Pilot Study to Determine the Feasibility of Establishing a Nationwide Program of Fisheries Habitat Restoration and Creation

February 9, 1990

Office of Protected Resources and Habitat Programs
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Silver Spring, MD

and

Operations, Construction, and Readiness Division

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Policy and Planning Division
Directorate of Civil Works
U.S. Army Corps of Engineers
Washington, D.C.

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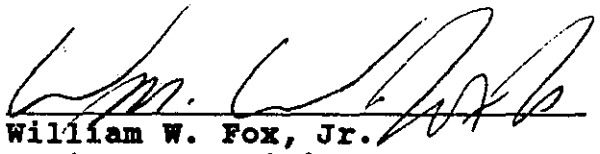

William W. Fox, Jr.
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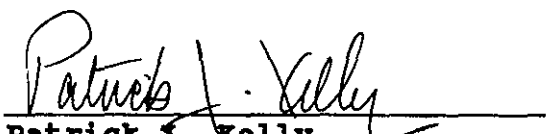

Patrick J. Kelly
Major General
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NMFS-CORPS PILOT STUDY

EXECUTIVE SUMMARY

Of particular importance to our Nation's marine fisheries is the loss each year of marine and estuarine habitats due to wetlands destruction, acid rain, nonpoint and point discharges, eutrophication, waste dumps, and other human impacts. Despite coastal planning efforts, human population growth and development continue to impart this net loss. Efforts to protect and preserve, while vital and in need of expansion, are only part of the answer. The Nation must either acquiesce to the inevitable habitat losses or pursue alternatives that will routinely restore fishery productivity as it is lost.

One alternative is systematic restoration and creation of fishery habitats along the Nation's coasts and rivers. While fishery habitat restoration technology needs much improvement, some techniques exist which will increase fisheries production and harvest. Research and monitoring efforts are currently underway to evaluate the effectiveness of other techniques which are unproven, but potentially valuable. In an increasing number of cases, available authorities and funding for habitat improvement have led to specific restoration features now in place or underway.

In October, 1985, an agreement was signed by the Administrator[1], National Oceanic and Atmospheric Administration (NOAA) and the Assistant Secretary of the Army (Civil Works). The agreement called for a three year Pilot Study to be conducted jointly by the National Marine Fisheries Service (NMFS) and the U.S. Army Corps of Engineers (Corps). The purpose was to determine the practicability of establishing, within existing authorities, resources, and funding, a nationwide NMFS-Corps program of fisheries habitat restoration and creation. It was envisioned that the resulting program also would more efficiently use the Corps planning, construction, and Operations and Maintenance (O&M) activities, while improving the overall cost-effectiveness of the Civil Works Program.

The cooperative Pilot Study occurred over the period November 1985 through October 1988. The first year involved startup and interagency selection of restoration and creation sites across the NMFS Northeast, Southeast and Southwest Regions. Projects within the Corps' O&M Program were screened for opportunities to restore and create habitats. Six sites were selected: two in California, two in Maryland, one each in North Carolina and Texas. Second and third year work consisted of contracting, construction, and monitoring at the six sites by the Corps, NMFS, and other participating agencies.

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[1]. Title has become Under Secretary of Commerce For Oceans and Atmosphere, U.S. Department of Commerce.

Pilot Study Findings

- Fisheries habitat restoration features can be identified and implemented in some Corps projects at no net increase in Corps project costs.

- Participating NMFS-Corps field offices of both agencies cited a high degree of interagency cooperation throughout the Pilot Study.

- Other Federal, state, and local agencies, and other parties generally were supportive of the intent of the Pilot Study. Many participated in screening, selection, approval, planning and/or monitoring.

- Generally, Pilot Study activities were readily integrated into the District project O&M work. Civil Works project purposes were achieved readily. Habitat construction was completed at all Pilot Study sites with the exception of Prospect Island, CA.

- Limited resources within NMFS constrained the number and location of selected Pilot Study sites; reduced the scope, extent, and nature of monitoring studies; and displaced other NMFS habitat program activities. Available resources are a major constraint to NMFS participation in an expanded program.

- Implementation of some habitat features (e.g., Pilot Study wetlands creation in North Carolina and Texas), which exhibit potential, but unproven, fishery productivity benefits, requires the inclusion of multi-year monitoring programs.

- A consensus of participating NMFS-Corps offices recommended an expanded program of National scope. Expanded NMFS participation would be contingent upon additional manpower and funding. Also, the Corps will need to dedicate appropriate manpower and funding to carry out its responsibilities.

Pursuant to the agreement, this final report has been prepared jointly by the NMFS and Corps for submission to the Assistant Secretary of the Army (Civil Works) and the Department of Commerce Under Secretary For Oceans and Atmosphere. It includes recommendations for the establishment of a nationwide NMFS-Corps program of fisheries habitat restoration and creation to be conducted within the Civil Works Program.

CONTENTS

I. CONCLUSIONS AND RECOMMENDATIONS

(1) Proposal For An Expanded National Program

Based on the positive NMFS-Corps experience under the 1985 NOAA-Army agreement, a National marine fisheries habitat restoration and creation program has a high probability of success. The NMFS-Corps Pilot Study demonstrated that fisheries habitat restoration and creation opportunities can be selected and implemented at no net increase in Corps project costs. It also demonstrated general cooperation and support by field offices of the U.S. Fish and Wildlife Service (U.S. FWS), the U.S. Environmental Protection Agency (EPA), state and local agencies, and others. Such a program would provide an interagency combination of authorities, resources, and expertise to mutually accomplish the Corps water resources mission and the habitat conservation missions of NMFS and other participating agencies.

Recommendations:

(1a) The Department of the Army and NOAA should establish a cooperative, nationwide NMFS-Corps program of fisheries habitat restoration and creation.

(1b) NOAA and Army should assist each other to the extent possible to secure needed resources that would enable such a National habitat program to achieve full success.

(1c) The program's goal should be to enhance the nation's marine fisheries productivity, while allowing orderly, environmentally compatible development of the Nation's water resources.

(1d) Restoration and creation opportunities should be selected from within the overall Civil Works Program, although most will probably be found among the Corps Federal projects and O&M activities.

(1e) Habitat features constructed under the program should be designed to result in a net increase of habitat when compared with current conditions.[2]

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[2]. The objective of the program should not be confused with that of constructing mitigation features designed to offset damages associated with proposed Corps construction and/or regulatory programs.

(1f) The program should be implemented in all geographic areas mutually covered by the respective jurisdictions of NMFS and the Corps.

(1g) Individual habitat restoration or creation features should be implementable with at least no net increase in Corps project costs and in a manner consistent with and not disruptive of project operations.

(1h) The program should be designed to enlist the cooperation and support of the Service, FWS, the U.S. Environmental Protection Agency, state and local agencies, and to obtain public awareness and citizens advisory inputs.

(2) Directly Implementable Habitat Features

Restoration and creation features (hereafter referred to as "habitat features"), which involve relatively minor or no monitoring requirements (e.g., Pilot Study artificial reef at Mission Bay, CA) can be planned and constructed within the annual Civil Works planning, construction, and O&M cycles of involved Corps Districts. However, limited funding, staff, and travel ceilings are a major constraint to NMFS participation in an expanded National program. Without provision of basic program resources, NMFS participation under an expanded agreement would consist of token, case-by-case involvement.

Recommendations:

(2a) Habitat features should be cooperatively and routinely identified, evaluated, and, if justified, implemented by NMFS, the Corps, and other agencies for fisheries habitat restoration and creation opportunities identified within the Civil Works Program.

(2b) In addition to minor research and monitoring requirements, selected habitat features should have reasonably predictable benefits to important fish and shellfish species.

(2c) Manpower and funding of NMFS offices and laboratories should be increased to permit full NMFS participation in the expanded program.

(2d) The Corps should structure its manpower and funding, as appropriate, to establish and maintain participation.

(3) Features With Substantial Monitoring Requirements

Some habitat features, hereafter referred to as "research features," require substantial monitoring programs (e.g., Pilot Study wetlands creation in North Carolina and Texas). Contributions of such features to fishery productivity are unproven, but potentially valuable. In such cases, the primary purposes become understanding and improving effectiveness of fisheries habitat restoration techniques and, ultimately, furthering restoration and creation technology. During the Pilot Study, the interagency pooling of research and construction talents led to habitat construction and monitoring of a quality and scale not generally available otherwise. Generally, costs of multi-year research and monitoring requirements would exceed the guideline of no net increase in Corps project costs and would exceed the normal operational resources presently available to NMFS. Therefore, monitoring work associated with such features will require alternative funding sources.

Recommendations:

(3a) As part of the nationwide NMFS-Corps program, the two agencies should cooperatively develop a proposal for a joint, coordinated Habitat Restoration Research & Monitoring Program. Development of the proposal should be coordinated with the Corps Wetland Research Program.

(3b) Because of NMFS' living marine resource mandates and technical marine science expertise and the Corps habitat restoration, enhancement and research and construction capabilities, monitoring programs on research features will be cooperatively designed and conducted by NMFS and the Corps. Additional base funding and manpower should be placed within NMFS to meet the monitoring needs of the nationwide program.

(3c) The primary objective of the Research and Monitoring Program, as well as the individual research features selected under it, should be to contribute to the improvement of fishery habitat restoration and creation technology, while expanding our understanding of the effectiveness and value of existing techniques.

(3d) Joint approval of individual features should be based upon their potential to understand the effectiveness of existing habitat restoration and creation techniques in increasing fisheries productivity and to improve restoration technology.

(4) Need For Corps Authority To Purchase Lands at Prospect Island

Removing levees along Prospect Island, California would eliminate O&M costs for levee maintenance, while restoring almost 1,400 acres of valuable wetlands and fishery habitat. If implemented, this particular feature would increase fishery productivity and assist the State's goal of increasing the amount of California wetlands. Despite these benefits, the Corps lacks authority to purchase these lands and it has been necessary to shelve the feature. Such authority is desirable to assure that project efficiencies, fisheries habitat, and other environmental benefits are not lost.

Recommendations:

(4a) The Army should identify and pursue appropriate means of acquiring lands at Prospect Island so that the area can be restored as a wetland and turned over to a natural resources agency for management. Suitable ways to address such opportunities as they arise in the future should be identified and the means to implement these features should be established.

(5) Undertaking An Expanded Program

Initiation of an expanded National program would require the development of a new NOAA-Army agreement. Also needed would be: (a) policies and guidance to the field, which reflect the experience gained through the Pilot Study; and (b) a process by which to cooperatively pursue identified legislative and funding needs.

Recommendation:

(5a) The Corps and NMFS should be directed to cooperatively develop a new NOAA-Army agreement and plan of implementation, and, as appropriate, take steps jointly to initiate plan implementation. The agreement and plan should be completed by July, 1990. Initial phases of the program should be underway in all NMFS regions by October, 1990.

II. BACKGROUND

A. ORIGIN OF COOPERATIVE AGREEMENT

The concept of a NMFS-Corps program, to restore and create habitats,[3] originated in 1984 during discussions between the NMFS Southeastern Regional Director and the Corps South Atlantic Division Engineer in Atlanta, Georgia. They considered the possibility for mutual NMFS-Corps cooperation to meet a common objective -- the cost-effective restoration and creation of important coastal fishery habitats in a manner consistent with the multiple use of coastal waters. Such cooperation would bring together at the field level NMFS technical marine science expertise and the Corps broad water resources "problem solving" experience, expertise, and capability to meet the objective.

The concept was endorsed and supported in Washington, D.C., by the NMFS Assistant Administrator for Fisheries and the Corps Director of Civil Works. The result was signature of a Cooperative NOAA-Army agreement (Appendix A) on October 25, 1985, by the Administrator of NOAA and the Acting Assistant Secretary of the Army (Civil Works).

The Nation's commercial and recreational fisheries contribute substantially to food supply, recreation, Gross National Product (GNP), foreign exchange, employment, and aesthetic values. Commercial fishing presently contributes an estimated $12 billion to the GNP, while some 18 million marine recreational anglers generate another $7.5 billion.

The NMFS Habitat Conservation Policy recognizes that human activities inevitably alter marine, estuarine, and anadromous species habitats, which are essential to maintaining the Nation's fisheries. Due to these alterations, the ability of these habitats to support fisheries production is diminishing. Meanwhile, pressures for their conversion to other uses are continuing. To offset these losses, NMFS is proceeding to: (1) promote, support, and originate technically feasible restoration

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[3]. The definition of habitat restoration and creation, as it applies under the Agreement, is for fisheries habitat created from opportunities identified within projects constructed and maintained by the Corps Civil Works Program. The work is designed to result in a net increase (e.g., aerial extent, density, and plant vigor or use) of fishery habitat when compared with current conditions. It should not be interpreted as including habitat restoration or creation for mitigation purposes. Nor does it advocate creation of new habitat at the expense of currently productive fishery habitat.

and creation of fisheries habitats; (2) conduct programs of research into the methodologies of fisheries habitat restoration; and (3) work directly with Federal resource, construction, licensing, and regulatory agencies in developing policies, guidelines, and rulemakings to promote the conservation of coastal fisheries habitats.

As the Federal government's principal water resources agency, the U.S. Army Corps of Engineers has broad authority, experience, expertise, and the capability to work within coastal and inland areas of the United States. Therefore, the Corps is in a position to work with NMFS in carrying out fisheries habitat restoration and creation projects while performing its own mission. The Corps annually disposes about 350 million cubic yards of dredged material, at considerable expense to the nation. Much of this material is clean and is suitable for beneficial uses, such as habitat creation or restoration. The Corps views this clean dredged material as a resource rather than a waste and seeks ways, in planning, construction, and operation and maintenance activities, to more efficiently and cost-effectively use some of this material for beneficial, environmentally acceptable purposes.

More efficient use of dredged material is just one of many ways the Corps could work with resource agencies, such as the National Marine Fisheries Service (NMFS), to help restore marine fisheries habitats. The Corps also has specific authority, under Section 150 of the Water Resources Development Act of 1976 (PL 94-587), to give full consideration to the creation of wetlands using dredged material associated with the construction and maintenance of Corps projects. The Corps also has conducted extensive basic and applied research in the beneficial uses of dredged material. The Corps long and broad experience in jetty and groin design and construction also has application for reef and other habitat development.

B. NATURE OF COOPERATIVE AGREEMENT

The purpose as stated in the October 25, 1985, agreement was:

> "... to conduct a cooperative Pilot Study by the NMFS and Corps to determine the practicability of establishing, within existing authorities, resources and funding, a NMFS-Corps nationwide habitat restoration and creation program. Such a program would contribute towards balancing fisheries habitat conservation with orderly development and management of the Nation's water resources."

The three year Pilot Study commenced with signature of the NOAA-Army agreement. The agreement called for the study to be carried out in two NMFS Regions and for one to three fisheries habitat restoration projects in each. NMFS and Corps field offices would work together to locate potential habitat restoration and creation sites in areas where active Corps projects, programs, and/or studies provide the necessary authority for Corps participation. The agreement and subsequent guidance emphasized:

(1) use of existing NMFS-Corps authorities, resources, and funds to implement selected habitat restoration and creation proposals;

(2) assessment of the cost effectiveness of the specific selected restoration and creation measures;

(3) importance of obtaining the cooperation and support of the U.S. FWS, the U.S. Environmental Protection Agency, state and local agencies, and others;

(4) restriction of the Pilot Study to two NMFS Regions with only 1-3 habitat restoration and creation sites in each region in order to include a mix of fisheries resources without placing excessive work load requirements on NMFS-Corps field staffs;

(5) employment of a team effort that combines NMFS technical fisheries expertise with the Corps broad water resources planning, engineering, design, and construction expertise and capability;

(6) broad discretion in implementation by the participating NMFS Regional Directors and Corps Division and District Engineers;

(7) monitoring studies to assess the success of restoration and creation projects; and

(8) identification of a broad range of habitat restoration and creation needs and opportunities among potential sites.

C. HABITAT RESTORATION AND CREATION -- STATE OF THE ART

A major assumption of the MOA was that fisheries production and/or harvest can be increased through techniques of habitat restoration and creation on a site by site basis. While the assumption is sound, often the degree of success is not readily predictable and benefits are difficult to quantify.

Generally, habitat restoration and creation projects are highly individual in nature, requiring tailored and, sometimes, innovative design applications to fit unique site and resource conditions. Examples of successful efforts include restoration of salmon runs through construction of fish ladders and lifts and removal of stream obstructions, increased shrimp production through water structure regulation to improve access, establishment of oysters through bed construction and seeding, reduction of water pollution by capping contaminated sediments with clean material, and increased angler harvest by construction of artificial reefs.

Techniques exist to revegetate salt marsh and seagrass meadows. The application and management of revegetation techniques reflect the developing state of the art and can be considered to be established procedures within limited ranges of environmental conditions (e.g., wave climate). However the persistence of the transplants, as well as the rate and extent of fisheries production resulting from the establishment of such revegetated habitats, has not been fully evaluated and is being investigated. The monitoring plans for the Pilot Study restoration projects in North Carolina and Texas were designed to provide additional information on the extent to which these man-made habitats compare with their natural counterparts.

D. REGIONAL SELECTION

Two NMFS Regions were selected during the period October 1985 - January 1986. Selection criteria included: fisheries resources and habitat diversity; abundance of apparent fisheries restoration and creation project opportunities; and relative interest displayed by the Regions. The Assistant Administrator for Fisheries solicited from all five Regional Directors a statement of available restoration and creation opportunities and any particular interest in being selected. The Regions were asked to consult informally with local Corps offices while developing their responses.

The Southeast Region was tentatively selected because of the high interest of its Regional Director and the large number of Corps projects with probable opportunities for restoration and enhancement. It was determined that the second Region should be on the west coast in order to maximize habitat and species diversity within the Pilot Study. The Southwest Region was tentatively selected because of the Regional Director's statement of interest and ready list of potential restoration and creation opportunities. These two Regions were approved by the NMFS Assistant Administrator for Fisheries in January 1986, after concurrence by the Director of Civil Works and the Assistant Secretary of the Army (Civil Works).

The Northeast NMFS Region was not originally included in the Pilot Study. However, during Pilot Study start-up, Headquarters guidance (NMFS, March 17, 1986; Corps, March 28, 1986) encouraged field offices of both agencies to enter into additional NMFS-Corps cooperative habitat restoration and creation projects. In January 1986, the NMFS Habitat Conservation Branch staff, Oxford, MD, requested the Corps Baltimore District to evaluate its dredging program for potential projects to improve oyster habitat in Chesapeake Bay. The Corps formed an inter-agency working group. From deliberations of that group came two cooperative restoration projects located on Chesapeake Bay (i.e., those at Twitch Cove and Slaughter Creek). During the course of the three year Pilot Study, work on the habitat features at these two projects paralleled that in the other regions. Because of the valuable additional experience provided by this work, they are addressed throughout this report as being part of the Pilot Study.

III. SITE SELECTION PROCESS

A. GUIDANCE FOR SITE SELECTION

Site selection was the first major phase of the Pilot Study and extended through the first year. Implementation was assigned to the designated NMFS Southeast and Southwest Regions and Science Centers and the Corps Divisions and Districts. The headquarters office role was to assist field operations in areas of National policy and programs. Guidance memoranda (Appendix B) were forwarded during January 1986 to the Southeast and Southwest NMFS Regions and Centers and their counterpart coastal Corps Divisions and Districts.

The guidance:

(1) directed the two NMFS Regions to host initial meetings with Corps Divisions in order to initiate joint planning;

(2) set forth a four step site selection strategy for use by the field offices;

(3) encouraged the selection of three restoration and creation sites in each Region;

(4) directed both NMFS and Corps research laboratories to participate in the Pilot Study; and

(5) called for consideration of a broad range of habitat restoration and creation projects.

B. PILOT STUDY START-UP

Field coordination started with NMFS-Corps interagency meetings hosted by NMFS offices in St. Petersburg, Florida, on February 13, 1986, and in Tiburon, CA, on March 14, 1986. Representatives included NMFS Regions and Centers, counterpart coastal Corps Divisions and Districts, as well as the Environmental Laboratory, Waterways Experiment Station (WES), Vicksburg, MS, and Washington, D.C. staffs of both agencies. At both meetings, NMFS-Corps Headquarters representatives described the intent and background of the agreement and field staffs started the process of planning site selection.

These initial meetings set the stage for a series of subsequent interagency meetings regarding site identification, project screening, design, site visits, and research planning. The southeast NMFS-Corps offices logged 21 interagency meetings through November 11, 1986, while 29 occurred in the southwest.

The NMFS Habitat Conservation Branch staff, Oxford, MD, and the Corps' Baltimore District began discussions in January, 1986. The Baltimore District convened an inter-agency working group and the first meeting was held June 19, 1986. The working group included the Corps North Atlantic Division, Baltimore and Norfolk Districts, and the Dredging Division of the Water Resources Support Center, NMFS, the Maryland Department of Natural Resources (MDNR), the Virginia Marine Resource Commission, and the Maryland Port Administration.

The establishment of NMFS-Corps coordination was assisted greatly by the high priority placed upon it by the Director of Civil Works and the Assistant Administrator for Fisheries and by the many NMFS-Corps working relationships already in place. The process was a complex one, complicated by the necessity for initial involvement of numerous NMFS-Corps offices and third parties. Table 1 lists the thirty NMFS-Corps Offices that participated in site selection, while Table 2 lists 46 other offices, agencies, and parties which were involved at one point or another. First year field reports of both agencies cited a high degree of NMFS-Corps interagency cooperation, as well as cooperation from other agencies and parties.

C. IDENTIFICATION AND SCREENING OF CANDIDATE SITES

1. Site Identification Process- The guidance (Appendix B) set forth four generic steps in the selection process: (a) identification of fisheries resources, habitat needs, and relevant Corps project and study authorities for the southeast and southwest regions; (b) development of a tentative list of specific candidate sites; (c) a comparative analysis of the candidate sites, taking into account their costs, institutional constraints, and third party views; and (d) selection of the sites.

Final site selections were made by the NMFS Regional Directors and the Corps Division and District Engineers with the concurrence of the appropriate headquarters offices.

2. Factors Regulating Site Selection-

NMFS-Corps Northeast, Southeast, and Southwest field offices evaluated 69 potential sites (24, 32, and 13 respectively), of which 6 were selected. Appendix D lists the 41 rejected sites in the Southeast and Southwest Regions, their proposed habitat features, and the reasons for their rejection. Six constraining factors were identified in the selection process and are discussed in the following subsections.

a. Costs

Cost factors fall into two categories: (1) project costs for the purchase, construction, and/or installation of restoration and creation features (e.g., channels, revetments, artificial reefs, and wetlands), and (2) agency operational costs (e.g., manpower, travel, planning, research, and monitoring).

One basic assumption of the Pilot Study was that the expense of constructing Corps project features to include habitat features would not involve a net increase in cost. Many opportunities did not make the candidate list because they could not meet the cost assumption. About one-half of the original 69 candidate sites themselves were eliminated wholly or partly because of project and/or operational costs. Project cost decisions were based on such elements as the expense to obtain and transport suitable quality sediments.

NMFS operational costs and manpower limitations impacted greatly the number, nature, and location of selected sites. Because of travel budget constraints, sites in the southeast were generally selected for their proximity to NMFS laboratories in order to assure technically adequate monitoring programs. Sites in states, such as Florida, Alabama, and Georgia, were eliminated in favor of closer sites in North Carolina and Texas.

Table 1. NMFS-Corps Offices which participated in site selection.

NMFS OFFICES

Northeast Region, Gloucester, MA
- Northeast Region Habitat Conservation Branch, Gloucester, MA
- Oxford Habitat Field Office, Oxford, MD

Southeast Region St. Petersburg, FL
- Habitat Conservation Division (HCD), St. Petersburg, FL
- Beaufort HCD Field Office, Beaufort, NC
- Panama City HCD Field Office, Panama City, FL
- Galveston HCD Field Office, Galveston, TX

Southeast Fisheries Center, St. Petersburg, FL
- Beaufort Laboratory, Beaufort, NC
- Galveston Laboratory, Galveston, TX

Southwest Regional Office, Terminal Island, CA
- Protected Species and Habitat Conservation Division, Terminal Island, CA
- Santa Rosa PS&HC Field Office, Santa Rosa, CA

NMFS Southwest Fisheries Center, LaJolla, CA
- Tiburon Laboratory, Tiburon, CA

Headquarters, Washington, D.C.
- Office of Protected Resources and Habitat Programs

CORPS OFFICES

North Atlantic Division,
- Baltimore District, Baltimore, MD
- Norfolk District, Norfolk, VA

South Atlantic Division, Atlanta, GA
- Wilmington District, Wilmington, NC
- Charleston District, Charleston, SC
- Savannah District, Savannah, GA
- Jacksonville District, Jacksonville, FL
- Mobile District, Mobile, AL

Lower Mississippi Valley Division, Vicksburg, MS
- New Orleans District, New Orleans, LA

Southwestern Division, Dallas, TX
- Fort Worth District, Fort Worth, TX
- Galveston District, Galveston, TX

WES, Vicksburg, MS

South Pacific Division, San Francisco, CA
- Los Angeles District, Los Angeles, CA
- Sacramento District, Sacramento, CA
- San Francisco District, San Francisco, CA

Board of Engineers for Rivers and Harbors, Ft. Belvoir, VA

Corps Headquarters, Washington, D.C.
- Directorate of Civil Works
  - Operations and Readiness Division
  - Planning Division
- Directorate of Research and Development

Table 2. Other agencies and organizations which participated in site selection.

NORTHEAST REGION
- Maryland State Department of Natural Resources
  - Coastal Resources Division
  - Fisheries Division
  - Wetlands Division
- Virginia Marine Resources Commission
- Maryland Port Administration
- U.S. Fish and Wildlife Service, Annapolis Field Office, Annapolis, MD

SOUTHEAST REGION
- U.S. Fish and Wildlife Service
  - Atlanta, GA Regional Office
    - Raleigh, NC Field Office
    - Lafayette, LA Field Office
  - Albuquerque, NM Regional Office
    - Houston (Clear Lake), TX Field Office
    - Clear Lake Field Office
- U.S. Environmental Protection Agency
  - Region IV, Atlanta, GA
  - Region VI, Dallas, TX
- U.S. Department of Agriculture
  - Soil Conservation Service
- State of North Carolina
  - Department of Natural Resources and Community Development
    - Division of Coastal Management
    - Division of Marine Fisheries
    - Division of Environmental Management
  - Wildlife Resources Commission
  - Division of Archives and History
- State of Florida
  - Department of Environmental Regulation
- State of Louisiana
  - Department of Geological Survey
  - Department of Natural Resources
    - Coastal Management Division
  - Department of Wildlife and Fisheries
- State of Texas
  - General Land Office
  - Parks and Wildlife Department
  - Water Commission
- North Carolina Sea Grant
- Texas Sea Grant
- North Carolina State University
- Texas A&M University
- Vermilion Parish Police Jury
- Vermilion Parish Rice Growers Association
- Gulf of Mexico Fishery Management Council
- Everglades Protection Association
- Mangrove Systems, Inc.

SOUTHWEST REGION
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- U.S. Coast Guard
- Sea Grant Advisory Service, NOAA
- State of California
  - Department of Fish and Game
  - Coastal Commission
  - Board of Reclamation
  - Regional Water Quality Control Board
  - State Resources Agency
- Humboldt State University
- Crescent City Harbor District
- Crescent City Commercial Fisherman's Association

The Pilot Study activities impacted on other NMFS regional and center habitat conservation activities. Preapplication consultation with constituents and site visits for Section 10/404 Permits were in some instances reduced, as were ongoing southeastern NMFS habitat research activities, National Pollution Discharge Elimination System (NPDES) permit reviews, and the Southeast Region's annual follow-up study on applicant compliance.

b. Variance with Third Party Interests

The need for support and cooperation by other agencies and parties was essential to the acceptance and implementation of Pilot Study restoration and creation projects. Because of the site locations in state waters, the support of state agencies was critical. The site selection process involved many different third party groups with varied and, sometimes, competing interests.

Efforts of NMFS-Corps field offices in establishing and maintaining needed cooperation were quite successful. The field reports indicate that other Federal agencies, state and local agencies, and others were generally supportive of the intent of the Pilot Study. Many became involved in the various stages of screening, review, and approval. The Wilmington District, for example, reported that "all state and Federal agencies have been very supportive during the coordination process and we are not aware of any opposition to the proposed action." The San Francisco District stated, "The major incentive with the reef project (Crescent City Harbor, CA) was the enthusiastic support of the concerned Federal, State, and local agencies, as well as Humboldt University." The NMFS Southeast Region reported that the resulting outstanding working relationships between Corps and NMFS staffs and, "...the openness of joint discussions with third parties" has increased interaction beyond the Corps and NMFS. Third parties took an active role in conduct of the Pilot Study. For example, the California Coastal Commission facilitated approval of the Mission Bay, CA candidate project by expeditious approval of the required State coastal permit. The North Carolina State University Department of Soil Science will be planting and monitoring marshgrass at the selected sites in North Carolina. NMFS and Corps personnel have cooperatively collected and analyzed sediment accumulation data from marshes at the North Carolina sites.

About 7 percent of the candidate sites were eliminated in whole or part because of third party concerns. For example, proposed shallow water fills (i.e., open water, unconfined disposal of dredged material) would be inconsistent with most state policies in the Southeast Region. The Catfish Point, LA shrimp restoration proposal was eliminated because of concerns raised by rice farming interests.

c. Out of Phase with Project Scheduling

Scheduling of ongoing Corps projects was a major factor, eliminating 45 % of the candidate sites. For example, several artificial reef projects in California were eliminated because of scheduling late in or beyond the three year Pilot Study period. The Sherman Island wetland project was set aside because it may be several years away. Many of the projects eliminated for this reason provide opportunities for future years in accordance with maintenance or construction schedules.

d. Inadequate Authorities

Questions about the applicability of Corps authorities eliminated 7 % of the identified sites. Numerous others were initially eliminated simply because of their location outside the limits of existing or planned Corps projects. Legal questions arose in some areas with regard to ownership of the study areas both before and after wetlands creation. The Brazos/San Bernard proposal to dredge an area to open it to tidal circulation was eliminated because the area to be dredged was not within the limits of any Corps project.

e. Low Likelihood of Fisheries Benefits

For 18 %, it was concluded that increased fisheries productivity resulting from the proposed habitat feature might not be high enough to warrant continued consideration.

f. Miscellaneous Constraints

Seven percent of the proposed sites were dropped because of real estate acquisition problems, and the need for extensive, lengthy study requirements; and the possibility of adverse environmental impacts which would offset benefits.

D. SIX SELECTED SITES

The Pilot Study projects came down to six sites. Diverse in terms of both proposed habitat modifications and impacted fisheries resources, they include:

(1) Southern California Reef Construction - Construction of reef habitat for kelp bass, sheephead, rockfish etc.;

(2) Sacramento River Delta Wetland Creation - Conversion of low elevation farmland to wetlands to restore rearing habitat for striped bass, steelhead, Chinook salmon, and American shad;

(3) Chesapeake Bay Shellfish Restoration - Creation of a 2.1 acre dredged material mound capped with oyster shells to supplement oyster production on a State-chartered oyster bar;

(4) Chesapeake Bay Vegetation - Creation of an eelgrass covered, dredge-material elevated bottom to provide a nursery area for fish and blue crabs, as well as a preferred shedding habitat for blue crabs

(5) North Carolina Marsh and Seagrass Creation - Grading and revegetation of three sites on existing disposal areas to stabilize sediments and create nursery habitat for shrimp, blue crabs, flounder, sea trout, menhaden, red drum, and their food resources; and

(6) Texas coast Marsh Creation - Salt marsh creation on dredged material deposits and channelization at two sites for water circulation and animal access to establish shrimp, seatrout, red drum, and flounder production.

IV. PROJECT IMPLEMENTATION

This chapter reports on activities and experience during the implementation phase of the Pilot Study. This phase covered the roughly two year period from site selection (September, 1986) through the formal completion of the NOAA-Army Agreement (i.e., October 24, 1988). Implementation consisted of cooperative planning, construction, and monitoring efforts with: diverse agency and program elements (e.g., planning, construction, maintenance, and monitoring); a broad range of Corps and state water resource development regulations and authorities; and the complex and unpredictable technology of fisheries habitat restoration.

Project descriptions, work accomplishments, constraints and benefits are discussed alphabetically by state in the following sections.

A. REEF CONSTRUCTION - MISSION BAY, CA.

1. Project Description

a. Nature of Corps Maintenance Work.-

The project is located in Mission Bay, San Diego, CA. Winter storms during 1986 caused damage to the outer 100 feet of the Mission Bay northern jetty, which protects the entrance to the Bay. During 1987, the Corps conducted repair work by replacing missing armor rock and by providing additional protection at the toe of the structure. The toe of the jetty is exposed to high levels of turbulence that causes the formation of a scour trench parallel to the jetty.

b. Habitat Restoration and Creation.-

The habitat creation feature is an artificial reef, constructed as part of the repair work. Following coordination and field reconnaissance, it was determined that the optimum enhancement measure would be a "boulder field" reef adjacent to the jetty. The contract for project construction was awarded on 6/29/87. Construction began on 9/1/87 and was completed on 9/22/87. Under initial plans, the reef was to be constructed about 50 feet from the jetty toe. However, during construction NMFS recommended that the boulder field be located an additional 50 feet from the toe of the jetty. The change was proposed in order to better separate the boulder field from the jetty and improve the evaluation of resulting fishery benefits. The final feature consists of several boulder clusters (three to five fifteen-ton stone) placed approximately one hundred feet from the toe of the jetty. The Corps also tested the effectiveness of the boulder cluster as a technique to inhibit formation of the scour trench, thus decreasing the potential for jetty damage.

c. Evaluation/Monitoring Program.-

Biological monitoring was conducted by NMFS from the time of construction till the completion of the Pilot Study period. Quantitative estimates of biological changes were not possible due to poor diving conditions and visibility at the study site.

d. Fisheries Benefits.-

Prior to reef placement, the bottom habitat consisted of shifting coarse sand, which is of relatively low value to fisheries resources. The reef structure was expected to improve the habitat value of the area. It was anticipated that reef species, such as kelp bass, sheephead, white surfperch, black surfperch, opaleye, brown rockfish, kelp rockfish, cabezon, and invertebrate species, such as crab and lobster, would become established.

While sampling constraints precluded quantitative assessment, it is concluded that the artificial reef is functioning in a manner similar to open coast natural reefs. Qualitative observations indicate that the reef underwent a colonization process typical for quarry rock substrate placed in the open coast marine environment. The colonization process appeared to be prolonged, probably due to the site's characteristic high surge conditions, including sand abrasion near the base of the reef structure.

During the second year after placement, successful recruitment of the giant kelp was observed. Later in the year, mature plants had become established on several of the large rocks. Associated with the kelp were black surfperch, juvenile kelp bass, and senorita fish.

e. Participants.-

Participation by the Corps included the Los Angeles District, Los Angeles, CA; South Pacific Division, San Francisco, CA; Environmental Laboratory, WES, Vicksburg, MS; and Corps Headquarters, Washington, D.C. NMFS-NOAA offices included the NMFS Southwest Regional Office, Habitat Conservation Branch, Terminal Island, CA; and NMFS Headquarters, Washington, D.C. Third parties included California State agencies (i.e., Department of Fish and Game, Coastal Commission, Board of Reclamation, Regional Water Quality Control Board, and State Resources Agency); and the U.S. FWS.

f. Costs.-

O&M construction costs with and without the artificial reef are estimated to be about equal. Other expenses included $ 49.1 K (i.e., $ 31.6 K for planning, selection, travel expenses, and monitoring activities; $ 5.5 K on a Los Angeles District survey of Mission Bay's north and middle jetties, including the habitat feature; and $ 12 K for a sidescan sonar survey of the repaired portions of the jetty). Subsequent to the Pilot Study, NMFS spent an additional $ 4.1 K for monitoring and other activities.

2. Factors Affecting Implementation

a. Incentives and Advantages.-

Since construction activities already involved the placement of rock at the project site, creation of the boulder field was easily accomplished. The Corps staff personnel effectively obtained the necessary District approvals. The Corps staff also responded immediately when NMFS requested changes in project design.

b. Constraints.-

A major constraint, at least for southern California and the Los Angeles District, is the relatively low number of marine related types of projects in which the Corps has direct involvement. Corps projects are generally limited to dredging of shoal areas from harbors and marinas or the maintenance and improvement of structures that protect these areas (primarily jetties). As a consequence, few opportunities exist for creation of fisheries habitat using such heavy construction techniques. During the first two years of the Pilot Program, the only category of fisheries habitat enhancement project which has been identified as feasible involves the construction of artificial reefs in conjunction with jetty related projects. This type of project is constrained by Pilot Study conditions, which required that a suitable project not increase project costs. While this cost factor was overcome for the Mission Bay project, it nevertheless eliminated several other projects that could have been constructed as part of this pilot effort. Also, biological monitoring has required a NMFS time commitment, at the expense of other program activities.

B. HABITAT RECLAMATION - PROSPECT ISLAND, CA

1. Project Description

a. Nature of Corps Maintenance Work.-

The Corps maintains the Sacramento River Deepwater Ship Canal, which was authorized in 1946 and completed in 1963. Levee maintenance at Prospect Island averages $311 K annually. Work includes dredging and levee maintenance. One element of this Federal project includes protection of a privately-owned, 1,276-acre farm by annually repairing levees.

b. Habitat Restoration and Creation.-

The cooperative Pilot Study project would result in restoration of about 1,276 acres of original estuarine shallow water habitat. The effort would replace a Federal levee maintenance responsibility on Prospect Island with a program to acquire the island, eliminate its present use and accompanying levee maintenance responsibility, and convert the island to shallow wetland and fisheries habitat. Upon purchase, work would involve: (1) breaching the levee, (2) modifying land profiles; (3) planting select wetland plant species; and (4) post-project biological monitoring. Once purchased, ownership would be transferred to the State of California. The present owner is a

willing seller, and the State is willing to accept title. The substitution of the proposed habitat restoration and creation feature for the levee maintenance responsibility would create valuable wetland and fish habitat, reducing taxpayers expenses (overall cost savings to the Corps).

At completion of the Pilot Study, the Corps Sacramento District proposal for the Pilot Project did not receive approval for the work. The Sacramento District and South Pacific Division staff agree that the proposed project warrants further consideration and, if possible, implementation. However, the project has been temporarily shelved, due to the unavailability of a suitable mechanism or authority to acquire the lands. At this time, NMFS managers are working with representatives of the California Department of Fish and Game to determine the availability of non-Federal funds.

c. Evaluation/Monitoring Program.-

A pre-project fishery survey would not be needed since the site consists of agricultural land. Following approval, the State, U.S. FWS, Corps, and NMFS will develop jointly a habitat construction plan. Following site inundation, a survey will be conducted to assess fish presence and abundance, forage organism availability, and vegetative succession.

Fish and forage organism sampling by beach seine is planned during late spring, summer, and early fall. Fish species will be recorded by size and quantity at various locations on the site. Forage organisms will be identified and quantified. Vegetative succession will be monitored.

d. Fisheries Benefits.-

Restoring the Prospect Island farmland to aquatic and wetland habitats would benefit both commercially and recreationally important fisheries, including salmon, shad, striped bass and steelhead. Other resources will benefit as well, including panfish, black bass, threadfin shad, waterfowl, and several rare plant species (hibiscus, tule pea, lilaeopsis). The largest benefit to anadromous fish would be the indirect contribution of detritus and food organisms to juvenile life stages, although the site would also provide select rearing and shelter habitat for small shad and striped bass. The Corps has projected a preliminary economic benefit of $3.3 KK per year to approximately 184,000 delta sportsmen.

e. Participants.-

Participation by the Corps included the Sacramento District, Sacramento, CA; South Pacific Division, San Francisco, CA; and Corps Headquarters, Washington, D.C. NMFS-NOAA offices included the NMFS Protected Species and Habitat Conservation Field Office, Santa Rosa, CA; the Southwest Regional Office, Habitat Conservation Branch, Terminal Island, CA; and NMFS Headquarters, Washington, D.C. Third parties included California State agencies (i.e., Department of Fish and Game, Coastal Commission, Board of Reclamation, Regional Water Quality Control Board, and State Resources Agency); Port of Sacramento; and the U.S. FWS.

f. Costs.-

The Corps spent $ 91 K through the end of the Pilot Study period (FY 1987 and FY 1988) and an additional $ 2 K during FY 1989 for project planning. NMFS costs over the Pilot Study period were $ 28.2 K for site selection, planning, and travel activities. NMFS has spent an additional $ 5 K for monitoring and other activities since completion of the Pilot Study period.

In the event a funding source becomes available, $ 3.7 KK would be needed to complete the project (1988 prices). This cost would include: real estate design memorandum, plans and specifications, environmental assessment, prepare and execute agreement, land acquisition, construction, and monitoring.

If implemented, cost savings to the Corps are estimated at $ 10-70 K annually (using a 50-year capital recovery factor). The future continued estimated annual cost, based on experience since 1963, of maintaining the levee along Prospect Island is $ 311 K. The total annual cost of acquisition ($ 226 K), and levee stabilization and utility relocation ($ 75 K) for the Prospect Island proposal is approximately $301 K (project costs). It is anticipated that detailed design considerations could effect additional cost savings beyond the estimated $ 10-70 K per year.

2. Factors Affecting Implementation

a. Incentives and Advantages.-

The Pilot Study stimulated creative planning by several state and Federal agencies. The effort was worthwhile to demonstrate the potential for habitat development through joint coordination. Cooperation between the Sacramento District of the Corps and NMFS produced a comprehensive project report and economic analysis which details the economic and wetland creation benefits. The findings indicate that removing levees along Prospect Island would create valuable wetland and fish habitat, while eliminating O&M costs.

The California Department of Fish and Game has provided enthusiastic cooperation. If implemented, the restoration would assist the State goal of increasing the amount of northern California wetlands by 50 % by the Year 2000. The Sacramento-San Joaquin Delta area in which the proposal is located has been identified as a high priority wetland improvement area for the State, which is taking the lead in the search for funding. At the time of this report, they have assumed a lead role in exploring ways to fund the proposal and obtain lands acquisition authorization for the Corps to proceed.

b. Constraints.-

The major constraint for NMFS participation was the limitation of project personnel and travel funds. The process required reprogramming at the sacrifice of other assigned responsibilities. Establishing a National program with staff commitments would require permanent reprogramming in the absence of staff increases.

Progress was detained for two years while determining that the Corps lacked a suitable authority to purchase land at Prospect Island. Had the determination occurred at the time of selection or soon thereafter, alternative courses of action could have been pursued, perhaps permitting identification of a funding source by completion of the Pilot Study.

A possible future constraint deals with Corps proposals to subsume restoration benefits at the Prospect Island site into broader mitigation objectives. The site was identified by NMFS and the Corps for restoration under the Army-NOAA agreement. Proposal for use of the restoration benefits as mitigation for development would not be consistent with the intent of the agreement.

C. OYSTER REEF CREATION - SLAUGHTER CREEK, MD

1. Project Description

a. Nature of Corps Maintenance Work.-

The Slaughter Creek channel is maintained by the Corps at 7 feet deep and about 100 feet wide. It has a dredging frequency of about five years. In 1981, dredged material from the channel was deposited in an environmentally acceptable upland site. The dredging, which included the Pilot Study restoration work occurred in 1987. Environmental coordination was initiated in June 1986 and completed in January 1987. The dredging and site

development contracts were advertised in February 1987 with the Notice to Proceed issued in May 1987. The dredging and Pilot Study oyster shell site development were completed in June 1987.

b. Habitat Restoration and Creation.-

An unproductive site adjacent to a productive oyster bar was selected to increase the probability of success (i.e., It is improbable that an artificial oyster reef could be established in a non-productive area where there would be no source of oyster spat). Approximately 14,000 cubic yards of dredged material were placed in conjunction with 2,256 cubic yards of contractor-placed oyster shell culch to create 2.1 acres of oyster reef adjacent to a State-charted, productive oyster bar.

The selected site exhibited fine sediment substrate unsuitable for oyster spat attachment. The created dredged material mound was capped with a layer of oyster culch intended to be about 8 inches thick in June 1987. Construction work was completed in June, 1987. The mound was left for natural oyster seeding during the summer and fall of 1987.

c. Evaluation/Monitoring Program.-

After shell culch placement in 1987, a side-scan sonar survey was conducted by the Corps. The purpose was to determine the distribution of the planted culch across the experimental area. Also during 1987, the MDNR conducted spring and fall surveys of shell depth, exposed shells, and spat abundance.

At the request of WES, the NMFS Beaufort Laboratory sampled the Slaughter Creek shell cap site during November 1988. The purpose was to confirm and map the Slaughter creek culch cap and determine the extent of spat settlement relative to several other oyster bars in the vicinity. The Beaufort staff also were requested to obtain a measure of shell cap thickness. A similar survey by the Beaufort Lab (contracted through WES) is planned for October/November 1989 in order to re-examine conclusions drawn from the 1988 data.

d. Fisheries Benefits.-

While additional sampling and analyses are needed, available data indicate that oysters are being produced on the Slaughter Creek reef. The November 1987 MDNR survey indicated that the rehabilitated oyster bar yielded approximately 62 spat/bushel relative to 39 spat/bushel at an adjacent natural bar, 82 spat/bu at an adjacent fresh bar, 241 spat/bu at Ragged Point Bar, and 341 spat/bu at the Little Choptank Bar.

Conclusions of the more detailed 1988 Beaufort Laboratory Study indicated that: (1) spat set at the experimental shell cap and natural sites were similar, while spat growth appeared to be greater at the experimental site; (2) growth and survival of the 1987 spat set appeared less at the experimental site; (3) growth of hooknosed mussels appeared lower at the experimental site than the natural site; and (4) the dredged material deposition and shell cap creation extends well beyond the proposed 2.1 acres. These conclusions will receive reexamination through at least one further sampling period in 1989. In a summer visit, Beaufort Laboratory staff expressed concern about the potential impact of fine sediments deposited on the experimental reef.

e. Participants.-

Participation by the Corps included the Baltimore District, Baltimore, MD; North Atlantic Division, New York, NY; WES, Vicksburg, MS; and Corps Headquarters, Washington, D.C. NMFS-NOAA offices included the NMFS Oxford Field Office, Oxford, MD; NMFS Beaufort Laboratory, Beaufort, NC.; and NMFS Headquarters, Washington, D.C. Third parties included MDNR, Annapolis, MD, the Maryland Port Administration, Baltimore, MD; the Virginia Marine Resource Commission, Newport News, VA; and the U.S. FWS Field Office, Annapolis, MD.

f. Costs.-

Corps project costs to implement the Pilot Study project were $ 89.7 K (i.e., excavation - $ 48.3 K; shell cap - $ 21.4 K; and MOB/DEMOB - $ 20 K). In providing leadership for the work, Corps costs included manpower for coordination, briefings, and report preparation.

A comparative analysis was used to evaluate costs of upland site disposal versus the oyster reef creation. Project cost estimates for the Slaughter Creek habitat creation showed an estimated savings of $ 64 K or 42 % (i.e., $89.7 K vs. $ 153.7 K for upland disposal). These savings accrued from the alleviated needs of building dikes and conducting quality assurance associated with upland dike disposal. Coordination costs would have been about the same for either creating the oyster reef or the historical method of disposal, since the coordination occurs on all maintenance dredging projects. There will be no maintenance costs.

The comparative analysis does not include NMFS and MDNR costs to plan and monitor the Twitch Cove study (i.e., approximately 4 1/2 man-days each); the Corps costs for hydrographic surveys ($6 K); and the $ 26.3 K NMFS Beaufort Laboratory evaluation of oyster survival, also funded by the Corps (FY 88 - $ 15.3 K; and FY 89 - $ 11 K).

The habitat creation reduced Federal and non-Federal costs associated with contained upland disposal coordination, land acquisition and construction. It also reduced Federal costs and provided enhanced customer service by providing more reliable channel maintenance. The improved agency relations expedited project coordination, while achieving cost savings.

2. Factors Affecting Implementation

a. Incentives and Advantages.-

This demonstration project would probably not have occurred without the support provided by the NOAA-Army agreement. The project's association with the agreement expedited the coordination and implementation of the construction. The restoration work was found to be compatible with normal O&M procedures. Preliminary data indicate the project may be cost effective and supplement the area's oyster production. The project may result in less costly long term placement sites, which in turn would provide more reliable channel maintenance and project programming. In addition the work has public appeal and has provided improved coordination with other agencies.

b. Constraints.-

Timing required special coordination to adapt the project to funding cycles, environmental dredging restrictions, oyster shell culch placement, etc.

At one point local oystermen became concerned that dredged material was being placed, or might drift onto a live oyster bar, threatening political intervention.

D. HABITAT VEGETATION - TWITCH COVE, MD

1. Project Description

a. Nature of Corps Maintenance Work.-

The Twitch Cove channel is the primary access route to Smith Island and is used by commercial fishermen and the inhabitants of Smith Island. The 7'X60'X5000' channel is maintained about every five years. The most recent dredging prior to the current project occurred in 1981. The historical and environmentally preferred disposal option has been upland in diked site.

b. Habitat Restoration and Creation.-

The average depth of Twitch Cove is too deep for natural growth of submerged aquatic vegetation. The goal of the project

was to construct a shallower, vegetated area capable of permitting such growth, with resulting enhancement of living aquatic resources.

The habitat creation work involved installation of a 500' X 860' "L" shaped area "wave screen" consisting of sand-filled Longard tubes. Dredged materials from the channel were used to fill the 3 acres of the area enclosed by the 40-inch diamater, Longard tubes. The resulting elevated and protected area was planted with eelgrass, a submerged plant which was expected to eventually cover the created area. The dredging and eelgrass plantings were completed in September 1987.

c. Evaluation/Monitoring Program.-

The Corps contract for eelgrass transplanting included a requirement for the contractor to submit semi-annual reports detailing plant densities, survivability, plant heights, and provide recommendations.

In addition, the site's plant growth was surveyed by the NMFS Beaufort Laboratory in July 1988, approximately one year after planting and again in 1989. The purpose of the Beaufort work was to determine relative survival of eelgrass transplants. Survival and coverage was assessed by combination of a point-dot grid systematic survey and aerial photography.

d. Fisheries Benefits.-

The primary benefit would be the presence of a submerged aquatic vegetation bed in an area where vegetation normally could not survive.

Based on sampling in June, 1988, the contractor reported an 85 % survival of eelgrass planting units in the northern 75 % of the site and a 10 % survival in the remaining area. The Beaufort Laboratory data of July 1988 indicated that 22 % of the site consisted of eelgrass habitat. A similar June 1989 study by Beaufort indicated 20.6 % coverage of eelgrass habitat, an estimated one year decline of 6.1 %. The studies also documented natural colonization by widgeongrass. The 1989 data indicated 15 % of the observed area was covered with this plant.

e. Participants.-

Participation by the Corps included the Baltimore District, Baltimore, MD; North Atlantic Division, New York, NY; WES, Vicksburg, MS; and Corps Headquarters, Washington, D.C. NMFS-NOAA offices included the NMFS Oxford Field Office, Oxford, MD; NMFS Beaufort Laboratory, Beaufort, NC.; and NMFS Headquarters, Washington, D.C. Third parties included MDNR, Annapolis, MD, the

Maryland Port Administration, Baltimore, MD; and the Virginia Marine Resource Commission, Newport News, VA. Additional assistance in a coordination role was provided by the U.S. FWS, Annapolis, MD. Also, Longard Corporation, under contract with the Corps, provided the Longard tubes and supervised installation. Environmental Concern, Inc. was responsible for the eelgrass transplanting under contract to the Corps.

f. Costs.-

Corps project costs to implement work at Twitch Cove were $ 281 K (i.e., excavation - $ 64.7 K; Longard Tubes - $ 23.6 K; eelgrass transplants - $57.9 K; MOB/DEMOB - $ 84.8 K; and placement modification - $50.3 K). In providing leadership for the work, Corps project costs included manpower for coordination, briefings, and report preparation.

A comparative analysis was used to evaluate costs of upland site disposal versus the habitat creation. Project cost estimates for the Twitch Cove seagrass habitat creation showed an estimated savings of $ 22 K or 7.5 % (i.e., $281 K vs. $ 303 K for upland disposal). These savings accrued from the alleviated needs of building dikes and conducting quality assurance associated with upland dike disposal. Coordination costs would have been about the same for either creating the seagrass bed or the historical method of disposal, since the coordination occurs on all maintenance dredging projects. There will be no maintenance costs.

Original estimated project cost savings of 27 % were reduced to 7 % due to unanticipated need to fill the Longard tubes with sand from a barge because of unusable onsite sediments.

The above analysis does not include NMFS and MDNR costs to plan and monitor the Twitch Cove study (i.e., approximately 18 man-days each) or the $ 18.7 K NMFS Beaufort Laboratory (i.e., FY 88 - $ 11 K; and FY 89 - $ 7.7 K for evaluation of seagrass planting success [also funded by the Corps]).

The habitat creation reduced Federal and non-Federal costs associated with contained upland disposal coordination, land acquisition and construction. It also reduced Federal costs and provided enhanced customer service by providing more reliable channel maintenance. The improved agency relations expedited project coordination, while achieving cost savings. The project also demonstrated that transplanting eelgrass onto fine sediments is difficult and requires technique improvement prior to subsequent implementation.

2. Factors Affecting Implementation

a. Incentives and Advantages.-

As in the case of Slaughter Creek, work under the agreement may allow identification of long term, productive placement sites, which in turn would provide more reliable channel maintenance and project programming.

This demonstration project would probably not have occurred without the support provided by the NOAA-Army agreement. The project's association with the agreement expedited the coordination and implementation of the construction. The restoration work was found to be compatible with normal Corps O&M procedures. Preliminary data indicate the project was done at a 7 % cost savings. If successful the project may insure long term productive placement sites, which in turn provides more reliable channel maintenance and project programming. In addition the work has public appeal and has provided improved coordination with other agencies.

b. Constraints.-

The area should have been characterized by a good baseline survey before the activity took place and monitored 2 to 4 times per year following placement of the material.

Timing required special coordination to adapt the project to funding cycles, environmental dredging restrictions, etc. The unforseen technical problems associated with filling the Longard tubes reduced cost savings from 27 % to 7 %.

E. WETLANDS CREATION - ATLANTIC INTRACOASTAL WATERWAY (AIWW), NC

1. Project Description

a. Nature of Corps Maintenance Work.-

Three dredged material disposal sites were selected for the Pilot Study in the Corps Wilmington District. Channels adjacent to all three sites are maintained routinely by hydraulic pipeline dredge every 1-3 years, and the upland portion of all three sites will continue to be used for the disposal of dredged material. Two sites are diked disposal islands located on the AIWW (i.e. one site is at Sneads Ferry near New River Inlet, while the second is at Swansboro near Bogue Inlet). The third site is a sandbag-diked disposal island located in Core Sound at Harkers Island adjacent to the existing channel from Back Sound to Cape Lookout Bight. Disposal at the Harkers Island site is by the

control of effluent method. The Sneads Ferry and Harkers Island sites received dredged material in the Winter of 1987/88. Disposal will occur at the Swansboro site in about 1990.

The three disposal sites have incurred significant erosion as the result of waves created by boat traffic and long fetches. Under the NOAA-Army agreement, marsh and seagrass were planted at each of the three disposal sites with the experimental co-objectives of (1) controlling site erosion and reducing sedimentation of the adjacent channels; and (2) enhancing the production of coastal marine/estuarine commercial and sport fish and shellfish.

b. Habitat Restoration or Creation.-

Three shallow, sloped intertidal areas (each about 70 m wide X 185 m long) were designed, graded, and, subsequently, vegetated with zones of marsh grass and subtidal seagrass to enhance the production of coastal marine/estuarine commercial and sport fish and shellfish (e.g., shrimp, menhaden, mullet, spotted and grey seatrout, red drum, croaker, spot, bluefish, and blue crabs, as well as their prey). The selected vegetation types are known to have high habitat values for production of the species cited above.

While carried out to enhance fishery production, the work was experimental in nature. Habitat creation at the three sites was designed to test the usefulness of marsh creation in increasing fishery productivity, as well as evaluating the relative effectiveness of various combinations of planted, unplanted, and reticulated areas.

The overall study design was developed by the NMFS Beaufort Laboratory. The Corps contracted: (1) the grading by a heavy equipment construction contractor, (2) the marsh planting by North Carolina State University (NCSU), and (3) seagrass planting by NMFS, Beaufort Laboratory. The grading and marsh planting were completed in the Spring of 1987 and the seagrass planting was conducted in June for the shoalgrass and in October for eelgrass. WES assisted with the design and installation of the saltmarsh plantings. The University of North Carolina at Wilmington (UNC-W) was contracted with to assure that colonial nesting waterbirds were not impacted during construction.

Six types of demonstration plots were established at each site. These included: (1) saltmarsh cordgrass with adjoining seagrass offshore; (2) saltmarsh cordgrass adjoining unplanted subtidal flats; (3) saltmarsh cordgrass containing shallow reticulations (channels) adjoining seagrass offshore; (4) reticulated saltmarsh cordgrass adjoining unplanted subtidal flats; (5) unplanted intertidal flats adjoining seagrass offshore; and (6) unplanted intertidal flats adjoining unplanted,

offshore subtidal flats. Eelgrass was not transplanted onto the Harkers Island site due to sediment accumulation making the transplant area too shallow to support that species year-round.

c. Evaluation/Monitoring Program.-

The extensive evaluation and monitoring program was initiated in the Spring of 1987. Participation included the Corps, North Carolina State University, NMFS, and WES. NCSU, which planted the marshgrass, conducts quarterly sampling of the planted marshgrass areas. NMFS planted the seagrass. The program was carried out at all three sites, as well as adjacent natural areas. Sampling included: water temperature, salinity, turbidity, currents, waves and wave energy, wind, etc., seagrass, sediment particle size, sediment accumulation, organic content and bacteria, and fauna. Drop net and block nets were used to collect samples of fish and other animals on the transplant sites and adjacent natural areas. Wave and wake data were collected at the sites until the plantings had stabilized (June 1988).

The three year period set forth by the NOAA-Army agreement did not provide sufficient time for full establishment of the marsh and seagrass and to complete monitoring of the habitat development. Additional sampling is planned during FYs 1989-1991, with resulting scientifically-valid projections.

d. Fisheries Benefits.-

Available information allows the following preliminary findings on the North Carolina sites.

The American beachgrass and cordgrasses are growing well at each site. Marsh plantings had stabilized by June 1988. The outlook also is good for permanent development of seagrass beds at all three sites. As of December 1987, eelgrass survival was nearly 100 % at all three sites. As of July 1987, transplant survival of shoalgrass was variable at the three sites (i.e., nearly 100 % at Harkers Island, 91 % at Swansboro, and 64 % at Sneeds Ferry). The 1987 & 1988 observations indicate that the cordgrasses have become effective in erosion control. However, the seagrass plantings had not grown together sufficiently to effect erosion control.

While aboveground cordgrass production was equivalent to that of nearby natural marshes, it is significant that the important belowground biomass standing crop was much lower. The restoration sites exhibited about one tenth the bacterial numbers and less organic matter and silt-clay content than that of adjacent, natural cordgrass marshes. Lower levels of organic matter in the transplanted marshes yield lower bacterial abundance, resulting in smaller detrital food webs and nutrient cycling. These data, supported by other studies, confirm that

development of belowground biomass and organic matter content of transplanted marshes may take years to match that in natural marshes.

Faunal data are quite preliminary and require additional seasons of sampling to determine if these trends are consistent. As of September 1987, the numbers of fauna using the natural salt marsh surface was substantially greater than any of the created plots. Fewest were found in the complete, uniformly-planted plot, where the entire subplot was covered. The data suggest that the reticulations in the marsh structure have the potential to enhance fishery utilization of the marsh surface. Fish sampling in seagrasses showed a dramatic, low number of fauna in the created beds, which is consistent with other studies from North Carolina and ongoing work in Florida.

The selection of the sites in proximity to three different tidal inlets along the North Carolina coast adds reliability to any generalizations arising from the work. It was also designed to provide information on the value of reticulated marshes (those displaying a network of tidal channels) as compared with channel free marshes as habitat for fishery organisms. Since aspects of habitat development and use as well as erosion control are being addressed from the start of the project, this will allow assessment of the application and limits of this approach to enhance fishery habitats and reduce erosion not only on existing disposal islands, but also potential new islands, expansion of existing islands and permit-related mitigation projects.

e. Participants.-

Corps participation included the Wilmington District, Wilmington, NC; South Atlantic Division, Atlanta, GA; WES, Vicksburg, MS; and Corps Headquarters, Washington, D.C. NMFS-NOAA offices included the Beaufort Laboratory, Beaufort, NC; Southeast Regional Office, St. Petersburg, FL; and NMFS Headquarters, Washington, D.C. Third parties included North Carolina State University, Raleigh, NC; University of North Carolina at Wilmington, N.C and the Institute of Marine Science, Morehead, NC.

f. Costs.-

Total costs for work at the three sites during the Pilot Study period were $723.8 K. Total Corps O&M costs were $316.6 K (i.e., planning - $15 K; construction - $ 15 K; inhouse contracting - $ 214 K; outside contracts -$ 57 K; and monitoring - $ 15.5 K. WES provided an additional $ 60 K for monitoring.

NMFS costs were $ 177.5 K (i.e., planning - $ 17.5 K; construction - $ 3 K; and inhouse monitoring - $ 157 K). The outside Corps contracts went to North Carolina State University, University of North Carolina - Wilmington, and NMFS for work mentioned previously. O&M costs without the feature were estimated at $ 230 K (i.e., $ 200 K for sandbags and $ 30 K for engineering and design).

An additional cost of $ 60 K for biological monitoring (i.e., bacteria, sediment, fishery organisms, and plant development) is projected for annual work during FY's 1989, 1990, and 1991 and biannual studies thereafter for several sampling cycles.

g. Agreements.-

Separate agreements developed during project implementation included: a memorandum of agreement with North Carolina State University to plant the marsh grass; a memorandum of agreement with the University of North Carolina at Wilmington to monitor the site for colonial water bird use during construction; a DA Form 2544 with NMFS to plant seagrass; a DA Form 2544 with WES to provide Wilmington District assistance in determining long-term stability of the sites; and a MS student at the University of North Carolina, Institute of Marine Science to assist NMFS with microbial investigations.

2. Factors Affecting Implementation

a. Incentives and Advantages.-

No significant objections were raised to project implementation. Involved agencies were willing to cooperate during planning, construction, and monitoring efforts.

The Corps' project advantage for creating fisheries habitat was the prospect of preventing erosion-caused losses of disposal capacity and reducing sedimentation back into adjacent channels. Through the cooperative efforts of the Wilmington District Corps, WES and the research and management staffs of the NMFS Southeast Region working together, evaluation of the effectiveness and appropriateness of this approach to habitat creation and erosion control will become better defined. Cooperative efforts also evolved on a research basis with NCSU on plant parameters, UNC Institute of Marine Science on some of the microbial process work, and the Wilmington District on sediment accumulation.

Construction and monitoring plans were designed and implemented following scientific procedures; therefore, results suitable for publication are anticipated.

Candidate sites were located near the Wilmington District Office and NMFS Beaufort Laboratory, in order to avoid time and travel expenses.

b. Constraints.-

The major constraint was inadequate funding for research and travel experienced by each respective research group. Some of the research items proposed at the outset of the study (i.e., meiofauna, benthic fauna, and predator-prey relationships) were eliminated due to funding and manpower constraints. Travel ceilings precluded selection of sites that were not near agency facilities and lack of research funds will and has caused rearrangement of priorities. If not for NMFS travel limitations, additional desirable sites would have probably been included with attendant benefits to the Pilot Study findings.

Full establishment of the marsh and seagrass and post construction monitoring of the fishery utilization of the sites was not possible within the three year Pilot Study period. However, NMFS has committed to follow-up monitoring of the marsh and seagrass at a reduced sampling effort subsequent to completion of the Pilot Study. During this period, the Corps will continue to use the islands, as needed, for the disposal of dredged material, while still protecting the Pilot Study sites.

At Harkers Island, shoalgrass planting occurred in June and the eelgrass in October. Subsequently, dredging operations occurred adjacent to the site during the winter of 1988/89. NMFS expressed concern that some of the dredged material reached the seagrass planting area. Natural wave action has essentially removed the deposited materials from the planting area and the impact on the seagrass plantings appears to have been minimal. The Corps rediked most of the unplanted portion of the island with sand bags in the winter of 1988/89 to prevent a recurrence.

F. WETLANDS CREATION - GULF INTRACOASTAL WATERWAY, TX.

1. Project Description

a. Nature of Corps Maintenance Work.-

The authorized 12 X 125 foot GIWW channel is maintained by the Galveston District every 3-4 years with dredged materials being discharged into unconfined or open water areas. The channel is routinely maintained by a hydraulic pipeline dredge. The next scheduled maintenance dredging is in FY 91.

b. Habitat Restoration and Creation.-

Two Pilot Study restoration projects were carried out at Chocolate Bay and Pelican Spit on the GIWW. Both were designed with a dual objective of stabilizing existing dredge material disposal areas and creating salt marshes of value for fishery species. Such salt marsh habitats are directly exploited by many fish species, including brown shrimp, white shrimp, blue crabs, spotted seatrout, and southern flounder. These habitats also have been shown to provide species such as brown shrimp with food and protection from predators.

In the northern Gulf of Mexico, salt marsh structure is strikingly reticulated (i.e, with islands of marsh interspersed among many small creeks and channels). This reticulated pattern with a large amount of marsh to open water edge may be partly responsible for the high productivity of many fishery species in the region. A large amount of edge should increase access to the marsh surface and increase the ability of organisms to exploit this habitat.

In many transplanted salt marshes, large stands of vegetation are created with little marsh to open water edge. The two created marshes were designed to test the hypothesis that increasing the marsh/water edge in a transplanted salt marsh, through the construction of access channels, will increase use of the marsh by fishery organisms. The channels may also provide new areas for submerged vegetation and should increase water exchange between the bay and the inner marsh. Increased flushing should decrease the buildup of soil salinity in the inner marsh, which can be detrimental to planting growth. Increasing the value of transplanted marshes for fishery species would possibly encourage marsh creation for fishery species at previously-used emergent disposal areas and in areas of eroding and subsiding marshlands.

At Chocolate Bay, the Pilot Study was carried out independent of maintenance dredging operations at a site where a salt marsh was already established, having been transplanted on dredge material in 1983. At this site, four "U"-shaped channels were constructed in experimental plots in December 1986. A marsh dragline was used to construct the double channels (each 1.5 m wide and 1 m deep) which followed the tracks of the marsh buggy and extended approximately 60 m into the marsh.

At Pelican Spit, the study area was created during an ongoing maintenance dredging activity. In November 1986, approximately 75,000 cubic yards of maintenance material from the intracoastal waterway was used to create intertidal habitat on subtidal bottom along the Spit. Seven acres of smooth cordgrass were transplanted on the site in April 1987, creating a marsh

approximately 40 m wide and 425 m long In January 1989, after the vegetation stabilized the area, five channels extending around 25 m into the marsh were constructed with a rotary ditcher. Each channel was approximately 2 m wide and 1 m deep.

c. Evaluation/Monitoring Program.-

Evaluation of the changes in fishery values resulting from alteration of the marshes at Chocolate Bay and Pelican Spit was conducted by NMFS. A drop enclosure was used at both sites to collect juvenile fishery organisms from the inner and outer marsh in both experimental (with channels) and control plots. Core samples were also collected to determine abundances of infaunal and epifaunal organisms used as food by many fishery species. The effect of channels on soil salinities and saltmarsh biomass and density was also evaluated to determine whether channel construction increased flushing of marsh sediments and affected salt marsh growth. In addition, quantitative monitoring was performed by the Corps to determine the growth and establishment of the transplanted marsh in comparison to a nearby natural control marsh system. Sampling included plant species, plant height and density, % cover, above ground biomass, and below ground biomass.

At Chocolate Bay, fishery organism sampling with drop enclosures and benthic cores was conducted in May, 1987, May 1988, and September 1988. Soil salinity and vegetation biomass and density in control and experimental plots were sampled in November 1987, May 1988, and December 1988. A comparison of plant growth in the transplanted marsh and nearby natural marsh was conducted by the Corps in November 1988.

At Pelican Spit, densities of fish species were measured with drop enclosures in October 1988 (before channel construction in January 1989). Sampling to determine the effect of increased marsh/water edge was conducted during the spring and fall of 1989. Monitoring of plant growth by the Corps was conducted in November, 1988.

d. Fisheries Benefits.-

The transplanted marsh at Chocolate Bay was well established and growth of the saltmarsh cordgrass was similar to or greater than that of a nearby natural marsh. Plant diversity in the transplanted marsh, however, was relatively low. Increasing marsh to water edge in the transplanted marsh appeared to increase utilization by most fishery species. Average densities of brown shrimp and all crustacea in the inner marsh significantly increased in the vicinity of the experimental channels. The channels themselves appeared to be a valuable habitat for fishes, especially small forage species. Fish

species diversity also was greater in the experimental areas when compared with controls. The overall abundance of benthic organisms (amphipods, tanaids, and polychaetes) was greater in marsh vegetation near the channels, when compared with control plots. Measurements also showed significant reduction of soil salinities near the channels in November 1987 and May 1988.

The experimental marsh at Pelican Spit was planted in April 1987, and the marsh was well established by the following Spring. Growth of saltmarsh cordgrass was greater than or similar to that in the donor marsh by the Fall of 1988. At the time of this report, analysis of fish and organism samples collected at Pelican Spit in the spring and fall of 1989 have not been completed. When these data are available, they will be used for comparison with fish density samples measured in October 1988, before channel construction in January 1989.

e. Participants.-

Participation by the Corps included the Galveston District, Galveston, TX; Southwestern Division, Dallas, TX; the WES, Vicksburg, MS; and Corps Headquarters, Washington, D.C. NMFS-NOAA offices included the Galveston Laboratory, Galveston, TX; Southeast Regional Office, St. Petersburg, FL; and NMFS Headquarters, Washington, D.C.

f. Costs.-

Corps costs for the three years of Pilot Study work at both Chocolate Bay and Pelican Spit came to $ 125 K. Costs at Chocolate Bay were $ 37 K ($ 5 K, planning; $12 K, construction; and $20 K, monitoring). Pelican Spit costs totaled $ 88 K ($ 5 K, planning; $ 62 K, construction; and $ 21 K, monitoring). An additional $ 30 K will be required to complete monitoring at the two sites.

Total NMFS costs during the Pilot Study came to $ 107 K ($ 14 K, planning; $ 2 K, construction; and $91 K, monitoring). An additional $ 46 K will be required to complete the planned monitoring program.

Comparative cost estimates for Chocolate Bay showed an estimated cost savings of $ 73 K (i.e., 32 % savings) occurred with the marsh creation. Costs were compared for dredged material disposal with and without the marsh creation. The savings accrued from reduced pipeline and levee costs, which would have been required for the use of presently available disposal areas. At Chocolate Bay, the marsh was in existence at the time the project was initiated and, therefore, the only actual project costs were for constructing the reticulation channels.

A similar analysis for Pelican Spit showed a net project cost increase of $ 1,700 K (i.e., - 0.7 %). The increase was the result of modification to an existing dredging contract required to include the Pilot Study work. Most of the increase was associated with additional pipelines ($ 36.1 K) needed to transport dredge material to the marsh creation site. It is not expected that such costs would occur in future work, if the marsh creation is included in development of the dredging contract. Without the additional $ 36.1 K of cost, the marsh creation would have resulted in a net savings of about 14 %.

2. Factors Affecting Implementation

a. Incentives and Advantages.-

The cooperative relationship between Galveston District and NMFS field personnel facilitated successful development and implementation of the project. The work combined the Corps' ability to physically construct and manipulate marshes with recent NMFS fishery assessment techniques.

The project will increase understanding of the important characteristics of marshes, improve knowledge of the important characteristics of shallow bay bottoms, and improve our ability to create valuable marshes for fishery species. A preliminary analysis of study results indicates that increasing the marsh/water edge in transplanted marshes will increase the density of fish and crustaceans in these habitats, which may result in increased fishery productivity.

b. Constraints.-

The relatively short timeframe for Pilot Study site selection resulted in the selection of Pelican Spit after the dredging contract had been awarded. The resulting contract modification resulted in increased costs that otherwise would not have been incurred.

V. FINDINGS

The findings are organized in five sections: (a) the site selection phase, from the first year joint NMFS-Corps annual progress report; (b) the restoration implementation phase, taken from the joint NMFS-Corps report for the second year and supplemental field reports for the third year; (c) responses of participating NMFS and Corps offices to eight key questions regarding feasibility of an expanded program; (d) Pilot Study costs, based on estimates provided by the participating offices; and (e) other information of importance in considering the feasibility of an expanded program.

A. STARTUP AND SITE SELECTION[4]

1. Startup

Startup was a complex process, complicated by the necessity for involvement by numerous NMFS-Corps offices and third parties (i.e., 13 NMFS offices, 18 Corps divisions and districts, WES, and 46 other agencies and parties).

2. NMFS-Corps Cooperation

Nearly all field progress reports of both agencies cited a high degree of NMFS-Corps cooperation during site selection. The Corps South Pacific Division reported:

> "Although the goals and objectives of the Memorandum of Agreement were grasped quickly, the initial planning process was slowed by the newness of the task. Biologists, as well as planners from the two agencies worked together, some for the first time, and it took a while to settle in and head in one direction. These delays were expected and have been resolved."

3. Participation of other Agencies

Efforts to establish and maintain needed cooperation were quite successful. Other Federal agencies, state and local agencies, and other parties were generally supportive of the Pilot Study. Many were subsequently to become involved in the various stages of screening, review, approval, construction, and monitoring.

4. Constraints In Site Selection

Sixty-nine candidate sites were identified for evaluation by the participating agencies and parties and six were finally selected for implementation. Several constraining factors were important in eliminating the 63 non-selected sites.

a. Costs

At the outset, many potential sites did not make the candidate list because they could not meet the Corps guidance that Pilot Study work was not to involve a net increase in project costs. Of the 69 candidate sites, about one-half were eliminated eventually because of cost considerations.

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[4]. Site selection was the first major phase of the Pilot Study and extended through the first year.

NMFS operational cost and limitations also regulated the number, nature, and location of selected sites. In order to assure technically adequate monitoring programs within travel constraints, sites in the Southeast were generally selected for their proximity to NMFS laboratories. Sites in Florida, Alabama, and Georgia were eliminated in favor of closer sites in North Carolina and Texas. Also, the Pilot Study activities displaced other ongoing NMFS Habitat Conservation Program activities.

b. Out of Phase with Project Scheduling

About 45 % were out of phase with scheduling of ongoing Corps projects. For example, artificial reef projects in California were eliminated because of scheduling late in or beyond the three year Pilot Study period. Such projects provide opportunities for future years in accordance with maintenance or construction schedules.

c. Low Likelihood of Fisheries Benefits

Lack of increased fisheries benefits was a key factor in eliminating about 18 % of the candidate sites.

d. Variance with Third Party Interests

About 7 percent were eliminated because of third party concerns. For example, the proposal for shrimp restoration at Catfish Point, LA was eliminated because of concerns raised by rice farming interests. Also, several candidate sites, involving filling of shallow water, on Galveston Bay were found to be inconsistent with Texas State policy (i.e., In some areas, states and Federal agencies, including NMFS, routinely oppose open water disposal of dredged materials).

e. Miscellaneous Constraints

An additional 13 % were dropped in whole or part because of questions regarding the applicability of Corps authorities, real estate acquisition problems, the need for extensive, lengthy study requirements, or the likiehood of benefit-offsetting, adverse environmental impacts.

5. Diversity of Final Sites

The final six Pilot Study projects are diverse in both proposed habitat modifications and impacted fisheries resources. They include: (a) creation of a dredged material mound capped with oyster shells to supplement oyster production (Chesapeake Bay Shellfish Restoration); (b) creation of nursery area for fish and blue crabs (Chesapeake Bay Vegetation); (c) grading and revegetation of three sites to stabilize sediments and create

nursery habitat for shrimp, blue crabs, sea trout, etc. (North Carolina coastal inlets); (d) salt marsh creation and channelization at two sites for shrimp, seatrout, and flounder production (Texas coast); (e) construction of an artificial reef for kelp bass, sheephead, rockfish etc. (southern California coast); and (f) a plan for conversion of low elevation farmland to wetlands (Sacramento River Delta, CA).

B. IMPLEMENTATION PHASE[5]

1. Positive Interagency Cooperation.

Throughout the Pilot Study period, field reports repeatedly made reference to continued, positive interaction among NMFS-Corps offices, including WES, during the implementation phase. Established coordination lines overcame unforseen events. For example, the Pelican Island site selection occurred after award of the dredging contract, necessitating renegotiation at increased costs. Another unforseen event was the technical problem associated with filling the Longard tubes at Twitch Cove, MD, which extended the field operation and reduced cost savings from 27 percent to 7 percent. NMFS reports commented on cooperative and effective Corps responses to resolve such matters. Also, other agencies continued active and willing roles in planning, construction, and monitoring efforts. No significant objections by third parties were reported.

2. Achievement of Mutual Goals.

Habitat construction was completed at all sites with the single exception of Prospect Island, CA (where completion is contingent upon finding a local sponsor for site purchase). With few exceptions, it was found that the planned Pilot Study work was readily integrated within routine District operations and maintenance. All Civil Works project purposes were achieved.

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[5]. The second major phase of the Pilot Study, implementation at the six Pilot Study sites extended over the two year period from selection through the end of the NOAA-Army Agreement (i.e., October 24, 1988). The work encompassed: diverse program elements of both agencies (e.g., planning, research, construction, maintenance, and monitoring); a broad range of Corps and state water resource development regulations and authorities; and the complex and underdeveloped technology of habitat restoration.

3. Enhancement of Civil Works Operations.

Several actual and potential benefits may prove to be more efficient models for Civil Works operations. For example, the use of dredged materials to construct habitat features at Twitch Cove and Slaughter Creek, MD, eliminated more costly disposal alternatives. The reduction of long-term erosion at the North Carolina sites may serve to conserve site disposal capacity. If completed, conversion of farmland to permanent estuarine habitat at Prospect Island, CA, will restore fishery habitat, with the additional benefit of reducing annual operating costs.

4. Limited Program Resources

Construction of the habitat features involved many requirements (e.g., interagency coordination, approvals, adjustments to contracts and schedules, and financial delays), adding to the workload of all involved parties. The NMFS commitment was particularly affected by shortages of funding, staff, and travel ceilings, as well as competition from other high priority assignments. Pressures to assure adequate monitoring and research programs were acute for the North Carolina and Texas projects, where important studies were eliminated on such things as meiofauna, benthic fauna, and predator-prey relationships.

C. COSTS FOR PILOT STUDY HABITAT RESTORATION

The Agreement states that the Pilot Study would: (1) be carried out within existing authorities, resources, and funding; and (2) assess the cost effectiveness of the selected restoration and creation projects. Each agency was responsible for funding needed to participate. Corps Pilot Study guidance (January 23, 1986) interpreted the Agreement as follows:

> "The success of the pilot study depends largely on our ability to demonstrate that we can work together in developing cost effective fisheries habitat restoration and creation measures within existing authorities. We do not expect any net increases in project costs resulting from this pilot study. On the contrary, we hope to demonstrate that there can be cost savings from, for example, restoring and creating fisheries habitats through the more efficient handling and use of dredged material, as compared to current practices. The pilot study is not limited to the use of dredged material for restoring and creating fisheries habitats. However, we believe dredged material

placement can play a major role in this program, and demonstrate significant cost savings. Cost savings resulting from, for example, reduced hauling distance of dredged material, could be applied to offset any additional costs associated with creating and restoring fisheries habitats."

Costs are discussed in two categories: (1) project costs for the purchase, construction, and/or installation of restoration and creation features (e.g., channels, revetments, artificial reefs, and wetlands), and (2) agency operational costs (e.g., manpower, travel, planning, research, and monitoring).

Table 1 presents estimates of Pilot Study project costs, while Table 2 addresses operational costs. More detailed information on costs is available in the individual project cost discussions of Chapter IV. PROJECT IMPLEMENTATION.

Based on the cost estimates and the field office comments, it has been possible to identify and successfully implement habitat restoration features in some Corps projects at no net increase in project cost. Indeed, cost savings occurred in several cases.

The information also shows that operational costs, particularly for NMFS, are substantial. As discussed in Chapter III (SITE SELECTION) and Chapter IV (PROJECT IMPLEMENTATION), NMFS operational costs: (a) constrained the number of Pilot Study sites selected, as well as their locations; and (2) impacted the extent and nature of monitoring studies.[6] The operations also impacted on other NMFS regional and center habitat conservation activities. Preapplication consultation with constituents and site visits for Section 10/404 Permits were in some instances reduced, as were ongoing southeastern NMFS habitat research activities, National Pollution Discharge Elimination System (NPDES) permit reviews, and the Southeast Region's annual follow-up study on applicant compliance.

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[6]. Because of travel budget constraints, sites in the Southeast were generally selected for their proximity to NMFS laboratories in order to assure technically adequate monitoring programs. Sites in states such as Florida, Alabama, and Georgia were eliminated in favor of closer sites in North Carolina and Texas.

Table 1. Differences in Corps O&M project costs with and without Pilot Study habitat features.

project	difference in project costs
Mission Bay Artificial Reef Construction, CA.	Costs about equal with and without reef
Prospect Island Estuary Reclamation, CA.	$ 91 K for habitat feature planning [7]
Slaughter Creek Oyster Bed, MD.	Savings estimated at $ 64 K (42 %)
Twitch Cove Submerged Vegetation, MD.	Savings estimated at $ 22 K (7.5 %)[8]
AIWW Wetlands Creation, NC.	$86.6 K for the three habitat features
GIWW Wetlands Creation, TX.	Savings of $ 73 K (32 %) at Chocolate Bay; cost increase of $ 1.7 K (0.7 %) at Pelican Spit[9]

[7]. The Corps estimates that an additional $ 2 K would be needed for additional planning. Should a funding source become available, $ 3.7 KK would be needed to complete the project (1988 prices). If implemented, project cost savings are estimated at $ 10-70 K annually.

[8]. Original estimated project cost savings of 27 % were reduced to 7 % due to unanticipated need to fill Longard tubes with sand from a barge.

[9]. The increase came from the need to modify an existing dredging contract to accommodate the Pilot Study work. Most of the increase was associated with additional pipelines ($ 36.1 K) needed to transport dredge material to the marsh creation site. It is not expected that such costs would occur in future work, if the marsh creation is included in project planning and contract development. Without the additional $ 36.1 K of cost, the marsh creation would have resulted in a net savings of about 14 %.

Table 2. Estimated NMFS and non-O&M Corps costs (e.g., manpower, travel, planning, research, and monitoring).

project	project costs
Mission Bay Artificial Reef Construction, CA.	NMFS - $ 16.6 K[10] WES - $ 27 K[11]
Prospect Island Estuary Reclamation, CA.	NMFS - $ 28.2 K[12]
Slaughter Creek Oyster Bed, MD.	NMFS - $ .9 K WES - $ 26,300 K[13]
Twitch Cove Submerged Vegetation, MD.	NMFS - $ .9 K WES - $ 18.7 K[14]
AIWW Wetlands Creation, NC.	NMFS - $ 177.5 K[15] WES - $ 60 K[16]
GIWW Wetlands Creation, TX.	NMFS - $ 107 K[17]

[10]. Additional $ 4.1 K expended after the Pilot Study period.

[11]. $ 15 K for planning, selection, travel expenses, and monitoring activities; and $ 12 K for sidescan sonar survey

[12]. Additional $ 5 K expended for monitoring and other activities after conclusion of Pilot Study.

[13]. Contract for Beaufort Laboratory evaluation of oyster survival.

[14]. Contract to NMFS Beaufort Laboratory for evaluation of seagrass planting success (FY 88 - $ 11,000; and FY 89 - $ 7,700).

[15]. An additional cost of $ 60 K for biological monitoring (i.e., bacteria, sediment, fishery organisms, and plant development) is projected for annual work during FY's 1989, 1990, and 1991 and biannual studies thereafter for several sampling cycles.

[16]. Contracts to North Carolina State University, University of North Carolina - Wilmington, and NMFS.

[17]. An additional $ 46 K is planned to complete the monitoring program.

D. RESPONSE TO FINAL FIELD INQUIRY

At the conclusion of the Pilot Study, participating NMFS and Corps field offices were asked to provide their views and recommendations on the feasibility of an expanded nationwide program. These offices were asked to respond to eight key questions in light of their three years of experience under the NOAA-Army agreement. This section provides a summary of their responses.

1. CAN SUCH A PROGRAM BE CARRIED OUT WITHIN EXISTING PROJECT COSTS AND OPERATIONAL RESOURCES? ARE COST SAVINGS POSSIBLE?

Corps Districts indicated that identified fisheries habitat restoration features can be carried out within existing O&M costs and, in some cases, cost savings are possible. For example, the Wilmington District reported, "Under certain circumstances, the program can be carried out under existing project costs and operational resources; cost savings are possible." The Baltimore District indicated that cost savings are probable. The Sacramento District stated, "Yes and no, when detailed designs and construction and associated efforts are needed, then added funds will be needed to produce them. The cost savings would follow from these efforts as we have found and anticipate at Prospect Island." and "Yes, we believe additional cost savings can be found in other projects by continuing this program." The Los Angeles District stated, "Possibly."

On the other hand, the absorption of operational costs, particularly those of NMFS, was a problem. While Corps Districts were generally able to assign travel, coordination, meetings, and reporting to project costs, NMFS Regions could not. The NMFS Southwest Region stated, "An expanded National program could not be carried out in the Southwest Region within existing operational resources. Reprogramming staff, as well as travel and other operational budget, would be required. No cost savings to NMFS would be expected to occur." The NMFS Northeast Region reported, "Cost savings (O&M) would accrue to the Corps, but could possibly be offset by additional costs to NMFS and cooperating state agencies for development of site creation guidelines, site selection, habitat creation guidance, compliance evaluation, and monitoring. These activities could involve additional travel, equipment, and salary costs." The NMFS Beaufort Laboratory stated, "This is in direct contrast to the additional costs that would be incurred by NMFS; costs that could not be met by existing operational resources. The costs to NMFS would include site creation guideline development, site selection, habitat creation guidance, compliance evaluation, and monitoring. Because project areas would not necessarily be close to NMFS facilities, there would be unknown travel, equipment, and salary costs. Costs listed in Part III for continued monitoring do not include travel costs, since those

sites were chosen for their proximity to an NMFS Laboratory." Corps Districts did not emphasize operational costs as a problem, probably because in the Corps such costs are accounted as O&M costs. The exception was the Sacramento District, which stated, "No, we do not believe that this program can be carried out within existing operational resources." and "Additional FTE allowance is needed in view of constraints on man power." Thus, operational expenses are a major constraint to NMFS participation in an expanded National program.

2. ARE THERE SUFFICIENT FISHERIES HABITAT RESTORATION AND CREATION OPPORTUNITIES WITHIN THE CIVIL WORKS PROGRAM OF YOUR AREA TO SUPPORT AN EXPANDED PROGRAM?

The responses indicate the numbers of opportunities vary from District to District, depending on such things as frequency of Corps projects and populations of fish and shellfish resources.

Most responses were affirmative. The Sacramento District reported, "Yes, we believe there are abundant fisheries habitat restoration projects and creation opportunities ... in the Sacramento District to support an expanded program." The NMFS Northeast Region stated, "Yes." The Baltimore District stated, "Yes; Shellfish enhancement in the Chesapeake Bay should become a "way of life." The Beaufort Laboratory stated, "Sufficient dredged material island projects exist within the Southeast Region where erosion control through wetland creation could be attempted."

Both the Southwest NMFS Region and the Los Angeles District expressed reservations about Southern California. The NMFS Southwest Region reported, "A major constraint, at least for Southern California and the Los Angeles Corps District, is the relatively low number of marine-related types of projects in which the Corps has direct involvement." The Los Angeles District reported, "Not particularly."

3. ARE EXISTING LAWS, POLICIES, PROGRAMS AND INTERAGENCY COOPERATION ADEQUATE TO SUPPORT AN EXPANDED PROGRAM?

The responses were unanimously yes. However, they were accompanied with some important caveats. For example, the NMFS Northeast Region said, "Yes, but not to a rapid or large scale expansion. Additional resources would be needed, or it would be necessary to reduce effort in another program." The Sacramento District detailed a number of "minor adjustments" for policies, programs and coordination (See Appendix D for specifics).

The NMFS Southeast Regional Office and Beaufort Laboratory stated that while existing laws, policies, and programs probably are adequate, "Interagency cooperation, however, may not be. Other interagency efforts are highly variable in the cooperation we (NMFS) receive throughout the Southeast...." They added, " Accordingly, an expansion would likely have to be limited to COE Districts where adequate interagency cooperation exists."

The Wilmington District reported that while existing laws, etc. would support an expanded program, "Activities such as the Chesapeake Bay work would not generally be supported by state and Federal agencies in the Wilmington District due to existing Federal, (e.g., Clean Water Act, as amended) and state laws and State Coastal Zone Management polices, unless there are no other feasible alternatives to in-water disposal."

4. WOULD AN EXPANDED PROGRAM AID THE CORPS AND NMFS IN ACCOMPLISHING THEIR RESPECTIVE WATER RESOURCE MISSIONS? WHAT FURTHER STEPS (E.G.,LEGISLATION, POLICIES, AND RESOURCES) WOULD IMPROVE PROGRAM VALUE AND EFFECTIVENESS?

A consensus indicated that an expanded program could assist in mission accomplishment. The Wilmington District stated that an expanded program would be useful if it could increase the feasibility of infrequently maintained, lower priority small navigation projects (e.g., projects similar to those involved in the Chesapeake Bay work). Implementation of such projects contributes to local economies. The Sacramento District stated, "Yes, an expanded program would make the program more visible and enable the program to be applied to more civil works projects. Both agencies serve the public welfare and by working together they will help each other do a better job at reducing costs while protecting and enhancing our Nation's resources." The NMFS Southeast Region reported that, "An expanded program could aid the NMFS in restoring marine, estuarine, and anadromous habitats."

The NMFS Beaufort Laboratory stated, "Retrofitting of existing sites provides an opportunity to regain some of the habitat losses experienced by past dredged material [work] implemented during maintenance operations, thereby reducing mobilization costs and realizing savings ..." At the same time Beaufort cautioned that, "If our goal is zero habitat loss, then an expanded program would likely play only a small part because we suspect that most opportunities would involve primarily conversion of aquatic habitats from one type to another."

5. ARE THERE SIGNIFICANT PROBLEMS AND/OR CONSTRAINTS THAT WOULD PRECLUDE OR HINDER AN EXPANDED National PROGRAM.

The following potential problems and constraints were identified:

(a) Insufficient agency commitment.

Successful implementation of an expanded program would be hindered without a positive agency commitment throughout the various levels of both NMFS and the Corps (e.g., operations, planning, and research arms). The Baltimore District stated that the importance of endorsement and commitment to make the concept work at all hierarchy levels cannot be emphasized enough. The NMFS Southwest Region commented that lack of clearly identifiable positive incentives to encourage Corps Districts and NMFS Regions not involved in the MOA Pilot Study to participate would be a major problem. The Sacramento District stated, "It will be helpful if a firm and clear policy statement is issued by HQUSACE to establish Corps policy on the extent to which added fishery habitat and cost savings are desired. Then, all elements of the Corps will be enabled to support the program more effectively. This will reduce confusion, resistance, and delays as occurred with the Prospect Island proposal."

(b) NMFS Operating Costs.

As discussed under Question A above, the single largest constraint to NMFS participation in an expanded program is operational resources (i.e., funding, staffing, and travel expenses). This problem was raised by all three participating NMFS Regions throughout all phases of the Pilot Study. While Corps Districts are generally able to assign travel, coordination, meetings, and reporting activities to project costs, NMFS Regions can not.

(c) Monitoring Costs.

Restoration features, such as the ones at Mission Bay, CA., and Prospect Island, CA., do not require multi-year, detailed monitoring programs. However, in many other cases, habitat restoration opportunities would not be agreed upon by NMFS and other agencies without provision for substantial, scientifically-defensible monitoring programs. The NMFS Beaufort Laboratory responded under Question 7 that, "An expanded program must be solidly based on scientific data and an acceptable definition of successful habitat creation." The NMFS Galveston Laboratory echoed this need. Also, the NMFS Northeast Region stated, "Monitoring needs to be increased significantly, both pre and post project, so that the value of the habitat at risk can be compared to the habitat created, particularly where the outcome may be in doubt.

This constraint was particularly apparent in the NMFS Southeast Region. While pressures to assure adequate monitoring and research programs were acute for the North Carolina and Texas projects, important studies had to be foregone on such things as meiofauna, benthic fauna, and predator-prey relationships.

(d) Lack of habitat restoration and creation opportunities.

As discussed under Question B above, both the Southwest NMFS Region and the Los Angeles District identified the scarceness of fisheries restoration and creation opportunities at Corps projects in Southern California. Such scarceness would be a major constraint where it exists. (However, the preponderance of the participating NMFS and Corps offices reported sufficient opportunities exist for an expanded program in many areas .)

(e) Third Party Objections.

Some potential restoration opportunities may be precluded based on political and/or legal objections by third parties. For example, many resource agencies operate under laws and policies which preclude and/or discourage open water disposal of dredged materials. NMFS offices themselves generally oppose open water disposal unless it is done on an experimental basis (i.e., at Slaughter Creek).

Public and special interest groups also may express opposition. During the Pilot Study, Chesapeake Bay oyster fishermen were concerned that sediment from open water disposal at Slaughter Creek, MD. might harm oysters in the area. The NMFS Northeast Region stated: "Problems and constraints include public attitudes toward overboard disposal, particularly where problems are perceived. Public information on the proposed project should be made available, particularly in the vicinity of the project, and public input should be received and evaluated." Also, during the Pilot Study selection process, a promising shrimp restoration feature at Grand-White Lakes, LA. was eliminated after objections by rice farmers and Congressional intervention.

6. ARE THERE REAL OR POTENTIAL BENEFITS (COST OR OTHERWISE) THAT WOULD OCCUR WITH AN EXPANDED PROGRAM?

All participating offices provided examples of real and/or potential benefits from an expanded program:

- benefits to fisheries resources and productivity with potentially damaging projects being converted into habitat enhancements or gains
- project cost savings to the Corps and local sponsors

- o benefits to fishermen, waterfowl hunters, and other recreationists
- o contribution to the Administration's goal of no net loss of wetlands
- o increased cooperation and understanding among participating agencies with provision of a highly visible image of interagency cooperation
- o improvements of restoration technology and understanding from evaluation/monitoring programs
- o provision of incentives for the Corps to fully implement fishery enhancement provisions of the Water Resources Development Act

7. WHAT OTHER FACTORS ARE IMPORTANT IN CONSIDERING AN EXPANDED PROGRAM?

The NMFS Beaufort Laboratory stated, "An expanded program must be solidly based on scientific data and an acceptable definition of successful habitat creation. While long-term monitoring of experimental plots is requisite to meet these goals, existing fishery habitat should not be sacrificed to provide the experimental setting; there are sufficient, existing problem sites that could be utilized. Concentration on open-water disposal alternatives are out of context, given that the Chesapeake Bay work has only undergone one evaluation that demonstrated reduced oyster spat growth on the site."

8. BASED ON THE ABOVE ANSWERS, WHAT ARE YOUR RECOMMENDATIONS REGARDING THE PRACTICABILITY OF AN EXPANDED, National PROGRAM?

A consensus of the participating offices recommended an expanded, National program.

The Baltimore, Sacramento, and Wilmington Districts all recommended an expanded program. The NMFS Southwest Region stated that, "A nationwide program should be recommended and an MOA implemented for a fixed time period. (It provides incentive and uniformity)." The Los Angeles District stated, "The practicability is high in-as-much as NEPA is served, and the Corps public image will be enhanced (particularly by local recreational fishermen)." The NMFS Galveston Laboratory endorsed an expanded program, but recommended that it be structured in the two levels, as proposed in the RECOMMENDATIONS section of this report. The NMFS Beaufort Laboratory qualified their endorsement

by stating that any NMFS commitment to an expanded program should be conditioned to include an expanded, in-house program to continue the efforts of the MOA, and then address only projects that will benefit fisheries. The NMFS Northeast Region's recommendation was: "Proceed with caution."

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

NOV 25 1985

F/M42:KRR
F/S1:JB
COE:PP

TO: Office, Regional and Center Directors, NMFS
USACE Division and District Commanders

FROM: William G. Gordon
Assistant Administrator for Fisheries, NMFS

H.J. Hatch
Major General, U. S. Army, Director of Civil Works

SUBJECT: Memorandum of Agreement Between NOAA and the Department of the Army for a Pilot Study to Restore and Create Fisheries Habitat

Attached for your information is a Memorandum of Agreement signed by the Administrator, National Oceanic and Atmospheric Administration, and the Acting Assistant Secretary of the Army (Civil Works). Under this agreement the National Marine Fisheries Service (NMFS) and the U.S. Army Corps of Engineers (CE) will conduct a 3-year pilot study to investigate the practicability of a national program for restoring and creating fisheries habitats within each agency's existing authorities, resources, and capabilities.

The agreement is intended to merge the NMFS's interest in the Nation's fisheries productivity and the Corps' water resources development program, engineering expertise and experience. Participating NMFS/CE offices will work cooperatively to identify and pursue innovative approaches to habitat restoration and creation. Habitats restored and/or created under this program will be primarily to restore fisheries habitats that were degraded or destroyed in the past or to create totally new habitats.

We jointly express our strong support for this agreement and are confident that all participating NMFS and CE field offices will cooperate fully to make this pilot study a success. General guidance on implementing the pilot study will follow in the near future once participating NMFS and CE field offices have been identified. The identification of potential participating NMFS and CE field offices is currently underway.

Attachment

COOPERATIVE AGREEMENT
BETWEEN THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
AND
DEPARTMENT OF THE ARMY
FOR A PILOT STUDY TO INVESTIGATE THE PRACTICABILITY
OF A NATIONAL PROGRAM FOR RESTORING AND
CREATING FISHERIES HABITAT

Background: Within the National Oceanic and Atmospheric Administration, the National Marine Fisheries Service (NMFS) has the primary Federal responsibility for the conservation, management, and development of the Nation's living marine resources. The NMFS Habitat Conservation Policy recognizes that mankind will inevitably alter marine, estuarine, and anadromous fish habitats which are essential to maintaining the Nation's fisheries. The ability of these habitats to support fisheries production is diminishing, while pressures for conversion to other uses are continuing. In accordance with this policy, NMFS is proceeding to: (1) promote, support, and originate habitat restoration and creation programs by Federal, State, and local resource, construction, and regulatory agencies and the private sector; and 2) work directly with Federal resource, construction, licensing, and regulatory agencies in developing policies, guidelines, and rulemaking to promote the conservation of coastal and anadromous fisheries habitats.

Within the Department of the Army, the U.S. Army Corps of Engineers (CE) has general authority and broad experience, expertise, and capability to work within coastal and inland areas of the United States. It also has general authority to create wetlands using dredged material associated with the construction and

maintenance of civil works projects. The CE has conducted extensive basic and applied research in the beneficial uses of dredged materials, and has demonstrated that under the proper conditions the restoration and creation of wetlands, seagrass beds, and other aquatic habitats is both possible and feasible.

Purpose: The purpose of this Memorandum of Agreement (MOA) is to conduct a cooperative pilot study by the NMFS and CE to determine the practicability of establishing, within existing authorities, resources, and funding, a NMFS-CE nationwide habitat restoration and creation program. Such a national program would contribute towards balancing fisheries habitat conservation with the orderly development and management of the Nation's water resources. The pilot study will assess the process of identification and selection of restoration and creation sites; planning, design, construction and maintenance of selected measures; and, as appropriate, the progress of plan implementation accomplished within the study period. The pilot study will also assess the cost effectiveness of the restoration and creation measures and the institutional arrangements required with affected Federal, regional, state, and local agencies in the above cited process.

Statutory Basis: This MOA is consistent with the following statutes:

1. Fish and Wildlife Act (PL 84-1024).
2. Fish and Wildlife Coordination Act of 1958 (PL 85-624, as amended).
3. National Environmental Policy Act of 1969 (PL 91-190, as amended).
4. Magnuson Fishery Conservation and Management Act of 1976 (PL 94-265, as amended).
5. Endangered Species Act of 1973 (PL 93-205, as amended).
6. Marine Mammal Protection Act of 1972 (PL 92-522).
7. River and Harbor Act of 1899 (33 U.S.C. 403, 407).
8. Water Resources Development Act of 1976 (PL 94-587), Section 150, Establishment of Wetland Areas in Connection with Dredging.
9. Marine Research, Protection and Sanctuaries Act of 1972 (PL 92-532).
10. Clean Water Act of 1977 (PL 95-217).
11. Section 219 of the River and Harbor and Flood Control Act of 1965 (PL 89-298).
12. The Coastal Zone Management Act of 1972 (PL 92-583, as amended).

General Scope: The pilot study will be conducted over a 3-year period commencing with the signing of this agreement, and will involve Washington, D.C., headquarters and selected field offices (i.e., NMFS Regions and CE Divisions and Districts) of both agencies. The study will be carried out in two NMFS Regions, and will involve two or more CE Divisions and Districts. One to three fisheries habitat restoration and creation sites will be selected for study in each of the two NMFS Regions. The exact scope of the pilot study will be set by NMFS and CE field offices working together to locate potential fisheries habitat restoration and creation sites in areas where appropriate active CE projects, programs and/or studies provide the necessary authority for CE participation.

Responsibilities: Selected NMFS Regions will furnish participating CE Divisions and Districts with proposed areas and sites of fisheries habitat restoration and creation, and will identify the fisheries resources expected to benefit. The appropriate CE Divisions and Districts will determine the extent of their authorities and capabilities to carry out the proposed restoration and creation actions. Based on this information and in consultation with the NMFS and CE Washington, D.C., headquarters offices, the involved field offices will jointly select specific fisheries habitat restoration and creation sites for inclusion in the pilot study. Implementation of the fisheries habitat restoration and creation activities included in the pilot study will be a team effort that combines NMFS

technical fisheries expertise with the CE's broad water resources planning, engineering, design and construction expertise and capability. Development of any specific field-level interagency working agreements associated with the pilot study will be left to the discretion of the participating NMFS Regional Directors and CE Division and District Engineers.

Funding: Each agency will be responsible for funding necessary for its participation both at the National and Field levels.

Reports and Documentation: On an annual basis, participating NMFS and CE field offices will prepare a joint progress report and submit it to their respective Washington headquarters offices. These reports will be evaluated by NMFS and CE headquarters staff and consolidated into a single annual progress report for appropriate Washington-level review. At the conclusion of the study, a joint NMFS-CE final assessment report will be submitted to the Administrator, NOAA, and the Assistant Secretary of the Army (Civil Works). This report will include conclusions and recommendations with regard to the practicability of implementing a NMFS-CE nationwide fisheries habitat restoration and creation program.

Effective Date and Duration: This MOA will become effective upon signature by both parties, and will remain in effect for three years. Either party may terminate the agreement 30 days after written notice to the other party.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Anthony J. Calio
Administrator, NOAA

OCT 23 1985

DEPARTMENT OF THE ARMY

Robert K. Dawson
Acting Assistant Secretary
of the Army (Civil Works)

25 OCT 1985

APPENDIX B: NMFS-CORPS GUIDANCE DOCUMENTS

JAN 22 1988

TO: F/SER - Jack T. Brawner
F/SEC - Richard J. Berry
F/SWR - E. Charles Fullerton
F/SWC - Izadore Barrett

FROM F - William G. Gordon

SUBJECT: Guidance for Implementing the NOAA/DA Pilot Study on Restoring and Creating Fisheries Habitats.

The following guidance is provided to assist you in implementing the Pilot Study and supplements the NOAA-DA Memorandum of Agreement (MOA) of October 25, 1985 (copy attached). The Corps of Engineers (CE) is forwarding consistent guidance to its participating field offices.

1. The Southeast Region (F/SER) and the Southwest Region (F/SWR) will have the overall NMFS leadership role in their respective regions for the Pilot Study. In coordination with their CE counterparts, the Southeast Fisheries Center (F/SEC) and the Southwest Fisheries Center (F/SWC) will participate in the conduct of any required site evaluation and monitoring activities. The Office of Protected Species and Habitat Conservation (F/M4) and the Office of Resource Investigation (F/S1) will be available to assist field operations in areas of national policy and programs and in coordination with the Office of the Chief of Engineers.

2. The MOA calls for one to three fisheries habitat restoration and creation projects in each of the selected Regions. Since we want to assure that the Pilot Study will provide an adequate assessment of the potential for a national NMFS-CE habitat restoration and creation program, each participating Region should strive to meet a target of three restoration and/or creation projects.

3. The next major phase of the Pilot Study will involve the joint NMFS-CE selection of specific sites for fisheries habitat restoration and creation. This phase will be handled primarily at the field level and, with this memorandum, its planning and organization is delegated to the Regional Director. The CE counterpart will be the appropriate Division Commander(s). For F/SER this will include the South

Atlantic, Lower Mississippi Valley, and Southwestern Divisions. For F/SWR it will be the Division Commander for the South Pacific Division.

Four steps are envisioned in this phase: (a) identification of fisheries resources habitat needs and relevant CE project and study authorities for the southeast and southwest regions; (b) development of a tentative list of specific candidate sites; (c) a comparative analysis of the candidate sites, taking into account their cost and institutional constraints; and (d) selection of the sites. Final site selections will be made by the Regional Director and Division and District Commander(s) with the concurrence of the offices of the Director of Civil Works and the Assistant Administrator for Fisheries.

F/SER and F/SWR should each host a joint one or two day meeting with the Division(s) in their respective regions by the end of February, 1986. The purpose of these meetings will be to undertake joint planning necessary to complete the final selection of Pilot Study sites (Step (d)) by May 1, 1986. Please keep F/M4 aware of evolving meeting arrangements so that we can schedule appropriate central office attendance.

4. Restoration and creation of wetlands and seagrass beds with suitable dredged material is recognized by both agencies as a significant opportunity to restore and create habitats. However, it is not the purpose of the Pilot Study that fisheries habitat restoration and creation projects be limited solely to wetlands and seagrass bed construction using dredged material. In the process of identifying candidate fisheries habitat sites, the broadest range of restoration and creation needs and opportunities should be examined.

F/SER has identified the following examples of ways to increase the fisheries productivity of shrimp, menhaden, oysters, blue crabs, sea trout, red drum, and snappers: the installation or removal of jetties, dams, channels, and obstacles, etc., to increase spawning and nursery areas, improve water flow within estuaries and river systems, increase flushing of pollution, increase aeration of water, and divert stressful current systems; and the construction of artificial reefs. F/SWR has identified the following ways to increase the productivity of California halibut, white sea bass, herring, starry flounder, and forage species: restoration of coastal wetlands; creation of eelgrass habitats; and construction of artificial reefs.

5. An essential role of the Regional Office will be to work cooperatively with the CE in establishing and maintaining needed cooperation with other agencies and parties. Since most activities will be located in State waters, the support and cooperation of State agencies will be critical to successful conduct of the study. The Pilot Study also presents an excellent forum to solicit the cooperation and support of the U.S. Fish and Wildlife Service, the Environmental Protection Agency, and others.

6. As appropriate, Regions and Centers should involve the technical and scientific capabilities, authorities, and program resources of other NOAA Line Organizations (LO's) to assist in the Pilot Study. When requested, F/M, F/S, and F/PP will assist in such inter-LO coordination.

7. Annual Joint Progress Reports by the NMFS and CE field offices should be forwarded by each region to F/M4 by November 1 of each Pilot Study year. The consolidated NMFS-CE annual progress report should be submitted to me by January 1 of each year. Pursuant to the MOA, a joint NMFS-CE final assessment at the end of the third year will be submitted to the Administrator, NOAA, and the Assistant Secretary of the Army (Civil Works).

8. Each involved Region and Center should promptly designate a coordinator to work with the CE and within NMFS. The central office coordinators will be Ken Roberts for F/M4 (FTS 634-7490) and Dean Parsons for F/S1 (FTS 634-7456).

Attachment

cc: F(2), F/M, F/M4(Brumsted), F/M42(Roberts, Hall), F/S(Rand, Angelovi F/S1(Knobl, Bellinger,Parsons), F/NER, F/NWR, F/AKR, F/NEC, F/NWAFC GC/E, F/PP, F/Sx4

DRAFT:NMFS:F/M42:JBellinger:634-7490:12/10/85:dc (disk #I - ed lguidance
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NMFS:F/M42:KRoberts:634-7490:1/16/86:dc
REVISED:KRoberts:634-7490:1/17/86:gec

DAEN-CWO-N/DAEN-CWP-P

S: 7 February 19[illegible]

2 6 JAN 19[illegible]

SUBJECT: Guidance for Implementing the NOAA/DA Pilot Study MOA on Restoring and Creating Fisheries Habitats

Commander, South Atlantic Division
Commander, Lower Mississippi Division
Commander, Southwestern Division
Commander, South Pacific Division
Director, Waterways Experiment Station

1. Reference: Joint National Marine Fisheries Services (NMFS) and Corps of Engineers (CE) letter of November 25, 1985, transmitting the Memorandum of Agreement between NOAA and DA, October 25, 1985.

2. The referenced joint letter advised that general guidance for implementing the pilot study would be furnished to NMFS and CE field offices. This letter provides such guidance, and supplements the enclosed NMFS guidance sent to their respective regional offices.

3. In accordance with provisions set forth in the cited MOA, NMFS has selected its Southeast and Southwest Regional Offices to participate in the pilot study. Therefore, coastal districts under your command are potential candidates for participating in the pilot study with the above NMFS Regional Offices. The final selection of participating Corps divisions and districts will depend on the existence of authorized Corps studies and projects that are determined to provide clear opportunities to restore and/or create fisheries habitat objectives set by NMFS Regional Offices.

4. As stated in the attached enclosure, the next major phase of the pilot study will involve the joint NMFS-CE selection of specific fisheries habitat restoration and creation sites, and will involve the completion of the following four steps: (a) the identification of fisheries resources habitat needs and relevant CE project and study authorities for the southeast and southwest regions; (b) development of a tentative list of specific candidate sites; (c) a comparative analysis of the candidate sites, taking into account their cost and institutional constraints; and (d) selection of the sites. Final site selections will be made by the

regional directors and division and district commanders in concurrence with the offices of the Assistant Administrator for Fisheries and the Director of Civil Works.

5. NMFS has asked its Southeast and Southwest Regional Offices to host a one- or two-day meeting with the appropriate division offices in their respective regions before the end of February 1986. The purpose of these meetings will be to initiate joint NMFS-CE planning necessary to complete the final selection of pilot study sites (Step d) by May 1, 1986. We support the purpose of these meetings, and the schedule set to accomplish pilot study site selection. Therefore, please advise when the date and location of the pilot study planning meeting in your area has been set so that we can schedule appropriate headquarters staff attendance.

6. Pilot study site evaluation and monitoring may require technical expertise available through NMFS and Corps research centers. In response to the need, NMFS has instructed its Southeast and Southwest Fisheries Centers to participate in the pilot study. We believe the Corps should provide counterpart expertise to the NMFS Fisheries Centers. Therefore, Corps laboratories will be requested to participate in the pilot study. Their primary responsibility will be to provide a coordination link with NMFS Fisheries centers, and to provide participating districts with information on data availability, data collection methods, and appropriate technical criteria for evaluating study results.

7. The success of the pilot study depends largely on our ability to demonstrate that we can work together in developing cost effective fisheries habitat restoration and creation measures within existing authorities. We do not expect any net increase in project costs resulting from this pilot study. On the contrary, we hope to demonstrate that there can be cost savings from, for example, restoring and creating fisheries habitats through the more efficient handling and use of dredged material, as compared to current practices. The pilot study is not limited to the use of dredged material for restoring and creating fisheries habitats. However, we believe dredged material placement can play a major role in this program, and demonstrate significant cost savings. Cost savings resulting from, for example, reduced hauling distance of dredged material, could be applied to offset any additional costs associated with creating and restoring fisheries habitats.

8. Effective intra- and interagency coordination and cooperation is essential throughout the conduct of the pilot study. To help in this effort, headquarters has formed a pilot study task group comprised of staff representing our Planning Division, Operations and Readiness Division, Policy Review and Analysis Division, Directorate of Research and Development, and the Dredging Division of the Water Resources Support Center to coordinate this effort with NMFS Washington and each Corps division, district, and the Waterways Experiment Station participating in the pilot study. Mr. Ted Pelliciotto of the Operations and Readiness

DAEN-CWO-M/DAEN-CWP-P
SUBJECT: Guidance for Implementing the NOAA/DA Pilot Study MOA on Restoring and Creating Fisheries Habitats

Division (DAEN-CWO-M) and Mr. Phillip Pierce of the Planning Division (DAEN-CWP-P) are the headquarters points of contact. To assist in needed coordination, similar points of contact should be identified within your division prior to the pilot study meeting discussed above. This list should be expanded to include district points of contact once it has been determined which districts have been selected to participate in the pilot study. It is both agencies' intent to leave the actual day-to-day pilot study work arrangements and details to participating NMFS field offices and Corps districts supported by their respective research laboratories. We see our primary role as being one of support to participating divisions and districts, assuring that pilot study objectives are met, coordinating pilot study activities and findings at the Washington level, and preparing Washington level reports called for in the MOA.

9. We are looking forward to putting this activity in the able hands of division and district commanders selected to participate in the pilot study. Please furnish DAEN-CWO-M/DAEN-CWP-P, by 7 February 1986, the names of division's operations and planning staff you have selected to participate in the pilot study.

FOR THE COMMANDER:

1 Encl

PATRICK J. KELLY
Brigadier General, USA
Deputy Director of Civil Works