements. Communication of habitat information was emphasized at the annual Anchorage Field Conservation Program for school children. In addition, information concerning essential habitat was included in the fishery management plans for the Tanner and king crab and salmon fisheries.

NORTHWEST REGION

Habitat Research

Research is underway to determine the impacts of expansion and operation of the Columbia River hydropower system on white sturgeon. In cooperation with the Corps of Engineers, staff are studying the habitat and species distributions of the Umpqua River estuary at an interim dredged material disposal site. A statistical model has been developed which accounts for 35 percent of the variation in neoplasm prevalence in English sole in Puget Sound. Other studies are addressing the need for methods to analyze the effects of tributyltin, the active ingredient in many marine anti-fouling paints, as well as organic contaminants in sediments and marine fish and invertebrate tissue samples.

Salmon And Groundfish FMPs

Habitat sections for the Pacific salmon and groundfish Fishery Management Plans (FMPs) were developed by the Northwest Region. The goal of these sections is to more closely link habitat management concerns with harvest management.

Fish and Wildlife Coordination Act

Under the authority of the Fish and Wildlife Coordination Act, work continues on a wide variety of issues. Concerned over past and future investments for anadromous fish protection, NMFS evaluated the Federal Energy Regulatory Commission's Cluster Impact Assessment Procedure implementation for the Salmon River Basin. Analysis of the Salmon River Basin Final Environmental Statement was judged by the Region as not adequately responding to agency and tribal comments and criticisms of the Cluster Impact Assessment Procedure. A long standing dispute regarding anadromous fish mitigation and compensation measures related to the construction and operation of the Rock Island Dam was resolved with the development of a settlement agreement. NMFS continues to work with the Corps of Engineers to study possible environmental impacts of proposed navigational dredging projects. Elimination or alteration of spawning habitat, disruption of water flow, increased salmon mortality, interference with sport and Indian tribal fisheries, and an overall decline in productivity of salmon resources have been identified as possible impacts of such projects.

Power Plants - A Concern For Anadromous Fish Resources

Concern for the anadromous fishery resources of the Pacific Northwest, prompted the Northwest Region to continue its extensive involvement with hydroelectric projects. Such projects may pose the foremost threat to anadromous fish resources in this area. Regional and Center staff provided design expertise for the Yakima Basin and Umatilla Basin Fish Passage Improvements Programs. Additionally, approximately 300 projects subject to regulation by the Federal Energy Regulatory Commission were evaluated for consistency with NMFS policies.

Resource Agencies Opposed To Homeporting Dredge Disposal

The NMFS, along with other Federal and state natural resource agencies, objected to the open water disposal sites proposed in the final supplemental U.S. Navy Environmental Impact Statement for the Puget Sound Region Ship Homeporting Project. NMFS elevated the decision to the Corps of Engineers Division level, where a compromise was achieved. This agreement, however, was later overturned by the Chief of Engineers Office, and the permit issued. Environmental groups are challenging the permit in court.

NMFS National Habitat Conservation Workshop

To augment intra-NOAA cooperation, the Northwest Region hosted a NMFS National Habitat Conservation Workshop in Portland, Oregon. All NMFS Regions, Centers, and the Washington, D.C. office were represented. The goal of the workshop was to more clearly define the NMFS Habitat Program. Recommendations were developed in a number of program areas: FERC issues, the Magnuson Fishery Conservation and Management Act, resource damage assessment and restoration under the Superfund Act, habitat mitigation practices and policies, the use of statistics in habitat programs, national strategies on aquaculture, artificial reefs and impoundments, and legislative goals.

Habitat Information Uses

Staff from NMFS continues to meet with representatives of Indian tribes, states, and special interest groups to discuss habitat issues of mutual concern. Detailed information on enhancement of anadromous fishery resources was provided to the Columbia River Education Project and the Sierra Club. Further, Regional and Center staff continue to communicate research findings in journals, reports to funding agencies, and presentations at national and international meetings.

SOUTHWEST REGION

Cooperative Projects

NMFS staff selected habitat enhancement projects in compliance with a Memorandum of Agreement between NMFS and the Corps of Engineers to restore marine habitat at ongoing Corps projects. Projects to restore over 1,200 acres of wetlands in California's Sacramento River delta are now underway. Two additional Memoranda of Agreement relate to the use of mitigation banking to offset negative habitat impacts from port developments in Los Angeles and Long Beach Harbors. In total, almost 600 acres of degraded tidal wetlands along the southern California coast will be restored under these two Memoranda. A Coordinated Operation Agreement signed by President Reagan makes possible more efficient operation of the Federal Central Valley Project and the California State Water Project. NMFS has emphasized that a key element of these Projects should be maintaining the quality and quantity of anadromous fish habitat in the Central Valley. Other cooperative projects include discussions with Federal, state, and university representatives regarding the status of eelgrass, managing inflows to estuaries, valuation of non-market aspects of natural resources, effects of freshwater diversion on the baitfish resources of Pearl Harbor, distribution of larval fishes near Oahu, the Hawaiian Islands Mapping Program, and a survey of groundfish in Southern California wetland and shallow water habitats.

Fishery Management Councils

Interaction with Regional Fishery Management Councils continued through analysis of the Groundfish Management Plan for the west coast and the habitat section of the Salmon Fishery Management Plan.

Sedimentation Reduction In San Francisco Bay

To reduce sedimentation throughout San Francisco Bay, NMFS persuaded the Corps of Engineers to eliminate a two-year-old requirement to slurry dredged material before disposal in the Bay. Negotiations

to determine a disposal site for dredged materials from the U.S. Navy San Francisco Homeporting Plan are continuing.

Protection Of Anadromous Fishery Resources

Protection of anadromous fishery resources remains a major Regional concern. Regional staff evaluated two major bank protection projects on the Sacramento River, assisted in developing a methodology to evaluate riparian habitat impacts of the projects, and stressed the need for a comprehensive analysis of impacts to salmon and riparian vegetation by the Corps of Engineers. Staff also attended coordination meetings on the Red Bluff Diversion Dam Fish Passage Program and provided considerable assistance in the development of criteria and specifications for fish screens. NMFS evaluated and recommended adoption of new water quality standards for the upper Sacramento River which has been plagued by heavy metal pollution from mine workings. Following this recommendation, a plan was devised for elimination of this source of pollution. The Region is currently developing a model to determine the value of chinook salmon habitat in the Sacramento River basin with the goal of allowing comparison with competing, non-fishery uses of river flows. In addition, the Region has been involved in shaping the Trinity River Restoration Program and the Klamath River Basin Fishery Restoration Bill.

Fish Barriers Identified

One existing dam, the Healdsburg Dam on the Russian River, and a proposed control structure on Montezuma Slough, have been identified by NMFS as possible barriers to fish passage. Regional staff were successful in requiring a salmon and steelhead trout predation study and modification or termination of operation of the Montezuma Slough Structure if NMFS determines that an unacceptable level of predation is occurring as a result of the structure. The Region has supplied the County with a memo report outlining the magnitude of fish blockage at the Healdsburg Dam along with suggestions for fish passage improvement.

Winter-run Chinook Not Listed As Threatened

Following a petition to list winter-run chinook salmon as a threatened species under the Endangered Species Act, the Region completed an analysis which concluded that the current freshwater and ocean harvests have not been significant factors in the decline of the run and that eliminating these harvests probably will not significantly aid in its restoration.

Preapplication Planning in Northern California

NMFS worked with environmental consultants to design a plan to assess fisheries resources possibly impacted by the proposed Chevron USA Wastewater Outfall. NMFS is also discouraging implementation of the two options proposed for the Santa Rosa Sewer Outfall - ocean disposal and San Francisco Bay Disposal. NMFS is recommending that adequate water standards be maintained which will ensure that existing fishery resources are not adversely impacted. Preapplication planning meetings were also held with representatives of the Lake Redding Hydropower Project, the Lake Red Bluff Hydropower Project, the Glenn-Colusa Irrigation District, the Pacific Gas and Electric Delta Plants, the East Yolo Water District, and the Middle River Barrier Project.

Habitat Mitigation Projects

Plans for the mitigation of project impacts were coordinated for Los Angeles Harbor, Mission Bay, and for two projects in San Diego Bay. Both projects in San Diego Bay included experimental eelgrass mitigation techniques where the project proponents initially constructed appropriate substrate for eelgrass and then transplanted the vegetation to the site. All mitigation projects will be monitored by NMFS.

Santa Barbara Oil Spill Coordination

NMFS staff coordinated closely with NOAA Hazardous Material staff during the recent oil spill resulting

from the sinking of the commercial cargo vessel PAC Baroness in the Santa Barbara Channel. There was also close coordination with the NOAA Marine Sanctuary Office responsible for the Santa Barbara Channel Islands Marine Sanctuary.

SOUTHEAST REGION

Project Collaboration

Coordination with the Corps of Engineers, Federal, state, and local agencies and groups occurred on a variety of projects. A Gulf Intracoastal Waterway Working Group was formed in Texas to discuss alternatives to spoil disposal in open water and wetlands. As recommended by NMFS, the Navy has agreed to eliminate an enlargement of a Corps of Engineer's disposal site in Corpus Christi Bay, Texas. Increased salinity, resuspension of toxins, loss of productive bay bottom, and increased turbidity were identified as probable impacts to the habitat of living marine resources associated with the Corps of Engineers' proposed project to deepen and widen navigation channels in Galveston Bay, Texas. Other projects evaluated include maintenance dredging projects in Wilmington Harbor, North Carolina and Apalachicola River, Florida, construction of navigation channels in the Port of Iberia, Louisiana, and sewage disposal in St. Andrew Bay, Florida.

NOAA's National Ocean Service, Ocean Assessment Division continued to determine the quantity of wetland habitat in the coastal U.S. by sampling National Wetland Inventory habitat maps in conjunction with the Southeast Region. Mapping of submerged aquatic vegetation is being conducted with NOAA's Photogrammetry Unit. Work with the Minerals Management Service involves assessing the toxicity of oil treated with dispersants. The Texas Water Development Board has provided money to conduct an evaluation of habitat in San Antonio, Galveston, and Lavaca Bays, Texas.

Other coordinated efforts included: evaluations and comments for proposed seagrass mitigation plans in the U.S. Virgin Islands, recommendations to the Navy to mitigate their Homeport impacts in Mobile Bay, Alabama, identification of study sites in North Carolina and Texas to address the NMFS-Corps of Engineers Memorandum of Agreement for a pilot study for restoring and creation fishery habitat, research and management issues relative to the Environmental Protection Agency's Albemarle-Pamlico Sound program, and marsh management in Louisiana.

Habitat Research

Goals of the Southeast Region's research program in 1987 were the distribution and recruitment of larval and juvenile fishes and factors influencing recruitment and survival of larvae, habitat supporting finfish and shellfish including evaluation of mitigation methodologies and the impact of altering environmental parameters, research on feeding habits and predator-prey interactions, and effects of metal contamination on larval fish food webs, mechanisms of metal accumulation and metabolism, and evaluation of metallic and organic contaminants in estuaries. Species of particular interest include Gulf menhaden, spot, Atlantic croaker, and seatrout. Specific projects entailed the effect of the Mississippi River Plume on the spatial distributions, feeding, growth, and nutritional condition of larval fishes, mapping the distribution of small plastic particles in relation to the abundance of larval and juvenile fish, and patterns of estuarine recruitment of larval fishes in North Carolina and Florida.

Interaction With Fishery Management Councils

The South Atlantic, Caribbean, and Gulf of Mexico Fishery Management Councils were assisted in the revision of their habitat polices and guidelines. Southeast Region staff also evaluated the habitat sections of the shrimp, red drum, billfish, reef fish, and snapper/grouper fishery management plans.

Assisting States

States have been assisted in developing mitigation procedures, upland spoil disposal alternatives, wetland loss estimates, and marsh management techniques. State agencies and groups currently being

assisted include the Lake Pontchartrain Task Force (Texas), the Louisiana Geological Survey, the North Carolina and Florida Departments of Natural Resources, and the South Carolina Department of Health and Environmental Control.

Mitigation of Project Impacts

More than 600 acres of anadromous fish habitat were recommended for conservation, primarily along the Atlantic seaboard. Efforts were targeted primarily at the conservation of striped bass, blueback herring, alewife, shad, and sturgeon.

Reduction of Project Impacts

Many adverse project impacts to marine fishery habitat have been eliminated or minimized by bi-weekly interagency screening of permit applications by the Corps of Engineers and preapplication meetings with applicants for permits. Geologic review meetings are also held to determine the feasibility of minimizing environmental impacts related to oil and gas exploration activities.

Dissemination of Information

Habitat information continues to be communicated through presentations, journal articles, poster sessions, lectures at museums and local clubs, and newspapers and magazines.

NORTHEAST REGION

Planning Documents Developed

The Northeast Region has developed a major planning document which stresses conservation, an obligation to develop a basic understanding of the productivity of living resources, prediction of the effects of natural and human-induced changes to the ecosystem, and assurance that living marine resource populations can sustain themselves. A "Framework for Inshore Research" has also been developed to address research in inshore areas where anthropogenic threats to living marine resources and habitats are perceived to be the greatest.

Habitat Research

The effect on populations of chronic, low level incidental take of marine mammals (harbor seals and harbor porpoise) is being determined. Additionally, the distribution of the humpback whale in the Gulf of Maine has been significantly correlated with the apparent abundance of the sand lance, their principal prey. Humpback whale sightings on Georges Bank, however, are not correlated with dense patches of sand lance.

Research emphasizing the reproductive success, survival, and recruitment of key species subjected to contaminants is being conducted in several Northeastern U.S. estuaries. Documents describing the environmental conditions in the Northwest Atlantic, the distribution and abundance of fish larvae in the Northwest Atlantic, the distribution of gadid larvae on Georges Bank, and the food and areal distribution of juvenile fish in the Northwest Atlantic have been compiled.

A summary of the results of NOAA's Northeast Monitoring Program for the first five years has been published. Information obtained from the Program indicated the coastal marine environment is generally free from high concentrations of pollutants and obvious biological effects of pollution.

A three-year interdisciplinary study to document changes in living marine resources and their habitats following the cessation of sewage sludge dumping at the 12-mile dumpsite in the New York Bight was launched. Effects of the relocation of sewage sludge dumping to the 106-mile site off New Jersey will

be monitored using infrared data on sea-surface temperature patterns collected by NOAA satellites.

Additional research projects are addressing striped bass abundance and survival, the effect of low oxygen on winter flounder feeding and growth, contaminant levels in ocean quahogs, the effect of heavy metals on benthic invertebrates, the relationship between sediment contaminants and fish lesions, and the effects of dredging restrictions on Chesapeake Bay oyster production.

Fishery Management Plans Evaluated

Habitat sections for surf clam and ocean quahog, summer flounder, American lobster, Atlantic salmon, and the New England groundfish Fishery Management Plans have been developed. Continued involvement is anticipated as habitat sections are incorporated into fishery management plans and environmental committees are created to screen evolving issues.

Activities Under the Fish and Wildlife Coordination Act

Proposals to locate floating pens in Maine and Massachusetts for finfish aquaculture were analyzed. Unanswered aspects of these projects include impacts of disease, excessive use of antibiotics, eutrophication, and physical impacts related to shading and gear displacements. Projects to impound wetlands or divert waterways for waterfowl habitat, sediment control, stormwater management, or water supply reservoirs continue to be proposed in the Chesapeake Bay watershed. Such projects threaten to inundate wetland habitats and reduce freshwater inflows. With growing pressures to expand public marina capabilities along the northeast Atlantic coast, numerous proposed marina projects have been evaluated. Marina projects raise several concerns: physical impacts associated with dredging coastal water and excavating nearshore uplands, fisheries impacts associated with destroying productive salt marshes, and possible impacts to water and sediment quality. Potential impacts of the Navy's test of its defense systems against electromagnetic pulses (EMPRESS II) have been identified as possibly affecting the behavior of marine organisms as well as displacing fishing and other recreational activities.

Collaboration With Other Agencies

Development of a Register of Classified Estuarine Waters with the Food and Drug Administration was completed. This Register summarizes data from state shellfish control agencies on the quality of shellfish producing waters. Research into non-point source pollution in Chesapeake Bay is being coordinated with the Soil Conservation Service and the Environmental Protection Agency. Goals for this research are improved marine and estuarine water quality and increased fishery productivity as a secondary benefit.

Habitat Information Uses

Numerous inquires from congressmen, fishing industry representatives, fishery council members, and the concerned public about the potential long-term implications of continued ocean dumping were addressed. Other requests for information included requests for information about cetacean entanglement and procedures for handling stranded marine mammals.

Summary Graphics of NMFS' COE Permit Evaluations

Figures 1 through 6 summarize NMFS evaluations of Corps of Engineers Section 10 and 404 permits for the calendar years 1986 and 1987. Please note that permit statistics in the text are summarized by fiscal year and small differences between the graphics and the text are to be expected.

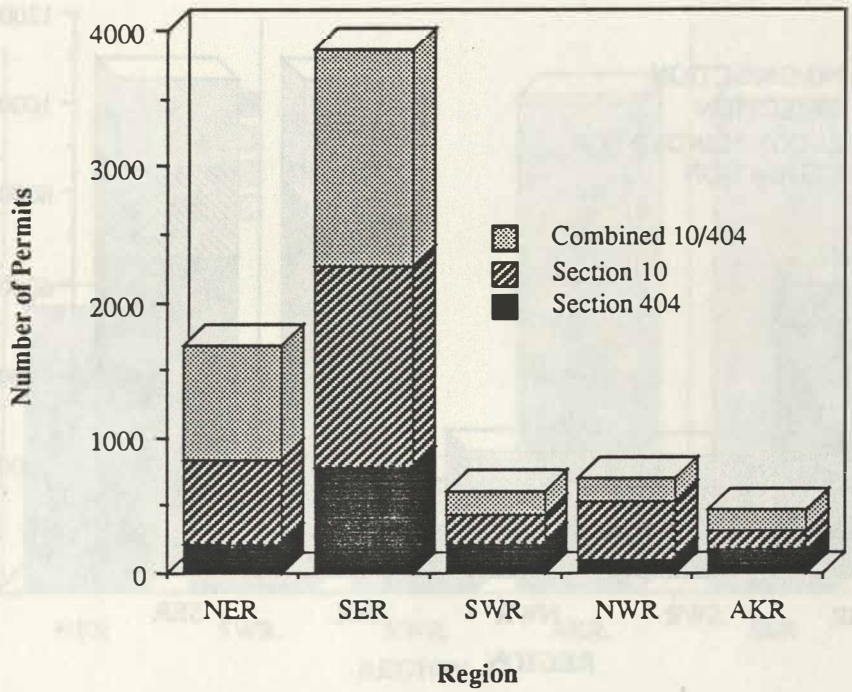


Figure 1: Number of COE Permits Evaluated by NMFS Regions During CY 1986

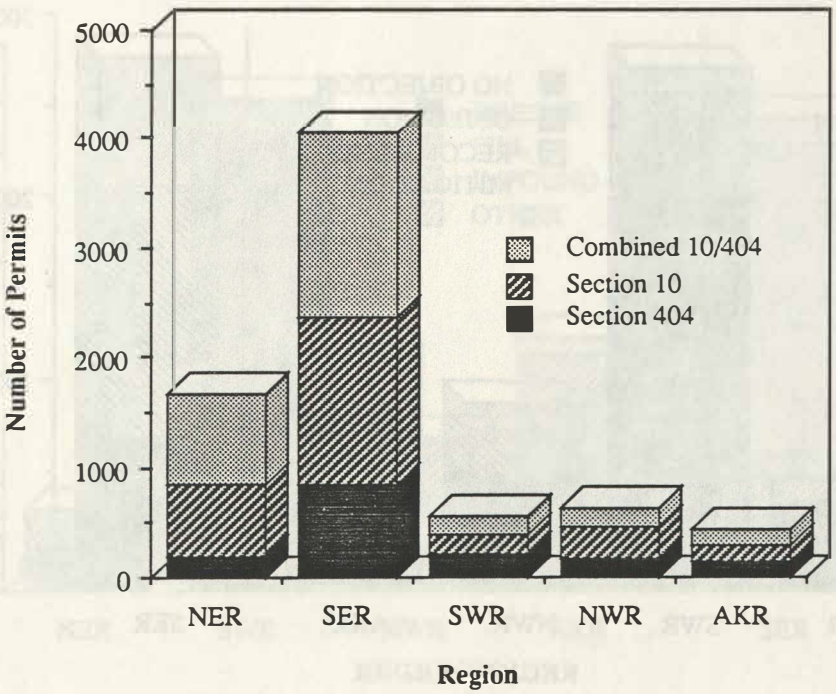


Figure 2: Number of COE Permits Evaluated By NMFS Regions During CY 1987

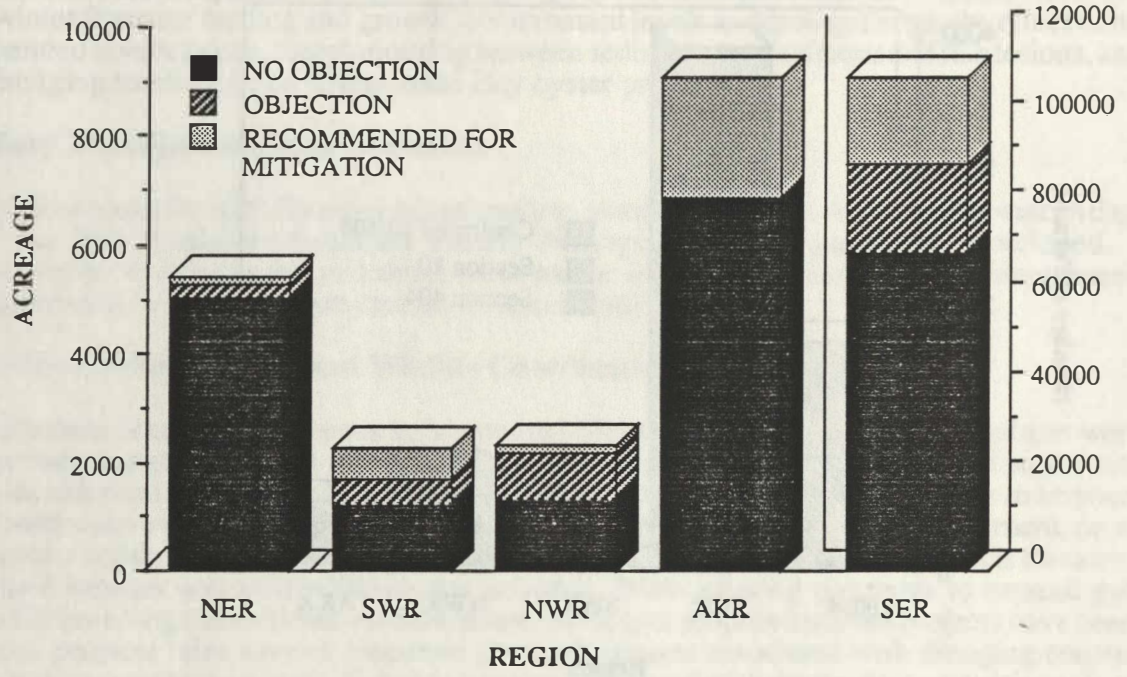


Figure 3: Acreage for which NMFS did not object to, objected to, and recommended for mitigation regarding COE permits for CY 1986.

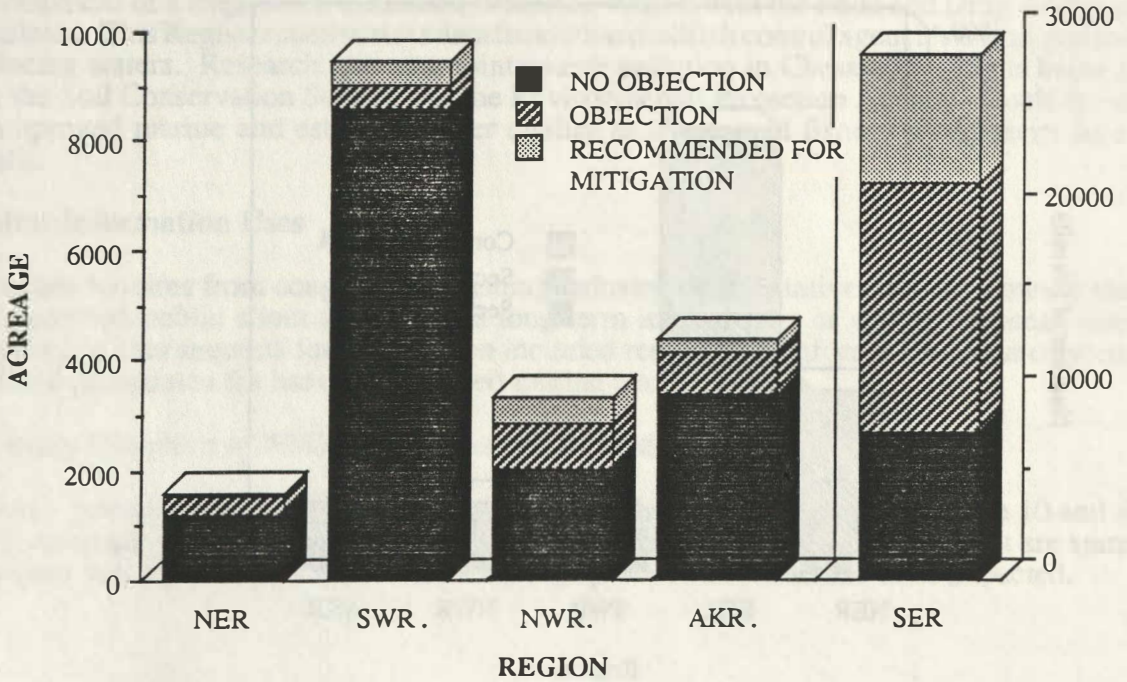


Figure 4: Acreage for which NMFS did not object to, objected to, and recommended for mitigation regarding COE permits for CY 1987

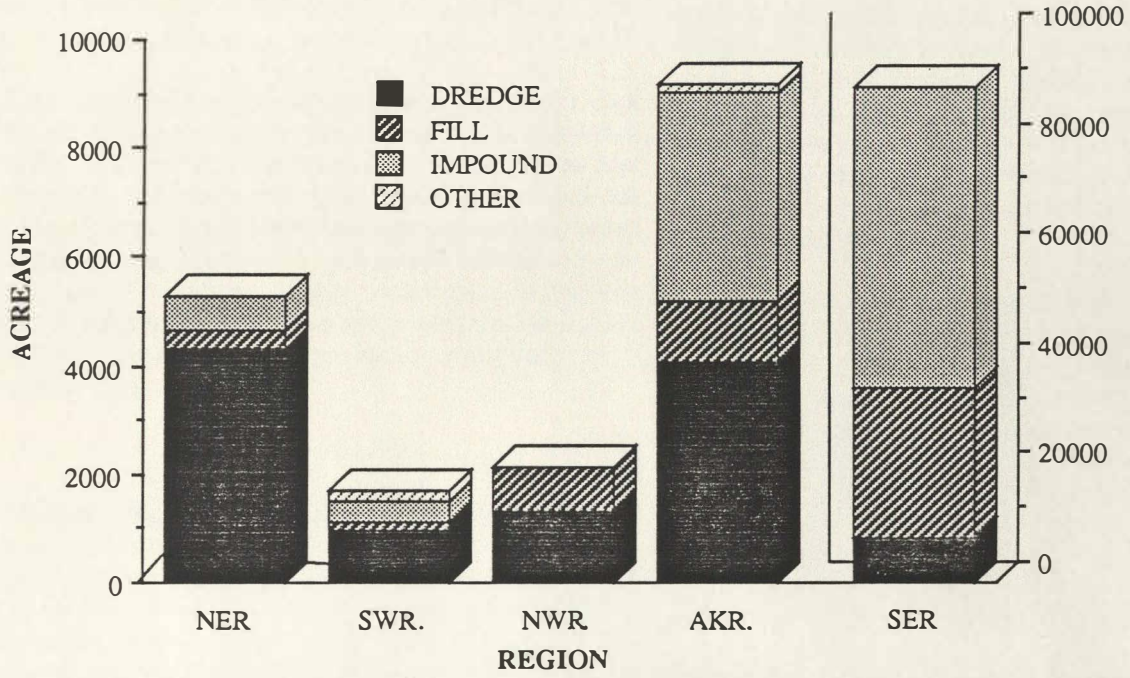


Figure 5: Acreage of habitat proposed for alterations by COE permits during CY 1986

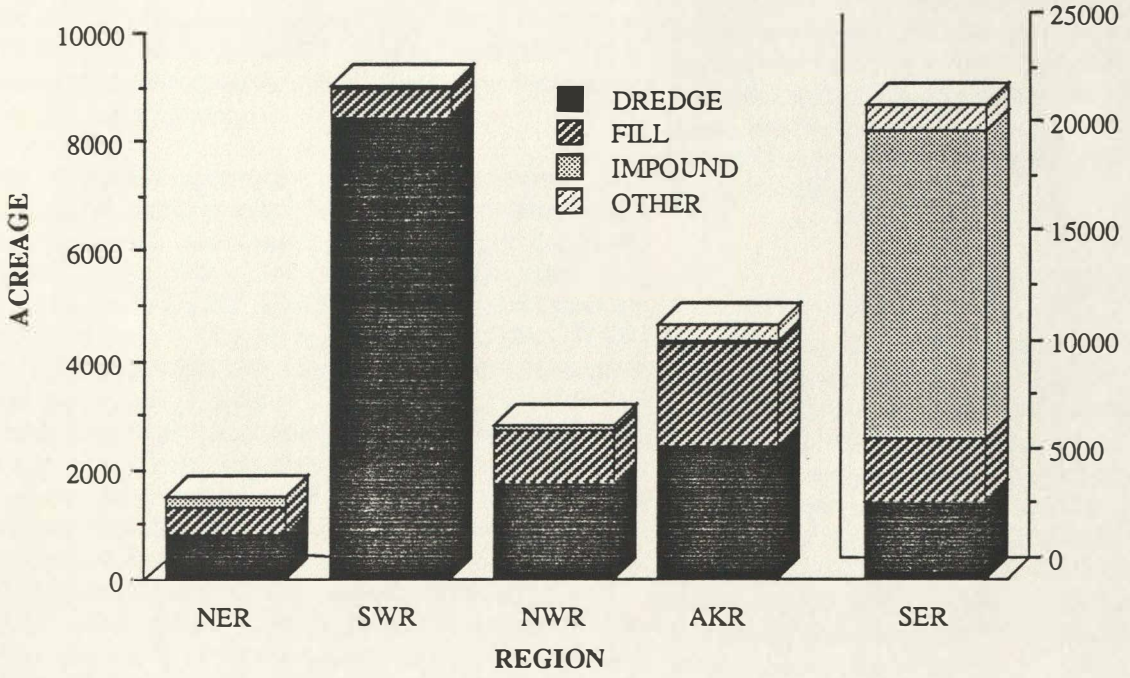


Figure 6: Acreage of habitat proposed for alteration by COE permits during CY 1987.

Biennial Report For Fiscal Years 1986 and 1987

IMPLEMENTATION STRATEGY 1: Research and Management Coordination

This Strategy calls for the establishment and maintenance of formal planning and coordination mechanisms between each NMFS Regional Office and Research Center. It has four objectives: 1) identify major living marine resources and threats to them, 2) enumerate habitat issues in priority order, 3) develop coordinated field strategies to address these issues, and 4) facilitate habitat conservation throughout NMFS' programs. All Regions and çenters are now operating under memoranda of agreement or similar cooperative arrangements.

ALASKA REGION

The Alaska Region (AKR) assisted the Auke Bay Laboratory (ABL) in field research under a Memorandum of Understanding titled, "Habitat Planning Strategy: Statement of Cooperation Between the Northwest and Alaska Fisheries Center, the Northwest Region, and the Alaska Region." This research had been identified as high priority by the Habitat Conservation Division (HCD). The work was originally intended to examine habitats at sites where logs are transferred from uplands to marine waters, but the potential for applications to intertidal and subtidal sites throughout the AKR soon became apparent. The research is directed toward the development of reliable and repeatable methods for evaluating submerged nearshore marine habitat in a manner that allows comparison with other nearby sites. Full cooperation between the AKR and the NWC has existed through all phases of the research to date (i.e., planning, data gathering, and data input efforts).

The AKR HCD completed a report detailing development activities in Alaska and the NMFS responses to those activities through our involvement with the Corps of Engineers (COE) Section 10/404 Permit Program. The report was published in June 1987, as NOAA Technical Memorandum NMFS F/AKR-6 "Report on the Alaska Region 10/404 Permit Coordination 1981 through 1985" and distributed to interested parties. The report is a detailed summary of permit actions NMFS analyzed during the 1981-1985 period, and was developed using data stored on the ADP permit tracking program maintained in the AKR. During this period HCD evaluated 2,315 proposed Section 10/404 actions. Most of these proposals (85%) were permitted by the COE. In all but 4% of the total actions, HCD worked successfully with the COE and the applicant to resolve resource concerns without requesting denial of the permit application. The most frequently requested authorization (40% of the total) involved placement of fill into wetland areas. Another 35% involved a combination of wetland fills and construction in navigable waterways. 58,902 acres of habitat were proposed for alteration during the study period. Through the involvement of NMFS and other resource agencies, the amount of habitat alteration actually authorized was 48% of that requested. Based upon the classification scheme used by the AKR, the most common purposes associated with permit applications, in decreasing frequency of occurrence, were the town/homesite, boating, oil and gas, mining, timber, aquaculture, and power generation categories.

The AKR and ABL administrators and staff communicate frequently to ensure that NMFS habitat actions are consistent with the AKR and National policies. A number of formal and informal meetings were held during the year to coordinate research direction and information dissemination. Topics covered included habitat use and importance for endangered species, pacific salmon, and commercially important shellfish.

NORTHWEST REGION

The Northwest Region (NWR) and Northwest and Alaska Fisheries Center (NWC) are continuing to operate under the joint Statement of Understanding negotiated during FY85. Quarterly planning and coordination meetings are held between NWR's Environmental and Technical Services Division (ETSD) and the NWC's Coastal and Estuarine Studies Division (CZESD). Of note, ETSD and CZESD worked together on an on-going cooperative project with the COE to study the possible environmental impacts of a proposed navigational channel in the Hanford Reach of the mid-Columbia River. However, ETSD and CZESD have terminated their participation in the study because of the NWR's opposition to the project (see implementation Strategy 4 for further details).

SOUTHWEST REGION

Southwest Region (SWR) Habitat staff continue to meet regularly with Southwest Fisheries Center (SWC) staff from La Jolla and Tiburon to identify and prioritize habitat conservation issues. The current efforts include the joint preparation of a framework to set northern California habitat conservation/restoration goals and to schedule particular tasks to fulfill those goals. In southern California, staff coordination is aimed at SWR/SWC participation in NOAA's Superfund efforts relating to a possible damage assessment against Montrose Chemical Company for historical DDT discharges to Santa Monica Bay.

SWR and SWC staff met in Portland August 5, 1987 for a four-day habitat workshop. All Regions and Centers were represented, as well as Central Office Habitat staff. Informa-

tion exchanges will benefit agency coordination and direction.

Region and Center representatives from around the nation met in Annapolis, Maryland late in the year to coordinate overall NMFS involvement with the Estuarine Program Office. The SWR has appointed the Northern Area Environmental Coordinator, located in the Santa Rosa field office, to represent the SWR formally in that effort.

The Southwest Fisheries Center is actively involved in two projects:

1. Turtle foraging habitat: Honolulu Laboratory (HL) staff closely interact with SWR to provide the best information possible for decisions on potential impacts of nearshore development on marine turtles.

2. Oil spills and non-point-source pollution: HL staff and SWR have collaborated on various issues related to a major oil spill that occurred in Pearl Harbor during 1987 and the ongoing problems of non-point-source marine pollution.

SOUTHEAST REGION

Research and management staffs in the Southeast Region (SER) have developed an effective and productive coordination process for habitat-related matters. Examples include input by the Southeast Fisheries Center (SEC) on significant water-development projects and projects requested for elevation to higher levels in the COE, collaboration on preparation and evaluations of scientific papers and research proposals, and continued close dialogue on ongoing mitigation studies. These communications occur virtually on a daily basis.

We continue to have an outstanding working relationship with the SEC's Beaufort Laboratory. This laboratory has provided excellent evaluations and comments for proposed seagrass mitigation plans (three in the U.S. Virgin Islands), has aided us in providing recommendations to the Navy to mitigate their Homeport impacts in Mobile Bay, Alabama, and provided comments on a COE thin-layer dredged material disposal study in Mobile Bay. The laboratory continues to supply us with reprints of work they accomplished. Laboratory staff also discussed research-management interactions with the SER at the National NMFS Habitat Conservation Workshop held in Portland, Oregon. In addition, plans and a tentative agenda were developed by the laboratory and the SER for a meeting to discuss habitat research and management during FY88.

Staff of the Beaufort and Galveston Laboratories and the SER coordinated efforts on pilot study sites in North Carolina and Texas to address the NMFS-COE Memorandum of Agreement (MOA) for a pilot study to investigate the practicability of a national program for restoring and creating fishery habitat. These efforts included joint meetings, site preparation, and initiation of monitoring studies. In Texas and North Carolina, SER's Galveston and Beaufort field offices have participated in some of the MOA site monitoring. The SEC and SER developed a joint progress report to Washington detailing the progress of the pilot study during FY86 and currently are cooperating with the COE in developing a joint progress report for FY87

SEC and SER staff also collaborated on determining priority management information needs issues in the region. SER provided input to draft documents being developed by the SEC on a NOAA Estuarine Initiative. Discussion of research and management issues relative to the Environmental Protection Agency (EPA) Albemarle-Pamlico Sound program also have been coordinated among SEC and SER staff.

Several meetings between SER staff and SEC researchers were held to discuss marsh management practices that impound thousands of acres of wetlands in Louisiana every year. The effect on fisheries, such as denying marine organisms access to large wetland tracts is a key issue. These meetings included a program evaluation of research being conducted at Louisiana State University (LSU) arranged by the SER for the SEC and Dr. Nancy Foster. Much of the ongoing and completed research resulted from an IPA at LSU funded by SER's HCD. This work is providing much new information which is vital for SER habitat conservation activities in Louisiana.

NORTHEAST REGION

Northeast Regional Action Plan

Coordination between the Northeast Region (NER) and the Northeast Fisheries Center (NEC) was bolstered by the appointment of a Regional Action Plan (RAP) Coordinator supported jointly by NER and NEC and stationed at NEC headquarters in Woods Hole, Massachusetts. The RAP Coordinator joined the NEC's Research Planning and Coordination Staff, a new unit that provides a focal point for scientific leadership, planning, evaluation, and coordination. Its staff provide liaison among NEC's research programs, and between these programs and their user groups.

The Northeast RAP is now in the implementation phase. Priorities established in the 1985 plan have been evaluated and translated into a detailed list of information and research needs for estuarine management. NER and NEC incorporated these priority needs into an inshore research initiative for FY89.

NEC's Research Program

NEC drafted a major planning document entitled "The Purpose and Direction of the NEC's Research Program". This "Core emphasis" document stresses conservation; i.e., the effects of man on fishery resources. It recognizes NEC's obligation to develop a basic understanding of the productivity of living resources of the Northwest Atlantic, and to predict the effects of fishery yields of natural and man-induced changes to the ecosystem. It states that the "Core emphasis" of NEC's research program is to define the limits of fishing and habitat degradation in the Northwest Atlantic that assure living resource populations can sustain themselves at levels consistent with prevailing fishery management policies and goals.

NEC's Framework for Inshore Research

Another major planning document completed by NEC, in collaboration with NER, was the NEC "Framework for Inshore Research". Completion of the Framework continued the evolution of the Northeast RAP process by proposing to expand NEC's base-funded research program in inshore areas, where the anthropogenic threats to living marine resources and habitats are perceived to be the greatest.

The Framework states that NEC's role in inshore waters is to integrate scientific information and conduct research necessary to support fishery conservation and management goals and objectives for species that move between inshore (within three miles) and offshore habitats, or that occur alongshore over a major portion of the Northeast U. S. coast. NEC's inshore research program focuses on addressing the highest priority threats to living marine resources and their habitats, and on obtaining general understanding of trends in natural system variability, so that changes related to these threats can be detected.

NEC completed a program development plan for a research initiative to expand and integrate NEC's inshore research program. The initiative is called ESCORT, which is an acronym for Estuarine and Coastal Research Thrust. The objective of ESCORT is to conduct a coherent, regional inshore research program that addresses issues and information needs relative to the conservation and management of living marine resources of the Northwest Atlantic ecosystem. The program's four major research areas are: 1) data and information management, 2) habitat requirements and use, 3) biological effects of habitat degradation, and 4) fishery statistics and stock assessments.

New Bedford Superfund Settlement

The U. S. Department of Justice and Massachusetts have agreed to a $2 million Superfund settlement with AVX Corporation for allegedly disposing polychlorinated biphenyls (PCBs) in New Bedford Harbor. Acting as public trustees, NOAA sued for damages to fishery resources and their habitat. With the settlement, the restoration process will begin. Settlements or court decisions on cases brought against other New Bedford PCB polluters may enhance the restoration budget. The NMFS, acting through the NER's Habitat Conservation Branch (HCB), will work closely with state officials on the restoration effort. This is one of the few examples of a Superfund restoration effort in marine waters.

NMFS is also working with COE on their draft analysis of estimated contaminant release that may result from dredging and disposal activities related to the proposed New Bedford Harbor Superfund pilot study. Our major concerns relate to the persistence, toxicity, and bioaccumulation potential of many PCB compounds. Because of those concerns, the health and edibility of fishery resources may be affected. HCB staff have urged that project plans include the specific dredging and disposal controls that will be utilized to limit contaminant dispersion and to define monitoring procedures and thresholds. HCB staff will remain involved with the COE, EPA, and the state as the pilot study proceeds.

106-Mile Dumpsite Monitoring Workshop

At the request of the EPA, NMFS' NER and NEC participated in a workshop to discuss scientific information needed for EPA's site-specific monitoring program of the ecological impacts of dumping municipal sludges at the 106-mile site. Since the 12-mile dumpsite was phased out in December 1987, EPA is accumulating information for new baselines. One major effort is to develop a monitoring program for all activities related to dumping and the marine environment near the dumpsite. Included are tests for bioaccumulation, spatial and temporal extent to sediment plumes, observations of protected species in the area, water chemistry, fish distribution, and deep sea benthos. EPA will continue to develop a monitoring plan and to gather technical information about the 106-mile site area.

Dredged Material Disposal Steering Committee

The New York District of the COE continues to host Steering Committee meetings to address major dredged material issues in the New York Harbor area. Issues related to containment islands, sanitary landfill cover, and subaqueous borrow pits have remained contentious throughout several years of committee meetings. The ultimate goal of the committee is to distill all possible recommendations concerning disposal of dredged material into a smaller group of viable alternatives. Although task force efforts have not achieved any consensus decisions yet, their efforts to address critical harbor issues are laudable. Research and analyses continue for sediment quality, upland disposal sites, fisheries studies, and benthic studies related to the three major disposal alternatives.

IMPLEMENTATION STRATEGY 2: Habitat Research

This Strategy calls for NMFS Fisheries Centers to conduct environmental and ecological research necessary to implement the Habitat Conservation Policy.

ALASKA REGION

Because of the need to use the most objective habitat assessment techniques available, HCD biologists have assisted ABL researchers with field work on a marine habitat rating index study. This cooperative research examines the possibility of formulating a rating index for intertidal and subtidal habitats. The rating index incorporates vegetative cover, the level of biotic heterogeneity, and commercial species use of benthic habitat at proposed marine development locations. Once developed and analyzed, the field techniques should produce a habitat rating index which will provide biologists with an assessment tool less costly than long term studies and more objective than present techniques. Field observations of seasonal and interannual variability of biotic populations as well as observer variability were completed in September 1987. Data analyses and reporting efforts are underway.

NORTHWEST REGION

Research continues to assess impacts of estuarine and coastal activities and development on anadromous and marine fish habitat. CZESD staff worked closely with other Federal and state agencies to improve habitat conservation research. Research to determine the impacts of expansion and operation of the Columbia River hydropower system on white sturgeon is underway for the Bonneville Power Administration (BPA), in coordination with concurrent activities of the Washington Department of Fisheries, the Oregon Department of Fish and Wildlife, and the FWS. There are at least four more years scheduled for this study of the habitat requirements of white sturgeon. The study deals specifically with the highest priority elements designated in the BPA plan to investigate early life history, stock status, population dynamics, habitat requirements, and reproductive biology of the white sturgeon.

The CZESD and the COE extended a cooperative investigation for a fourth year to study the effects of dredging and dredge-disposal on Dungeness crabs in the Columbia River estuary. These crabs are the basis of valuable commercial and recreational fisheries, and the Columbia River estuary is a critical rearing ground for juvenile crabs. Based upon studies of the seasonal distribution of crabs, CZESD has recommended changes in dredging schedules and techniques, to avoid habitat disturbance and entrainment of juvenile crabs.

The CZESD, in cooperation with the COE, conducted research on habitat and species distributions off the Umpqua River estuary (southern Oregon coast) at an interim dredged material disposal site. This study supplements previous years' studies at similar sites on the Oregon and Washington coasts.

The Center's Environmental Conservation Division (ECD) completed a three and a half year study on the etiology of liver tumors in English sole. During the course of this study, significant advances were made in the understanding of the relationship between liver neoplasms and chemical contaminants. In laboratory studies, a spectrum of liver lesions were produced in English sole following exposure to extracts of urban estuarine sediments. In addition, utilizing data collected in field studies, a statistical model was developed which accounts for 35% of the variation in neoplasm prevalence in English sole in Puget Sound based on fish size and sediment concentrations of selected classes of xenobiotics.

ECD scientists continued to evaluate and adapt sensitive methods suitable for use in large-scale monitoring programs for assessing exposure to and effects of environmental contaminants in marine species. Promising results were obtained utilizing a radioactive postlabeling technique to detect xenobiotic-DNA adducts in bottomfish, and in refinement of techniques for measuring the contaminant-inducible activation-detoxification enzymes found in fish liver tissue.

Studies conducted in the ECD's National Analytical Laboratory have led to significant advances in methodology used to analyze organic contaminants in sediments and marine fish and invertebrate tissue samples. A rapid, efficient high-performance liquid chromatographic method was developed to replace a more traditional, labor-intensive procedure which utilized gravity-flow columns. Other ECD studies addressed the urgent need for analytical methods for tributyltin, the active ingredient in many marine anti-fouling bottom paints. These studies resulted in development of an analytical method utilizing organic solvent extraction and gas chromatography/mass spectroscopy which has the advantages of high recovery and low limits of detection.

SOUTHWEST REGION

SWR Habitat staff coordinated with SWC staff in selecting habitat enhancement projects to pursue in complying with the October 25, 1985 MOA between NOAA and the COE. Projects were selected and progress is underway to restore 1,276 acres of wetland in the Sacramento delta.

SWR Habitat staff met with a variety of state, Federal, university, and SWC representatives at the Tiburon Laboratory, to discuss the status of eelgrass (*Zostera marina*) in California. The objectives of those discussions were to identify the extent of eelgrass resources throughout the State, to compile a list of existing eelgrass related research efforts,

to identify potential threats to established eelgrass resources, and to develop strategies to ensure the conservation of this valuable resource.

As a result of that coordination an eelgrass inventory was initiated in San Francisco Bay. This habitat information has never before been collected and it is critical to manage habitat and fish resources in the face of continuous shoreline development. Regional Habitat staff is providing project staff and direction while the SWC Tiburon is providing equipment and facilities.

SWR/SWC coordination in relation to habitat related research continued during the monitoring of three major ongoing contracts in California:

1) "Success of Shallow Water Fisheries Habitat Creation - Upper Newport Bay, CA" - Contractor, CA State University at Northridge.

2) "Southern California Wetland/Shallow Water Habitat Investigations" - SWC contract leader.

3) "Economic Evaluation of Chinook Salmon Habitat in the Sacramento River System" - SWR contract leader.

Managing Inflows to Estuaries

NMFS was one of a number of fishery and environmental groups to sponsor the symposium on Managing Inflows to Estuaries. The symposium was split into two concurrent segments (inflows and economics). The section on management of fresh water inflows into bays and estuaries was very well attended; nearly 250 participants and 40 speakers took part. In addition to sessions on southern California and central coast lagoon systems, the symposium featured indicator and inflow problems of San Francisco and Humboldt Bays.

The economic sessions were closed to a limited group of 40 and 12 speakers. The economics panel dealt with the valuation of non-market aspects of natural resources. Discussion centered on the concepts of willingness to pay (WTP) and whether it was appropriate for enhancement or resource gains; and willingness to accept (WTA) and whether it was the proper method for valuing for resource loss or mitigation. The panel, which was a prestigious group of academic and agency resource economists, reached the following general conclusions:

1) WTP and WTA were soundly based in economic theory. An important underlying tenant in the WTA concept was the issue of "resource ownership," which has been settled in the recent Mono Lake and Racanelli court decisions.

2) There is no reason, in theory, why WTP and WTA values must be similar - no reason why they cannot be substantially different. In fact WTA will almost always be higher than WTP - the amount of the difference depending on the degree of elasticity between "environment" and "income."

3) There is no reason, with WTA, to simply throw out or eliminate very high "outlyer" values. They are real expressions of value and should somehow be included.

4) Natural resource economists and managers should continue to vigorously develop methodology to measure WTA, in order to improve the statistically reliability of value estimates. Reliability was a major concern of many present.

5) To even the most cautious economists at the conference, use of WTA was probably acceptable for evaluating issues of policy - such as those being probed in NMFS' contract model of water and salmon in the Sacramento River system.

An executive summary of the symposium and separate full proceedings was published in July 1987.

Effects of freshwater diversion on the baitfish resources of Pearl Harbor, Oahu

In response to information that the State of Hawaii had tentative plans to divert freshwater from Waikele Stream, the main source for inflow to Pearl Harbor, the Honolulu Laboratory began a study of the fluctuations of the Pearl Harbor population of nehu, the primary baitfish used by the skipjack tuna fishery. So far this study has estimated nehu biomass, using the egg production method, on a weekly basis for over 75 consecutive weeks. Hydrographic, meteorological, and river flow data are simultaneously collected to determine if the observed population fluctuations are related to easily measured physical factors. Likewise, the commercial fishery is monitored to determine if population fluctuations are related to catch. Preliminary analysis suggests that fecundity is related to available food supply and that spawning frequency is related to water temperature. Future work in collaboration with staff members of the University of Hawaii will be directed toward determining the role of freshwater input on primary productivity.

Distribution of larval fishes near Oahu

Kahe Point, Oahu, has been proposed as the site of the first Ocean Thermal Energy Conversion (OTEC) facility. The proposed facility would draw large volumes of both cold, deep seawater and warm, surface water to exploit the thermal differential and generate power. The HL program has conducted four seasonal cruises to define the onshore-offshore, day-night, and vertical distribution of larval fishes in the region of this plant. Knowledge of the distribution and abundance of these vulnerable life stages will allow better assessment of potential impacts of impingement and entrainment by the OTEC operation. Recently a summary report on this study has been provided to the NOAA Ocean Minerals

and Energy Division.

Hawaiian Islands Mapping Program

The Hawaiian Islands Mapping Program (HIMP), an interactive mapping system designed to run on IBM compatible micro-computers, was completed in 1987. This program will generate maps of the Hawaiian Islands at a variety spacial scales ranging from a few kilometers to the entire archipelago using a library of digitized maps. Base maps consist of coastlines, but for many areas a user can elect to have one or more depth contours included on the map. A user can also elect to have sampling or commercial catch data summarized on the base map in a variety of ways, including numeric or symbolic representation of either a type or a quantity at a location or a series of locations expressed as a trackline. A user's guide to the HIMP system has been produced as an Administrative Report.

Survey of groundfish in Southern California wetland/shallow water habitats

In cooperation with SWR conservation staff, the La Jolla Laboratory completed the first year of a two-year survey of groundfish in Southern California wetland/shallow water habitats. An annual report for FY87 was prepared and distributed to SWR conservation staff and to other agencies. The report was also presented at the National Habitat Conservation Workshop in Portland, Oregon, in August of 1987. The key findings of the report were as follows: 1) California halibut are dependent upon bays and lagoons as nursery areas from settlement until about 13 months old; 2) deep dredging and loss of shallow water mud flat habitat within bay-lagoon systems may reduce carrying capacity of nursery areas as halibut densities are highest in shallow water areas (depth < 1 m); and 3) shallow areas along the open coast are white seabass nursery habitat.

SOUTHEAST REGION

Fishery habitat research conducted by the SEC during FY87 dealt with the relationships between key habitats and processes and important fishery species. The multidisciplinary research program of estuarine-coastal habitats emphasizes a balanced mixture of field and laboratory studies. The research goals of the program are: 1) to determine the key functional relationships (i.e., key processes) which regulate fishery production; and 2) to develop the capability to predict and assess man-related impacts (e.g., environmental alterations and contaminant additions) on fishery organisms and their habitats. During FY87 research emphasis was on: 1) the distribution and recruitment of larval and juvenile fishes, and factors influencing recruitment and survival of larvae; 2) habitat supporting finfish and shellfish, including evaluation of mitigation methodologies and the impact of altering environmental parameters; 3) research on feeding habits and predator-prey interactions; and 4) effects of metal contamination on larval fish food webs, mechanisms of metal accumulation and metabolism, and evaluation of metallic and organic contaminants in estuaries.

Coastal and oceanic research has shown that larval fishes, including Gulf menhaden and spot, are aggregated, possibly by localized hydrodynamic convergence, along the Mississippi River plume turbidity front in the northern Gulf of Mexico. Larvae in this frontal zone appear to be better fed than larvae of the same species from adjacent waters. Data are being analyzed to document how this plume may affect the spatial distributions, feeding, growth, and nutritional condition of larval fishes. Research is continuing into the meteorological and hydrodynamic mechanisms that influence the shoreward transport of larval fishes, and research has begun to examine the mechanisms that might account for the spatial distribution of king and Spanish mackerel larvae on the southeastern continental shelf.

A new research project as a part of the NMFS Marine Entanglement Research Program was begun. Plankton samples taken in the northern Gulf of Mexico (Cape San Blas, Florida; Mississippi River plume; Galveston, Texas) are being examined for the presence of small plastic (polystyrene) particles of a size (0.1 to 2.0 millimeters) that could be ingested by larval or juvenile fish. Mapping the distribution and abundance of these particles in relation to the concentrations of larval and juvenile fish provides preliminary data upon which we will base future sampling and laboratory feeding studies. Additionally, an investigator from the NMFS ABL, on rotational assignment to the Beaufort Laboratory, initiated with the Beaufort Laboratory staff a study of plastic litter on the North Carolina coast.

Estuarine research conducted by the SEC included recruitment to estuaries; utilization of various wetland habitat types as a measure of relative habitat value; predator-prey interactions; uses of detrital material; evaluation of impacts to fishery habitats including freshwater inflow and temperatures; the functional value of mitigated and created wetland habitats; and synthesis of information on wetland acreages and fishery species life histories.

Studies were conducted in North Carolina and Florida that coupled patterns of estuarine recruitment of larval fishes with subsequent distributions of juveniles in the estuary. May was the peak month for the most individual larvae as well as for the maximum number of species collected during the sampling in the inlet. Analysis of data on the relative abundance of all immigrating species shows that only 17 species are recruited in winter and that five species (spot, Atlantic croaker, Atlantic menhaden, pinfish, and speckled worm eel) make up 90% of all individuals collected. The marsh surface appears to be important as a refuge and feeding ground for many post larval fishes and macrocrustaceans using estuaries. A total of 35 species of fishes were captured during the

year from *Spartina* marshes (15 resident and 20 seasonal transients), as well as penaeid shrimp (three species) and blue crabs. Important recreational or commercial species using this habitat include southern flounder, summer flounder, spotted seatrout, striped mullet, sheepshead, gray snapper, and red drum. Field sampling also continued in North Carolina to determine fishery utilization in high marsh (*Juncus*) habitat. Data analysis indicates utilization as far as 2000-2400 meters along any one transect line by predominantly *Fundulus* spp. and mosquitofish.

Research on recruitment to and use of natural seagrass meadows in south Florida showed that spotted seatrout was the only commercial/recreational species whose larvae were regularly collected. This species appears to spawn in intermediate to high salinity waters within western Florida Bay and adjacent estuarine waters, but not in brackish waters. Analysis demonstrated that comparatively higher sediment organic contents, slightly shallower water, and abundant *Halodule* and *Syringodium* were important factors at stations belonging to the typically high density fish cluster.

Evaluation of the use of a variety of habitats in Texas over a wide range of salinities showed that abundances of estuarine organisms were comparatively lower where the greatest mixing of river water and lowest salinities persisted. As a result, usage of nursery habitats in San Antonio Bay was positively correlated with salinity. In neighboring Lavaca Bay, studies have assessed the impact of short-term pulses of fresh water on fishery habitat utilization. Ten days after the onset of flooding, salinities were lower than 0.1 parts per thousand, and significant numbers of brown shrimp, blue crabs, flounder, menhaden and other estuarine organisms were still present in the marshes, albeit at reduced densities. This investigation demonstrated the physiological capability of large estuarine organisms to withstand abrupt salinity reductions in nature and to remain in place relatively unaffected. In Galveston Bay, the largest bay in Texas with the largest freshwater source (the Trinity River), a similar investigation was conducted that related nursery habitats to salinity. The comparatively high utilization of *Spartina* habitat by fishery animals under long-term moderate salinities was not affected by short-term lowering of salinity. On the other hand, delta habitats that developed from long-term low salinities were not extensively utilized by estuarine species under normal low salinity conditions. Laboratory research is demonstrating that long-term salinity effects on factors such as development of food populations (epiphytes, amphipods, worms) appear to have more influence on distributions of shrimp and other estuarine organisms than the direct effects of salinity. These factors also may determine the comparative value of nursery habitats for fishery species.

Research on the distribution, abundance, and habitat use by shellfish and finfish provides a basis to formulate and test hypotheses concerning the role of habitat interactions in the survival of estuarine organisms. Burrowing of penaeid shrimp is largely controlled by daily illumination patterns, but at low light intensities other factors can affect this behavior. The effects of salinity, size, density, hunger, and substrate type on burrowing by *Penaeus aztecus* and *P. setiferus* were examined in the laboratory. Overall, burrowing was reduced with increased sediment grain size, hunger level and density, and with decreased salinity and size of the shrimp. Laboratory studies showed that salinity and turbidity significantly affected selection for vegetative structure by brown shrimp, and that the distribution of food and substrate in experimental tanks also affected selection patterns.

A survey was continued at the Beaufort Laboratory to determine the relative importance of detritus in the diet of Atlantic menhaden from Maine to Florida. Microscopic analysis of fish gut contents showed that amorphous detritus was the primary item ingested (usually greater than 80%) by juvenile and adult menhaden in estuaries. Digestibility estimates for organic matter were generally high, indicating that amorphous detrital material is readily assimilated. However, the origin of amorphous detritus in the diet of these fish, which likely affects its digestibility, is unclear. The detrital material utilized by menhaden and other estuarine organisms is derived from marshes, seagrass meadows, and mangrove forests. Modeling efforts suggest that a reduction in the outflow of organics from the marsh could result in as much as a 20% loss in the potential landings of some fishery species.

Field evaluations also are providing a basis to generate and test hypothesis concerning the role and impact of environmental parameters on fishery organisms and their habitats under both laboratory and field conditions. The study of effects of salinity and temperature combinations indicated that temperature alone has far more effect upon growth and survival of postlarval penaeids than either salinity alone or the interaction of the two factors. Such laboratory studies are related to results from field sampling which have indicated that distribution of penaeid shrimp is related more closely to habitat characteristics (food, substrate, etc.) that may be controlled in part by the long-term salinity regime, rather than by short-term fluctuations.

A model was developed to estimate the effect of excessively high discharges from the Faka Union Canal on Faka Union Bay, a small estuary in the Ten Thousand Islands, Florida. The model, based on a statistically significant relationship between fish abundances and salinity, suggests that fish abundances could be improved by reducing canal discharges to approximately 30% of the present level.

Research also was conducted on the influence of water quality on the production and distribution of seagrass habitats shown to be important nursery areas. An intensive field study has been undertaken to examine the diurnal, seasonal, and annual light regime in Hobe Sound, Florida, in conjunction with a study of seagrass distribution, abundance, and growth. During FY87 research continued to examine whether the

production, standing crop, and density of temperate and tropical seagrasses are limited by nutrients, and therefore could be impacted by reduction of nutrient input by reduced freshwater inflow or increased nutrients through eutrophication. One study demonstrated that the plant community responded to nutrient additions with a change in species dominance from *Thalassia* to *Halodule*. These results, taken in conjunction with natural seagrass distributions within Florida Bay, indicate that water circulation plays a major role in providing nutrients (primarily phosphorus) for seagrass productivity.

Since there are virtually no data as to whether artificially propagated seagrass beds and salt marshes provide fishery habitat values equivalent to the natural beds they are to replace, research is being conducted to develop and evaluate habitat creation techniques. Numerical abundance of all fauna, whether fish or crustacea, were shown to be generally an order of magnitude less in eelgrass transplants after 250 days and bare areas as compared to natural beds. Samples from a two-year-old transplant implied eventual convergence of natural bed and transplant bed fauna, pointing out the need for making bed persistence a requirement of mitigation specifications. In a Tampa Bay, Florida, study the fastest-growing seagrass species in the southeast, *H. wriqhtii* (shoalgrass), was transplanted into five experimental plots around Tampa and Hillsborough Bays. The transplants are being compared to adjacent, unplanted bare areas as well as natural stands of *T. testudinum*, *S. filiforme* (manatee grass), *L. wriqhtii*, and a rhyzophytic macroalgae, *Caulerpa prolifera.* After the first sampling, numerical abundances of fauna in natural seagrass and *Caulerpa* beds were similar and significantly greater than transplanted or unvegetated areas, which were in turn similar to each other. Microbial abundance in transplanted seagrass bed sediments was measured as part of the evaluation of transplanted seagrass as replacement habitat. Microbial abundance in 250-day old transplanted *Zostera* sediments was no greater than in adjacent unvegetated sediments. Natural *Zostera* grassbed sediments had a much greater microbial abundance. Sediment organic carbon and percent silt-clay were positively correlated with bacteria abundance.

Two marsh mitigation sites in North Carolina are being evaluated. A two-year-old marsh mitigation site is being utilized by fishes, but the prevalent species are not those common to the area that this mitigation site compensates for; the adjacent natural marsh is utilized by more and, in some cases, different species than the mitigated marsh. At the second site, block netting of a marsh transplanted in 1974 and an adjacent natural salt marsh is demonstrating similar use patterns by fish species. The Beaufort Laboratory, under a contract with the Waterways Experiment Station of the COE, began late in FY87 to sample fishes and invertebrates at 26 sites in Florida where *Spartina* marshes have been planted as a consequence of mitigation actions. During FY87 the research on the NMFS-COE MOA in North Carolina and Texas was initiated. Plants were transplanted, channels dug, and sampling was begun.

Trace metal studies in the SEC have focused on four areas: 1) manganese distribution, speciation and cycling in marine waters, 2) determination of total dissolved and ionic copper and zinc in estuarine waters, 3) bioassay of trace metal pollution in estuaries, 4) monitoring levels of contaminants in 17 estuaries in the southeast, and 5) determining mechanisms of metal regulation in shellfish.

Research on the cycling of manganese between soluble, bioavailable Mn+ and insoluble manganese oxides demonstrated a dynamic redox cycle in which manganese oxidation is microbially catalyzed. Experiments in trace metal buffered media indicate that the toxicity of copper, zinc, and cadmium is inversely related to the soluble manganese concentration due to competitive interactions between manganese and other metals. Hence, the concentration of dissolved manganese is an important factor affecting the toxicity of these metals to organisms in estuarine and coastal waters. Dissolved and free ionic copper and zinc concentrations were measured in samples collected from the heavily contaminated Elizabeth River-Hampton Roads system and in the lower Chesapeake Bay. Based on these studies, it was hypothesized that existing levels of trace metals in some contaminated estuaries are sufficiently high to adversely affect estuarine organisms. To test this hypothesis, bioassays were conducted with the larvae of *Acartia tonsa* in water from the Elizabeth River estuary, Hampton Roads, and lower Chesapeake Bay. The survival of these organisms was measured in parallel water samples with and without added synthetic chelating agents (EDTA or NTA), which were added to reduce the free ion concentration and biological availability of toxic trace metals. They demonstrated that existing free copper and zinc ion concentrations are sufficiently high in some contaminated estuaries to be toxic to sensitive marine organisms.

The fourth area of research involves NOAA's National Status and Trends Program which is currently collecting samples in the southeast for the fourth consecutive year. Samples of fish (Atlantic croaker and spot) and sediments are collected from 18 sites along the Southeast Atlantic and Gulf of Mexico coasts. Liver and sediment samples are analyzed at the Beaufort Laboratory for trace metals and at the Charleston Laboratory for synthetic organics and petroleum hydrocarbons. Liver, kidney, and gill samples are screened at the NEC, Oxford Laboratory, for histopathological abnormalities.

Investigations have shown that in the oyster, *Crassostrea virginica*, the reproductive cycle significantly alters the mobilization and partitioning of copper both intracellularly and in the whole animal. In the blue crab, *Callinectes sapidus*, major redistributions and changes in the intracellular partitioning of both copper and zinc can be correlated with

the stages of the molt cycle.

NORTHEAST REGION

Long Island Sound Management Committee

HCB staff continue to represent the NOAA at Long Island Sound Management Committee meetings. Many of the technical discussions related to future research plans concern dissolved oxygen (DO) levels and hypoxia events in the western sound. The EPA is studying the particular DO needs of winter flounder, and the University of Connecticut is studying related issues on two species within the context of total water quality.

Marine Mammal Research

The HCB protected species staff met with the NEC and key marine mammal researchers to discuss the direction of future marine mammal research in the Northeast. The status of past and ongoing research projects was discussed. One of our remaining problem; centers around chronic low level incidental take that occurs in various New England fisheries. Ongoing research has shown that harbor seals and harbor porpoise are the major species affected by certain fisheries in the Gulf of Maine. Adequate biological information has been collected to assess the effects of this take on the harbor seal, but not the harbor porpoise. Hence, marine mammal research efforts will be redirected toward the porpoise.

The NEC has entered into a Cooperative Agreement with the Right Whale Consortium to undertake significant studies on the North Atlantic right whale. The agreement calls for research as specified by the Marine Mammal Commission in their Right Whale Research and Management Plan developed last year.

In coordination with the NEC, the HCB developed a summary of its Federally-funded marine mammal research in the NER. Our submittal will become part of the annual report of the Marine Mammal Commission Report.

Habitat Studies

The Kemp's ridley sea turtle habitat use studies currently being conducted by Okeanos Research Foundation in Long Island Sound with sonic and radio tagged turtles is providing us with some very important preliminary information concerning the ridleys' summer feeding and habitat preferences.

The COE Cape Cod staff has agreed to be on the lookout for sea turtles utilizing the canal and adjacent waters, as part of our regional sea turtle sighting network. HCB staff with assistance from the Mass. Audubon Society Wellfleet Sanctuary will provide a sea turtle identification seminar for the COE staff in the near future.

Disposal Site Monitoring

NMFS is concerned that current dredged material disposal and site management practices could endanger the health and edibility of valuable commercial and recreational fish and shellfish. NMFS has written to EPA Region I and the COE, New England Division to express these concerns and to suggest ways to reduce risks to living marine resources, their habitats, and the industries and people that depend on them for food or livelihood.

One specific issue is capping at the Boston Foul Area Disposal Site. Our concerns are that contaminated materials have been dumped at that site and that capping with clean materials may not be possible due to shifting water currents and depth. The COE is not contemplating additional research to address NMFS concerns. Once research is completed, NMFS suggests that all Federal agencies involved in site designation and management should work together to develop a strategy for future projects that may involve dredging of contaminated materials or disposal at an offshore site. Since several contaminated Northeast harbors need maintenance dredging, this issue will probably demand significant attention for several years.

Increased Estuarine Research Emphasis in the Northeast

In cooperation with the EPA, the states, and academia, NEC began expanding its research efforts in several Northeast estuaries. Research emphasis is on the reproductive success, survival, and recruitment of key species subjected to contaminant effects. Major emphasis is on studies of the winter flounder (*Pseudopleuronectes americanus*) and the hard clam (*Mercenaria*) ; limited research is being conducted on the American oyster (*Crassostrea virginica*) and the American lobster (*Homarus americanus*). Studies are being conducted in Long Island Sound, Narragansett Bay, and Buzzards Bay. Stock assessment and population modelling techniques will be used to link pollutant effects on individual organisms to population-level impacts.

Environmental Conditions in the Northwest Atlantic Described

NEC prepared four reports of environmental conditions in the Northwest Atlantic during 1985 and three during 1986. The reports covered: 1) variations in the shelf-water front position from Georges Bank to Cape Romain; 2) water column thermal structure across the shelf and slope southeast of Sandy Hook, New Jersey; 3) sea-surface temperatures in the Northwest Atlantic (1985 only); and 4) anticyclonic warm-core Gulf Stream rings off the Northeast U.S.

Larval Fish Distribution Portrayed for the Northwest Atlantic

NEC produced a major atlas summarizing the distribution and abundance of fish larvae collected in the Northwest Atlantic during the first seven years of the MARMAP (Marine Resources Monitoring, Assessment, and Prediction) surveys, 1977-84. This atlas provides pictorial descriptions of the distribution patterns of numerically dominant larvae representing 26 taxa.

The annual spawning cycles of most fish species in the Northwest Atlantic result in a peak in larval abundance during the warm water months (June-October), and a decrease in both abundance and species diversity during the winter. The species composition and abundance rankings change dramatically from south to north: over 30% of the taxa in the Mid-Atlantic area do not occur in the Gulf of Maine; an additional 20% of the taxa in the Gulf of Maine occur in very low numbers there, yet are quite abundant in the Mid-Atlantic. Sand lance (*Ammodytes* spp.) larvae dominated the winter collections in most of the region, accounting for over 90% of the winter larval fish community. The spring spawning migration of Atlantic mackerel (*Scomber scombrus*) through the survey area produces large concentrations of larvae throughout the region.

Vertical Distribution, Growth, and Condition of Gadid Larvae Related to Prey Density and Environmental Conditions on Georges Bank

NEC published additional information on the fine-scale vertical and horizontal distribution of gadid larvae and their prey on Georges Bank. This information provides valuable insights into the possible relations among the physical environment, prey availability, and growth of haddock (*Melanogrammus aeglefinus)* and Atlantic cod (*Gadus morhua*) larvae on Georges Bank — factors that may ultimately affect recruitment of these species.

Atlantic cod and haddock larvae were found throughout the water column from near bottom to surface on southern Georges Bank; however, most of the larval population resided in water depths of 10-40 meters.

The peak densities of cod and haddock larvae generally coincided with the highest prey (primarily copepods) biomass vertically. Higher levels of available prey were found at two stratified sites than at a well-mixed site. Up to 50% of the haddock larvae from the well-mixed site were in poor condition, based on their RNA-DNA ratios. Stratified conditions in the spring may favor good growth and survival of haddock larvae, whereas cod larvae may be better adapted to grow and survive in well-mixed waters at lower levels of available food than haddock larvae.

Food and Areal Distribution of Juvenile Fish in the Northwest Atlantic Described

NEC published a report summarizing the food and seasonal geographic distribution of juveniles of 17 Northwest Atlantic fish species collected during 1973-76. This report provides comprehensive data on specific prey organisms and cumulative distribution plots showing areas of juvenile fish concentrations. Juveniles (fish about one year old or younger) of many Northwest Atlantic fish species are concentrated either in shoal regions or close to shore, whereas others tend to concentrate around the 100-m depth contour. For example, juvenile spotted hake (*Urophycis regia*), scup (*Stenotomus chrysops*), and butterfish (*Peprilus triacanthus*) were caught most often either close to shore or at about 100 meters in the Middle Atlantic and Southern New England areas. Concentrations of juvenile Atlantic cod and haddock were found along the 100-meter depth contour in the Gulf of Maine (mostly in waters off Boston, Massachusetts, and on southwestern Georges Bank near the Great South Channel). Some seasonality was also apparent. For example, juvenile little skate (*Raja erinacea*), silver hake (*Merluccius bilinearis*), red hake (*Urophyis chuss*), scup, and yellowtail flounder (*Limanda ferruginea*) were most abundant during spring off Long Island, New York ("Southern New England" area). Availability of prey, preferred habitat, and suitable bottom water temperatures are probable factors influencing these distributional patterns.

Distribution of Humpback Whales Correlated with Their Prey

NEC and the Manomet Bird Observatory determined that the present distribution of the humpback whale (*Megaptera novaeangliae*) in the Gulf of Maine (based on shipboard sighting data) is significantly correlated with the apparent abundance (based on NEC groundfish survey standardized tows) of the sand lance, their principal prey. Conversely, humpback whale sightings and sand lance abundance on Georges Bank are not correlated, despite dense patches of sand lance in that region. Therefore, bottom topography and foraging behavior are important factors influencing the feeding distribution of humpback whales.

Lobsters and Crabs Compete for Shelter

Investigators at NEC and the University of Rhode Island have determined that shelter availability is a critical feature of lobster habitat, and that competition for shelter sites may play a central role in lobster population dynamics. Post-settlement lobsters are particularly vulnerable to predators. Locating and successfully occupying and defending a shelter site is critical for survival. Final larval stage lobsters preferentially settle in substrates where shelter is available.

American lobsters, rock crabs (*Cancer irroratus*), and jonah crabs (*Cancer borealis*) are potential competitors in rocky

subtidal areas of Narragansett Bay, Rhode Island. SCUBA divers found lobsters exclusively on rocky substrates; jonah crabs, primarily in rock habitat, but also in gravel and mud; and rock crabs, only in sandy areas. Lobsters excavate shelters, whereas jonah and rock crabs bury themselves in the substrate. Lobsters do not bury, and jonah and rock crabs seldom burrow. Thus, lobsters are much more strongly adapted (and tied) to shelter use than these two species of *Cancer* crabs.

Daily removal of lobsters from field quadrats in a rock-sand substrate in Narragansett Bay resulted in a decrease in density of lobsters and an increase in density of jonah crabs (primarily small ones) when compared with control quadrats.

Laboratory tests were conducted with a predator, tautog (*Tautoga onitis*), present. All three species selected rocky habitat when alone, but rock crabs shifted to sand when a jonah crab was present. Both species of crabs markedly decreased shelter use in the presence of lobsters, whereas lobsters decreased shelter use only slightly when competing with crabs. In aggressive encounters, lobsters usually were victorious over both species of crabs, and jonah crabs defeated rock crabs. But lobsters unable to obtain shelter suffered much higher injury and mortality rates from predation than the controls, whereas jonah crab mortality rates were unchanged. Since lobsters are less flexible in their habitat use than jonah crabs, loss of shelter through competition has more severe consequences for lobsters than for jonah crabs.

Northeast Monitoring Program Results Summarized

NEC published a summary of the results of NOAA's Northeast Monitoring Program (NEMP) for the first five years (1979-84). Information obtained from the pilot phase of NEMP revealed a coastal marine environment generally free from high concentrations of pollutants, and from obvious biological effects of pollutants. However, in several small portions of the area there was size evidence of pollution and related effects.

Major findings of the Biological Effects component of NEMP include the following:

* Abnormal blood chemistry was characteristic of flounders collected from inshore areas. Abnormal hematological values in flounders from Long Island Sound approximately matched the pollution gradient. Fish collected in the western, more polluted, end of the Sound had the most abnormal values.

* High levels of a stress-indicating kidney enzyme were found in flounders from polluted areas, including Buzzards Bay, the New York Bight Apex, Block Island Sound, lower Delaware Bay, and the lower Merrimack River. Enzyme levels revert to normal in fish that move to cleaner waters.

* Cytogenetic abnormalities of mackerel eggs collected in the New York Bight were significantly correlated with pollutants, including aromatic hydrocarbons, chlorinated hydrocarbons, and heavy metals.

* Pathological conditions were more prevalent in fish from nearshore areas. Fin erosion and liver neoplasms appear to be reliable indicators of effects of degraded environments on fish.

* More gill pathology was found in blue mussels (*Mytilus edulis*) from degraded habitats, such as Raritan Bay, New Jersey, Cape May, New Jersey, and an oil-spill area near Searsport, Maine, than other locations. Inflammation and ciliate infestations were found in mussels from these sites, but were rare in the other coastal locations sampled.

* Sediments contaminated with crude oil caused changes in burrowing behavior of benthic organisms, which would increase their vulnerability to predation.

* Benthic polychaetes exposed to sediments contaminated with cadmium were unable to avoid contact with the contaminant, and bioaccumulation resulted.

* Survival of laboratory-reared striped bass larvae was inversely correlated with contaminant body burdens of female parents obtained from several rivers and hatcheries in the eastern U.S.

The five years of NEMP monitoring also established baselines for water and sediment quality, abundance and diversity of infaunal benthos, and body burdens and biological effects for fish and fish habitats throughout the Northeast shelf ecosystem. The data will improve our ability to characterize fish and environmental quality on the continental shelf. If the same species and sites were later re-examined using comparable methods, comparison with data acquired during the pilot phase of NEMP would aid in detecting changes.

12-Mile Dumpsite Recovery Study Initiated

NEC launched a 3-year interdisciplinary study to document changes in living marine resources and their habitats following the planned cessation of sewage sludge dumping at the 12-mile dumpsite in the inner New York Bight. Cessation of sewage sludge dumping should be followed by physical, chemical, and biological changes that will directly and indirectly affect the abundance, distribution, and utilization of fishery resources.

The purpose of this study is to determine if and how this site's fisheries resources and habitats respond to the dumping phaseout. NEC began frequent sampling of 22 stations in and around the dumpsite that will continue for at least a year after

the dumping stops in December 1987.

The study evaluates changes in the distribution and abundance of demersal fishes and benthic invertebrates; changes in fish diets; pathology: changes in tissue levels of microbial and chemical contaminants in fish and shellfish; the roles of water mass movement, nutrient loading and hypoxia, and sediment contamination and transport on seabed oxygen consumption; and other chemical processes. Complementary field and laboratory studies will address causes and effects of episodic hypoxia, organic chemical contaminants, and metals on important resources. NEC is cooperating with EPA, the Food and Drug Administration, the New Jersey Department of Environmental Protection, and others on several components of this study.

From July 1986 through June 1987, during intensive trawling surveys of three stations chosen to represent a gradient of sludge influence, many species of demersal fish were collected. Little skate:and winter flounder were most abundant numerically, making up 59% and 12% of the total demersal fish biomass. The rock crab dominated the invertebrate biomass. Although some seasonal shifts were noted, the annual mean biomass of fish and invertebrates at the "enriched" station was about double the biomass at both the "polluted" station at the edge of the dumpsite and the cleaner "reference" station. Incidence of disease has been usually less than 2% of any sample, although higher incidence was observed at the enriched station. Tagging returns (1.5%) from winter flounder collected both inshore and around the dumpsite suggest a more dispersive pattern of movement into southern Long Island Sound than expected.

Differences observed in the benthic macrofauna agree with the variation expected along the pollution gradient represented by the three stations. The most heavily polluted station had the fewest species, including pollution-sensitive molluscs and crustaceans, whereas the reference station had the most. Field experiments on the effects of selected contaminants on settlement of larval invertebrates indicated that domestic sewage sludge generally has a depressing effect on settlement of all larvae, whereas settlement in sulfide-contaminated sediment appears to be species-specific. Concentrations of bacteria in sediment (total and fecal coliform, *E. coli*, *Vibrio* spp., and *C. perfringens*) were generally highest at the polluted station, intermediate at the enriched station, and lowest at the reference station.

In the sludge accumulation area, reducing conditions in sediments were less severe and less prolonged in the summers of 1986 and 1987 than in previous summers. A preliminary comparison of the redox potential and benthic faunal data at the most polluted station during July - September 1986 suggests a close association between sediment chemistry and benthic community dynamics. Following the July 1986 redox minimum in surface sediments, sediment oxidation conditions increased through August, in association with a large decrease in *Capitella* abundance. Both trends reversed in September.

Seabed oxygen demand rates in the area immediately east of the 12-mile dumpsite appear to be declining as a response to a 30% reduction in dumping. Comparable data from other stations in this area support the hypothesis that oxygen demand by the sediments adjacent to the sewage sludge dumpsite will decline to more natural rates as dumping is phased out.

Sediments obtained from stations on the sludge dumpsite transect from March 1985 to October 1986 were analyzed for total organic carbon. Stations in the Christiaensen Basin accumulation area had relatively high organic carbon concentrations and variability. There is a suggestion of decreased concentrations and variability at these stations since June 1986; however, more analyses are needed to ascertain if this trend is real and continuing. The stations outside the Basin, including the one at the northern edge of the dumpsite that receives a large portion of the sludge dumped, had relatively low concentrations of organic carbon, a finding consistent with the sandy nature of these sediments.

Synoptic surveys in and around the Hudson Shelf Valley in mid-May 1987 indicate the rapid rate of circulation of near-bottom water. A small area of oxygen-depleted water (<80% saturation) detected to the northwest of the dumpsite during May 12-17 expanded nearly 5-fold over a 5-day period, extending 20 km south of the area by May 17-20. During the same survey, density structure along the axis of the Hudson Shelf Valley indicated down-valley flow of bottom water. Vertical salinity profiles also revealed the presence of a major plume of low salinity (<31 ppt) water from the Hudson-Raritan Estuary that was up to 15 m thick and extended up to 25 km offshore along the northern New Jersey coast. During May 12-17, the edge of the plume, as defined by the 31 ppt isohaline, cut through the western third of the 12-mile dumpsite. Five days later, it had shifted to just outside the southwest corner of the site. Clearly, the dumpsite receives some pollutant inputs from the plume in addition to those dumped there, but the amount is unknown. Current meters deployed in May 1987 at seven locations in and around the valley will provide necessary data to model sediment transport and distribution.

Sewage Sludge Dumping at 106-Mile Dumpsite Monitored by Remote Sensing

Regulations imposed by EPA beginning in March 1986 call for a phased relocation of sewage sludge dumping from the 12-mile site off Sandy Hook, New Jersey to the 106-mile site on the continental slope south of Hudson Canyon. The relocation of dumping was scheduled to be completed by December 31, 1987, at which time the 106-mile site would receive all municipal sludge generated by New York City, two New York counties, and six New Jersey municipalities,

in addition to industrial chemical wastes, which have been dumped there periodically since 1972. The annual input of sewage sludge is estimated to be about 2 billion gallons, based on 1985 totals.

The NEC is monitoring infrared data from NOAA satellites to map sea-surface temperatures in the area of the 106-mile site. The surface temperature patterns portrayed are used to determine which of four common water masses (shelf, slope, warm-core ring, or Gulf Stream water) received wastes dumped at the site each week. A report summarizing the quantities of wastes dumped into each water mass at the site from October 1985 through September 1986 was issued by the NEC, and another for October 1986 - September 1987 is in preparation.

Sediment Contaminants Analyzed for Northeast Estuaries

As part of the National Status and Trends (S&T) Program's Benthic Surveillance Project, NEC analyzed sediment samples from several Northeast estuaries for 17 metals, 14 of which are possible contaminants. The estuaries first analyzed were those expected to be most polluted: Raritan-Hudson, Long Island Sound, Narragansett Bay, Boston Harbor, and Salem Harbor. As expected, the Raritan-Hudson system had the highest concentrations for most heavy metals in 1984, followed by Boston Harbor. However, the highest concentrations of chromium and cadmium were from Salem Harbor.

NEC completed analyses and prepared a report on heavy metal concentrations in sediment samples collected at 17 sites during the second year (1985) of monitoring for the S&T Program's Benthic Surveillance Project. At the 12 sites for which there are now two years of observations, no significant changes in metal concentrations were apparent; Boston and Salem Harbors and Lower New York Bay remain the most contaminated sites in the Northeast.

Five sites were examined for the first time in 1985: Frenchman's Bay (Maine), Penobscot Bay (Maine), Great Bay (New Jersey), upper Chesapeake Bay (near Baltimore), and mid-Chesapeake Bay (near the Potomac River mouth). Of the 17 metals analyzed, only zinc and chromium levels in Penobscot and Great Bays, and zinc, chromium, and nickel levels in upper Chesapeake Bay, appeared to be elevated.

Winthrop Harbor, MA Overlooking Logan Airport, Boston Skyline, and the NOAA Status and Trends Site in Boston Harbor, Found to be Highly Polluted.

Polycyclic Aromatic Hydrocarbons Analyzed in Gulf of Maine Sediments

Scientists from NEC, the Bigelow Laboratory, and Duke University analyzed sediments from 19 stations in the Gulf of Maine for 16 priority polycyclic aromatic hydrocarbon (PAH) compounds in 1983. Sediment PAH concentrations in Gulf of Maine were generally an order of magnitude lower than those observed in the coastal zone, but higher than those on Georges Bank. Sediment PAH concentration was directly related to sediment grain size, total organic carbon, and distance from source. Observed PAH distributions support the conclusion that the principal transport mechanism is through the atmosphere, possibly augmented locally by sediment resuspension and transport from coastal embayments.

Contaminant Levels Analyzed in Ocean Quahogs

NEC and Batelle New England Laboratory found that contaminant levels in ocean quahogs (*Arctica islandica)* in the Northwest Atlantic between Virginia and Nova Scotia were generally low. The study investigated body burden levels of polychlorinated biphenyls (PCB), PAH, total petroleum hydrocarbons, and trace metals (silver, cadmium, chromium, copper, nickel, lead, and zinc). The highest levels of these contaminants were generally found in samples from known areas of inputs (e.g., waste dumpsites) or adjacent to heavily industrialized coastal areas (e.g., inner New York Bight, Rhode Island Sound, and Buzzards Bay/New Bedford Harbor, Massachusetts).

Interaction of Heavy Metal Contaminants in Sea Scallops

Cadmium is normally detoxified by the sea scallop (*Placopecten magellanicus*) kidney. In response to the presence of cadmium, the kidney produces a protein that binds to the metal and immobilizes it. But when even a small amount of copper is present, the copper displaces the cadmium from the binding protein, thereby releasing the cadmium to interfere with the scallop's physiological health. The presence of copper can also disrupt the scallop's ability to detoxify other heavy metals such as zinc and manganese. These findings emphasize the importance of considering the synergistic effects of multiple contaminants in pollutant-effect studies.

Chronically Low Oxygen Reduces Winter Flounder Feeding and Growth

NEC has begun to examine the effects of chronic low levels of dissolved oxygen (DO) in Northeast inshore waters during the summer months on the activity, feeding, and growth of young-of-the-year winter flounder. Initial results show that fish exposed to DO concentrations of 7 (approximately normal for unpolluted waters during the summer), 4, and 2 mg/l for two-week periods continue to feed and grow. However, food consumption and growth rate were significantly less at 2 mg/l. Such reduced growth would at least increase the time spent at smaller and more vulnerable sizes, and could contribute to increased predatory mortality.

Striped Bass Abundance and Survival Monitored

Abundance indices for juvenile striped bass (*Morone saxatilis*) during 1986 decreased in Albermarle Sound and increased in the Hudson River and the Maryland and Virginia tributaries to Chesapeake Bay. However, all indices except for the Virginia tributaries still remain far below the long-term average. These findings emerged from a workshop, held under the auspices of the Emergency Striped Bass Study, in which participants evaluated recent research on the striped bass.

Field studies during 1986 showed reduced survival (relative to controls) of larval striped bass in the Nanticoke and Potomac Rivers, but not in the Delaware and Chesapeake Canal. The reduced survival in the Nanticoke and Potomac appeared to be linked to poor water quality (low pH, heavy metal contamination, etc.). But water quality in the Canal appeared to be good for survival of the larvae. The combination of low pH and aluminum contamination can be an important cause of larval mortality in some areas and years, although data analyzed thus far provide no evidence that an increase in acid precipitation and deposition is the culprit in the overall decline of striped bass production in recent years.

Larval Settlement of Benthic Invertebrates Diversity Affected by Heavy Metals

NEC's experiments on the effects of sediment-borne heavy metals on larval settling and colonization by benthic invertebrates suggest that benthic invertebrate populations that inhabit chronically contaminated environments can develop a tolerance for — or at least a lack of avoidance of — heavy metal contaminated sediments. Arrays of trays containing either "clean" sediment or sediment with metals added to approximate both the "average" and the most contaminated" sediments in heavily polluted Raritan Bay were planted in Sandy Hook Bay (a moderately polluted habitat just east of Raritan Bay) and in Barnegat Bay (a relatively clean habitat south of Sandy Hook Bay).

In Barnegat Bay, nematodes, polychaetes, and harpacticoid copepods settled in significantly higher numbers in the "clean" sediment. But in Sandy Hook Bay, there were significant differences in settlement of these kinds of invertebrates between "clean" and "average contaminated" sediments; polychaete settlement was not significantly different among the "clean," "average, " and "most contaminated" sediments; and amphipod settlement was actually greater in the "average" and "most contaminated" sediments than in the "clean" sediment. Experiments were repeated in Barnegat Bay to determine which metals were most limiting to larval

settlement in a relatively clean habitat. Results indicated that cadmium was the most toxic metal tested.

Burrowing and Feeding Behavior of Bloodworms Affected by Oiled Sediment

NEC's experiments on the effects of sublethal levels of oiled sediment on the burrowing and feeding behavior of the bloodworm (*Glycera dibranchiata*) revealed that bloodworms burrow as rapidly into oiled sediment as into unoiled sediment. However, when bloodworms emerged from oiled sediment, debilitation was so severe that it was evident that their burrowing behavior was not directed, and therefore was not indicative of avoidance. Emerged bloodworms would be highly vulnerable to predation by a variety of marine fish.

Young winter Flounder Readily Ingest oil-Contaminated Prey

One-year-old winter flounder will readily approach and ingest sandworms (*Nereis virens*) — an important prey item — that have been heavily contaminated with crude oil. These findings emerged from NEC studies designed to measure the effects of oil contamination, low dissolved oxygen, and other perturbations on the normal activity and feeding of age-0 and age-1 flounders. A future study will examine the effects of oil uptake in young flounders through such prey ingestion.

Preliminary Findings Associate Sediment Contaminants with Fish Lesions

NEC completed a report on fish disease data collected in 1984 as part of NOAA's S&T Program. Because only one year's data were analyzed, and because those data have not yet been analyzed in detail, any conclusions must be considered preliminary and subject to change. Given these caveats, it appears that certain liver and kidney lesions in the fish species being monitored (e.g., winter flounder and Atlantic croaker, *Micropogon undulatus*) correlate well with the presence of high levels of some sediment contaminants.

High Incidence of Liver Disease Detected in New Bedford Harbor winter Flounders

In a cooperative study with the Massachusetts Division of Marine Fisheries, NEC found that 42% of the winter flounder examined from New Bedford's Clark Cove had areas of inflamed and dead liver tissue that could reasonably be interpreted to affect the health of these fish. Fish from other areas along the Massachusetts coast had lower occurrences of liver lesions. The species most affected — winter flounder — spends much of its time on the bottom within a relatively small territory. The area in question — New Bedford Harbor — has bottom sediments with exceptionally high concentrations of PCB, which are known liver toxins.

PCB Levels and Genetic Abnormalities Recorded for Young Winter Flounder

NEC analyzed winter flounder eggs from Long Island Sound for levels of PCB, and winter flounder embryos from Long Island Sound and Boston Harbor for genetic abnormalities. As expected, eggs collected from fish in the less polluted habitats of eastern Long Island Sound had lower PCB levels than eggs from fish in the more polluted habitats of western Long Island Sound. Winter flounder embryos from Boston Harbor had a high incidence and severity of faulty cell differentiation, which is generally associated with subsequent tumor development. Previous field studies on Atlantic mackerel, cod, and pollock (*Pollachius virens*) embryos have linked aromatic hydrocarbon pollution to such faulty cell differentiation. Boston Harbor has significant aromatic hydrocarbon pollution and a high incidence of adult winter flounder tumors.

Winter Flounder Reproductive Efficiency Variable in Long Island Sound

A joint NEC/EPA study has shown significant variation in winter flounder reproductive efficiency in Long Island Sound. These results are based on a sampling of eggs, embryos, and yolk-sac larvae from 90 winter flounder collected during the 1986 spawning season at 6 sites located in Long Island Sound along a pollution gradient. The six sites were Hempstead and Shoreham in New York, and Hammonasset, Milford, New Haven (Morris Cove), and Norwalk in Connecticut. Using the criteria of fertilization success, pre-hatch mortality, larval malformation, and size at hatch, investigators found that the Shoreham flounders had the best reproductive efficiency, Morris Cove the worst. Embryos and larvae from Shoreham had a 5-fold greater survival rate than those from Morris Cove.

Model Developed for Evaluating Effects of Dredging Restrictions on Chesapeake Bay Oyster Production

NEC participated in a workshop that produced a model for evaluating the effects of channel dredging restrictions on Chesapeake Bay oyster production. The COE found that the new suction dredge design retains most of the silt, thereby minimizing the siltation of oyster seed beds and subsequent reduction of juvenile oyster abundance.

IMPLEMENTATION STRATEGY 3: Fishery Management Councils and Plans

This Strategy has two important elements: incorporating agencies' habitat requirements in Fishery Management Plans, and involving Fishery Management Councils more fully in habitat issues.

ALASKA REGION

The North Pacific Fishery Management Council (NPFMC) and Federal regulatory agencies in Alaska were informed of the recent changes to the Magnuson Fishery Conservation and Management regulations that addressed fishery habitat. The NPFMC can comment on fishery habitat concerns directly to the appropriate Federal agency and that agency is required to respond with details on how those NPFMC concerns will be addressed.

Habitat considerations required by amendments to the Magnuson Act (Section 302 and 303) for king and tanner crab in the Bering Sea and Aleutian Islands were prepared and submitted to the NPFMC plan development committee.

NORTHWEST REGION

The NWR worked closely with the staff of the Pacific Fishery Management Council (PFMC) and with the PFMC Habitat Committee during FY87 on a number of habitat issues. Significant accomplishments include the Council's adoption of habitat sections for the Pacific salmon FMP and the groundfish FMP. These habitat sections were developed by ETSD, in close consultation with PFMC staff and the PFMC Habitat Committee. The documents describe the habitat types and requirements of the species within each FMP, outline threats to those habitats, and make recommendations for the conservation and protection of habitat required for the survival and optimum production of salmon and groundfish species. The goal of the habitat sections is to more closely link habitat management concerns with harvest management.

SOUTHWEST REGION

SWR Habitat staff provided a formal briefing to the Council Habitat Committee. Described were habitat staff expertise, work demands, and habitat priorities of future importance to the Council.

During the past year, NMFS northern California staff analyzed and commented on the draft habitat section of the Salmon Fishery Management Plan. In addition, PFMC staff provided us with data and interpretation of salmon harvests, as part of our analysis of the status of winter-run chinook. Continued communication was maintained concerning our Contract to model the value of salmon habitat in the Sacramento River system.

Finally, NMFS southern area staff evaluated and commented on the draft habitat section of the Groundfish Management Plan for the west coast.

Our relationship with the Western Pacific Region Fisheries Management Council (WPRFMC) concerning habitat issues has not significantly changed from last year.

SOUTHEAST REGION

SER personnel routinely involved Fishery Management Councils (FMC) in habitat issues by enlisting FMC support for water-development activities that affect fishery resources covered by a fishery management plan (FMP). The FMCs were briefed on actions that could affect their interests and provided supporting documentation on which decisions and comments could be based.

In responses to the Gulf of Mexico FMC Habitat Advisory Committee, Mid-Atlantic and South Atlantic FMCs, and MAFAC, staff from the SEC provided presentations on habitat, mitigation, and fishery research in the SEC. The SEC completed a draft report for the Caribbean FMC on the ecological basis of fishery yield of the Puerto Rico-Virgin Islands insular shelf based on a evaluation of the available literature.

The South Atlantic, Caribbean, and Gulf of Mexico FMCs were assisted in the revision of their habitat policies and guidelines. These changes are complete and strengthen Council involvement in habitat issues. HCD personnel attended many Council meetings to provide answers to the technical questions that were raised.

SER personnel formally briefed the Gulf of Mexico FMC's Louisiana/Mississippi Habitat Advisory Panel on key projects and chaired presentations on the implications of marsh management in Louisiana. The importance of this topic is underscored by the fact that such marsh management has been proposed in over 440 square miles of Louisiana coastal marshes. SER staff obtained expert input by university and governmental scientists. The SER has recommended that the Council take a definitive position on marsh management to ensure protection and accessibility of habitats supporting living marine resources. As a result, the Council recommended to the regulatory agencies that additional marsh management plans not be permitted pending the completion of a programmatic environmental impact statement (EIS).

The SER analyzed the habitat sections of the shrimp, red drum, billfish, reef fish, and snapper/grouper FMPs. Portions of the shrimp FMP were rewritten by the HCD and will be added to the plan.

NORTHEAST REGION

Applying Habitat Information to Council Activities

Recent amendments to the Magnuson Fishery Conserva-

tion and Management Act mandate that fishery management councils include habitat sections in all FMPs and exercise broad authority to evaluate Federal proposals that may affect fisheries under council jurisdiction. HCB staff continue to work with council staff and members to develop policies, committees, and procedures to meet these new mandates. HCB is now providing staff support to the Councils on developing habitat sections for surf clam and ocean quahog, summerflounder, American lobster, Atlantic Salmon, and groundfish fishery management plans. In the Mid. Atlantic, the council has actively participated in decisions related to EMPRESS (a NATO test operation scheduled for Chesapeake Bay) and several dredging proposals. In New England, the council provided comments to the Minerals Management Service on OCS lease sale 96. Continued involvement is anticipated as habitat sections are incorporated into fishery management plans and environmental committees are created to screen evolving issues.

Marine Mammal and Fishery Interactions

Constituents often report gear or habitat conflicts between protected species and commercial or recreational fisheries. A developing issue is the possible predation by harbor seals on Atlantic salmon and lobsters. This issue is most severe in northern New England. HCB staff have participated in special informational meetings to discuss provisions of the Marine Mammal Protection Act which allow commercial fishermen to protect their catch, gear, and person from injury from marine mammals.

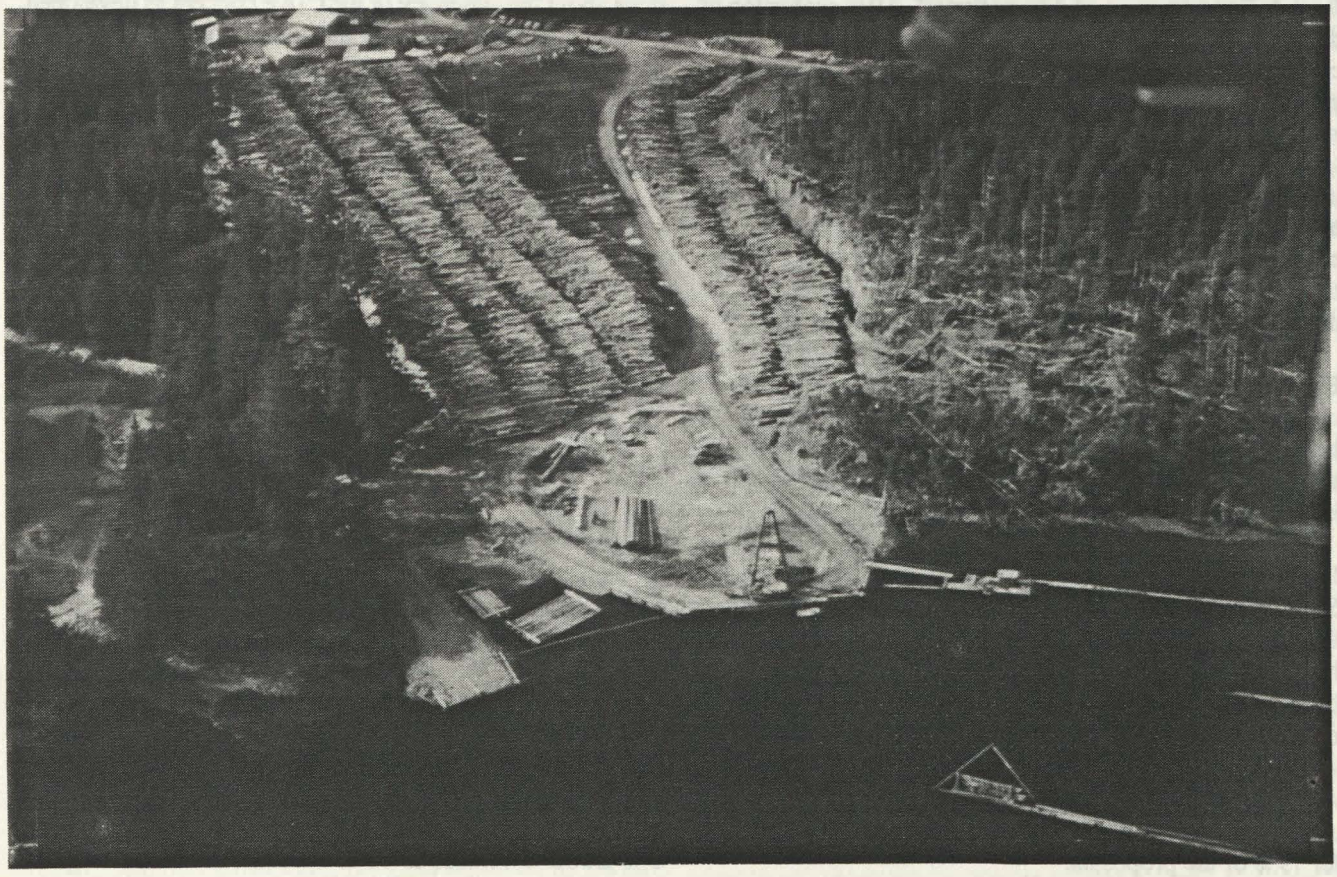
IMPLEMENTATION STRATEGY 4: *Fish and Wildlife Coordination Act*

This Strategy calls for the continued use of the Fish and Wildlife Coordination Act (FWCA) and other authorities that allow NMFS to influence other Federal agencies' actions affecting fish and shellfish habitats.

ALASKA REGION

During FY87, the AKR responded to 18 requests for information under Section 7 of the Endangered Species Act. A Biological Opinion was prepared on the Chukchi Sea Lease Sale 109 and two previous Opinions were evaluated.

Concerning OCS Lease Sale 109 in the Chukchi Sea, NMFS concluded that the leasing and exploration phases are not likely to jeopardize the continued existence of any endan-



Log Transfer Site, Rowan Bay, Kuiu Island, Alaska - Bank Loss and Deposition May Degrade the Benthic Habitat for Shellfish at Such Facilities.

gered or threatened marine cetaceans. NMFS also provided its views on the entire action, including development and production. The document pointed out that if oil/gas development and production activities affected the spring lead systems used by bowhead whales for their migration it would be likely to jeopardize the population. This threat should be recognized as early as possible so that the oil companies will be aware of possible future restrictions. Included in the document were reasonable and prudent alternatives to the action to avoid jeopardy.

A proposal by Dome Petroleum Corporation, for a Deep Stratigraphic Test well in the Chukchi Sea, was essentially identical to a project proposed last year by Northern Technical Services. NMFS determined that the proposed activity is unlikely to jeopardize the continued existence of any marine mammal species. We do, however, remain concerned about the cumulative effects of OCS leasing and exploration on endangered whales and recommended the Minerals Management Service continue to investigate the effects of all authorized offshore activities to ensure that, collectively, they will not jeopardize the continued existence of any listed endangered species.

The National Park Service (NPS) provided NMFS with a paper titled "Proposed Changes in Vessel Entries to Glacier Bay: A Consideration of Alternatives." After evaluation of the paper and discussions with NPS personnel, NMFS concurred with the NPS' position that an overall seasonal increase in vessel traffic of no more than 6 large ships and 76 small craft is within the scope of activities considered in the 1984 Biological Opinion. This concurrence was based in part on the understanding that abundance of humpback whales, humpback prey and acoustical monitoring programs will continue at equivalent to present levels, operational restrictions on vessels remain, and actual vessel use levels are documented.

Eleven major draft or final environmental impact statements covering activities such as oil and gas development, timber harvest, pipeline construction, mining, and construction of boat harbors were evaluated and comments provided on issues affecting anadromous, estuarine, or marine resources.

In Alaska, HCD responded to 419 COE public notices for Section 10/404 Department of Army permit applications during the year. Without modification, these projects would have affected 1793 acres of habitat by dredging, 1414 acres by filling, and 45 acres by impoundment. Another 545 acres of navigable waters would have been effected by piers, wharfs, docks, floating camps/lodges, and log storage. The AKR recommended denial of 4% of the applications, project alterations to 17%, and did not object to issuance of permits for 79% of the proposals.

Ten hydroelectric power projects were analyzed during the year. A Petition to Intervene was filed with the Federal Energy Regulatory Commission (FERC) on three proposed hydroelectric power projects. Those three projects have the potential to significantly affect anadromous fish resources/habitat and subsequently the commercial fisheries in the Cordova, Hydaberg, and Ketchikan, Alaska areas. We are working closely with other interested parties to maintain or enhance the commercially important fisheries in the affected systems.

NORTHWEST REGION

During FY87, the NWR continued working on a wide variety of issues involving the FWCA and protection of important anadromous fish habitats. A number of these are described below.

The NWR performed an indepth evaluation of the Federal Energy Regulatory Commission's (FERC) Cluster Impact Assessment Procedure (CIAP) implementation for the Salmon River Basin. The CIAP was developed by FERC after an increase in the number of hydroelectric project proposals prompted resource agencies and Indian tribes to request cumulative impact analysis. However, NMFS, along with other resource agencies and tribes, have serious reservations about the adequacy of the CIAP concept as developed, and are concerned that past and future investments of hundreds of millions of dollars for anadromous fish protection and restoration may be jeopardized.

After reviewing the Salmon River Basin Draft Environmental Impact Statement (DEIS) at the end of FY86, NMFS recommended that FERC prepare a programmatic DEIS to respond to numerous adverse comments by the reviewing agencies and Indian tribes. The Final EIS did not adequately respond to agency and tribal comments and criticisms of the CIAP process, and FERC has not yet taken licensing actions recommended in the FEIS.

The last two annual habitat reports contained discussions under this implementation strategy of NWR/ETSD involvement in litigation over inadequate fish protection at Rock Island Dam on the Columbia River. The ETSD was involved in the development of a settlement agreement, signed in FY87, that will resolve long-standing disputes regarding anadromous fish mitigation and compensation measures related to the construction and operation of Rock Island Dam. The agreement defines the commitments and obligations of the involved parties in providing spills for fish passage, hatchery compensation, and adult and juvenile fish protection facilities at the dam.

The ETSD continues to be involved in settlement negotiations at other mid-Columbia projects, including Wells Dam, Rocky Reach Dam, Wanapum Dam, and Priest Rapids Dam. In addition, the ETSD processed over 800 permit applica-

tions from the COE. The permit applications were evaluated for possible fishery habitat impacts, and responded to accordingly.

As mentioned under implementation Strategy 1, the NWR and the NWC began in FY86 to work with the COE to study the possible environmental impacts of navigational dredging project proposed by the COE for the Hanford Reach of the mid-Columbia River. The Hanford Reach is the only remaining upriver bright fall chinook salmon spawning area of any significance in the Columbia River. Over the past few years the number of fall chinook salmon returning to spawn in the Hanford Reach has more than doubled. The NWR has expressed opposition to the project based on concerns regarding its potential for impacts on the fall chinook resource. Potential impacts include elimination or alteration of spawning habitat, disruption of the natural flow of the river, increases in salmon mortality, interference with sport and Indian tribal fisheries, and an overall decline in the productivity of the salmon resource in the region.

The aerial photo depicts two large controversial projects on the west coast of Oahu, Hawaii which NMFS has been involved with. A summary of the projects and NMFS Habitat Conservation Program input is as follows:

At the right hand side of the photo is a portion of the recently completed Barbers Point Deep Draft Harbor. The harbor was dredged "in the dry" behind an impervious shoreline berm under specifications by NMFS in order to prevent long term impacts from turbidity in coastal waters. Blasting and dredging of the entrance channel was done under a strict time frame to avoid impacts toseasonally occurring endangered species, specifically the humpback whale, and monitored closely to minimize impacts to the extensive coral reef fronting the project.

The cleared land and initiation of dredging a marina (middle of photo) and four artificial lagoons (left-center of photo) is for the Ko Olina Resort

Aerial photo, Depicting Two Large Controversial Projects on the West Coast of Oahu, Hawaii Which NMFS Has Been Involved with.

(West Beach Estates) project. Again NMFS has specified that the marina and lagoons be dredged behind impervious berms prior to connecting with the ocean. NMFS also required the resort developer to change his plans for a separate marina entrance channel and instead utilize the existing deep-draft harbor entrance channel.

An artificial reef is to be constructed offshore from the north end of the project as mitigation for habitat lost during construction of the four lagoon entrance channels. In addition the channels themselves are designed to enhance fishery habitat. Further safeguards will be triggered if the monitoring program soindicates. NMFS participates in monthly meetings at the Ko Olina project site and

SOUTHWEST REGION

Almost all major habitat project involvements by Regional staff fell under the umbrella of Strategy 4.

SWR Habitat staff successfully took the lead in persuading the COE, San Francisco District, to eliminate a two-year-old requirement to slurry dredged material before disposal in San Francisco Bay. This should reduce sedimentation throughout the bay and encourage selection of a proper ocean disposal site.

The U.S. Navy San Francisco Homeporting Plan was evaluated thoroughly. Although there is considerable concern for water quality issues (dredging, dredged material disposal, graywater discharge, and stormwater runoff), numerous individual and interagency meetings developed considerable data to assess most impacts adequately. The final selection of a disposal site is not fully resolved.

SOUTHEAST REGION

Preliminary SER data demonstrates the importance of the involvement by the Habitat Conservation Division (HCD) in the COE's wetlands regulatory programs. For FY87, 4,045 water-development proposals were analyzed. Based on a sample of these proposals 16,512 acres of wetlands were proposed for alteration, including 8,869 acres requested to be impounded for marsh management. The HCD agreed that 8,548 acres could be permitted, and recommended that over 7,166 acres of wetlands be restored, generated, or enhanced. This acreage was to mitigate for wetland alterations accepted by the HCD.

Efforts were expanded in Louisiana to work collectively with other agencies and landowners to develop management plans for marshes which are deteriorating due to manmade causes, subsidence, erosion, and so forth. During FY87 more than 2,745 acres of wetlands were proposed to be impounded. Our goal is to insure that management plans for the impoundments allow for continued access by marine and estuarine-dependent fish and shellfish. To date, more than 65 management plans have been completed covering more than 550 square miles (370,570 acres) of Louisiana's coastal wetlands.

Two reports describing SER habitat conservation efforts were prepared and/or presented during FY87. The first report describes HCD efforts for 1986, and provides a comprehensive analysis of the habitat database for 1986. The second report evaluates success in having recommendations included in permits issued by the COE. Results document a very effective habitat conservation program which at a minimum accounted for the potential conservation for the 1986 calendar year of almost 20,000 acres out of at least 90,000 acres of wetlands proposed for alteration by 969 water-development projects (3,900 projects were evaluated). SER recommendations were fully and partially accepted 80.6% of the time by the COE and rejected 19.4% of the time. The SER now has data on 6,354 projects proposed since 1981 indicating that almost 275,000 acres of wetlands were proposed for alteration by these projects. The SER recommended that more than 119,000 acres of wetlands be conserved. Since 1981 the HCD analyzed more than 27,000 individual proposals that requested the alteration of wetlands in the southeast.

SEC scientists continued to work closely with the COE, the SER, and other Federal and state agencies to increase awareness of the shortcomings of some mitigation technologies, advantages of some technologies, and lack of information on the value of mitigated habitats for fishery resources. Research information is being developed in part through enhancement monies. The Beaufort Laboratory staff met with representatives of SER, NER, FWS, and COE to discuss impoundment issues in South Carolina, Louisiana, and Maryland. SEC scientists established or continued cooperative research efforts with the Texas Water Development Board, FWS, Florida Department of Natural Resources, and COE. SEC staff published or submitted for publication 17 articles or reports on mitigation and management of wetland systems and environmental impacts which provide material pertinent to SER management decisions. The SEC also provided recommendations to the SER on permits in North Carolina, Florida, Alabama, Louisiana, Texas, and the U.S. Virgin Islands.

The following summarize major FWCA activities the SER was involved in during the fiscal year:

Gulf Intracoastal Waterway Working Group in Texas - SER staff participated in the formation of this interagency workgroup which was established to update information regarding improved alternatives to current spoil disposal in open water and wetlands. To help initiate this process, the SER has contributed to parts of an issue paper, especially to a section which shows that there have been many recent developments that justify a supplement to the 12-year-old

Gulf Coast Wetlands are Being Submerged by Land Subsidence.

EIS. The supplemental EIS would identify and promote measures to significantly reduce spoil disposal in bays and wetlands.

U.S. Navy Gulf Coast Strategic Homeporting - The Navy has agreed to eliminate an enlargement of a COE confined disposal site, consisting of over 400 acres in Corpus Christi Bay, Texas, as recommended by the SER. Alternatively, the Navy obtained an upland site to receive spoil from dredging for their proposed battleship and carrier base.

Galveston Bay Area Navigation Study (GBANS), Texas - The GBANS calls for widening and deepening the 50 mile long Houston Ship Channel and the 3.6 mile long Galveston Channel. The proposal would result in the channel, through the less than 10 foot deep bay from the Gulf of Mexico to Houston, being doubled in cross-sectional area and deepened by a third. Nearly 1,000 acres of bay bottom would be deepened, while approximately 11,300 acres of additional productive bay bottom would be covered with dredged material. Salinity regimes in Galveston Bay also would be severely altered, especially when considered along with the effects of the Wallisville Reservoir project and other reservoirs proposed on the tributaries to Galveston Bay. It is estimated that there would be as much as a two-third loss of the commercial oyster harvest and disruption of fish and shrimp habitats in the Galveston estuary. The FWS also has predicted the resuspension of arsenic, cadmium, and copper which are toxic to larval shellfish and finfish. Poly-cyclic aromatic hydrocarbons would be resuspended to levels that may be toxic, carcinogenic, or cause behavioral disorders in marine life. The dredged material also would disrupt circulation in the bay while increasing turbidity during dredging which would be conducted continuously for six to eight years.

Wallisville Reservoir, Texas - The COE started constructing a dam in the late 1960s that would impound most of the Trinity River delta tidal wetlands which are excellent fish and crustacean nursery areas. Trinity River freshwater and sediment inflows to Galveston Bay would be greatly reduced by this reservoir with resulting salinity rises in fresh to brackish marshes. Project construction, however, was halted by a Federal district court in the early 1970s. Subsequently, the COE scaled down the proposed reservoir size, to avoid inundating most of the nearby brackish marshes, but the reservoir still would reduce water and sediment inflow to the estuary and increase salinity. Since the scaled down project

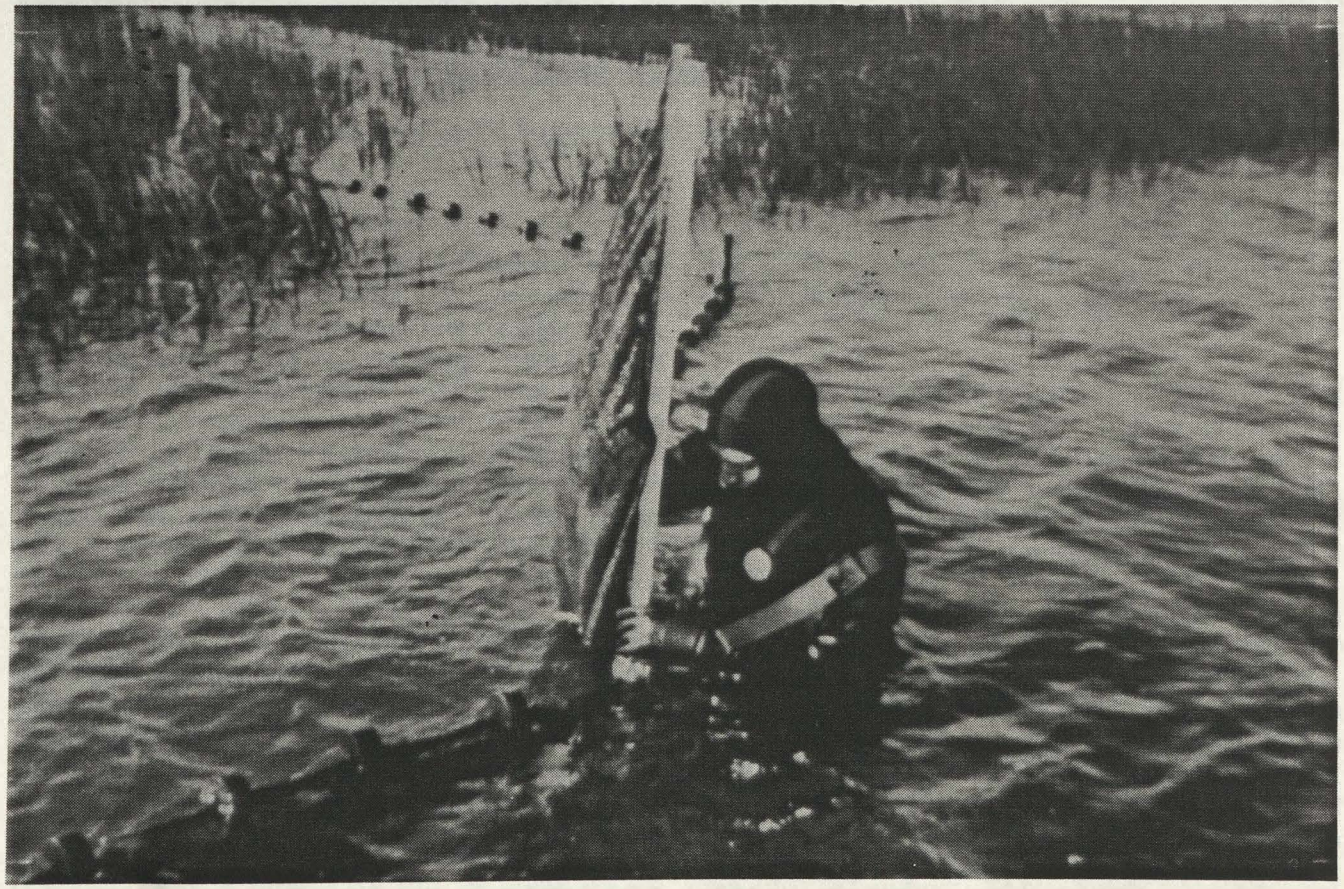
no longer had fish and wildlife and navigation purposes, it was not approved by the COE Board of Engineers for Rivers and Harbors. The COE, therefore, again added fish and wildlife and navigation purposes to secure congressional funding. They converted their previous estimates of a $1,000,000 per year fishery loss to an estimated $200,000 enhancement by claiming that whenever they returned the public reservoir site lands to private ownership, these lands would become heavily developed. The District Court has continued the injunction after a trial at which the NMFS testified that the COE had not coordinated the changes pursuant to the FWCA and the National Environmental Policy Act before the project was resubmitted to Congress for funding.

Playa del Rio Project, Cameron County, Texas - In addition to the items addressed in FY87, the SER has participated in scoping meetings held to identify information and items which must be addressed in the EIS being developed for this 12,000 acre project proposed primarily in wetlands.

Cameron-Creole Watershed Project, Lake Calcasieu, Louisiana - SER staff has actively participated on the Soil Conservation Service (SCS) Steering and Advisory Committee. The project involves an 18 mile long levee with five water control structures between nearly 100,000 acres of tidal marsh and the Calcasieu Lake estuary. Our involvement over about two decades has helped bring about the addition of four water exchange structures between the Lake and the marshes and the installation of vertical slots in the water exchange weirs in the structures. Such slots enable exchange of water, marine organisms, and detritus throughout the water column.

Port of Iberia, Louisiana, Navigation Channel - since June 1985, SER has been involved in the analysis and negotiation of a proposed 30-mile-long navigation channel from the Gulf of Mexico, across Vermilion Bay, to the Port of Iberia. Major issues involve habitat destruction and salt water intrusion. The NMFS and Gulf of Mexico FMC have recommended that the permit not be issued and that an EIS be prepared. Recently, the EPA determined that, pursuant to section 103 of the Marine Protection, Research and Sanctuaries Act, an EIS addressing ocean dumping is required. NMFS has continued to urge the COE to prepare an EIS on the remainder of the project.

Louisiana Marsh Management Issues - The SER has been involved in the analysis of numerous plans for the construc-



Diver Placing a Block Net in an Emergent Marsh.

tion of levees and water control structures on private land in coastal Louisiana for the purpose of marsh management. Cumulatively, these plans would directly affect fishery access to hundreds of square miles of coastal wetlands. We are continuing to work with applicants and state and Federal agency representatives on design and operation of projects. However, recent advances in our understanding of the effects of marsh management on living marine resources and increased proposals in non-impounded brackish to saline marsh have led us to begin recommending that permits for most management plans not be issued. We are urging the COE and the SCS to cooperatively prepare an EIS to address cumulative impact issues and to identify information needs necessary to make appropriate permit decision.

City of Boca Raton, Florida, Beach Nourishment Project - The Jacksonville District COE issued an EIS and public notice for a beach nourishment project to be constructed by the City of Boca Raton, Florida. The proposal did not specifically designate the borrow areas offshore and involved the permanent burying of about 4.4 acres of exposed rock outcrops. EPA developed extensive data showing that the beach is not rapidly eroding and the project was not necessary to protect structures or provide beach for recreational purposes. The EIS received negative comments from EPA, NMFS, and the FWS. EPA and NMFS objected to the project and criticized the reports submitted by contractors to the COE regarding the value of the rock outcrops to fishery resources. Negotiations between EPA and the COE resulted in the EPA re-interpreting their data and position. NMFS deferred to EPA because of the heavy reliance on EPA-obtained data. Negotiations continue.

Apalachicola River, Florida, Maintenance Dredging Project - Under the conditions of the existing two-year maintenance dredging permit, the Mobile District COE monitors the placement of dredged material into existing, marked, within-bank disposal sites. Early dredging operations on the Apalachicola River experienced several problems due to COE inspectors not adequately monitoring disposal areas for wet weather sloughs, elevation of dredged material in relation to the natural river berm, and dike efficiency. This resulted in four significant violations, one of which has been satisfactorily restored, one is in the process of being restored, and two that have received no action to date. The COE has attempted to prevent further violations by replacing inspectors and retraining existing inspectors in the relative merits and significance of following and adhering to the special conditions of the issued permit. These changes were brought about at the request of the Department of Environmental Regulation and the Technical Advisory Committee of which the SER is an important member.

St. Andrew Bay, Florida, Sewage Disposal Issue - The SER has been heavily involved with the EPA regarding the disposal of treated domestic sewage and paper company effluents to St. Andrew Bay. Our numerous comments and recommendations have been mostly ignored by EPA. This year we have been active again with the problem with the same results. EPA agrees that the FWCA applies to their NPDES permit system, but does little with SER comments. A Memorandum of Agreement between EPA, FWS, and NMFS was discussed to make our comments and recommendations more meaningful. Nothing has been done. We continue to request impact studies and cumulative assessments with little response.

Wilmington Harbor, North Carolina, 50-year Maintenance Dredging Plan - The SER assisted the Wilmington District COE in identifying islands in the lower Cape Fear River where spoil material could be placed in conjunction with marsh building projects. The objective of this effort was to stabilize the islands through reduced dike erosion and to mitigate unavoidable habitat losses through marsh creation. This effort was a spin- off from coordination achieved under the NMFS-COE MOA for conducting pilot studies to create and/or enhance wetlands.

NORTHEAST REGION

Fish Aquaculture Pens

Finfish aquaculture has blossomed into lucrative business in Scandinavia, the Canadian provinces, and the Pacific Northwest. Now, HCB staff are seeing similar proposals to locate floating fish pens in Maine and Massachusetts. Project plans call for installing 160 floating pens per project to rear Atlantic salmon, rainbow trout, or Atlantic halibut for commercial retail. Among the unanswered environmental questions are impacts of disease, excessive use of antibiotics, eutrophication associated with concentrating fishing holding pens, and physical impacts related to shading and gear displacements. These issues are currently under review for several projects. Colleagues in Canada and Scandinavia have been contacted.

Chesapeake Bay Impoundments and Water Supply Reservoirs

Proposals to impound wetlands or divert waterways for waterfowl habitat, sediment control, stormwater management, or water supply reservoirs continue to be a problem in Chesapeake Bay watersheds. These projects threaten to inundate wetland habitats and reduce freshwater flow, thereby affecting estuarine and anadromous resources. In Maryland, pond and lake acreage increased 365% between 1955 and 1978, while 24,000 acres of wetlands were lost in the same period. Waterfowl impoundments are a prominent problem in Maryland where 55 permits were issued affecting 623 acres of wetlands from 1981 through 1986.

In Virginia, water supply reservoirs are the major problem. A proposal to construct a reservoir on Beaverdam Swamp in

Gloucester County, Virginia, will destroy approximately 370 acres of wetlands. Related impacts include reduced freshwater flow, increased salinity regimes, and interruption of nutrient and detrital exchange with the Chesapeake Bay ecosystem that can negatively affect recreational and commercial fish stocks.

A major concern relative to water supply reservoirs is cumulative impacts. Since issuance of the Gloucester County permit, permit requests from James City County for a reservoir on Ware Creek (470+ acres of wetlands) and Hanover County for a reservoir on Crump Creed (90+ acres of wetlands) have been submitted. Other projects are in early planning stages. The NMFS supports comprehensive planning to develop regional solutions to water supply problems.

New Jersey Marina Project

With growing pressures to expand public marina capabilities, HCB evaluates numerous proposed projects to construct large marina facilities throughout the northeast. One typical project is a 264-slip marina on Sewaran Peninsula on the Smith Creek tributary to the Arthur Kill at Woodbridge, NJ. The project plans would require 13,000 cubic yards to be dredged and 240,000 cubic yards to be excavated from uplands to create the marina basin; a fringing salt marsh would be destroyed. This project raises the usual concerns associated with marina development: 1) physical impacts associated with dredging coastal waters and excavating nearshore uplands; 2) fisheries impacts associated with destroying productive salt marshes; and 3) possible impacts to water and sediment quality from organic pollutants emanating from the marina. These and similar issues are under consideration coastwide.

National Position on Pile-Supported Platforms

The NER of the NMFS, and presumably our colleagues elsewhere, have noted a proliferation of coastal projects built on pile-supported platforms. Although platforms significantly affect shallow-water habitat and fish stocks, this type of engineering design is not subject to the same regulatory scrutiny as solid fills, thereby compounding our efforts to fulfill agency mandates for fishery resources. The NER has suggested to NMFS headquarters that EPA, FWS, and NMFS combine to develop a strategy against this trend in habitat loss. Preferably we can work with the COE to develop a unified strategy. This work is underway in an ad hoc nature in the field but could greatly benefit from national attention.

Draft Report on Seasonal Constraints

The COE's Waterways Experiment Station (WES) has prepared a draft report on seasonal constraints to Section 10 and 404 wetland permits. WES assumed that seasonal dredging restrictions cause an unwarranted burden on the dredging community and local government. HCB staff used personal experiences and a consultant report to justify seasonal restrictions. The problems perceived by WES and the COE districts are usually relieved by waivers and variances that can be applied on a case-by-case basis. HCB continued to refute the COE's defense of the proposal to eliminate seasonal restrictions. We will continue these discussions if WES proceeds to a final report.

EMPRESS II

NMFS continues to work with the Navy on the potential impacts of EMPRESS II to estuarine species and habitat. This project represents the Navy's test of its defense systems against electromagnetic pulses. We claim such studies would expose the environment and organisms to pulses which may affect behavior, and that fishing and recreational activities would be displaced. Testing may occur in Chesapeake Bay and outside the mouth of the bay in the Virginia Capes region. Of special concern are affects of pulses on menhaden. Chesapeake Bay is a very important nursery zone for the schooling fish; pulses may expose large numbers of juvenile fish to unnecessary stresses with largely unknown repercussions. Other continuing concerns relate to sea turtles and marine mammals. NMFS will reserve its final comments on protected species until the ongoing studies by the Navy are completed. The HCB will continue to provide NMFS input to this project throughout the remainder of the current EIS process.

Craney Island Disposal Area

The Norfolk District, COE, proposes to modify the Craney Island dredged spoil containment area, which will result in the loss of 43 acres of subtidal habitat. The COE considers that the project is in the "public interest" and, therefore, no compensation is needed for unavoidable habitat losses. HCB's position is that habitat compensation be required for all projects (i.e., "no net loss of habitat"), if fisheries production is to be maintained. HCB received support from the Tidewater Chapter of the American Fisheries Society. Discussions of the issue with the COE continue.

Sears Island Project

The HCB provided comments to the Federal Highway Administration on the draft environmental impact statement for the Sears Island dry cargo pier and access road in Searsport, Maine. NMFS comments paralleled concerns expressed since our involvement with the project began in 1983, especially analysis of the Mack Point alternative site, the solid fill pier versus an open pile and crib structure, the placement of culverts and/or a partial bridge for the causeway, and mitigation for habitat disruption to shellfish and finfish. Our comments restated those impacts and once again reiterated our concern that other alternatives be considered, including other sites such as Mack Point and various mitiga-

tionpackagesto compensate for lobster and clam habitat loss.

IMPLEMENTATION STRATEGY 5: Assisting States

This Strategy calls for NMFS to assist states Interstate Fisheries Commissions, and Fishery Management Councils on fisheries habitat matters.

ALASKA REGION

Information was provided and/or reviews completed on four coastal area management plans or amendments to existing Coastal Management Programs. Our main concern with most coastal programs is the treatment of uses deemed appropriate for coastal tidal areas and their adjacent wetlands. We believe some program policies are inconsistent with the intent of the Alaska Coastal Management Program and Section 404(b)(1) Guidelines of the Federal Clean Water Act. Many of our concerns involve water dependency, an issue defined both under the Federal Coastal Zone Management Act, and under the Department of Army 's Corps of Engineers (COE) permit program. Several coastal uses approved by many plans, i.e., hotels, restaurants, and gift shops, are inconsistent with the Clean Water Act and would fail the scrutiny required under Section 404(b)(1) before a Department of Army permit could be issued.

The Alaska Department of Transportation and Public Facilities requested our cooperation in assessing the environmental effects from four proposed highway projects and the proposed expansion of three airports. All of these projects have the potential to affect wetlands and/or anadromous fish streams. Mitigation measures recommended or adopted for the different projects ranged from timing stipulations to protect aquatic resources during critical life stages to the elimination of parts of a project.

HCD participated in the preparation of a fish and wildlife action plan in response to the anticipated advance of the Hubbard Glacier near Yakutat, Alaska, which is expected to block off Russell Fjord within the next three years. If the glacier completely blocks off the mouth of Russell Fjord, water would overflow into the Situk River, an important producer of anadromous fish. It is estimated the flow would be increased 12 times above normal discharge, severely affecting existing sport, commercial, and subsistence fisheries which are important components in the economy of the city of Yakutat. The action plan includes: 1) descriptions of probable effects on fish and wildlife resources, 2) a listing of proposed projects that will provide needed information on the amount of losses or gains in habitat and species, and 3) a preliminary listing of potential mitigative strategies for maintaining fish and wildlife populations. The ABL is conducting studies to assess habitat use by anadromous fish and to establish baseline monitoring stations in the Situk River. These data will be used to forecast effects the overflow will have on the resources in the affected area and subsequently on the residents of the city of Yakutat.

NORTHWEST REGION

The discussion under implementation Strategy 3 describes NWR's involvement in habitat issues with the Pacific Fishery Management Council. The NWR is also assisting the State of Oregon in the identification of research priorities and the preparation of an environmental studies program relative to the potential development of oil and mineral resources of the Oregon coast.

SOUTHWEST REGION

See the information presented under Strategy 3.

SOUTHEAST REGION

The State of Florida's Technical Subcommittee on Mosquito Impoundments, a subcommittee of the Governor's Working Group on Mosquito Control has been renamed as the Subcommittee on Managed Marshes (SOMM) and given broader review responsibilities by the Florida legislature. The SOMM continues to provide guidance to and evaluation of rotational impoundment management plans for various mosquito impoundments along Florida's east coast. They also have prepared guidelines for rotary ditching for mosquito control and have been involved with the preparation of an open water marsh management plan. SOMM guidelines suggest that management plans be written with the mutual objectives of mosquito control, fish and wildlife resources, and water quality enhancement. It is the responsibility of the SOMM to bring the latest information and research to the attention of the state and Federal regulatory agencies thereby allowing these findings to be incorporated into the appropriate permits as best management practices. A SER biologist is a participating member of the SOMM.

Staff from the SEC Beaufort and Galveston Laboratories worked closely with the states throughout the region. SEC staff worked with North Carolina and Florida Department of Natural Resources (DNR) offices on mitigation procedures and evaluation needs. Staff also have worked closely with the South Florida Water Management Board and the Texas Water Development Board on the impacts of freshwater inflow on estuarine habitats, One SEC staff member presented a discussion of the problems, pitfalls, and potential of habitat mitigation at the National Coastal Zone Managers Workshop sponsored by NOAA's Office of Coastal Resources Management. Similar presentations were given at FMC meetings. The Texas State Department of Highways

and Public Transportation (SDHPT), the local sponsor of the 400-mile-long Gulf Intracoastal Waterway (GIWW) in Texas, was assisted in their pursuit of upland spoil disposal alternatives to current open bay and wetland disposal. We continue to participate in the GIWW Advisory Committee meetings and are assisting SDHPT in seeking upland disposal sites as well as other alternatives to bay disposal.

The Houston City Council Flood Management Committee, on developing a 50-year water supply master plan, was advised to adopt one of three plans presented by their consultants. This plan would eliminate the need for the completion of Wallisville Reservoir by the COE. At a public hearing in which we were invited to participate, we informed the City of Houston how damaging the completion and proposed operation of the Wallisville Lake project would be to the marine fishery resources and habitats in the Galveston Bay estuarine system. A withdrawal by the City of Houston from its principal local sponsorship of the project may prevent its completion, regardless of the COE's intentions.

Participation was continued on the Lake Pontchartrain Task Force created by the Governor of Louisiana to study the feasibility of designating the Lake Pontchartrain - Lake Maurepas basin as a special management area. During this fiscal year our main role has been to keep certain parish and industry representatives on the task force from significantly weakening the generally adequate guidelines drafted by the Louisiana DNR, Coastal Management Division.

The State of Louisiana, particularly the Louisiana Geological Survey and DNR, have been assisted by our participation in workshops and task forces to address issues such as wetland loss, marsh management, and research. As a result, in September 1987, a technical issues paper was developed that identified topics which required more information needs. In addition, we have actively participated in the Governor's Task Force to develop a special area management plan for Lakes Pontchartrain and Maurepas.

SER personnel attended the initial meeting of the Louisiana State/Federal Coastal Task Force. Major agenda items addressed were: status of major wetland enhancement projects and programs; evaluation of planning effects and proposed actions; status of FY88 funding for authorized wetland programs; future efforts, including interaction with State Coastal Protection Task Force recently formed by the Governor; and the formation of Technical Review and Research Needs Committees.

We continue to participate as a member of the Agency on Bay Management which was created in 1985 to promote improved management, enhancement, and restoration of Tampa Bay, Florida, and associated natural resources. Working through numerous committees the Agency is monitoring the state of Tampa Bay, improving intergovernmental coordination among resource management agencies, and implementing specific habitat enhancement and restoration projects.

The SER is working with the State of Mississippi in the revisions to the Special Area Management Plan necessary for the Navy's Homeporting activities at Pascagoula, Mississippi.

We participate with the State of Florida in its interagency analysis of the dredging of the Apalachicola River and the development of the Navigation Maintenance Plan for this Federal project. The SER also plans an active role as a member of the state-Federal team assessing impacts of dredging and other modifications of the Apalachicola River, Florida.

The SER serves on the South Florida Water Management District's Lake Okeechobee Regulatory Review Committee.

The SER coordinated with the South Carolina Department of Health and Environmental Control in the development of a plan for sewage treatment facilities in rural areas. Our goal was to insure that the treatment facilities and associated pipelines did not impact fishery resources and their habitats.

NORTHEAST REGION

Sturgeon Bay Marina Proposal

Although NMFS has greatly reduced its permit evaluation effort in the Great Lakes area, HCB was requested by the COE, St. Paul District and the FWS, Great Lakes Region to provide comments on an application to modify and expand a marina proposal previously authorized by a COE permit. The project plans called for installing docks, piers, pilings, and floats in Sturgeon Bay, Wisconsin. NMFS concerns paralleled those expressed to the COE by the FWS and the Wisconsin Department of Natural Resources. All agencies concurred that the original permit should be suspended and the permit application under analysis should be denied. One of the major NMFS concerns was that the project would affect Wisconsin efforts to develop a self-sustaining walleye fishery in Sturgeon Bay; NMFS grant-in-aid programs have provided approximately $400,000 on a matching basis since 1976 to Wisconsin to restore the fishery. NMFS is also concerned that shallow Sturgeon Bay waters could be affected by increased marine traffic, perhaps to the extent that turbidity and vegetation are affected. These habitat changes and the usual marina pollution problems could also have an affect on the walleye population.

Dredged Material Disposal Site Planning

HCB staff continue to lend technical expertise to state and Federal agencies during negotiations to locate open water disposal sites for clean dredged material in Cape Cod Bay and Rhode Island waters. To date, our input has included participating in public decision processes, commenting on environmental impact reports and providing living marine resource information to all parties. Among the remaining concerns are the physical and chemical criteria used to define acceptable materials and the possible impacts of certain site alternatives on marine mammals.

IMPLEMENTATION STRATEGY 6: Interagency Agreements

Support for new interagency operating arrangement (e.g., Memoranda of Agreement (MOAs), informal contracts) is the major feature of this Strategy.

ALASKA REGION

HCD is a participant on the Alaska Working Group on Cooperative Fisheries-Forestry Research. The group has supported several studies on habitat requirements of both marine and freshwater organisms that are affected by timber harvest. Group members include NMFS; Forest Service; State of Alaska Departments involved with water quality, lands, forestry, fish and wildlife, and the office of the Governor; private timber land owners; and fishing industry groups. Several studies recommended by the working group have been funded and results are being used in management decisions by timber managers and resource agencies.

An Alaska Region (AKR) staff biologist is formulating the final 5-year study plan for the Endicott Development Project's environmental monitoring program. The monitoring program was designed to assess impacts of the 4.8 mile long Endicott causeway on anadromous fish species in the nearshore coastal Beaufort Sea. The 5-year plan will be used by the COE and the monitoring program's interagency technical committee to ensure development of studies to aid in the assessment of project effects on coastal fisheries and to recommend modifications to the existing causeway.

NORTHWEST REGION

As in previous years, the Norhtwest Region (NWR) has been actively engaged in fostering interagency cooperation in habitat management and conservation efforts. The NWR continues to operate under existing cooperative agreements, including those covering the operation of hatcheries, fishways, and irrigation diversion screens under the Columbia River Fisheries Development Program.

In FY87, the CZESD cooperated with other agencies under the following interagency agreements or contracts relating to habitat studies:

1) COE — habitat characterization of interim coastal dumpsite at Umpqua River estuary.

2) COE — effects of dredging and dredged material disposal on Dungeness crabs in the Columbia River estuary.

3) Bonneville Power Administration — characterization of white sturgeon populations and habitat in the Columbia River.

4) COE — chemical and biological characterization of sediments in Seattle's Duwamish Waterway proposed for dredging.

5) COE/EPA — evaluation of long-term sediment bioassays for use in the Puget Sound Dredge Disposal Analysis program.

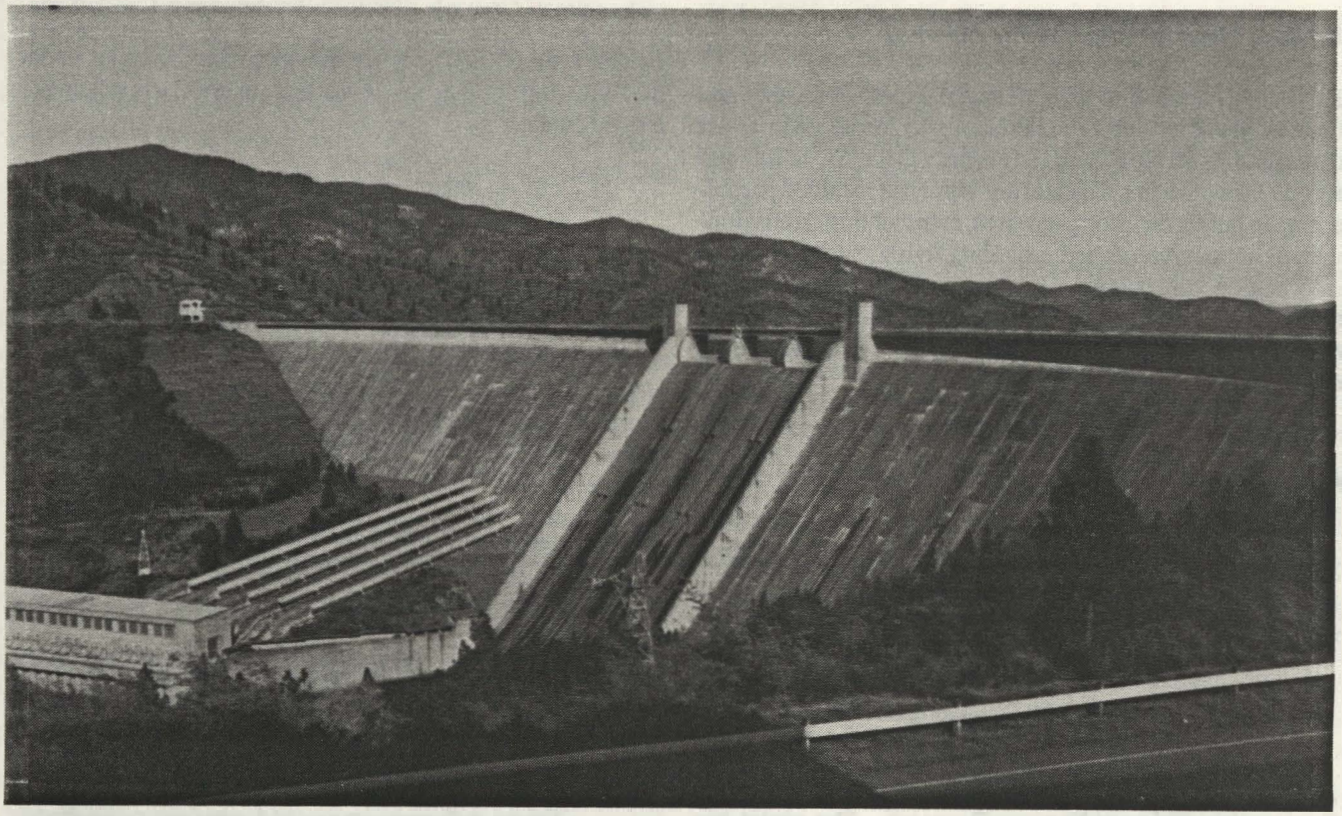
6) COE — analyses for tributyltin in selected Puget Sound sediments proposed for maintenance dredging for tributyltin.

7) National Cancer Institute — studies on the etiology of tumors in bottom-dwelling marine fish.

8) COE — collaboration with staff scientists at the COE's Waterways Experiment station to develop methods to reduce the costs of predredging sediment analysis.

SOUTHWEST REGION

Two other MOA's are also now in effect among the SWR, and several other state and local entities. Both MOA's relate to mitigation banks developed in southern California, to offset negative habitat impacts from Port developments in Los Angeles/Long Beach Harbors. The first governs the restoration of 400+ acres of degraded wetlands known as the Batiquitos Lagoon, approximately 90 miles to the south of the entity responsible for the restoration, the Port of Los Angeles. The second MOA involves restoration of degraded coastal habitats in the Federal Seal Beach Wildlife Refuge, currently managed by the Department of Interior. That restoration is being carried out by the Port of Long Beach. The two MOA's together involve the restoration of almost 600 acres of degraded tidal wetlands along the southern California coast, which historically has lost almost 90% of this habitat type since the turn of the century.



Shasta Dam (at mile 310) on the Sacramento River, CA.

Coordinated Operation Agreement

In 1986, the bill to authorize the Coordinated Operation Agreement (COA) was signed by President Reagan. The COA would make possible more efficient operation of the Federal Central Valley Project (CVP) and the California State Water Project (SWP). In addition, the COA would commit the Bureau of Reclamation (BR), for the first time, to State water quality standards in the Sacramento-San Joaquin delta.

NMFS has expressed its position to BR that the key element in maintaining the quality and quantity of anadromous fish habitat in the Central Valley is understanding clearly the relationship between flows and fish production. We, and our sister fishery agencies, see the COA and the establishment of adequate fishery flows as part of a comprehensive approach to equitable solution of these issues. We are concerned because a comprehensive evaluation of fishery instream flow needs in the Central Valley has only just begun this past year. In addition, we believe there has been a demonstrated failure of the existing WR 1485 delta water quality standards, and thus no adequate basis for establishing fishery flows anywhere in the system.

Some of the mitigation recommendations (contained in the U.S. Fish and Wildlife Services's (FWS) FWCA Report on the COA) appear to have been met. For instance, the BR has recently agreed to provide, for the first time, Project Power for operation of the mitigation hatchery at Coleman. And it appears that the BR will renegotiate the 1948 "CVP mitigation agreement" with the FWS. However, there are other mitigation measures on which no apparent progress has been made: 1) implementation of temperature control measures at major reservoirs on the Sacramento and Trinity Rivers (Shasta and Clair Engle Lakes), and 2) minimum fishery flows in the American and Trinity Rivers.

Of particular concern to NMFS is the proposed "trial" marketing of one million acre-feet of water, supposedly "freed up" by the increased efficiency of the COA. Initial scoping is underway, on this proposed sale, even though fishery flow needs haven't yet been set. In addition, BR indicates that they may plan to take the Trinity River flows, which in 1980 were designated by Secretary Andrus as Trinity River fishery flows, back into the Sacramento River at some future time.

Mission Bay and Prospect Island Habitat Creation

The most important interagency operating agreement for Southwest Region (SWR), is the NOAA/COE habitat creation MOA.

NMFS and the COE signed a MOA in 1985 to conduct a pilot study to determine the feasibility of establishing a nationwide habitat restoration and creation program. As part of this pilot study, plans were recently completed for the creation of an artificial reef adjacent to the Mission Bay north jetty. This work is to be done in conjunction with repair work required for the jetty which sustained damaged during prior winter storms. The biological monitoring study to be conducted by NMFS on the newly created habitat will document the value of the site to marine fishery resources.

This habitat restoration site was selected to enhance anadromous fish, primarily juvenile striped bass. It is located adjacent to Cache Slough in the Sacramento-San Joaquin Delta. Approximately 1,276 acres of partially abandoned farmland are protected by low-level levees maintained by the COE at an annual cost of $300,000. The concept of this pilot project is to determine if this site can be restored to a valuable wetland. This will involve purchasing the land, making minor site modifications and evaluating post-project habitat values.

The COE is preparing a benefit-cost analysis to determine the feasibility of the project. To support this effort, the NMFS prepared a preliminary report that provided information regarding the post-project habitat value for the site. This value ranges from $175,000 to $223,000 annually, depending on final habitat design.

SOUTHEAST REGION

The Southeast Fisheries Center (SEC) in conjunction with NOAA's National Ocean Service (NOS), Ocean Assessment Division (OAD), continued to determine the quantity of wetland habitat in the coastal U.S. by sampling National Wetland Inventory habitat maps using a dot grid matrix procedure. All available maps (412) in the northeast were completed. These provided the following for Maine-Connecticut: 1.5 million acres of forested wetlands, 157,500 acres of tidal flats, 89,200 acres of salt marsh and 72,700 acres of fresh marsh. To date, 450 of the available 800 maps for the Gulf Coast have been analyzed. In addition, 95 maps for the Albemarle-Pamlico area of North Carolina were evaluated, revealing 857,900 acres of forested wetlands, 127,500 acres of salt marsh, 29,900 acres of fresh marsh, and 17,800 acres of tidal flats.

Mapping of submerged aquatic vegetation (SAV) in the Albemarle-Pamlico Sound area of North Carolina was initiated. NOAA's Photogrammetry Unit will supply, under subcontract to the Beaufort Laboratory, aerial photographs of the study area, and Beaufort will identify, locate and quantify SAV from the photography using video image analysis and ground truthing. These data will be superimposed on NOS topographic maps to produce a chart product.
Investigations with the OAD were initiated during FY87 to compile data on the life history, distribution, and abundance of 35 selected fish and invertebrate species in each of 13 estuaries in the Gulf of Mexico from Florida to Mobile Bay. The completed database will be part of the National Inventory which will enable comparisons among species or species groups, specific life stages, estuaries, and geographic areas. The Southeast Region (SER) worked with the Minerals Management Service (MMS) to develop a protocol which would address the toxicity of oil treated with dispersants.

We have requested that the Environmental Protection Agency (EPA) Region IV enter into an agreement with NMFS and the FWS for implementing FWCA responsibilities for NPDES permits. EPA has not yet acted on this request.

During FY87 the SEC was involved with 10 funding agreements. In one agreement the COE funded the transplanting of seagrasses at the NMFS-COE MOA study sites in North Carolina. A second interagency agreement took the form of the NMFS-COE MOA to create and enhance habitats in North Carolina and Texas. The COE also provided funds to conduct an evaluation of the use of "successful" mitigation marshes in Florida. The FWS continued funding the Beaufort Laboratory to evaluate the use of high *Juncus* marshes in North Carolina, and initiated the funding of a research project designed to evaluate the impact of turbidity on seagrasses in Hobe Sound, Florida. Florida DNR is funding a study of the use of transplanted seagrasses in Tampa Bay by fishes and invertebrates. The EPA provided research monies to Beaufort to conduct an evaluation of the distribution of submerged aquatic vegetation in the Albemarle-Pamlico Sound estuarine complex. The Texas Water Development Board provided research monies for habitat evaluation research in San Antonio, Galveston, and Lavaca Bays, Texas, while the South Florida Water Management District supported research on freshwater inflow to Faka Union Bay, Florida. NASA provided research funding to evaluate a spatial computer model and remote sensing study of wetland loss in Louisiana.

The SER, along with representatives of the FWS, Texas Parks and Wildlife Department, Texas Nature Conservancy, and the Brazos River Harbor Navigation District signed a "Mitigation Plan for Freeport Harbor Development" developed by that navigation district in consultation with the other agencies. The plan, which will allow spoil disposal on some wetlands already segregated from the estuary by the completed Federal hurricane protection levee, would reestablish tidal exchange to 1,000 acres of what was previously tidal marsh at the Brazos River mouth.

Based on the early success of the marsh construction undertaken under the NMFS-COE MOA, the Wilmington District COE is recommending the application of this technology to ongoing maintenance dredging projects such as the Wilmington Harbor, North Carolina, 50-year Maintenance Dredging

Plan.

NORTHEAST REGION

National Shellfish Register

The NMFS and Food and Drug Administration (FDA) have collaborated on the 1985 Register of Classified Estuarine Waters. This is the first Register produced under a new agreement between NMFS and FDA; earlier versions were produced about every five years by FDA. The Register (maps and text) summarizes data from state shellfish control agencies on the quality of shellfish producing waters. Such information is useful in assessing potential impacts of coastal construction projects.

New Memorandum of Agreement with the COE

The Department of Commerce and the Army have revised their Memorandum of Agreement on implementing Section 404(q) of the Clean Water Act. The new MOA expands NMFS authorities to raise permit-related wetland resource issues to higher levels in the COE regional offices and to the Assistant Secretary of the Army. More importantly, the MOA recognizes the importance of resolving permit questions at the regional level.

Buzzards Bay Project Activities

The Habitat Conservation Branch (HCB) continues to represent NOAA and the NMFS on the Buzzards Bay Project Management and Technical Advisory Committees. The Technical Advisory Committee has established working groups for monitoring and characterization. The monitoring group is developing a prototypical plan for nutrients, toxics, and metals plus their effects over time. EPA monies may initiate this effort, but the project is concerned about a long-term commitment. The characterization working group is focusing on data synthesis in an effort to coordinate historical work on the status and trends of environmental conditions in the bay.

Non-Point Source Pollution

The Northeast Region (NER) has recognized non-point source pollution as one of the major environmental problems threatening coastal habitats throughout the Northeast. Since problems are particularly acute in the Chesapeake Bay area, the HCB has pursued several studies to investigate the effectiveness and cost of best management practices to reduce agricultural non-point source pollution. Since those efforts failed, the Branch has re-contacted the Soil Conservation Service and EPA to solicit their interest in similar work. The overall goal of this research would be improved marine/estuarine water quality, with the secondary benefit of increased fishery productivity. We will continue to work cooperatively with Federal and state agencies to address this priority resource problem.

Waterfowl Impoundment Guidelines

HCB has developed draft criteria and guidelines for siting and constructing waterfowl impoundments. These wetland activities, which pose particular problems in the Mid-Atlantic, led the HCB-Oxford office to prepare draft criteria and guidelines. Upon finalization, the packet may be used to evaluate all waterfowl enhancement projects in the Northeast. Considerable state, Federal, and private coordination was included in developing the draft criteria and guidelines.

Dioxin Working Committee

NMFS is participating in an interagency working committee to formulate a bioaccumulation guidance matrix value for 2,3,7,8-TCDD (dioxin). This toxic contaminant has been found in sediments and animals in coastal waters off New Jersey. In the working committee, NMFS noted that dumping of TCDD may violate the requirements of several international and national conventions, that the proposed matrix value is likely to be greatly influenced by the Food and Drug Administration's level of concern of 50 parts per trillion in edible fish flesh, and that TCDD has gained a reputation of being perhaps the most potent synthetic toxic chemical known. Its presence in the estuarine and marine waters of the New York Bight could represent a grave threat to aquatic inhabitants regardless of the results of 10-day bioassay tests.

IMPLEMENTATION STRATEGY 7: Anadromous Fish

Strategy 7 emphasizes NMFS' continuing interest in protecting and managing habitats supporting anadromous fishes.

ALASKA REGION

The Alaska Region (AKR) completed Tier II consultation on a Minor License application for dam rehabilitation on Pelican Creek in Southeast Alaska and appealed an application for Exemption from Licensing from FERC for a small hydroelectric project on Bell Island, near Ketchikan. Both projects have the potential to impact the returns of pink, chum, and coho salmon. In addition, the Bell Island project could preclude the use of headwater lakes for salmonid enhancement.

In the past most major hydroelectric projects in southeast Alaska have been directed toward tapping perched lakes above the upstream limits of anadromous salmonids with minor direct effects on anadromous fish. Recently, however, projects are being proposed on lakes, rivers, and streams associated with important runs of salmon. Dewatering spawning and rearing areas are AKR's most significant

concerns.

A Petition to Intervene was filed for the Reynolds Creek hydroelectric power project in southeast Alaska near Hydaberg. The project consists of a siphon intake in Lake Mellen to a powerhouse at tidewater. The FERC application refers to this project as a run-of-river project; however, NMFS considers it to be a diversion project. If the project is constructed as planned, water used to generate power would be diverted from Lake Mellen to tidewater, bypassing Reynolds Creek. Reynolds Creek produces important runs of pink salmon. Peak escapement was estimated at 20,000 spawners in 1974. In 1986, Alaska Department of Fish and Game aerial surveyors estimated that more than 110,000 pink salmon were present in the intertidal area immediately adjacent to this stream. Reynolds Creek also supports runs of coho and chum salmon. Construction and operation of the project without regard to fishery resources could quantitatively reduce spawning and incubation habitat for pink, chum, and coho salmon as well as rearing habitat for juvenile coho.

NORTHWEST REGION

The NWR continues its extensive involvement in the evaluation of hydroelectric projects and resource development plans that cumulatively constitute the foremost threat to anadromous fish habitat in the NWR. For example in FY87, the Environmental and Technical Services Division (ETSD) was involved with approximately 300 FERC projects.

In addition, ETSD continued its extensive involvement in the design and operational oversight of fish passage facilities at new and existing hydropower and other water control projects. ETSD contributes significant engineering expertise to the conceptual planning phase, preliminary design, and preparation of operating criteria for fish passage facilities in the Pacific Northwest, as well as in other regions upon request by the appropriate state or Federal agencies. During FY87 considerable engineering effort was devoted to fish passage in the SWR.

In FY87, ETSD continued to provide design expertise to the $53 million Yakima Basin Fish Passage Improvements Program. The Yakima Basin is considered to be the area in the Columbia River Basin with the greatest potential for significant increases in anadromous fish production. Fish passage facilities in the Yakima were either non-existent or inadequate, due to age or poor design. ETSD engineers are providing recommendations for fish passage improvements at over twenty Yakima Basin project sites. At the end of FY87, approximately 90% of the design effort and 75% of the construction of screens and ladders to aid fish passage had been completed.

Also in FY87, progress on the $10 million Umatilla River Basin Fish Passage Improvements Program reached a stage involving significant ETSD engineering participation. The Umatilla Basin, as with the Yakima Basin, previously had inadequate fish passage facilities.

ETSD engineers are continuously involved with the design of modifications to existing facilities and new juvenile and adult passage facilities on the mainstem Columbia and Snake Rivers, and participate in field inspections of mainstem fish passage facilities to verify compliance with operational criteria and guidelines.

The NWC's FY87 habitat-related studies of anadromous fish were primarily those connected with the evaluation of white sturgeon populations (see Implementation Strategy 2). CZESD also added to earlier studies on the migration rates and relative survival of juvenile salmonids reaching the Columbia River estuary.

SOUTHWEST REGION

Sacramento River - Bank Protection Projects

There are two major bank protection projects on the Sacramento River: 1) the Chico Landing to Red Bluff Project and 2) the Sacramento River Bank Protection Project. The former is limited in geographic range and its name implies. The second covers the Sacramento River downstream to about Collinsville. Both Projects were slowed to a crawl last year, because of a Jeopardy Biological Opinion issued by the FWS for an endangered beetle (under the Endangered Species Act). The only "active" work on these projects was related to the Butte City to Chico Landing reach of the Sacramento River Bank Protection Project.

NMFS evaluated an addendum to the Final Supplement to the COE Final Environmental Impact Statement (EIS). While there have been improvements in the document, we still have only promises; the EIS lacks a firm evaluation of salmon and riparian vegetation impacts and commitment to mitigation measures. We provided assistance, along with other fishery agencies, in developing a methodology to evaluate riparian habitat impacts of this bank protection project. A modified Habitat Evaluation Procedure is being proposed by the FWS. The COE will also conduct a land-use analysis to examine "secondary" impacts to riparian habitats.

During the year, NMFS analyzed the results of juvenile fish studies that have been conducted by the FWS for the Project. While hydrologic conditions have not been optimal for quantitative evaluation, it is clear that juvenile, rearing salmonids are found in lesser abundance over areas that have received "traditional" rock riprap than over natural, undisturbed areas. An important study element, which was not fully evaluated, is whether young fish find some modification of riprap bank protection preferable to similar unmodified

reaches. NMFS is exploring, with FWS and the COE, the possibility of cooperatively funding further fish rearing studies.

Red Bluff Diversion Dam - Fish Passage Program

A full schedule of coordination meetings continued on the Red Bluff Diversion Dam (RBDD) Fish Passage Program (FPP). The FPP has prescribed replacing the five louver-bays (which "leaked" an average of 500,000 juvenile salmon per year) with a 600 foot long array of 18 foot diameter stainless steel drum screens. We recommended, and after considerable technical controversy, the BR agreed that the screens would be placed at the present site of the fish louvers - near the river, at the head of the desilting basin. Our reason was to prevent the creation of a large area (16 acres) of ideal predator habitat, between the river and the fish screens.

SWR and NWR staff have provided considerable assistance to the BR in the development of criteria and specifications for the screens. During the year, all three of the fishery agencies agreed to the Design Concept and BR is currently in the midst of the design phase for the new screens. We anticipate construction by about 1989.

The fishery agencies now believe that a major component of mortality is predation by squawfish. We believe that juveniles passing the RBDD become stressed and disoriented and are subject to an exceptionally high predation rate. In an effort to address this problem, NMFS staff (SWR33 and SWC3) began to evaluate a proposed, experimental commercial fishery for Sacramento River squawfish. SWC3 had earlier determined that there is a market for live squawfish in the San Francisco Bay area. Preliminary trapping efforts in and around the RBDD have not met with success.

Once again in 1986, the FPP was successful in obtaining fish flows to reduce juvenile salmonid mortality during outmigration. Negotiations with BR resulted in the scheduling of about 50,000 acre-feet of fishery flows in mid-May. The flows were scheduled as a pulse to move both hatchery and naturally spawned chinook past RBDD and the Glenn-Colusa Irrigation District (GCID) pumps. In addition, the FWS' Coleman Hatchery released its production during the flow release, timed to pass RBDD during the night (the lowest period of predation).

Spring Creek Acid Mine Pollution

NMFS evaluated and recommended adoption new water quality standards for the upper Sacramento River. The new standards are included in a National Pollution Discharge Elimination System Permit (NPDES), which was designed to protect salmon and steelhead from heavy metal toxicity. The Iron Mountain Mine Inc.'s (IMM) inactive mine workings on

Red Bluff Diversion Dam (at mile 213 on the Sacramento River, CA) - Note Gates Out of the Water to Facilitate Winter Chinook Passage.

Spring Creek are the major source of heavy metal pollution in the upper Sacramento River. Their discharge had been regulated by a Regional Board Order, which required IMM to remove 95% of their effluent-copper and use best practicable control technology to meet Basin Plan objectives for heavy metals. This previous Order had expired. Following our comments, and those of other agencies at the Public Hearing, the Regional Board adopted the Notice of Proposed Waste Discharge Requirements and Tentative Cease and Desist Order for IMM. The new standards implement the 1982 EPA "Best Technology Available" limitations for the ore mining industry, and set receiving water limitations that formed the basis for possible enforcement and EPA Superfund action.

Following the Regional Boards action, EPA formally adopted a $70 million Source Control Plan for the IMM property. Previously EPA had designated the site as one of its priority Superfund sites.

The Plan would 1) enlarge the existing Spring Creek Debris Dam to more safely hold polluted effluent, 2) plug mine portals with a foam like concrete mixture, 3) cover fractured mine tailings slopes, and 4) divert existing streams from the area of the abandoned mines.

Thus EPA appears to have rejected IMM's proposal to use their radically new, heavy-metal extraction process, known as "solution mining." Fishery agencies have been concerned that IMM's solution-mining, pollution control process was too experimental and might not work and it may exacerbate the existing anadromous fish toxicity problem and delay it's resolution. We understand that the $5 million appropriation for the first year's work under the Plan has been put off for a year.

NMFS Contract to Determine the Value of Salmon Habitat

Significant progress has occurred on NMFS' contract to

1) Solve the fish passage problem at the Red Bluff Diversion Dam,

2) Initiate an artificial propagation program for winter-run chinook at Coleman National Fish Hatchery,

3) Restore spawning habitat in the Redding area,

4) Develop measures to control squawfish at the Red Bluff Diversion Dam,

5) Restrict the in-river sport fishery for winter-run chinook,

6) Develop water temperature control for drought years,

7) Correct the Spring Creek toxicity problem,

8) Correct the problem at the Anderson-Cottonwood Irrigation District Dam,

9) Correct the spilling basin problem at Keswick Dam, and

10) Continue to expand studies on winter-run chinook salmon.

determine the value of chinook salmon habitat in the Sacramento River basin. Northern Area Office habitat staff met with Mssrs. Garcia, Meyer and Huppert to continue coordination on economic issues. A meeting has held with all of the principals and representatives of FWS, CDFG, BR, and DWR to hear Dr. Mike Rozengurt present his analyses of the available river hydrological data bases and the calculations for water year type classifications. Dr. Rozengurt presented this material at the National Estuarine Symposium in Washington D. C. a year agoand has been contracted by our Central Office to prepare a formal paper on his analysis.

Once again there have been requests to expand the model's coverage to the San Joaquin River and the winter-run chinook. CDFG' Fresno staff expressed interest in using the model to analyze mitigation alternatives in the San Joaquin river.

Following initial briefings and submittal of technical material concerning the biophysical model Biosystems and NMFS staff met again in Stockton with the agency staffs of the Delta Interagency Committees. The flow of information was free, productive, and has lead to several material improvements. The Contract should be complete by October of this year. The Contractor is on track; about 70% of the funds have been spent to date.

It is our goal that the model will allow comparison with competing, non-fishery uses of river flows. We believe that a clearer understanding of the relative economics of competing water uses should lead to more sensible means of managing existing resources - particularly if manageable differences develop in the time and place specific value of water.

Petition to List Winter-Run Chinook as a Threatened Species

In November 1985, the California-Nevada Chapter of the American Fisheries Society petitioned NMFS to list the winter run of chinook salmon in the Sacramento River as a threatened species under the Endangered Species Act. NMFS determined that the Petition contains substantial information indicating the recommended action may be warranted. The SWR subsequently established a panel of salmon experts to evaluate the status of the winter-run chinook stock and make recommendations regarding disposition of the petition.

Northern Area Office habitat staff prepared a report on the possible freshwater and ocean harvest impacts on the winter-run population. The report concluded that the harvest has not been a significant factor in the decline of the run and that eliminating harvest probably will not significantly aid in the restoration of the run. This analysis was included as part of the winter-run chinook Stock Assessment Report.

After considerable discussion and analysis, agreement was reached by the fishery resource agencies on a Winter-run Chinook Restoration Plan:

The SWR received material commitments from fishery and water development agencies to execute this Restoration Plan.

When it become apparent that good progress was possible, the Regional Director made the decision not to recommend listing the winter-run as Threatened. A Draft Notice for publication in the Federal Register was submitted in December, 1986. Final rulemaking should occur early in 1987.

During the past winter, the BR has raised the gates at RBDD, in an effort to improve passage of winter-run spawners. All three fishery agencies are cooperating on a plan to monitor the restoration of the stock.

Montezuma Slough Control Structure

The NMFS has long held that construction of the Montezuma Slough Control Structure (MSCS) could cause a delay in juvenile fish movement, which will increase predation mortality, and reduce the abundance of striped bass food organisms. The structure would allow the State to effectively block the flow of water in Montezuma Slough to control water salinities in Suisun Marsh. Proper salinity levels must be controlled to maintain favorable waterfowl habitat in the privately managed refuges.

When the final MSCS COE Permit was analyzed and signed NMFS was successful in obtaining permit conditions that required 1) a salmon and steelhead predation study and 2) modification of or termination of operation of the structure if NMFS determines that an unacceptable level of predation is occurring.

Trinity River Restoration Program - PL-541

Progress has been predictably slow during the first full year since the Trinity River Restoration Program was authorized. The BR has experienced severe budget cutbacks. Operation and Maintenance funds (which were to have been used for work on the Grass Valley Debris Dam and the Trinity River Hatchery Modernization) were almost eliminated. After protest by the Task Force and intervention from Congressman Bosco, a compromise was reached whereby no specific State share would be assigned to hatchery renovation work, and BR would assign no more than half of the costs to Trinity River Program funds. BR reports that initial work has begun on the dam and plans have been made to rear hatchery Trinity Hatchery fish at nearby by on-river ponds, while work is proceeding at the hatchery.

Klamath River Basin Fishery Restoration Bill - HR 4712

The Klamath Basin has historically supported large populations of anadromous fish. The basin is California's largest producer of steelhead and coho salmon; it is also the second most important contributor to the State's chinook salmon fishery. However, the development of natural resources and periodic natural events have caused drastic reductions in salmon and steelhead populations throughout the Klamath Basin. Habitat loss or degradation and over fishing are the most frequently cited reasons for these declines.

After two years of debate, the Congress passed and President Reagan signed the Klamath River Basin Fishery Restoration Bill (HR 4712). NMFS habitat staff provided technical analysis and recommended support for the bill. The $42 million restoration program, to be overseen by a task force of Federal, state, local, and user group representatives, will focus on repair of damaged salmon and steelhead spawning and rearing habitat and development of new artificial propagation facilities to supplement the river's natural stocks. Together with the Trinity River Restoration Program, enacted in 1984, the Klamath bill commits almost $100 million to fisheries restoration efforts in the Klamath River basin over the next 20 years.

Healdsburg Dam - Russian River

The controversy over the Healdsburg Dam continues. The dam on the Russian River is used to impound water for a summer pool which is used by the Sonoma County Department of Parks and Recreation. At the request of United Anglers (UA), NMFS' fish passage engineer visited the site and prepared a memo report outlining the magnitude of the fish blockage at the dam and detailing some short- and long-term measures that would improve passage. Under threat of legal action from UA, the County drafted a contract for preliminary biological and engineering surveys, as well as designs and cost estimates to implement fish passage improvements.

Despite good intentions, the Board of Supervisors voted down funds for the work. As a result, UA has begun proceedings to sue the County. They will be asking for complete removal of the low permanent cement dam that now serves as the base structure for the summer dam.

In addition, SWR Habitat staff and GCSW presented testimony at formal California State Water Resources Control Board hearings. These hearings will collect evidence needed

to reallocate available water supplies throughout California. It is extremely important to anadromous fisheries and fisheries of San Francisco Bay that adequate flows are preserved. Further testimony is anticipated as the hearings progress.

Nearly completed is a two-year contract to provide a biophysical-economic model to measure and evaluate the effects of various Sacramento River outflow scenarios on chinook salmon survival. The model is generating considerable interest and respect of other resource agencies, including water management agencies. The model presently is undergoing final peer evaluation before being submitted by the contractor to NMFS as a finished product.

SOUTHEAST REGION

During FY87, the SER continued to recommend against the destruction of anadromous fish habitat and the restoration and generation of new anadromous fish habitat. More than 600 acres of anadromous fish habitat were recommended for conservation primarily along the Atlantic seaboard. Efforts were targeted primarily at the conservation of striped bass, blueback herring, alewife, shad, Atlantic sturgeon, and shortnose sturgeon.

The SER continued to play an active role as a member of the state-Federal team assessing the impacts of the dredging and other modifications of the Apalachicola River, Florida, on sturgeon and stripped bass. We are involved in a state-Federal meeting on the future of these species in the Apalachicola River.

The SER participated in a workshop sponsored by the Wilmington District COE to address the impacts of dredging on anadromous fish. Committees were formed to address impacts to different life stages (e.g., eggs, larvae, adults). We will be reviewing and commenting on the future work of the committee.

NORTHEAST REGION

Sewalls Falls Hydroelectric Project

Sewalls Falls has evolved into one of the most controversial hydropower projects in New England. Although NMFS did not formally intervene on the project to the FERC during the last evaluation opportunity, we have continually stated in letters that we were concerned about anadromous fish resources and their habitat. This past spring, the applicant withdrew its request for a project permit. Department of the Interior's (DOI's) decision to support their FWS field staff in opposing Sewalls Falls represents a major victory for salmon restoration efforts on the Merrimack River.

Susquehanna River Fish Restoration

Although the NMFS is an unofficial voting member of the Susquehanna River Anadromous Fish Restoration Committee, we join the official state, Federal, and private company members in announcing the successful efforts to restore shad to the Susquehanna River, especially above the Conowingo Dam. Based on a Maryland tag and recapture population assessment, the latest estimate for the American shad population in lower Susquehanna River and flats area is almost twice the size of last year's estimate. The cooperative efforts by utility companies and resource agencies to restore shad are represented of a successful effort to recoup the benefits of a healthy commercial and recreational stock.

Windsor Locks Hydroelectric Project

As an official intervener in the Windsor Locks Hydroelectric Project, HCB provided detailed comments on additional information provided to us for this first dam on the main stem of the Connecticut River in Hartford County, Connecticut. Project plans consist of rebuilding and stabilizing portions of an existing dam, including three gates to control an existing breach. The revised engineering plans appear to provide acceptable passage for anadromous fish. In separate negotiations, the applicant agreed to develop and implement a monitoring program to assess the actual effects of the proposed changes on fish passage through a dedicated gate. Since there is no guarantee that these plans will be successful, HCB continues to have concerns about the potential effects of the proposed dam project on the endangered shortnose sturgeon. Accordingly, HCB recommended continued research into the specific needs of the shortnose sturgeon for upstream and downstream passage. Specifically, information is needed on flow velocities, slope, and bottom type. A separate design for a screen to assist downstream migration of andromous fish may pose a problem for shortnose sturgeon. Slight modifications to the screen operation may reduce problems during unusual flood periods. HCB will continue to work with FERC and the applicant to discharge our responsibilities under the Federal Power Act and Section 7 of the Endangered Species Act.

Virginia/Maryland Anadromous Restoration Initiatives

The HCB has actively participated with these states in developing anadromous restoration programs for several years. In Virginia, fishway construction is in progress on the Meherrin River near Emporia, and will begin soon on Walkers Dam on the Chickahominy River. Plans are also being developed for the James and Appomattox Rivers. In addition, the FERC license for the Embrey Dam on the Rappahannock River contains a NMFS Section 18 perscription for fishway construction.

In Maryland, efforts are underway to restore anadromous fish in the Patapsco River, and passage at small blockages (under

10 feet) is being investigated on other watersheds.

The 1987 Chesapeake Bay Agreement commits the jurisdictions to provide fish passage at dams and to remove blockages when necessary to restore natural migration. HCB is part of a workgroup developing the plan to implement this commitment.

IMPLEMENTATION STRATEGY 8: Preapplication Planning

This Strategy emphasizes the importance of pre-application involvement with applicants and Federal and state planning and regulatory agencies.

ALASKA REGION

Biologist-divers from HCD continue to make subtidal surveys at the request of the U.S. Forest Service, Native Corporations, and other Federal and state agencies at locations proposed for development from timber harvest activities, mining, and waste discharge from on- and offshore manufacturing and processing plants. Many of the projects proposed are months to years away from formal Department of Army permit applications, but by identifying highly productive habitat early, associate activities can be relocated into areas which are not highly productive or sensitive. Information from biological surveys is used not only for Department of Army permit actions, but also in the preparation of environmental assessments and environmental impact statements.

NORTHWEST REGION

The NWR was extensively involved and provided comments to the COE on the final supplemental U.S. Navy Environmental Impact Statement for the Puget Sound Region Ship Homeporting Project. In addition, the Regional Director made two trips to Washington, D.C. to testify at Congressional subcommittee hearings on this topic. The project will require the dredging of approximately three million cubic yards from the East Waterway of Everett Harbor. It is estimated that one-third of this dredged material is severely contaminated.

The NWR, along with other resource agencies, objected to the proposed open-water sites proposed by the Navy for disposal of the dredged material because of potential impacts to fish habitat. A nearby upland site was recommended as an alternative disposal site.

The COE issued the permit over NMFS objections. NMFS elevated the decision to the COE Division level, where a compromise was agreed upon. This agreement was later overturned by the COE's Chief of Engineers Office, and the permit was issued. As a result, NMFS reverted to its original objections. The COE permit is expected to be challenged in court by various environmental groups.

The ETSD participated in FY87 as a member of an interagency task force charged with the development of a long-term solution to sedimentation problems in the Snake River. The task force has developed a multi-year study to evaluate impacts of disposal of dredged material and the potential to create juvenile anadromous fish habitat with dredged material.

Also in FY87, the NWR objected to the construction of a 1200 slip marina in Elliott Bay near Seattle, which would have eliminated one of the last natural intertidal habitats in the entire estuary. The site is also one of the few remaining usual and accustomed native fishing sites for the Muckleshoot and Suquamish Indian tribes. Mitigation offered by the COE was unacceptable. A final decision by the COE on the issuance of the permit is forthcoming.

SOUTHWEST REGION

Chevron USA Wastewater Outfall

Chevron, which operates a refinery near Richmond, was instructed to increase dilution of their wastewater outfall to 10:1 dilution by July 1987. The outfall presently discharges to a small creek, then to San Pablo Bay. A deepwater outfall into the Bay with multiple diffusers is now proposed for construction in order to meet the dilution requirement. NMFS participated extensively with the environmental consultants and assisted in the design of a plan to assess resources of the area and to project probable effects. Of particular concern is the impact of the wastewater plume on upstream migrating salmon and steelhead, since certain chemical elements are known to delay migration in chinook salmon. An extensive environmental impact report was prepared and critiqued by NMFS staff. Early consultation and strict enforcement of California water quality standards produced a reasonable option for Chevron that minimizes adverse impacts to fish resources. The study is providing site-specific information that will be useful to habitat managers on other projects or issues. Subsequent fish and bioaccummulation monitoring will be performed by Chevron. NMFS staff will evaluate this information closely to assess previous assumptions and decisions.

Santa Rosa Sewer Outfall

The City of Santa Rosa is a rapidly growing bedroom community of San Francisco. As a result, it is outgrowing current wastewater disposal capabilities. Several discharges to the nearby Russian River exceeded California water quality standards (dilution criterion). The river supports valuable

salmon, steelhead trout and shad fisheries. The important decisions that soon will be made are where and how the wastewater will be disposed. Two options are preferred by the City; both are discouraged by NMFS. These include ocean disposal and San Francisco Bay disposal. Our strategy is to push hard for 1) keeping Russian River water in the Russian River basin and 2) substantially improving the quality of the effluent. Technology for advanced wastewater treatment is available, but exceeds the costs of the two disposal options identified. NMFS will continue to recommend that adequate water standards be maintained which ensure that existing fishery resources are not adversely impacted.

Pacific Texas Landfill Project - Los Angeles Harbor

The Pacific Texas Pipeline Company along with the Port of Los Angeles proposed to construct a 141 acre fill in Los Angeles Harbor for the purpose of supporting a tanker berthing and petroleum terminal facility. Because on-site mitigation was not feasible given the size of the project and lack of suitable mitigation sites, efforts were directed at finding an appropriate off-site location for this mitigation work. The restoration to tidal action of a degraded wetland system appeared to be the best option since fishery species which would benefit from the restoration were similar to those which would be adversely impacted at the Harbor fill site. The Batiquitos Lagoon site was determined to be the best opportunity available since considerable work had already begun by the California State Coastal Conservancy regarding the development of a restoration plan for the Lagoon. Although the details have yet to be finalized, the project could result in restoring to tidal action of up to 529 acres of intertidal and subtidal habitat which is more than sufficient to mitigate the PACTEX project. Any excess could be used to offset the impacts of future Port projects.

Mission Bay Eelgrass Transplanting Project

The City of San Diego recently began a massive beach widening project in the Sail Bay area of Mission Bay. The source of material for this project was an area immediately offshore of the recipient beach. NMFS expressed several concerns with the project including the expected loss of 17 acres of eelgrass and the use of the proposed dredge site since the top three feet of dredged material consisted primarily of fine silts which would be unsuitable as beach turbidity. As a consequence of NMFS involvement with this project, the City was required to remove to an upland site the top silty layer of dredged material and transplant an equivalent area of eelgrass as that which was lost from construction activities. Because the transplant was one of the largest ever attempted, specialized techniques were developed by the City's contractor to assist in the completion of the transplant in an efficient manner.

Eelgrass Related Projects - San Diego Bay

Naval Amphibious Base Dredging Project A Memorandum of Agreement (MOA) was signed among the Navy, NMFS, U.S. Fish and Wildlife Service (FWS), and CDFG regarding the implementation of a mitigation program to offset the adverse impacts associated with the proposed dredging project. Part of that Agreement required the Navy to construct an eight acre eelgrass transplantation site near the Amphibious Base and transplant eelgrass to the site. The work related to the construction of the mitigation site was completed in late 1986. During the fall of 1987 NMFS will participate in eelgrass transplanting efforts. The Navy has also contracted with NMFS to perform monitoring activities associated with the transplant in order to document whether the project has complied with the MOA and to recommend remedial actions should the project not meet the agreed upon objectives.

Harbor Island Marina Project

A marina construction project was proposed for construction along the undeveloped east basin of Harbor Island. The project included the construction of a bulkhead and the dredging of the adjacent water area to allow sufficient depth for boat moorings. Prior surveys conducted several years before the current marina project had been proposed did not indicate the presence of any submerged vegetation. However, a SCUBA diving survey conducted by NMFS observed the presence of a small amount of eelgrass. It appeared that a recent dredging project had exposed coarse grain sand along the perimeter of the basin making the nearshore area suitable for the establishment of eelgrass. As a consequence, the project sponsor was required to provide mitigation for the existing area of eelgrass which would be lost as a result of the proposed marina project, as well as for areas where eelgrass was not currently growing but was expected to become established.

Both of these projects in San Diego Bay required the implementation of an experimental eelgrass mitigation technique where the project proponents were required to construct an appropriate substrate for the establishment of eelgrass and then transplant the vegetation to the site. Both projects include extensive monitoring of the work and also include provisions for remedial action should the sites not be constructed as designed or if the required transplanting efforts prove to be unsuccessful.

Lake Redding Hydropower Project (FERC No. 2828)

NMFS continued to coordinate with FERC staff on the preparation of their Draft EIS on the Lake Redding Hydroelectric Project. In addition, our Northern Area Office staff has participated in the scoping for a Draft Environmental Impact Report (DEIR) which the City of Redding Planning Department is preparing pursuant to State environmental law. We met several times with representatives of the fishery

agencies, the City and their environmental consultants to evaluate and revise their proposed fishery and hydrologic study plans. The City has already obtained a one year extension to complete the studies, but there are many areas that fall far short. The City may request that FWS do some of the studies on contract and then request that FERC grant an additional delay. The City's Project now excludes fish passage and screens. NMFS requested and was granted formal Intervenor status from FERC on this Project.

Lake Red Bluff Hydropower Project (FERC NO. 2827)

Since 1985, NMFS and the other fishery resource agencies have apparently been successful in persuading the City of Redding to suspend their efforts to obtain a FERC License for the proposed Lake Red Bluff Hydropower Project on the upper Sacramento River in northern California. The project would utilize the existing Bureau of Reclamation (BR) Red Bluff Diversion Dam (RBDD) to provide water to two bulb turbines.

NMFS and the other fishery resource agencies requested that FERC and the City not proceed with the Project until the interagency evaluation of fish passage problems at the RBDD had been completed and restoration efforts had born fruit. We pointed out our concern over the possible impacts to winter-run chinook and ultimately the Department of Interior concluded that the proposed hydro project was incompatible with the purposes of its Red Bluff Diversion Dam. Very recently, FERC has dismissed the City's License application. We anticipate, however that the City will appeal this decision.

Glenn-Colusa Irrigation District

We attended several meetings with representatives of the fishery and environmental agencies, the COE, and the Glenn-Colusa Irrigation District (GCID) to discuss resolution of the outstanding fishery issues on the pending COE Section 10 and 404 permit. The GCID pumping operation is the largest and oldest on the entire river and may, in CDFG's opinion, be the largest source of mortality on the river, below the RBDD. Recent changes in the Sacramento River stream bed have altered the screen bypass flows, so that at lower river flows, the channel that leads to the screens becomes a dead end "predation sink."

The GCID has petitioned the COE to drop their claim of Section 404 jurisdiction, arguing that as an agricultural diversion structure, it is covered by a Nationwide Permit. The COE has asked EPA if they would like to take over the jurisdiction question - EPA is considering the matter.

With extensive assistance from F/NWR5, the Northern Area staff have developed a comprehensive approach to resolving the long term problem that would involve major river work by the COE and cooperative funding for other irrigation and fishery facilities. Foremost among the changes required are 1) raising the river's water surface elevation three to four feet and 2) constructing an entirely new, enclosed fish-screen bypass facility. Considerable disagreement exists as to what base assumptions are used, what legal relief may exist, and who will pay for what. It may be that local and Federal legislators will soon pick up the ball.

Pacific Gas and Electric Delta Plants - 316(b)

During 1986, following much discussion and disagreement, negotiations were completed concerning the required mitigation and operation standards at Pacific Gas and Electric Company's (PG&E) Pittsburg and Antioch Power Plants, in the Sacramento-San Joaquin delta. The new NPDES Permits, which were adopted last year by both Regional Boards, will allow PG&E to manage for specific, numerical mortality reductions as a goal rather than an absolute standard. However, the penalty for missing the "goal" is changed to a progressive payment in hatchery striped bass - the further away from the goal, the more hatchery fish are proportionally owed.

Middle River Barrier

NMFS staff met twice during the year with DWR, FWS, and CDFG to discuss the proposed construction of a tidal barrier in Middle River (San Joaquin) in an attempt to resolve water quality and quantity problems experienced by farmers, at low river flows, in the South Delta Water Agency (SDWA). This has been brought on by the severe drafting of the San Joaquin caused by the Federal and State water project pumps. These problems are coincidentally bad for fish. The SDWA sued the DWR, seeking relief. Subsequently, DWR has entered into an agreement with the SDWA to evaluate and implement long-term solutions.

This past year, NMFS evaluated a PN for DWR to place a temporary barrier in Middle River, as part of an interim, emergency solution. The long-term solution includes a variety of various sloughs and channel barriers in the vicinity of Clifton Court Forebay. One alternative would enlarge Clifton Court Forebay and move the intake to the north end. (If this solution sounds remarkably like a revisitation of the 1983 Delta Water Transfer Alternatives, well...)! NMFS voiced several concerns about fish survival that should be studied and addressed in the EIR and EIS. In addition, we pointed out that anything which changed the capacity at Clifton Court/Pumps would require evaluation of the fish screen needs and trigger a new Section 10 COE permit (called for by the District Court in the Sierra Club lawsuit on the addition of new SWR pumps).

East Yolo Water District

The East Yolo Water District, representing the area of east Sacramento, has proposed to install a pumping facility for domestic drinking water. While they plan to equip their pump intakes with the latest Johnson Wedge-wire Fish Screens, their consultants indicate that up to 51 million larval shad and 20 million larval striped bass will be entrained annually. NMFS has opposed the Permit until a agreement has been reached to provide adequate mitigation. (Recent agreements have been reached with PG&E and DWR for replacement of their project related striped bass losses with hatchery plants.) The Applicant's consultant estimates that the loss of larval bass is equivalent to about 23,000 bass yearlings. Since there are a number of successful private striped bass hatcheries in the Delta, it is very likely that such a plan could be worked out. However, we know of no effective means to mitigate for the lost shad; it is not likely that the fishery agencies will pursue this point.

Summer Dam - Austin Creek/Russian River

Once again, the controversy over the placement of summer gravel dams in Russian River basin streams continued last year. The Cazadero Dam Committee has signed a 5-year COE Permit that reduced the number of dams to 28 and implemented many recommended mitigation measures. The new Permit also set as a goal the significant reduction of the area of stream habitat inundated by the dams and mandates a new study of the biology and hydrology of Austin Creek. However, not withstanding this "temporary" settlement, NMFS has been deluged with letters from citizens in support of the summer dams in Austin Creek. Despite our previous urging, we have not heard anything further about the requested comprehensive study or the COE's EIS. We hope that we do not find an unprepared and surprised Applicant in five years.

SOUTHEAST REGION

The SER actively participates in the bi-weekly interagency screening of permit applications by the COE. These, plus numerous preapplication meetings with applicants for permits, have enabled us to continue to eliminate or minimize many adverse project impacts to marine fishery habitat prior to public notice issuance. The HCD expended considerable effort to urge prospective permit applicants to coordinate early with NMFS and to assist them by resolving issues before a permit application is made. During FY87, the HCD attended more than 230 preapplication meetings. Many of these resulted from increased efficiency due to the establishment of the new HCD field office in Baton Rouge, Louisiana. The two resident biologists attended at least 90 preapplication meetings.

An important activity of the SEC habitat program has been to provide recommendations to SER staff in preapplication consultations. Recommendations were made on several projects in North Carolina, Florida, and the U.S. Virgin Islands that would impact seagrasses; information related to projects dealing with marshes in North Carolina, South Carolina, Georgia, and Louisiana also were requested for input by SEC staff.

SER personnel participated in a conference with the Galveston District COE where plans for FY88 and FY89 maintenance dredging of the Gulf Intracoastal Waterway and the ship channels in the District were presented. For FY88 projections were that 20 contracts would be let to dredge 34 million cubic yards of material at a cost of $42 million. The estimate for FY89 was that 20 contracts would be let to dredge 37 million cubic yards of material at a cost of more than $43 million.

In Louisiana, many of our preapplication activities include Louisiana's Coastal Management Division with whom we cooperate with in habitat conservation efforts. We also frequently participate in geologic review meetings hosted by the State to determine the feasibility of minimizing environmental impacts related to oil and gas exploration activities through the use of directional drilling techniques. After technical constraints and least damaging alternatives are evaluated, HCD staff identifies potential mitigation to offset unavoidable marine fishery impacts. The presence of the geologist has greatly increased the frequency of applicants indicating that they could explore or develop the petroleum reserves by directional drilling, which reduces the size of canals through marshes for access to well sites.

NORTHEAST REGION

Regional Mitigation Initiative

HCB staff in Sandy Hook continue to discuss with the COE (Philadelphia District) the prospects of a special district-wide mitigation initiative. Our primary objective is to make mitigation conditions more realistic and scientifically valid. Great concern has arisen about mitigation, specifically compensation, and whether mitigation conditions to permits achieve a reasonable balance with impacts. This interagency effort could result in a conference and/or special task force.

New Bedford Harbor Superfund Site Clean-Up

HCB continues to assist the COE's evaluation of alternative locations for the New Bedford Harbor pilot study's confined disposal facility. The pilot study will involve small-scale dredging of contaminated materials, which then must be disposed of in a facility yet to be designed. The evaluation has focused on relative cost and engineering feasibility of alternatives and has not yet addressed the environmental and social factors. HCB also commented on the time frame for dredging since blueback herring and alewifes may be affected.

IMPLEMENTATION STRATEGY 9: Integrating Programs

This Strategy is designed to facilitate integration of habitat considerations into all NMFS programs.

ALASKA REGION

HCD has provided information to develop/improve habitat sections of the Tanner and king crab fishery management plans as well as revision of the salmon plan. Work on the habitat amendment to the salmon plan is continuing and is being coordinated with ABL personnel. HCD also provided evaluation and comment on numerous policy documents as requested by Headquarters.

NORTHWEST REGION

The NWR provided an indepth analysis for NOAA Administrator Calio on proposed legislation regarding instream flow and water appropriations in the Snake River (Idaho) above Swan Falls.

SOUTHWEST REGION

Refer to SWR efforts to integrate habitat considerations into the Council FMP process as outlined under the discussions relating to Strategy 3.

SOUTHEAST REGION

Integration of SER and SEC habitat considerations is demonstrated through the unified regional priorities documents that were developed during this fiscal year; the interaction of research and management staff in evaluation of permits submitted to the COE; the development of research projects that directly respond to fishery habitat management information needs; and the publication of joint manuscripts on management issues; and joint recommendations for research and management to address habitat issues.

Integration of SER and SEC habitat considerations is further demonstrated through continued discussion of priority habitat issue needs in the region during FY87; presentation of papers on SEC/SER integrated research activities and management needs at several NMFS, NOAA and FMC meetings; development of research projects by SEC staff responding directly to SER management needs; and publication of manuscripts by SEC staff or jointly with SER staff on research and management issues.

NORTHEAST REGION

Right Whale Research Proposal

The Northeast Fisheries Center (NEC) was provided with special initiative monies to be used on right whale research. The NEC asked the HCB protected species staff to join a panel to evaluate a proposal that was submitted by a consortium of marine mammal researchers. The proposal was designed to address those right whale research priorities that were identified in the Right whale Research and Management Plan put together by the Marine Mammal Commission. The proposal was analyzed thoroughly, and constructive comments were given to the NEC for development of a Cooperative Agreement with the Consortium. The NEC staff has since met with the Consortium and a final Cooperative Agreement is being prepared for utilizing the initiative funds to undertake significant right whale research efforts.

Stock Assessment Workshop

HCB staff participated in a stock assessment workshop hosted by the NMFS NEC in Woods Hole. A series of assessments and status reports were presented for each species of interest in the Mid-Atlantic and New England areas, including squid, yellowtail flounder, witch flounder, hakes, mackerel, redfish, haddock, and butterfish.

NOAA's Superfund Activities

Branch staff represented the NMFS field habitat units at a special Superfund meeting on March 19th in Washington. Using the Northeast experiences as a template, NOAA office representatives discussed the agency's approach to fulfilling NOAA's Superfund mandates for assessment and restoration. Experiences in EPA's Region I are now being adapted to EPA Regions II and III, which are now preparing for heavy Superfund workloads in the coming years.

IMPLEMENTATION STRATEGY 10: Intra-NOAA Cooperation

This Strategy emphasizes greater intra-NOAA cooperation in habitat conservation.

NORTHWEST REGION

In August 1987, the NWR hosted a National Habitat Conservation Workshop. Attendees included NMFS habitat staff from all regions and the Washington office. The goal of the workshop was to more clearly define the NMFS Habitat Program. Recommendations were developed in a number of program areas, including FERC issues, the Magnuson Fishery Conservation and Management Act, resource damage

assessment and restoration under the Superfund Act, habitat mitigation practices and policies, the use of statistics in habitat programs, national strategies on aquaculture, artificial reefs and impoundments, and legislative goals.

The CZESD is continuing the development of a living resource "West Coast Estuarine Atlas" for NOAA's Ocean Assessments Division (OAD). This estuarine inventory includes data on the distribution, abundance, and life histories of key fishes and invertebrates from the major California, Oregon, and Washington estuaries.

The ECD also continued its work with OAD in the National Status and Trends program. Division personnel were responsible for sample collection and data analyses for the West Coast and Alaska National Benthic Surveillance Project. In addition, the Division continued to work under OAD funding on a project evaluating reproductive success of bottom fish residing in polluted embayments.

SOUTHWEST REGION

SWR and SWC Tiburon staff participated at management and technical levels with other NOAA elements, state agencies, other Federal agencies, fishing and conservation organizations, and public representatives. One major example is the effort by EPA to develop an intensive management program for San Francisco Bay. The bay is designated an estuary of national importance through the EPA's National Estuary Program. Coordination occurs with Sea Grant, Estuarine Program Office, National Ocean Service, the Gulf of the Farallons National Marine Sanctuary and the NMFS; this coordination continues as the program continues. A workshop was attended at Annapolis, Maryland for the specific purpose of coordinating all appropriate NOAA elements (including NOAA Corps) as inter-NOAA involvement concerns EPA's National Estuary Program.

Regional Habitat staff coordinated closely with General Counsel in developing and presenting legal testimony as described earlier in Strategy 7.

One NOAA Corps Officer was assigned to the northern California habitat office for a three-year period. He is reviewing habitat assessments of major impacts (e.g., offshore development, Federal projects, etc.) and supervises special habitat investigations in northern California. This inter-NOAA personnel assignment opportunity is especially productive.

Regional Habitat staff coordinated closely with NOAA Hazardous Material staff during the recent oil spill related to the sinking of the commercial cargo vessel PAC Baroness, in the Santa Barbara Channel. Coordination was also quite close with the Marine Sanctuary Office responsible for the Santa Barbara Channel Islands Marine Sanctuary.

Also, SWR and SWC staffs are continuing to cooperate with General Counsel, and National Ocean Service representatives in their determination as to whether to pursue a formal damage claim by NOAA relating to DDT discharges to Santa Monica Bay, California.

The OTEC study referred to under Strategies 2 and 12 was conducted in close association with the Ocean Minerals and Energy Division in Washington.

SOUTHEAST REGION

At the request of NOAA's Office of Ocean and Coastal Resource Management, SER personnel continue to represent NOAA on the Gulf of Mexico and South Atlantic Regional Technical Working Groups (RTWG). These are regional advisory committees of the Outer Continental Shelf Advisory Board established by the Outer Continental Shelf Lands Act, as amended. The RTWGs regularly provide advice to the MMS and the Secretary of the Interior concerning OCS mineral exploration and development and needed environmental studies. The Gulf of Mexico representative has been actively seeking to have MMS study the impacts of dispersed OCS oils on sensitive life stages of major Gulf of Mexico fishery species.

The SER and SEC continue to coordinate with NOAA's Estuarine Protection Office (EPO) on activities such as the EPA Gulf Initiative.

The SER and SEC hold yearly meetings with Sea Grant to discuss areas of mutual interest, research directions and needs, and methods to insure closer coordination.

The SEC works closely with other components of NOAA on a continuing basis. The Beaufort Laboratory and the NOS have joint efforts underway on wetland mapping; fishery distribution, abundance and life histories; and NOAA's National Status and Trends Program. Program efforts also are coordinated with NOAA's Marine Entanglement Program. The SEC has worked closely with NOAA's EPO on the development of an Estuarine Program Initiative. The SER and SEC have interacted closely with EPO regarding NOAA's involvement in the EPA Gulf Initiative. SEC staff also serve as NOAA representatives to the EPA's Albemarle-Pamlico Sound Program, serving on both the Policy Committee and Technical Committee. In addition, staff of the Beaufort and Galveston Laboratories routinely serve as referees for NOAA's Sea Grant and Sanctuaries programs and participate in site reviews.

NORTHEAST REGION

Identification of Critical Habitat Issues for Chesapeake Bay

Using the Northeast Regional Action Plan (RAP) process, staff from the NER and NEC combined to develop a list of issues, threats, priorities, and linkages for habitat issues in the Chesapeake Bay. The list will be shared with the EPA for use in their work on Phase II of the Chesapeake Bay Restoration and Protection Plan. Key issues raised by NMFS included urbanization, non-point source pollution, construction activities, freshwater diversions, industrial waste water discharge, domestic waste water discharge, power generation, resource utilization and development, agricultural practices, aquacultural practices, waste disposal, port development and utilization, anadromous watershed development and consolidation, wetland use and modification, and mineral extraction.

Scientific Research Permits

Staff evaluated applications for scientific permits from the NEC and NWC and SEC, all part of the NMFS research program. In each case, HCB recommended that the applications be approved. Information from cooperative research on protected species provides a valuable source of management information. In the southeast, information from cooperative research on the incidental take of sea turtles, recaptures of head-started animals (animals reared in captivity for release at a late date), and live or dead stranded sea turtles contributes significantly to our understanding or sea turtle mortality, survivorship, movement, and life history. Such information allows the agency to make more informed recommendations on development applications.

Annual Marine Mammal Report

The NER has submitted its contribution to the 1986/1987 annual report to Congress on activities related to the Marine Mammal Protection Act. Our summary describes work on marine mammal and fisheries interactions, management programs for cetaceans and pinnipeds, stranding activities, and incidental take of marine mammals in the Western North Atlantic.

Norfolk Canyon National Marine Sanctuary

In response to a special Mid-Atlantic Fishery Management Council inquiry, the HCB provided a brief summary of the status on designating Norfolk Canyon as an active national marine sanctuary. Currently, the site is on the active candidate list, a step which initiates preliminary consultation and consideration of site boundaries and regulations. Our evaluation identified protected species, commercial fisheries, and recreational uses in the Norfolk Canyon area.

Entanglement Program

The NMFS NWC continues to coordinate a national entanglement program for NOAA. HCB staff have provided comments to the project coordinator to insure that Northwest Atlantic perspectives are included. Summary reports on Northeast entanglement studies included "Research on the use of degradable fishing gear and packaging materials." Other reports from a marine debris roundtable discussion focused on solutions to the debris problem, information on the U.S. position to international agreements such as MARPOL Annex V, an issue paper and work plan for the development of a marine debris education program for the Northwestern Atlantic and Gulf of Mexico, and a study of the amount of plastic debris ingested by sea turtles.

IMPLEMENTATION STRATEGY 11: Regulatory Relief

This Strategy is directed at conserving fisheries habitats as the Federal regulatory relief process is carried out.

ALASKA REGION

HCD has successfully pursued incorporation into the State of Alaska electronic mail system (PROFS). By coming on line with this mail system, correspondence and review with state agencies on Department of Army regulatory permits and state development activities has been expedited. The anticipated incorporation of the COE into the PROFS system should further expedite permit evaluation through bypass of surface mail.

NORTHWEST REGION

The NWR's ETSD is a participating member of the Northwest Power Planning Council's Hydropower Assessment Steering Committee, which is involved in the development of protected area designations. The goals of the Steering Committee are 1) that all habitat currently used by anadromous fish and habitat potentially usable by anadromous fish in the Columbia River basin should be protected from new hydroelectric dam development; 2) all habitat currently used by anadromous fish outside of the Columbia River Basin should be protected, and 3) high quality resident fish and wildlife areas both inside and outside the Columbia River Basin should be protected.

SOUTHWEST REGION

The SWR will continue to participate in the evaluation and development of proposed new Federal and state laws, regulations and policies as required. Coordination on Federal issues will proceed primarily through the Central Office.

SOUTHEAST REGION

SER personnel participated in the interagency task force meeting on the Special Area Management Plan for Lakes Pontchartrain and Maurepas. A resolution was passed to encourage expedited approval by the COE of the partial diversion of the Mississippi River to Lake Pontchartrain.

Numerous planning meetings were held with the COE to discuss The Water Resources Development Act of 1986 (PL 99-662). This Act calls for increased commitment of NMFS in water resources issues, especially mitigation.

Staff analyzed and commented on a variety of new and renewal general permit applications. Our efforts have insured that individual and cumulative habitat losses are minimized while speeding up and simplifying the evaluation process for many permit applicants.

The SER serves on the Lake Okeechobee Regulatory Review Committee.

This is an interagency committee of regulatory reviewers who can provide technical input while projects are in the planning phase. This process would result in final project designs that meet applicable regulatory requirements and subsequently would expedite the regulatory permit analysis process.

NORTHEAST REGION

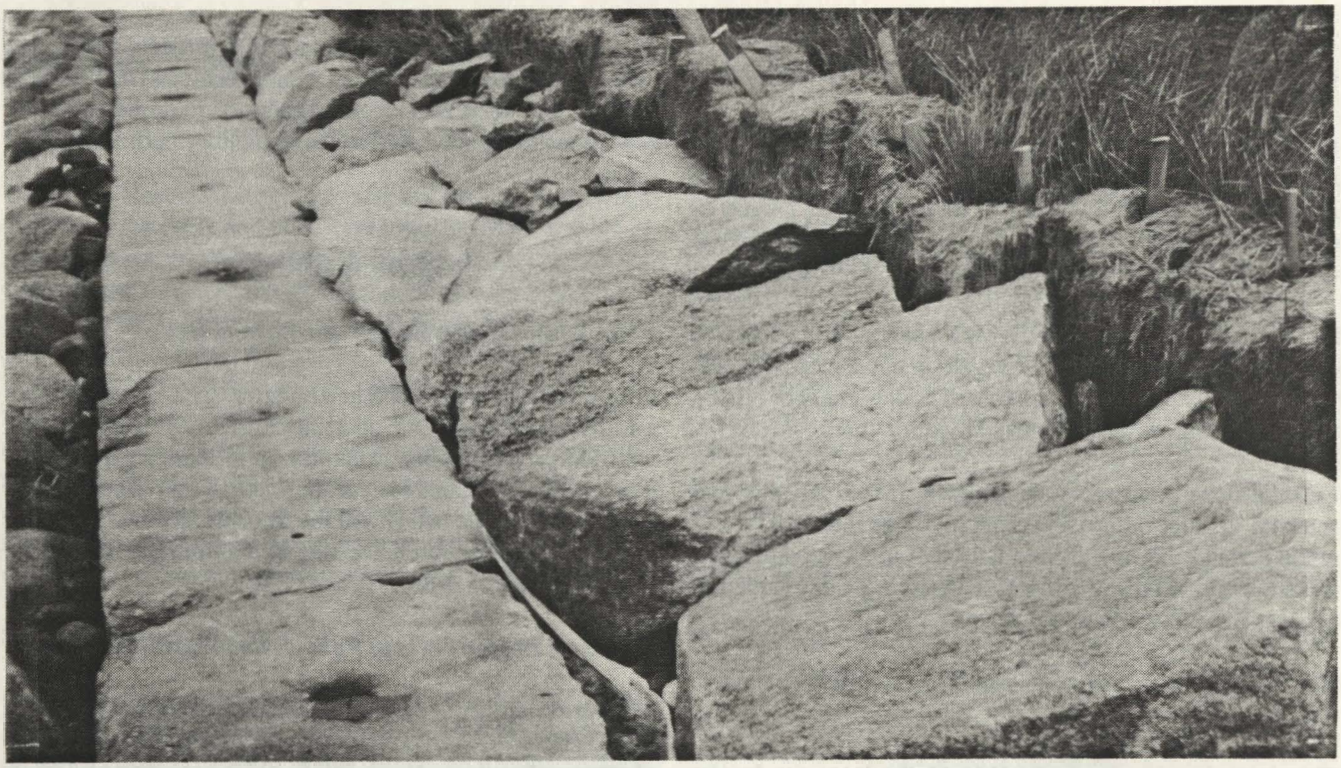
Hydropower Memorandum of Understanding

In conjunction with NMFS headquarters, NOAA negotiated a draft Memorandum of Understanding (MOU) with the Federal Energy Regulatory Commission to clarify administrative procedures related to hydropower application evaluation and comment. The MOU will incorporate recent changes to the Federal Power Act embodied in the Energy Consumers Protection Act of 1986.

Northeast Region Habitat Policies and Guidelines

HCB is currently developing a packet of explanatory guidelines, statements, and policies on a variety of habitat-related programs. The packet will clarify NER positions on issues

Benthos Sampling to Determine Potential Effects of Marina Expansion in the Annisquam River, Gloucester MA.



Shoreline and Dune Protection Techniques Attempting to Slow Severe Erosion and Protect Intense Residential Development on a Dune System, New Seabury, MA.

ranging from mitigation to anadromous fish habitat management to Superfund jurisdiction. The information should clarify for constituents and other government agencies what role NMFS will play in various resource issues.

Harbor Characterization Report

In 1983, the Inter-Agency Technical Group (ITG) for Dredged Material Management in New England was formed. The ITG's top priorities were to standardize data requirements associated with harbor permits, to determine data gaps, and to determine the need for further sediment testing, all on a harbor-wide basis. To achieve that goal the ITG agreed to develop a strategy for characterizing harbor sediments. That report was finalized in 1985 and submitted to agency directors for signature. To date all participating states and Federal agencies have signed the report except the COE. HCB continues to negotiate with the Waltham district to gather their support for the ITG report. Once adopted the report will represent a real opportunity to ease environmental information processing burdens for any permit covered by a harbor characterization document.

Memorandum of Agreement with COE on Clean Water Act

The NMFS and COE continue to work on revisions to their Memorandum of Agreement (MOA) on implementing Section 404 of the Clean Water Act. The agencies currently operate under an MOA from 1982 that establishes a protocol for analysis of NMFS advice and COE decisions on wetland projects. The new revisions address some long standing NMFS concerns and offer both agencies the opportunity to resolve problems at lower administrative levels.

Virginia Regional Permit

Following consultation with HCB, the Norfolk District, COE, modified state regional permit (RP-19) for Virginia to include more activities. The modifications will expedite permit processing time, reduce paperwork, and streamline the permit process for applicants. However, the District has also proposed two additional regional permits, which would have delegated permitting authority to reservoir managers (RP-22) or county wetlands boards (RP-26). Objections to RP-22 have been resolved. Unresolved issues relative to RP-26 are: 1) only EPA can delegate permit authority, 2) the permit is not category specific as required, and 3) our Congressionally mandated review authority cannot be preempted without our express consent. Both FWS and EPA concur. Several environmental groups have expressed interest in the issue.

IMPLEMENTATION STRATEGY 12: *Communicating Habitat Information*

This Strategy emphasizes communication of habitat conservation program progress and results to NMFS constituencies.

ALASKA REGION

The Anchorage Field Office staff participated in the annual Anchorage Field Conservation Program for sixth grade students. A hands-on game was developed to show the relationships between man induced ocean disturbances (noise) and whales in their ocean environment.

The HCD prepared a Technical Assistance Report for the Lisburne (offshore) Development Project which provided a general background on the biology of fish populations in the project area and submitted it to regulatory agencies. Copies of the report "Report on the Alaska Region Section 10/404 Permit Coordination, 1981 through 1985" mentioned earlier were distributed to NOAA elements and state and Federal regulatory and resource agencies.

NORTHWEST REGION

The NWR routinely meets with representatives of Indian tribes, states, and special interest groups to discuss habitat issues of mutual concern. NWR staff has provided detailed information on anadromous fish enhancement activities in different river basins in the NWR to a number of groups, including the Columbia River Education Project and the Sierra Club.

Besides the distribution of reports relating to previously discussed research projects, the CZESD reviews its Habitat Investigations Program at many regional and local meetings. These meetings are attended by other Federal agency representatives, as well as State, local, and interagency personnel.

The ECD continues to communicate results of its habitat research in scientific papers in peer-reviewed journals, in annual and final reports to funding agencies, and in presentations at national and international scientific meetings.

SOUTHWEST REGION

A joint State/Sea Grant/NMFS publication, "California Marine Sportfish Identification" booklet was published and is in the process of being distributed. It contains habitat and biological information for 78 fish species. Regional Habitat staff participated in the development of the document.

As described in Strategy 7, habitat requirements were presented to the State Water Board as formal testimony. Such public testimony will continue in the future.

Northern California Habitat staff presented an overview of the SWR's concerns regarding oil drilling off the north coast of California to a group of local government representatives and fishing groups in November of last year.

Southern California Habitat staff gave a presentation at the Tiburon Laboratory Eelgrass Conference in May entitled "Fishery Utilization of Eelgrass Beds and Non-vegetated Shallow Water Areas in San Diego Bay."

SOUTHEAST REGION

The SER and SEC communicated habitat information through presentations at scientific and management meetings; journal publications, poster sessions, lectures in classrooms, lectures at museums and local clubs; discussions with various environmental interests; articles in newspapers and popular magazines; broadcasts on national public radio and television news programs and wide distribution of reprints.

Among the papers published or submitted for publication this year dealing with habitat issues were: "Modeling the effects of coastal change on marine resources;" "Habitat development applications: Use of seagrass transplanting for habitats development on dredged material;" "Transplanting of seagrasses, *Halodule wriqhtii*, *Syringodium filiforme*, and *Thalassia testudinum* for stabilization and habitat development;" "The use of ecological data in the implementation and management of seagrass restorations;" "Preliminary results of the 1984-1985 National Benthic Surveillance Project: Southeast Atlantic and Gulf of Mexico coasts;" "National Marine Fisheries Service habitat conservation efforts in the Southeast Region of the United States from 1981 through 1985;" "Creation of fishery habitat in estuaries;" "The potential impact of ocean thermal energy conversion (OTEC) on fisheries;" "Fish population responses to chronic and acute pollution: The influence of life history strategies;" "The mangrove prop root habitat: a refuge and nursery area for fish;" " Biological effects of trace metals in estuaries;" "National Marine Fisheries Service habitat conservation efforts in the coastal southeastern United States for 1986;" and "Treatment of National Marine Fisheries Service Recommendations by the COE in the Southeast Region of the United States from 1981 through 1985."

Among the presentations given this year were reports on management, mitigation information needs, and research directions provided to FMCs and the Office of Coastal Resource Management. Discussions of SEC habitat research were held at the American Fisheries Society National Workshop, and at national and international scientific and management meetings. SER habitat management presentations were given at the 14th Annual Conference on Wetlands Restora-

tion and Creation; The Fourth Water Quality and Wetlands Management Conference; The National HCD Workshop, Portland, Oregon; the SER Recreational Fisheries Steering Committee; and at joint meetings with Sea Grant. The staff of the SEC Beaufort Laboratory presented displays on marine mammals at local festivals and at museums. The laboratory also continued its work with the NMFS/Duke University "Dolphin Watch" program. Much of the effort with marine mammals during this fiscal year was associated with responding to strandings of *Tursiops truncatus* (Atlantic bottlenose dolphin), and explanation of events associated with the disease problems. Some necropsy work was done in conjunction with the Smithsonian Institution.

SER personnel presented another photographic exhibit of habitat loss and conservation and restoration in Louisiana and Texas at an open house of the Galveston Laboratory held again this year. The exhibit was viewed by many people.

NORTHEAST REGION

Increased Ocean Dumping Concerns

In recent months, HCB staff have received numerous inquiries from congressmen, fishing industry representatives, fishery council members, and the concerned public about the potential long-term implications of continued ocean dumping. Most concern focuses on the 106-mile dumpsite east of Atlantic City, NJ and the adjacent acid dumpsite. Sludge disposal by 12 haulers is now being moved from the defunct 12-mile dumpsite to the 106-mile dumpsite; duPont remains the sole user of the acid dumpsite, which is immediately west of the 106-mile dumpsite. The ground-swell of concerns may lead to recommendations against ocean dumping or for expanded monitoring and enforcement of existing activities.

Cetacean Entanglement and Incidental Take Report

Upon request of the Cetacean Society International, HCB staff compiled a summary of entanglements and incidental takes of baleen whales and of toothed whales caught incidentally during commercial fishing operations. All takes were authorized by permit programs managed by the NMFS pursuant to the Marine Mammal Protection Act of 1972.

Procedures for Handling Stranded Marine Mammals

Staff distributed a reference manual to all Marine Mammal Protection Act permit holders to standardize procedures for handling stranded marine mammals. The document should enable stranding network volunteers to collect more detailed and accurate data regarding human and marine mammal interactions. Resulting information should help document the severity of human impacts on marine mammal stocks.

Study of Dredged-Related Impacts

Staff participated in an COE's workshop on the effects of dredging operations on anadromous fish. The primary objective was to develop a broad study outline to address the problems created for anadromous fish by an operating dredge. Disposal issues were not addressed. Impacts to migrating anadromous fish included problems with turbidity, dredge noise, toxics, and masking of chemical cues. These issues were considered for all age groups. Among the study alternatives were a number of tagging and tracking methods tested in on-site laboratory systems.

Beach Clean-Ups

As part of the annual Coastweek celebration, the HCB coordinated 23 beach clean-ups along the Massachusetts coast. The effort serves as a rudimentary data collection venture to determine the types of marine debris that may cause problems to turtles, fish, birds, and marine mammals. Three years of Coastweek clean-ups on the Massachusetts' coast revealed an average of about 100 pounds of marine debris (mostly plastics) per mile of shore line. In 1987, 391 volunteers collected 3,380 pounds of litter along 39.5 miles of shoreline. Similar efforts were conducted in most northeastern states.

APPENDIX

Section 10 and 404 Public Notices Reviewed for CY 1986/1987

SECTION 10 AND 404 PUBLIC NOTICES EVALUATED BY NMFS REGIONS FOR CALENDAR YEAR 1986[1]

Region	NER	SER	SWR	NWR	AKR	TOTAL
Corps public notices received:						
Section 404	230	780	224	101	175	1510
Section 10	657	1482	213	430	133	2915
Combined Section 10/404	902	1610	177	162	148	2999
Individual state permits[2]	130	0	0	0	0	130
Total	1919	3872	614	693	456	7554
Permit applications evaluated with minor modifications recommended[3]	304	556	53	25	52	990
Permit applications evaluated with permit denial recommended unless major modifications were made[4]	124	535	30	55	0	744
Total recommendations for denial	59	0	18	0	17	94
Permits with major recommendations referred under MOA	0	1	0	1	0	2
Referrals resulted in decision which:						
Supported NMFS' comments	0	0	0	0	0	0
Supported applicant's proposal	0	0	0	1	0	1
Resulted in compromise	0	0	0	0	0	0
Number of recommendations of denial at district level	0	0	0	51	0	51
Permits issued over NMFS objections, but not recommended for referral under MOA	59	0	2	4	0	65
Permits with denial recommended under MOA	0	0	0	1	0	1
Timeliness regarding preparation of major recommendations after receipt of public notices:						
Numer of extensions	0	0	0	3	9	12
Responses sent late	0	0	25	28	30	83
Responses by extended due date	0	0	0	4	26	30
Acreage of habitat proposed for alterations:						
Acreage proposed for dredging	4334.5	7952.6	949.8	1313.1	4196.1	18746.1
Acreage proposed for filling	344	27400	145.5	841.5	1149.1	29880.1
Acreage proposed for impounding	603.9	55205.4	427.5	0	3820.5	60057.3
Other[5]	0	0.5	177.5	0	175.8	353.8
Total	5282.4	90558.5	1700.3	2154.6	9341.5	109037.3

Calendar year 1986 cont.

Region	NER	SER	SWR	NWR	AKR	TOTAL
Acreage for which NMFS did not object to proposed alteration:						
Dredging	4162.9	5912.8	903.3	1148.7	2125.8	14253.5
Filling	284.8	21415.9	87.9	149.5	977.7	22915.8
Impounding	557.7	43508.8	77.5	0	3820	47964
Other[5]	0	0	115.8	0	49.8	165.6
Total	5005.4	70837.5	1184.5	1298.2	6973.3	85298.9
Acreage for which NMFS recommended against proposed alteration:						
Dredging	171.6	2039.8	46.5	163.8	2.1	2423.8
Filling	59.2	5984.1	59	691.9	37.4	6831.6
Impounding	46.1	11696.6	350	0	0	12092.7
Other[5]	0	0.5	54.7	0	28.7	83.9
Total	276.9	19721	510.2	855.7	68.2	21432
Acreage recommended for mitigation:						
Restore habitat	6.4	2612.7	480.7	50	2254.4	5404.2
Generate new habitat	133.1	5818.9	77.6	96.4	0	6126
Other[5]	0	41241.6	0	0	0	41241.6
Total	139.5	49673.2	558.3	146.4	2254.4	52771.8
Acreage affected by Corps' decision:						
Dredging	1474.9		445.9	1313.2	1812.6	5046.6
Filling	43		70.6	841.5	1035.3	2090.4
Impounding	30.7		4.5	0	3820	3905.2
Restore	2.8		489.1	50	0	541.9
Generate	85.2		65.5	96.4	0	247.1
Other[5]	0		306.5	0	148.3	454.8
Total	1636.6	4152.3	1532.1	2301.1	6816.2	16438.3
Requests for evaluation of unauthorized activities	0	304	0	27	45	376
Responses to requests for evaluation of unauthorized activities	0	304	0	27	45	376
Permits issued with:						
Major recommendations included	187	183	29	57	0	456
Major recommendations not included	59	44	0	4	0	107
Probable acreage lost from non-inclusion of NMFS recommendations:						
Dredging	5.5	0	0	0	96.1	101.6
Filling	3.6	0	0	411.6	53.4	468.6
Other[5]	2	0	0	0	28.9	30.9
Total	11.1	1728	0	411.6	178.4	2329.1
Permits pending	762	0	0	0	0	762

[1] January 1, 1986 to December 31, 1986.
[2] Northeast region only, state permits from Maine reviewed for Federal interests
[3] Minor modifications are those where recommendations are made but elevation of the case under the 404(q) MOA would be improbable.
[4] Major recommendations are those where elevation under 404(q) MOA would be seriously considered should the recommendations be excluded from a permit.
[5] Category includes proposals to drain wetlands, or construction of riprap, docks, piers, and log rafts.
NOTE: Figures represent initial estimates only and are subject to change. Figures may not add up due to rounding.

SECTION 10 AND 404 PUBLIC NOTICES EVALUATED BY NMFS REGIONS FOR CALENDAR YEAR 1987[1]

Region	NER	SER	SWR	NWR	AKR	TOTAL
Corps public notices received:						
Section 404	193	849	209	174	135	1560
Section 10	646	1515	186	281	149	2777
Combined Section 10/404	821	1701	169	174	129	2994
Individual state permits[2]	26	0	0	0	0	26
Total	1686	4065	564	629	413	7357
Permit applications evaluated with minor modifications recommended[3]	313	697	54	4	63	1131
Permit applications evaluated with permit denial recommended unless major modifications were made[4]	108	612	23	27	1	771
Total recommendations for denial	62	0	33	0	10	105
Permits with major recommendations referred under MOA	0	0	0	0	0	0
Referrals resulted in decision which:						
Supported NMFS' comments	0	0	0	0	0	0
Supported applicant's proposal	0	0	0	0	0	0
Resulted in compromise	0	0	0	0	0	0
Number of recommendations of denial at district level	0	0	0	43	0	43
Permits issued over NMFS objections, but not recommended for referral under MOA	19	52	2	2	0	75
Permits with denial recommended under MOA	0	0	0	0	0	0
Timeliness regarding preparation of major recommendations after receipt of public notices:						
Numer of extensions	0	0	0	7	2	9
Responses sent late	0	0	12	57	29	98
Responses by extended due date	0	0	0	6	42	48
Acreage of habitat proposed for alterations:						
Acreage proposed for dredging	824.6	3503	8443.3	1747	2105.4	16623.3
Acreage proposed for filling	505.8	2899	534.4	995.6	1796.8	6731.6
Acreage proposed for impounding	196.2	14048	9.1	77	44.2	14374.5
Other[5]	0	1303	44.8	0	216.3	1564.1
Total	1526.6	21753	9031.6	2819.6	4162.7	39293.5

Calendar year 1987 cont.

Region	NER	SER	SWR	NWR	AKR	TOTAL
Acreage for which NMFS did not object to proposed alteration:						
Dredging	744.4	2166	8115.4	1434.6	1635.3	14095.7
Filling	289.5	1189	424.5	503.1	1614.8	4020.9
Impounding	154.7	4779	9.1	77	44.2	5064
Other	0	0	34.3	9.2	73	116.5
Total	1188.6	8134	8583.3	2023.9	3367.3	23297.1
Acreage for which NMFS recommended against proposed alteration:						
Dredging	80.2	1337	327.9	312.9	267.3	2325.3
Filling	216.2	1709	109.9	509.2	15.8	2560.1
Impounding	41.5	9269	0	0	0	9310.5
Other	0	1303	10.5	0	0.1	1313.6
Total	337.9	13618	448.3	822.1	283.2	15509.5
Acreage recommended for mitigation:						
Restore habitat	0.9	417	157.3	291.9	286.1	1153.2
Generate new habitat	50	495	274.1	217.3	0	1036.4
Other	0	6227	0	0	0	6227
Total	50.9	7139	431.4	509.2	286.1	8416.6
Acreage affected by Corps' decision:						
Dredging	183.9	668	2077.5	1730.7	1085.3	5745.4
Filling	17.9	707	95	1001.2	1455.9	3277
Impounding	2	675	1.9	77	44.2	800.1
Restore	0.7	55	82	319.4	0	457.1
Generate	20.7	485	302	226.5	0	1034.2
Other	0	678	27.7	0	195.3	901
Total	225.2	3268	2586.1	3354.8	2780.7	12214.8
Requests for evaluation of unauthorized activities	0	456	0	36	34	526
Responses to requests for evaluation of unauthorized activities	0	456	0	30	34	520
Permits issued with:						
Major recommendations included	81	155	12	54	0	302
Major recommendations not included	19	51	0	9	0	79
Probable acreage lost from non-inclusion of NMFS recommendations:						
Dredging	0.2		0	50	0	50.2
Filling	1.2		0	144.6	0.6	146.4
Other	0		0	0	7.9	7.9
Total	1.4	786	0	194.6	8.5	990.5
Permits pending	1029	0	0	0	0	1029

[1] January 1, 1987 to December 31, 1987.
[2] Northeast region only, state permits from Maine reviewed for Federal interests
[3] Minor modifications are those where recommendations are made but elevation of the case under the 404(q) MOA would be improbable.
[4] Major recommendations are those where elevation under 404(q) MOA would be seriously considered should the recommendations be excluded from a permit.
[5] Category includes proposals to drain wetlands, or construction of riprap ,docks, piers, and log rafts.
NOTE: Figures represent initial estimates only and are subject to change. Figures may not add up due to rounding.