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# NATIONAL MARINE POLLUTION PROGRAM

## Agency Program Summaries FY 1983 Update

### Appendix No. 1 to the Federal Plan for Ocean Pollution Research, Development, and Monitoring

COASTAL ZONE  
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**U.S. DEPARTMENT OF COMMERCE**  
National Oceanic and Atmospheric Administration  
National Ocean Service  
National Marine Pollution Program Office

*NOAA / Natl Marine Pollution Program Office*  
Coastal Zone Information Center

Interagency Committee on Ocean Pollution  
Research, Development, and Monitoring

Federal Coordinating Council for Science,  
Engineering, and Technology

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Department of Agriculture  
Department of Commerce  
Department of Defense  
Department of Energy  
Department of Health and  
Human Services  
Department of the Interior

Department of Transportation  
Environmental Protection Agency  
National Aeronautics and Space  
Administration  
National Science Foundation  
Nuclear Regulatory Commission

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ACKNOWLEDGMENTS

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# NATIONAL MARINE POLLUTION PROGRAM

## Agency Program Summaries FY 1983 Update

### Appendix No. 1 to the Federal Plan for Ocean Pollution Research, Development, and Monitoring

Prepared by  
National Marine Pollution Program Office

U. S. DEPARTMENT OF COMMERCE NOAA  
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U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
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## PREFACE

The National Ocean Pollution Planning Act, P.L. 95-273 (as amended), calls for the establishment of a comprehensive, coordinated, and effective Federal program for ocean pollution research, development, and monitoring. The Act directs the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), in consultation with other agencies, to prepare a five-year Plan for Ocean Pollution Research, Development, and Monitoring every three years. The Plan is to include an inventory of existing Federal programs, an analysis of the extent to which existing programs assist in meeting National needs and problems, recommendations for changes in the overall Federal effort where necessary, and a report on budget coordination efforts.

To carry out the purposes of the Act, an interagency committee was chartered within the Office of the President's Science Advisor. The Interagency Committee on Ocean Pollution Research, Development, and Monitoring (COPRDM) is chaired by NOAA's Deputy Administrator and is comprised of senior representatives from eleven departments and independent agencies. COPRDM's mission is to conduct evaluations of Federal efforts and to identify and implement cooperative research programs. The committee also seeks to avoid unnecessary duplication among Federal agencies and seeks better planning and more effective use of available funds, personnel, vessels, facilities, and equipment.

NOAA established the National Marine Pollution Program Office (NMPPPO) to provide a focal point for coordinating Federal efforts on a day-to-day basis. This office is responsible for updating the five-year Plan and coordinating implementation of the recommendations of the Plan. An interagency task force provides agency representation to NMPPPO in Plan preparation and implementation. The Plan was first published in 1979 and was revised in 1981.

The Agency Program Summaries is one of a series of documents published by NMPPPO to meet the mandates of the National Ocean Pollution Planning Act. The Act calls for a detailed listing of all existing Federal programs related to ocean pollution research, development, and monitoring. Two reports are published on an annual basis to meet this requirement. One of these contains summaries of the major programs conducted by the Federal agencies, the second is a catalog of the specific projects that comprise these programs. The following report is the FY 1983 update of the former.

Andrew Robertson  
Director,  
National Marine Pollution  
Program Office

**SUMMARY AND CONTENTS**

NATIONAL MARINE POLLUTION PROGRAM  
 AGENCY PROGRAM SUMMARIES: 1983 UPDATE

TABLE OF CONTENTS

	<u>Page</u>
SUMMARY AND CONTENTS	
Introduction and Overview.....	1
DEPARTMENT OF AGRICULTURE.....	I-101
DEPARTMENT OF COMMERCE	
National Bureau of Standards.....	II-101
National Oceanic and Atmospheric Administration.....	II-201
DEPARTMENT OF DEFENSE	
Army Corps of Engineers.....	III-101
Department of the Navy.....	III-201
DEPARTMENT OF ENERGY.....	IV-101
DEPARTMENT OF HEALTH AND HUMAN SERVICES	
Food and Drug Administration.....	V-101
National Institute of Environmental Health Sciences.....	V-201
DEPARTMENT OF THE INTERIOR	
Minerals Management Service.....	VI-101
United States Fish and Wildlife Service.....	VI-201
United States Geological Survey.....	VI-301
DEPARTMENT OF TRANSPORTATION	
United States Coast Guard.....	VII-101
ENVIRONMENTAL PROTECTION AGENCY.....	VIII-101
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.....	IX-101
NATIONAL SCIENCE FOUNDATION.....	X-101
NUCLEAR REGULATORY COMMISSION.....	XI-101
APPENDIX	
National Marine Pollution Program Funding	
Emphasis by Cause.....	XII-101
National Marine Pollution Program Funding	
Emphasis by Pollutant.....	XII-201

NATIONAL MARINE POLLUTION PROGRAM  
Agency Program Summaries: FY 1983 Update

INTRODUCTION

In May of 1978, Congress enacted Public Law 95-273, the National Ocean Pollution Planning Act, which designated the National Oceanic and Atmospheric Administration (NOAA) as the lead Federal agency responsible for preparing a comprehensive 5-year plan for the overall Federal effort in ocean pollution research, development, and monitoring. The Act calls for this plan to include a detailed listing of all existing Federal programs related to ocean pollution research, development, and monitoring. The following report represents the FY 1983 update of this listing.

The Agency Program Summaries: FY 1983 Update presents an overview of the activities of each of the eleven Federal departments and agencies that are currently engaged in marine pollution programs. The update reviews the marine pollution programs undertaken by each of these departments and agencies by describing program goals, objectives, recent accomplishments, future milestones, funding for fiscal years 1982 through 1985, and legislative mandates. In addition, this update includes a discussion of Federal personnel, facilities, vessels and other equipment currently assigned to ocean pollution programs. A more detailed description of the specific projects within each program can be found in a companion document, the National Marine Pollution Program, Catalog of Federal Projects: FY 1983 Update.

Some of the funding figures presented in this update differ from those listed in previous versions of the Agency Program Summaries, even though both describe the same programs and years of funding. The budget figures have been adjusted in this update to reflect later budget changes and a reevaluation by some agencies of the programs that should be considered as marine pollution related. The budget figures in this document are estimates of actual expenditures during FY 1982-1984; the FY 1985 program budgets are based on the Presidential budget for this fiscal year.

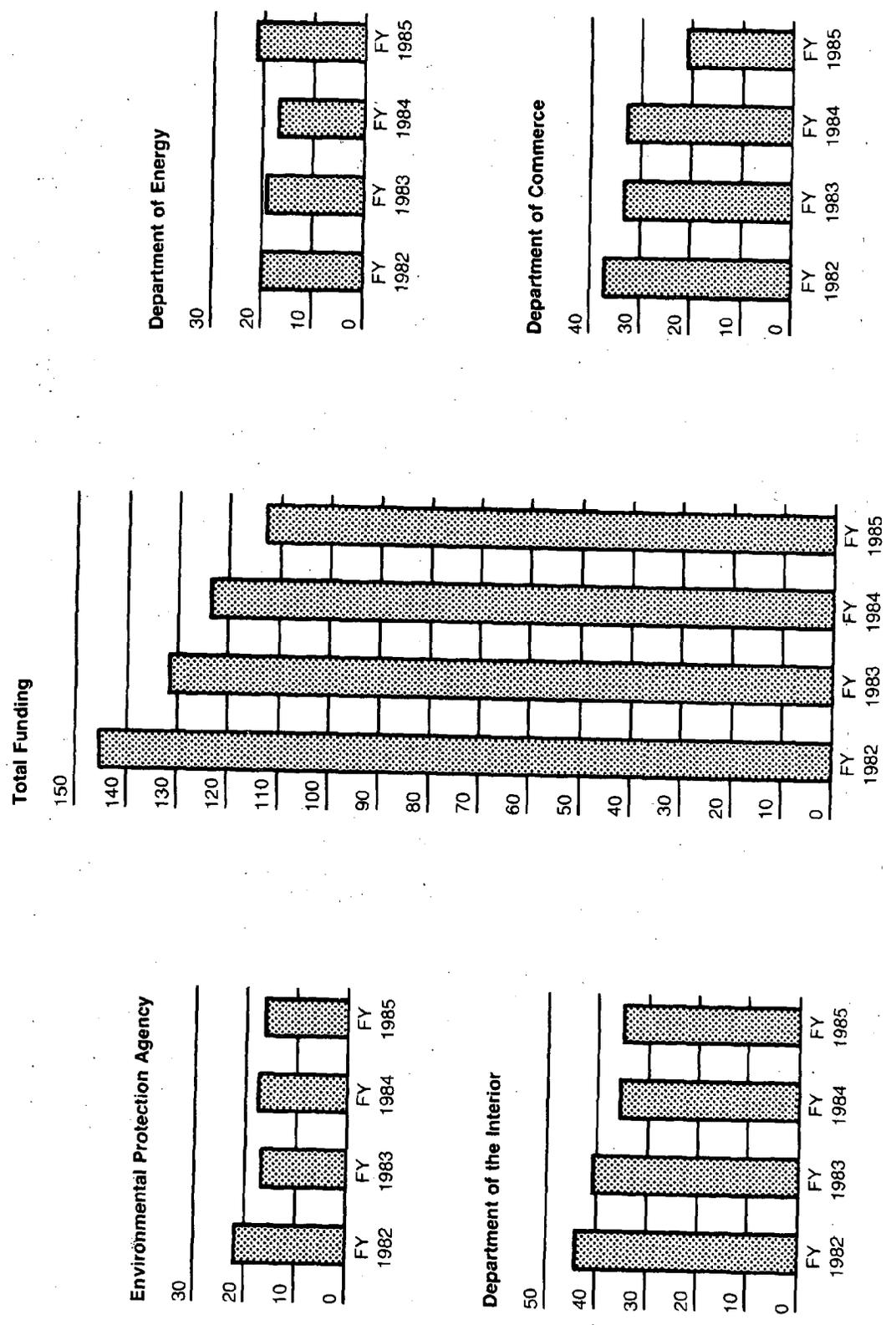
OVERVIEW OF FUNDING LEVELS FOR FY 1982 THROUGH FY 1985

Estimated National Marine Pollution Program funding levels for FY 1982 through FY 1985 are presented in Table 1 for the eleven agencies and departments that are part of the program. During this time, four agencies and departments contributed over 75% of the total program budget: NOAA of the Department of Commerce (DOC), the Minerals Management Service (MMS) of the Department of the Interior (DOI), the Environmental Protection Agency (EPA) and the Department of Energy (DOE). Funding trends for the total program and the four individual agencies and departments that have the largest input into the program are represented in Figure 1.

TABLE 1. NATIONAL MARINE POLLUTION PROGRAM FUNDING LEVELS: FY 1982 - 1985 (FUNDING IN THOUSANDS OF DOLLARS)

Agency	FY 1982 Estimates	FY 1983 Estimates	FY 1984 Estimates	FY 1985 Presidential Budget
Department of Agriculture.....	196	196	196	196
Department of Commerce				
National Oceanic and Atmospheric Administration....	37,418	33,645	33,154	21,124
Department of Defense				
Army Corps of Engineers.....	9,486	9,875	9,829	8,899
U.S. Navy.....	1,039	1,125	1,820	2,100
Department of Energy.....	20,268	19,052	17,635	21,835
Department of Health and Human Services				
National Institute of Environmental Health Sciences	1,043	909	1,097	1,228
Food and Drug Administration.....	2,100	2,200	2,300	2,450
Department of the Interior				
Minerals Management Service.....	30,635	33,549	27,888	27,888
U.S. Fish and Wildlife Service.....	2,902	2,362	2,279	2,254
U.S. Geological Survey.....	10,552	5,130	5,555	5,372
Department of Transportation				
U.S. Coast Guard.....	3,460	2,945	1,208	965
Environmental Protection Agency.....	22,120	17,587	17,774	16,726
National Aeronautics and Space Administration.....	1,900	2,050	2,200	2,200
National Science Foundation.....	2,496	1,566	1,100	400
Nuclear Regulatory Commission.....	285	20	0	0
TOTAL	145,900	132,211	124,035	113,637

**FIGURE 1. TOTAL FUNDING (\$ IN MILLIONS) FOR THE NATIONAL MARINE POLLUTION PROGRAM AND FUNDING FOR THE INDIVIDUAL AGENCIES WITH THE LARGEST INPUT INTO THE PROGRAM; FY 1982-FY 1985**



FY 1982 - 1984

A \$21 million (15%) decrease in funding for the total program occurred between FY 1982 and FY 1984. During that time, seven of the eleven agencies experienced a reduction in pollution research funding (Table 2), three received increased funding (Table 3) and one (the Department of Agriculture) was level funded. DOI, EPA and NOAA together accounted for over 70% of the total funding reduction experienced by the Federal agencies participating in the National Marine Pollution Program.

The trend in all DOI program areas from FY 1982 to 1984 was downward, accounting for 35% (about \$8 million) of the total decrease in marine pollution funding. The largest portion of the DOI decrease resulted from 40% and 50% cutbacks to USGS's Water Resources and Geologic Division programs respectively, plus the termination of the Earth Sciences Application Program at the end of FY 1982. Part of these reductions are the result of an FY 1982 reevaluation, by USGS, of which of their programs in reality support the Federal Marine Pollution Program. About 85% of the reduction in EPA's budget between FY 1982 and FY 1984 was the result of the termination of the Chesapeake Bay Research Program at the end of FY 1983, plus the loss of about \$1.7 million from their Water Quality Research budget. A large portion of the reduction in NOAA funding was the result of a cutback, by NOAA, in ship support for marine pollution programs, in funds available for coastal states through the Coastal Zone Management Program and in the Engineering and Technology Development Program.

FY 1985 Proposed Budget

The Presidential budget for FY 1985 proposes an additional \$10 million reduction in marine pollution research funding or a 7% decrease from FY 1984 levels. The majority of this decrease is the result of a proposed \$12 million reduction to the FY 1985 NOAA budget. This reduction represents the proposed termination of NOAA's regional and ocean dumping research (\$5.8 million), Coastal Zone Management Program (\$1 million), National Sea Grant Program (\$1.8 million) and the Great Lakes Environmental Research Laboratory's pollution program (\$2.5 million). Offsetting these proposed FY 1985 decreases somewhat, is a proposed \$4 million increase in DOE's Subseabed Disposal Program to further investigate the technical and environmental feasibility of radioactive waste disposal in the deep ocean floor.

Reductions and/or increases in the Federal marine pollution programs, as proposed in the President's FY 1985 budget, can be seen in Table 1 and individual program budgets for all agencies and departments are included in the main text of this document.

## OVERVIEW OF FUNDING EMPHASIS FOR FY 1983

An analysis of the FY 1983 Federal Marine Pollution Program is presented here from three different perspectives:

- 0 Funding allocated to major areas of concern

TABLE 2. AGENCIES WITH DECREASED MARINE POLLUTION FUNDING BETWEEN  
FY 1982 - FY 1984 (FUNDING IN THOUSANDS OF DOLLARS).

Agency	Amount of Funding Decrease (FY 1982 - FY 1984)	% of FY 1982 Agency Funding
DOC		
NOAA	4,264	11
DOE	2,633	13
DOI		
MMS	2,747	9
FWS	623	22
USGS	4,997	47
DOT		
USCG	2,252	65
EPA	4,346	20
NSF	1,396	56
NRC	285	100
TOTAL	23,543	---

TABLE 3. AGENCIES WITH INCREASED MARINE POLLUTION FUNDING BETWEEN  
FY 1982 - FY 1984 (FUNDING IN THOUSANDS OF DOLLARS).

Agency	Amount of Increased Funding (FY 1982 - FY 1984)	% of FY 1982 Agency Funding
DOD		
COE	343	4
U.S. Navy	781	75
DHHS	254	8
NASA	300	16
TOTAL	1,678	--

- 0 Funding allocated to specific pollutants or pollutant categories.
- 0 Federal personnel, facilities, vessels and other equipment assigned specifically to marine pollution programs.

Each of these three categories will be discussed separately.

Funding Allocated to Areas of Concern

All funding for the National Marine Pollution Program has been placed under the following ten broad categories or activities for analysis.\*

Marine Waste Disposal	Coastal Activities
Marine Mining	Generic Pollution Studies
Marine Energy Development	Monitoring
Marine Transportation	Basic Studies
Accidental Discharges	General Program Support

Figure 2 represents the total distribution of Federal funds spent on marine pollution activities and the relative amount of agency support given to each of these ten categories or activities during FY 1983. Figure 3 gives a further breakout of funding support within each of these ten categories.

Five agencies funded marine waste disposal research activities in FY 1983: NOAA, DOE, COE, EPA and FWS. Of these, NOAA contributed the largest percentage (36%), primarily for studies of sewage, industrial waste and dredged material disposal. DOE research focused principally on the study of brine and radioactive waste disposal, while COE studies were mostly aimed at the study of the implications of the disposal of dredged material. The emphasis of EPA research was on the effects of municipal and radioactive waste disposal.

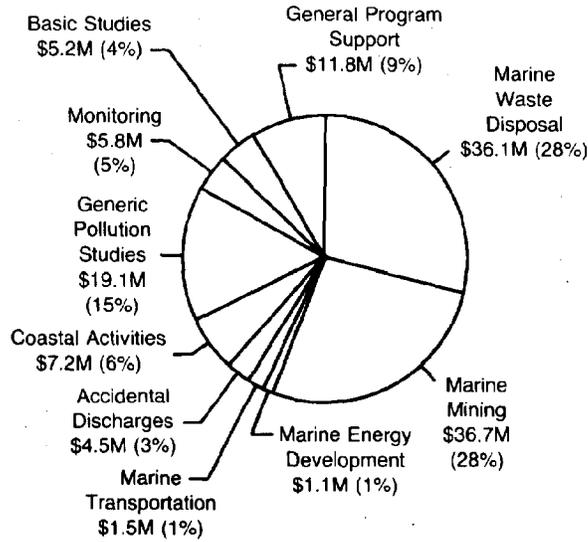
Marine mining research received over \$36 million in FY 1983, the largest amount spent on any of the ten categories. MMS contributed over 90% of these funds for research on the effects of outer continental shelf (OCS) oil and gas development. The smaller amounts spent by NOAA, EPA, the U.S. Fish and Wildlife Service (FWS), and the U.S. Geological Survey (USGS) were for research into the effects of oil and gas development; sand, gravel, and shell mining; and deep seabed mining.

Funding by NOAA and DOE in marine energy development was entirely for ocean thermal energy conversion (OTEC) research. The U.S. Navy and NOAA funded all of the research on the environmental effects of marine transportation. The majority of these funds were spent on shipboard pollution source control and treatment technology. Only NOAA and the Coast Guard contributed to research related to the accidental discharge of oil and hazardous materials into marine waters. These studies include spill transport, fate, effects, prevention, containment and cleanup.

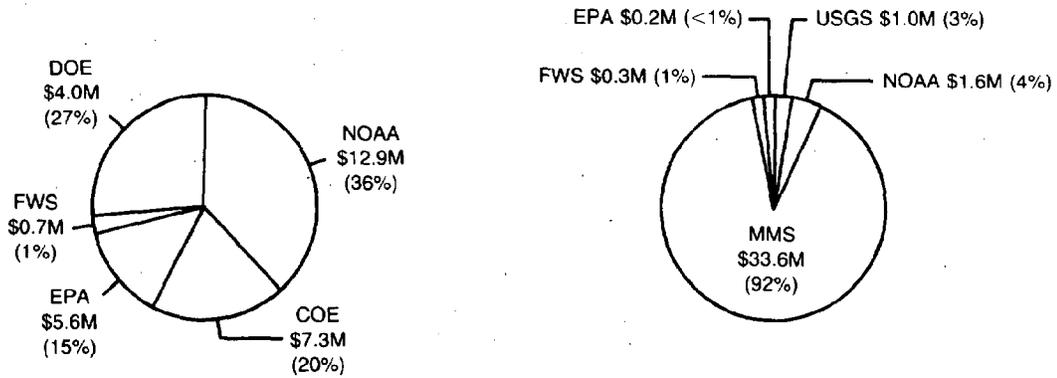
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\* EPA Great Lakes National Program funds are not included in this analysis. See EPA text for program description.

**FIGURE 2. TOTAL DISTRIBUTION OF FY 1983 FEDERAL FUNDS SPENT ON MARINE POLLUTION ACTIVITIES, AND AGENCY SUPPORT FOR EACH MARINE POLLUTION RESEARCH ACTIVITY**

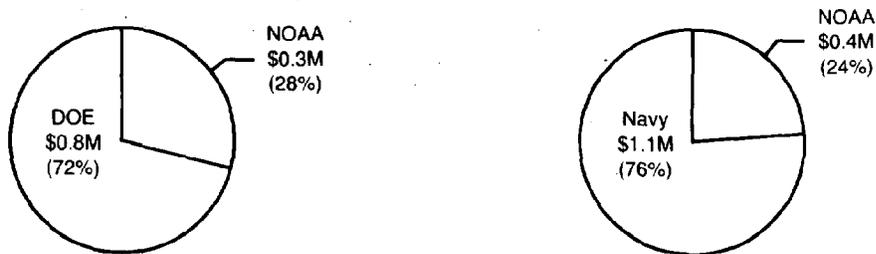


**Total Distribution of Federal Funding**



**Marine Waste Disposal**

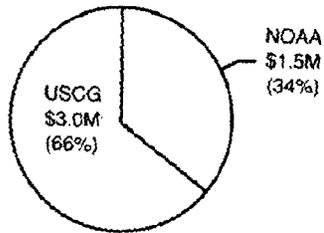
**Marine Mining**



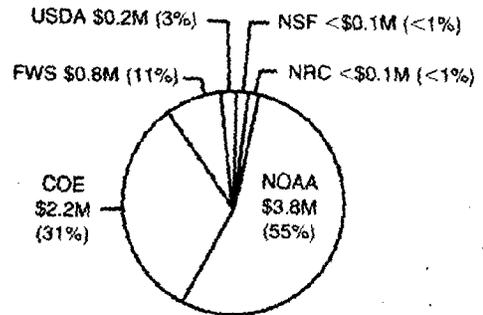
**Marine Energy Development**

**Marine Transportation**

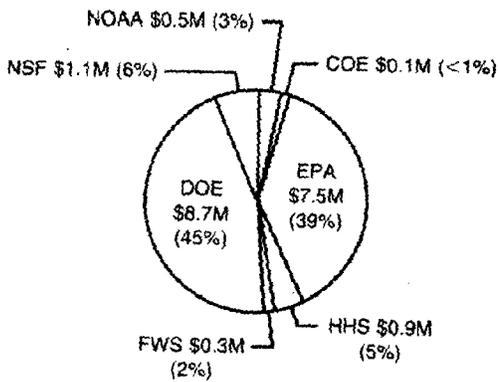
FIGURE 2 (Cont.)



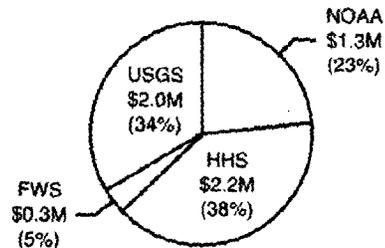
Accidental Discharges



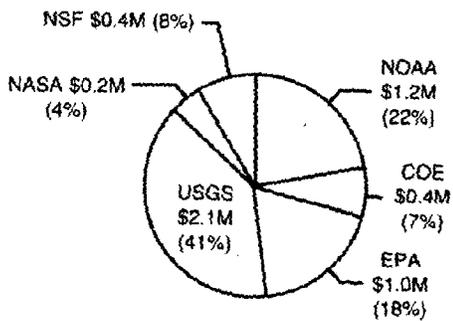
Coastal Activities



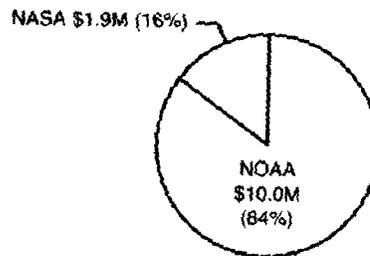
Generic Pollution Studies



Monitoring

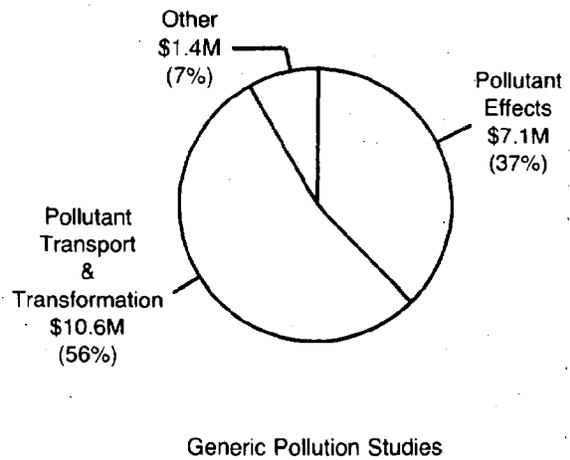
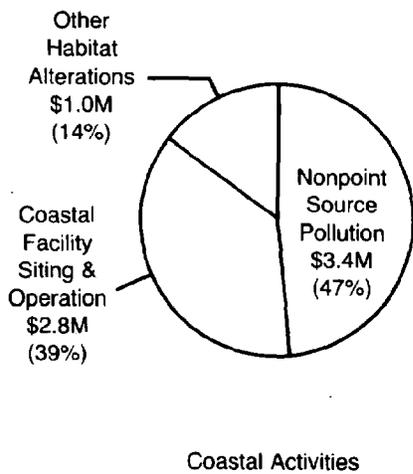
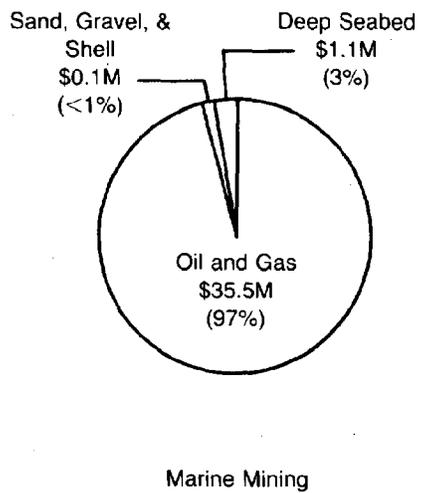
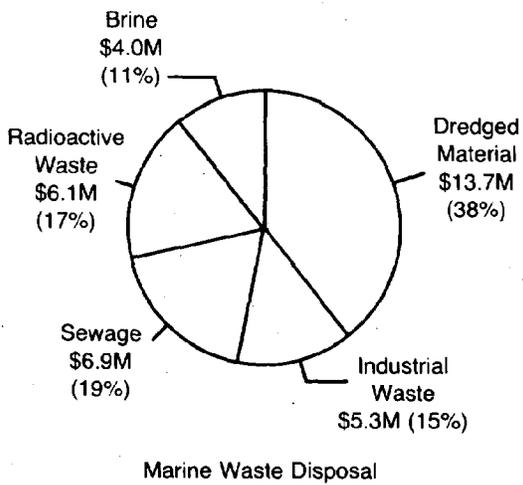


Basic Studies

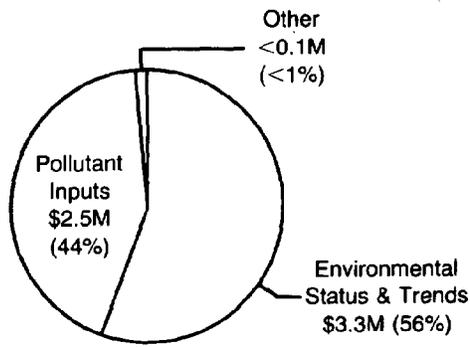


General Program Support

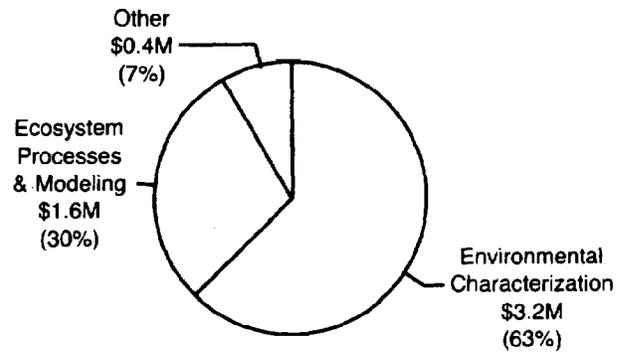
**FIGURE 3. DISTRIBUTION OF FY 1983 FEDERAL FUNDS SPENT ON EACH SPECIFIC CAUSE OF MARINE POLLUTION**



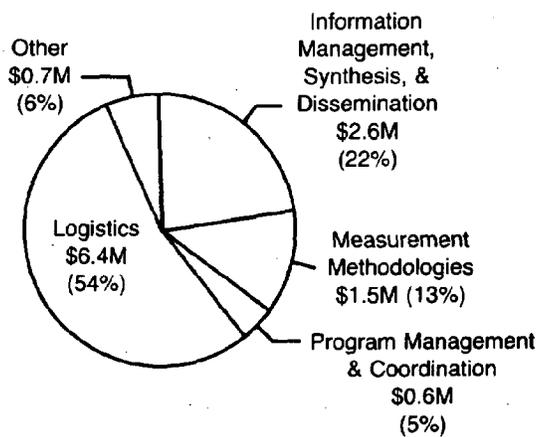
**FIGURE 3 (Cont.)**



Monitoring



Basic Studies



General Program Support

Marine Energy Development - \$1.1M  
 Marine Transportation - \$1.5M  
 Accidental Discharges - \$4.5M

NOAA and COE contributed over 85% of the total funds spent for studies on the effects of coastal activities. This money was used to focus on the effects of nonpoint source pollution caused by coastal land uses, and to a lesser extent, on facility siting and other habitat alterations.

Generic studies received about \$19 million in FY 1983. Generic studies are not related to a specific polluting activity, but rather contribute to our understanding of ocean pollution effects regardless of the source. Research under this category includes environmental characterization, environmental processes, effects of pollutants, pollutant transport and transformation, and modeling. Seven of the eleven agencies involved in the National Marine Pollution Program funded some type of generic research in FY 1983. Almost 85% of these funds were spent by DOE and EPA on the transport, fate and effects of various pollutants in different environments and under differing conditions.

Marine pollution monitoring activities in FY 1983 were principally conducted by FDA, USGS and NOAA. FDA's monitoring activities, which accounted for nearly 40% of the total monitoring budget, supported its Shellfish Sanitation Program. USGS funds, almost 35% of the monitoring total, principally went to support the operation of downstream gauges on major U.S. rivers to measure various water quantity and quality parameters. Most of NOAA's money in this category was used to support the Northeast Monitoring Program (NEMP) and the habitat investigations efforts of the National Marine Fisheries Service (NMFS).

The basic studies category includes research and monitoring that characterizes the biological, physical, geological and chemical components of a region, which are necessary to assess the impacts of ocean use activities. Over 60% of these funds were expended by USGS and NOAA, particularly for environmental characterization studies. Four other agencies, EPA, NASA, NSF and COE also contributed funds toward environmental characterization, ecosystem processes and modeling research.

The FY 1983 budget for general program support includes funding for support services that are available across the program but not linked directly to a specific cause of pollution. This includes: information management, synthesis and dissemination; quality assurance projects; development of measurement methodologies; and other types of program support such as ship operations. Only two agencies, NOAA and NASA reported funding under this program category. About 85% of these funds were expended by NOAA, the majority of these went for ship time costs in support of marine pollution related research. NASA's funds were devoted to development of new and improved remote sensing techniques for marine pollution research and monitoring.

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Appendix I presents a detailed matrix of the allocation of Federal marine pollution expenditures for FY 1983 based on the ten pollution activity categories for each department or agency.

Funding Allocated to Specific Pollutants or Pollutant Categories

For the analysis of marine pollution funding by pollutant, agency expenditures were divided into the following pollutant categories:

Petroleum and Petroleum Products	Nutrients and other Biostimulants
Synthetic Organic Chemicals	Microorganisms and Pathogens
Metals and Inorganic Chemicals	Halogenation Products
Habitat Modification and	Miscellaneous
Sediment Deposition	Not Pollutant-Specific
Artificial Radionuclides	

Figure 4 presents the total distribution of Federal funds expended for each of the pollutant categories as well as the relative amounts of agency support in each of these same categories. Appendix II, located at the rear of this report, presents a detailed matrix of the FY 1983 expenditures of Federal funds attributed to the study of each of these ten categories.

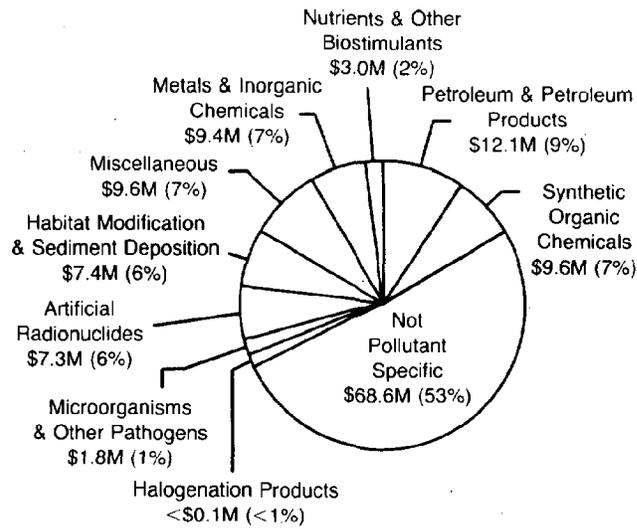
Over 50% of all FY 1983 expenditures fell into the Not Pollutant-Specific category. This category includes funding for generic marine pollution research and monitoring as well as funding for supporting services that are not linked to a specific pollutant. Within this category over 60% of the funds come from NOAA and MMS to support ship time, environmental characterization and processes related research. Specifically, these funds are identified in MMS's OCS oil and gas studies and NOAA's ocean dumping, coastal and estuarine monitoring and oil spill programs, among others.

The petroleum and petroleum products category accounted for the largest percentage (9%) of funds spent for a particular pollutant. The majority of these funds were contributed by MMS in support of their OCS oil and gas program. The Coast Guard also has a significant program designed to provide information on prevention, mitigation, modeling and clean up of oil and other hazardous materials after accidental spills. NOAA supports a considerable research program in this category to investigate many of the implications of petroleum inputs, fates and effects in the marine environment.

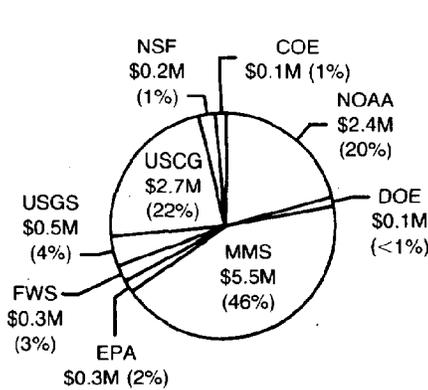
Over 75% of the National Marine Pollution Program synthetic organics research is housed in two agencies, EPA and NOAA. Much of this funding supports EPA's water quality monitoring programs (e.g. Great Lakes Research and Monitoring Program) and NOAA's newly established Status and Trends Assessment Program. Research and monitoring studies on the inputs, transport, fate and effects of metals and inorganic chemicals was conducted by seven of the eleven agencies which sponsor marine pollution studies. Over 70% of these funds went to support NOAA, DOE and EPA's programs related to ocean waste disposal, water quality monitoring and effects of inorganic chemicals on living marine resources.

Almost 70% of the Federal program in the habitat modification category was contributed by COE to sponsor research related to the

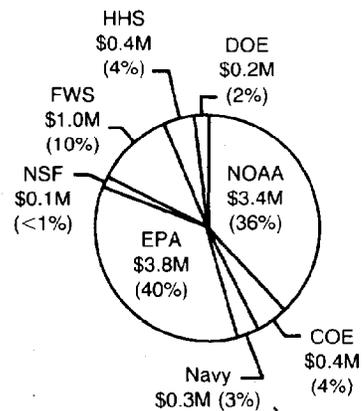
**FIGURE 4. TOTAL DISTRIBUTION OF FY 1983 FEDERAL FUNDS SPENT ON SPECIFIC POLLUTANTS, AND AGENCY SUPPORT FOR EACH POLLUTANT CATEGORY**



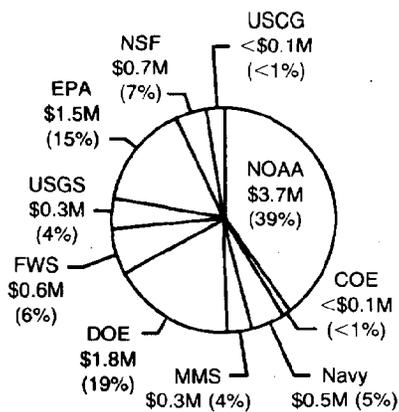
**Total Distribution of Federal Funding**



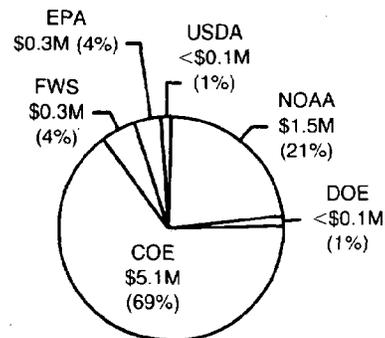
**Petroleum & Petroleum Products**



**Synthetic Organic Chemicals**

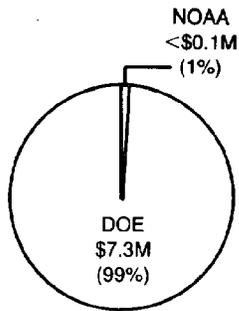


**Metals & Inorganic Chemicals**

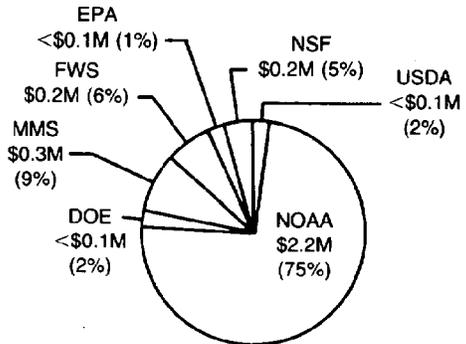


**Habitat Modification & Sediment Deposition**

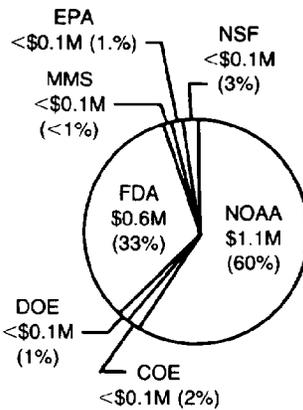
Figure 4 (Cont.)



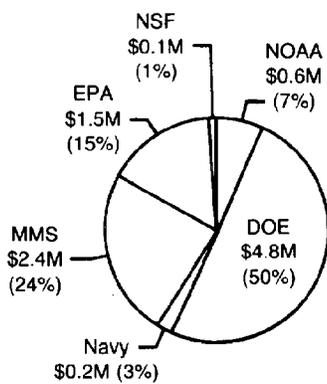
Artificial Radionuclides



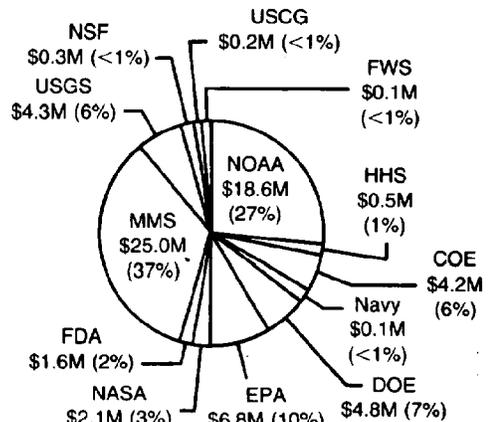
Nutrients and Other Biostimulants



Microorganisms and Pathogens



Miscellaneous



Non Pollutant Specific

disposal and beneficial uses of dredged materials as well as to evaluate and/or control the impacts of other Corps activities occurring in the coastal environment.

Virtually all of the Federal research done on artificial radionuclides is supported by DOE to study the implications of radionuclide entry into the marine environment from natural fallout, nuclear power plants, subseabed disposal, etc. About 75% of the research incorporated into the nutrients and other biostimulants category is supported by NOAA and is aimed at understanding the implications of point and non-point source nutrient inputs into marine and Great Lakes environments.

Over 90% of the total Federal funds devoted to microorganisms and pathogens research was sponsored by NOAA's National Fishery Ecology Program and National Sea Grant Program, among others, plus FDA's Shellfish Sanitation Program. The study of halogenation products receives the least amount of Federal funds of the ten categories discussed in this report. A total of less than \$70 thousand is being spent by NOAA, COE and NRC to understand the impact on the marine environment of using chlorine in drinking water, as a biocide in power plants, etc.

DOE and MMS together account for about 75% of the funds spent in the miscellaneous category. This category includes funds spent for various specific pollutants that do not fall within the other categories. Generally, the funding for these pollutants is relatively small and supported by one agency under a specific legislative mandate. Included in this category are funds spent investigating noise pollution caused by OCS oil and gas activities; the use of dispersants on oil spills; the implications of the disposal of drilling muds and cuttings; and of the disposal of large amounts of brine into the marine environment. DOE's emphasis addresses their Strategic Petroleum Reserve Program responsibilities related to brine disposal. The MMS program is focused on the drilling muds and cuttings problems on the Alaska OCS.

#### Federal Personnel, Facilities, Vessels and Equipment

A total of 528 full-time equivalents (FTE's) was reported by the eleven agencies as being substantially devoted to portions of the Federal Marine Pollution Program (Figure 5). Almost 75% of these FTE's were reported as scientific professional, with the remainder being administrative support. The majority of these positions were reported by the two agencies, NOAA (37%) and EPA (25%), with the most extensive system of field laboratories. Additional information on these personnel can be found in the "Federal Personnel and Facilities" sections of each agency's text.

In FY 1983 23 Federal laboratories were listed as being substantially involved in marine pollution research and monitoring

TABLE 4  
 INVENTORY OF FEDERAL PERSONNEL, FACILITIES  
 AND RESEARCH VESSELS ASSOCIATED WITH  
 FY 1983 FEDERAL MARINE POLLUTION PROGRAMS

Agency	Personnel (FTE)*		Laboratories	Vessels **				
	Professional	Administrative		I	II	III	IV	V
DOC								
NOAA	182	45	10	3	1	4		
DOD								
COE	30	20	6					
Navy	4		1					
DOE	3	0.5						
DHHS								
FDA	20	11	2					
DOI								
MMS	38	7						
USGS	35							1
EPA	82	50	4			1	1	
<b>TOTALS</b>	<b>394</b>	<b>133.5</b>	<b>23</b>	<b>3</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>1</b>

\* Full Time Equivalents

\*\* Class I over 275' LOA  
 Class II 201' to 274' LOA  
 Class III 163' to 200' LOA  
 Class IV 100' to 162' LOA  
 Class V less than 100' LOA

activities. Ten of these laboratories are NOAA's, seven of which belong to the National Marine Fisheries Service (NMFS) and the other three to the Environmental Research Laboratories (ERL). The NMFS laboratories that support marine pollution studies are administratively under the Northeast Fisheries Center and the Northwest and Alaska Fisheries Center, and are primarily concerned with marine pollution problems as they relate to living marine resources. NOAA's ERL laboratories in Miami, FL, Seattle, WA and Ann Arbor, MI are involved with a broad spectrum of the pollution problems found in the Nation's coastal and adjacent open ocean areas. COE sponsors marine pollution studies at the Waterways Experiment Station, Vicksburg, MS as well as at their five division laboratories located in Massachusetts, Oregon, Georgia, California and Texas. EPA carries out its marine pollution studies at their laboratories in Narragansett, RI, Newport, OR, Gulf Breeze, FL and Grosse Isle, MI. FDA maintains a shellfish sanitation laboratory at Davisville, RI and a fisheries research laboratory on Dauphin Island, AL. The Navy carries out some of its marine pollution studies at the David Taylor Naval Ship R&D Center in Annapolis, MD.

A total of eleven vessels over 50' in length over all (LOA) were reported as being used in marine pollution related studies during FY 1983. The largest marine pollution "fleet" is managed by NOAA's National Ocean Service (NOS). It includes three large Class I vessels (over 275' LOA), the DISCOVERER, RESEARCHER and SURVEYOR; one Class II vessel (201' to 274' LOA), the MILLER FREEMAN; and four Class III vessels (163' to 200' LOA), the ALBATROSS IV, McARTHUR, PEIRCE and WHITING. EPA has authority over one Class III vessel, the ANTELOPE, and one Class IV vessel (100' to 162' LOA), the RODGER SIMONS, which is used in the Great Lakes region. The POLARIS, a Class V vessel (less than 100' LOA) spent approximately 150 sea days operating in the vicinity of San Francisco Bay in support of USGS pollution related studies. The COE operates numerous small vessels under 50' LOA, including survey boats, dredges and work boats. Boats of this size are not included in the Federal inventory of vessels used for marine pollution related activities.

A large and varied inventory of major equipment was reported by the Federal agencies as being used in their marine pollution research and monitoring activities in FY 1983. A description of this equipment can be found in the main text of this document.

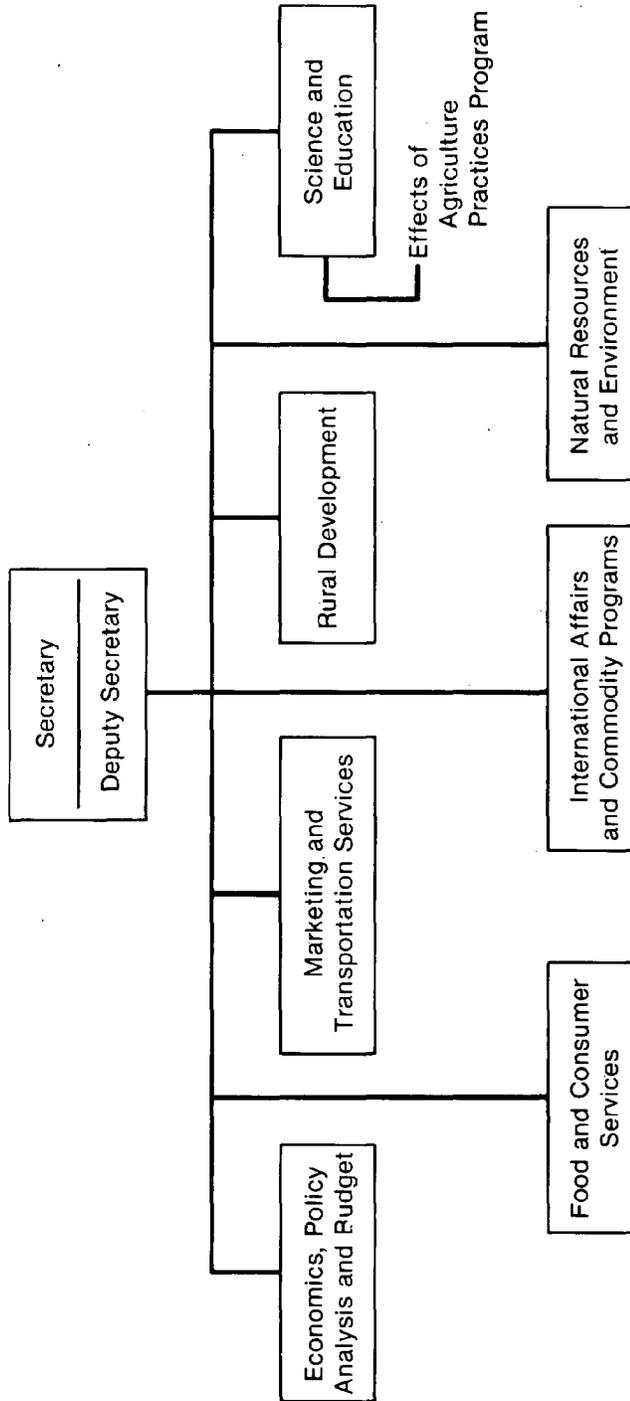
**I. DEPARTMENT OF AGRICULTURE**

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

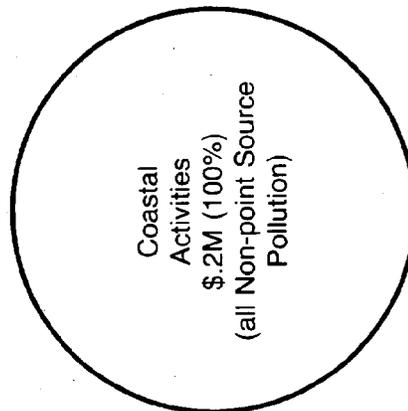
CONTENTS

	<u>Page</u>
ORGANIZATION CHART.....	I-ii
FUNDING EMPHASIS GRAPH.....	I-iii
MISSION STATEMENT.....	I-101
FEDERAL PERSONNEL AND FACILITIES.....	I-101
PROGRAM DESCRIPTION	
Effects of Agricultural Practices Program.....	I-101
LEGISLATIVE MANDATES.....	I-102

UNITED STATES DEPARTMENT OF AGRICULTURE



**DEPARTMENT OF AGRICULTURE  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY1983 ESTIMATES**



UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

MISSION STATEMENT

A relatively small portion of the United States Department of Agriculture's research effort addresses the effects of agricultural and natural resources practices on the quality of the marine environment. The effort is centered in the office of the Assistant Secretary for Science and Education. The overall Science and Education mission of USDA is to conduct research, development, and education on problems related to agricultural production and to the protection of the environment.

FEDERAL PERSONNEL AND FACILITIES

The USDA does not have any staff who are specifically assigned to marine pollution programs nor does it have any facilities, vessels, or equipment that are specifically designated for support of such programs.

PROGRAM DESCRIPTION

Effects of Agricultural Practices Program

USDA studies include research on pollution problems caused by soil erosion, agricultural runoff, agricultural waste disposal, offsite and downstream effects of sediment, nutrients and pesticides, transport and transformation of pollutants, and their effects on organisms and ecosystems. Emphasis is on effective management and use of the nation's soil, water, and air resources, and on reducing pollutants in receiving streams, lakes, estuaries, and oceans. Research is accomplished through cooperation with State and other universities and through contracts and grants. These funds are administered by the State agricultural experiment stations and are used to support high-priority research in each State.

Estimated Funding (in thousand \$)

<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85*</u>
\$196	\$196	\$196	\$196

\* Presidential budget submission.

Information Source

Dr. Gary R. Evans  
 Coordinator for Natural Resources  
 USDA, Cooperative State Research Service  
 Room 121, West Auditors Building  
 Washington, DC 20251

UNITED STATES DEPARTMENT OF AGRICULTURE

LEGISLATIVE MANDATES

Department of Agriculture Organic Act of 1862 (5 U.S.C. 511)

Research and Marketing Act of 1946, as amended (70 S.C. - 427, 4271)

National Agricultural Research, Extension, and Teaching Policy  
Act of 1977 (P.L. 91-113, and other Congressional mandates)



**II. DEPARTMENT OF COMMERCE**

DEPARTMENT OF COMMERCE

CONTENTS

	<u>Page</u>
NATIONAL BUREAU OF STANDARDS	
MISSION .....	II-101
FEDERAL PERSONNEL AND FACILITIES.....	II-103
PROGRAM DESCRIPTION	
Center for Analytical Chemistry.....	II-103
ORGANIZATION CHART.....	II-104
LEGISLATIVE MANDATES.....	II-105
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	
MISSIONS AND MANDATES.....	II-201
FEDERAL PERSONNEL AND FACILITIES.....	II-203
ORGANIZATION CHART.....	II-204
FUNDING SUMMARY.....	II-205
FUNDING EMPHASIS GRAPH.....	II-206
PROGRAM DESCRIPTIONS	
Coastal and Estuarine Assessment Program.....	II-209
Ocean Use Impact Assessment Program.....	II-212
Strategic Assessment Program.....	II-217
Hazardous Materials Spill Response Program.....	II-219
National Marine Pollution Program.....	II-222
Deep Seabed Mining Environmental Research Program.....	II-224
Ocean Thermal Energy Conversion Program.....	II-227
Chesapeake Bay Program.....	II-230
Measurement Systems Development and Engineering Services Program.....	II-231

Contents (cont'd)

	<u>Page</u>
National Marine Sanctuaries Program.....	II-233
Coastal Zone Management Program.....	II-235
Ship Support.....	II-237
Environmental Research Laboratories Ocean	
Pollution Studies.....	II-238
Environmental Research Laboratories Great Lakes	
Pollution Studies.....	II-242
Sea Grant Ocean Pollution Program.....	II-245
National Fishery Ecology Program.....	II-247
Microconstituents Program.....	II-251
Ocean Pollution Data and Information Network.....	II-253

DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS

MISSION

The National Bureau of Standards (NBS) has responsibility for the custody, maintenance, and development of the national standards of measurement, and the provision of means and methods for making measurements consistent with those standards. NBS cooperates with other Federal agencies for the development of standard practices and the establishment of reference bases in support of national programs.

NATIONAL MEASUREMENT LABORATORY

Provides the national system of physical and chemical measurement; coordinates the system with measurement systems of other nations, and furnishes essential services leading to accurate and uniform physical and chemical measurement throughout the Nation's scientific community, industry, and commerce; conducts research leading to improved methods of measurement, standards, and data on the properties of materials needed by industry, commerce, educational institutions, and government; provides advisory and research services to other government agencies; conducts physical and chemical research; develops, produces, and distributes standard reference materials; provides standard reference data; provides calibration services; and collaborates with the Bureau's major organizational units in carrying out its responsibilities.

Center for Analytical Chemistry

Develops and maintains the scientific competence and experimental facilities necessary to provide the Nation with uniform measurements, measurement methodology, and measurement services in the field of analytical chemistry; carries out basic and applied research in analytical chemistry; develops and improves methods for the separation, analysis and characterization of materials, including Standard Reference Materials; conducts fundamental investigations of the phenomena on which measurement of the composition and behavior of chemical systems is based; uses these measurement methods to improve the accuracy of compositional measurements and, thereby, the comparability among laboratories throughout the United States as well as to ensure measurement compatibility with other nations; uses these techniques to assist in the solution of problems that impact the Nation, e.g., in improving the accuracy of clinical analytical chemistry, and air and water pollution analyses, provides advisory services in analytical chemistry to government agencies, scientific organizations, and industry; participates in collaborative efforts with other NBS centers in the interdisciplinary applications of analytical chemistry.

Inorganic Analytical Research Division

Conducts research and development in the qualitative and quantitative determination of inorganic species; develops and certifies Standard Reference Materials for inorganic species in a variety of matrix types; develops instrumentation and analytical techniques for the application of inorganic mass spectrometric techniques to analysis including the calibration of absolute isotope abundance ratios, isotope dilution mass spectrometry, and the determination of the atomic weights of the elements; provides advisory services to government agencies, scientific organizations, and industry; conducts research and development in analytical chemistry methodology involving atomic and molecular spectroscopy; investigates the application of laser excitation and absorption techniques to analysis, conducts research and development for the application of nuclear activation techniques to analysis, including radiochemical separations techniques; carries out research and development in solution chemistry for determining homogeneity and for characterizing materials by titrimetry, gravimetry, gas evolution, and by complexation and separation techniques involving ion exchange and solvent extraction methodology; conducts research and development on electrochemical methods of analysis including voltammetry, coulometry, potentiometry, and the determination and standardization of pH.

Organic Analytical Research Division

Develops and improves techniques for the preparation, purification, characterization, and analysis of biologically important organic materials with emphasis on determination of their chemical and physical properties and structure; conducts research on the preparation and production of standard bioorganic materials, and on the application of stable isotopes and radioisotopes to reaction mechanisms and quantitative analysis; provides advisory services to government agencies, scientific organizations, and industry; conducts research on the fundamental chemical and physical processes of chromatographic separations and the accurate measurement of trace quantities of organic compounds; separates, identifies, and measures organic systems directed towards the certification of Standard Reference Materials used in the analysis of biological and environmental samples for trace organic constituents; conducts research on sampling, sample handling, high-resolution chromatographic separations, and trace organic detectors including organic mass spectrometry.

Gas and Particulate Science Division

Conducts research and development on the analysis of gases and gaseous systems especially as applied to the determination of gaseous constituents of air and air pollutants; develops and certifies Standard Reference Materials for gas mixtures, permeation devices and particulates, and techniques for their utilization in practical analysis procedures; provides advisory services to government agencies, scientific organizations, and industry; develops methodology for the physical and chemical characterization of fine particulates including measurements of particle size, size distribution and composition using electron and ion probe microanalysis,

laser microRaman analysis, and optical microscopy; conducts research and development in microanalysis techniques to examine very small regions of larger samples; performs research and development in x-ray fluorescence analysis.

#### FEDERAL PERSONNEL AND FACILITIES

The National Bureau of Standards does not have any staff who are specifically assigned to marine pollution programs nor does it have any facilities, vessels, or equipment that are specifically designated for support of such programs.

#### PROGRAM DESCRIPTION

##### Center for Analytical Chemistry

The program of the Center for Analytical Chemistry includes research in analytical methods and standard reference materials (SRM's), the provision of quality assurance services, and services to other agencies of government. Measurement research is carried out on organic, inorganic, gaseous species and particulate matter. Many of the Center's services are applicable to ocean pollution research and monitoring programs. These include measurement of hazardous wastes, organic and inorganic species in water, organic and inorganic species in marine organisms and sediments, research in sampling, analytical design, and long-term storage of samples.

Scientists in the Center for Analytical Chemistry are currently working with the National Marine Pollution Program to develop generic guidelines for use in writing quality assurance plans for scientific measurement programs undertaken by agencies involved in the assessment of marine pollution. As one phase of the development of these guidelines a workshop for scientists from participating agencies will be held at NBS to discuss quality assurance of marine pollution measurements.

##### Estimated Funding\*

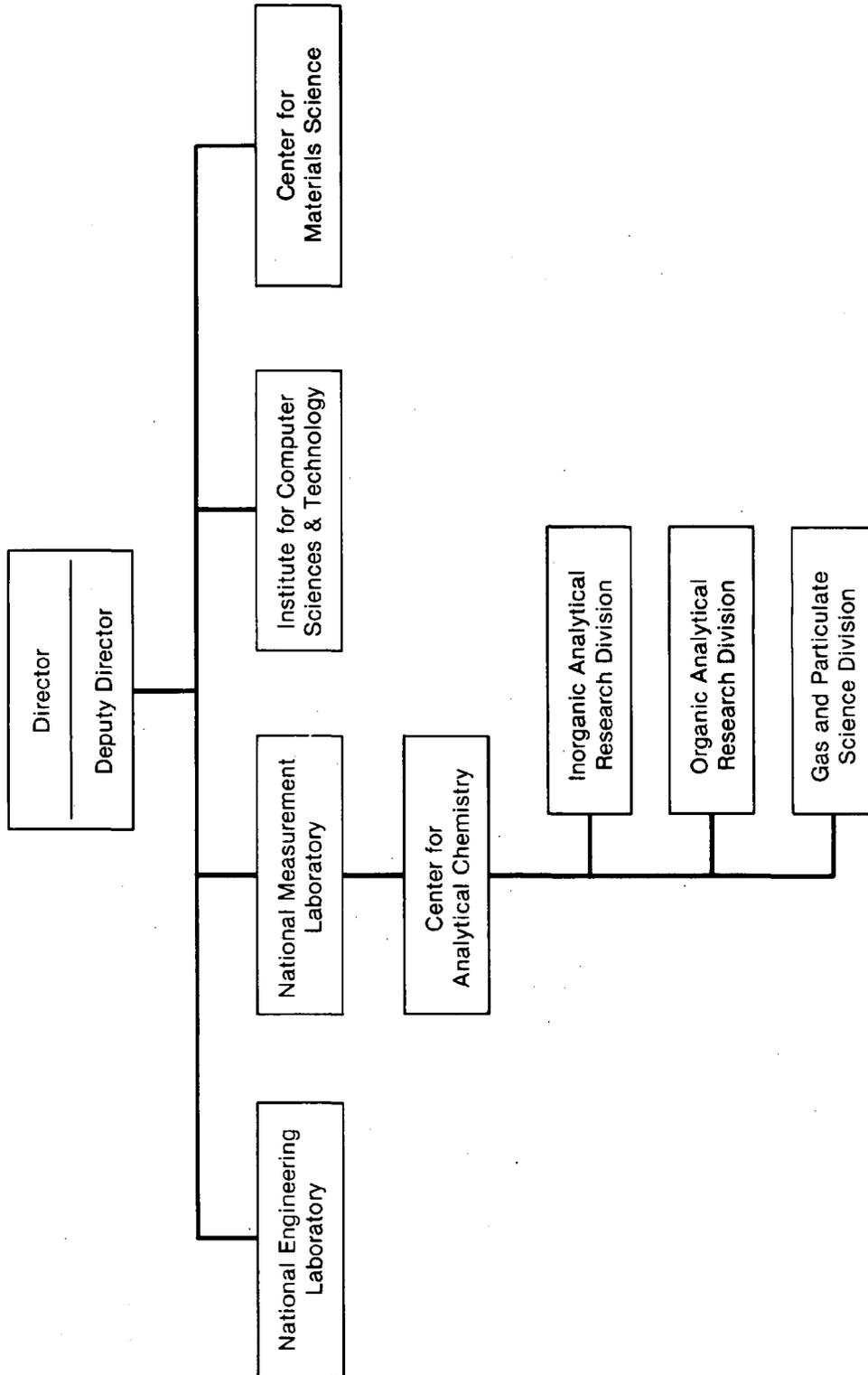
<u>FY81</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>
\$0	\$0	\$0	\$0

\* Marine pollution related activities at NBS are carried out on a reimbursable basis.

##### Program Manager

Dr. Harry Hertz  
Center for Analytical Chemistry  
National Bureau of Standards  
Washington, D.C. 20234  
(301) 921-2851

U.S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS



## LEGISLATIVE MANDATES

Under Section 2 of the Act of March 3, 1901, as amended (15 U.S.C. 272), NBS is authorized to undertake the following functions:

- o The custody, maintenance, and development of the national standards of measurement, and the provision of means and methods for making measurements consistent with those standards, including the comparison of standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the Government.
- o The determination of physical constants and properties of materials when such data are of great importance to scientific or manufacturing interests and are not to be obtained of sufficient accuracy elsewhere.
- o The development of methods for testing materials, mechanisms, and structures, and the testing of materials, supplies, and equipment, including items purchased for use by Government departments and independent establishments.
- o Cooperation with other governmental agencies and with private organizations in the establishment of standard practices, incorporated in codes and specifications.
- o Advisory service to Government agencies on scientific and technical problems.
- o Invention and development of devices to serve special needs of the Government.

Moreover, NBS is authorized under the Standard Reference Data Act (15 USC 290-290f) to provide for, in collaboration with other Federal agencies, the collection, compilation, critical evaluation, publication, and dissemination of standard reference data on physical and chemical properties of substances.

DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATIONMarine Pollution Programs

## MISSIONS AND MANDATES

The National Oceanic and Atmospheric Administration (NOAA) was established in 1970 to provide a civilian governmental focus dealing with the problems of the oceans and the atmosphere in a unified manner. The NOAA concept was the result of two concurrent trends in national science policy development: (1) a conviction that the nation should pay increased attention to the wise development of oceanic resources; and (2) a growing recognition that the oceans and the atmosphere are interacting parts of the total environmental system, and to deal more effectively with ocean-atmosphere problems, a new organizational approach was needed.

During the past 10 years, NOAA's responsibilities have grown. Now an important part of NOAA's mission relates to marine pollution and the balanced management of the marine environment. NOAA programs in support of this mission work toward the development of an information base designed to contribute to the rational, efficient, and equitable utilization, conservation, and development of our oceanic and coastal resources.

NOAA marine pollution responsibilities are specifically addressed in the National Ocean Pollution Planning Act of 1978 (33 U.S.C. 1701 et seq.). This Act directs the Administrator of NOAA, in consultation with the Director of the Office of Science and Technology Policy of the Executive Office of the President, and other appropriate officials, to prepare and update every three years a comprehensive five-year plan for the overall Federal effort in ocean pollution research, development, and monitoring (Section 4), and to provide financial assistance for such activities if they received high priority in the five-year plan and are not being addressed adequately by any existing Federal programs (Section 6). The Act directs NOAA to establish a comprehensive coordinated, and effective ocean pollution research, development, and monitoring program (Section 5), and to ensure that results, findings, and information regarding Federal ocean pollution research, development, and monitoring programs are disseminated in a timely manner and useful form to Federal and other user groups having an interest in such information (Section 8).

Additional responsibilities related to marine pollution were assigned to NOAA by the Secretary of Commerce in response to Title II of the Marine Protection, Research, and Sanctuaries Act (33 U.S.C. 1401), which directs the Secretary to establish a comprehensive and continuing program of monitoring and research with respect to the possible long-range effects of pollution, overfishing, and man-induced changes of ocean ecosystems.

Under other statutory mandates NOAA conducts, supports, or coordinates ocean resource use development programs and living marine resource management and protection programs. Several of these programs must consider the environmental impacts of resource use and development activities or the existing and potential ocean pollution conditions on living resource management.

In addition to fulfilling NOAA missions, the NOAA marine pollution programs are often performed in cooperation with other agencies, helping these agencies to achieve their missions. Cooperation among several NOAA programs and programs of the Environmental Protection Agency, the Minerals Management Service of the Department of Interior, the U.S. Coast Guard (Department of Transportation) and the Department of Energy has been particularly significant.

The NOAA marine pollution program goals reflect the goals identified for the Federal ocean pollution program in the five-year Federal Marine Pollution Program Plan, the goals of the Department of Commerce, and the missions of the Agency.

These are:

- o Guide national policy decisions on marine pollution issues based upon scientific information.
- o Provide leadership in planning and coordinating Federal marine pollution research, development, and monitoring activities; in preparing and synthesizing results from such activities; and in disseminating information in a timely manner and in useful formats to all relevant users.
- o Develop sufficient understanding of marine ecosystems to provide a sound evaluation of the impacts of the use of the marine environment as a source of renewable and non-renewable resources.
- o Support efforts to prevent, or mitigate, the effects of accidental releases of oil and hazardous materials into the marine environment.
- o Protect the integrity, productivity, and aesthetic quality of the marine system from unacceptable ocean use practices and to enhance already degraded systems by recommending possible mitigatory and/or restorative actions.
- o Document and evaluate the status and trends of source loadings, ambient levels, and biological accumulations of critical pollutants and the probable effects of these pollutants on human health and marine ecosystems.

#### Marine Pollution Programs

In FY 1983, as a result of the NOAA internal reorganization and a review of the marine pollution programs of the agency, several programs were integrated and redefined. Most of the changes occurred within the Ocean Assessments Division of the National Ocean Service. A Coastal and Estuarine Assessment Program was initiated to integrate better the coastal and estuarine studies that were supported by the former Hudson Raritan Estuary/New York Bight Project, the Puget Sound Project, the Northeast Monitoring Program (NEMP), and relevant parts of the Long-Range Effects Research Program and the Financial Assistance Program. A major emphasis

is being placed on the characterization of the current status and the spatial and temporal trends of the environmental quality of the nation's coastal and estuarine waters. A NOAA-wide Quality Assurance Program is coordinated through this program.

The Ocean Use Impact Assessment Program was established to focus the studies supported by parts of the former Long-Range Effects Research Program and the Financial Assistance Program on the impacts of specific ocean uses, such as the impacts of ocean outfalls, ocean dumping and dredging activities, and oil and gas development on the outer continental shelf (OCS), and to integrate these studies with those supported by the former Ocean Dumping Program. The current emphasis is on evaluating the effects of ocean dumping and OCS oil and gas activities.

The scope of the comprehensive, interdisciplinary assessment activities undertaken by the former Ocean Resources Coordination and Assessment Program (ORCA) has been expanded to include a number of new issues related to multiple use of resources in the proposed Exclusive Economic Zone (EEZ). The program evaluates existing and projected coastal and ocean resource demands in terms of levels of use, resource availability, pollution discharges, potential environmental impacts and use conflicts, and maintains comprehensive national inventories of coastal and ocean resources and their existing and proposed uses. It develops strategic assessment methods and maintains an operational capability with which to evaluate environmental and economic effects of national policies and management strategies affecting coastal and ocean resources. A new program, the Strategic Assessment Program, has been adopted to reflect better the type of national resource use conflict assessment activities performed.

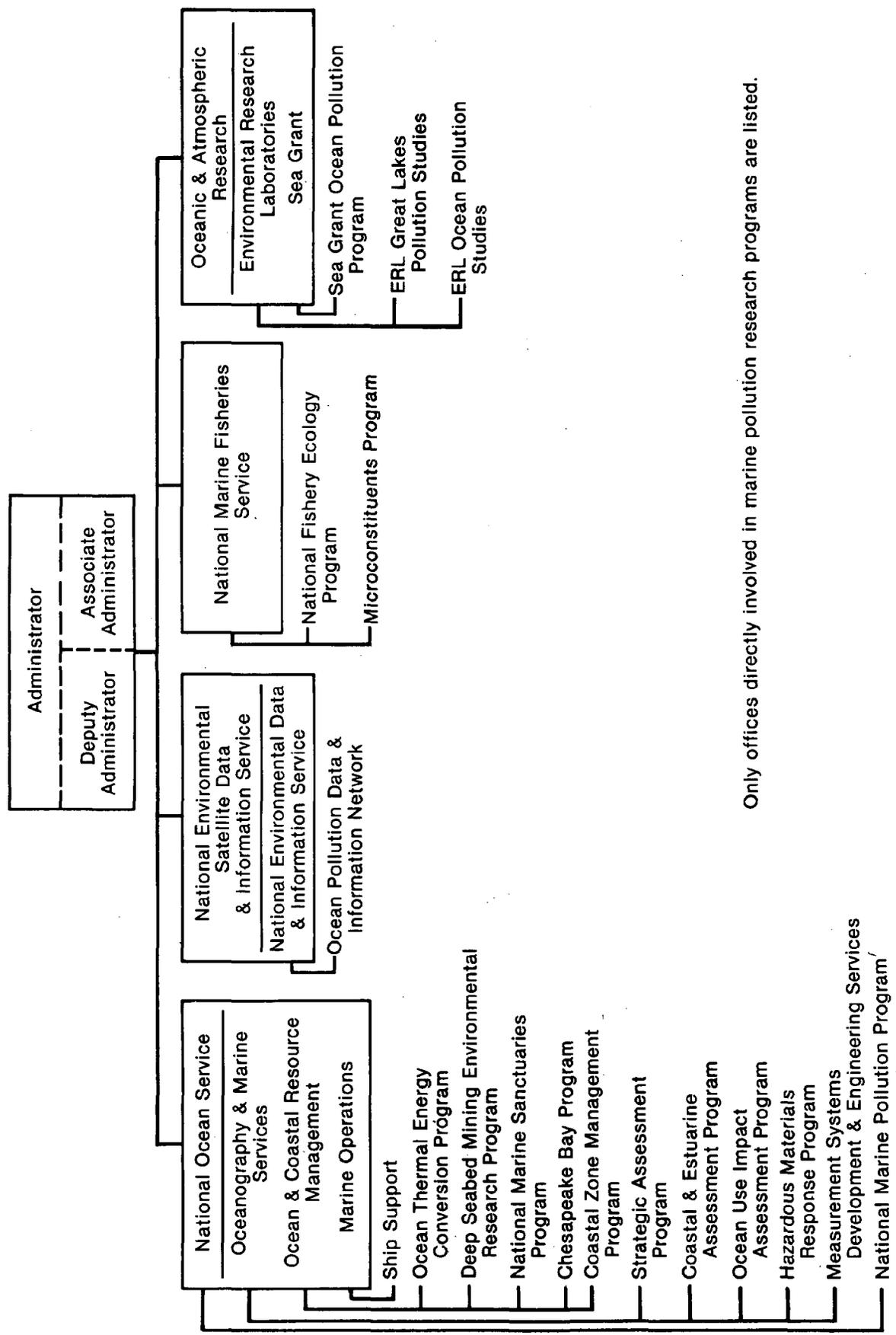
One consequence of the reorganization of the programs within the National Marine Fisheries Service was the establishment of the National Fishery Ecology Program. The new program will integrate better the marine pollution studies conducted under the former Habitat Investigation Program with investigations conducted in support of other related fishery management issues.

Because of their contribution to marine pollution management issues, three other NOAA programs have been added to the list of programs to this update. These are: the Coastal Zone Management Program, the National Marine Sanctuaries Program, and the Chesapeake Bay Program. With the reorganization and the addition of these programs, in FY 1983 NOAA had 18 programs of activities related to ocean pollution research, development, and monitoring. The description of these programs will follow the NOAA Line Organization structure.

#### FEDERAL PERSONNEL AND FACILITIES

NOAA's marine pollution-related research, development, monitoring, and management activities are conducted in four of NOAA's Line Organizations: National Ocean Service (NOS), National Marine Fisheries Service (NMFS), Oceanic and Atmospheric Research (OAR), and National Environmental Satellite Data and Information Service (NESDIS). There is a total of 227 full-time equivalent (FTE) personnel in NOAA's marine pollution program,

**U.S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**



Only offices directly involved in marine pollution research programs are listed.

DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION <sup>a</sup>

PROGRAM FUNDING SUMMARY  
RELATED TO OCEAN POLLUTION RESEARCH, DEVELOPMENT, AND MONITORING  
HISTORICAL BUDGET AND ESTIMATED OUT-YEAR FUNDING  
FISCAL YEARS 1982 - 1985

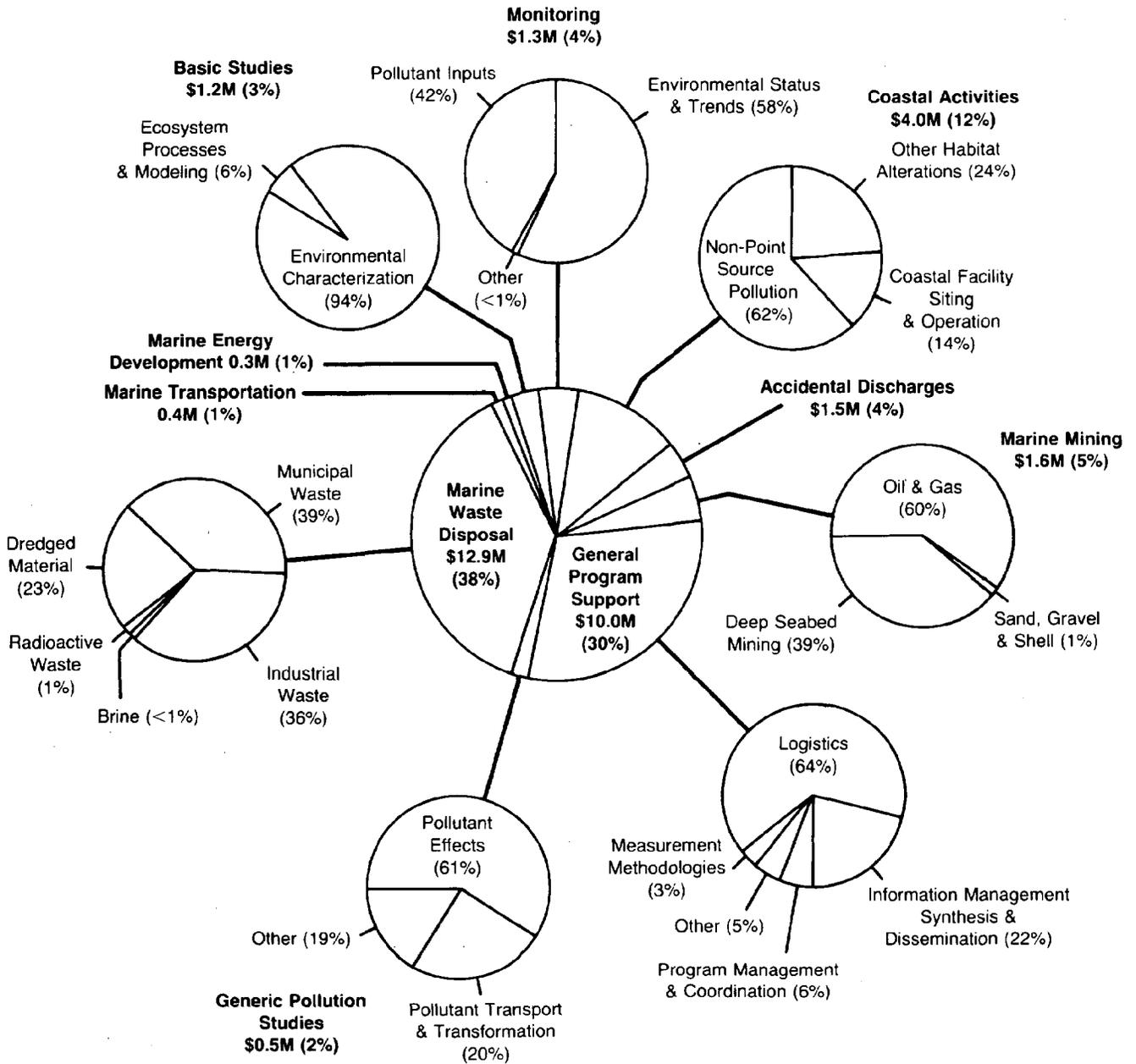
(in thousands \$)

	FY 82 (Estimated)	FY 83 (Estimated)	FY 84 (Estimated)	FY 85 (Presidential)
Coastal and Estuarine Assessment Program	5,768	7,204	7,300	4,244
Ocean Use Impact Assessment Program	5,931	3,683	3,000	484
Strategic Assessment Program	600	1,374	1,734	1,900
Hazardous Materials Response Program	932	1,305	1,500	1,400
National Marine Pollution Program <sup>b</sup>	680	692	1,263	1,263
Deep Seabed Mining Environmental Research Program	450	591	435	530
Ocean Thermal Energy Conversion Program	208	288	125	125
Chesapeake Bay Program	0	250	300	0
Measurement Systems Devel. & Engin. Svcs.	560	10	40	100
National Marine Sanctuaries Program	75	111	65	35
Coastal Zone Management Programs	1,650	350	1,050	0
Ship Support	8,899	6,349	5,988	5,000
ERL Ocean Pollution Studies	2,490	1,768	1,978	1,978
ERL Great Lakes Pollution Studies	2,478	2,262	2,478	0
Sea Grant Ocean Pollution Program	2,091	1,797	1,833	0
National Fishery Ecology Program	3,865	4,811	3,975	3,975
Microconstituents Program	181	240	90	90
Ocean Pollution Data and Information Network <sup>b</sup>	560	560	--	--
<b>NOAA TOTAL</b>	<b>37,418</b>	<b>33,645</b>	<b>33,154</b>	<b>21,124</b>

<sup>a</sup> The new configuration of marine pollution programs in NOAA under the reorganization in November 1982 is reflect in this listing.

<sup>b</sup> Starting in FY 1984, the Ocean Pollution Data and Information Network (OPDIN) is combined with the National Marine Pollution Program (NMPP). This accounts for the increased funding for NMPP between FY 1983 and FY 1984 and the zero funding for OPDIN after FY 1983.

**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY 1983 ESTIMATES**



of these NOS programs have 74 FTEs, OAR programs have 77 FTEs, NMFS programs have 72 FTEs, and the NESDIS program has 4 FTEs. The majority of these positions represent professional and technical staff (approx. 80%).

The NOS manages the NOAA fleet. Eight ships are involved in the FY 1983 and FY 1984 programs. The three Class I vessels include the DISCOVERER, RESEARCHER, and the SURVEYOR. These ships are capable of conducting worldwide oceanographic research, staying at sea for approximately 30 days. They are equipped with two oceanographic winches capable of reaching 19,000 ft, and with a deep sea winch capable of reaching 40,000 ft. Each ship has several up-to-date communication systems and navigational equipment, including a satellite navigation system. In addition to narrow beam echo-sounders, one of the ships is equipped with a side-scan sonar, and one with a Sea-Beam system. They each have modern physical, chemical, geological, and geophysical oceanographic equipment on board, over 2,000 ft<sup>2</sup> of laboratory space, and a modern computer facility.

A Class II ship, the MILLER FREEMAN, conducts mostly fishery and living marine resources research of the U.S. Pacific Coast and in Alaska waters. It is equipped with three oceanographic winches capable of reaching 19,000 ft, and three fishery winches with maximum pull of 30,000 lbs. It has several state-of-the-art communication systems and navigation equipment, including a satellite navigation system. In addition to deep and shallow water echo sounders, it has a fish finder and net sonde and fish sonar. It has sophisticated physical oceanographic equipment (STD, XBT, Rosette) and over 1,000 ft<sup>2</sup> laboratory space.

Four Class III vessels, the ALBATROS IV, McARTHUR, PEIRCE and WHITING, normally engaged in hydrographic surveys, circulatory studies, and fishery and living resources research (ALBATROSS IV), at times support the NOAA marine pollution program. Each ship has at least three oceanographic (or combination of oceanographic and fishery trawl) winches, modern communication and navigational equipment, echo sounders, physical oceanographic equipment, and shipboard computer systems.

Of the 12 marine pollution programs of NOS, only those conducted by the Office of Oceanography and Marine Services own pollution-related equipment. The list includes a large number of current meters, other physical oceanographic equipment, two Raydist navigation systems, three range-finders, several portable laboratory vans, a mass-spectrometer, atomicabsorption spectrophotometer, auto-analyser, liquid scintillation spectrometer and two gas-chromatographs.

The marine pollution programs of the NMFS are conducted at the regional fisheries centers under the National Marine Fishery Ecology Program. The majority of the activities occur at the laboratories of the Northeast Fisheries Center (NEFC) and the Northwest and Alaska Fisheries Center (NWAFC). Facilities of the NEFC laboratories include a total of approximately 110,000 ft<sup>2</sup> building and laboratory space containing scanning and transmission electron microscopes, high-speed centrifuges, atomic absorbtion spectrometers, gas and liquid chromatography apparatus,

and other specialized equipment. In addition a sophisticated pollution exposure system for fish and a satellite remote sensing system are used for the pollution program.

NWAFRC pollution research is conducted in the Seattle and Auke Bay (Alaska) laboratories. Building and lab space at these facilities totals 100,000 ft<sup>2</sup>. The laboratories are equipped for sophisticated pollution/habitat analyses, including high pressure liquid chromatographs, a combined gas chromatographic-mass spectrometer, scintillation counters, and electron microscopes (scanning and transmission).

Within OAR three laboratory facilities are devoted to oceanographic and limnological research. These laboratories are the Atlantic Oceanographic and Meteorological Laboratory (AOML), located in Miami, Florida; the Pacific Marine Environmental Laboratory (PMEL), located in Seattle, Washington; and the Great Lakes Environmental Research Laboratory (GLERL), located in Ann Arbor, Michigan. All these laboratories have major capabilities to address marine and limnological pollution problems.

At AOML a significant portion of research in physical, chemical, geological, and biological oceanography is devoted to problems in marine pollution. The facility contains 1,200 ft<sup>2</sup> of laboratory space available for pollution studies and approximately another 500 ft<sup>2</sup> of laboratory facilities in portable vans for shipboard use. A completely equipped marine chemistry and biology laboratory has the capability of studying the fates and effects of marine pollutants and their interactions with the lower trophic levels of the ocean. The laboratory is equipped to measure metals, natural and synthetic organic compounds, nutrients, and volatile components of the upper ocean. Unique equipment devoted substantially to marine pollution include a double entry clean van with class 100 quality air for trace metal research, and one extensively electronically modified Princeton Applied Research anodic stripping voltammetry polarograph.

The marine pollution research programs of PMEL are conducted in the Marine Assessment Research Division. The division has over 4,000 ft<sup>2</sup> of laboratory space in nine organic, inorganic, and radiochemistry laboratories along with a clean room and a clean van for shipboard use. Currently, these laboratories are used about 60% of the time for marine pollution research. Four gas chromatographs, two elemental analyzers, a Coulter counter, and a liquid scintillation spectrometer are entirely or substantially devoted to PMEL marine pollution research.

The pollution research in GLERL includes programs in toxic organic contaminants, and eutrophication. The 3,500 ft<sup>2</sup> of laboratory space includes a water chemistry laboratory, a sediment laboratory, a biological laboratory, and a computer laboratory, all devoting a significant portion of their time to pollution research. In addition, GLERL shares a radio-nuclide facility at the University of Michigan for its pollution research based on radiochemistry. Significant equipment capability devoted to marine pollution research include a 65-foot research vessel, a mobile chemistry and biology laboratory, various chromatographs, a Coulter counter, a liquid scintillation counter, growth chambers, alpha and gamma spectroscopy systems, and a VAX 11/780 computer system.

Within NESDIS, the National Oceanographic Data Center (NODC) provides staff and other resources to support the Ocean Pollution Data and Information Network (OPDIN). In addition to the Washington, D.C. office, part-time support of OPDIN tasks are provided by NODC regional liaison offices. The five liaison offices are located at the Woods Hole Oceanographic Institution in Woods Hole, Massachusetts, at AOML, in Miami, Florida, at the Scripps Institution of Oceanography in La Jolla, California, PMEL, in Seattle, Washington, and at the Arctic Environmental Information and Data Center, University of Alaska in Anchorage, Alaska.

Equipment at NODC includes IBM programmable work stations, a ModComp minicomputer, and access through various terminals, to the NESDIS UNIVAC 1100 systems at Asheville, NC and Suitland, MD and to the DEC 10/20 system at Waltham, MA. These major computer facilities support NODC data base and data/information transmission activities and involve large data bases associated with marine pollution concerns.

#### PROGRAM DESCRIPTIONS

##### Coastal and Estuarine Assessment Program

The Coastal and Estuarine Assessment Program was established in 1983 in order to integrate better the coastal and estuarine studies performed historically by the Hudson Raritan Estuary/New York Bight Project, the Puget Sound Project, the Ocean Pollution Monitoring Program, and relevant parts of the former Long-Range Effect Research Program and the Financial Assistance Program. The new comprehensive program conducts national and regional studies in representative coastal regions and estuaries to develop improved methods for use by NOAA, other public agencies, and the public sector in assessing throughout the Nation the effects of coastal and estuarine resource use activities. The Program: (1) provides assessment services and information to regional and local public agencies and public interest groups for developing and evaluating resource management strategies; (2) develops improved understanding of the physical, chemical, and ecological functions and processes relevant to the resolution of resource use conflicts in coastal and estuarine ecosystems; (3) and determines trends in marine environmental quality for use in identifying and evaluating chronic and cumulative environmental problems in the Nation's coastal waters. The Program has two major topical activities: (1) Status and Trends Assessment; and (2) Environmental Studies.

The Status and Trends Assessment activities will: (1) quantify the present concentrations of toxicants and pathogens in U.S. coastal and estuarine waters, sediments, and tissues of key organisms; and (2) determine the temporal trends and spatial distributions of these concentrations. Results will be used to assess the potential impact of contaminants on human health, and on protected, commercially important, and otherwise valuable living marine resources. The program will rely on a nationally uniform set of new measurements and on existing data obtained by other Federal, state and local agencies, and will ensure the quality and inter-regional comparability of marine environmental quality measurements.

Goal

The goal of the Status and Trends Assessment activities is: To characterize the current status, and the spatial and temporal trends of the environmental quality of the nation's coastal and estuarine areas.

Objectives

- Define a cost-effective plan for national surveillance of coastal and estuarine trends in environmental quality.
- Conduct a national surveillance of coastal and estuarine areas to detect large-scale spatial and temporal trends in environmental quality.
- Evaluate data from the national surveillance, from appropriate historical data bases, and from other sources to identify those marine areas, contaminants, or resources needing increased management or technical attention.
- Disseminate data, information, findings, and recommendations for use by management and the general public.

As part of the Status and Trends Assessment activities, the Coastal and Estuarine Assessment Program and the National Fishery Ecology Program will continue to support systematic physical, geochemical, and biological measurements off the northeast coast of the United States, (the Northeast Monitoring Program, NEMP) and will publish annual and other reports on the state of environmental quality of that region.

The Environmental Studies activities of the Program will develop and apply techniques and methodologies to determine the significance of the changes in marine environmental quality. These studies will link ocean-use activities, particularly marine and waste disposal practices to their environmental consequences, and will continue to improve our understanding of estuarine and coastal processes. The initial focus is on the Hudson-Raritan Estuary/New York Bight and the Puget Sound areas, but studies will be extended to other stressed environments. Selection of studies will be based on the known national significance of the problems, and on the potential applicability of the results to other stressed environments.

Goal

The goal of these Environmental Studies activities is: To assess the implications of human activities on estuarine and coastal ecosystems, and to provide recommendations for resolution of waste disposal and resource use conflicts.

Objectives

- Assess the management implications of eutrophication and low dissolved oxygen in coastal and estuarine environments to fish, shellfish, and other marine resources.

- Assess the management implications of pathogens and toxic chemicals in coastal and estuarine environments on human health.
- Assess the management implications of pollutants in estuarine and coastal environments on fisheries stocks, benthos, birds and mammals, and other marine resources.
- Develop predictive algorithms for relating pollutant loadings to effects on estuarine and coastal environments for improved management.
- Disseminate data, information, findings, and recommendations for use by management and the general public.

The Coastal and Estuarine Assessment Program also coordinates a NOAA quality assurance program for marine environmental measurements. This program will provide estimates of data quality and will maintain mechanisms for evaluating data comparability among the various NOAA laboratories, other national laboratories, and international organizations.

#### Milestones

##### FY83

- Complete interpretation of circulation in Puget Sound based on historical records.
- Complete Hudson/Raritan Estuary water quality report.
- Complete determination of priority pollutants affecting the environmental quality of the Hudson/Raritan Estuary.
- Contribute to annual report on the state of environmental quality of the Northeast U.S. coast (NEMP).

##### FY84

- Complete national review of monitoring techniques.
- Complete national inventory of monitoring programs.
- Complete nationwide evaluation of the coastal and estuarine eutrophication problem.
- Complete analysis of sampling efforts required to detect important changes in 11 measures of environmental impact.
- Continue testing of 11 indices of coastal degradation.
- Determine the relative toxicity of selected toxic chemical fractions found in Puget Sound sediments.

- Apply historical and recent scientific observations to predictions of contaminant fate and effects of Puget Sound.
- Contribute to annual report on the state of environmental quality off the Northeast U.S. coast (NEMP).
- Publish report on the comparison of distribution patterns of selected finfish and shellfish to patterns of anthropogenic and natural variables encountered in the Hudson/Raritan Estuary.

FY85

- Issue annual report on the nationwide status of coastal and estuarine quality.
- Determine trends of histopathological disorders among bottom fish in Puget Sound.
- Determine human exposure to toxicants through consumption of noncommercial fish caught in Puget Sound.
- Document associations between historical declines of finfish and shellfish in five northeastern estuaries and pollution in these estuaries.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$5,768	\$7,204	\$7,300	\$4,244

\* Presidential budget submission

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Ocean-Use Impact Assessment Program

The Ocean-Use Impact Assessment Program (OUIAP) assesses the impacts of specified, individual ocean use activities, such as ocean dumping, outer continental shelf oil and gas exploration and development, and marine mining; quantifies the potential sources, transport, and transformations of contaminants associated with specific ocean-use activities; identifies and quantifies the short- and long-term effects of contaminants and other environmental perturbations associated with specific ocean-use activities on marine resources-at-risk from those activities; and

interprets the effects of specified activities based on prototype site-specific or process-specific studies and develops and evaluates management strategies for use by NOAA, other public agencies, and the private sector.

The goals of the OUIAP are to quantify the environmental consequences of existing and proposed resource-management and development activities and to develop management recommendations that will ensure adequate protection of the ocean environment. The OUIAP currently emphasizes two categories of ocean use: deliberate waste disposal into the oceans and oil and gas development on the outer continental shelf.

A program of research was established in 1977 to carry out Section 201 of the Marine Protection, Research, and Sanctuaries Act of 1972 (P.L. 92-532). This Act requires NOAA to conduct a comprehensive and continuing program of research and monitoring on the effects of ocean waste disposal. Study of ocean waste disposal has consisted primarily of investigations centered on specific wastes being dumped at specific locations and complementary laboratory research on ecological contamination. The assessment techniques developed as a result of research and monitoring efforts will be tested and applied at other sites in support of developing generic technical approaches and overall management strategies for marine waste disposal.

An Outer Continental Shelf Environmental Assessment Program (OCSEAP) was established in 1974, by an Interagency Agreement between NOAA and the Department of the Interior's Minerals Management Service. This program was incorporated into OUIAP in 1983. Through OCSEAP, we conduct a multi-disciplinary research program to identify and predict the potential environment effects of oil and gas development on the Outer Continental Shelf, particularly around Alaska. About 50 research projects, encompassing biological, chemical, geological, and physical aspects of environmental assessments are conducted each year in accord with the needs and timing of specific leasing decisions of the Department of the Interior. The results of these projects are integrated and interpreted to support leasing and management decisions related to OCS oil and gas development.

### Objectives

#### A. Ocean Dumping

- Identify and quantify the short- and long-term effects of contaminants and other environmental perturbations associated with ocean waste disposal on marine resources at risk from this activity.
- Provide ability to predict contaminant distributions and biological responses due to proposed ocean waste disposal plans.
- Define monitoring strategies to test predicted effects of waste disposal.
- Interpret the effects of ocean dumping on prototype site-specific and process-specific studies and develop and evaluate management strategies for use by Federal, state, and local agencies.

**B. OCS Oil and Gas Development**

- Provide information about the OCS environment that will enable DOI to make sound management decisions regarding the development of mineral resources on the OCS.
- Acquire information that will enable DOI to identify those aspects of the environment that might be affected by oil and gas exploration and development.
- Establish a basis for predicting the effects of OCS oil and gas activities on the environment.
- Acquire impact data that may result in modification of leasing stipulations, operating regulations, and OCS operating orders in order to permit more efficient resource recovery with adequate environmental protection.

**Accomplishments****A. Ocean Dumping**

- Published assessments of waste distributions and effects at the two U.S. deep ocean dumpsites.
- Predicted consequences of large volume sewage sludge dumping at a deep ocean site off U.S. east coast.
- Evaluated variations of and reasons for phytoplanktonic responses to trace metal contamination as a function of metal, oceanic region and complexation capacity of water.
- Tested techniques for identifying planktonic communities as being affected by water contamination.
- Examined the effects of particle concentration and turbulence on the rate of descent of ocean disposed sewage sludge particles.
- Investigated the possible relationship among tissue contamination in marine animals, biochemical alterations and lowered abundance of fishery resources.
- Researched those factors affecting transfer of contaminants from waste to marine organisms which are subject to management control.
- Found that human enteroviruses have survived in sediment at a sewage sludge disposal site 17 months after disposal ended.

**B. OCS Oil and Gas Development**

- Published numerous synthesis reports describing resource distributions, circulation features and potential impacts in Alaskan OCS areas proposed for leasing.

- Developed seismic risk analyses for coastal and nearshore Alaskan regions.
- Investigated regional circulation and meteorology in Alaska and modeled oceanographic circulation as a basis for predicting spill trajectories.
- Investigated and described the distribution of subsea permafrost and ice gouging features that could restrict oil and gas development.
- Investigated the seasonal distribution, abundance, habitat and trophic dependencies, and behavior of biological resources that could be impacted by oil and gas development.
- Investigated and modeled the weathering, transport and biological effects of petroleum in Alaskan regions.

### Milestones

FY83

#### A. Ocean Dumping

- Prepared a progress report on the horizontal and vertical transport model for sewage sludge at the northeast deep ocean sites.
- Prepared report, with EPA and NMFS, on assessment of the impacts of past, ongoing, and proposed ocean dumping activities at the 106-mile dumpsite.
- Completed Proceedings of the 3rd International Ocean Dumping Symposium.
- Submitted a mathematical model for horizontal and vertical transport of sewage sludge.

#### B. OCS Oil and Gas Development

- Published synthesis reports on the possible consequences of oil and gas development in the St. George Basin and Beaufort Sea (Sale 71) areas, respectively.
- Conducted two Synthesis Meetings related to proposed oil and gas development in the Navarin Basin and Diapir Field.
- Conducted a three-day workshop to develop a monitoring program for detection and documentation of environmental changes that may result from OCS oil and gas development and production in the Beaufort Sea.
- Published annual report for FY82 and Technical Development Plan for FY84.

FY84

## A. Ocean Dumping

- Complete Proceeding of the 4th International Ocean Dumping Symposium.
- Complete comprehensive report on the biological uptake of contaminants from sewage sludge-amended sediments.
- Complete report on the oceanic transport of sewage sludge disposed at sea.
- Complete draft monitoring plan for the 106-mile dumpsite.
- Submit Volumes 4, 5, and 6 of the International Ocean Disposal Symposium Volumes to the publisher. These volumes contain technical and summary chapters on wastes from energy production, deep-sea disposal and near-shore disposal.
- Submit FY83 Title II Report to Congress to NOAA Administration.

## B. OCS Oil and Gas Development

- Prepare FY 83 Annual Report to Minerals Management Service.
- Prepare operational schedules, including helicopter and ship support schedules.
- Complete draft monitoring plan for the Beaufort Sea OCS area.
- Publish FY85 Technical Development Plan.
- Complete synthesis reports on the Barrow Arch and North Aleutian Shelf Lease Areas.

FY85

## A. Ocean Dumping

- Conduct 5th Ocean Dumping Symposium.
- Complete report on contaminant transfers, transformation, and impacts resulting from dredged material disposal.
- Develop comprehensive methods for risk assessment and economic evaluations for ocean-dumped waste material.
- Develop comprehensive methods for risk assessment and economic evaluations for ocean-dumped waste material.

## B. OCS Oil and Gas Development

- Prepare FY84 Annual Report and FY86 Plan for MMS.

- Conduct synthesis meetings and prepare reports for current lease areas.
- Prepare extended monitoring plans for Alaskan OCS area.

Estimated Funding (in thousands \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$5,931	\$3,683	\$3,000	\$484

\* Presidential budget submission

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Strategic Assessment Program

This program is carried out by the Strategic Assessment Branch (SAB) of the Ocean Assessments Division, Office of Oceanography and Marine Services, National Ocean Service, National Oceanic and Atmospheric Administration.

Through its Strategic Assessment Program, SAB conducts comprehensive interdisciplinary assessments of multiple ocean resource uses for the Nation and its major coastal and ocean regions to determine marine resource development strategies which will result in maximum benefit to the Nation with minimum environmental damage or conflicts among uses. To accomplish this goal, SAB evaluates existing and projected ocean resource demands in terms of levels of use, resource availability, pollution discharge, potential environmental impacts and use conflicts, and maintains comprehensive national inventories of coastal and ocean resources and their existing and proposed uses. SAB develops strategic assessment methods and maintains an operational capability with which to evaluate the environmental and economic effects of national policies and management strategies affecting coastal and ocean resources.

A series of five regional assessments of the entire U.S. Exclusive Economic Zone (EEZ) has been initiated to identify significant resource use conflicts before they occur. SAB is currently working on regional assessments of the Gulf of Mexico, and Bering, Chukchi, and Beaufort Seas. A regional assessment has been completed for the east coast. Data collection for the west coast will be initiated this year. Two important components of the Strategic Assessment Program are the development and maintenance of a national coastal pollution discharge inventory and an automated data base on the spatial and temporal distribution of the life history of living marine resources in the EEZ. These assessments are unique within NOAA because of their comprehensive national focus.

Objectives

The marine pollution related objectives of the program are to:

- Identify and quantify present or potential pollution related ocean resource use conflicts for the Nation;
- Collect and synthesize information on coastal and ocean pollution discharges in the Nation's coastal and ocean regions to assist decisionmakers in developing and evaluating resource management strategies; and
- Develop an operational national level capability to enable assessment of significant marine pollution and resource use management strategies in a timely, comprehensive, and cost effective manner.

MilestonesFY 1983

- Initiate expansion and update of east coast and west coast components of National Coastal Pollutant Discharge Inventory.
- Complete analysis of operational discharges of oil from marine transportation sources for the east coast.
- Complete estimates of sludge production in municipal wastewater treatment plants in the Nation's coastal zone.
- Complete development of operational framework for identifying and evaluating alternative ocean dump sites.
- Complete development of framework for developing a National Estuarine Inventory.

FY 1984

- Submit Gulf of Mexico Data Atlas to printer.
- Complete data summaries and documentation for the Gulf of Mexico component of the National Coastal Pollutant Discharge Inventory.
- Complete computer entry and edit of Gulf of Mexico component of Living Marine Resource Data Base.
- Complete revisions of living marine resource maps for Bering, Chukchi, Beaufort Seas assessment.
- Initiate living marine resource data collection for the west coast and Gulf of Alaska.
- Complete analysis of operational discharges of oil from marine transportation sources for the west coast.

- Complete development of surface pollutant transport model for the west coast.
- Complete development of "simple" subsurface pollutant transport for the east coast.
- Initiate data collection and synthesis for developing a National Estuarine Inventory.
- Initiate data collection and synthesis for a national assessment of marine recreation values.

FY 1985

- Complete east coast component of National Coast Pollutant Discharge Inventory.
- Complete data collection and national assessment of marine recreation values.
- Complete development of major components of National Estuarine Inventory.
- Complete computer entry of Bering, Chukchi, and Beaufort Seas component of Living Marine Resource Data Base.
- Initiate data collection for nonliving marine resource data elements for West Coast Data Atlas.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$600	\$1,374	\$1,734	\$1,900

\* Presidential budget submission

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Hazardous Materials Spill Resonse Program

The Hazardous Materials Response Program is a participant in the National Oil and Hazardous Substances Pollution Contingency Plan, which was formulated in accordance with the Federal Water Pollution Control Act, to coordinate response by departments and agencies of the Federal Government in an effort to protect the environment and minimize damage from pollutant

discharges. NOAA has the lead in developing scientific plans and coordinating scientific input related to spills occurring in coastal waters, the 200-mile fisheries economic zone, and the Great Lakes.

#### Goal

The goal of the project is to protect regions of the United States coastal zone from adverse impacts which may result from major spills of oil and other hazardous substances.

#### Objectives

The objectives of the project are to:

- Provide the National Response Team, Regional Response Teams, and On-Scene Coordinators with highly qualified scientific assistance in mitigating or preventing the human health, environmental, and socio-economic impacts of spills of oil or hazardous substances;
- Develop and establish appropriate plans and procedures for dealing with scientific aspects of spills of oil and hazardous substances of major concern;
- Provide scientific assistance in assessing the environmental and socio-economic damage resulting from such spills; and
- Maximize the research advantage offered by spill situations, especially opportunities for research which will improve future response capabilities.

#### Milestones

A major activity within the FY82-85 period will be the development of scientific plans or upgrading of existing scientific response plans for various regions of the United States coastal zone. Development of such plans include the following:

#### FY 1983

- Train response personnel in hazardous material operations involving most commonly spilled substances.
- Place response personnel in each of the coastal regions relative to local U.S. Coast Guard Districts.
- Fully equip response personnel for field sampling and analysis of hazardous materials.
- Expand the listing of high risk substances information on proper response measures for response personnel.

FY 1984

- Develop scientific response plans for the ports of Anchorage, Seattle, San Francisco, New Orleans, Miami, Norfolk, Portland (Maine), and Chicago.
- Expand training of spill response personnel to include additional hazardous substances.
- Conduct dispersant use workshops in Federal Regions 2, 3, 4, 9 and 9 Oceania.
- Develop rapid and effective on-scene analytical techniques to detect human exposure to toxic chemicals.
- Establish professional computer communications and information management expertise for the use of regional personnel.

FY 1985

- Continued development and support of Scientific Support Coordinators' (SSC's) capabilities in each U.S. Coast Guard District.
- Application of a methodology which results in the identification and ranking of problems associated with toxic chemical intrusion into U.S. coastal waters.
- Modify "off-the-shelf" analytical equipment to meet the requirements of emergency spill responses.
- Continued development and expansion of NOAA's system for providing chemical and toxicological information in support of Federal spill response efforts.
- Develop computerized Environmental Sensitivity Index (ESI) maps.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$932	\$1,305	\$1,500	\$1,400

\* Presidential budget submission

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### National Marine Pollution Program

The National Marine Pollution Program Office (NMPPPO), a staff office to the Assistant Administrator for Ocean Services and Coastal Zone Management, is concerned with the coordination of ocean pollution research, development, and monitoring programs supported by all Federal departments and agencies. NMPPPO conducts these activities in response to the mandate of the National Ocean Pollution Planning Act (Section 4).

#### Goal

The goal of NMPPPO is to improve the planning and coordination of ocean pollution research programs conducted by all Federal agencies and departments. NMPPPO facilitates the coordination of activities among 16 Federal agencies to assure that national research needs related to ocean pollution are appropriately addressed by the overall Federal program, and that unnecessary duplication and overlap are avoided.

#### Objectives

NMPPPO has two major programmatic objectives. The first objective is to periodically revise the National Marine Pollution Program Plan. This involves compiling and analyzing information on all ocean pollution programs supported by Federal agencies. The interval between National Plans is 3 years.

NMPPPO's second objective is to increase the effectiveness of the National Program by coordinating and facilitating the implementation of recommendations in the National Marine Pollution Program Plan. This is accomplished through a variety of mechanisms such as developing implementation strategies, working closely with individual agency representatives to assure progress, and providing "seed money" and a contracting umbrella for efforts supported by several concerned agencies.

#### Milestones

Future efforts by NMPPPO will focus on two major areas: (1) plan preparation; and (2) implementation of recommendations. The activities related to plan preparation involve describing and analyzing Federal programs and are performed on a continuing basis. Specific tasks in this area are:

- o Review and update the Federal Plan every 3 years. The third plan is due to Congress in September 1985. In preparation for the third plan, a workshop on national marine pollution was held in the Spring of 1984.
- o Revise the Program Summary every year.
- o Revise the Project Catalog every year.

Activities in the implementation area change depending on the selection of recommendations included in the current Plan, and progress made toward implementing recommendations. Tasks in this area for FY 1984 and FY 1985 include:

- o Evaluate needs for further research on long-term effects of OCS oil and gas development.
- o Determine ocean pollution research requirements related to increasing coal use and export.
- o Develop an interagency Action Plan for Ocean Dumping Research and Monitoring
- o Develop an interagency Action Plan for Radioactive Waste Disposal Research.
- o Conduct an assessment of quality assurance programs used by Federal agencies for making chemical measurements, and implement recommendations for standardization and coordination.

These objectives address the most important recommendations in the Federal Plan for FY 1981 - FY 1985. Recommendations that will appear in subsequent Federal plans cannot be specifically identified at this time. However, it is likely that implementation efforts during FY 1985 - FY 1989 will include the following:

- o Implement the recommendations of the study on long-term effects of OCS oil and gas development.
- o Coordinate the implementation of an interagency monitoring program for assessing the status of coastal and estuarine areas in the U.S.
- o Promote implementation of Action Plans for Ocean Dumping and Radioactive Waste Disposal.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84*</u>	<u>FY85**</u>
\$680	\$692	\$1,263	\$1,263

\* Starting in FY 1984 the Ocean Pollution Data Information Network is combined with the National Marine Pollution Program (see page II-253)

\*\* Presidential budget submission

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Deep Seabed Mining Environmental Research Program

Public Law 96-283, The Deep Seabed Hard Mineral Resources Act of 1980 requires NOAA to establish a program to encourage and regulate the exploration and commercial recovery of hard mineral resources of the deep seabed by U.S. citizens. It gives the Administrator of NOAA the responsibility for issuance of licenses and permits for the exploration and commercial recovery of these resources, and for the development of regulations for the protection of the marine environment, conservation of natural resources, and preservation and safety of life and property at sea. It also directs the Administrator of NOAA to "...expand and accelerate the program assessing the effects on the environment from exploration and commercial recovery activities; including sea based processing and the disposal at sea of processing wastes..." to support the regulatory framework.

The Deep Ocean Mining Environmental Study (DOMES), which was completed by NOAA in September 1980, provided a broad characterization of the area of potential mining in the Pacific Ocean, a first-order predictive capability relating to the impacts from mining and the framework within which to refine predictions and assessments of potential environmental impacts. NOAA also has performed research on nodule processing activities to permit the assessment of potential onshore and near-shore effects. During the period of FY 1982 - FY 1985, NOAA's research will focus on the potential long-term impacts from deep seabed mining and from the development of an effective monitoring strategy.

Program DescriptionGoal

The goal of this research program is to provide relevant and timely scientific information to enable government decisions to be made regarding the mining of hard mineral resources in the deep ocean in an environmentally sound manner.

Objectives

The major program objectives during FY 1982 - FY 1985 are to improve predictions of potential adverse impacts from mining through:

- Improvement in plume modelling, both surface and benthic.
- Better definition of environmental characteristics in the area of potential mining and analysis of the potential change in these characteristics that would result from mining activities.
- Development of models for assessment of benthic impact.
- Study of an area that has been impacted by test mining.
- Evaluation of the feasibility of simulating a small-scale, benthic mining "impact."

Previous Work

Since the DOMES program was completed in 1980, NOAA has primarily concentrated its marine environmental efforts on literature analyses and laboratory experiments addressing both marine environmental effects and issues associated with waste disposal. Recently completed work has suggested that at sea disposal of nodule processing wastes may be a viable option, pending more complete analysis of the waste characteristics and the location where disposal is being considered. The surface discharge resulting from onboard separation of the nodules from the sediment appears to sink more rapidly than originally predicted due to a larger component of larger, denser particles and agglomerates. Pycnocline accumulation of the fine particles in the discharge was suggested as a potential problem, but appears, after laboratory measurements were made of settling velocities of mining particles, not to be a real concern. Feeding inhibition of larval billfish and tuna by increased suspended matter concentrations does not appear to be likely due to the high dilution that occurs upon discharge and the characteristics of these fish that would likely mitigate such an effect.

As a result of these efforts, NOAA's primary research has shifted from the water column effects to evaluation of the severity of the benthic impact and effective means to assess impact. In FY 1982, NOAA funded the National Academy of Sciences' Ocean Policy Committee to conduct an analysis of the scientific validity of the concept of "stable reference areas." These areas are required by law to be negotiated with other potential mining nations to serve as a reference zone against which the impact of mining can be assessed. They are also to serve as a preserve for the maintenance of representative biota of the deep seabed. The Academy conducted four meetings during FY 1982 and FY 1983 and issued a final report in December 1983 presenting their recommendations. This report states that the concept is scientifically valid if two types of areas are defined, one for assessment purposes, the other for preservation of biota. The report also lays out a research program to develop the information base to better define an effective assessment or monitoring program and to identify characteristics of areas for preservation. The majority of NOAA's deep seabed mining research in the next five years will be directed toward the benthic research recommended in this report.

MilestonesFY 1982

- Complete evaluation of the at-sea waste disposal option.
- Refine mining plume dispersion model through laboratory studies.
- Initiate evaluation of stable reference area concept.
- Evaluate the potential for adverse effects on larvae of commercial fisheries from deep seabed mining.
- Complete analysis of the potential adverse effects on zooplankton as a result of trace metal uptake.

FY 1983

- Complete analysis and characterization of manganese processing wastes for the evaluation of onshore and offshore disposal options.
- Complete laboratory work determining settling velocity spectra for representative mining discharges.
- Deploy equipment to measure near-bottom currents and suspended sediment concentrations.
- Complete meetings on stable reference area concept and scientific implementation.
- Initiate field study of recovery of area following test mining.
- Initiate development of models to better define important parameters to sample for assessing benthic impact and to predict benthic successional patterns that may be expected following mining impact.
- Initiate further analyses of benthic samples collected in area of potential mining.
- Initiate analysis of feasibility of conducting a small-scale, controlled benthic impact study, simulating benthic mining plume effect.

FY 1984

- Complete evaluation of benthic recovery at test mining area.
- Analyze benthic current and nephelometer data collected over one year in area of potential mining.
- Continue sampling and successional model development.
- Continue benthic sample analysis.
- Continue analysis of feasibility of controlled impact study.
- Begin study evaluating settling velocity spectra of abyssal sediments.

FY 1985

- Continue analyses of benthic samples.
- Continue development of models.
- Continue evaluating feasibility of controlled impact study.
- Evaluate alternative remote sensing strategies for monitoring seabed mining environmental effects.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$450	\$591	\$435	\$530

\* Presidential budget submission

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Ocean Thermal Energy Conversion Program

The Ocean Thermal Energy Conversion Act of 1980 (P.L. 96-320) authorizes NOAA to develop and implement a licensing program for commercial ocean thermal energy conversion (OTEC) facilities and plantships. In response to that mandate, NOAA established the Office of Ocean Minerals and Energy (OME) office that now resides within the Office of Ocean and Coastal Resource Management, National Ocean Service. OME is responsible for NOAA's OTEC program responsibilities as well as those assigned to NOAA by the Deep Seabed Hard Mineral Resources Act of 1980 (P.L. 96-283).

The OTEC legislation assigned to NOAA three specific areas of responsibility: regulation development and licensing, compliance monitoring, and environmental research and assessment.

OTEC Regulation Development and Licensing -- NOAA was given the responsibility to develop the OTEC licensing regime required by P.L. 96-320, including the issuance of draft and final licensing regulations, and to operate a unique "one-stop" program for licensing OTEC facilities and plantships.

OTEC Compliance -- NOAA is charged with responding to the requirements of P.L. 96-320 regarding monitoring of OTEC licensees' activities and ensuring compliance with the terms, conditions, and restrictions of OTEC licenses and other statutory requirements applicable to OTEC construction, ownership, location, and operation.

OTEC Environmental Research and Assessment -- NOAA is responsible for meeting the requirements of Section 107 of the Act regarding protection of the environment. This includes preparing and submitting to the Congress the OTEC environmental effects assessment program plan required by the Act; initiating environmental effects studies in those areas where uncertainties threaten to impede orderly development of the U.S. OTEC industry; and analyzing environmental information and preparing environmental impact statements so as to make informed decisions on individual OTEC facility and plantship license applications.

Goal

The goal of the environmental segment of the OTEC Program is to develop the scientific and technical information necessary to provide for protection of the marine and coastal environment and to minimize any adverse environmental impact which might occur as a consequence of the commercial development of ocean thermal energy conversion facilities and plantships under the legal requirements mandated by the Ocean Thermal Energy Conversion Act.

Objectives

The objectives are to:

- o Determine any short-term and long-term effects on the environment which may occur as a result of the operation of OTEC facilities and plantships;
- o Determine the nature and magnitude of any oceanographic, atmospheric, weather, climatic, or biological changes on the environment which may occur as a result of deployment and operation of large numbers of OTEC facilities and plantships;
- o Determine the nature and magnitude of any oceanographic, biological, or other changes in the environment which may occur as a result of the operation of electric transmission cables and equipment located in the water column or on or in the seabed, including the environmental hazards of accidentally severed cables; and
- o Determine whether the magnitude of one or more of the cumulative environmental effects of deployment and operation of large numbers of OTEC facilities and plantships requires that an upper limit be placed on the number or total capacity of such facilities or plantships to be licensed under P.L. 96-320.

Accomplishments

Section 107 of the OTEC Act of 1980 required NOAA to initiate a program to assess the effects on the environment of ocean thermal energy conversion facilities and plantships. Furthermore, a plan for carrying out this program was required. The development of an environmental effects research plan commenced in FY 1981; after a number of revisions, the plan was finalized and published in June, 1982. The plan identifies general research needs and identifies priorities and the associated budget needs for FY 1981-FY 1983.

Also initiated in FY 1981 was a study to define screening procedures that would aid in assessing the completeness of the environmental assessments in an application for a commercial OTEC license. The final report outlines methods for quick assessments of the hydrodynamic influence of OTEC plants, and identifies screening procedures based upon biological and other concerns.

Two environmental studies were initiated in FY82: a study to determine the regional influence of an OTEC operation, and a study to begin to identify the potential risk to commercial and recreational fisheries of OTEC operations. These two topics were identified in the environmental effects assessment research plan as being of high priority. The results of the "regional influence" study will provide NOAA with a basis for defining the area within which one OTEC plant might be expected to impinge on the operation of another OTEC plant (Section 102 (3)(1)), and for determining physical-chemical perturbations to the water column that could result in biological effects. The fisheries study is a synthesis of existing information that may have pertinence to OTEC operations, and an extrapolation to possible impacts on fisheries. The key concerns here will be entrainment and impingement, biocide usage, seawater redistribution, and attraction and avoidance. NOAA believes that there is existing information on these topics, gained from other coastal activities such as conventional and nuclear-fueled power plant operations, that has application to OTEC operations. The synthesis of this information will provide a first step in assessing the potential risk to fisheries of OTEC operations, and in defining the detailed requirements of future research efforts.

#### Milestones

##### FY83

- o Continue study of water mass redistributions and the regional influence of OTEC operations.
- o Complete initial study of the potential risk to commercial and recreational fisheries of OTEC operations.

##### FY84

- o Complete study of water mass redistributions and the regional influence of OTEC operations.
- o Initiate additional studies on the impacts to commercial and recreational fisheries of OTEC operations (based on results of the FY82-83 study).

##### FY85

- o Continue studies on the impacts to commercial and recreational fisheries of OTEC operations.
- o Initiate monitoring studies of any operating OTEC plants.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$208	\$288	\$125	\$125

\* Presidential budget submission

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Chesapeake Bay Program

In FY 1983 and FY 1984 the Congress made available to NOAA special appropriations for use in long-term monitoring, research and management activities pertaining to the Chesapeake Bay. These funds have been granted as a Coastal Zone Management Interstate Grant, under Section 309 of the Coastal Zone Management Act, to the Maryland Department of Natural Resources (DNR), acting on behalf of the members of the Chesapeake Bay Implementation Committee.

Entities receiving funding under the FY 1983 award include the Maryland DNR, Maryland Sea Grant, the Virginia Marine Resources Commission, the Virginia Institute of Marine Science, and Pennsylvania's Susquehanna River Basin Commission. These funds were spent to procure a VAX 11/780 computer system and other ADP equipment for the monitoring program, for a juvenile fish survey in the Upper Chesapeake, the reformatting of Pennsylvania's juvenile fish data, and monitoring activities in the Upper Bay. The Maryland DNR is preparing another Section 309 grant application on behalf of the Committee for use of FY 1984 funds.

Goal

The improvement of the Chesapeake Bay and its resources.

Objectives

Support of research, monitoring and management activities necessary to meet this goal.

Milestones

- Completion of FY 1983 projects by June 30, 1984.
- Award of FY 1984 grant funds by June 30, 1984.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$0	\$250	\$300	\$0

\* Presidential budget submission

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Measurement Systems Development and Engineering Services Program

This program is designed to provide NOAA with the necessary technology and engineering for meeting its mandate of conducting a comprehensive and coordinated ocean pollution research, development, and monitoring program. The major functions of the program are to advance technology, engage in engineering development and research, and provide engineering support to NOAA and other Federal agencies.

Implicit in NOAA's mission to assess the impact of pollution on ocean, coastal, and Great Lakes ecosystems is the measurement of pollutant levels and determination of how environmental conditions influence their distribution and concentration. Therefore, the technology development goals of NOAA are directed toward improving measurement capabilities, which in turn improve NOAA's effectiveness in responding to its ocean pollution mission.

Goal

The goal of the program is to assure that the observational equipment and systems provide the most effective response to the stated missions of NOAA's pollution-related research and monitoring programs.

Objectives

- Develop and demonstrate new and improved experimental in situ chemical measurement sensors and techniques (i.e., enzyme-pollution detector; profiling dissolved oxygen sensor; and automated in situ sampler for trace organics).

Accomplishments - FY 1982

- Miniature dissolved oxygen (D.O.) sensors have been fabricated with membrane coatings to evaluate the effect of this coating, particularly with respect to water flow sensitivity. Testing had commenced and is expected to be completed in early FY 1983. A pressure chamber was fabricated to evaluate the effect of pressure on sensor performance. Tests began at the University of Rhode Island for completion in FY 1983. All the required laboratory tests on a profiling D.O. system have been completed.
- The development of a breadboard for the biodetection (enzyme) system has been completed and tested. The enzyme chosen (G6PD) is a dehydrogen that has a sensitivity to selected metal. Other members of this class should not require the lengthy experimentation necessary for immobilization and use.
- A prototype automated in-situ trace organic sampler was developed, and testing of programming and mechanical parts were completed at the manufacturer's plant as specified. Evaluation of several collector materials at Florida Institute of Technology (FIT) has shown XAD-2 and Tenax resins to be superior in collecting properties to other materials for general analytical properties.
- A study contract was awarded to EG&G to develop a systems-analysis approach for determining optimal mix or "mixes" of observational platforms and techniques necessary to perform those observations required in the conduct of NOAA's marine pollution-related measurement programs.

MilestonesFY 1983

- Complete tests of new porous membrane materials and multiple cathode geometrics for reduction of sensitivity to flow and the effect of pressure on sensor performance.
- Completed the first three phases of a four-phase program designed to determine the optimal mix of monitoring platforms and techniques. The first phase will consider pollution monitoring data requirements relative to objectives. The second phase identifies alternative measurement options, and the third deals with the design of a statistically valid monitoring scheme. The final phase will trade off the options within the scheme and determine the "optimal" mix or mixes of observational platforms and techniques necessary to produce the required data.
- Evaluate the capability of the laser raman spectroscopy technique to measure several selected marine pollutants.

FY 1984

- Determine limits of detection of selected pollutants, phenols, by the laser-raman technique.

FY 1985

- Determine precision and accuracy of the laser-raman technique; design a shipboard unit; and perform at-sea trials.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$560	\$10	\$40	\$100

\* Presidential budget submission

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National Marine Sanctuaries Program

The National Marine Sanctuary Program was established in 1972 to carry out Title III of the Marine Protection, Research, and Sanctuaries Act (P.L. 92-532), which authorizes the Secretary of Commerce to designate ocean waters as national marine sanctuaries for the purpose of preserving or restoring their conservation, recreational, ecological or esthetic values. The Program is managed by the Sanctuary Programs Division (SPD) in the Office of Ocean and Coastal Resource Management (OCRM).

The Program presently manages six national marine sanctuary sites: USS MONITOR (North Carolina), Gray's Reef (Georgia), Key Largo (Florida), Looe Key (Florida), Channel Islands (California) and Point Reyes-Farallon Islands (California). Research investigations at each site address resource management issues.

A major investigation sponsored by SPD at Key Largo National Marine Sanctuary addresses marine pollution issues. A multi-year interdisciplinary research project is underway to develop a hydrodynamic water quality model of the Sanctuary and surrounding areas. The research program centers on the investigation of the following: (1) spatial and seasonal water circulation patterns; (2) water quality parameters; and (3) community metabolism. The long-term data sets (since 1980 and continuing) used to generate the model include measurements of current speed and direction, water temperatures, tidal elevation, meteorological conditions, dissolved oxygen, phosphate, nitrate, ammonia, PH, turbidity and salinity. Estimates of primary production

and respiration are being calculated based on field measurements of carbon dioxide flux. The sanctuary environment will continue to be monitored to verify and fine-tune the model over time. The model will enable SPD to predict the behavior of the environment in response to natural as well as pollution events. Production runs of the model which simulate environmental events, such as oil spills, pesticide dumping, and increased turbidity will be performed in FY 1984 to identify early warning signs, and to plan management responses in the event that adverse conditions occur.

### Goal

A major goal of the Program is to promote and coordinate research, to expand scientific knowledge of national marine sanctuaries and to improve management decisionmaking.

### Accomplishments - FY82-83

- Data from a two-year (continuing) water circulation study in Key Largo National Marine Sanctuary have been used to identify mechanisms by which water quality of the sanctuary can be altered.
- Water quality and community metabolism data are being analyzed and, coupled with circulation data, are being incorporated into a hydrodynamic water quality model.

### Milestones

#### FY 1983

- Collect circulation, water quality and community metabolism data in Key Largo National Marine Sanctuary and surrounding areas.
- Incorporate field data into a hydrodynamic water quality model.

#### FY 1984

- Conduct a workshop in the Key Largo area to identify environmental scenarios for production runs of the model.
- Calibrate and verify the model and perform production runs of environmental scenarios.
- Identify sites and parameters for long-term monitoring and for fine-tuning the model.

#### FY 1985 and Beyond

- Use the model to predict the behavior of the sanctuary environment in response to natural and pollution events.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$75	\$111	\$65	\$35

\* Presidential budget submission

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Coastal Zone Management Programs

As a result of the Stratton Commission Report of 1969, the Congress established the Coastal Zone Management Program (CZMP) through the passage of the Coastal Zone Management Act of 1972 (CZMA). The Congress believed that the key to effective coastal resource management was to encourage coastal states to exercise their full constitutional authority over land and waters by voluntarily developing and implementing Federally approved state coastal zone management programs.

On the national level the CZMP and its associated Coastal Energy Impact and OCS State Participation Programs, created by the 1976 and 1978 amendments to the CZMA, are administered by the Office of Ocean and Coastal Resource Management (OCRM) of NOAA's National Ocean Service. OCRM's basic functions are to participate in the development, approval, and continuing review and evaluation of state CZM programs, to provide technical assistance on coastal resource management issues, and to provide Federal funds to assist states in their management of coastal land and water uses.

From 1974 through 1979 thirty-five oceanic and Great Lakes states and territories received 80% matching funds to develop CZM programs. To date 28 state CZM programs have received Federal approval. Virginia is seeking Federal approval in 1984. Non-participating states are Georgia, Illinois, Indiana, Minnesota, Ohio, and Texas.

Once approved, state programs are eligible for 80% matching grants for state program administration and projects. Projects usually are undertaken on a state-wide planning level or to meet specific local problems and are concentrated in nearshore and estuarine locations. Among these activities are projects related to ocean and Great Lake pollution problems. Specific activities have included: oil spill contingency planning; studies of chronic hydrocarbon leakages in anchorage areas; the effects of coal leachates on water quality and living resources; solid waste disposal studies; dredged material productive use and disposal studies including long-term monitoring of beach nourishment areas; toxic substance level analyses; and thermal pollution studies.

Actual funding for pollution-related projects is difficult to determine since CZM program emphasis varies from state to state. However, almost all states spend at least some portion of their funds on these activities. For purposes of this report a level of 5% of appropriations is assumed to be spent on pollution-related work.

### Goal

The goal of the CZM programs is to support the national interest in the effective management, beneficial use, protection and development of the coastal zone and its resources.

### Objectives

#### State

- Provide effective management of the coastal land and water resources of the state.

#### Federal

- Assure that existing state CZM programs continue to adequately perform the functions required to retain Federal program approval.
- Assist states seeking to develop Federally approvable coastal zone management programs.

### Milestones

- Twelve month grants will be awarded to the 28 states with approved CZM programs from January 1984 through September 1984.
- Assuming receipt of program approval, Virginia will receive a CZM grant in September 1984.
- Reviews of state CZM programs are conducted on a continuing basis. The OCRM should be contacted for information pertaining to specific states.

### Estimated Funding\* (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$1,650	\$350	\$1,050	\$0

\* Based on an assumed spending rate for pollution studies of 5% of available appropriations

\*\* Presidential budget submission

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Ship Support

The Office of Marine Operations of the National Ocean Service of NOAA manages the NOAA fleet and coordinates fleet support for NOAA's marine pollution research and monitoring activities. Traditionally, ship support services are provided for activities managed by the Outer Continental Shelf Environmental Assessment Program (which is otherwise funded by the Minerals Management Service of DOI), the Coastal and Estuarine Assessment Program, the Ocean Use Impact Assessment Program, Deep Seabed Mining Environmental Research Program, Measurement Systems Development and Engineering Services Program, the Habitat Investigation Program, and the Environmental Research Laboratories Ocean Pollution Studies Program.

The NOAA ships involved recently in support of these activities include the: DISCOVERER, RESEARCHER, SURVEYOR, MILLER FREEMAN, ALBATROS IV, McARTHUR, PEIRCE, and WHITING. During FY 1983, 451 ship days were devoted for marine pollution work; for FY 1984 the estimated ship-days are 437 days.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$8,899	\$6,349	\$5,988	\$5,000

\* Presidential budget submission

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Environmental Research Laboratories (ERL) Ocean Pollution Studies

ERL conducts a program of pollution assessment and research in oceanic waters at the Atlantic Oceanographic and Meteorological Laboratory (AOML) and the Pacific Marine Environmental Laboratory (PMEL). These laboratories conduct process-oriented research to improve our understanding of natural oceanic systems and the ecological impacts of human-induced stresses on these systems, and problem oriented research to develop improved assessment capabilities, including environmental prediction models. This later research seeks to improve our understanding of the environmental mechanisms, particularly in coastal regions, that determine how contaminants enter marine waters; how these contaminants are transformed, transported, and stored; how their concentrations vary with space and with time; and how they effect the ecosystem. This research is intended to provide a scientific basis for management decisions associated with the development and utilization of marine resources. The program focuses on coastal regions and estuaries, and is supporting programs managed by the Ocean Assessments Division (OAD) of the National Ocean Service (NOS).

ERL's marine pollution program has the following objectives:

- o To improve understanding of, information on, and ability to model those system processes that relate to transport dynamics and fate of toxic organics, trace metals, and nutrients.
- o To determine the major controlling factors of trace metal speciation in marine waters and the effects that spatial and temporal variations in the kinds, speciation, and amounts of trace metals have on critical ecosystem processes controlling productivity.
- o To improve the theoretical and empirical understanding of coastal and continental shelf transport processes, with application to decisions affecting oil and gas development, fisheries, mineral extraction and marine waste disposal.
- o To determine the chemical and physical mechanisms of pollutant transport by particulates in coastal waters and estuaries; and determine the budget, residence times, and fates of selected pollutant compounds in these systems.
- o To develop improved ecosystem models applicable to coastal waters and estuaries in order to trace the pathways of toxic organics and trace metals, and to simulate ecosystem responses to varying nutrient loadings.
- o To develop, test, evaluate, and apply marine pollution management modeling and improved environmental systems engineering methods to: (1) Estimate pollutant loading, (2) Estimate environmental information and impacts on uses, and (3) Organize the environmental information for decision purposes.

These objectives are consistent with the goals and objectives of NOAA's Marine Pollution Program Plan.

Marine pollution research at AOML is an integral part of that laboratory's program in marine assessment. A major goal is to develop an understanding of ocean processes, their variations, and effect of these variations on ocean resources, especially living marine resources. Present research at AOML is of two types: (1) Generic research programs such as Transformation and Assimilation of Pollutants by Natural Processes (TAP), and Pollutant-Particle Relationships in the Marine Environment (P-PRIME); and (2) Application of the results of these generic programs to recognized or perceived marine pollution programs, such as the disposal of sewage sludge in the New York Bight.

Chemical and biological research at AOML seeks to determine which natural or pollutant derived organic materials in seawater complex toxic or essential trace metals, and what effect such complexing has on marine productivity. The work, which is conducted cooperatively with the National Marine Fisheries Service/Southeast Fisheries Center under partial NOS sponsorship, focuses on the synergistic effects of natural and pollutant organic matter and bioactive metals on the food web.

Geochemical research at AOML investigates the mechanisms by which particulate matter in marine ecosystems functions in the transport and removal of pollutants. The research program focuses on large river-ocean interfaces (e.g. the Mississippi outflow), and is designed to test the hypothesis that major river outflows can effectively deal with large pollutant loadings because of packaging of the pollutants by particles, rapid sedimentation, and burial. The research is attempting to determine the efficiency of this packaging, the permanence of removal of pollutants from the water column to the sea floor sediments, and the magnitude of fluxes back to the overlying water column. Efforts thus far have focused on the Mississippi River outflow and the nearby Gulf of Mexico. Pollutants of primary interest are lead, cadmium, toxaphene and dioxins. Special emphasis is being placed on learning the effects of the recent decline in amounts of tetraethyl lead in gasolines on fluxes of lead to the ocean via rivers.

Biological and chemical research in AOML's marine pollution program is supplemented by concomitant physical transport studies, and the development of improved instrumentation for the measurement of physical parameters. Special emphasis has been placed on the development of acoustic measurement techniques, such as Doppler current meters and suspended sediment profiling systems.

At PMEL emphasis is on understanding the complex physical and geochemical processes that determine the extent of human impact on the marine environment. Although the geographic focus of these studies has been the Pacific Northwest and Alaskan coastal and estuarine waters, the scientific knowledge acquired and methodologies developed are applicable to other marine systems.

Research conducted by PMEL on the fates of trace elements in estuarine and coastal environments determines the mechanisms involved in the flocculation of trace metals in estuarine and coastal marine waters, determines their remobilization rates from sediments, and develops first-order models for maintenance of dynamic equilibrium for trace metals in

estuaries. Studies of particulate transport processes delineate the interplay between fluid and material fluxes in the estuarine and coastal environment and develop predictive models of pollutant transport useful for resource management decision. Research on organics in estuarine systems determines the fate and transport pathways of volatile and suspended organics in coastal and estuarine systems.

Research in the Puget Sound-Strait of Juan de Fuca system has been underway for several years. These studies are leading to a better understanding of the Sound's ability to accommodate pollutant inputs. Many pollutants adhere to and move with particles, and ultimately are buried or transported out of the Sound along with particles. The emphasis of much of PMEL's research, therefore, has been on particle transport and fate. PMEL also conducts research on water circulation and mixing in Puget Sound in order to gain a better understanding of the physical processes important in determining the capacity of Puget Sound to accommodate municipal and industrial wastes from the growing urban complex.

Work is presently underway at PMEL to create a demographic, economic, and environmental data base that will provide some guidance on the likely input of pollutants over the last eight decades of the Puget Sound region's industrialization, and thereby make possible forecasts of future trends.

PMEL research in Alaska has focused on defining the environmental conditions that may affect or be affected by future petroleum exploration and development on the Outer Continental Shelf. The results of this research are also being applied to the fisheries of the region in an attempt to understand better the effects of the environment on fish recruitment. Studies along the north side of the Aleutian Peninsula have been conducted to determine the potential role of particulates in transporting spilled crude oil.

### Milestones

#### FY83

- Determine the effect of regulatory controls on anthropogenic sources of lead and lead transport to the ocean via the Mississippi River.
- Preliminary assessment of bulk transport of pollutant-laden particulates in southern main basin of Puget Sound.
- Completion of demographic model of Puget Sound Estuary watershed
- Refinement and submission for publication of box model of circulation and water exchange in Puget Sound main basin
- Improve understanding of flushing characteristics of Puget Sound through quantitative estimates of water exchange rates at entrance sill

FY84

- Complete test of the hypothesis that Poverty Bay is a major sink for particulate-born pollutants in the main basin of Puget Sound.
- Validate box model estimates of pollutant residence times in the southern main basin of Puget Sound.
- Develop crude mass balance for petroleum hydrocarbons in the surface waters of the Gulf of Mexico and the Caribbean Sea.
- Continue development and testing of acoustic Doppler current meter.
- Measure rate of production of natural organic modulators of free metal activity in seawater in boreal waters.

FY85

- Provide improved forecasts of pollutant loading in Puget Sound, based on demographic model and box model estimates of pollutant loading.
- Begin interpretation of effects of pollutants and disturbance on bottom sediments and biological communities in Puget Sound.
- Complete study of the New York Bight Apex and apply the model developed in the TAP/Food Chain Dynamics program to problems in dredge spoil and sewage sludge dumping.

FY 86-87

- Commence pilot studies to develop a strategy for determining the coastal ocean's capability to accommodate specific pollutant inputs.
- Apply results of research on pollutant-particle relationships in the Mississippi Delta to other river outflows and adjacent coastal waters.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$2,490	\$1,768	\$1,978	\$1,978

\* Presidential budget submission

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Environmental Research Laboratories Great Lakes Pollution Studies

The Great Lakes Environmental Research Laboratory (GLERL) conducts a program of research on the physics, chemistry, and biology of the Great Lakes and their connecting channels. One element of the GLERL program is the Great Lakes Pollution Studies, which consist of: (1) Process studies to improve our understanding and prediction of the impact of pollutants on the lakes; and (2) Problem-oriented research to develop improved engineering prediction models. The entire Great Lakes system (including the deep portions of the lakes as well as the nearshore areas) is of concern.

Goal

The goal of the Great Lakes Pollution Studies is to provide needed information through research to help maintain or improve the quality and usefulness of the Great Lakes.

Objectives

The objectives of the Great Lakes Pollution Studies are to:

- o Develop improved and useful ecosystem models applicable to the Great Lakes to understand system processes related to the concentrations, locations, decay rates, residence times, and eventual sinks of toxic organic compounds and nutrients and to trace the pathways and determine the fate of synthetic organics and nutrients.
- o Develop, test, evaluate and apply lake pollution management modeling and improved environmental systems engineering methods:
  - to estimate loading of synthetic organics and nutrients from point and area sources through both water and atmospheric pathways; and,
  - to organize the environmental information for decision-making purposes.
- o Provide an advisory service on pollution in the Great Lakes for planning, operational, and decision-making organizations.

Significant Accomplishments Through FY83

- o A multidisciplinary "state-of-the-art" document on phosphorus cycling was prepared. Based on that document, a five-year research plan for nutrient cycling studies was developed.
- o Ecosystem models demonstrated the importance of zooplankton in supplying nutrients to phosphorus-limited phytoplankton in the Great Lakes.

- o Large (>0.5 mm in length) sediment animals (macrobenthos) were demonstrated to reflect polluted conditions more effectively than smaller animals (meiobenthos) in the Great Lakes.
- o Uncertainty analysis was applied to ecosystem models; this allows managers to quantify the potential errors associated with environmental models.
- o Thermal bars were shown to be unimportant barriers for offshore transport of nearshore contaminants.
- o The potential importance of benthic animals to regenerating nutrients from lake sediments was demonstrated.
- o Microscale heterogeneity in phytoplankton uptake of nutrients excreted by zooplankters was experimentally demonstrated.
- o Equilibrium models predicting the distribution of an organic contaminant based on the contaminant's solubility and a physical description of the ecosystem.
- o Improved understanding and prediction of equilibrium partition coefficients as a function of the concentration of substrate was developed.
- o Estimates of the resuspension rates of sediments and calculations were made of the flux of reentrained PCBs in Lake Michigan.
- o Estimates of bioconcentration of contaminants by benthic organisms, along with rates and depths of bioturbation.
- o A model was constructed of the horizontal movement of sediment associated contaminants under the influence of wind driven currents.
- o Improved estimates of photodecomposition rates of selected PCB and PAH congeners in lake water were developed.
- o Laboratory measurements of the partitioning of PAH's and PCB's between dissolved and particle bound phases for sediment-pore water matrices show very high concentrations in the dissolved phase; these contaminants appear to desorb near the sediment-water interface and to form stable associations with the natural dissolved organic matter in this region.
- o Laboratory studies of intact sediment cores indicated that significant quantities of nutrients were released from aerobic sediments.
- o A toxic substances model for easy implementation by managers was developed and refined.

- o The composition of the soluble reactive phosphorus pool in lake water was shown to be heterogeneous, free orthophosphate is often an order of magnitude lower than indicated by chemical measurements, and the major fraction of the soluble reactive phosphorus pool is unavailable for immediate use by microorganisms.
- o Temporal and spatial variations in the meiobenthos of nearshore Lake Michigan were documented.
- o The patterns and rates of nitrogen (ammonium and amino acids) release by Great Lakes benthic invertebrates were quantified and compared to phosphorus release rates for the same animals.
- o New Microchemical techniques were developed and adapted to measuring nutrient regeneration in small systems containing water, sediments, and organisms.
- o Diffuse and point-source loads of various forms of phosphorus, nitrogen, chloride, and suspended solids were estimated for Lake Superior.
- o PAH compounds, such as benzo(a)pyrene and anthracene, have been shown to form complexes with naturally occurring organic matter.

#### Milestones

##### FY84

- Complete study of chemical composition and decomposition pathways of phosphorus pool in Lake Michigan.
- Identify and quantify important biological nutrient regeneration processes.
- Develop detailed phosphorus cycling model.
- Complete chemical analyses and model calibration for the high sediment accumulation regions of the Great Lakes.
- Complete study of rates and effects of complexation of toxic organics by naturally occurring organics.
- Complete development of nearshore ecosystem model.

##### FY85

- Complete field study of benthic community structure, comparison with historical surveys, and evaluation of long-term pollution effects in Lake Michigan.
- Complete a two dimensional time dependent toxic cycling and transport model.

- Complete model of time dependent sorption process.
- Complete calibration of nearshore ecosystem model to simulate and predict water quality and ecosystem changes in lakes.
- Develop and apply a management oriented model with focuses on pollution problems in nearshore areas of the Great Lakes.
- Assess the long-term significance to society of accumulations of toxic materials in the depositional areas of the Great Lakes.

### Interagency Interactions

GLERL is interacting with a wide variety of other agencies, both public and private, in the field of pollution research on a continuing basis. For example, interactions with the U.S. Coast Guard are frequent in conjunction with activities on oil and pollution spill models. Research on particle dynamics will become more and more important to the U.S. Army Corps of Engineers due to their interest in the disposal of dredged spoil as more is learned of the processes involved through GLERL studies. The Environmental Protection Agency has funded a major data collection effort on Lake Erie. Other work with EPA involves measuring PCB loads in Lake Michigan. Sample sharing, intercalibration, data transfer and consultation are involved. Canadian agencies such as the Canada Centre for Inland Waters are integrally involved with nearly all of the efforts listed.

### Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$2,478	\$2,262	\$2,478	\$0

\* Presidential budget submission

### Project Manager

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### Grants

#### Sea Grant Ocean Pollution Program

The Sea Grant Program was established under the National Sea Grant College Act of 1966 and transferred to NOAA from the National Science Foundation in 1970 by Reorganization Plan No. 4.

The National Sea Grant Program is a cooperative Federal/State Program and as such one-third of the total program funds must be from non-Federal (State or local government, or industry) sources. Only the

total grant must meet matching requirements, consequently, individual projects may contain more or less matching funds depending on the amount of nonfederal support available.

The basic goal of the National Sea Grant Program is to encourage the wise utilization of the nation's marine resources through application of academic expertise in locally directed and coordinated research, education, and advisory service programs designed to meet local, regional, and national needs.

The Sea Grant Ocean Pollution Program, funded by the National Program, is intended to solve pollution problems which have a direct impact on state and local activities in fisheries, recreation, and overall resource management. Funding is provided to selected colleges and universities throughout the nation to meet these needs. Based upon present budget proposals, this program will be eliminated in FY 1985.

Research projects on pollution caused by industrial waste disposal, municipal waste disposal, energy development and extraction efforts, and recreational usage, among others, are presently supported by this program. Pollutants under study include synthetic organics, petroleum products and their components, radionuclides, heavy metals, nutrients, and human pathogens. Due to the current emphasis on pollution problems caused by synthetic organics (toxics), it is likely that the Program will shift during the FY 1984-1986 period toward a greater research effort concerning the sources, fate and effect of these compounds, provided funding is available. Research on the behavior of human pathogens in the marine environment will also be given additional emphasis during this period.

To respond to the most pressing needs, future marine pollution research is likely to be concentrated in the Great Lakes, and the major estuaries of the East Coast and Gulf regions.

### Goal

The Sea Grant Ocean Pollution Program is responsive to the National Sea Grant goal discussed above.

### Objectives

The objectives of Sea Grant sponsored research in ocean pollution are to:

- Develop understanding of critical marine pollution problems which threaten the development and utilization of marine resources;
- Develop and test in cooperation with marine industries the various alternatives for handling and disposing of their industrial wastes that threaten the marine environment; and

- Cooperate with state and local governments on research to develop understandings of marine problems that threaten public interests in the marine environment.

#### Milestones

Individual research projects sponsored by Sea Grant may range from one to five years; with three year projects being most common. The proposed FY 1985 budget eliminates the National Sea Grant Program. Thus, research funds for this program will be withdrawn beginning with FY 1985.

#### Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$2,091	\$1,797	\$1,833	\$0

#### Program Coordinator

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#### National Fishery Ecology Program

The National Marine Fisheries Service (NMFS) has responsibility by Congressional mandate for conserving and managing fishery stocks of the outer continental shelf. Several legislative acts, including the Fishery Conservation and Management Act of 1976, require the Secretary of Commerce to initiate comprehensive programs of fishery research including the impacts of pollution on the abundance and availability of fishery resources. The Fishery Ecology Program within NMFS conducts research directed toward understanding the effects of man-induced and natural changes on the abundance, distribution and health of living marine resources of commercial and recreational importance. Laboratory and field research investigations are conducted on (1) The environmental requirements of living marine resources from reproduction, growth, and other ecological parameters and (2) The impacts of human activities (contaminant inputs and physical alterations) on habitats.

#### Goals

The goal of the program is to:

- Provide high quality research products designed to fulfill user needs for the conservation and management of living marine resources and their habitats.

Objectives

The objectives of the program are to:

- Understand the effects of pollutants on living marine resources;
- Develop methods for assessing the viability of fishery stocks and habitats;
- Develop methods for predicting the effects of man's activities on marine ecosystems and their components;
- Understand effects of physical perturbations on coastal ecosystems;
- Develop efficient systems for transfer and dissemination of habitat and marine pollution information.

Northeast Fisheries Center

The northeast region has extensive urban and industrial development. There are diverse point and non-point pollutant discharges in the estuarine and nearshore environment, and extensive ocean disposal of wastes, including dredged material, sewage sludge, and industrial materials. The region utilizes enormous energy resources and is currently undergoing rapid growth in energy exploration and development.

Key components of the program are studies of physiological, biochemical, and behavioral effects of key pollutants such as heavy metals, petroleum hydrocarbons, and other organic toxic substances such as PCBs and DDT. Pollutant effects on genetic mechanisms, relationships between principal pollutants and disease, and effects of pollution and environmental degradation on individuals, populations, and community structure are also being studied. Goals and objectives have been established to address the impacts that these activities have on coastal and shelf fishery resources.

Goals

- Conserve and effectively manage living marine resources by providing a comprehensive research program on the effects of marine pollution on living marine resources;
- Maintain an assessment of the health of coastal marine ecosystems of the northeastern United States, and
- Provide information necessary to wisely manage multiple uses of marine habitats now and in the future in the Northeast.

Objectives

- Determine the existing levels of a wide variety of contaminants in water, sediments, and biota;

- Establish and maintain a historical record of data resulting from other marine pollution programs in the Northeast, and foster cooperation and coordination of coastal and shelf monitoring and research efforts off the Middle Atlantic and New England States;
- Provide timely, relevant information to planning, management and regulatory groups and to the public;
- Determine the effects of specific human actions on the coastal marine environment and its resources;
- Detect and provide early warnings of severe or potentially irreversible changes within the coastal marine ecosystem; and,
- Develop and apply standard methodologies for operational monitoring.

#### Milestones

- Conduct intensive contaminant monitoring of the New York and Mid-Atlantic Bights.
- Issue Mid-Atlantic shelf-slope assessment (106-mile characterization).
- Conduct laboratory studies on the physiological and biochemical effects of metals on lobsters and bivalve molluscs.
- Issue final report on the impact of New York Bight waste disposal on secondary benthic invertebrate production.
- Finalize and implement the Regional Action Plan, publish planning document.
- Finalize the third annual Northeast Monitoring Program (NEMP) report on the health of the habitat.
- Complete publication on the incidence of pathogens in clean versus polluted ocean sediments.
- In a cooperative effort, develop and implement an environmental risk assessment program.

#### Northwest and Alaska Fisheries Center

Parts of the northwest region have experienced urban and industrial development similar to, but not as extensive as other regions. Major development has occurred in the Seattle and Puget Sound areas, with resultant pollution from petroleum hydrocarbons, metals and synthetic organics. Another concern is impacts on fishery habitats and resources associated with petroleum exploration, exploitation, and transportation in Alaskan environments.

Goals

- Improve abilities for identifying and measuring the sources, nature and degree of marine pollution in estuarine and coastal waters of the Pacific Northwest and Alaska.
- Use state-of-the-art methodology to assess the effects of pollutants, especially petroleum hydrocarbons, on marine species and ecosystems.

Objectives

- Determine acute and long-term effects of single and multiple contaminant exposures on critical physiological, biochemical, and behavioral functions of key marine species;
- Determine correlations between exposure to pollutants and pathological changes in marine fish and invertebrates;
- Evaluate sublethal biochemical effects of contaminants on marine fish and shellfish;
- Provide state-of-the-art analytical techniques (including inter-laboratory calibration and quality assurance) for measuring pollutant levels in environmental and tissue samples;

Milestones

- Conduct field studies to determine the degree of pollution as well as the extent and frequency of abnormalities in fish and shellfish in northern estuarine and coastal waters.
- Identify pollution-related aberrations in northern estuarine (e.g., Puget Sound) and coastal waters as determined from field studies.
- Conduct laboratory studies on the effects of sediment-associated marine contaminants on biota of the North Pacific Ocean.
- Identify chemicals found in polluted estuarine environments which cause toxic effects on marine biota under laboratory conditions.
- Conduct studies on bioavailability, bioconcentration, and metabolism of a broad spectrum of sediment-associated contaminants in invertebrates and fish.
- Conduct research on the importance of food chain transfer of pollutants and metabolites in marine biota.
- Conduct field investigations and laboratory studies on marine organisms impacted by major accidental spills of hazardous material.

- Determine the effects of long-term exposure to oiled food and oiled sediment on the reproduction of Dungeness crab.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$3,865	\$4,811	\$3,975	\$3,975

\* Presidential budget submission

Project Manager

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Microconstituents Program

The Microconstituents Program is designed to determine the kinds and levels of contaminants in the tissues of fishery products of recreational, food, and industrial use.

While the program focuses on the ultimate impact of contaminants on man, this research has many features in common with other Federal programs which examine the impact of pollution on the health of living marine resources.

The program provides three related types of information which, considered together, permit a more accurate determination of the public health significance of contaminants in fish. They are: (1) The levels of contaminants in fish, (2) The chemical form and interaction of those contaminants, and (3) The consumption patterns for fishery products in the United States. Acute and chronic toxicological considerations are evaluated, through animal feeding studies, for extrapolation to the human situation. Synergism/antagonism, as well as nutritional aspects, are also considered in this research.

These studies are carried out at the Northwest and Alaska Fisheries Center in Seattle and at the Southeast Fisheries Center's Charleston Laboratory.

Goals

The goals of this program are to:

- Identify and determine levels and relative human toxicity of contaminants in selected fish and seafood products;

- Assess the significance of consuming contaminated products in terms of consumer safety; and
- Provide information generated by the program to appropriate agencies and groups having complementary responsibilities and interests for consumer safety, resource management decisions, and the harvesting and utilization of national marine resources.

### Objectives

The objectives of the program are to:

- Identify and measure levels of heavy metals, synthetic organics and microorganisms of public health significance in fish and shellfish;
- Survey the levels of PCBs in selected fishery products at the national level;
- Isolate, purify, and identify chemical/biochemical forms of heavy metals accumulated in fish and shellfish tissues, including determination of the toxicological and/or nutritional significance of these metals when ingested in seafood;
- Coordinate studies dealing with ciguatera poisoning associated with marine products; and
- Implement a national contaminant data base system.

### Milestones

#### FY83

- Issued report on the value of dietary selenium as an antagonist to mercury in seafoods;
- Issued report on the nature and extent of petroleum hydrocarbon contamination of the national fishery resources;
- Issued assessment report on human health hazards from petroleum-contaminated seafoods including the modifying effects of petroleum hydrocarbons on other marine contaminants (organics, metals, microbes).

#### FY84

- Develop and promote, through technology transfer, improved methods for measuring viral and bacterial contamination of molluscan shellfish, with emphasis on enteric viruses in oysters;
- Determine the significance of cadmium and mercury contamination of seafoods in relation to consumer safety;

- Develop and promote the use of, through technology transfer, a sensitive test for the unambiguous detection of ciguatera in seafoods;
- Develop and maintain a comprehensive data management system for storage, retrieval, and use of organic contaminants information; and
- Obtain baseline data on organic contaminants in selected commercially important finfish and for shellfish species.

Estimated Funding (in thousands \$)\*

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$181	\$240	\$90	\$90

\* Represents amount directly related to a pollution monitoring program.

\*\* Presidential budget submission

Program Coordinator

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Ocean Pollution Data and Information Network

Program Objectives

In 1978, Congress passed the National Ocean Pollution Planning Act (P.L. 95-273). Section 8 of that Act states that the Administrator of the National Oceanic and Atmospheric Administration (NOAA) "shall ensure that the results, findings, and information regarding ocean pollution programs conducted or sponsored by the Federal Government be disseminated in a timely manner and useful form" to all interested parties. In response to the mandate, the National Oceanographic Data Center (NODC) of NOAA has developed the Ocean Pollution Data and Information Network (OPDIN), to be completely operational by 1985. The objectives of the OPDIN are: 1) To improve the timely acquisition and processing of marine pollution data and information; 2) To facilitate timely dissemination of that information in useful forms; and 3) To coordinate and improve communication among Federal agencies, as well as state and local governments and the private sector, concerning marine pollution activities. The OPDIN will maximize use of existing resources; it will not replace existing programs or data or information systems.

The network consists of the Central Coordination and Referral Office (CCRO), Regional Coordination and Referral Offices (currently NODC liaison offices serve as RCROs), and participating Federal agencies. The CCRO is located at the NODC in Washington, D.C. The CCRO serves as the focal point for disseminating data and information in useful forms from Federal

and related marine pollution activities. The RCROs provide similar services and are located in coastal regions in order to promote timely, local responses to requests from the different regions.

The CCRO, as the coordination point in the Network, is involved in Network design and development tasks, and in the implementation of components of an operational OPDIN, as discussed below.

#### Accomplishments/Milestones

- In May 1982, the Central Coordination and Referral Office convened the OPDIN Planning Workshop at the National Oceanographic Data Center, Washington, D.C. Participants from nine Federal agencies, whose expenditures accounted for nearly 90% of FY 1980 marine pollution expenditures, reviewed efforts to date and discussed future direction for OPDIN design. A "straw man" conceptual design for OPDIN was presented. Specific comments and recommendations from participants were received and addressed. Agency participation in OPDIN development and operations via membership on an OPDIN Round Table was recommended.

To date OPDIN accomplishments under the phased implementation approach recommended by the OPDIN planning Workshop include:

- Coordination with elements of NOAA and other agencies and the private sector for adapting data processing, storage, retrieval, and display technologies to support decision-making concerning marine pollution problems.
- Completion of a Toxic Substances and Pollutant Data System within NODC. This includes conversion of selected data types to the NODC Toxic Substances and Pollutant data format, improved quality control, and more comprehensive inventories of data associated with this format. The Chemical Abstract Service (CAS) chemical code system developed by the American Chemical Society has been adapted for use in this format to assure national acceptance for reporting pollutant concentrations.
- Evaluation of methods for improved data entry of nonautomated pollution data through a cooperative agreement with the University of Alaska. The task was completed in June 1983; coordination between the CCRO and University of Alaska/RCRO personnel continue for addressing specific agency data entry problems concerning marine pollution investigations.
- Evaluation of data synthesis techniques and microcomputer applications to provide timely and useful information on pollution-related activities for specific regions. A prototype task by the Marine Sciences Research Center of the State University of New York has been jointly funded over a two-year

period by the OPDIN and the William F. Donner Foundation, and is scheduled for completion in June 1984. The portotype study involves the Hudson-Raritan Estuary using an IBM Personal Computer.

- The annual update of the automated version of the National Marine Pollution Information System (NMPIS), mandated under Section 4 of the Act, accomplished by NODC in cooperation with the National Marine Pollution Program Office (NMPPPO). This system provides timely information and automated summaries of Federal marine pollution activities as inputs to the Federal Plan generated by the NMPPPO. Special products from NMPIS for Federal and other interested parties are provided on a reimbursable basis.
- Partial funding support for the publication and distribution of the Coastal Ocean Pollution Assessment News (COPAS), a quarterly newsletter supported jointly within NOAA (NOS, NMFS, NESDIS).

For the long-term, the CCRO is managing the developmental activities directed toward a fully operational OPDIN by 1985. This task has provided, through contractor support an analysis of existing systems, an OPDIN guidelines and scope document, an OPDIN conceptual design, detailed systems requirements, a profile of potential OPDIN users, and a handbook of Federal systems and services. Distribution of these documents has been made to NOAA and other Federal offices that are potential Network participants. The final components of OPDIN, as specified by the detailed design requirements, will be implemented by early 1985.

Estimated Funding\* (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u>
\$560	\$560	\$0	\$0

\* Starting in FY 1984 OPDIN is combined with the National Marine Pollution Program.

Program Manager

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**III. DEPARTMENT OF DEFENSE**

DEPARTMENT OF DEFENSE

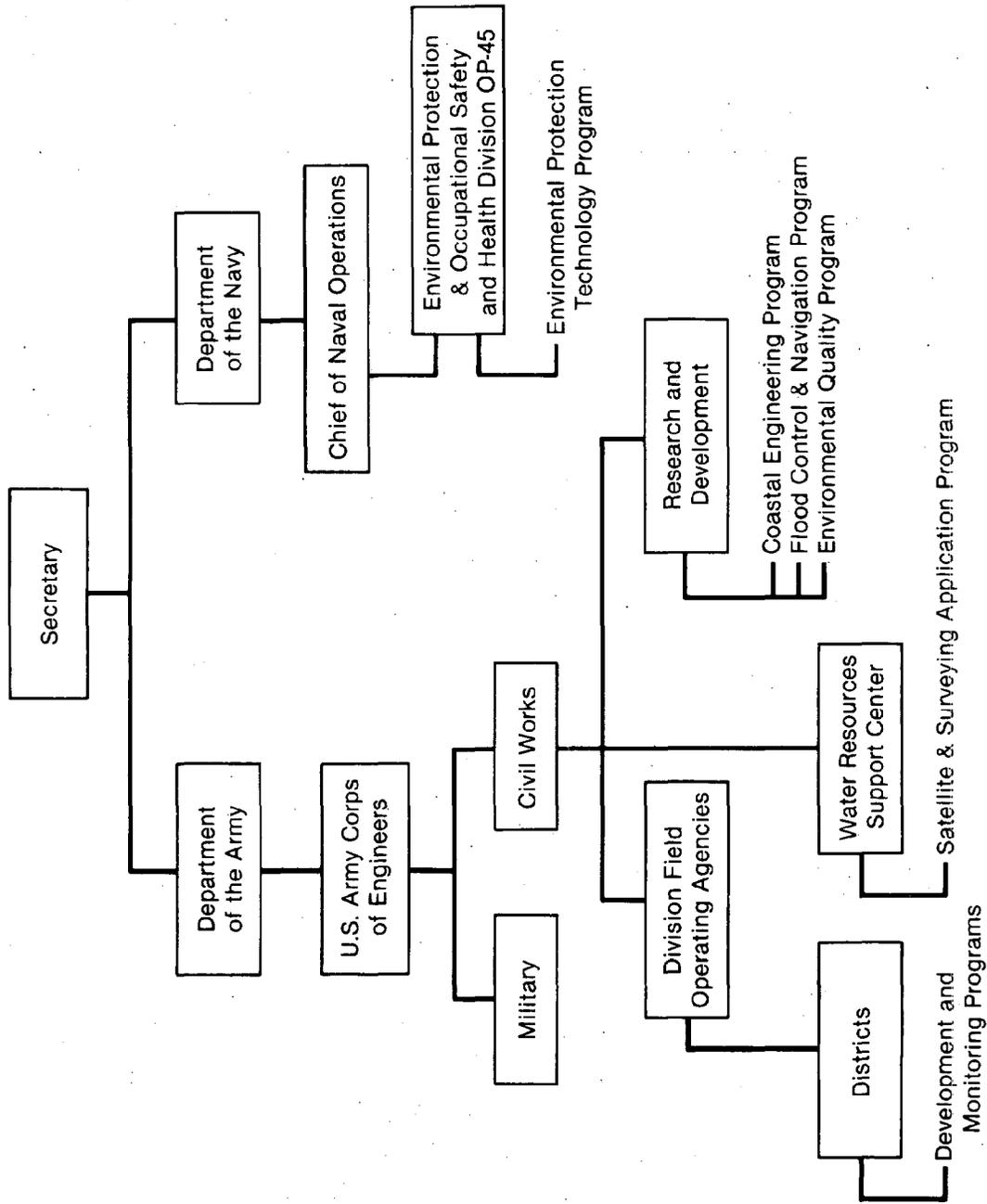
CONTENTS

	<u>Page</u>
DEPARTMENT OF DEFENSE ORGANIZATIONAL CHART.....	III-iii
DEPARTMENT OF DEFENSE PROGRAM FUNDING SUMMARY.....	III-iv
U.S. ARMY CORPS OF ENGINEERS FUNDING EMPHASIS GRAPH.....	III-v
U.S. NAVY FUNDING EMPHASIS GRAPH.....	III-vi
U.S. ARMY CORPS OF ENGINEERS	
RESEARCH/DEVELOPMENT PROGRAMS.....	III-101
Coastal Engineering Program.....	III-102
Flood Control and Navigation Program.....	III-108
Environmental Quality Program.....	III-113
Satellite and Surveying Applications Program.....	III-129
DEVELOPMENT/MONITORING PROGRAMS.....	III-134
North Atlantic Division Program.....	III-134
New England Division Program.....	III-138
South Atlantic Division Program.....	III-139
North Pacific Division Program.....	III-141
North Central Division Program.....	III-143
Lower Mississippi Valley Division Program.....	III-144
Pacific Ocean Division Program.....	III-144
South Pacific Division Program.....	III-146
Southwest Division Program.....	III-147
FEDERAL PERSONNEL AND FACILITIES.....	III-147
PUBLIC LAWS AND EXECUTIVE ORDERS.....	III-148

Contents (cont'd)

	<u>Page</u>
U.S. NAVY	
MISSION STATEMENT.....	III-201
FEDERAL PERSONNEL AND FACILITIES.....	III-201
PROGRAM DESCRIPTION	
Environmental Prtoection Technology Program.....	III-201

DEPARTMENT OF DEFENSE



Only offices directly involved in marine pollution research are listed.

DEPARTMENT OF DEFENSE

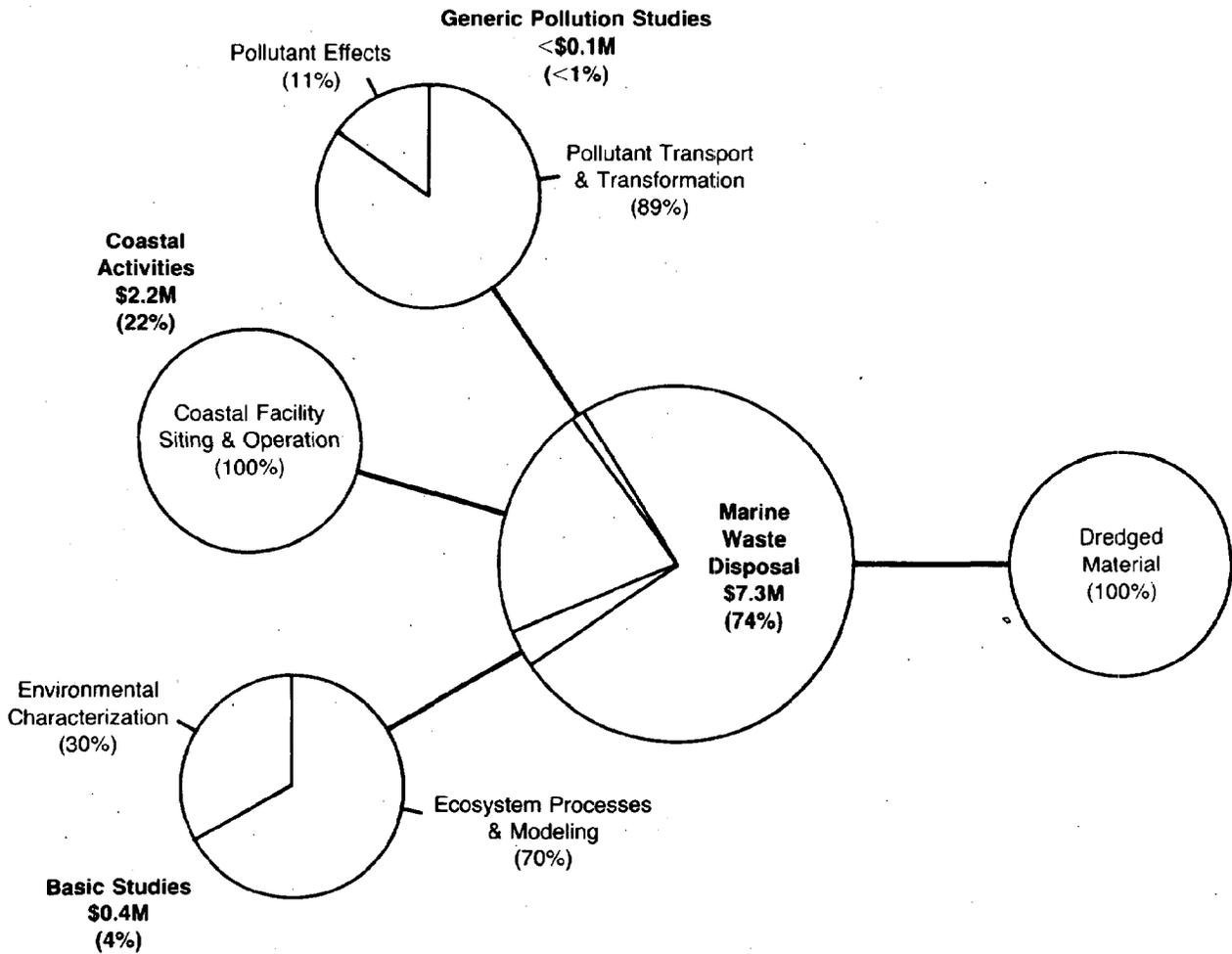
PROGRAM FUNDING SUMMARY  
 RELATED TO OCEAN POLLUTION RESEARCH, DEVELOPMENT AND MONITORING  
 HISTORICAL BUDGET AND ESTIMATED OUT-YEAR FUNDING  
 FISCAL YEARS 1982 - 1985

(in Thousand \$)

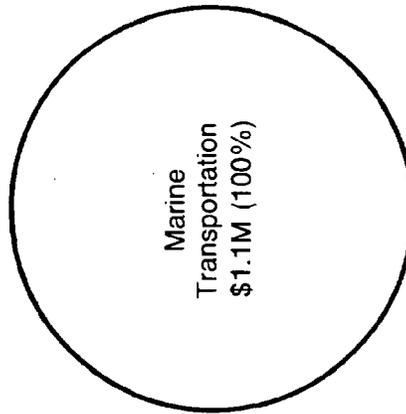
	FY 82 (Estimated)	FY 83 (Estimated)	FY 84 (Estimated)	FY 85 (Presidential)
<u>Army Corps of Engineers</u>				
Research and Development Programs				
Coastal Engineering Program	1,195	940	859	985
Flood Control and Navigation Program	1,505	865	515	330
Environmental Quality Program	3,818	4,587	4,650	4,119
Satellite and Surveying Applications Program	150	180	251	235
Development and Monitoring Programs				
North Atlantic Division Program	982	688	962	635
New England Division Program	800	800	700	700
South Atlantic Division Program	165	565	275	100
North Pacific Division Program	390	245	266	900
North Central Division Program	118	553	666	560
Lower Mississippi River Division Program	95 <sup>a</sup>	50	30	30
Pacific Ocean Division Program	5	2	0	0
South Pacific Division Program	213	300	555	205
Southwest Division Program	50	100	100	100
<b>ARMY CORPS OF ENGINEERS TOTAL</b>	<b>9,486</b>	<b>9,875</b>	<b>9,829</b>	<b>8,899</b>
<u>U.S. Navy</u>				
Environmental Protection Technology Program	1,039	1,125	1,820	2,100
<b>DEPARTMENT OF DEFENSE TOTAL</b>	<b>10,525</b>	<b>11,000</b>	<b>11,649</b>	<b>10,999</b>

<sup>a</sup> The amount reported for this program in FY 1982 differs from that reported in the FY 1982 Program Summaries Update. See the program description in this section for details.

**DEPARTMENT OF DEFENSE  
U.S. ARMY CORPS OF ENGINEERS  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY 1983 ESTIMATES**



**DEPARTMENT OF DEFENSE  
U.S. NAVY  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY1983 ESTIMATES**



DEPARTMENT OF DEFENSE  
U.S. ARMY CORPS OF ENGINEERS

RESEARCH/DEVELOPMENT PROGRAMS

The Chief of Engineers, under the direction and supervision of the Secretary of the Army, has major and broad responsibilities in inland waters, nearshore areas, and ocean environments. Therefore, it is essential that the Corps undertake and manage research and development efforts to meet our mission responsibilities assigned by public laws (see Section IV) in a timely and efficient manner.

GOALS

The long range goal of the Corps' Research Program is to provide the Corps' capability, through timely research and development, to accomplish its water resources mission and program with optimum effectiveness, economy and safety, and with serious concern for protection or enhancement of environmental values.

The Corps has four research areas where ocean pollution research development and monitoring (OPRDM) are being conducted when ocean, estuaries and the Great Lakes regions are considered under the stated program. They are:

- . Coastal Engineering
- . Flood Control and Navigation
- . Environmental Quality
- . Satellite and Surveying Applications

Information derived from these research areas can be generally categorized under the following broad headings as related to OPRDM:

- . Applied research/monitoring to assess the impacts of Corps Civil Works activities as well as activities regulated by the Corps within the coastal environment. Due to the diversity and scope of the Corps Civil Works Program, this information must be assessed as part of a broader framework to include not only protection of the ocean, but also its adjacent coastal and inland environments.
- . Development and testing of cost effective as well as environmentally compatible engineering solutions and alternatives.
- . Data acquisition/analyses for engineering purposes, which, in turn, contribute to a more effective understanding of dynamic coastal processes.

These Corps research and development activities related to OPRDM are accomplished primarily through three Corps research facilities: Waterways Experiment Station (WES), Vicksburg, Mississippi; Coastal Engineering Research Center, (CERC), Vicksburg, Mississippi; and the Cold Regions Research and Engineering Laboratory (CRR&L), Hanover, New Hampshire. In addition, the Corps district and division offices conduct region- and/or project-specific developmental research and monitoring in support of their assigned engineering missions. These development and monitoring activities are described by division office.

### PROGRAM DESCRIPTIONS

#### Coastal Engineering Program

The Corps missions require coastal engineering expertise in the design, construction, operation, and maintenance of three general types of projects or facilities in and near the surf zones of the U. S. oceanic and Great Lakes shores: harbors for small craft for commercial and recreational fishing; harbors for large, ocean-going vessels for coastal and international commerce; and shore and beach restoration, protection, and stabilization to provide beaches, to prevent or lessen erosion damage, and hurricane-induced flood damage, and to provide recreation. Additionally, the Corps requires coastal engineering expertise to regulate construction in the waters of the United States.

Under the Corps mission of protecting and restoring coastal shores, consideration is given to both structural and nonstructural solutions. The Corps R&D Program develops techniques, equipment, and procedures for determining or predicting wave direction and magnitude, interactions between shore materials, protective structures, and wave forces; and the effects produced by changes in the geometric configuration of bays and inlets. Examples of current activities to improve methods and designs and to minimize costs of planning construction, operation and maintenance functions are:

- o Decrease probability for loss of life and damage to coastal property from storms by continuing development of improved coastal flooding prediction techniques.
- o Investigate the effects of storms that overflow barrier islands and develop guidance to assure that coastal projects are constructed with a minimum of interference with natural processes.
- o Develop techniques for predicting the pattern and rate of shoaling in harbor entrance channels so that dredging operations can be optimized.
- o Improve estuary water quality through improved forecasting techniques for dilution of pollutants.
- o Optimize wave and current data collection for use in design of beach and harbor improvements.

### Accomplishments

Although millions of dollars are devoted by the Corps to maintenance of harbor entrances and navigation channels, local governments, industry and private citizens annually expend many times the cost of Corps projects. The Corps, as the Federal agency charged with the mission of research for coastal engineering, is a tremendous resource of information and data needed by others in the design of coastal engineering works. Through Corps research in coastal engineering an understanding of coastal processes has been achieved. Some of the results of the Corps research program which address these needs are incorporated into technical and guidance documents used by the Corps and others. Examples include: Coastal Engineering Manual Chapter on "Tides and Tidal Datum Planes"; Coastal Engineering Technical Aids: "Users' Guide to Computing Longshore Transport of Sand," "Estimation of Wave Transmission Coefficients for Overtopping of Impermeable Breakwaters," "Maximum Wave Height and Critical Water Depth for Irregular Waves in the Surf Zones"; guidance documents: "Energy Spectra in Shallow U. S. Coastal Waters," "Effects of Structure and Lake Levels on Bluff and Shore Erosion in Berrien County, Michigan," "Wave Transmission and Reflection Characteristics of Breakwaters," "Energy Flux Method for Predicting Longshore Transport," "Engineering Characteristics of Tidal Inlet Bay System," and "Calculating Bottom Friction Factors for Waves." The Coastal Engineering Research Center, (CERC) located at Vicksburg, Mississippi is the lead Corps laboratory for the research being conducted under coastal engineering for the OPRDM program. CERC was moved from Fort Belvoir, Virginia to WES, Vicksburg, Mississippi in July 1983 to consolidate like functions and to improve efficiency. Major revisions in the Corps research and development programs resulted. The Coastal Ecology program was transferred to the WES Environmental Laboratory. The Wave Dynamics Division of the WES Hydraulics Laboratory became part of CERC. Programs were combined and frequently renamed. Therefore, this section has changed in organization from previous years. The following work is being accomplished at CERC.

### Inlet Bar Channel Shoaling Project

#### Goals

To maintain an effective navigation channel at a coastal inlet, it is usually necessary to dredge a channel through the offshore bar. Subsequent to dredging, this channel will usually be filled by deposition of sediment and it may migrate along shore in response to the dominant wave and longshore current conditions. In order to effectively plan and to evaluate the economics of channels dredged through offshore bars, the pattern and rate of channel shoaling must be predicted for given hydrographic and environmental conditions.

#### Objectives

The objectives of this project are to review and evaluate the literature, and field and laboratory data on the nature and rate of shoaling of channels dredged through offshore bars; to define and quantify important dominating environmental factors such as wave climate, tide levels, inlet channel flow; to develop a field data collection program to obtain any additional

needed data at selected inlet(s); and to develop design guidelines for predicting shoaling patterns and rates and for maintaining a reasonably stable channel geometry through the offshore bar.

#### Milestones

##### FY 82

Efforts will commence to collect existing field data on channel shoaling and to initiate collection of additional field data as necessary to improve design procedures.

##### FY 83

Field data collection will continue. Evaluation of existing field data will be completed.

##### FY 84

Field data collection will be completed.

##### FY 85

Workshop, October 1987.

The final report will be completed and published, October 1987.

Coastal Engineering Technical Aid on Inlet Bar Channel Design, October 1987.

#### Littoral Data Collection Methods and their Engineering Application Project

##### Goals

Present methods of data collection and analysis do not refine salient features of coastal climate sufficiently for coastal engineering design purposes. Additionally, present design methodology does not address probabilistic nature of data collected. Benefits derived would be better estimates of sand transport for sand bypassing and coastal structure design, improved ability to ascertain project costs (by improved shoaling or accretion rates), and reduced structure costs due to better design.

##### Objectives

Develop new data collection and analysis techniques for visually and instrumentally obtained surf, longshore current, and sand transport data. Develop and refine methods of applying data collection results to the solution of sand bypassing and coastal structure design problems.

MilestonesFY 83

CETA - Coastal Algorithms II - Jan. 83.  
CETA - Coastal Algorithms III - Aug. 83.

FY 84

TP - Statistics of Longshore Energy Flux - May 84.  
TR - Directional Wave Gage (DPG) - May 84.  
TP - Sand Transport Distribution - Sept. 84.

FY 86

TR - Directional Wave Analysis for Sand Transport Computation - Sept. 86.  
TR - Time Series Forecasting of Wave Statistics - Sept. 86.

Wave Estimation for DesignGoals

To obtain accurate estimates from hindcasts and measurements of all aspects of shallow water wave conditions which are important in engineering work and to understand how the estimates are best used in design, construction, operation and maintenance of coastal projects. To obtain background for development of Engineering Manuals for Coastal Waves and Water Levels.

Objectives

To improve the Corps capability to estimate wave conditions for use in design, construction, operation and maintenance of coastal projects.

MilestonesFY 81

CETA digital Bathymetric Data Oct. 81; CETA Depth-Limited Wave Energy - Nov. 81; CETA Energy Losses - Nov. 81; Documentation Wave Transformation Programs - Nov. 81; CETN Wave Height Parameters - Dec. 81; TR Irregular Wave Models Dec. 81.

FY 82

TR Wave Groups Aug. 82; TR Depth-Limited Wave Height - Aug. 82; Documentation Directional Spectrum Program June 82.  
Workshop Nearshore Current Modeling - June 82.

FY 83

CETA DHI Model Dec. 83; Workshop Wave Groups - Sept. 83; Workshop Directional Spectra - Sept. 83.  
Workshop Shallow Water Wave Height Estimation - Sept. 83.

FY 84

CETN Automated Analysis of Radar Imagery - Aug. 84; Workshop Automated Radar Analysis - Sept. 84; Workshop Modeling Shallow Water Waves - Sept. 84.

FY 85

CETA Narrow Fetches Nov. 84; CETA Wave Height Distribution - Jan. 85; Documentation Shallow Water Growth Model - Aug. 85.

FY 86

CETA Shallow Water Design Curves - Oct. 85; Workshop Irregular Waves in Design - Nov. 85; CETN Radar for Directional Spectra - July 86; Workshop Narrow Fetches - Nov. 85.

FY 86

Documentation Hurricane Wave Model - Oct. 86; Workshop Hurricane Wave Model - June 87.

FY 87

Documentation Hurricane Wave Model Oct. 86; Workshop Hurricane Wave Model June 87.

Nearshore Waves and CurrentsGoals

For inlet design, beach protection, and harbor design, it is essential that coastal engineers be able to predict sediment transport in the coastal zone. The mean currents induced by waves and wind stresses in shallow water provide in many instances the major mechanism for the transport of sediment, pollutants and other constituents in shallow coastal waters. The currents are poorly predicted at the present time, with most predictive models only including wave action.

Objectives

The objective of this work unit is to develop methods of predicting wave and wind induced currents in and near the surf zone. The mean currents induced by waves and wind stresses in shallow water provide in

many instances the major mechanism for the transport of sediment, pollutants and other constituents in shallow coastal waters. The work unit will address wind and wave action and other processes which are found to be important will consider longshore as well as cross-shore transport models.

Milestones

FY 81

Bibliography and State-of-the-art report prepared (2 volume CERC reports) Sept. 81.

FY 82

Workshop Present State of Development in Nearshore Current Modeling June 1982.

FY 83

CERC report on workshop Conclusions March 1983.

FY 84

Users guide for computer model for prediction of nearshore currents March 1984.

FY 85

Report on effects of infra gravity waves in the surf zone Sept. 85.

FY 86

Update users guide for model including sediment transport Sept. 86.

FY 87

Updated users guide for model including structures.

FY 88

Short course on Nearshore Current Models.

Estimated Funding of Coastal Engineering Program (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$1,195	\$940	\$859	\$985

\* Presidential budget submission

Program Technical Monitor

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Flood Control And Navigation Program

This research area is concerned with improving cost effectiveness in design, construction, operation, and maintenance of engineering works for flood control, navigation, and related purposes, including channels and canals, locks and dams, levees and floodwalls, channel and bank stabilization, diversion structures, pumping stations, and hydropower plants. Some examples of current activities to improve methods and designs and to minimize costs of planning, construction, operation, and maintenance functions are:

- o Develop criteria for maintenance of deep-draft entrance channels to assure safe navigation conditions with minimum effort.
- o Develop guidance for channel configuration and improved safety and efficiency of tows approaching navigation locks.
- o Continue development of techniques for using recently developed dredging equipment with emphasis on pumpout barges for high solids concentration mixtures and field evaluation of portable mini-dredging systems.
- o Continue development of criteria for use of advance maintenance - overdepth and overwidth - dredging for entrance channels to reduce dredging frequency.
- o Continue development of methods for design of effective sediment traps to reduce maintenance dredging in estuarine navigation channels and stilling basins with focus on the side channels diversion concept.
- o Continue development of numerical models to rapidly predict navigation channels shoaling rates for use in scheduling of maintenance dredging.

The following Flood Control and Navigation research is being performed at the Waterways Experiment Station (WES), the Cold Regions Research and Engineering Laboratory (CRREL), and the Coastal Engineering Research Center (CERC).

MilestonesFY 81

A report describing the state-of-knowledge of shoaling processes for the six study subtasks will be completed. A research plan addressing needs identified in the report will also be completed. Work will be completed on field site studies.

Improved Dredging Methods ProjectsGoals

A critical need exists to research potential improvements in existing dredging methods and transmit the results of such research to the field as rapidly as possible. The COE maintenance dredging effort is undergoing important changes in approach and requirements which make such research especially necessary.

Objectives

To investigate potential improvements in existing maintenance dredging methods in support of COE Civil Works missions.

MilestonesFY 83

Draft Report on Hydraulic Dredging	Feb. 83.
ETL on Hydraulic Dredging	Sept. 83.
Information for Revision of Engineering Regulations (ER) 1130-2-307, Dredging Policies and Practices; Input to Chapter 13 on EM on Deep Draft Navigation Project Design; and Input to Chapter 5 of EM on Inlet Stabilization and Sand Bypassing	Sept. 83.

FY 84

Report in HDPE vs. steel pipe, Sept. 84.

FY 85

Report on high density slurry flow, March 85.

FY 86

Report on flexible dredge hose, Sept. 86

FY 87

Hopper dredge load measuring instruments, Dec. 87.

FY 88

Information for revision of ER 1130-2-307, Dredging Policies and Practices, Sept. 88.

Erosion Control of Scour During Construction ProjectGoals

The work involves analytic, field, and laboratory studies of scouring action near structures. Laboratory studies will be performed to determine stability curves for underlayer material placed to prevent erosion. Numerical models will be developed to allow the prediction of when and where scour will occur, the severity of the scour, and methods to minimize the scouring action. Field observations will be made of scour during construction and of techniques to minimize this scour.

Objective

The objective of this work unit is to develop techniques to predict the severity and minimize scouring action during nearshore construction.

MilestonesFY 82

Information available for ETL on Stability of Underlayer Material, Sept. 82

FY 83

Computer program and Users Manual for Scour Numerical Model, Sept. 83.

FY 84

Information available for ETL on Scour Prevention Techniques

Information available for update of EM 1110-2-2904, Design of Breakwaters and Jetties, Sept. 84

Advance Maintenance for Entrance Channels ProjectGoals

In order to evaluate the effectiveness of advance maintenance dredging, the effect of channel depth and width on shoaling and resultant dredging frequency must be understood. All Corps dredged entrance channels

have been identified and those to which advance maintenance is applied have been so designated. Historical dredging data from selected projects will be analyzed to study the effect of channel depth and width on both dredging frequency and volume. The feasibility of a modeling approach to the problem, including physical, numerical, analytic, and empirical models, will be investigated.

### Objectives

The objectives of this study are to develop rational criteria for the use of advance maintenance (overdepth and overwidth dredging) for entrance channels by evaluating the effect of depth and width on dredging frequency.

### Milestones

#### FY 81

ETL on Present Practices, Sept. 81.

#### FY 82

Projects Evaluation, Sept. 82.

#### FY 83

Predictive Modeling Investigation, March 83.

Technical Report(s), Sept. 83.

ETL on New Estuarine Procedure Applied to Entrance Channels, Sep 83

#### FY 84

Information for Revision to Maintenance Practices  
Section of EM 1110-2-1607, Tidal Hydraulics;  
ER 1130-2-307, Dredging Policies and Practices;  
Chapter 9 of New EM on Deep Draft Channel Design;  
Chapters 1, 2, 5, and 7 of new EM on Inlet  
Stabilization and Sand Bypassing; and Channel Depths  
Section of new EM on Small Boat Basin Design, July 84

ETL on Recommended Procedures, Sep 84

### Numerical Prediction of Navigation Channel Maintenance Project

#### Goals

The computer code "Mathematical Model of Estuarial Sediment Transport" developed by Ariathurai, MacArthur, and Krone for the Dredged Material Research Program will be enhanced to become a general purpose sediment

transport model capable of analyzing noncohesive, as well as cohesive sediment problems. The program will be documented and guidelines prepared to aid field offices.

### Objectives

The objectives of this study are to develop numerical prediction techniques for assessing the impact of changes in sediment loads, water discharges, flow hydraulics, dredging frequency, channel size, or disposal techniques on the quantity of sediment being dredged and frequency of dredging operation.

### Milestones

#### FY 81

Report on analysis of flume experiments with cohesive sediment, July 81.

Improved version of STUDH to model 3-D problems, July 81.

Hydrodynamic code compatible with 3-D version of STUDH, July 81.

#### FY 83

Guidelines and information on use of models available for ETL and EM's on Deep Draft Navigation Project Design and Navigation Channel Stabilization, Sept. 83.

#### FY 84

ETL on Deep Draft Navigation Project Design and Navigation Channel Stabilization, April 84.

## Effectiveness of Expedient Emergency Flood Fighting Structures Project

### Goals

The study will be conducted on a prototype scale basis within a controlled basin. Various types and heights of expedient structures will be tested for static and dynamic loading conditions that normally occur during flooding. This work will be coordinated closely with district and division personnel for maximum input and feedback.

### Objectives

The objectives of this study are to determine the limits and effectiveness of expedient flood fighting structures and provide design criteria by which they can be validated or improved.

MilestonesFY 82

Information for ETL on design criteria of 2-ft-high concepts  
Sept. 82.

FY 83

Information for ETL on design criteria of 4-ft-high concepts  
Sept. 83

FY 84

Information for ETL on design criteria of 6-ft-high concepts  
Sept. 84

FY 85

Incremental and/or total information available for inclusion  
in special EC or brochure and training courses, Dec. 84.

Estimated Funding for Flood Control and Navigation Program (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$1,505	\$865	\$515	\$330

\* Presidential budget submission

Program Technical Monitor

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Environmental Quality Program

The environmental quality research area is concerned with how the construction, operation, and maintenance of Corps water resources projects impact on the environment and the maintenance of national water quality standards, including the Corps role in the Urban Studies Program and related activities. The planning, development, and management of water resources projects require R&D to assure compliance with Federal and State environmental legislation and regulations at a reasonable cost. Many of these recent regulations have tightened the environmental quality standards and constraints on water resources projects, thereby increasing the need for improved capabilities to attain and maintain this higher

and economically, the R&D program is concerned with the development of techniques and procedures for assessing, evaluating, and controlling the impact which activities of the Corps and urban communities have on the environment. Some examples of these developments are discussed below:

- o Continue the evaluation of existing marsh/estuarine water quality and ecological modeling techniques to determine their usefulness in addressing environmental problems associated with Corps activities in coastal regions, and in developing improved modeling where required.
- o Develop guidance for Corps planners for describing the relationship between Corps activities and measurable fish and shellfish habitat value changes.
- o Develop methods to determine and interpret environmental effects of contaminant mobility, bioaccumulation, and biomagnification of toxic substances in dredged material; to focus on toxic substances chemistry processes, including long-term effects, techniques for sampling and measuring low-level toxic substances; and to estimate pollution potential of area discharges.

OPRDM-related research conducted under the Corps' environmental quality program is primarily the responsibility of the Waterways Experiment Station (WES) located in Vicksburg, Mississippi through its Dredging Operations Technical Support (DOTS) Program and the Environmental Laboratory. The Coastal Ecology portion of the work was transferred from the Coastal Engineering Research Center (CERC) to the WES Environmental Laboratory in July 1983. The research was transferred from the Coastal Engineering Program to the Environmental Quality Program at that time. The research areas dealing with OPRDM are described below:

#### Erosion Control Techniques Using Plants Project

##### Goals

Marsh plants have been used successfully to stabilize eroding shores and dredged material in many sheltered coastal areas. This has been achieved in a variety of intertidal environments at a fraction of the cost required for comparable structural protection. Recent studies have also shown that submerged grasses (seagrasses) also stabilize bottom sediments and help control shore erosion. However, little information is available on site conditions which are suitable for the use of these alternatives. In addition, project engineers do not have specifications for the design of vegetative stabilization projects. With information on site selection and design developed by this work unit, divisions and districts will be able to give full consideration to these alternatives on a project to project basis. This technology will also be widely applicable to mitigation and habitat enhancement projects that require the restoration of marsh and seagrass habitats.

Objectives

To provide a natural, inexpensive efficient method of shore erosion control using coastal marsh plants and seagrasses in areas of relatively low wave energy.

MilestonesFY 81

Literature Review "Seagrasses and Seagrass Planting Techniques," Nov. 80.

Workshop "Seagrass Planting," Duck, N.C., May 81

FY 82

Workshop CERC. "Seagrass Planting," Duck, N.C., May 83.

FY 83

Coastal Engineering Technical Aids (CETA) "Sediment Trapping and Wave Attenuation by Seagrasses," July 83.

FY 84

Workshop, May 84

TR-Atlantic Seagrass Transplanting Study, May 84.

CETN-Gulf Coast Seagrass Planting Methodology, April 84.

"Environmental Engineer Manual for Deep Draft Navigation Projects".

FY 85

Workshop, May 85

CETA-Gulf Coast Seagrass Planting Methodology, Jan. 85.

TR-Gulf Coast Seagrass Transplanting Study, April 85.

"Environmental Engineer Manual for Coastal Shore Erosion Control and Hurricane Protection Projects,".

FY 86

Workshop, May 86

CETA-Pacific Coast Seagrass Planting Methodology, Aug. 86.

FY 87

Workshop, May 87.

TR-Pacific Coast Seagrass Transplanting Study, April 87.

Beach and Foredune Ecology ProjectGoals

Beach nourishment and dune stabilization are the two most common nonstructural alternatives used in coastal shore protection projects. These alternatives are often less costly than structural measures and are widely used by the Corps of Engineers and others. To comply with NEPA Corps offices must be able to assess the environmental impacts associated with beach nourishment and dune stabilization projects. The Corps must be able to accurately assess the impacts of structural alternatives on the barrier island ecosystem and other coastal shores. Therefore, it is important that the potential effects of these activities be quantified and this information made available to Corps offices through workshops, guidelines, technical reports and consulting. Field offices will use this technology in planning, designing and regulating shore stabilization and other coastal projects.

Objectives

To define and evaluate the environmental impacts of beach nourishment, dune stabilization and other construction upon the biotic communities of barrier islands and coastal shores.

MilestonesFY 81

Hold a workshop in May 81 in beach nourishment guidelines.  
Publish a Coastal Engineering Technical Note (CETN) on beach nourishment in the Gulf in Sept. 81.

FY 82

Hold workshop on beach nourishment May 82.  
Publish a CETA on evaluating beach nourishment projects, Feb. 82.

FY 83

Distribute CETN on beach nourishment - Great Lakes, Dec. 82.  
Guidance Report on the evaluation of beach nourishment projects, Dec. 82.

FY 84

Hold a workshop on beach nourishment, May 84.  
Publish life-history synopsis on sea turtles, especially as related to beach nourishment, Sep. 84.

FY 85

Workshop, May 85  
CETA on environmental changes associated with foredune construction, (updated) Sep. 86.

FY 86

Workshop, May 86.

Publish guidance on effects of beach nourishment on nesting sea turtles, Sept. 86.

Ecological Effects of Rubble Structures ProjectGoals

Rubble structures are ubiquitous within estuarine and coastal systems. However, only a limited amount of information on the ecological effects of such structures exists. This results in the inability of the coastal districts to adequately evaluate construction alternatives relative to environmental impacts. Coastal structures result in changes in hydrodynamic patterns, sedimentation patterns, and habitat types that in turn can have a detrimental effect on aquatic biological communities. Any changes in biological community structure and function resulting from the construction of such structures have to be evaluated relative to existing conditions in the aquatic system, and to construction and non-construction alternatives that could be employed.

Objectives

The objectives of this project are to define and quantify the ecological effects of rubble groins, jetties and breakwaters in four U.S. coastal areas and the Great Lakes.

Milestones:FY 81

Workshop - May 81

CETN - Immediate Effects of Jetty Construction at Murrells Inlet, S.C. - Aug 81.

FY 82

A state-of-the-art workshop on the ecological evaluation of the effect of rubble-mound construction, May 82.

Coastal Engineering Technical Note entitled "Guide to Evaluating the Biological Effects of Weir Jetty Construction on the South Atlantic Coast," Dec. 82.

FY 83

Engineering Manual Chapter on "Environmental Impacts" in "Design" of Coastal Revetments, Seawalls, and Bulkheads."

FY 84

Coastal Engineering Technical Note "Guide to Evaluating the Biological Effects of a Rubble Structure on the Mid-Atlantic Coast," March 84.  
Workshop on Ecological Evaluations of Rubble Structures, May 84.

FY 85

Coastal Engineering Technical Note entitled "Guide to Evaluating the Biological Effects of a Rubble Structure in the Great Lakes," March 85.

FY 86

Workshop on Ecological Evaluation of Rubble Structures, May 86.

FY 87

Workshop Summarizing Ecological Effects of Rubble Structures, May 87  
CETN on "Biological Effects of Rubble-mound Construction on the Gulf Coast."  
CETA on "The Ecological Effects of Rubble Structures," Sept. 87.

Effects of Channel Deepening and Jetties on Fish and Shellfish Migration Project

Goals

Coastal jetties may interfere with the migration of fish and shellfish between the inshore and offshore waters. Jetties may stop or delay the normal migration into coastal bays and estuaries at critical periods in the life history of these organisms. Delays may result in concentrating the animals and subject them to high mortality because of increased vulnerability to predators.

Objectives

The objectives of this project are to determine how widening and deepening inlet channels and building jetties affect the migration of commercial and sport species of marine fish and shellfish in and out of coastal estuaries, and to quantify the ecological effects where possible.

MilestonesFY 81

CETN on sampling methodology for evaluating fish movement across the weir of a weir-jetty.

FY 83

"Annotated Bibliography on the Biological Effects of Constructing Channels, Jetties, and Other Coastal Structures," Jan. 83.

FY 84

Coastal Engineering Technical Note entitled "Guide to State-of-the-Art Methods for Evaluating Effects of Channel Deepening and Jetties on Fish and Shellfish Migration," Oct. 84.

FY 85

Coastal Engineering Technical Note on "Use of Coastal Species Profiles for evaluating Ecological Effects of Channel Deepening and Jetties," Nov. 84.

FY 86

CETA entitled "Evaluation of Effects of Channel Deepening and Jetty Construction on Fish and Shellfish Migration, Jan. 86. Workshop, July 86 to discuss CETA.

Dredged Material Research and Development

Under Section 404 of Public Law 92-500 (Clean Water Act) and Section 103 of Public Law 92-532 (Ocean Dumping Act) the CE is responsible for permitting the placement of dredged and fill material in the nation's waterways and the transportation of dredged material for disposal in the oceans. At present, the CE receives more than 10,000 permit applications annually under Sections 404 and 103. Although the CE does not issue permits for its own activities, by law the CE must comply with criteria applied to a permit applicant.

In regard to ocean dredged material disposal activities, the Second Federal Plan for OPRDM, published in September 1981, identified as a high priority research need, the development of improved techniques for predicting the environmental impacts of chemical contaminants associated with dredged material. The following dredged material research was developed in response to this identified research priority:

Long-term Effects of Dredging Operations (LEDO) ProjectObjectives

This research program was formally established in FY82. Its objectives are to provide new or improved state-of-the-art technology for predicting long-term environmental impacts of dredging operations and to improve or develop methods for minimizing any adverse impacts associated with dredged material disposal. Work is currently being conducted to determine the effects of aquatic disposal and the effects of terrestrial disposal. LEDO is planned as a continuing program since applied environmental research must address current problems and research priorities are subject to change.

Specific areas of research in LEDO include the following:

- a. Bioaccumulation and biomagnification in the aquatic environment. Establish the significance of bioaccumulation and biomagnification of contaminants associated with the aquatic disposal of dredged material and develop or improve predictive techniques for bioaccumulation and biomagnification.

- b. Minimize procedures to reduce adverse impacts. Field-test procedures that will eliminate or minimize adverse impacts of dredged material disposal. One possible procedure under study is capping contaminated material with noncontaminated material.
- c. Upland plant and animal bioassays procedures. Improve first-generation plant and animal bioassays for predicting uptake of contaminants in wetland upland areas.
- d. Water quality. Increase the understanding of the geochemical changes that occur with time in upland dredged material containment areas; develop or improve techniques for predicting contaminant concentrations in the effluent from these sites.

Study results will provide a much broadened state-of-the-art technical basis for the Corps' implementation of its environmental responsibilities under Federal legislation. Emphasis will be placed on presenting research results in the international technical and scientific literature as well as making results immediately available to the field through normal Corps channels.

#### Milestones

##### FY 83

Revised EPA/CE implementation manuals for Section 103 and 404 criteria.

Modified elutriate test procedures for containment area effluents.

Developed fresh and saltwater plant bioassay techniques.

##### FY 84

Develop Predictive techniques for contaminant levels in containment area effluents.

Determine mixing zones for containment area effluents.

##### FY 85

Determine efficiency of capping to contain contaminants.

Develop techniques for predicting pollution potential of diked containment areas.

Determine food web biomagnification of contaminants in aquatic ecosystems.

##### FY 86

Technical reports -- assessment of predictive techniques for biomagnification and bioaccumulation.

- Determine environmental consequences of bioaccumulation.
- Develop procedures for assessing cumulative effects of dredged material discharges.
- Consider assessing regional effects of multiple discharges.
- Develop animal bioassays for upland disposal alternatives.
- Complete synthesis reports on LEDO investigations.

#### Field Verification Project

During planning of LEDO field studies with the Corps' New England Division, it became apparent that a unique set of circumstances existed in the New England region of the United States where three disposal alternatives could be evaluated at the same time (open-water disposal, upland disposal, and marsh creation). The Field Verification Program was established as a cooperative effort between the Corps and EPA to field-verify existing predictive testing procedures. Through the program, promising procedures already developed by the Corps along with techniques developed by EPA for nondredged materials will be applied to project conditions at Black Rock Harbor, Bridgeport, Connecticut, using dredged material from that single maintenance operation. Although the three disposal alternatives have been evaluated independently during the DMRP, these field studies will provide the first opportunity for direct comparison of the environmental consequences using the same dredged material under different disposal conditions.

The program's major areas of investigation include:

- a. Bioaccumulation of contaminants by aquatic animals. Levels of bioaccumulation of selected contaminants over time, biological and physical factors affecting bioaccumulation, and variability of bioaccumulation predictions will be documented in the laboratory. Bioaccumulation will then be determined under field conditions and compared to laboratory predictions to verify the accuracy of the prediction methods.
- b. Consequences of bioaccumulation in aquatic animals. Several physiological indices of biological health will be determined in organisms that have accumulated contaminants from dredged material. These indices, previously developed by EPA for use in nondredged material regulatory programs, will include scope for growth, benthic and reproductive effects, effects on enzyme systems, and histopathological parameters. The responses of aquatic animals to contaminants will first be determined in the laboratory to establish feasibility for assessing dredged material effects and correlation with bioaccumulation. Responses will then be verified in aquatic organisms exposed to contaminated sediments in the field.

- c. Effects of aquatic disposal on community structures. Effects of contaminated dredged material disposal on community structures will be determined by measuring mortality, reproduction, and intrinsic rate of growth in selected populations within aquatic communities. These assessments will be documented in the laboratory and verified by monitoring in the field.
- d. Dredged material movement. A three-dimensional dredged material transport model will be calibrated and verified using previously gathered field data. The model responds to changes in wind and tide, surface heat, salt flux, and flow using specific measurements of salinity, temperature, and surface elevations (or currents) taken at open inflow boundaries. The contribution to dredged material dispersion of sediment disturbance from resuspension by benthic animals will also be evaluated.
- e. Effects of upland disposal on water quality. Laboratory tests for predicting effluent quality will be conducted on contaminated sediments prior to placement in a confined disposal area. The confined disposal area will be designed, operated, and managed to ensure optimum fill configuration for the field studies and evaluation of water quality effects. During filling operations, influent and effluent water quality parameters will be monitored extensively at selected stations within the disposal area. Following disposal, the quality of surface water runoff will be determined by collecting surface water samples from controlled simulation of rainfall. Monitoring wells will be placed around and within the disposal area, and groundwater samples taken before, during, and after filling.
- f. Bioaccumulation of contaminants in upland and wetland plants. First-generation test procedures from DOTS and other studies will be verified at the field site. Saltmarsh plants will be grown under controlled wetland and upland conditions and analyzed for contaminant bioaccumulation. Field tests will be conducted to verify laboratory test results. Saltmarsh plants will be planted at the upland disposal facility at Black Rock Harbor and sampled each year to determine contaminant bioaccumulation.
- g. Bioaccumulation of contaminants in upland and wetland animals. Existing upland and wetland animal bioassay test procedures developed in Europe will be verified in the field using selected upland animals (annelid worms) and wetland animals (snails).

Results of the Field Verification Program will provide both the Corps and EPA with documented and verified state-of-the-art procedures for complying with national regulatory requirements and international agreements. The study was initiated in FY 82 and is scheduled to be completed in 5 years.

Milestones

Data obtained from this program will be incorporated into technical reports and field guidance as listed under the LEDO program milestones. In addition, the following milestones are provided.

FY 83

Guidance for 3-dimensional dredged material transport model.

FY 84

Reports and guidance on surface water runoff quality, and leachate/groundwater quality.

Technical report on laboratory documentation of the precision and accuracy of regulatory bioaccumulation procedures.

FY 85

Field wetland animal bioassays.

FY 86

Technical reports and guidance on bioaccumulation as determined by field verified scope for growth assessments, genetic and reproduction assessments, enzyme parameters, and histopathological appraisals.

Technical report on field verification of the precision and accuracy of regulatory bioaccumulation predictions.

TR on effects of aquatic disposal on community structure.

Synthesis reports on results of disposal alternative assessments and predictive procedures.

Dredging Contaminated Sediments Project

In the United States, much work has been conducted over the past 10 years on the effects of dredged material disposal. Little work has been done on the effects of the dredging operation because it was felt that the disposal operation would have the most significant impact. However, due to the need to dredge highly contaminated sediments, it became apparent that research was required to establish environmental parameters associated with conventional dredges as well as investigating and developing procedures and/or equipment to minimize adverse effects from the dredging operation.

Objectives

Existing data on the resuspension of sediments and contaminants will be collected on a national and international basis. In addition, field studies will be conducted at various sites where unconventional equipment is being used. Based on these data, guidelines will be developed for dredging highly contaminated sediments to minimize any adverse impacts.

MilestonesFY 83

Draft ETL on existing dredge performance data, Sept. 83.

FY 84

Draft ETL on results of field evaluations, Sept. 84.  
Draft ETL on Laboratory Predictive Tests, Sept. 84.

FY 85

Draft EP on dredging contaminated sediments, Sept. 85

FY 86

Up EM on dredging and dredged material disposal, Sept. 86  
Final report on dredging contaminated, Sept. 86.  
DOTS Information Exchange Bulletin. Significant findings will be published periodically in the Bulletin. Sept. 86.

Long-term Monitoring Project

A number of aquatic, wetland and confined dredged material disposal site investigations were undertaken by the Corps Dredged Material Research Program, completed in 1978. However, due to the short time frame of the DMRP, 5 years, monitoring of a number of these sites beyond the time frame of the DMRP was considered desirable and has been undertaken under the centralized management of the DOT'S program. Much of this work is now incorporated into the LEDO Program and the Wetlands Research Program. The following describes the long-term monitoring efforts to be continued under the DOT'S prgram:

a. Long-term Monitoring of Selected Open-Water Disposal Sites.

Work will continue under this effort to complete ongoing research efforts at two aquatic sites, Lake Erie at Ashtabula, Ohio, and Elliott Bay off Puget Sound, Washington, as well as to develop effective field monitoring protocols for aquatic dredged material disposal sites. In regard to the latter objective, maximum advantage will be undertaken of ongoing efforts by the Corps district and division offices. An additional monitoring effort was initiated in FY 82 at Coos Bay, Oregon, in conjunction with the Portland District Office.

- b. Monitoring of Habitat Development Field Sites. The DMRP documented that productive habitats such as marshes could be created with dredged material. This work unit will continue the monitoring of seven marsh and upland habitat development sites established under the DMRP to determine their long-term viability and relative value. These sites are located at Miller Sands, Columbia River, Oregon; Salt Pond 3, South San Francisco Bay, California; Bolivar Peninsula, Texas; Apalachicola Bay, Florida; Buttermilk Sound, Georgia; James River, Virginia; and Nutt Island, Connecticut River.
- c. Verification and Refinement of Engineering Methodologies for Dredging and Dredged Material Disposal. Further verification and refinement of engineering techniques developed under the DMRP will be conducted. These include dewatering techniques for diked containment areas, control strategies for minimizing contaminant, return flows to surface and groundwater supplies from containment areas, and long-term management of diked areas for maximum use.

#### Milestones

##### FY 81

Final contractor reports on aquatic disposal sites at Elliot Bay and Lake Erie.

##### FY 82

Synthesis report on aquatic disposal sites.

Interim technical report on habitat development sites.

EM revisions on guidelines for design and operation of chemical clarification systems for containment area effluents.

##### FY 83-86

Revisions to EM's on dredging and dredged material disposal.

##### FY 84

Interim TR on habitat development sites.

Input to LEDO, wetlands programs and revisions to EPA/Corps 404 and 103 implementation manuals.

##### FY 86

Final reports on aquatic sites and monitoring requirements.

Final report on all habitat development sites.

Long-Term Management Strategy (LTMS) for Dredged Material Disposal ProjectGoals

The development of LTMS'S for dredged material disposal is a complex and time-consuming process, and in most cases must consider social, economic, environmental, institutional, and operational constraints. Although some Districts are developing such strategies, some are still the results of last minute site specific needs. This lack of long-term management strategy is especially crucial in ports where such strategy could help meet future defense related military needs. Many of the elements for developing such strategies either exist today or could be developed from the results of research, monitoring, and field activities conducted by the Corps over the past 10 years.

The present need is for a procedure or conceptual framework that would: (1) identify and assess the critical elements necessary for a long-term strategy for dredged material disposal; and (2) provide user guidance of such elements in such a way as to permit effective disposal.

Objectives

The principal objective of this work is to provide the field with protocols for developing LTMS'S for disposing of dredged material in an economically and environmentally sound manner.

MilestonesFY 84

A national workshop aimed specifically at long-term management of dredged material disposal will be held. This workshop, held in cooperation with the National Oceanic and Atmospheric Administration (NOAA), will identify what has been done in the past, what is presently being done and what should be done in the future. Initiate work to define capacity of aquatic disposal sites and develop a methodology for determining that capacity. This has been recognized by the field and WRSC-D as a priority element needed for LTMS and therefore this work will start prior to development of the conceptual framework or workshop. At present, site designation is the priority of the Army/EPA Ocean Dumping Task Force and site capacity is a crucial element for site designation. The information gained in this effort should add significantly to the Task Force needs.

Out Years Plans

Monitoring of the capping operation in New York will be completed in FY 85. A report describing that effort will be drafted in FY 85 for final publication in FY 86. The long-term management conceptual framework, initiated in FY 84, will be completed and presented in draft report form in FY 85.

This draft conceptual framework will guide further development of existing elements. Missing elements will be pursued depending on technical and/or political need.

Work will also continue on defining or developing methodology for determining site capacity for aquatic dredged material disposal sites. Draft guidance will be issued in September 1985.

### Wetlands Project

Implementation of Section 404 of the Clean Water Act has given broad responsibilities to the Corps in the regulation of dredged and fill activities in wetlands. In addition, both the Clean Water Act and the Ocean Dumping Act require the Corps to evaluate and assess relative impacts of dredged material disposal alternatives, including disposal within wetlands, and both for Federal projects as well as for permit applications for dredged or fill material disposal. Determination of the landward limit of wetlands is in question because of the lack of definitive scientific information on the subject. Evaluation of permit and construction activities in wetlands may ultimately be based on the functional values of that resource. Specific qualitative and quantitative data on this object are lacking.

### Objectives

Priority wetland research needs have been identified in two major areas. The first is to develop improved and standardized techniques to assist CE field personnel in the identification and delineation of wetlands subject to jurisdiction under the Section 404 regulatory program. The second is the assessment and quantification of wetland values for use in the evaluation of permit activities, and to meet CE needs in planning, construction, and operational activities in wetland areas. Research into the identification and delineation of wetlands began in FY 78 and should be completed in FY 84. Functional values research was initiated in FY 82. Central elements are presented below:

#### A. Identification and delineation.

1. Transition zone analysis. Develop and compare vegetative, soil, and hydrologic techniques which can be used to determine saturated soil conditions and periodic inundation.
2. Nongrowing season vegetation techniques. Develop regional procedures for the identification and delineation of wetlands during fall and winter seasons.
3. Plant tolerance indices. Document and evaluate plant tolerance to inundation and saturated soil conditions for the purposes of developing quantitative tolerance indices.

#### B. Functional values.

1. Identification and qualitative assessment. Develop qualitative techniques for the assessment of wetland functional values.

2. Quantification of selected functional values. Develop and field test techniques for the accurate determination of selected wetland values. Priority will be given to water quality, habitat value, nutrient cycling, cultural values, erosion protection, and primary productivity.

### Milestones

#### FY 81

Wetland Guide for the South Atlantic States

Wetland Guide for the North Atlantic States

Wetland Guide for Alaska

#### FY 82

Synthesis of Transition Zone Methodologies

EP - Transition Zone Analysis

Wetlands Manual

Part I - Technical Standard

Part II - Methodology

Part III - Workbook

Workshop on Wetlands

#### FY 83-84

Wetlands Manual

#### FY 85-87

Wetlands Values Manual

#### FY 86

EP - Interim guidance on wetland restoration

### Procedure for Benthic Resource Assessment Project

#### Goals

The influence of numerous CE activities on bottom substrate conditions leads to benthic invertebrate community investigations in many CE projects. Despite the commonplace procurement of benthic data, no procedure exists which is able to use this data, and output information with economic and social significance in impact statements. Neither does a procedure

exist for quantifying the impacts of CE activities on bottom (benthic) fish resources. The need for such a procedure is indicated by Section 404 of the Clean Water Act, Section 103 of the Ocean Dumping Act and the expressed concerns of various Federal and State agencies reviewing CE plans and operations for flood control and navigation in U.S. waters.

#### Objectives

This research will provide District offices with a procedure to measure or predict the impacts of a project's structural and operational alternatives on important estuarine and marine bottom fish resources. The procedure will be time and cost efficient, quantitative, technically and legally defensible, and capable of producing output with economic and social significance.

#### Milestones

##### FY 84

User information product presenting a field tested and technically reviewed procedure for assessing benthic resources, June 84.

Final technology transfer workshop, August 84.

#### Estimated Funding for the Environmental Quality Program (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$3,818	\$4,587	\$4,650	\$4,119

\* Presidential budget submission

#### Program Technical Monitor

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#### Satellite And Surveying Applications Program

The Satellite and Surveying Applications Program includes research, development, test, and evaluation activities necessary to adapt and apply new technology in surveying and in satellite remote sensing and positioning systems to improve Corps functions and to minimize costs. The remote sensing program has been a continuing effort on the part of the Corps to explore fully the numerous technical and economic capabilities available through the program formerly entitled "Earth Resources Satellites." Activities to be addressed include consideration of data element interpretation techniques, data handling, and the contribution of satellite-acquired

data to water resources planning and management models. The Corps is exploring the use of the precise measurement and positioning capabilities developed to support the Federal dam safety program and those derived from Army/NASA satellite research and development to meet some of the needs of its water resources program. Research activities in the current program include:

- o Development of the capability to use satellite data for detecting and mapping areas with a high potential for being identified as wetlands by Corps field offices and to establish criteria for use of this capability.
- o Evaluation, in coordination with NASA and DOD, of the use of present and future satellite data for solving coastal engineering problems.
- o Evaluation of the airborne Lidar system in obtaining hydrographic data in coastal and ocean environments.
- o Evaluation of remote sensing techniques for monitoring coastal environmental conditions and water quality for short and long-term trends.
- o Evaluation of remote sensing techniques to monitor changes in aquatic vegetation in coastal and estuarine environments.

Remotely sensed data as outlined in the panel report prepared by the Space Applications Board Assembly of Engineers (1980) are now being applied to the following water resources problems by the Corps through their on-going research and technology transfer programs.

- o Surveillance of river channels and beach migration.
- o Monitoring of silting in lakes.
- o Assessment of tidal regimes in estuarine environments.
- o In 1980 the Corps completed the first remote sensing program at the Duck field test site in North Carolina. Over 100 flights were conducted using sensors that supplied information on wind speed and direction, waves, currents, water level and other data required for solving coastal engineering problems. It is by far the most complete and well documented data set available to evaluate remote sensing versus conventional methods for obtaining coastal and ocean data.

The research being conducted under the satellite and survey remote sensing program is accomplished primarily by using the Corps research laboratories. They are as follows:

Coastal Engineering Research Center (CERC)  
Cold Regions Research and Engineering Laboratory (CRREL)  
Waterways Experiment Station (WES)  
Engineering Topographic Laboratory (ETL)

The following is a summary of the work that is ongoing and planned for the area in remote sensing associated to ocean pollution problems. In all instances, the program is applications oriented and uses the highly technical research outputs from NASA and others to ensure a timely technology assessment and transfer to assist the Corps.

### Coastal Engineering Remote Sensing Applications Research Project (CERSARP)

#### Goal

The goal of this project is to develop improved cost-effective techniques for acquiring coastal time-space interrelationships.

#### Objectives

The objectives of this project are to plan, implement, and evaluate the use of remote sensing to demonstrate and field test remote sensing techniques for coastal engineering applications. To evaluate, coordinate with NASA and DOD and other agencies, and test the use of satellite data of present and future systems applications to coastal engineering.

Approach: Existing remote sensing technology will be tested and its cost-effectiveness evaluated for acquisition of coastal data such as: underwater bathymetry using airborne lasers, sediment distribution and water quality using film and filter combinations and lasers; and wave climate and current data using active microwave systems. Aircraft missions with coincident ground truth will be conducted at the field Research Facility, Duck, NC in conjunction with other organizations for demonstrating and developing techniques for the use of remote sensing data. Analysis will compare remote sensing data with conventional systems in the time and spatial domains. Areas to be addressed are underwater topography, wave climate determination, water quality, longshore transport and shoreline mapping. Evaluation of SEASAT data for ocean wave, current and wave transformation detection and the intercomparison of Landsat and SEASAT data will be accomplished. The application and evaluation of active satellite microwave systems will be developed for input to future spaceborne design. The Corps' planned use for the National Oceanic Satellite System (NOSS) (2nd generation SEASAT) and its integration with the Landsat-D program will be developed and coordinated.

#### Milestones:

##### FY 81

After Action Report  
Workshop

##### FY 82

Landsat-SEASAT Comparison  
Laser Evaluation  
Analysis  
NOSS Experiment Plan

FY 83

CETN - Coherent Wave Radar, Surface Currents, June 83.  
CETA - Sensor Selection for Wave Data, June 83.

FY 84

CETN - High Frequency Radar, Wave Direction, Oct. 83.  
CETN - Surface Currents, Water Body Movement, May 84.

FY 85

CETA - Wave and Current Measurements Techniques for Calibration of Numerical Models, June 85.

FY 86

CETN - Remote Sensing Systems to Detect Underwater Topography, June 86.

Integrated Hydrographic Survey Systems Project

Goals

The product market is continually monitored by the coordinating group. Information is transferred to the field either directly for specific problems or through report, conferences, and training courses.

Objectives

The objectives of this study are to continually update the Corps hydrographic surveying capability by developing effective and efficient methods, systems, and equipment.

Milestones

FY 81

Technician Training course, March 81.

FY 82

Complete Heave Correction Equip Eval., Jan. 82.

FY 83

Report (ETL on Evaluation of Heave Correction Equip), Aug. 82.

FY 83

Tech Tru Course, March 83.  
Field Eval Heav Corr Equip., July 83.

FY 84

Heave Corr Equip Rpt., April 84.

FY 85

HS Product Std Rpt., Feb 85.  
Survey Requirements, Meetings, Feb. 85.  
Proceedings, Aug. 85.

FY 86

HS Equip Std Rpt., Dec. 86

Annually

Training Courses

Biennially

Conferences

Continuing

District Assistance

\* Not financed with work unit funds.

Estimated Funding for Satellite and Surveying Applications Program

(in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$150	\$180	\$251	\$235

\* Presidential budget submission

Program Technical Monitor

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DEVELOPMENT/MONITORING PROGRAMS

The Corps districts and divisions are in charge of the Corps day-to-day operations. They do not normally run the research projects, but they do conduct all of the operational activities dealing with monitoring and data acquisition and interpretation as well as project-specific developmental research.

Program Technical Monitor For All Division And District Programs

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The following is the list of Corps projects from division and districts included under OPRDM:

North Atlantic Division Program

(New York District)

Monitoring of Capping Operations Project

The Capping Operation Project was designed to assess the feasibility for "capping" of potentially contaminated dredged material with clean dredged material. Monitoring studies were initiated for the purpose of studying the effectiveness and stability of the cap covering the dredged material from NY Harbor.

Short-term biological monitoring -- Bioaccumulation potential at the capping site was examined with the use of mussels contained in bags suspended from platforms in the capping area, the mud dump and various control and reference sites in the New York Bight area.

Sediment transport monitoring -- The sediment transport monitoring involved determining the stability of the cap and considered the long-term sediment transport caused by currents and storm-generated waves at the entire "Mud Dump" site.

Sediment Budget Study -- This study was designed to quantify the dry mass of dredged material involved in each stage of typical clamshell dredging and disposal activities in order to identify and quantify "losses" of dredged material.

Chemical Signature Study -- This study addressed the issue of contaminants released from sediments into the ocean. The Chemical Signature Study looked at the transfer of chemical pollutants from marine sediments into the marine environment.

Long-term monitoring -- Long term bioaccumulation potential at the capping site and sites within the "Mud Dump" and the New York Bight area will be monitored by using a variety of marine fauna. In addition to bioaccumulation studies, recolonization and population dynamics will be monitored.

#### Capping Synthesis Report

The final reports for the above-mentioned monitoring studies, excluding the Long Range Monitoring Plan, are being incorporated and synthesized into a Capping Synthesis Report to be completed by September 1982. In addition to the above-mentioned monitoring studies, the Capping Synthesis Report will incorporate the results of studies related to the capping of dredged material (e.g. DAMOS).

#### Subaqueous Borrow Pits Project

One portion of this study deals with biological studies and monitoring techniques. The biological monitoring involves pre-dumping analysis of the fisheries and other marine communities existing in the borrow pits before dumping of dredged material. A long-term fishery study of the borrow pit and its surrounding waters is presently being conducted. In addition, monitoring will include projection of impacts on local marine ecosystems and evaluation of potential for contaminant release during disposal and before capping.

The second part of the study deals with sediment stability monitoring which includes monitoring of erosion under normal and storm conditions.

It should be noted that the progress of the subaqueous Borrow Pit project cannot proceed until litigation is completed.

#### Milestones (Status as of August 3, 1982)

DESCRIPTION	DATE OF COMPLETION		COMPLETED
	Early	Late	
Implement Guidance Manual	12/29/80	7/5/82	Dec. 1980
Implement Matrices	10/12/81	2/11/85	Oct. 1981
Final EPA EIS Mud Dump	11/23/81	6/3/85	Nov. 1981
Annual Report-Mussel Study	10/19/81	7/2/84	Oct. 1981
Final Report - Mussel Study	3/29/82	12/10/84	Mar. 1982
Initiate Contract - Long Range Monitoring	11/22/82	3/14/83	
Annual Report - Long Range Monitoring	1/6/84	4/7/84	
Final Report - Sediment Budget	9/6/82	5/20/85	

Final Report - Sediment Transport	9/27/82	5/20/85	
Final Report - Chemical Signature	6/21/82	2/18/85	June 1982
Synthesis Report - Capping	8/30/82	4/22/85	
<sup>1</sup> Initial Pilot Project - Sub-aqueous Borrow Pit	5/30/83	4/23/84	

## (Norfolk District)

In the past, maintenance dredging material removed from the Thimble Shoal Channel portion of the Norfolk Harbor system and the Cape Henry Channel reach of the Baltimore Harbor system has been placed in the EPA interim designated Dam Neck ocean disposal site. On 30 April 1980, Norfolk District established a permanent, deeper water ocean disposal site to handle the suitable maintenance material as well as the suitable new work material from the navigation channels serving the Chesapeake Bay. This new disposal area is known as the Norfolk disposal site. It is located in the Atlantic Ocean within a circular area with a 4-nautical mile radius with a center point of 39° 59' N Latitude, 75° 39' W Longitude. This site is in about 70 feet of water, approximately 17 nautical miles from the mouth of the Chesapeake Bay. Portions of this area were established earlier in this century for the disposal of dredged material and were used intermittently until about 1965.

The Dam Neck interim disposal site will continue to be used as required and will undergo future study to enable full site designation. No funding levels or milestones have been established for this work.

Ocean Disposal of Dredged Material Project

The Corps, with NOAA support is in the monitoring phase at the Norfolk disposal site. The FEIS for this site was filed on July 23, 1982, and the Corps has requested final EPA designation for the site.

Objective

The site is intended for the long-term disposal of dredged material from the Lower Chesapeake Bay channels.

Milestones

The required monitoring of the site will continue indefinitely. Dredged material in the Craney Island Disposal Area is also being tested to determine what material is suitable for removal and disposal in the Norfolk disposal site.

Underwater Bar ProjectGoals

The planned deepening of the Thimble Shoals navigation channel would make available approximately 28 million cubic yards of sandy material which will require disposal. Instead of just relying on the ocean or other disposal media to assimilate this material as a waste or by-product, the Norfolk District is treating this material as a valuable resource. The District is evaluating the possibility of constructing an offshore bar or berm, generally parallel to the shoreline and on the downdrift side of the offshore entrance channel.

Objectives

Potential beneficial aspects include stockpiling of sand for later rehandling, possible mitigation of effects of storm waves along the shoreline to in turn reduce severe beach erosion to Virginia Beach, and, finally, as a potential fish attractor due to the relief provided by bar construction.

MilestonesFY 83

A test operation using fine-grained sand, point dumping by hopper dredge and state-of-the-art vessel positioning, have demonstrated the construction feasibility of the concept. An analysis of this operation indicates that the imposition of controls on dumping did not affect contract costs. The demonstration proved conclusively that the technology for bar construction is in hand.

FY 84

The District is continuing to evaluate the possibility of employing this beneficial use concept at Norfolk. If, in fact, the decision is made to use this concept, the District will undertake extensive monitoring and documentation of this effort.

Estimated Funding for North Atlantic Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$982	\$688	\$962	\$635

\* Presidential budget submission

New England Division (NED) Program

Dredging is an important part of NED's civil works mission. NED maintains over 100 Federal projects and processes approximately 100 permit applications for private dredging each year. In order to carry out our statutory mandate to see that all dredged material disposal complies with current regulations, it is important that NED conduct its own program of development and monitoring in regard to dredged material disposal based on regional and site-specific concerns.

Presently the NED has two projects:

Disposal Area Monitoring System (DAMOS)  
Field Verification Program (FVP)

Goals

**DAMOS:** DAMOS monitors the short- and long-term effects of dredged materials on the ocean resources in and around the major ocean dumping grounds of New England. Goals include the development and implementation of management and regulatory programs, policies, and procedures for the disposal of dredged materials.

**FVP:** As the New England aspect of the Long-Term Effects of Dredging Operations (LEDO) Program, FVP will study the relationships of contaminants and nutrients contained in dredged material with the disposal site environment. In particular, this program will address contaminant availability, uptake, and subsequent histological/pathological effects on organisms. Parallel biological and chemical analyses on the same homogenized sediment will alleviate problems of incomparable test results. The goal of FVP is to develop short-term testing procedures which can be used to predict long-term effects of dredged material disposal. The FVP will assess disposal in open water and the creation of upland and wetland habitats with material from the same project.

Milestones

**DAMOS:** Generated baseline and regular monitoring data on the individual ocean disposal sites and the behavior of dredged materials in general has put into perspective the alleged harmful effects of dredged material disposal particularly in Long Island Sound. In 1982-86 DAMOS will be developing effective monitoring techniques which will make comprehensive collection of data more efficient. Progress reports share ocean disposal technology with other Corps offices and other public and private agencies. The monitoring program is studying the effectiveness of containing polluted dredged spoils by covering them with materials having different physical or chemical characteristics.

A typical DAMOS milestone chart for each fiscal year follows:

Winter Cruise	Dec-Jan
Report on Winter Cruise	June

Summer Cruise                      July-Aug  
 Report on Summer Cruise          Nov

FVP: Initiated study of aquatic disposal site. Collected sediment and water samples from the project area for chemical analysis and for use in laboratory biological assessments.

FVP is designed as a five-year program by which the cooperative efforts of the Corps Waterways Experiment Station, EPA's Narragansett Lab, and NED will lead to the goal described above. The funding levels for NED OPRDM programs, listed below, include NED's funding input to the FVP.

Estimated Funding for New England Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$800	\$800	\$700	\$700

\* Presidential budget submission

South Atlantic Division (SAD) Program

(Jacksonville District)

Disposal Area Monitoring and Site Designation

Monitoring of water quality for certification of dredging disposal operations in ocean waters surrounding Florida is continuing. Field surveys of potential ocean dredged material disposal sites are being conducted.

Milestones

Site designation studies completed in FY82. Monitoring continued as required.

(Charleston District)

Monitoring Project

When dredged material can be practically moved from inner harbor to ocean disposal areas, this material will be monitored closely and compared to the district's base-line data.

Objectives

The objectives of this study are to develop a long-term monitoring program when fine grain materials from the inner harbor are ocean disposed.

Milestones

Monitor sediment distribution, water quality and benthic organisms as required by law on an annual basis.

Ocean Site Designation Studies

Field studies were initiated in FY 83 to obtain data on bottom sediments, bed forms, water quality, benthic organisms and bioaccumulation in order to obtain final EPA designation of the Georgetown ocean dredged material disposal site. Winter and summer sampling is anticipated.

Milestones

Field surveys completed in FY83. Site designation EIS and data report to be prepared in FY84.

(Mobile District)

Mississippi Sound Study

Two biological studies are being conducted for the Mississippi Sound and adjacent study area. Benthic macroinfauna communities will be delineated and associated with key environmental parameters as habitat descriptors in Mississippi sound and in six areas on the adjacent Gulf of Mexico Inner Continental Shelf. Based on available information, the seasonal spatial extent of nursery areas, spawning areas, and migratory routes for 40 species of demersal and pelagic finfish and shellfish in Mississippi sound, Mobile Bay, and adjacent Gulf of Mexico waters out to the 20 fathom contour will be defined. Data will be available on a computerized data management system and maps will be produced.

Eight fixed sampling stations within six potential offshore disposal areas extending 10 miles in the Gulf were established and continued through August 1981. This program is intended to physically characterize these potential disposal areas.

Eight box core replicates were collected at 96 stations, 40 of which were in the Gulf, during surveys being conducted in fall 1980 and spring 1981. Samples were analyzed for macroinfauna (all organisms retained on a 0.5 mm. sieve), sediment grain size (including settling velocity, and total organic carbon. Salinity, temperature, dissolved oxygen, and depth were recorded at each station. After communities are delineated and habitats defined, they will be evaluated in terms of their relative values as trophic supports for important finfish and shellfish species.

Objectives

To provide baseline data on a number of potential, (including off-shore) alternative dredged material disposal sites for input into longer term planning for dredged material disposal.

Milestones: Completion of sampling at six potential offshore disposal areas, 1981.

Site Designation Studies

Site designation studies initiated in FY83 for the Mobile Harbor deepening and Pasengoula Harbor physical, chemical, and biological data will be collected over two seasons. Field studies will be completed in FY83.

Estimated Funding for South Atlantic Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$165	\$565	\$275	\$100

\* Presidential budget submission

North Pacific Division (NPD) Program

(Portland District)

Goals

In 1982, concentrated on determining baseline environmental conditions in Oregon watersheds and continental shelf. Obtained data on sediment fate on continental shelf to help assess long-term impacts of ocean disposal.

In 1983, only two projects to be studied for this year -- Coos Bay ocean disposal and Columbia River proposed deepening of the channel. Funding for all others has been cut.

In 1984, proposed ocean disposal site final designation studies. Data obtained from 1979 to 1983 is expected to be of great use but more site-specific data is to be obtained this year.

Objectives

There are several objectives which vary in importance depending on the project being studied.

1. Adherence to testing requirements of Sections 404 and 103.
2. Determine whether ocean, beach, or estuarine disposal would cause least impact environmentally.

3. Determine best management and mitigation procedures.
4. Identify further study areas.
5. Identify background conditions to assess impacts a project could cause.
6. Obtain physical data on the sediments to be used for engineering or dredging.
7. Assist long-term and cumulative impacts of a specific project and of disposal operations throughout the Oregon coastal environment.
8. Provide a holistic view of environmental impacts of a project.

### Milestones

#### FY 82

Complete study with USGS to determine regional contaminant levels, future testing requirements, and a comprehensive view of region's environmental setting. Complete bulk of testing at Coos Bay. Determine sediment fate and disposal impacts at its ocean disposal sites. Determine best management techniques and best disposal sites on continental shelf.

#### FY 83

Determine impacts of deepening the mouth of Columbia River navigation channel. Determine best ocean disposal site. Complete Coos Bay study.

#### FY 84

Accomplish testing of and obtain final designation of ocean disposal sites for all Portland District dredging projects.

### (Seattle District)

The proposed widening and deepening of the Federal navigation channel in Grays Harbor will require disposal of an initial 17.1 million cubic yards (c.y.) of material. Maintenance dredging of the Federal channel will require the disposal of an additional 2.35 million c.y. of material annually. The recommended plan calls for disposal of 7.2 million c.y. of initial material and 0.80 million c.y. of annual maintenance material at an ocean site tentatively set at 3.5 miles offshore of Grays Harbor.

### Objectives

The objectives of this study are to select and monitor an ocean dumping site for dredged material from Grays Harbor, Washington.

MilestonesFY 81

Preliminary status report on ocean disposal site designation.

FY 82

Submittal of feasibility report.

FY 85-86

Detailed ocean disposal site designation studies of the continuation of planning and engineering stage.

Estimated Funding for North Pacific Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$390	\$245	\$266	\$900

\* Presidential budget submission

North Central Division (NCD) Program

NCD's development and monitoring program is categorized as follows:

Activity

1. Development - Development research will be initiated in FY83 to evaluate the effectiveness of capping contaminated dredged material with clean material as a means of isolating these materials from the aquatic ecosystem. This effort is scheduled to continue, at least through the end of FY86.
2. Confined Disposal Facility (CDF) Monitoring - Data collection at Great Lakes CDF's is a continuous program and is required by law for the Corps. The objectives of this effort are to monitor these CDF's to determine the effectiveness of the containment measures.
3. Interagency Development and Monitoring - This is a planned interagency activity for FY83 between the Detroit district and the EPA Duluth Laboratory. The study would involve an assessment of PCB bioaccumulation, using sediments obtained from Sheboygan Harbor, Wisconsin.

Milestones

Annual reports are prepared on the CDF monitoring efforts. Reports on other activities will be prepared as determined necessary.

Estimated Funding for North Central Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$118	\$553	\$666	\$560

\* Presidential budget submission

Lower Mississippi Valley Division (LMVD) Program

(New Orleans District)

Funding provided to EPA for collection of baseline data and preparation of EIS's in support of final designation for continuing use of interim designated ocean dredged material disposal sites within the New Orleans District jurisdiction.

Objectives

To insure compliance of existing interim designated and historically used ocean sites with EPA implementing criteria for the 1972 Ocean Dumping Act, as amended.

Milestones

Final EIS's and EPA site designation for continuing use scheduled for completion during FY83.

Estimated Funding Summary for Lower Mississippi Valley Division (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
95	50	30	30

\* In the FY 1982 Program Summaries Update, this program was reported as zero funded in FY 1982. The amount reported here is a more accurate estimate of FY 1982 funding for this program.

\*\* Presidential budget submission

Pacific Ocean Division (POD) ProgramGoals

The purpose of this research is to revise the established bioassay and bioaccumulation testing methodology for dredged materials derived from federally maintained harbors. The material is disposed at deep ocean disposal sites in Hawaii which EPA designated in 1981. Research will also concentrate on modifying EPA approved procedures for division-wide application, based upon implementation of a testing program for the disposal of dredged materials originating from Nawiliwili and/or Port Allen

Harbors in FY83 and from Honolulu, Hilo and Kahului in subsequent years. Studies will also evaluate comparable bioassay/bioaccumulation studies for dredged material from Pearl Harbor and local government agencies. Successful completion of research will establish an acceptable Corps/EPA methodology for testing dredged materials in compliance with EPA ocean dumping testing regulations.

#### Objective

The objective of the study will be to establish guidelines for acceptable methodology on bioassay and bioaccumulation testing at ocean dredged material disposal sites.

#### Milestones

##### FY 82

Bioassay and bioaccumulation testing procedures for Port Allen and Nawiliwili Harbors approved. Studies due to be completed by end of CY 1982.

##### FY 83

Revision and approval of program for remaining harbors.

##### FY 84-86

Bioassay and bioaccumulation studies for remaining harbors conducted.

#### Monitoring of Dredged Material Ocean Disposal Sites Project

##### Goals

EPA has designated five deep ocean sites in Hawaii for the purpose of dredged material disposal. The EIS for site designation points out data gaps and the need for additional monitoring at the disposal sites. The proposed monitoring studies involve gathering data to eliminate the gaps and assess long-term impacts and recolonization of benthic marine life at the disposal sites. Additional current and physical oceanographic measurements may be taken to improve characterization of dredged material transport at the dump sites. More detailed characterization of dredged materials and their suitability for ocean disposal will be covered under a separate study. The FY82 studies involved NOAA supported use of a deep diving submersible at one site (South Oahu). The FY83 program will continue the use of the Hawaii Undersea Research Laboratory (HURL) deep sea submersible for more quantitative studies at the South Oahu Site and for exploratory observations at Kahului and Hilo Deep Ocean Disposal Sites. Tentative approval for use of HURL submersible received.

Objectives

The objectives of the study are to characterize dredged material transport and to assess the long-term impacts and recolonization of benthic marine life at ocean dredged material disposal sites.

MilestonesFY 84

Report on disposal investigations

Estimated Funding of Pacific Ocean Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$5	\$2	\$0	\$0

\* Presidential budget submission

South Pacific Division (SPD) Program

Reported OPRDM-related efforts within the SPD are related exclusively to requirements for final designation of historically-used ocean dredged material disposal sites.

Objectives

To prepare baseline studies from existing data as well as field surveys, effect interagency coordination, and to prepare and coordinate Environmental Impact Statement in support of final designation of SPD's top priority ocean disposal sites. These sites include the Humboldt Bay and San Francisco-100 Fathom sites within the San Francisco district, and the Los Angeles and San Diego ocean sites within the Los Angeles district.

MilestonesFY 82

Initiate baseline studies of the San Francisco 100-Fathom site.

FY 83

Complete baseline studies of the 100-Fathom site. Initiate baseline surveys of the Humboldt, San Diego and Los Angeles ocean sites and complete.

FY 84

Complete all studies and site designation EIS's.

Estimated Funding South Pacific Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$213	\$300	\$555	\$205

\* Presidential budget submission

Southwest Division (SWD) Program

(Galveston District)

Goal

The goal of this program is to monitor data collection activities at dredged material ocean disposal sites.

Objectives

The objectives of this study are to monitor physical and chemical parameters to assess the effect of dredging operations.

Milestones: Prepare annual data reports as required.

Estimated Funding Southwest Division (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$50	\$100	\$100	\$100

\* Presidential budget submission

## FEDERAL PERSONNEL AND FACILITIES

Personnel. The U.S. Army Corps of Engineers has 2 positions specifically responsible for coordinating Corps input to the National Marine Pollution Program. The Corps has 30 full-time equivalent professional positions substantially devoted to elements of the Program and 20 technical/administrative positions. The vast majority of these personnel are associated with research, development, and monitoring programs involving dredging and/or the disposal of dredged material in the coastal or ocean environment. The remainder of the staff is generally involved with projects on coastal land use particularly as it relates to Corps projects.

Vessels. The Corps operates numerous survey boats, work boats, and a minimum fleet of 11 dredges for emergency and national defense purposes as authorized by Public law 95-269. However, no vessels greater than 50 feet in length are maintained for R&D or site monitoring purposes. Large research vessels are chartered under interagency agreement or contract when required.

Facilities. Three of the five laboratories at the Waterways Experiment Station, P.O. Box 631, Vicksburg, MS 39180, conduct research and development pertinent to the National Marine Pollution Program: the Environmental Laboratory, the Coastal Engineering Research Center, and the Hydraulics Laboratory. The Corps also maintains five division laboratories with full water quality, bioassay and sediment analysis capabilities: New England Division, Waltham, MA; North Pacific Division, Troutdale, OR; South Atlantic Division, Marietta, GA; South Pacific Division, Sausalito, CA; Southwest Division, Dallas, TX.

Equipment. The Corps maintains a variety of scientific equipment at the facilities listed above. No major equipment is devoted exclusively to ocean pollution research but is used for water quality and sediment characterization. The Corps Labs operate: 10 Atomic Absorption Spectrometers, 9 Gas Chromatographs, 2 Nuclear Density Probes, 2 GC Mass Spectrometers, 1 -14 Channel Technicon Autoanalyzer, 1 Scintillation Counter, 1 DC Plasma Arc Unit, and 1 Scanning Electron Microscope, and all the attendant computer hardware analysis. The Coastal Engineering Research Center, in particular, maintains current meters, wave gages, and automated surveying equipment for monitoring the fate of dredged materials in the ocean environment. The Waterways Experiment Station maintains and operates a vast array of physical and numerical models, and the necessary computer services, useful in predicting the fate of pollutants in the marine environment.

#### PUBLIC LAWS AND EXECUTIVE ORDERS

Many public laws and executive orders have been enacted that provide the Corps with the authority to accomplish its designated responsibilities (Appendix 1). As early as 3 March 1875 under the Rivers and Harbors Act, funds were made available to the Secretary of the Army to perform the Corps' operational requirements on navigable waterways. This act has been modified throughout the years, and on 31 December 1970, Public Law 91-611, the Rivers and Harbors and Flood Control Act was passed. Section 123 of this public law designated that the Chief of Engineers should construct, operate, and maintain contained spoil disposal facilities of sufficient capacity in the Great Lakes region. In 1972, Section 103 of Public Law 92-532, the Marine Protection, Research and Sanctuaries Act charged the Corps with the authority to issue permits for the transportation of dredged material for the purpose of dumping this material in ocean waters, where it has been determined that the dumping will not unreasonably degrade or endanger human health, welfare or amenities, or the marine environment, ecological systems or economic potential. It also authorized the Chief of Engineers to extend to all navigable waters, connecting channels, tributary streams, other waters of this U.S. and waters contiguous to the U.S., a comprehensive program of research, study and experimentation relating to dredged material.

One of the most significant public laws, Public Law 94-587, the Water Resources Development Act of 1976, vested in the Secretary of the Army acting through the Chief of Engineers, the responsibility for the construction, repair, and preservation of certain public works on rivers

and harbors for navigation, flood control and other purposes. Over 25 projects were authorized under this act. In addition, Section 150 of the public law gave authority to the Chief of Engineers to establish wetland areas as part of an authorized water resources development project. The Chief of Engineers must make a judgment as to the environmental, economic and social benefit of the wetland areas.

In the Corps, dredging and dredged material disposal policies and practices are related to the following activities:

- a. Channel dimensions authorized
- b. Prohibition on dredging shoreward of harbor lines
- c. Reconnaissance and condition surveys
- d. Channel sweeping
- e. After dredging surveys
- f. Channel dimensions to be provided
- g. Channel clearing
- h. Disposal of dredged material (Public Laws 92-500, 92-532, 92-611, 94-587)
- i. Alternate disposal areas
- j. Initial maintenance
- k. Performance of dredging
- l. Hopper dredged assignments
- m. Operation of hopper dredges
- n. Diked containment areas (Public Law 91-611 and Public Law 94-587)
- o. Beach nourishment (Public Law 94-587)

Environmental considerations related to dredged material disposal policies and practices are found in the Federal Water Pollution Act and Amendments of 1972 (PL 92-500). The following sections are prominent in the Corps' mission:

- a. Section 404(a) - Permit Authority
- b. Section 404(b) - Guidelines Development by EPA for Site Specification
- c. Section 404(e) - Site Selection Prohibition by EPA

- d. Section 404(r) - Exemption for Congressionally Authorized Projects - 404 in Planning Phase
- e. Section 404(t) - State Permits
- f. Section 307(a)(5) - Toxic Substances and Effluent Standards
- g. Section 311 - Oil and Hazardous Substances
- h. Section 401 - State Certification
- i. Section 403(c) - Ocean Discharge Criteria
- j. Section 313 - Compliance with Federal and State Requirements

The Corps' authority to perform their mission can be separated as follows:

a. Discharge of Dredged and Fill Material into Waters of the United States - Section 404 of PL 92-500 authorized the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredged or fill material into waters of the United States at specified disposal sites. It also provides that guidelines developed by the EPA be applied by the Corps in selection of disposal sites and in the application review process. The Corps issued final regulations for the Regulatory Program of the Corps of Engineers in July 1977 (Federal Register, Vol. 40, No. 173, 5 September 1975) to be used by the Corps in evaluating proposed discharges of dredged or fill material into navigable waters. In May 1976, the Corps issued an interim guidance manual as specified in the 5 September 1975 Federal Register, Ecological Evaluation of Proposed Discharge of Dredged or Fill Material into Navigable Waters, USAE Waterways Experiment Station MP D-76-17, to initiate implementation of the program.

Determinations to be made in a 404(b) evaluation include: an evaluation of feasible alternatives; a determination that the discharge meets all of the requirements of the Act (PL 92-500); a determination that the proposed discharge will not result in an unacceptable degradation of the physical, biological, and chemical integrity of the waters of the United States; and consider the factors in Section 403(c)(1) and 404(c) of the Act. Further, the proposed discharge will be conducted in a manner to minimize potential degradation of the physical, biological, and chemical integrity of the waters of the United States.

Other rules and regulations that apply to dredged and fill material discharges into waters of the United States are given in 33 CFR 209-145, Disposal of Dredged Material in Navigable Ocean Waters, 22 July 1974 (39 FR 26635-26642); Consideration of Wetlands Policies in Operations and Maintenance Activities, EC 1130-2-157 (Project Operation); Environmental Consideration: Water Quality and Wetlands, Draft ER 1105-1-401 (Planning); Implementation of Executive Order 11988 on floodplain management, ER 1165-2-XXX; and other specific references given in Section 3 of this ER.

b. Transportation for the Dumping of Dredged Material into Ocean Waters - Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, PL 92-532, specifies that all proposed operations involving the transportation and dumping of dredging material into ocean waters must be evaluated to determine the potential environmental impact of such activities. This must be done by the Secretary of the Army and the Administrator of the Environmental Protection Agency (EPA) acting cooperatively through the District Engineer and Regional Administrator. Environmental evaluation must be in accordance with criteria published by EPA in the Federal Register, Vol 42, No. 7, Tuesday, 14 January 1977. Implementation of this evaluation program is aided by use of an EPA/CE Technical Committee on Criteria for Dredged and Fill Material, "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters; Implementation Manual for Section 103 of PL 92-532 (MPRSA of 1972)," July 1977. The ocean dumping criteria require that what are listed as interim ocean disposal sites be designated as final ocean disposal sites by January 1980. This designation can only follow a comprehensive ecological investigation of the site and preparation of an EIS on the site designation by the EPA.

An ocean dumping evaluation must consider materials prohibited from disposal by international treaty (PL 92-254), the environmental impact, general compatibility of the material with the disposal site, the need for ocean dumping with a thorough review of alternatives, impacts on aesthetics, recreation, and economics, and impacts on other uses of the oceans. Evaluations in 33 CFR 209.120 or 33 CFR 209.145 must also be applied.

In addition, Section 115 of the Federal Water Pollution Control Act, Amendments of 1972, states that the Administrator of the Environmental Protection Agency be directed to identify the location of in-place pollutants with emphasis on toxic pollutants in harbors and navigable waterways and is authorized, acting through the Secretary of the Army, to make contracts for the removal and appropriate disposal of such materials from critical port and harbor areas.

The research conducted by the Corps of Engineers in regards to its mission responsibilities is accomplished under the authority of Public Law 95-224 dated 3 February 1978. Being the only Federal agency with primary responsibilities in navigation, flood control and hydropower, it is essential to have a research program that addresses timely solutions to our pressing problem in coastal and inland waters. Our program in OPRDM is designed to provide these solutions.

DEPARTMENT OF DEFENSE  
DEPARTMENT OF THE NAVY

## MISSION STATEMENT

The U.S. Navy, as a major service of the Department of Defense has the primary mission of national security of the United States. Because the primary operational medium of the U.S. Navy is the oceans of the world, it is only natural that the oceanic environment should be the object of extensive research.

The environmental quality research conducted within the Department of the Navy is in response to needs generated by standards established by environmental legislation. It is Navy policy to comply with Federal, state, and international environmental regulations. Navy ships are being outfitted with the necessary equipment and are required to follow discharge restrictions in compliance with governing regulations.

The Navy began a ship-related pollution abatement program in 1970 in response to new and challenging Federal environmental protection legislation and Executive Orders. During its very early phase it was assumed that available technology could be applied to Navy ships with little or no modification. This assumption quickly proved to be erroneous because of problems with space and weight limitations, maintainability and reliability, manning criteria, and the unique characteristics of the wastes generated. Consequently, a comprehensive research and development program was established in 1972, both to develop new technologies for ship pollution abatement equipment and to make major modifications to existing equipment to make it suitable for mission unique operations.

## FEDERAL PERSONNEL AND FACILITIES

The Navy has four scientific personnel who are specifically assigned to the Marine Pollution Program described herein and makes use of a laboratory and associated equipment at David Taylor Naval Ship Research and Development Center, Annapolis, MD. The laboratory and various instruments such as an atomic absorption spectroscopy device are used primarily for other environmental programs but are shared for the programs described herein.

## PROGRAM DESCRIPTION

Environmental Protection Technology Program

The Environmental Protection Technology Program consists of four program elements of the Navy Research, Development, Test and Evaluation budget in the areas of Research (61152N & 61153N), Exploratory Development (62765N), and Advanced Development (63721N). Naval Systems Commands and laboratories, frequently assisted by private sector contractors, and universities, execute the program. The bulk of this program concerns

the development of onboard systems for source reduction, control, and treatment technology. This includes establishment and maintenance of a data base on quality and generation rates of all shipboard wastes including expended ordnance. The remainder of the effort addresses environmental and health effects of, primarily, hull antifouling coatings which are essential for maintenance of top speed capability but slowly release heavy metal compounds. Removal of such coatings in drydock operations can create environmental problems. This led to the development of systems to detoxify organotin hull coatings and paint removal debris, and studies of short and long-range environmental effects of organotin compounds.

The Navy Environmental Protection Technology Program has activities related to Ocean Pollution Research, Development and Monitoring (OPRDM) concentrated in the following two areas:

- o Ordnance
- o Paints and Antifouling Coatings

#### Ordnance

It is essential that the Navy test the underwater effectiveness of new explosives and weapons. However, tests have been delayed or moved because of environmental concerns. The ability to predict environmental effects will allow the preparation of credible impact statements, thus complying with legal requirements as well as avoiding costly delays. A set of preliminary guidelines was developed. Topics studied included effects of explosion on fish with swim-bladders in deep water and benthic organisms, dispersion of explosion products, cratering and noise. Input was provided to several Environmental Impact Statements. Ordnance program plans are to computerize existing prediction models, develop a method to predict damage to mammals, design a method to disperse fish from explosive test areas, and publish a handbook of comprehensive environmental guidelines for underwater tests.

#### Paints and Antifouling Coatings

Organotin-based antifouling hull coatings are commercially available and a decision for Fleet-wide use is pending. Very substantial dollar benefits from fuel savings and reduced number of drydocks are expected. In compliance with the National Environmental Policy Act, an Environmental Assessment (EA) of the Fleet-wide use of organotin paints is being prepared. This EA includes Naval operations at San Diego, Norfolk, Vallejo, Little Creek, Pearl Harbor and Charlestown as well as the preparation of dynamic estuary models of some of these harbors. Harbor modeling is being coordinated with the U.S. Army Corps of Engineers. In support of the EA the following RDT&E Efforts are underway:

- a) Chronic toxicity data to calculate a chronic water quality standard according to EPA procedures;
- b) Organotin degradation rates and pathways in the water column, sediment and tissues;
- c) Bioavailability of organotin after it enters the environment and absorbs on particulate surfaces;
- d) Bioconcentration in several marine organisms as well as food chain effects;
- e) Toxicity of sediments containing organotin and the effect on dredge disposal;
- f) Harbor monitoring strategies including

development of analytical procedures to speciate organotin at the parts per trillion level and the use of sentinel organisms such as mussels;  
g) Shipyard procedures to minimize or eliminate discharge of organotin from drydocks.

### Objectives

Develop procedures and equipment to minimize or eliminate organotin antifouling paint wastes generated during drydock operations, and assess the environmental consequences of the Fleet-wide use of these paints.

### Goals

The goals of the Navy Environmental Protection Technology Program are to :

- o Develop systems and procedures that will permit the Navy to meet present and future environmental regulations without impairing military readiness of its operational units;
- o Develop environmental protection technology that meets Navy needs and requirements in a timely and cost-effective manner, when technology from the civilian sector is not adequate or applicable;
- o Develop data and information, pertinent to Navy operations, on which to base new or changed standards or criteria; and,
- o Develop, in concert with other agencies, an environmental technology base that includes pollution source reduction, abatement or treatment techniques, and an assessment of Navy operations on the environment.

### Estimated Funding (in thousand \$)

The listing below represents a summation of planning estimate for each year as shown.

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$1,039	\$1,125	\$1,820	\$2,100

\* Presidential budget submission

### Program Manager

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**IV. DEPARTMENT OF ENERGY**

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DEPARTMENT OF ENERGY

CONTENTS

	<u>Page</u>
MISSION AND MANDATES.....	IV-101
HISTORY OF DOE MARINE RESEARCH.....	IV-101
CONDUCT OF DOE MARINE RESEARCH.....	IV-102
FEDERAL PERSONNEL AND FACILITIES.....	IV-103
COORDINATION WITH OTHER AGENCIES.....	IV-103
DOE ORGANIZATION CHART.....	IV-104
DOE PROGRAM FUNDING SUMMARY.....	IV-105
DOE FUNDING EMPHASIS GRAPH.....	IV-106
DOE OCEAN POLLUTION PROGRAMS.....	IV-103
Ocean Thermal Energy Conversion Program.....	IV-103
Ecological Research Programs.....	IV-108
Regional Marine Program.....	IV-108
Radioecology Program.....	IV-110
Physiological Ecology Program.....	IV-112
Strategic Petroleum Reserve Program.....	IV-114
Subseabed Disposal Program.....	IV-119

## DEPARTMENT OF ENERGY

## MISSION AND MANDATES

The Department of Energy (DOE) plans and manages Federal energy programs. A major DOE objective is to carry out or manage comprehensive and well balanced research to ensure that energy programs are consistent with national environmental goals and policies. To fulfill these DOE missions and objectives, an extensive marine research program is conducted by the Department. The elements of this marine research program are described in this document.

Authority to support a marine research program is provided by the following legislation:

- o P.L. 585, the Atomic Energy Act of 1946, authorized the conduct of research and development activities relating to utilization of fissionable and radioactive materials for medical, biological, and health purposes and for the protection of health during research and development activities.
- o P.L. 83-703, the Atomic Energy Act of 1954, as amended, expanded the authority of the AEC to make arrangements for the protection of health and the promotion of safety during research and production activities, and the preservation and enhancement of a viable environment.
- o P.L. 93-577, the Federal Non-Nuclear Energy Research and Development Act of 1974, authorized the initiation of a comprehensive non-nuclear energy research, development, and demonstration program to include the environmental and social consequences of the various technologies.
- o P.L. 95-91, the Department of Energy Organizational Act of 1977, provided for the incorporation of national environmental protection goals in the formulation and implementation of energy programs and to advance the goals of restoring, protecting and enhancing environmental quality in the pursuit of energy development.

## HISTORY OF DOE MARINE RESEARCH

In 1954, the contamination by radioactive fallout of a Japanese fishing boat and its load of fish from the Pacific atomic bomb tests stimulated the development of an Atomic Energy Commission (AEC) program of oceanography. The AEC research addressed whether radioactivity released to the ocean would be transported into Japanese waters by the Kuroshio Current, whether fish taken from contaminated areas of the ocean could be safely eaten, and what the ultimate fate of the radioactivity would be. The oceanography work done, mostly by academic scientists, led to the 1957 publication of the National Academy of Sciences of Oceanography and Fisheries calling for "fundamental research--in the next decade--to learn more about the ocean and its contents than has been learned since modern oceanography began 80 years ago."

The oceanographic program which grew in the 1960's, addressed the NAS concerns. The problem was made easier by the pollutant itself. Radionuclides decay at fixed rates, and oceanographers were able to use a number of radionuclides to follow and time the processes occurring in the ocean. In 1971, the National Academy of Sciences published "Radioactivity in the Marine Environment" which synthesized what had been learned since the initial atomic bomb detonation in the Pacific. Almost all of this research was done by contractors to the AEC, a predecessor of the Department of Energy.

The wisdom in setting up the initial program to learn the processes in the ocean that affect behavior of radioactivity rather than to simply monitor radioactivity is now evident. The fundamental processes that govern the movement of radionuclides in the ocean also control the behavior of other pollutants in the marine environment; the initial program thus provided the tools and insight to proceed with the problem of other energy-derived pollutants.

In the early 1970's, fallout had subsided, and the new concern of the AEC was for radioactivity from shore-based nuclear plants and other energy-related activities, and the possibility of marine contamination from offshore nuclear power plants. In response, the marine program was extended into shallow coastal water, where pollution problems are much greater. Boundary areas in the ocean are always productive, and the coastal zone with interfaces of land with water and seawater with fresh water are especially productive and subject to damage from pollutants. At the same time, there is less water available in the shallow coastal waters to dilute the pollutants which flow into this area.

To attack the complex problems on the shelf more effectively, a program was initiated in the mid-1970's to create regional research teams made up of biologists, chemists, and physical oceanographers, because interdisciplinary teams would more rapidly and effectively unravel the problems by working together. This concept is now operational in the New York Bight, the Southeast, California, and working together under regional coordinators, often in cooperation with other government agencies.

The Department of Energy is gaining an understanding of the cycling and behavior of energy-related pollutants in the coastal zone from its long experience and by its focus on processes and systems through the use of regional teams and laboratory studies. This long-term approach is unique among government agencies with marine research efforts but it has been an important element in giving an understanding of the dynamics of pollutants in the coastal areas.

#### CONDUCT OF DOE MARINE RESEARCH

##### DEPARTMENT ORGANIZATION

DOE marine research is conducted in four major program offices. The following offices conduct ocean pollution research, development and monitoring:

- o Conservation and Renewable Energy - Ocean Thermal Energy Conversion (OTEC) Program
- o Energy Research - Ecological Research Programs
- o Environmental Protection, Safety, and Emergency Preparedness - Strategic Petroleum Reserve Program
- o Nuclear Energy - Subseabed Disposal Program

#### FEDERAL PERSONNEL AND FACILITIES

While no one at DOE is exclusively assigned to marine pollution studies, the amount of time spent in support of pollution work while performing other full time duties can be roughly estimated as 3 FTE, professional and 0.5 FTE secretarial/clerical. DOE has no laboratories or equipment dedicated to marine pollution research because all such work is performed under contract.

#### COORDINATION WITH OTHER AGENCIES

Coordination of the marine program with other agencies takes place at the headquarters level and at the regional level. At headquarters, the staff maintains a close liaison with staff members of other agencies by attending program reviews held by other agencies, and inviting agency representatives to the DOE program reviews. Full cooperation and contribution of staff time and materials is being provided for interagency committees as well. These interactions provide a conduit for information on research by other agencies and, more importantly, provide an opportunity for multiagency funding of research projects that are of mutual interest to two or more agencies.

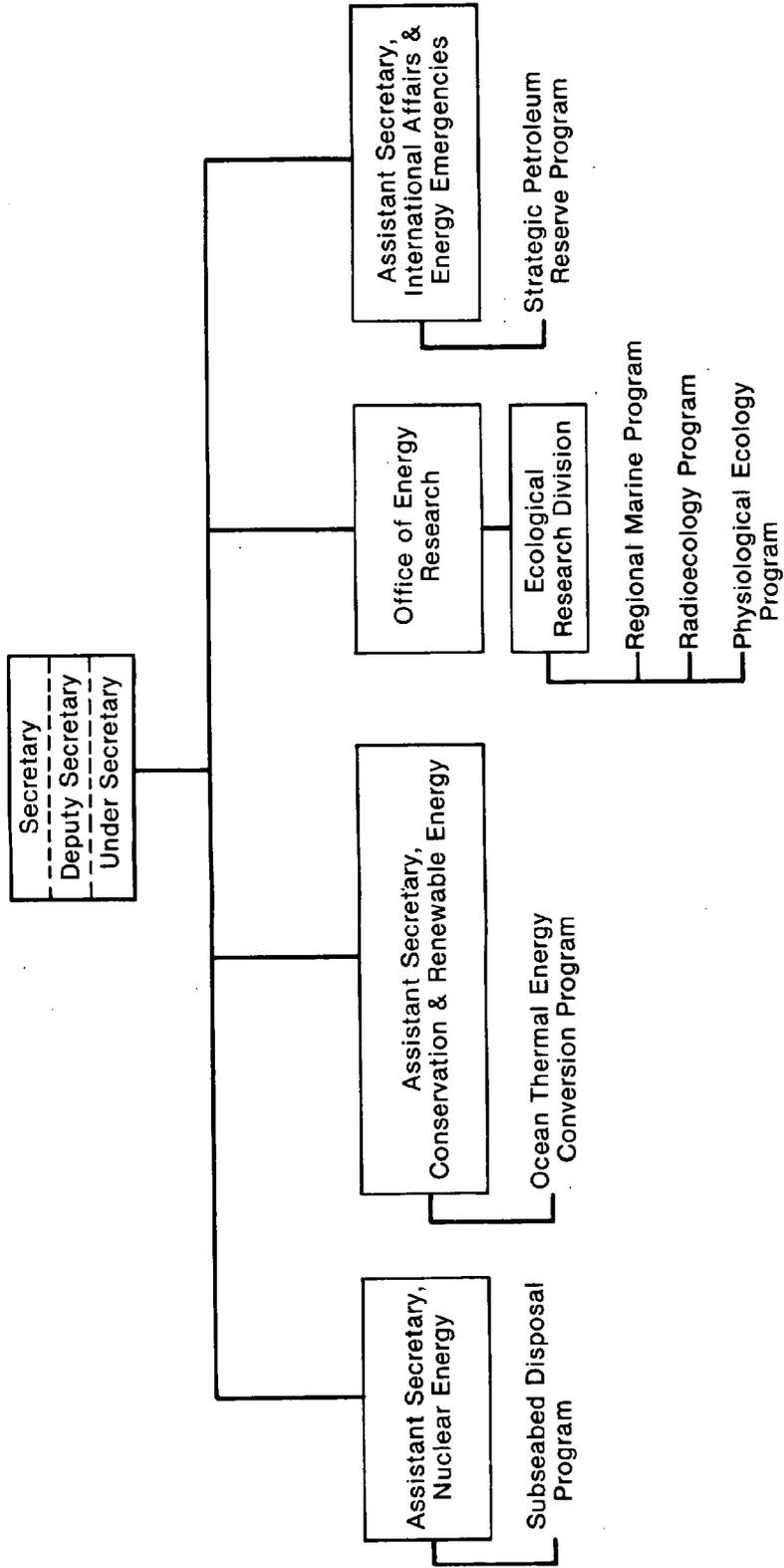
#### DOE OCEAN POLLUTION PROGRAMS

The DOE Organization Chart (p. IV-104) shows which organizational components of DOE are responsible for specific programs. The DOE Program Funding Summary (p. IV-105) provides an overview of DOE programs containing elements related to ocean pollution research, development and monitoring and provides total program funding levels. The following program descriptions provide more information on the goals, objectives, and accomplishments of each program.

##### Ocean Thermal Energy Conversion Program

The ocean energy programs of the Department of Energy (DOE) are primarily oriented to identifying and extracting renewable sources of energy from the oceans. DOE pursues these programs so that it can contribute to reducing the national dependence on oil imports and other exhaustible

U.S. DEPARTMENT OF ENERGY



Only offices directly involved in marine pollution research programs are listed.

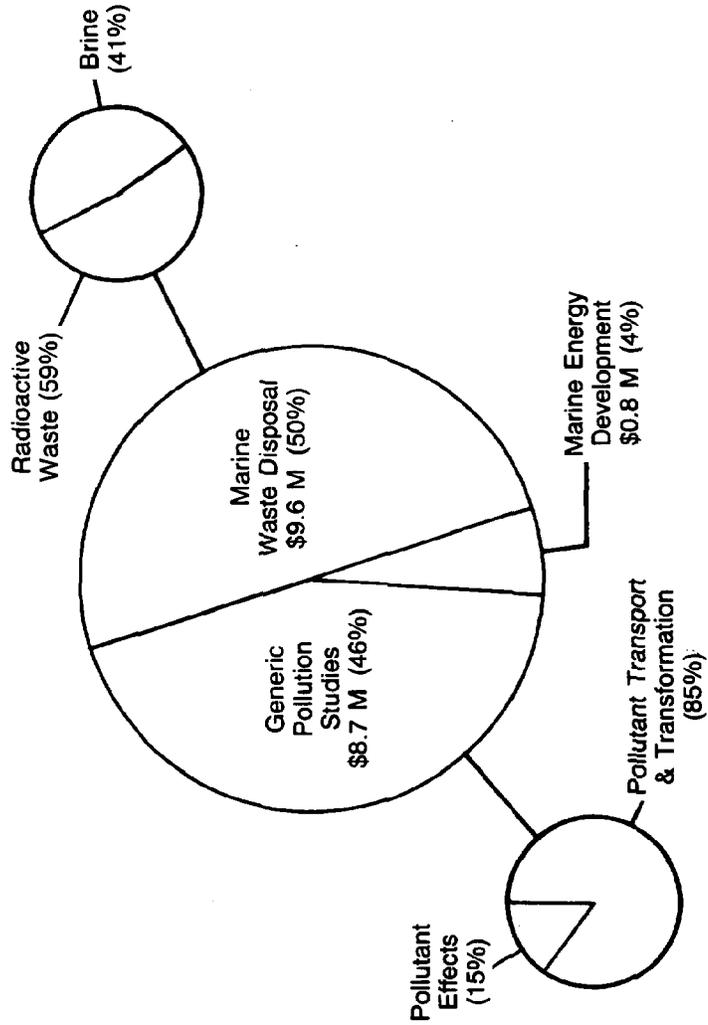
DEPARTMENT OF ENERGY

PROGRAM FUNDING SUMMARY  
 RELATED TO OCEAN POLLUTION RESEARCH, DEVELOPMENT AND MONITORING  
 HISTORICAL BUDGET AND ESTIMATED OUT-YEAR FUNDING  
 FISCAL YEARS 1982 - 1985

(in Thousand \$)

	FY 82 (Estimated)	FY 83 (Estimated)	FY 84 (Estimated)	FY 85 (Presidential)
Ocean Thermal Energy Conversion Program	1,040	760	500	500
Ecological Research Programs	6,931	5,922	5,657	5,657
Regional Marine Program	1,891	1,454	1,247	1,247
Radioecology Program	1,206	1,306	1,351	1,351
Physiological Ecology Program	3,300	3,960	2,580	2,680
Strategic Petroleum Reserve Program	5,900	5,650	6,300	10,400
Subseabed Disposal Program				
DEPARTMENT OF ENERGY TOTAL	20,268	19,052	17,635	21,835

DEPARTMENT OF ENERGY  
 OCEAN POLLUTION RESEARCH AND MONITORING  
 FUNDING EMPHASIS  
 FY 1983 ESTIMATES



fuels, in accordance with the National Energy Act. Ocean energy research and development efforts of DOE are centralized in the Ocean Energy Systems Program, in the Office of Conservation and Renewable Energy.

The description of the program presented here will address only that area applicable to marine pollution studies, a small part of the total effort.

### Goal

The goal of the Ocean Energy Systems Program is to develop options which can be used to extract and distribute significant amounts of energy from the ocean in a reliable, environmentally acceptable, and cost effective manner.

### Objectives

The program objectives are to identify available ocean energy resources, identify potential energy extraction and conversion techniques, assess technical and economic feasibility, and develop technology to induce industry participation leading to commercial use.

### Accomplishments

During the period of this report, technological research in the Ocean Energy System Program has focused on four techniques for extracting energy from the oceans. These techniques are: ocean thermal energy conversion (OTEC); salinity gradient energy conversion; and, extraction of kinetic energy from waves and currents.

Of the four main technology areas, OTEC is the most advanced. DOE has assessed OTEC as being near economic viability. The other three technologies require further research, technology, and systems-definition efforts to determine promising candidate systems for commercial-scale conceptual design. Accordingly, approximately 95% of the Ocean Energy Systems Program budget has been allocated to OTEC.

### Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$1,040	\$760	\$500	\$500

\* Presidential budget submission

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### Ecological Research Programs

The Office of Energy Research's efforts in ocean research are primarily in the Office of Health and Environmental Research (OHER). Legislation established a broad mission of comprehensive research on the overall environmental effects of energy technology developments, which includes nuclear, fossil fuel, and other renewable resources.

#### Goal

This research program was established to conduct a scientifically sound and comprehensive program of research and assessment to identify, analyze and reduce health and environmental uncertainties that impede the implementation of domestic energy policy in a manner that is safe and environmentally acceptable.

#### Objectives

The marine research program is a very small part of a broader, integrated program of health and environmental research designed to identify, measure, and characterize energy-related releases of pollution into the terrestrial, freshwater, and marine environment; understand their transport, conversion, and ultimate fate; determine their ecological impact; and define their potential effects on human health. In addition, research is supported to identify processes that degrade and detoxify energy materials. Those program areas including marine research are the Regional Marine Program, the Radioecology Program, and the Physiological Ecology Program. A brief description of the goals and objectives of these three programs and the accomplishments that are broadly applicable to marine pollution are described below.

#### Regional Marine Program

The marine waters surrounding the U.S. provide food and resources on the one hand while assimilating discharges from various sources on the other. Different energy-related technologies can have similar impacts on the marine system, such as causing shifts in marine populations due to nutrient changes, disruption of breeding areas, increased incidence of diseased organisms, etc. In order to anticipate or predict these impacts and develop strategies to mitigate against serious damage, the functioning and dynamics of the marine system need to be studied, particularly to understand which impacts can cause serious or long lasting injury and which ones can be assimilated with minimum perturbation. Furthermore, understanding of processes will aid in the technological development of new and innovative energy sources derived from the ocean system.

#### Goal

The goal of the Regional Marine Program is to conduct research that will establish a base of knowledge that is necessary to evaluate the impact of both present and future energy development on the oceans, particularly waters adjacent to the continental U.S.

### Objectives

The long-term research in this program is carried out to determine the movement of water masses and modification of movement patterns by natural factors in order to explain how nutrients, energy-related chemicals, and living and non-living particles will be transported, distributed and deposited. Additional objectives include determining the pathways and fates of energy-related materials in marine food chains and the resilience of the marine coastal system disturbed by energy-related activities.

### Accomplishments

- o Mid-shelf water in the Northwest was found to move faster than near or outer shelf water in the same direction as the prevailing winds. Research indicated that shelf currents often move in directions opposite to mid and outer shelf currents. This is important for predicting the dispersion of major spills that may take place in this region.
- o Pollutants discharged from the rivers off Georgia, South Carolina, or Northern Florida, were found to enter into a long shore circulation along the coast and flush only slowly into outer shelf waters. Materials in the mid shelf area are removed on an average of every 15 days. Flushing time of water masses at the shelf break is from two to five days.
- o A simple, inexpensive model has been developed which incorporates the effects of bottom organisms on the transport of sediments and pollutants bound to sediments so that cycling and accumulation of pollutants can be predicted.
- o Large scale climatic events in the eastern North Pacific bring nutrients to the surface, regulating the productivity in the South Carolina Bight. A model that couples productivity with climatic changes, including sea surface temperature, has been developed to determine which increases of primary productivity in the Bight are related to these natural events versus those of anthropogenic origin.
- o The flow of continental shelf water was found to move southwestward along the east coast, collecting water and pollutants from estuaries and ultimately moving off the shelf near Cape Hatteras.
- o Primary production in the Mid-Atlantic Bight was determined to vary seasonally by a factor of ten, indicating a baseline of variance with which manmade disturbances might be compared. This contrasts with the South Atlantic Bight where seasonal changes in productivity do not occur. In the Mid-Atlantic Bight, productivity was found to be driven by shelf break intrusions of nutrient-rich subsurface water, by tidal mixing on Georges Bank and its subsequent movement down current, and by estuarine discharge of increasing volume from north to south. Thus, if there is interference with or pollutant introduction into these intrusions or eddies, productivity in the region could be affected.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$6,931	\$5,922	\$5,657	\$5,657

\* Presidential budget submission

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Radioecology Program

Radionuclides, which enter the environment from nuclear power plants, worldwide fallout or from natural sources, present us with both a problem and an opportunity. The problem is that food chains or processes might return certain radionuclides to humans. The opportunity results from the fact that radionuclides, with their built-in timing mechanisms, are useful tools in determining the rates of oceanographic, geochemical, and biological processes. Mixing rates, turnover times, and rates of sedimentation are examples of processes that have been greatly clarified by the use of radionuclides in the ocean.

Goals

Understanding the processes that affect the fate and behavior of radionuclides and analogous trace metals in the ocean is a major goal of this program as well as the determination of pathways that lead back to humans. A further goal is to relate radionuclide behavior to other trace elements in the ocean.

Objectives

Research is conducted to gain better understandings of the many processes in the ocean that affect the movement and fate of radionuclides and other pollutants. The program is designed to take advantage of the unique properties of naturally occurring and artificial radionuclides, the extreme sensitivity of detection and the known rates of decay, to provide an insight into how fast materials in the ocean are turning over, and where the major sinks and reservoirs are.

Accomplishments

- o A synthesis of several years of study has shown that many radioactive and other trace elements move laterally in the ocean often ending up in continental shelf areas where they are concentrated at the sediment-water interface.
- o The Specific-Activity concept, utilizing the isotope dilution factor, is a way to protect humans from radioactivity introduced into the ocean. This concept is widely used by health officials in the United States, and it allows regulators to limit the amount of any radionuclide dumped in the ocean to levels that do not impact humans.
- o Radionuclides were discovered to be useful as tracers for physical transport processes. Certain naturally occurring radionuclides, such as those in the thorium and uranium series and those produced by cosmic ray bombardment, as well as radionuclides which have been introduced into the environment through weapons testing or waste disposal procedures may be used as tracers. Tracers which dissolve and maintain their solubility were found to be useful in determining water mass movements while those which adsorb strongly to particulate matter were found advantageous to measure sedimentation rates and the rates and direction of horizontal movement of sediments on ocean bottoms.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$1,891	\$1,454	\$1,247	\$1,247

\* Presidential budget submission

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#### Physiological Ecology Program

The Physiological Ecology Program studies model systems and factors such as genetics and physiology that respond to pollutant exposure. The research plan is designed to identify and distinguish between: (1) the chronic effects of pollution which act on the organism and cause histological, physiological, genetic, developmental, etc., changes; (2) the population and community level effects resulting from sublethal effects on individuals that ultimately change the potential of the populations to grow, reproduce, and compete; (3) effects on the community level arising from differences in species sensitivity and responses, and; (4) the long-term effects on the ecosystem, i.e., changes in chemical and physical characteristics as well as biological alteration.

#### Goals

This program proposes to determine the upper limits of pollutant exposure that will allow organisms and ecosystems to exist without adverse ecological perturbations. By identifying the physiological processes and kinetics governing the fate and transfer of pollutants from source to final residence, pollutant concentrations and chemical species to which organisms are exposed and the resulting impacts may be predicted.

#### Objectives

By studying the physiological processes involved, metabolic pathways can be identified, effects of previous exposure can be assessed, compartmentalization of pollutants may be evaluated in terms of tolerance and potential detoxification mechanisms, and adaptive responses can be recognized. The effects of pollutants on reproduction and development relative to overall population composition and recruitment are crucial factors in predicting if an ecosystem is in jeopardy due to long-term pollution. Vast differences in tolerances and responses exist among species, and these differences need to be known if the impact of energy-related pollutants on marine ecosystems is to be understood.

Accomplishments

- o Mussels and marine worms which were exposed to mercury and copper, respectively, were found to exhibit enhanced levels of those metals associated with metal-binding proteins, suggesting a natural sequestration and/or detoxification process. Metal concentration in those organisms is associated with interactions between exposure level, metal species, and duration of exposure and protein synthesis, and is not a strict function of exposure alone. Previous exposure of mussels to low mercury and certain other metal (e.g., copper) concentrations was found to result in an increased tolerance to normally toxic concentrations of mercury. Regeneration of worm gills injured by copper exposure was observed even while copper concentration was increased in the gills and coincided with the induction of copper-binding proteins.
- o Antibodies to mercury-binding proteins in mussels have been developed. This will provide a method to identify the location of the cellular mechanism for metal-binding protein synthesis, the storage site(s) of bound metals, and the depuration process.
- o Fatty acid variation in three zooplankton communities has been found to display a unique pattern over an annual cycle with environmental change directly related to biochemical variability. Patterns of variation in the minor fatty acids are affected most strongly by physical environmental parameters whereas the variation of the major fatty acids is more responsive to differences in species composition, diversity and food web relationships. Taken together, these two aspects of biochemical pattern appear to characterize complex species assemblages. The result offers a new strategem for convenient assessment of continually changing states in a natural community with application to identification of impacts caused by man.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$1,206	\$1,306	\$1,351	\$1,351

\* Presidential budget submission

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### Strategic Petroleum Reserve Program

The Department of Energy has been developing the Strategic Petroleum Reserve (SPR) of up to one billion barrels<sup>1</sup> of crude oil as mandated by the Energy Conservation and Policy Act of 1975, Title I, Part B (P.L. 94-163). Most of the SPR storage capacity is being developed utilizing solution-mined caverns in salt domes along the Gulf of Mexico near major existing oil distribution systems and refineries.

Caverns are created by controlled dissolution or leaching of salt stock with fresh or brackish water. Creation of one barrel of space produces about seven barrels of brine. Further, injection of one barrel of oil displaces one barrel of brine. Hence, the development of a prototypical 200 million barrel (200 MMB) site will produce more than 1,700 MMB of brine to create the caverns and fill them with oil.

To meet the schedule objectives of the SPR requires brine disposal at rates from 0.7 to 1.4 MMB per day per site. The only practicable method of disposal at these rates is ocean discharge. Underground injection has been tried and found impracticable except as a short-term backup at a greatly reduced rate.

Brines generally are about 95 percent saturated (saturation is 264 ppt or 317 g/l at 15.5°C) and have a density of 1.2 g/l. Brine composition is about 98 percent sodium and chloride, 1 percent sulfate, 0.7 percent calcium, magnesium and potassium and 0.02 percent trace elements. Calcium: magnesium ratio is between 2 and 3. The pH ranges from 7.1 to 7.6. Brine temperature may range from ambient to an estimated 50°C. Dissolved oxygen, difficult to measure in such a medium, is assumed to approach zero.

The major environmental concerns of ocean discharge included: siting considerations; assurance of complete dispersion of the brine plume; biotic effects of elevated salinity; abiotic effects, including distortion of ion ratios in seawater and alteration of sedimentary pore water; hydrocarbons from the caverns dissolved and suspended in the brine; pollutant constituents of the raw water, such as heavy metals and pesticide residues.

In anticipation of major data requirements for program decisions and permit acquisition and compliance, the SPR Oceanographic Support Activity was initiated in 1976 with an Interagency Agreement with the National Oceanic and Atmospheric Administration (NOAA). Centralized program management was established in what is now the National Environmental Satellite Data and Information Service (NEDIS), Assessment and Information Services Centers, Marine Environmental Assessment Division. Other NOAA elements involved include the National Marine Fisheries Service (NMFS), the National Ocean Service (NOS), the NOAA Data Buoy Center (NDBC) and the Office of Sea Grant. NOAA has involved the Massachusetts Institute of Technology (MIT), Texas A&M University (TAMU) and the Naval Ocean Research and Development Activity (NORDA). Other universities and private firms have participated under DOE contract.

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<sup>1</sup> one barrel = 42 U.S. gal.

The study area included a 300-mile stretch of the Louisiana-Texas inner continental shelf in depths ranging from 6 to 21 m and distances from shore ranging from 3 to 26 statute miles. Pre-existing data were scarce throughout the area, particularly time series of statics and kinematics. It is a difficult area for data collection. Experimental designs have been influenced by the high density of shipping traffic and oil and gas production and by the fact that this is the most heavily fished area in the world. These factors plus the frequency of tropical storms have contributed to substantial losses of data records and equipment.

At the beginning of the program, MIT engineers were tasked to develop a conceptual brine diffuser design and a transient computer model to simulate dilution rates and areal extent of a negatively buoyant brine discharge from the ocean bottom as a function of jet mixing from the diffuser ports and current speed and direction. Static bioassays of acute toxicity of related salinity and temperature were conducted on selected species important to the study area and the results were applied to the plume model to predict exposures and effects. A series of four background reports of marine environmental conditions for the area from Bryan Mound to Chacahoula were prepared utilizing available data and information. A workshop was convened with participants from government, industry and academia; diffuser siting criteria were recommended; and preliminary candidate diffuser sites were selected for six candidate SPR salt dome storage sites.

Site-specific baseline characterization programs were developed and initiated for the candidate brine diffuser sites associated with Bryan Mound, Big Hill, Black Bayou, West Hackberry, Weeks Island and Chacahoula. The data are diverse as a consequence of differences in priorities and funding among sites and differences in the views of the investigators. In all cases, emphasis was on impacts assessment of brine discharge.

Major investments were made in measurement quality control, centralized data management through NEDIS and data synthesis and interpretation. The SPR Program Data Base is archived in the National Oceanographic Data Center, NEDIS.

A composite summary of data types among all sites includes the following: Physical data consists of time series obtained by internally recording instruments and satellite telemetering instruments of: wind speed and direction; barometric pressure; air and sea surface temperature; water level; wave height and period; near-surface, mid-depth and near-bottom currents with associated conductivity and temperature. In addition, there are monthly shipboard hydrographic observations of CTD/DO and vertical current profiles taken with over-the-side current meters as well as limited data of field efforts to estimate vertical and horizontal eddy diffusion coefficients.

With the exception of the NMFS biological and chemical surveys of West Hackberry and Weeks Island, which employed quarterly sampling as a follow-on to prior surveys conducted by DOE contractors, the SPR biological data base includes monthly sampling of meiobenthos, macrobenthos, macrocrustacea, sediment texture, zooplankton, phytoplankton, chlorophyll a and phaeophytin. Nekton sampling was limited to demersal finfish taken with bottom trawls. Bacteriology, mycology and microplankton are minimally represented in the SPR data base.

Chemical data include hydrocarbons and trace elements in water, sediment and tissues; dissolved and particulate organic carbon in the water column and sediments; total suspended particulates, nutrients and dissolved oxygen in the water column; and major ions dissolved in the water column and in sediment pore water.

The longest baseline has been obtained at Bryan Mound where sampling continued without interruption from September 1977 until brine discharge began in March 1980. Black Bayou was terminated after 9 months of sampling, from September 1977 through May 1978. West Hackberry and Weeks Island baselines consist of 9 months of monthly sampling followed by one year of quarterly sampling. Big Hill and Chacahoula baselines covered the period September 1977 through October 1978 and September 1977 through November 1978, respectively.

The present structure of the SPR Oceanographic Support Activity is in response to permit compliance requirements which include an unusual degree of data requirements beyond those traditionally associated with compliance monitoring, for example, site-specific and regional trend and effects assessments and predictions including discrimination of sources of environmental and ecological variation. Specifically, it has been required that the program document the orientation and extent (acreage) of salinity isopleths and types and degrees of effects by acreages about the diffuser and to predict the perturbations throughout the food web in the adjacent area and throughout regional commercial fisheries. With regard to the last, it is required that the program document the presence or absence of shrimp spawning sites within the range of influence of each brine diffuser.

#### Goal

The goal of the SPR Oceanographic Support Activity is to provide the information necessary to support SPR environmental planning, compliance with NEPA, site selection, design and operations decisions and permit acquisition and compliance regarding large-scale ocean discharge of brine.

#### Objectives

- o To develop a conceptual design for a large-scale brine diffuser that would result in minimal impacts to the marine environment.
- o To develop a computerized time-dependent numerical model to predict dispersion of saturated brine in the marine environment.
- o To develop siting criteria for large-scale ocean discharge of saturated brine.
- o To develop baseline characterizations of physiography, meteorology, hydrography, circulation, water and sediment quality, and biotic communities at each candidate diffuser site.
- o To determine acute toxicity of increased salinity on commercially important species and selected members of their food chain.

- o To predict the nature and extent of site-specific effects of brine discharge on sediment and water quality and on biotic communities.
- o To identify brown and white shrimp spawning areas off Texas and Louisiana and relate them to season, hydrographic data and sediment texture and chemical characteristics.
- o To develop techniques for discriminating among sources of annual variation in regional shrimp catch.
- o To determine avoidance/attraction behavior response of shrimp and redfish to elevated salinities.
- o To develop shipboard techniques for observing orientation and extent of the brine plume about the diffuser in near-real time.
- o To develop and implement techniques to assure the integrity of each diffuser system and its performance in real time.
- o To conduct intensive, site-specific monitoring of brine discharge to determine the nature and extent of effects on the biotic communities and water and sediment quality in the area of brine influence about each diffuser.
- o To determine the effects of brine discharge on regional shrimp migratory patterns, reproduction, growth rates and mortality.
- o To validate the transient brine plume model by comparing hindcasts with discharge observations.
- o To develop computerized ecosystem models to assess effects of brine discharge on carbon flux throughout the food web.
- o To develop a computerized regional data base and provide for its archival in the National Oceanographic Data Center and for public dissemination of results.

#### Accomplishments

FY 79-80

- o Completed collection of baseline data sets for candidate diffuser sites associated with Bryan Mound, Big Hill, Black Bayou, West Hackberry, Weeks Island and Chacahoula.
- o Completed negotiations and acquired EPA approval of DOE Monitoring Plan for Bryan Mound Brine Disposal to the Gulf of Mexico.
- o Successfully conducted 32-day Gulf At-Sea Performance (GASP) Experiment in April/May 1979, a field study to compare in-situ performance of various types of current meters (rotor, acoustic, burst acoustic and burst electro-magnetic), 1 m, 2 m, 3 m and 4 m off the bottom, and fixed platforms vs. compliant moorings. Environmental conditions were representative of conditions experienced during the entire baseline

field effort. Field data correlated laboratory test data with an error prediction model; from these, total measurement uncertainties as functions of environmental variables were developed. Differences in signal-to-noise ratio between rigid and compliant moorings were indeterminate due to magnitude of vertical shear relative to vertical freedom of movement of tethered instruments and compliant moorings. Vertical shear averaged  $5 \times 10^{-2} \text{ s}^{-1}$ ,  $10^3$  times larger than horizontal shear.

- o Installed and initiated operation of BRIMS, a real-time telemetering data acquisition system developed by NORDA for the Bryan Mound diffuser; conductivity/temperature sensors implanted in the bottom about the diffuser, a flow meter installed in the diffuser and a bottom-mounted current meter are hard wired to a buoy which telemeters data to a PDP-11 system at the site of processing, conversion to engineering units, storage and transmission to EPA, NOAA and DOE.
- o Brine discharge commenced at Bryan Mound March 1980; TAMU shipboard plume tracking system successful in defining orientation and limits of plume.

## FY 81

- o Installed West Hackberry fixed platform at the diffuser, the telemetering data acquisition system and bottom mounted array of in situ sensors.
- o Brine discharge commenced at West Hackberry May 1981; discharge monitoring conducted by McNeese State University and TAMU.
- o Completion of first year of Bryan Mound discharge monitoring; corroborated predictions of brine plume model; site-specific environmental impacts negligible.
- o Received EPA approval of Revised DOE Monitoring Plan for Bryan Mound Brine Disposal to the Gulf of Mexico which reduced the number of variables measured and sampling frequency.

## FY 82

- o Computerized static and dynamic ecosystem models made operational.
- o Completed acute toxicity and avoidance/attraction bioassays, spawning site survey, and shrimp-mark release components of regional shrimp fishery assessments; completed regional shrimp fishery baseline for Big Hill.
- o Completion of first year of West Hackberry discharge monitoring corroborated favorable monitoring results of Bryan Mound.
- o Received EPA approval of Revised DOE Monitoring Plan for West Hackberry Brine Disposal to the Gulf of Mexico which reduced the number of variables measured and sampling frequency.

## FY 83

- o Completed impact assessment of brine discharge on shrimp fishery resources.
- o Resumed oceanographic characterization of proposed Big Hill brine discharge site.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$3,300	\$3,960	\$2,580	\$2,680

\* Presidential budget submission

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Subseabed Disposal Program

The Department of Energy's Subseabed Disposal Program is a component of the larger DOE Commercial Waste Management Program. The major thrust of the Commercial Waste Management Program, under the Assistant Secretary for Nuclear Energy, is toward the isolation of radioactive wastes within stable geologic formations, at depths reachable by conventional mining methods, including the assessment of subseabed disposal. Legislation has been introduced in the Congress which would require the Federal Government to specify a timetable and waste disposal media for high level waste. The program is being conducted at the Sandia National Laboratory, Albuquerque, New Mexico.

The Subseabed Disposal Program is assessing the technical and environmental feasibility of isolating appropriately packaged high-level radioactive waste and spent reactor fuel within the stable sedimentary formations beneath the deep ocean. The concept as currently envisioned involves the emplacement of high-level waste canisters tens of meters into the deep ocean sediments by means of free-fall penetrators, ram injectors, or other controlled emplacement techniques.

Goals

The goals of this program include: develop siting criteria; develop and verify complex models for performance prediction; identify and quantify thermal, chemical, and other interactions of the waste package and the sediment; identify and quantify methods of canister transportation and placement; and perform environmental studies and instrumentation development.

### Objectives

The near-term objectives are to determine if the deep ocean sediments are an effective, natural barrier for confinement of packaged high-level waste; and whether the barriers continue to be effective after emplacement of the waste canisters. The environmental research efforts are primarily focused on determining technical and environmental feasibility, including assessment of ocean currents and mass transport, sorptive characteristics of the deep ocean sediments, radiation and thermal effects, characterization of the benthic biological community, and the survey of potential location areas. The secondary objective is to develop and maintain the capability for assessing other Nations' ocean disposal programs and to cooperate with them as appropriate.

### Accomplishments

While the program is relatively young, several major accomplishments in the marine pollution area are worth noting. They are:

- o Regional study areas have been identified for further study in both the North Atlantic and North Pacific Oceans.
- o Physical and chemical data on the red clay sediments indicate a high absorption coefficient for radionuclides.
- o Predictive models have been developed which include physical oceanographic transport, biological transport, ion transport through the sediments, thermal effects on sediments, and canister response.
- o Internationally, cooperation with other nations on their subseabed disposal programs has been established. The U.S. has participated for several years in the Seabed Working Group of the Nuclear Energy Agency. Significant areas of cooperation have been identified by the Group.
- o Domestically, program representatives have maintained exchange of information and program status review with the other Federal agencies including EPA, NOAA, NRC, NASA, and the Department of State.
- o Studies demonstrated that greatly increased temperature changes the pH of sea water from alkaline to acid.
- o The first international Biological Oceanography Workshop relative to cycling and transport of radionuclides in subseabed disposal took place in 1981, as did the Sixth NEA Radioactive Waste Management
- o Committee/International Seabed Working Group meeting. Proceedings from both meetings were published.
- o Identification of key radionuclide pathways back to man and the testing of predictive models using mathematical representations completed.

- o A recommendation for a reference study location in the North Atlantic Ocean made.
- o Predictive models for the stability of red clays in thermal and radiation fields completed.
- o The question of natural ocean convection occurrence, and how to deal with it, if present, resolved.
- o Several papers completed on the characterization of the biota of the deep ocean.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$5,900	\$5,650	\$6,300	\$10,400

\* Presidential budget submission

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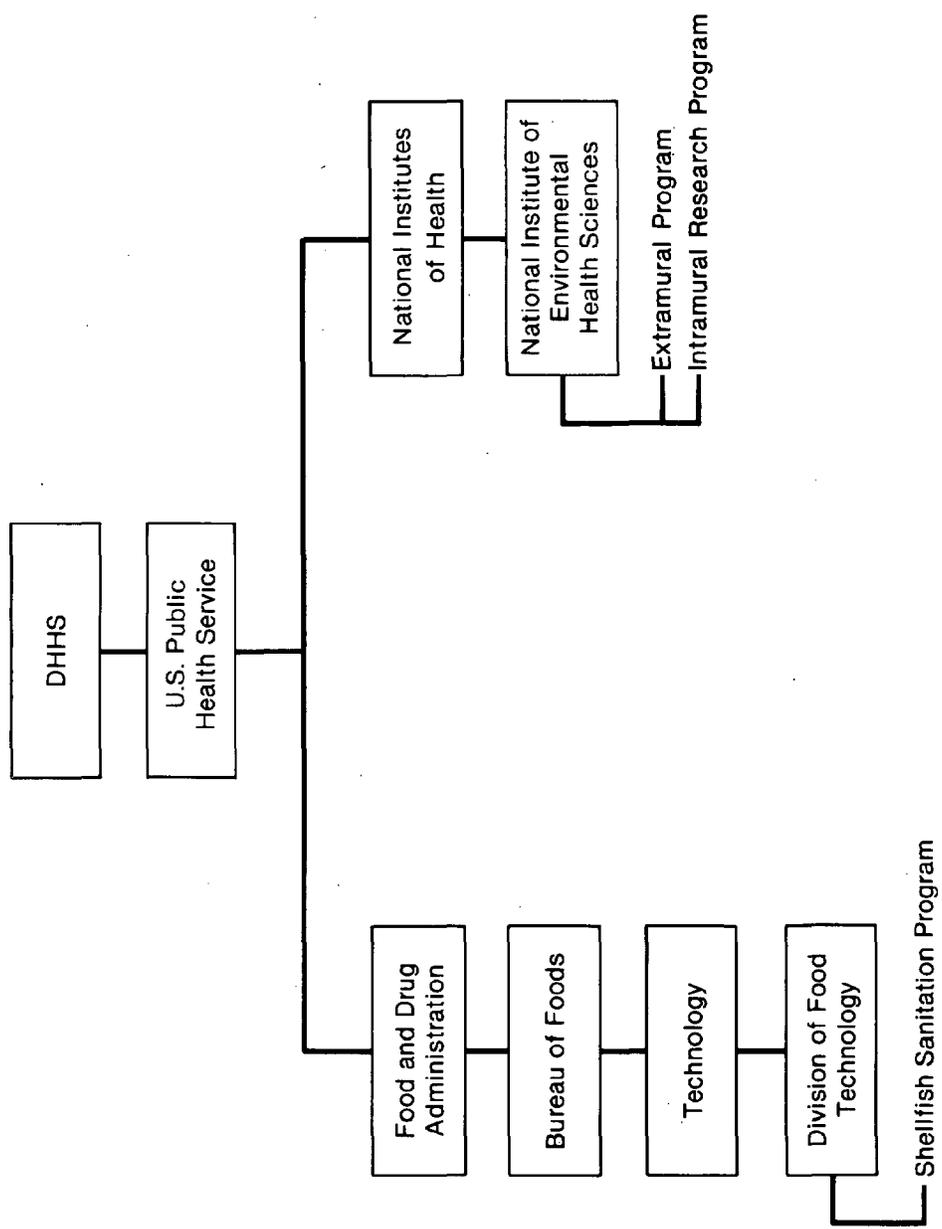
V. DEPARTMENT OF HEALTH AND  
HUMAN SERVICES

DEPARTMENT OF HEALTH AND HUMAN SERVICES

CONTENTS

	<u>Page</u>
ORGANIZATION CHART.....	V-ii
FUNDING SUMMARY.....	V-iii
FUNDING EMPHASIS GRAPH.....	V-iv
NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES	
MISSION.....	V-101
MANDATE.....	V-101
FEDERAL PERSONNEL AND FACILITIES.....	V-102
PROGRAM DESCRIPTIONS	
Overview.....	V-102
Intramural Research Program.....	V-102
Extramural Program.....	V-104
FOOD AND DRUG ADMINISTRATION	
MISSION.....	V-201
MANDATE.....	V-201
PROGRAM DESCRIPTION	
Shellfish Sanitation Program.....	V-201
FEDERAL PERSONNEL AND FACILITIES.....	V-203

DEPARTMENT OF HEALTH AND HUMAN SERVICES



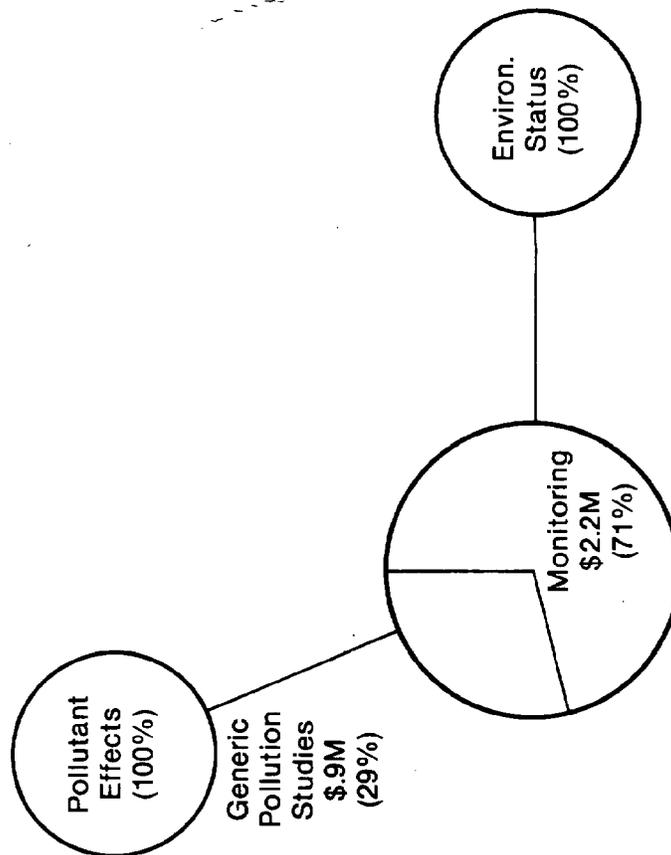
Only offices involved in marine pollution research programs are listed.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

PROGRAM FUNDING SUMMARY  
 RELATED TO OCEAN POLLUTION RESEARCH, DEVELOPMENT, AND MONITORING  
 HISTORICAL BUDGET AND ESTIMATED OUT-YEAR FUNDING  
 FISCAL YEARS 1982 - 1985

	(in thousands \$)			
	FY 82 (Estimated)	FY 83 (Estimated)	FY 84 (Estimated)	FY 85 (Presidential)
<u>National Institute of Environmental Health Sciences</u>				
Intramural Research Program	455	309	309	324
Extramural Program	588	600	788	904
<u>Food and Drug Administration</u>				
Shellfish Sanitation Program	2,100	2,200	2,300	2,450
	<u>3,143</u>	<u>3,109</u>	<u>3,397</u>	<u>3,678</u>
DHHS TOTAL				

**DEPARTMENT OF HEALTH AND HUMAN SERVICES  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY 1983 ESTIMATES**



DEPARTMENT OF HEALTH AND HUMAN SERVICES  
NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES

MISSION

The National Institute of Environmental Health Sciences (NIEHS) has the broadest responsibility among Federal agencies for the support of research, and the training of research manpower, in the area of effects of chemical and physical environmental agents on human health. The research activities of NIEHS, which range from basic research to applied programs are directed toward developing a better understanding of what environmental factors can cause or aggravate environmentally-related diseases and how and why these diseases develop. In carrying out its activities, NIEHS focuses on:

- o Identifying hazardous agents and assessing their effects on human health;
- o Identifying susceptible populations and determining the reasons for their susceptibility;
- o Determining how chemicals are metabolized, stored, and excreted so that predictions as to duration of toxic action, sites of toxic effects, and species differences in chemical toxicity can be made; and
- o Developing more sensitive, rapid, and species-specific toxicity testing methods and modifying current methods so that injury can be detected at the earliest possible stage in the disease process.

While the focus of research and resources supported by NIEHS is on human health, it is clear that NIEHS mission responsibilities encompass the total environment and that much of the understanding of etiological and pathological relations must be developed through experimental models other than man. It is in this context that NIEHS, through two of its four programs -- the Intramural Research Program and the Extramural Program -- supports ocean pollution-related research. This research can be divided into two primary types: (1) Studies of aquatic organisms from polluted waters as early indicators of pollution and sometimes of specific hazardous substances, and (2) studies using aquatic organisms as experimental models for specific diseases.

MANDATE

The authority under which NIEHS supports and conducts its research is Section 301 of the Public Health Service Act, which gives the Secretary, DHHS, broad powers to conduct and support research relating to the causes, diagnosis, treatment, control, and prevention of physical and mental diseases and impairments of man.

## FEDERAL PERSONNEL AND FACILITIES

At this time, no Federal personnel, facilities, vessels, or other equipment are exclusively or substantially employed in direct support of this program. Both the Intramural and Extramural Research Programs serve as a small component of the overall program in Environmental Health Sciences.

## PROGRAM DESCRIPTIONS

## OVERVIEW

The NIEHS Intramural Research Program (IRP) and Extramural Program (EP) activities that support the overall Federal ocean pollution research, development, and monitoring program are aimed at developing an understanding of the factors in the marine environment which have an adverse effect upon human health and the mechanisms through which that toxicity is expressed. These activities are carried out primarily through the IRP supported Florida Marine Laboratory (the Whitney Laboratory) and three EP supported Marine and Freshwater Biomedical Research Centers. EP also supports one individual research grant that is related to ocean pollution.

## NIEHS Support for Ocean Pollution Research

Estimated Funding for Ocean Pollution Research (in thousand \$)

	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
IRP	\$455	\$309	\$309	\$324
EP	\$588	\$600	\$788	\$904
TOTAL	<u>\$1,043</u>	<u>\$909</u>	<u>\$1,097</u>	<u>\$1,228</u>

\* Presidential budget submission

Intramural Research ProgramProgram Goals

Ocean pollution-related efforts undertaken in the Intramural Research Program involve use of a variety of aquatic animals and mammalian species, for comparison purposes, to understand toxicological/pharmacological/physiological effects and problems. Major emphasis is focused on toxication-detoxication systems, transport and excretionary mechanisms, and membrane toxicity. The uptake, distribution, metabolism, and excretion of pollutants by various marine species, and the role of metabolism in the storage and the chemical form of the accumulated xenobiotics (or foreign chemicals) in these species is assessed. Major emphasis is on determining how, why, and where marine species accumulate pollutants that have potential for harm to humans

and whether or not mixtures of pollutants may lead to accumulation of more toxic forms or higher levels of pollutants than single chemical exposure. The factors that determine the rate of xenobiotic excretion also are evaluated in aquatic and mammalian species to help assess the mechanisms leading to toxicity of chemicals that occur as environmental pollutants.

#### Accomplishments

A recent accomplishment by IRP scientists was the demonstration that excretion of polycyclic aromatic hydrocarbons and their metabolites depends upon: (a) metabolism to glucuronide and sulfate conjugates and; (b) active tubular secretion of these conjugates via the organic anion transport system. Inhibition of organic anion transport by other anions, including the phenozacetic acid herbicides, was shown to produce marked retardation of elimination.

#### Program Objectives, FY 1982-1985

- o To examine the role of conjugation reactions in excretion of environmental chemicals;
- o To use membrane vesicle techniques to determine the driving force for organic anion transport, which is the primary determinant of the rate at which xenobiotics and their metabolites are eliminated;
- o To examine properties of the membrane processes responsible for sulfate regulation;
- o To integrate membrane function and metabolic events to obtain a detailed picture of the processes controlling excretion of foreign chemicals and the effects of these compounds on membrane functions;
- o To investigate the metabolism of environmental pollutants in marine species that are used as human food; and
- o To take advantage of unique biochemical/morphological characteristics of toxication-detoxication processes in aquatic animals for mechanistic evaluation.

#### Milestones, FY 1983-1986

- o Development of a detailed picture of membrane functions (e.g., lumenal reabsorptive transport of glucose and amino acids, contralumenal secretory transport of sulfate and organic anions)
- o Correlation of the chemical and physical properties of foreign compounds with their effects on specific processes (e.g., the uncoupler -- protonophore -- pentachlorophenol with contralumenal proton coupled sulfate transport)
- o Characterization of the glutathione transferase E-2, E-3, and E-4.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$455	\$309	\$309	\$324

\* Presidential budget submission

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Extramural ProgramProgram Goals

The NIEHS Extramural Program is concerned with supporting research on the distribution and alteration of environmental compounds in the marine environment and their accumulation and biological effects in marine biota. Emphasis is placed on understanding known or potential toxic effects in the human population. The Marine and Freshwater Biomedical Research Center grants awarded by NIEHS are targeted toward augmenting the national level of basic biomedical research related to environmental health in marine and freshwater laboratories and assisting the laboratories to attain stable environments for research and research training in which aquatic organisms are used in the solution of environmental health problems. The areas of particular interest include: (1) dynamics and mechanisms of bioaccumulation and transformation of chemical pollutants, (2) behavioral toxicology, (3) environmental mutagenesis and reproductive toxicology, (4) organ toxicology, (5) pharmacology, (6) comparative toxicology and pharmacology, and (7) natural toxins.

Accomplishments

Currently, NIEHS provides support for three Marine and Freshwater Biomedical Research Centers that focus on encouraging the fuller use of marine and freshwater resources in assessment, prediction, and determination of mechanisms of environmental factors hazardous to human health. This support has enabled these centers to focus research in areas of their expertise and to coordinate lectures, meetings, and visiting scholars programs in order to stimulate research and information exchange concerning problems in the marine sciences that are relevant to environmental health.

Program Objectives, FY 1982-1985

- o To examine whether factors such as temperature, salinity, and induction of metabolizing enzymes, affect toxicity primarily by affecting the kinetics of accumulation of xenobiotic from solution;

- o To identify chemical species containing selenium as they occur in living organisms so that the manner in which selenium becomes incorporated into higher animals and mammals can be determined, which will increase understanding about the toxicity of selenium compounds;
- o To study the bioaccumulation of three heavy metals by marine bacteria and help elucidate the relationship between such bioaccumulation and the heavy-metal poisoning of fish and other higher organisms in the marine food chain; and
- o To study the behavioral aspects of pollution of estuarine and marine systems.

#### Milestones, FY 1983-1986

- o Continued development and promotion of multidisciplinary research and research training for the mutual assistance in the solution of human-related marine environmental health problems and the use of marine resources in basic research concerning human health problems
- o Use of aquatic animals for mutagenesis and teratogenesis investigation with environmental pollutants such as hydrocarbons and metals as etiologic agents
- o Development of pharmacokinetic models for the accumulation by Cyprinodon variegatus of four xenobiotics that are common pollutants of water

#### Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$588	\$600	\$788	\$904

\* Presidential budget submission

#### EP Contact

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 Program Analyst, Extramural Program  
 NIEHS  
 P.O. Box 12233  
 Research Triangle Park, N.C. 27709  
 FTS 629-7727 or (919) 541-7727

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
FOOD AND DRUG ADMINISTRATION

MISSION

The Food and Drug Administration (FDA) is a scientific regulatory agency responsible for the safety of the nation's foods, cosmetics, drugs, medical devices, biologics, and electronic radiological products. Its mission is to assure that: (1) food is safe and wholesome; (2) drugs, biological products, therapeutic devices and diagnostic products are safe and effective; (3) cosmetics are safe; (4) the use of radiological products does not result in unnecessary exposure of radiation and; (5) all of these products are honestly labeled.

FDA's regulatory strategy consists of four basic elements. First, its strategy is anticipatory rather than reactionary. It is preventive rather than corrective. Since it does not have the physical or financial resources to continuously police every segment of the industrial community, the agency tries to build safety into products rather than to check for safety after a product has been produced. Second, FDA's regulatory strategy is to base its actions on the sound analysis of good scientific data. Third, FDA encourages a high level of two-way communications between the agency and its constituents. To that end, FDA has done much in recent years to increase communications with industry, the public, the scientific and medical community, and other interested parties. Finally, the agency regulatory strategy is an enlightened approach to enforcement. Enforcement starts with the establishment of clear standards that are effectively communicated to industry. Subsequent monitoring and, if necessary, corrective action, is followed by appropriate preventive action to avoid future problems.

MANDATE

Section 361 of the Public Health Service Act provides for Federal assistance to states in preventing the interstate transmission of disease. Program participation by the states in the National Shellfish Sanitation Program is entirely voluntary, and the program's success is determined primarily by the cooperation of state and local food control agencies. Section 401 of the Food, Drug, and Cosmetic Act authorizes FDA to set standards of quality, Section 402 defines conditions under which a food is considered adulterated, and Section 403 deals with the proper labeling of foods.

PROGRAM DESCRIPTION

Shellfish Sanitation Program

The Shellfish Sanitation Program is a cooperative state-Federal-industry program. As part of FDA's responsibility for the safety of food products,

the agency's Bureau of Foods carries out regulatory and research activities to assure that shellfish are safe for human consumption.

Shellfish such as oysters, clams, and mussels become contaminated from polluted waters because they have the ability to concentrate pathogenic micro-organisms and toxic chemicals from their environment. The increased population in coastal communities and the trend toward industrial development on estuaries continually increase the potential for harmful pollution in shellfish growing areas. Diseases such as infectious hepatitis, typhoid fever, and diseases caused by metallic poisoning from industrial wastes can be and are caused by the consumption of contaminated shellfish. Naturally occurring marine biotoxins such as paralytic shellfish poison in shellfish also cause illness and death in humans.

#### Goal

The goal of the Shellfish Sanitation Program is to assure the safety of shellfish for human consumption.

#### Milestones, FY 1982-1986

- o Revise administrative procedures and technical guidelines for the sanitary control of growing waters, harvesting, processing facilities, and marketing practices.
- o Promote the adoption of recommended shellfish sanitary practices for incorporation into State and foreign law and regulations.
- o Develop and maintain international agreements for the purposes of assuring a safe supply of imported shellfish.
- o Evaluate annually the effectiveness of State and foreign shellfish sanitary control programs and seek necessary corrective measures.
- o Conduct research, technical assistance, training courses and seminars to advance the sanitary control of shellfish and improve the safety and quality of shellfish.

#### Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$2,100	\$2,200	\$2,300	\$2,450

\* Presidential budget submission

#### Information Source

J. David Clem  
 FDA/Bureau of Foods  
 Shellfish Sanitation Branch  
 200 C Street, S.W.  
 Washington, D.C. 20204  
 (202) 485-0149

## FEDERAL PERSONNEL AND FACILITIES

Research activities associated with the Agency's Shellfish Sanitation Program are carried out in two facilities, the Northeast Technical Services Unit (NETSU) in Davisville, Rhode Island, and the Fishery Research Branch in Dauphin Island, Alabama, with some additional support activities in the Shellfish Sanitation Branch in Washington D.C.

Personnel

Scientific Professionals	20
Technicians	5
Secretarial/Administrative support	<u>6</u>

Total FTEs 31

Facilities

## NETSU:

NETSU leases 16,126 square feet of indoor space in building S-26 of the Davisville Complex owned by the Department of Navy. Additionally, 4,000 square feet are available in an FDA building located on 1.7 acres of waterfront property in Davisville.

(An equipped mobile laboratory is included in the description of equipment.)

## Fishery Research Branch:

The Fishery Research Branch in Dauphin Island, Alabama is situated in a fishery product growing, harvesting, processing, and marketing area which provides easy access to resident and migrating species of marine life and allows year-round field research capability. The sea water environment provides additional research capabilities for studying and solving practical regulatory problems of public health significance.

The main building, which is in very good condition, houses the laboratories, offices and support services. The facility is a single story structure of masonry construction. Total floor space is about 10,000 square feet consisting of 11 laboratory modules (10x20) and a wet laboratory for the conduct of studies utilizing holding or flow-through sea water systems. The wet laboratory has a 150 gallon-per-minute temperature-controlled sea water supply.

VESSELS

There are no vessels exceeding 50 feet in the Shellfish Sanitation Program.

EQUIPMENT (Cost > \$10,000)

## NETSU:

1. Mobile Bacteriological Laboratory - 12 tons
2. Walk-In Facilities:
  - Freezer - 8' x 12' x 6 3/4' -20°C
  - Incubator - 8' x 12' x 6 3/4' 35°C
  - Refrigerator - 8' x 12' x 6 3/4' 5°C
3. Ultracentrifuge
4. "Better Built" Glassware Washer
5. Autoclave

## Fishery Research Branch:

1. Three Spectrophotometers:
  - #AA503 (w/accessories)
  - Varian #118C (w/accessories)
  - PE#MFF-4 (w/accessories)
2. Beta Liquid Scintillation Counter (w/accessories)
3. Gamma Tandem Counter
4. Packard Sampler Oxidizer
5. Multi-Scan Titertex



DEPARTMENT OF THE INTERIOR

CONTENTS

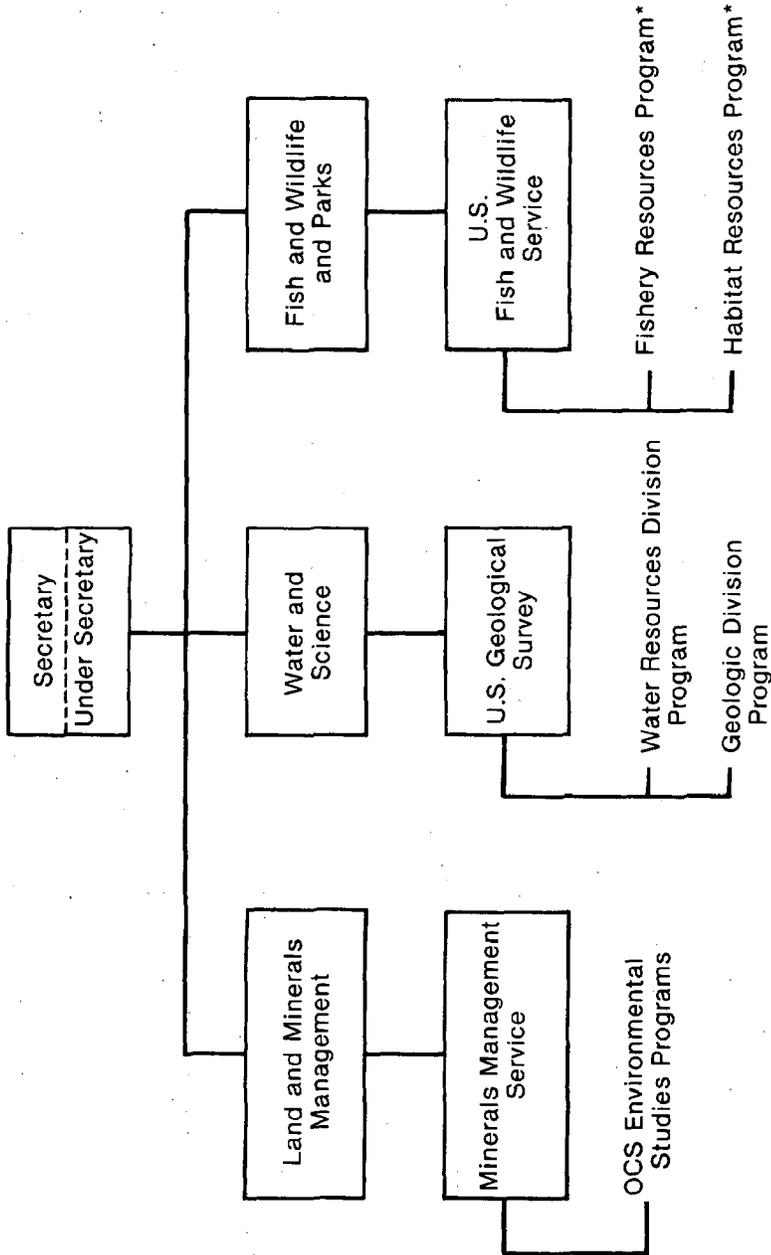
	<u>Page</u>
DEPARTMENT OF THE INTERIOR ORGANIZATIONAL CHART.....	VI-iii
DEPARTMENT OF THE INTERIOR FUNDING SUMMARY.....	VI-iv
MINERALS MANAGEMENT SERVICE FUNDING EMPHASIS GRAPH.....	VI-v
U.S. FISH AND WILDLIFE SERVICE FUNDING EMPHASIS GRAPH.....	VI-vi
U.S. GEOLOGICAL SURVEY FUNDING EMPHASIS GRAPH.....	VI-vii
MINERALS MANAGEMENT SERVICE	
MISSION.....	VI-101
FEDERAL PERSONNEL AND FACILITIES.....	VI-105
PROGRAM DESCRIPTIONS	
Washington D.C. Office Studies Program.....	VI-108
Atlantic OCS Regional Studies Program.....	VI-110
Gulf of Mexico OCS Regional Studies Program.....	VI-114
Pacific OCS Regional Studies Program.....	VI-118
Alaska OCS Regional Studies Program.....	VI-121
Alaska Socioeconomic Studies And Milestones.....	VI-136
U.S. FISH AND WILDLIFE SERVICE	
MISSION STATEMENT.....	VI-201
FEDERAL PERSONNEL AND FACILITIES.....	VI-201
PROGRAM DESCRIPTIONS	
Fishery Resources Program.....	VI-201
Habitat Resources Program.....	VI-203
U.S. GEOLOGICAL SURVEY	
MISSION.....	VI-301

Contents (cont'd.)

PROGRAM DESCRIPTIONS

Water Resources Division Program.....	VI-301
Earth Sciences Applications Program.....	VI-301
Geologic Division Program.....	VI-302
FEDERAL PERSONNEL AND FACILITIES.....	VI-303

**U.S. DEPARTMENT OF THE INTERIOR**



Only offices directly involved in marine pollution research programs are listed.

\* Not a program itself but represents funds from a number of different programs within FWS which contribute to marine pollution research.

DEPARTMENT OF THE INTERIOR

PROGRAM FUNDING SUMMARY  
 RELATED TO OCEAN POLLUTION RESEARCH, DEVELOPMENT AND MONITORING  
 HISTORICAL BUDGET AND ESTIMATED OUT-YEAR FUNDING  
 FISCAL YEARS 1982 - 1985

(in Thousand Dollars)

	FY 82	FY 83	FY 84	FY 85
<u>Minerals Management Service</u>				
Washington D.C. Office Studies Program	1,235 a	1,856	4,068 b	----- c
Atlantic OCS Regional Studies Program	7,877 a	7,838	5,237	-----
Gulf of Mexico OCS Regional Studies Program	3,707 a	5,481	3,000	-----
Pacific OCS Regional Studies Program	3,623	5,167	3,813	-----
Alaska OCS Regional Studies Program	14,193 a	13,207	11,770	-----
<u>MMS TOTAL</u>	30,635	33,549	27,888	27,888
<u>U.S. Fish and Wildlife Service</u>				
Fishery Resources Program	705	661	658	658
Habitat Resources Program	2,197 a	1,701	1,621	1,596
<u>FWS TOTAL</u>	2,902	2,362	2,279	2,254
<u>U.S. Geological Survey</u>				
Water Resources Division Program	6,113	3,758	3,700	3,500
Geologic Division Program	3,935 a	1,372	1,855	1,872
Earth Sciences Applications Program d	504	---	---	---
<u>USGS TOTAL</u>	10,552	5,130	5,555	5,372
<u>DEPARTMENT OF THE INTERIOR TOTAL</u>	44,089	41,041	35,722	35,514

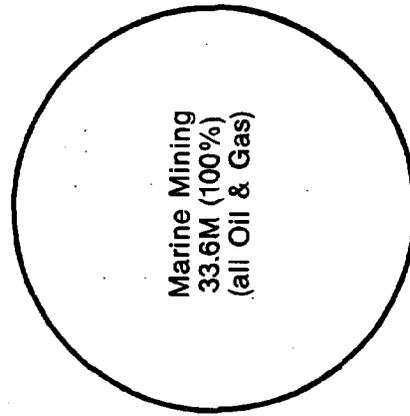
a The amount reported for this program in FY 1982 differs from that reported in the FY 1982 Program Summaries Update. See the program description in this section for details.

b 75% of Washington Office funding will be allocated to the field offices.

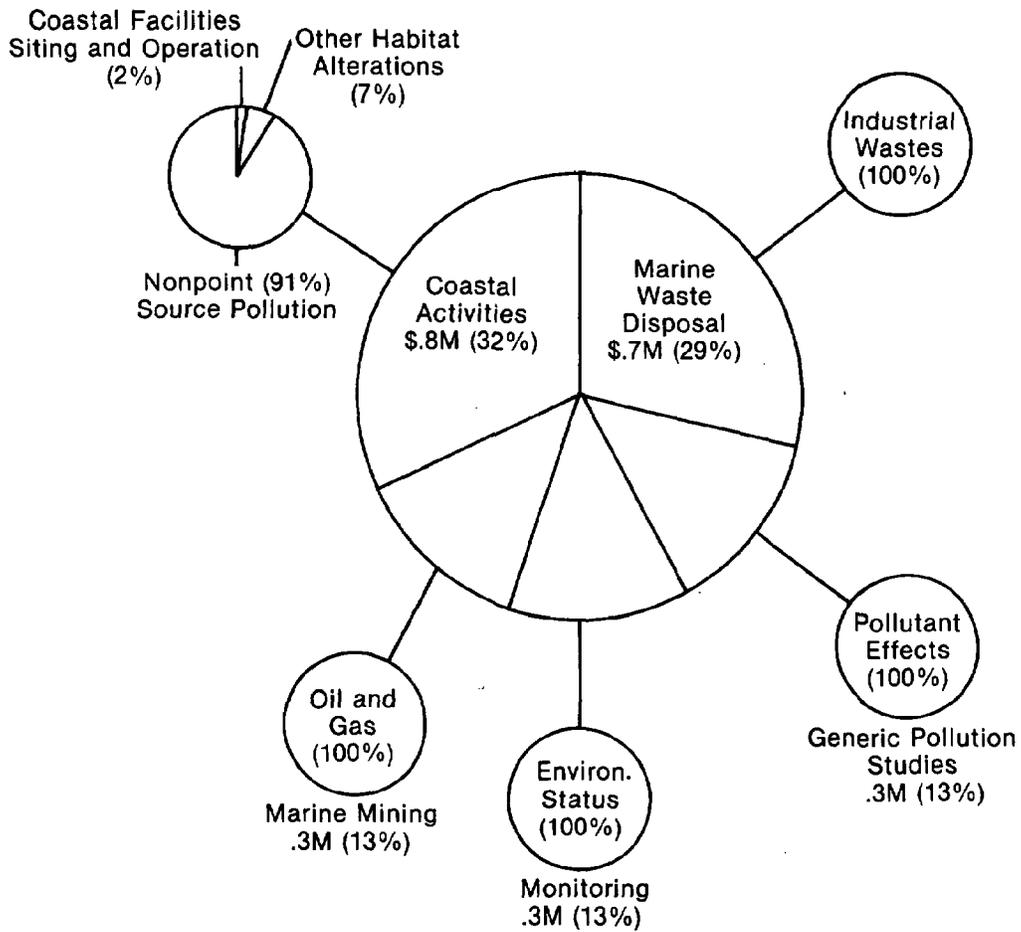
c FY 1985 total budget for MMS is level, apportionment between Washington and the Regional Offices has not yet been determined.

d This program was terminated at the end of FY 1982.

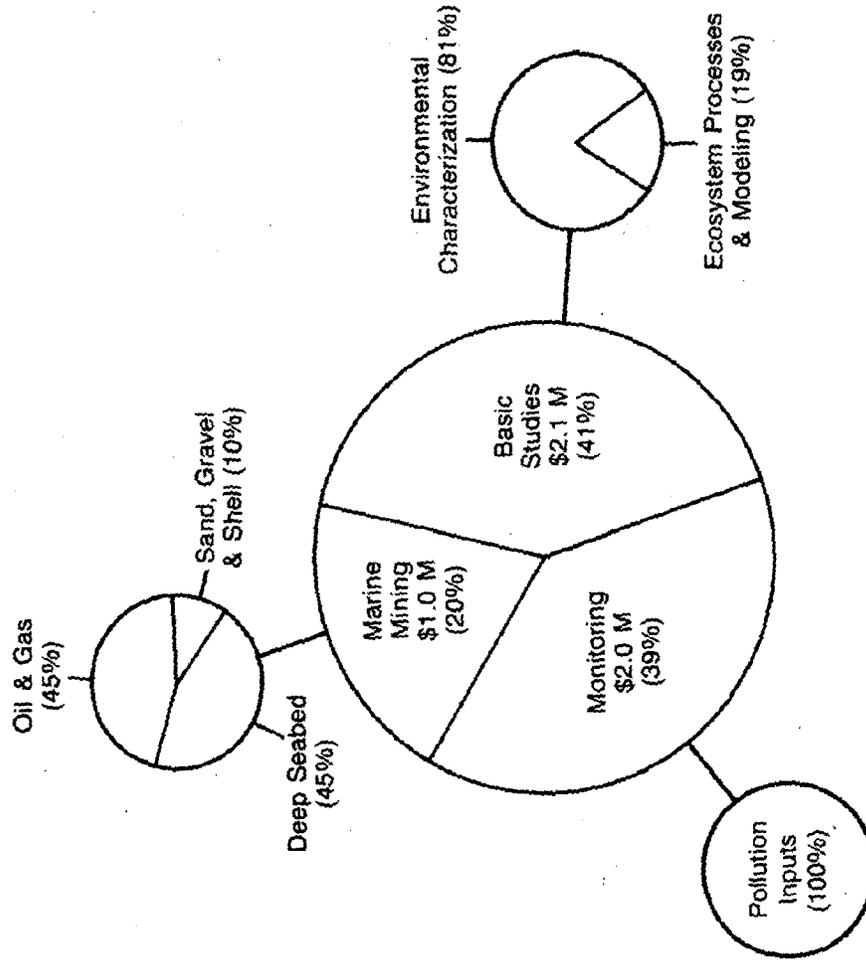
**DEPARTMENT OF THE INTERIOR  
MINERALS MANAGEMENT SERVICE  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY1983 ESTIMATES**



**DEPARTMENT OF THE INTERIOR  
U.S. FISH AND WILDLIFE SERVICE  
OCEAN POLLUTION RESEARCH & MONITORING  
FUNDING EMPHASIS  
FY 1983 ESTIMATES**



DEPARTMENT OF THE INTERIOR  
 U.S. GEOLOGICAL SURVEY  
 OCEAN POLLUTION RESEARCH AND MONITORING  
 FUNDING EMPHASIS  
 FY 1983 ESTIMATES



DEPARTMENT OF THE INTERIOR  
MINERALS MANAGEMENT SERVICE

MISSION

Subsequent to the passage of the Outer Continental Shelf (OCS) Lands Act of 1953 (67 Stat 462), the Secretary of the Interior designated the Bureau of Land Management (BLM) as the Administrative Agency for leasing submerged Federal lands and the U.S. Geological Survey for supervising development and production. In May 1983, all Department of the Interior leasing and resource management functions for the OCS were consolidated within the Minerals Management Service (MMS).

As stated in the OCS Lands Act Amendments of 1978 (PL 95-372), the four major goals for the comprehensive management of the OCS minerals are:

- o To ensure orderly development of the marine mineral resources to meet the energy demands of the Nation.
- o To provide for the protection of the human, marine, and coastal environments concomitant with mineral resource development.
- o To provide for receipt of a fair market value for the leased mineral resources.
- o To preserve and maintain free enterprise competition.

To meet goal 2 above, and to meet information and administrative requirements of the National Environmental Policy Act of 1969, a nationwide OCS Environmental Studies Program was initiated by BLM (now MMS) in 1973 to provide additional environmental information and analysis on marine and coastal ecosystems and to seek to establish benchmark environmental conditions in all OCS areas for future identification of alterations caused by OCS activities.

Objectives

The objectives of the OCS Environmental Studies Program are "to establish information needed for prediction, assessment and management of impacts on the OCS and the nearshore area which may be affected . . ." (43 CFR 3301.7). The studies are designed to:

- o Provide information on the status of the environment upon which the prediction of the impacts of OCS oil and gas development for leasing decisionmaking may be used.
- o Provide information on the ways and extent that OCS development can potentially impact the human, marine, biological, and coastal area.

- o Ensure that information already available or being collected under the program is in a form that can be used in the decisionmaking process associated with a specific leasing action or with the longer term OCS mineral management responsibilities.
- o Provide a basis for future monitoring of OCS operations.

The purpose of the studies program is to ensure that the environmental information on which these decisions are based is complete and is the most definitive that can be assembled at the time.

#### Coordination With Other Agencies

At the present time, Federal research, development, and monitoring programs related to ocean pollution are being administered by 8 departments, 9 independent agencies, and 37 Bureaus within Departments and agencies. With this division of authorities and responsibilities among Federal entities, the need for coordination and cooperation among the various entities is obvious. The MMS has complete responsibility for the multi-year process leading to lease sales, and to adequately assess the leasehold operations that follow. The U.S. Fish and Wildlife Service participated in the OCS leasing and development process regarding the management and use of the Nation's fish and wildlife resources and their habitats.

There are agencies that have regulatory responsibilities on the OCS such as the Corps of Engineers and the U.S. Coast Guard which exercise responsibility for decisions regarding impediments to navigation, the National Marine Fisheries Service which has the responsibility for implementation of the Fisheries Conservation and Management Act and the Marine Mammal Protection Act, and the U.S. Environmental Protection Agency which has the responsibility for issuing point source discharge permits. Interaction with these agencies on a regular basis is required for solicitation of expert advice, information sharing, and joint planning of programs. The purposes of joint planning are to avoid duplication of effort, develop complementary programs, maximize efforts resulting in sharing of logistical support and joint funding of projects, and observe pertinent departmental and legal requirements.

#### Program Trends

The environmental studies program was initiated in 1973 with a series of information syntheses on the environmental and economic characteristics of various OCS leasing areas. The program grew rapidly with emphasis on benchmark studies designed to describe the physical, chemical, geological and biological components of OCS lease areas in a manner which would permit sound statistical comparison to post-development conditions. In 1977-78 the program began to shift its emphasis away from benchmark studies. Based on recommendations received from the National Research Council, an emphasis was placed on relating research efforts more directly to the specific resource management decisions associated with the OCS Leasing Program.

Since 1981 a growing emphasis in the Program has been toward a better understanding of natural oceanographic processes that influence the long-term cumulative impacts of OCS oil and gas development activities. Since 1982 increased emphasis has also been given to information management. Table 1 indicates funding trends among the Regions and the Washington Office for the period FY 1982 - FY 1984.

<u>Program Office</u>	<u>Budget Allocations</u>		
	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84*</u>
Atlantic Regional Studies	\$ 7,877	\$ 7,837	\$ 5,237
Gulf of Mexico Regional Studies	3,707	5,480	3,000
Pacific Regional Studies	3,623	5,167	3,812
Alaska Regional Studies	14,193	13,207	11,770
Washington/Generic Studies	1,235	1,856	4,068
<b>Total</b>	<b>\$30,637</b>	<b>\$33,548</b>	<b>\$27,888</b>

\* Estimated Allocations for FY 1984

Table 1. Funding Trends FY 1982 - FY 1984

### Funding

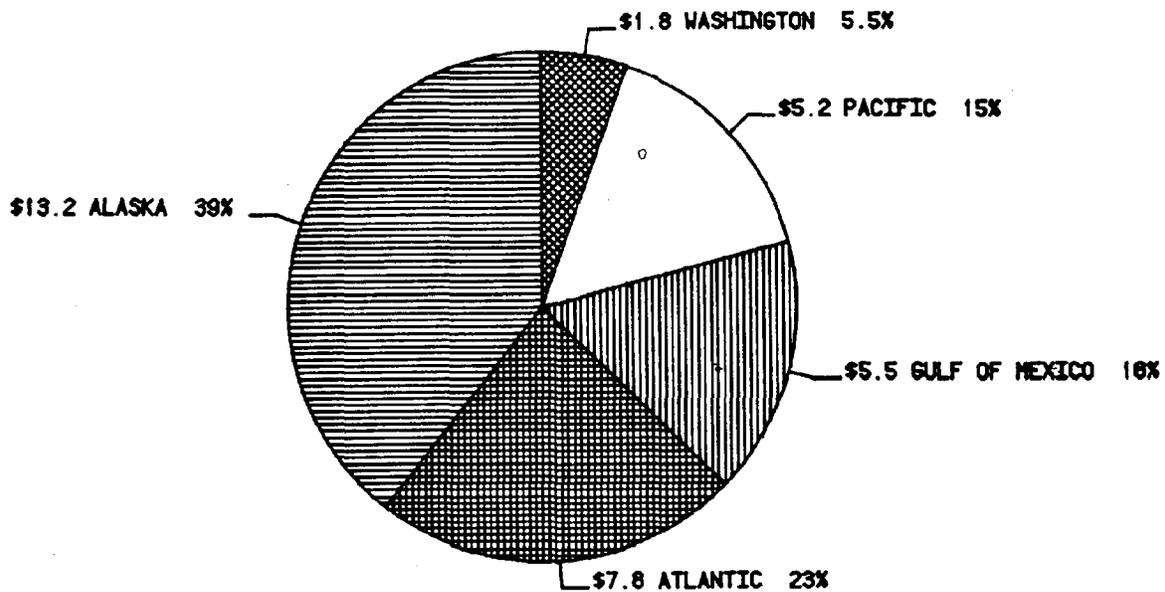
The Fiscal Year (FY) 1983 Environmental Studies Program was officially funded at a level of \$27.88 million. Additional funds added to the program brought the FY 1983 total to \$33.5 million. Allocation of these funds to various topical areas, and OCS Regions is illustrated in Figure 1. The President's budget for FY 1984 is approximately \$27.88 million.

The funding level required to support all of the studies requested by the OCS offices and the Branch of Environmental Studies normally exceeds the actual annual program budget. In recognition of this situation, MMS designed a set of criteria to provide an orderly process for determining which proposed studies would be funded during any FY. These criteria consider the following topics:

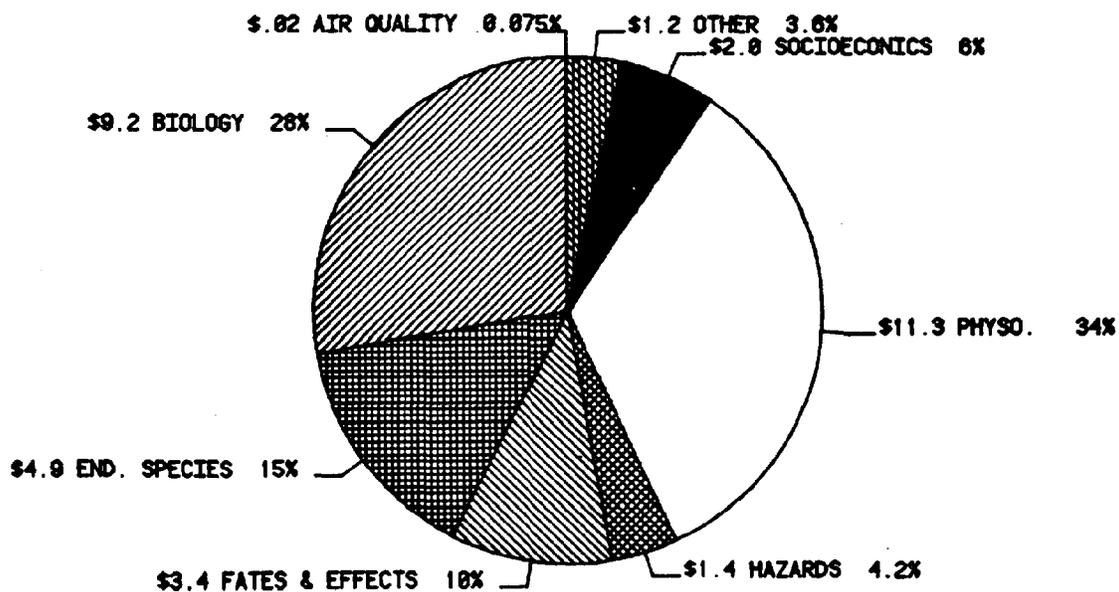
- o The MMS's mandate for conducting the study.
- o Time available before scheduled leasing or lease management decisions.
- o Applicability of study results, methodology or technology to other OCS areas.
- o Present availability and completeness of the data.
- o Regional or programmatic importance of the study.

These criteria were used to determine regional priorities and to formulate the FY 1983 National Study List as part of the Environmental Studies Program for the FY 1983.

# REGIONAL ALLOCATION FY83 (MILLIONS OF DOLLARS)



# DISCIPLINE EXPENDITURES FY83 (MILLIONS OF DOLLARS)



Current Studies

The following are descriptions of environmental studies included in the MMS Environmental Studies Program for FY 1983 which were designed to support the Department's OCS leasing program for petroleum exploration and development. The MMS revises its environmental studies programs to respond to the most current lease schedule. The lease schedule effective during 1983 was issued in July 1982.

The studies were formulated by MMS's Regional OCS offices and the Bureau's Branch of Environmental Studies in Washington, D.C. The four OCS Offices are responsible for managing environmental studies within their respective areas of jurisdiction. These areas include (see Figure 2 and 3:

- o Atlantic OCS Region--North, Middle and South Atlantic U.S. OCS
- o Gulf of Mexico OCS Region--Western, Central and Eastern Gulf of Mexico
- o Pacific OCS Region--Southern, Central and Northern California
- o Alaska OCS Region--Gulf of Alaska, Bering Sea and Arctic Subregions

## FEDERAL PERSONNEL AND FACILITIES

The MMS is a management-oriented agency and has not established an in-house capability for field or laboratory research. Thus, while ships and laboratories account for a significant amount of the research budget, none are reported. Technical experts in Washington and each of the Regional Offices are responsible for planning, implementing and monitoring research projects that are contracted out to the private sector and other Federal and State agencies. During FY 1983, the MMS Environmental Studies Program was staffed at the approximate levels indicated below:

Scientific professionals	<u>FTE</u> 38
Secretarial/administrative	7





## PROGRAM DESCRIPTIONS

Washington, D.C. Office Studies ProgramProgram Rationale

The Washington, D.C., office is responsible for developing studies that are National in scope and address issues that are common to more than one region and relate to information needs that may recur in several decision points.

The studies in the following section represent national or generic studies which were funded through the Washington, D.C., office during FY 1983. Other generic studies can be found in the Regional Office programs. The distinction is primarily administrative and relates to the contract management responsibilities and resources of the various offices. Some of the studies conducted by the Washington Office can also be considered as program quality assurance and general management.

Program Quality Assurance

The goal of this program is to maintain the highest quality science and data synthesis in the environmental studies program. Major objectives of this program in 1983 include:

- o Curate biological specimens from OCS studies by the Smithsonian Institution.
- o Conduct a national hydrocarbon chemistry intercalibration program.
- o Provide major support to scientists to publish in peer-reviewed literature data and findings from the early (1974-1980) environmental studies program.
- o Provide support to major conferences and workshops oriented towards the development of a fundamental understanding of oceanographic processes and applications to impact assessment.
- o Provide general support to UNOLS, NAS Ocean Sciences Board, etc.
- o Improve management and dissemination of environmental studies information.

Lease Sale Studies

The goal of this program is to provide generic and sale specific analyses in support of the Secretary's lease schedule. Major components include:

- o Development of oil spill probability projections.
- o Analysis of marine productivity in the various OCS planning areas.

- o Development of bathymetric maps.

#### Program History and Milestones

A report of major significance was produced in 1983 which evaluated the fates and effects of drilling muds and cuttings discharged into the marine environment. Findings indicate that extensive research focused specifically on drilling fluid discharges is not needed.

As a result of the FY 1982-1983 program objective to support publication of environmental studies information in peer-reviewed literature, over 35 separate papers have been commissioned in the following categories: benthic biology, fates and effects, endangered species and pollutant transport. Plans for FY 1984 and beyond are for peer-reviewed papers to be commissioned directly as a part of the research contract.

During 1983 a workshop was cosponsored with the Environmental Protection Agency to apply the adaptive environmental assessment methodology to the issue of environmental impacts associated with drilling mud discharges. A simulation model was developed which combines predictions of physical transport with biological effects. A final report is scheduled for 1984.

During FY 1983 work was initiated on the development of an annual program prospectus. A FY 1984 prospectus will be completed by mid-1984. In future years the prospectus will be available in the beginning of the fiscal year. Additionally, abstracts are being prepared for all research projects initiated since 1973. Approximately 125 abstracts will be produced annually through FY 1985.

Over twenty reports and papers have been prepared on the oil spill probability projections for each of the OCS Regions in support of the leasing activities in these areas. This is a continuing activity with analyses and reports prepared for each OCS lease offering.

During 1983, 49 bathymetric maps and topographic bathymetric maps were prepared for leasing activities in the OCS Regions. Trends for FY 1984 and 1985 indicate that the mapping activity will be concentrated primarily in Alaska.

#### Estimated Funding (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$1,235	\$1,856	\$4,068	-

\* In the FY 1982 Program Summaries Update, funding for this program in FY 1982 was reported as \$1,347K. The amount reported here is a more accurate estimate of FY 1982 funding for this program.

\*\* FY 1985 total budget for MMS is level, apportionment between Washington and the Regional Offices has not yet been determined.

Program Contacts

Primary responsibilities are indicated for the Washington, D.C., office program management staff in the Branch of Environmental Studies: \*

Dr. Thomas Ahlfield--Benthic Biology Program (202) 343-7744

Ms. Cheryl Anderson--Socioeconomic Program

Mr. Thomas Burke--Atlantic OCS Studies Area Coordinator

Mr. James Cimato--Fates and Effects Program

Mr. Federick Sieber--Alaskan OCS Studies Area Coordinator

Mr. Tim Sullivan--Endangered Species Program

Mr. Herb Kaufman--Pacific OCS Studies Area Coordinator

Mr. James Lane--Gulf of Mexico Studies Area Coordinator

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\* Branch of Environmental Studies  
Minerals Service  
Department of the Interior  
18th & C Streets, N.W.  
Washington, DC 20240

Atlantic OCS Regional Studies Program

The Atlantic OCS Region is bounded on the north by the Northeast Channel between the Georges Bank and the Scotian Shelf, and on the South by the tip of Florida. For leasing purposes, the region is subdivided into the North, Middle and South Atlantic planning areas. The FY 1983 Regional Studies Plan, which provides detailed rationale and planning information for the region's FY 1983 program was based on the July 1982 Final 5-Year OCS Oil and Gas Leasing Schedule, with attendant changes in sale dates.

The sales on the July 1982 schedule include:

<u>Planning Area</u>	<u>Proposed Sale Date</u>
North Atlantic	October 1982 (cancelled) February 1984 (on hold) February 1986 (on hold)
Middle Atlantic	April 1983 June 1985
South Atlantic	July 1983 January 1985 January 1987

Program Rationale

Eight sales have been held in the Atlantic OCS region along with one reoffering sale which included tracts from the Atlantic as well as other OCS Regions. To date, limited exploration has taken place in each of the three planning areas in the Atlantic.

The Atlantic Region Program has been designed in the context of developing an understanding of the dominant physical and biological processes in the area. This information is applied to leasing management decisions including the development of mitigating measures. These studies are intended to facilitate development activities should they occur.

The principal goals of this regional program are to:

- o Determine the short and long-term impacts of drilling operations on biological communities.
- o Describe the distribution, abundance, and migration routes of endangered species and other living marine resources to assist the assessment of potential impacts resulting from oil and gas development activities.
- o Understand physical processes and transport mechanisms of drilling effluents especially in deep water on the continental slope and rise.

The following objectives have been implemented, or were active, as specific projects through the Atlantic OCS Regional Office in FY 1983.

- o Endangered Species--determine effects of noise and oil components on cetaceans; identify marine mammal and turtle populations, habitats and migration routes; determine effects of oil on turtles.
- o Georges Bank Monitoring--determine long-term effects of drilling operations on benthic communities near-field and regionally.
- o Pollutant Transport--characterize physical processes on North/Mid-Atlantic continental rise, slope and canyons. Determine how these processes might transmit effects of OCS drilling related activities to benthic communities, particularly in canyon areas. Characterize near-bottom and midwater current regimes over the Blake Plateau; continue long-term, multilevel circulation measurements, collection and analysis of surface forcing data, meteorologic data, and monitoring of gulfstream perturbations. Determine general circulation features and their variability along the Mid-Atlantic slope/rise; assess influence of Gulf Stream on general circulation patterns.
- o Marine Ecosystems--characterize potentially vulnerable organisms and habitats on the North, Mid, and South Atlantic Continental Slope and Rise. Characterize benthic/nektonic communities associated with live bottom areas in the South Atlantic.

A detailed rationale for the Atlantic OCS Regional Program can be found in the FY 1983 and FY 1984 MMS "Regional Studies Plan for the Atlantic Outer Continental Shelf."

### Program History

The Atlantic OCS Program is comprised of 14 active projects which are described in detail in the National Marine Pollution Program Catalog of Federal Projects. Following is a brief topical summary of accomplishments and findings through FY 1983.

- o Endangered Species: The Cetacean and Turtle Assessment Program, a 39-month survey of over a quarter of a million miles of trackline and over 11,000 sightings of marine mammals and over 2,800 sightings of marine turtles, was brought to a close with completion of a final report. This project characterizes temporal and spatial distributions, size and extent of populations, and identifies, delineates, and describes areas of importance to marine mammals and marine turtles.

In a project begun in 1979 results reported in late 1982 indicate that dolphins can probably visually detect a 1 mm film of dark crude oil. In laboratory studies the avoidance of oil was clear and consistent. Further studies were initiated this year to explore avoidance behavior and to enhance extrapolation to the open ocean environment.

A multi-year study, cosponsored with the Gulf of Mexico OCS Region, was initiated this year to determine whether marine turtles are attracted to oil and tar balls and to determine the effects of exposure and ingestion.

- o Georges Bank Monitoring: This major program was begun in 1981 to monitor changes in the biological, geological and chemical properties in the benthic environment before, during and after exploratory drilling activities and to determine whether changes were caused by the drilling activity. Another objective was to determine the fate of the discharged materials. Reports have been produced annually which characterize seasonal and spatial variability in the benthic environment. Results to date indicate no significant biological impacts associated with exploratory drilling. Barium was found to be a good tracer of drilling mud because of the low background found on Georges Bank. The high energy of the Georges Bank environment tended to widely disperse drilling discharges.
- o Pollutant Transport: A three-year program studying canyon and slope processes in the North and Mid-Atlantic was concluded with the preparation of a final report. Canyon dynamics and faunal assemblages were studied in the Baltimore and Lydonia Canyons. Slope areas studied were: 1) between Linden Kohl and Carteret Canyons; 2) between Toms and Meys Canyons; and 3) between Veatch and Hydrographer Canyons.

A three-year physical oceanography program was initiated in the Mid-Atlantic continental slope and rise.

- o Marine Ecosystems: Two three-year studies were begun this year of the biological processes on the north, mid and south Atlantic continental slope and rise.

Milestones

The major projects identified below will receive funding or will be active in the years indicated. This list is not all inclusive.

<u>Major Program Milestones</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
Endangered Species				
Effects of Oil on Marine Mammals				
Effects of Oil on Marine Turtles				
Georges Bank Monitoring				
Pollutant Transport				
Physical Processes Mid-Atlantic Slope/Rise				
Physical Oceanography Final Synthesis: South Atlantic				
Atlantic OCS Circulation Model				
Marine Ecosystems				
Biological Processes: North, Mid-Atlantic Slope Rise				
Biological Processes: South Atlantic Slope Rise				
South Atlantic Living Marine Resources				

Estimated Funding (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$7,877	\$7,837	\$5,237	----

\* In the FY 1982 Program Summaries Update, funding for this program in FY 1982 was reported as \$7,823K. The amount reported here is a more accurate estimate of FY 1982 funding for this program.

\*\* The total FY 1985 MMS Environmental Studies Program is level funded. Regional allocations have not yet been determined.

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Gulf Of Mexico OCS Regional Studies Program

The Gulf of Mexico Regional Office is responsible for administering the Outer Continental Shelf Oil and Gas Program in the Gulf of Mexico OCS area. The July 1982 Final 5-Year OCS Leasing Schedule included the following sales:

<u>Planning Area</u>	<u>Proposed Sales Dates</u>
Western Gulf	August 1983 July 1984 August 1985 July 1986
Central Gulf	May 1983 April 1984 May 1985 April 1986 April 1987
Eastern Gulf	November 1983 November 1985
Gulfwide	November 1982

Program Rationale

Forty-eight oil and gas lease sales have been held in the Gulf of Mexico since 1953. In that time over 15 million acres have been leased. Presently, the Gulf leasing activity (number of tracts leased) accounts for 78% of all U.S. OCS leasing. Almost 21,000 wells have been drilled in Gulf OCS waters and approximately 6,500 are actively producing oil or gas today. There are almost 3000 platforms currently emplaced in the Gulf OCS waters and over 13,000 miles of pipeline in support of this production effort. Of the oil and gas produced from U.S. OCS areas, the Gulf of Mexico accounts for over 94%.

Framed in the context of a lengthy history of oil and gas development activity, the Gulf of Mexico Regional Program emphasizes the assessment of long-term impacts. The principal goals of the Gulf of Mexico Studies Program are summarized below:

- o Develop a management information base for marine and coastal areas of concern.
- o Describe the effects of OCS activities on the biological environment, especially on particularly productive features and habitats.
- o Produce information for the development of measures to minimize potential impacts of OCS activities.

- o Describe the physical and biological processes which are dominant in Gulf OCS areas which may play a role in an assessment of oil and gas development related impacts on the marine ecosystem.

The following objectives have been implemented as specific projects through the Gulf of Mexico Regional Office:

- o Coastal Characterizations--develop an ecosystem model to delineate structure, function, and interaction of natural resource populations, habitats, and processes for the Alabama and Florida-Gulf coastal zones; synthesis of available environmental and economic information and development of land use and habitat maps.
- o Pollutant Transport--collect meteorologic and physical oceanographic data throughout the Gulf to support a predictive modeling effort used in oil spill risk analysis.
- o Marine Ecosystems--synthesize literature and conduct field studies to characterize the continental slope and abyssal plain ecosystem in areas of OCS leasing; characterize the benthic communities of the southwest Florida shelf; initiate program focusing on Mississippi-Alabama shelf.
- o Endangered Species--synthesize literature on distribution of marine mammals, turtles and birds in the Gulf of Mexico and the potential impact of oil and gas activities; determine the effects of oil exposure and ingestion on turtles.
- o Benthic Habitat Mapping--synthesize 8 years of field data collected to interpret the geologic framework and history of the Gulf of Mexico with the identification of potential geologic hazards particularly in the Mississippi River Delta region.

A detailed rationale for the Gulf of Mexico Regional Program can be found in the FY 1983 and FY 1984 MMS "Regional Studies Plan for the Gulf of Mexico."

### Program History

The Gulf of Mexico Program is comprised of more than 20 active projects which are described in detail in the National Marine Pollution Program Catalog of Federal Projects. Following is a brief topical summary of accomplishments and findings through FY 1983.

- o Coastal Characterizations: This suite of long-term coastal studies is managed by the National Coastal Ecosystem Team of the Fish and Wildlife Service (FWS) and comprises their coastal ecological characterization study program for the Gulf of Mexico. Under this multi-year program, a series of literature compilations, synthesis papers, fine-scale habitat and land-use mapping, and ecosystem models have been developed for the coastal zone of the entire Gulf of Mexico. This large task has been handled as a series of five smaller projects, each defined by regional hydrologic regimes. Many interim deliverable products (maps, synthesis reports, etc.) are available in final form

and others are available to decisionmakers in draft or preliminary form. This program provides an excellent environmental and socioeconomic information and planning base for the Gulf coastal zone.

- o Pollutant Transport: These projects have been developed to achieve a firm understanding of water circulation in the Gulf to support the MMS oil spill risk analysis model, to further understanding of the marine ecosystem of the Gulf, to provide a basis for understanding the functional processes of the Gulf ecosystem, and to support coordinating agencies interested in projecting impacts due to actual spills. Completed studies consist of efforts aimed primarily at synthesis of available hydrographic or circulation information, at development or testing of circulation models for the Gulf, and field data gathering from ships at sea, from instrumental drifting buoys, and from aircraft or satellites. The presently active and planned studies will expand the data and information base and will support refinement of a recently developed, comprehensive circulation model with the goal of understanding Gulf current patterns and hydrology as well as a capability for diagnostic and prognostic circulation modeling. These are multi-year efforts, many of which are projected through 1985.
  
- o Marine Ecosystems: During 1983 the eight-year topographic features project was brought to completion. This series of studies concentrated on the geologic features, local water circulation and biologic communities of about three dozen submarine banks located along the shelf edge off Texas, Louisiana, and Florida. The most prominent of the banks studied are the East and West Flower Garden Banks and the Florida Middle Ground. Studies of each of these banks included precision bathymetric mapping of topographic relief, studies of the seafloor and shallow subsurface geology, delineation and characterization of biologic communities, some analyses of trace metals and hydrocarbons in sediments or biota at certain banks, and elucidation of water circulation near the Flower Garden Banks. The objective of the studies has been an understanding of the extent and nature of these features for environmental assessment purposes, including determination of the need for biologic or geologic stipulations to protect the various banks.

A project was initiated this year to gather and synthesize available information for the continental shelf between the Mississippi shelf and the western side of the deSota Canyon. This synthesis will serve as a base for planning future field efforts.

During 1983 the ongoing southwest Florida shelf ecosystem program was redirected towards studies of biological and physical processes in the area. To date the study has relied on shallow geophysical survey techniques, and towed and still cameras for biological reconnaissance and bottom sampling for determining sedimentary characteristics and the nature of biological communities.

During 1983 a major study program of the continental slope and adjacent shelf was initiated for the area from Corpus Christi, Texas, to Charlotte Harbor, Florida. This series of projects is aimed initially at a characterization of the seafloor and biologic communities.

- o Endangered Species: A major multi-year literature and data synthesis for marine and coastal distributions, abundances, migration routes, natural histories and potential for impact due to oil and gas activities entered the final phase with completion expected in early FY 1984. Also, analysis and reporting of information resulting from aerial surveys of offshore areas for marine mammals and marine turtles was recently completed. A study, cosponsored with the Atlantic OCS Region, was initiated this year to determine the effects of oil on marine turtles.

Milestones

The major projects identified below will receive funding or will be active in the years indicated. This list is not all inclusive.

<u>Major Program Milestones</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
Coastal Characterizations				
Northwest Gulf of Mexico				
Southwest Florida Shelf				
Pollutant Transport				
Gulf of Mexico Physical Oceanography				
Field Program				
Circulation Modeling				
Marine Ecosystem				
Southwest Florida Shelf Studies				
Mississippi-Alabama Shelf Ecosystem Studies				
Continental Slope Studies				
Endangered Species				
Literature Synthesis				
Effects of Oil on Turtles				

Estimated Funding (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$3,707	\$5,480	\$3,000	----

\* In the FY 1982 Program Summaries Update, funding for this program in FY 1982 was reported as \$3,736K. The amount reported here is a more accurate estimate of FY 1982 funding for this program.

\*\* The total FY 1985 MMS Environmental Studies Program is level funded Regional Allocations have not yet been determined.

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Pacific OCS Regional Studies Program

The Pacific OCS Regional Office has jurisdiction for oil and gas leasing and development activities in the Southern California and Central and Northern California planning areas. The FY 1983 Regional Studies Plan, which provides detailed rationale and planning information for the region's FY 1983 program, was based on the July 1982 Final 5-Year OCS Oil and Gas Leasing Schedule.

The area sales on the July 1982 schedule include:

<u>Planning Area</u>	<u>Proposed Sale Date</u>
Central and Northern California	September 1983 September 1985
Southern California	January 1984 (on hold) January 1986 (on hold)

Program Rationale

In California Federal waters, there are presently 15 platforms that have been installed and 9 others in various stages of planning in the Santa Barbara Channel and the San Pedro Bay. Seven sales have been held in the California OCS since 1966 resulting in over 225 exploration wells and 450 development wells. The Pacific Regional Program is set in the context of the need to establish monitoring efforts in light of a significant increase in the current and planned oil and gas development activities in the Santa Barbara Channel and the Santa Maria Basin.

The principal goals of this regional program include:

- o Predict potential impacts of air quality in the California coastal area resulting from existing and proposed OCS oil and gas leasing and development activities.
- o Determine the potential impacts to marine mammal and seabird populations from existing and planned OCS activities.
- o Determine the short- and long-term impacts of OCS discharges on benthic communities.

- o Assess the socioeconomic impacts of OCS oil and gas development to California coastal communities.
- o Identify the major transport processes in the ocean offshore California to assess pollutant transport from OCS oil and gas development activities.

The following objectives have been implemented as specific projects by the Pacific OCS Regional Office.

- o Pollutant Transport--through a program of modeling and field data collection, develop the capability to assess and predict air quality impacts from OCS oil and gas activities; and the transport mechanisms acting on the ocean which control the trajectory and fate of pollutants.
- o Marine Ecosystems--characterize biological communities in California intertidal areas and benthic communities in the Santa Maria Basin and Western Santa Barbara Channel.
- o Marine Mammals (and seabirds)--identify and map marine mammal and seabird population and abundance; define and quantify risks to selected species and populations; evaluate long-term effects of oil ingestion on seabird populations.
- o Socioeconomic--identify and evaluate measures to minimize sea floor disturbances causing space use conflicts; develop techniques for assessing and predicting socioeconomic impacts of OCS activities on the coastal counties of California.

A detailed rationale for the Pacific OCS Regional Program can be found in the FY 1983 and FY 1984 MMS "California OCS Environmental Studies Plan."

#### Program History

The Pacific OCS Regional Program is comprised of more than 18 active projects, which are described in detail in the National Marine Pollution Program Catalog of Federal Projects. Following is a brief topical summary of some of the major studies underway or completed in FY 1983.

- o Pollutant Transport: A major multi-year field program and modeling effort is underway in the Santa Barbara Channel. The field program consists of a series of hydrographic cruises, surface drifter and long-term current meter deployments. Results will be meshed with a numerical simulation of the circulation to develop an enhanced picture of the currents in the region. Additionally a 36-month project was initiated in Central California coastal waters to describe surface circulation patterns and 3-dimensional velocity and density structure. Also, a study was initiated to better define the physical and biological processes which influence the long-term transport and fate of drilling muds in the California OCS.

- o Marine Ecosystems: In preparation for future benthic monitoring studies a major field effort and historical data analysis effort was initiated in 1983 for the Santa Barbara Channel and Santa Maria Basin areas. Results of this reconnaissance will be used to guide the design of monitoring efforts and the selection of appropriate "experimental" and "control" locations. A 5-year field program was initiated this year to describe the long term variation of intertidal community structure and to determine the response of rocky intertidal communities to natural and man-induced perturbations.
- o Endangered Species: Following 3 years of aerial surveys of marine mammals and seabirds in the California OCS coastal and offshore area reports have been prepared in 1983 which include maps and overlays depicting important marine mammal and seabird congregation, breeding, feeding and migration areas. Effects of El Niño on breeding activities extended a multi-year study of long-term sublethal effects of ingested oil on a population of Cassin's Auklets in the Farallon Islands. A similar additional effort was begun using a Wedge-Tailed Shearwater population on Manana Island, Hawaii. During 1983 work progressed in an effort to use simulation modeling to define the risks from oil and gas development activities to populations of marine mammals and seabirds.

A three-year field and data/literature analysis effort was initiated in 1983 to develop predictions of how the California sea otter population size and productivity would be affected by oil spills. Components of this effort also include computer simulations incorporating population dynamics and movement patterns.

- o Socioeconomics: This year two socioeconomic projects were initiated in the Pacific OCS Region. The first is an effort to analyze the socioeconomic changes in Santa Barbara and Ventura counties that may be attributable to Federal OCS oil and gas development. Evaluation of diagnostic socioeconomic factors will also be a component of this effort. The second effort begun this year seek to identify and evaluate measures to minimize sea floor space use conflicts which may arise between the California trawl fishing industry and the oil and gas industry.

Milestones

The major projects identified below will receive funding or will be active in the years indicated. This list is not all inclusive.

<u>Major Program Milestones</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
Pollutant Transport				
Santa Barbara Channel Circulation				
California Shelf Circulation				
Long-term Transport				

	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
Marine Ecosystems				
Benthic Biological Characterizations				
Rocky Intertidal Community Studies				
Endangered Species				
Seabird Oil Toxicity				
California Sea Otter Studies				
Marine Mammal and Seabird Surveys				
Marine Mammal and Seabird Risk Analysis				
Socioeconomics				
Fishing Mitigation Study				
Cumulative Socioeconomic Impacts				

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$3,623	\$5,167	\$3,813	--

\* The total FY 1985 MMS Environmental Studies Program is level funded. Regional Allocations have not yet been determined.

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Alaska OCS Regional Studies Program

The Alaska Regional Office is responsible for administering lease sales for all OCS areas in Alaska. To support leasing and subsequent development and production activity, MMS must determine the environmental costs and multiple use conflicts in order to make well-informed Alaska OCS leasing decisions.

The approved 5-year OCS Oil and Gas Leasing Schedule (July 1982) includes the following future sales in Alaska planning areas:

Arctic Region

<u>Planning Area</u>	<u>Proposed Sale Date</u>
Diapir Field	June 1984
Barrow Arch	February 1985 (on hold)
Diapir Field	June 1986
Barrow Arch	February 1987

Bering Sea and Gulf of Alaska Regions

<u>Planning Area</u>	<u>Proposed Sale Date</u>
Navarin Basin	April 1984
Gulf of Alaska/Cook Inlet	October 1984
St. George Basin	December 1984
N. Aleutian Basin	April 1985
Norton Basin	October 1985
Navarin Basin	March 1986
Kodiak	October 1986
St. Groege Basin	December 1986
Shumagin	June 1987

Program Rationale

Framed in the context of analysis and study of interrelated ecosystem components, the MMS Alaska Region studies program is dedicated to provision of information essential to long- and short-term oil and gas leasing decision needs. In anticipation of shifts in information needs relative to development decisions, the Environmental Studies Program is continuing to integrate planning to meet post-lease and monitoring information requirements. Detailed rationale for the Alaska Region's program can be found in the FY 1983 and FY 1984 Alaska Regional Studies Plan.

As the managing agency for the OCS leasing program, the MMS has initiated environmental and socioeconomic studies to ensure that the potential adverse effects on the environment are considered in management decision.

A portion of Alaskan environmental studies program is planned and conducted for MMS through an interagency agreement with the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. NOAA manages this program component through the Outer Continental Shelf Environmental Assessment Program (OCSEAP) office in Juneau, Alaska. Other environmental and all socioeconomic studies are administered and contracted directly from the Alaska OCS Regional Office in Anchorage.

The principal goals of the Alaskan studies program are to:

- o Elucidate physical processes that influence oil and gas related pollutant transport.

- o Characterize regional biota, habitats and ecosystems. Elucidate ecosystem functioning to develop analyses of impacts from oil and gas development activities.
- o Describe geologic and ice hazards that may affect oil and gas development activities.
- o Determine and assess potential social, economic and physical impacts onshore from oil and gas development activities.

#### Program History

The Alaskan Program is comprised of over 50 active projects which are described in detail in the National Marine Pollution Program Catalog of Federal Projects. Following is a brief topical summary of accomplishments and findings through Fiscal Year (FY) 1983.

- o Endangered Species: The Alaska OCS provides habitat to several endangered species, notably the bowhead whale. In recent years much public and governmental attention in Alaska has been given to the potential effects of oil and gas exploration and production activities on the status and behavior of the bowhead. Studies have concentrated upon observations of bowhead migration routes, potential feeding areas and behavior. A unique role of bowhead study components is to support seasonal drilling and geophysical survey monitoring program needs. Studies carried out during FY 1983 provided further confirmation of the bowheads' overwintering grounds in the south-central Bering Sea. During fall months, information on the status of the bowhead migration is transmitted from the field directly to MMS regulatory authorities. Other studies in the Bering Sea include recent emphasis on surveys of distribution and abundance of endangered whales and feeding ecology of gray whales. Experimental research on gray whale behavior in response to oil and gas sound sources has also been addressed.
- o Living Resources: There are a large number of cetaceans and pinnipeds in the Alaska OCS which are not endangered species. These include ringed seals, bearded seals, belukha whales, walrus and others. The studies program has investigated the life history, food habits, abundance and distribution of several important species, as well as the aspects of their interaction with oil and gas development activities. For example, recent emphases have focused on the study of effects of on-ice seismic exploration on ringed seal behavior and distribution. FY 1983 marked the conclusion of seven years of study of the Pacific walrus and the achievement of a major milestone in the study of the biology of an important subsistence resource in Alaska.

Other studies have investigated the sensitivity of belukha whales to noise and disturbance. Radio-tags were applied to belukhas in Bristol Bay providing new insight into their behavior. The results of these studies are used in devising development stipulation.

In addition to important studies on marine mammals, Living Resources studies contracted by OCSEAP for MMS addressed commercial and subsistence fisheries and marine birds. Studies were targeted at important Bering Sea commercial fisheries species such as red King, Tanner, blue King, and Korean hair crabs. During FY 1983, final project reports provided comprehensive discussions on the status of the Bering Sea crab resources and fisheries as well as new information on red King crab and other decapod early life stages. Work was continued on simulation modeling of Bering Sea fisheries with the intent to quantify potential damage to commercial fisheries if accidental oil spills were to occur. In addition to fisheries studies in the Bering Sea, several were also conducted in the Chukchi Sea during FY 1983.

Three major studies of seabirds were completed in FY 1983, including population studies in the Bering Sea and reproductive ecology-trophics of marine birds of the Gulf of Alaska. Another study completed during FY 1983 provided definition and assignation of environmental "values" to marine oriented birds. This involved ranking geographic area by the perceived vulnerability to oil of the avian groups present. Breeding bird populations were identified as the most important group to protect, while molting, migrating and overwintering populations were judged to be of lesser value. Seabird studies were also conducted in areas of the Beaufort and Chukchi Seas and shorebird research in the Southern Chukchi.

- o Oil Spill Fates and Effects: A vital portion of the studies program is centered on the fate and weathering of spilled oil and the results oil spills may have upon the marine habitat and biota. Recent studies investigated the effects of hydrocarbons on king crabs, tanner crabs and salmonids, supported the BIOS oil spill test program in the Canadian Arctic, and investigated the weathering of spilled oil in open water and in sea ice. A model and users manual was completed for weathering of oil in open water. A subroutine capable of simulating the transport of water column hydrocarbons to the bottom is under development. As mentioned above, another model is under development which will quantify losses of commercially important fisheries to oil spills.
- o Environmental Geology and Hazards: The cold climate of the Alaska OCS results in extensive sea ice and permafrost. These pose complications for oil and gas development, which in turn might lead to damage to habitat of various species. Accordingly, the studies program has continued to investigate the bottom gouging by ice ridges, ice ridge and lead formations, ice motion and, to a lesser degree, marine permafrost behavior. The information from these studies is used in defining potential areas of difficulty for oil and gas operations.
- o Pollutant Transport: The presence of ice is the most important factor to be considered in the prediction or tracking of trajectories of spilled oil in the Arctic. During FY 1983 all the various processes believed to account for the behavior of oil in ice was reviewed along with a statistical analysis of ice motion near potential oil

spill sites. Oil spill trajectories were predicted in open waters using the Rand circulation model and in ice-covered waters using the work described above. Field efforts continued to investigate wind and sea ice motion.

- o Ecosystem Studies: During FY 1983, syntheses of information describing regional ecosystems in the Yukon River Delta and North Aleutian Basin were completed. Field ecosystem studies in the eastern Beaufort Sea and a coastal area of the northern Chukchi Sea were underway in FY 1983.
- o Environmental Monitoring: Since 1981, the Alaska OCS Region of MMS has performed monitoring studies through aerial surveys and behavior studies of bowhead whales. In a unique information transfer, the MMS investigators pass data on the status of whale migration and whale behavior directly to MMS and National Marine Fisheries Service (NMFS) regulatory authorities. These daily status reports are used by MMS authorities to make decisions regarding timing and location of offshore operations, such as geophysical exploration and exploration drilling. Whale monitoring efforts continued in FY 1983 and are likely to be incorporated as part of MMS Offshore Field Operations and Resource Evaluation Monitoring Plans for FY 1984.
- o In FY 1983, the Alaska Region also initiated efforts to develop additional ecosystem-targeted monitoring programs. Results of a Beaufort Sea Monitoring workshop will be used by the Alaska Region studies staff to guide implementation phases of additional MMS monitoring efforts, especially efforts related to tests of hypotheses regarding change in lower trophic levels.

These, and other long-term study efforts, are expected to provide the basic framework by which the Alaska OCS Region will meet monitoring requirements under the OCS Lands Act Amendments.

- o Alaska Socioeconomic Studies Program (SESP): The SESP has utilized a core program of seven studies. The first is a Petroleum Technology Assessment which establishes development scenarios. The remaining six studies follow an impact evaluation process, utilizing the scenarios, which can be generalized into five basic steps: 1) description of baseline conditions; 2) forecast of conditions based on current trends without sale; 3) forecast of conditions with the sale in addition to current trends; 4) analysis of difference between the forecasts. The core studies are as follows:

(1) Petroleum Technology Assessment. To identify petroleum technology and activity scenarios that may be used in the lease area to develop oil and gas resources. Specific issues addressed include: resource scenario development; environmental constraints from oceanography and geology; technology availability; development components; production components; facilities siting; manpower requirements; and economics of development.

(2) Economic and Demographic Impact Assessment. To forecast impacts of a sale upon population and key regional economic indicators statewide. Specific variables addressed include: statewide and regional growth patterns; population changes; employment; income; state and local revenues; state and local expenditures; and fiscal policies.

(3) Anchorage Impacts. To forecast the impacts of a sale upon the city Anchorage. Anchorage's infrastructure is impacted by most activities in the State as it is Alaska's main urban and transportation center. Specific elements addressed include: education; public safety; leisure; utilities; housing; health services; social services; and local transportation.

(4) Transportation System Impacts. To forecast the impacts of a sale upon Alaska's transportation systems statewide. Specific elements addressed include: air, land and marine modes; major facilities and routes; usage and demand; capacities; technology; and regulation plans and policies.

(5) Local Socioeconomic System Impacts. To forecast the effects of a sale upon socioeconomic systems. Specific issues addressed include: local community focus; population; employment; expenditures and revenues; education; public safety; recreation; utilities, land use; housing; health; and social services.

(6) Commercial Fishing Industry Impacts. To forecast the effects of a sale upon Alaska's commercial fishing industry. Specific issues addressed include; fishing industry activities of harvesting and processing; employment; utility needs; harbors and port facilities; competition for labor; competition for ocean space use; and competition for infrastructure services.

(7) Local Sociocultural System Impacts. To forecast the effects of a sale upon local sociocultural systems. Specific issues addressed include: local community ties; territorial and linguistic boundaries; settlement patterns; subsistence patterns and values; and social organization such as family and community, social systems, political systems, and response patterns to change.

The SESP began in 1976, at which time, oil exploration activities were underway following the first Alaska OCS oil and gas lease sale-- the Northern Gulf of Alaska lease sale 39. Late in 1977, the Federal Cook Inlet Sale, CI was held. Because the decisionmaking process requires a long lead time preceding a sale, the SESP studies began in 1976 and focused on the 1979 Federal/State Beaufort Sea Sale. These studies were completed early in 1978. Since then the core studies were completed early in 1978. Since then the core studies have been completed for the northern Gulf of Alaska, Sale 55; Western Gulf of Alaska-Kodiak, Sale 46; second generation Lower Cook Inlet, Sale 60; Diapir Field, Sale 71; Norton Basin, Sale 57; St. George Basin, Sale 70; and North Aleutian Shelf, Sale 75. Beginning in 1982, studies began on the Navarin Basin, Sale 83; Diapir Field, Sale 87; Norton Basin, Sale 88, and St. George Basin,

Sale 89. The Barrow Arch, Sale 85, and the North Aleutian Basin, Sale 92 were covered in FY 1983. In initiating the Barrow Arch, SESP core studies have been performed for each planning area at least once.

The earlier studies in the program relied primarily on the collection of secondary information for the baseline work. Since FY 1982, this has shifted towards substantial field efforts to collect more detailed information. As a result of the increasing use of field efforts, the study design is developing into that of case studies examining socioeconomic and sociocultural issues simultaneously. Another trend is to shift away from narrowly oriented studies to those of regional or statewide scope. Specialized studies have also been designed to develop an understanding of dynamic relationships or to fill information gaps. These studies are as follows:

Monitoring of petroleum activities - FY 1980 Lower Cook Inlet  
 FY 1983 Beaufort Sea  
 Impacts from enclave development on Alaska - FY 1980  
 Cumulative impacts of OCS development - FY 1981 Bering Sea  
 FY 1983 North Slope  
 Social indicator evaluation for impact monitoring - FY 1981  
 Aleutian Basin  
 Impacts of disruption of subsistence resources - FY 1981  
 Subsistence based economies in rural communities - FY 1982

In addition to the development of special studies, there has been a concentrated effort on having SESP findings published in peer reviewed literature. Publications requirements have been added to most of the ongoing special studies. Several small contracts have been procured to analyze completed SESP findings, most notably one for the review of the Economic and Demographic Modeling approach and results.

#### MILESTONES

To provide greater insight into the size and topical coverage of the Alaskan program, planned milestones are presented in terms of report due dates.

- o TITLE: Aerial Surveys of Endangered Whales in the Northern Bering, Chukchi, and Beaufort Seas. (MMS)

FY 1982 Annual report received December 1983

FY 1983 Annual report due June 1984

FY 1984 Final report due June 1985

- o TITLE: Possible Effects of Acoustic and Other Stimuli Associated with Oil and Gas Exploration/Development on the Behavior of the Bowhead Whale. (MMS)

FY 1982 Annual report received December 1983  
FY 1983 Annual report due April 1984  
FY 1984 Final report due April 1985

- o TITLE: Development of Satellite Linked Methods of Large Cetacean Tagging and Tracking Capabilities in OCS Lease Areas. (MMS)

Successful satellite tracking of Humpback whale August 1983  
FY 1982 Progress report received September 1983  
Bowhead tagging, Alaska OCS September 1984  
FY 1983 Progress report due October 1984

- o TITLE: Computer Simulation of the Probability of Endangered Whale Interaction with Oil Spills in the Beaufort, Chukchi, and Bering Seas. (MMS)

Feasibility report due October 1984  
Model development and simulation - September 1984-February 1985  
Final report due March 1986

- o TITLE: Investigation of the Potential Effects of Underwater Noise from Petroleum Industry Activities on Migratory Gray Whale Behavior. (MMS)

Annual Report received December 1983  
Final report due December 1984

- o TITLE: Studies of the Effects of Experimentally Produced Noise Associated with Oil and Gas Exploration and Development on Sea Otters in California. (MMS)

Final report received November 1983

- o TITLE: Distribution, Abundance, Composition, and Variability of the Western Beaufort Sea Benthos. (OCSEAP)

Final report was due in March 1983  
Project completed

- o TITLE: Delineation of Permafrost Beneath the Arctic Seas. (OCSEAP)

Final report due June 1984

- o TITLE: Offshore Permafrost Studies: Arctic Lease Areas. (OCSEAP)

Final report due April 1984

- o TITLE: Subsea Permafrost and Gravel Resources. (OCSEAP)  
Final report on permafrost due January 31, 1984  
Final report on gravel resources due January 3, 1984
  
- o TITLE: Environmental Assessment of Selected Habitats in Arctic Littoral Systems. (OCSEAP)  
Final report due September 30, 1982
  
- o TITLE: Nutrient Dynamics and Trophic System Energetics in Nearshore Beaufort Sea Waters. (OCSEAP)  
Final Report received  
Project completed
  
- o TITLE: The Transport and Behavior of Oil Spilled In and Under Sea Ice. (OCSEAP)  
Final report received  
Project completed
  
- o TITLE: Geophysical and Biological Reconnaissance of Rock Habitats in Eastern Camden Bay, Beaufort Sea, Alaska (OCSEAP)  
Final report received July 1983  
Projects completed
  
- o TITLE: Nearshore Fish Survey in the Western Beaufort Sea: Harrison Bay to Elson Lagoon. (OCSEAP)  
Final report received June 1983  
Project completed
  
- o TITLE: Environmental Characterization of Lagoons and Nearshore Shelf Regions in the Eastern Beaufort Sea. (OCSEAP)  
Final report received August 1983  
Project completed
  
- o TITLE: Fish Distribution and Use of Nearshore Waters in the Northeastern Chukchi Sea. (OCSEAP)  
Final report due December 31, 1983

- o TITLE: Synthesis of Permafrost Information. (OCSEAP)  
Project completed
  
- o TITLE: Publication Support for the Book, "The Alaska Beaufort Sea: Ecosystems and Environment. (OCSEAP)  
The book is to be published by Academic Press in July 1984
  
- o TITLE: Primary Productivity and Nutrient Dynamics in the Chukchi Sea. (OCSEAP)  
Data report due December 31, 1983
  
- o TITLE: Biological Reconnaissance of Boulder Island Shoal in Western Camden Bay, Beaufort Sea, Alaska. (OCSEAP)  
Final report due January 31, 1984
  
- o TITLE: Technical and Scientific Support for Preparation of Workshop Documentation. (OCSEAP)  
Final report due December 15, 1983
  
- o TITLE: Sea Ice Ridges and Pile-up. (OCSEAP)  
Annual report due June 1984  
Final report due September 1984
  
- o TITLE: Current Measurements in Possible Dispersal Regions of Arctic Seas. (OCSEAP)  
Final report due December 1983
  
- o TITLE: Shorebird Dependence on Arctic Littoral Habitats. (OCSEAP)  
Final report (synthesis) due December 13, 1983
  
- o TITLE: Distribution, Abundance, and Feeding of Birds Associated with Sea Ice. (OCSEAP)  
Final report due December 31, 1983
  
- o TITLE: Geologic Environment of the Chukchi and Beaufort Sea Shelf and Coastal Regions. (OCSEAP)

Annual report due April 1984 (1983 work)  
Annual report due April 1985 (1984 work)

- o TITLE: Effects of Seismic Exploration on Ringed Seal Distribution, Abundance, and Reproductive Success. (OCSEAP)

Digital data due September 30, 1984  
Final report due December 31, 1984

- o TITLE: Remote Sensing Analysis of Ice Conditions and Other Parameters of Interest to the Outer Continental Shelf Environmental Assessment Program. (OCSEAP)

Annual report due September 30, 1983  
North Aleutian Basin report due November 1983

- o TITLE: Meteorological Regimes in the Arctic. (OCSEAP)

Preliminary report on FY 1983 objectives due April 1984  
Final report on headland effects due September 1984  
Final report on wind fields vs. buoy motion due September 1984  
Syntheses report on wind fields and ice movement due December 1984

- o TITLE: Numerical Modeling of Storm Surges in the Beaufort and Chukchi Seas. (OCSEAP)

Report on ice motions due May 1984  
Storm surge on the Yukon Delta Report due December 1984

- o TITLE: Acoustic Research on Ringed Seals. (OCSEAP)

Annual report due December 13, 1984  
Audio data due December 31, 1984

- o TITLE: Environmental Characterization and Biological Utilization of Peard Bay. (OCSEAP)

Phase I final report due August 31, 1984  
Phase II final report due August 31, 1985

- o TITLE: Oceanographic Data from the Bering, Chukchi, and Beaufort Seas. (OCSEAP)

Final report due March 31, 1984

- o TITLE: Chukchi Sea Coastal Studies: Geomorphology, Environmental Sensitivity, and Persistence of Spilled Oil. (OCSEAP)  
  
Final report due April 1984
  
- o TITLE: Nearshore and Coastal Circulation in the Northeastern Chukchi Sea. (OCSEAP)  
  
Semi-annual report due November 30, 1983  
Final report due April 30, 1984
  
- o TITLE: Belukha Whale Disturbance Studies. (OCSEAP)  
  
Final report due January 1984
  
- o TITLE: A Seismotectonic Analysis of the Seismic and Volcanic Hazards in the Pribilof-Eastern Aleutian Islands Region. (OCSEAP)  
  
Final report received  
Project completed
  
- o TITLE: Pelagic Distribution and Abundance of Seabirds in the Gulf of Alaska and Eastern Bering Sea. (OCSEAP)  
  
Final report submitted  
Project completed
  
- o TITLE: Zooplankton Distribution and Acoustic Studies in the Bering Sea. (OCSEAP)  
  
Final report received  
Project completed
  
- o TITLE: Compilation of a Homogenous Earthquake Catalog for the Alaskan-Aleutian Range. (OCSEAP)  
  
Final report due November 1983
  
- o TITLE: Seafloor Hazards and Related Surficial Geology, Navarin Basin Province, Northern Bering Sea. (OCSEAP)  
  
Final report received  
Project completed
  
- o TITLE: Seafloor Geologic Hazards on the North Aleutian Shelf. (OCSEAP)

Final report received  
Project completed

- o TITLE: Population Dynamics of King, Tanner, and Other Decapod Larvae in the Southeastern Bering Sea. (OCSEAP)

Final report received  
Project completed

- o TITLE: Modern Populations, Demography, Migrations, Trophics, and Historical Status of the Pacific Walrus. (OCSEAP)

Final report due December 31, 1983

- o TITLE: Investigations of Belukha Whales in Coastal Waters of Western and Northern Alaska. (OCSEAP)

Final report due December 31, 1983

- o TITLE: Boundary Conditions and Verification of Circulation and Oil Spill Trajectories in the Eastern Bering Sea Shelf. (OCSEAP)

Final report due December 31, 1983

- o TITLE: Ecological Characterization of Shallow Subtidal Habitats in the North Aleutian Shelf. (OCSEAP)

Final report due October 14, 1983

- o TITLE: Endangered Whale Surveys of the Navarin Basin, Alaska. (OCSEAP)

Final report due January 4, 1984

- o TITLE: Feeding Ecology of Gray Whales (Eschrichtius robustus) in the Chirikof Basin, Summer 1982. (OCSEAP)

Final report due October 1, 1983

- o TITLE: Pribilof Islands Seabird Census. (OCSEAP)

Final report received  
Project completed

- o TITLE: Assessment of Gray Whale Feeding Grounds and Seafloor Interaction in the Northeastern Bering Sea. (OCSEAP)

Final report due October 1983

- o TITLE: Environmental Characterization of the North Aleutian Shelf Nearshore Region. (OCSEAP)

Final report due December 31, 1983

- o TITLE: Ecological Characterization of the Yukon River Delta. (OCSEAP)

Final report due October 31, 1983

- o TITLE: Pelagic Distribution of Seabirds, Analysis of Encounter Probability, and Risk Assessment. (OCSEAP)

Final report due January 31, 1984

- o TITLE: Oil Spill Impact Analysis in the Beaufort, Chukchi, and Bering Seas.

North Aleutian trajectories due October 1983

Norton Basin trajectories due April 1984

Navarin Basin trajectories due September 1984

Peard Bay, Barter Island, Cold Bay Circulation Report due September 1984

- o TITLE: Analysis of Populations and Trophics at Large Seabird Colonies in the Chukchi and Northern Bering Seas. (OCSEAP)

Final report and digital data due May 31, 1984

- o TITLE: Aerial Surveys of Endangered Whales in the Southeastern Bering Sea and Shelikof Strait. (OCSEAP)

Final report due August 31, 1984

- o TITLE: Feeding Ecology of Juvenile King and Tanner Crabs in the Southeastern Bering Sea. (OCSEAP)

Final report due December 31, 1983

- o TITLE: Distribution, Abundance, and Biology of Blue King and Korean Hair Crabs Around the Pribilof Islands. (OCSEAP)

Final report due July 31, 1984

- o TITLE: Distribution of Larval and Juvenile Red King Crab in the North Aleutian Basin. (OCSEAP)

Final report due April 30, 1984

- o TITLE: Simulation Modeling of the Effects of Acute Oil Spills on Commercially Important Fishery Resources in the Bering Sea. (OCSEAP)

Tabular simulation results due August 1984

Final report due September 1984

- o TITLE: Earthquake Activity and Ground Shaking In and Along the Eastern Gulf of Alaska. (OCSEAP)

Final report received

Project completed

- o TITLE: The Breeding Biology and Feeding Ecology of Marine Birds in the Gulf of Alaska. (OCSEAP)

Final report completed

Project completed

- o TITLE: Distribution and Abundance of Decapod Larvae of the Kodiak Shelf. (OCSEAP)

Final report received

Project completed

- o TITLE: Marine Geotechnical Program in Support of Geological Hazards Study. (OCSEAP)

Final report received June 1983

Project completed

- o TITLE: Development and Initial Application of Software to Produce a Seismic Hazard Analysis of the Gulf of Alaska. (OCSEAP)

Final report received

Project completed

- o TITLE: Storm-Petrels as Indicators of Environmental Conditions. (OCSEAP)

Final report due October 1, 1983

- o TITLE: Gulf of Alaska Book. (OCSEAP)

The book will be completed by December 31, 1984 and published in 1985.

- o TITLE: Multivariate Analysis of Petroleum Weathering in the Marine Environment - Subarctic. (OCSEAP)

User's manual received August 1, 1983  
Final report due October 1, 1983

- o TITLE: The Nature and Biological Effects of Weathered Petroleum. (OCSEAP)

Final report due October 1, 1983

- o TITLE: Lethal and Sublethal Effects of Petroleum Contamination on the Post-Larval Stages of King Crab. (OCSEAP)

Final report was due April 1, 1983

- o TITLE: Quality Assurance Program for Trace Petroleum Component Analysis. (OCSEAP)

Annual report due October 1, 1983  
Semi-annual report due April 1, 1984  
Annual report due October 1, 1984

- o TITLE: Baffin Island Oil Spill (BIOS) Project. (OCSEAP)

Annual report due September 1, 1983  
Annual report due September 1, 1984

- o TITLE: Predictive Assessment for the Weathering of Oil in the Presence of Sea Ice. (OCSEAP)

Semi-annual report due April 1, 1984  
Final report due January 1, 1985

- o TITLE: Reproductive Success in Tanner (Chionoecetes bairdi) and Dungeness (Cancer magister) Crabs During Long-Term Exposures to Oil-Contaminated Sediments. (OCSEAP)

Final report on tanner crab due October 1, 1983  
Final report on tanner and dungeness due December 1, 1984

Alaska Socioeconomic Studies And Milestones

The SESP studies in FY 1983 are listed below under the categories of General Studies, Arctic Studies, and Sub-arctic Studies. All are contracted by MMS.

GENERAL STUDIES

Economic and Demographic Systems Analyses for Lease Offerings North Aleutian Basin (4/85), Norton Basin (10/85), Navarin Basin (3/86), Gulf of Alaska/Cook Inlet (10/84), Diapir Field (6/84) and St. George Basin (12/84).

Final forecasts and due dates as follows:

North Aleutian Basin (4/85)	December 1983
Norton Basin (10/85)	April 1984
Navarin Basin (3/86)	September 1984
Gulf of Alaska/Cook Inlet (10/84)	December 1984
Diapir Field (6/84)	August 1983
St. George Basin (12/84)	January 1984

MILESTONES

- o TITLE: Effects of Renewable Resource Harvest Disruptions on socioeconomic and Sociocultural Systems Impact Analysis: Unalakleet, St. Lawrence Island, and Wainwright.

Final reports are due as follows: Unalaklett - January 1984; St. Lawrence Island - February 1984; Wainwright - March 1984

- o TITLE: Cultural Resources Compendium.

Draft final report submitted in October 1983

- o TITLE: Rural/Subsistence Based Economies.

Draft final report was submitted in November 1983

- o TITLE: Social Indicators for OCS Impact Monitoring.

Final report submitted in May 1983

- o TITLE: Anchorage Impacts Analysis.

The final report is due in January 1984.

- o TITLE: Nuiqsut Case Study.

Final report is due in January 1984

- o TITLE: Recreation User Study.

Final report is due in April 1984

- o TITLE: Transportation Systems Impact Analysis for the Bering Sea, Navarin Basin and Diapir Field.

The Bering Sea final report is due in April 1984  
The Diapir Field final report is due is March 1984  
The Navarin Basin final report is due in July 1984.

- o TITLE: Comparative Analysis of Offshore Loading and Pipeline Systems.

Final report due August 1984

#### ARCTIC STUDIES

- o TITLE: Chukchi Sea and Hope Basin Petroleum Technology Assessments.

Final reports submitted in December 1982 and July 1983

- o TITLE: Marketability of Bering Sea Gas.

The final report was submitted in May 1983

- o TITLE: Chukchi Sea Socioeconomic Study.

The final report is due in December 1983

- o TITLE: Impact Assessment of Transportation Systems for Lease Offerings Barrow Arch (2/85) and North Aleutian Basin (4/85).

Final report will be due in December 1983

- o TITLE: Petroleum Activity Monitoring for Lease Sales BF and 70, and Lease Offering Navarin Basin (3/84).

Draft final report due in January 1984

- o TITLE: Bering Sea Cumulative Commercial Fishing Industries Impact Analysis.

The final report is due in March 1984

- o TITLE: Publications Projects: Sociocultural Review of the Southwest Bering Commercial Fishing Industries in the Bering Sea and Economic, Demographic and Fiscal Effects of OCS Activities.

The final journal articles for all three components are due in July 1984

- o TITLE: Damage Functions and Oil/Fish Interaction.

Draft final report is due October 1984

- TITLE: Cumulative Effects of North Slope Oil and Gas Development.

Draft final report due September 1984

#### SUB-ARCTIC STUDIES

- o TITLE: Norton Sound Socioeconomic Study.

The draft final report was submitted in August 1983

- o TITLE: Unalaska-Cold Bay Case Study.

Final reports were submitted in August 1983

- o TITLE: Sub-arctic Alaska Deep Water Petroleum Technology Assessment.

Draft final report due in January 1984

- o TITLE: North Aleutian Basin Commercial Fishing Industry Analysis Update.

Final report is due in February 1984

- o TITLE: North Aleutian Shelf Socioeconomic Study.

Final report due in March 1984

Estimated Funding (in thousand \$)

	<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
Alaskan Environmental Studies	\$12,768	\$11,772	--	--
Alaskan Socioeconomic Studies	<u>\$1,425</u>	<u>\$1,298</u>	<u>--</u>	<u>--</u>
TOTAL	\$14,193	\$13,207	\$11,770	\$11,770

\* In the FY 1982 Program Summaries Update, funding for this program in FY 1982 was reported as \$13,733K. The amount reported here is a more accurate estimate of FY 1982 funding for this program.

\*\* The total FY 1985 MMS Environmental Studies Program is level funded. Regional allocations have not yet been determined.

Regional Program Contacts:

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Chief, Environmental Studies Section  
Minerals Management Service  
Alaska OCS Regional Office  
P.O. Box 101159  
Anchorage, Alaska 99510  
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Mr. Thomas Warren  
Chief, Socioeconomic Studies Section  
Minerals Management Service  
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Telephone: (907) 261-2426

DEPARTMENT OF THE INTERIOR  
U.S. FISH AND WILDLIFE SERVICE

MISSION STATEMENT

The U.S. Fish and Wildlife Service has general responsibility for perpetuating and providing public use and enjoyment of fish and wildlife of the United States. Its functions include responsibility for fish and wildlife resources and habitats of national interest through research, management, and provision of technical assistance to other Federal and non-government agencies and States.

The operations of the Service include those conducted in the entire coastal zone, the contiguous lands, and the waters that flow into the zone. Through the Assistant Secretary for Fish and Wildlife and Parks, the Service acts as principal environmental protection advisor in reviewing various Departmental policy and option documents for energy development programs including those in the Coastal Zone.

The Service places high priorities on activities that will assure protection of fish and wildlife. Portions of its component programs with marine-pollution-related goals, objectives, and activities constitute important factors in the protection, conservation, and enhancement of estuarine and coastal fish and wildlife resources and their habitats.

FEDERAL PERSONNEL AND FACILITIES

None of the FWS laboratories, equipment, or vessels are exclusively or substantially devoted to any activity directly related to marine pollution research or monitoring. However, personnel associated with marine pollution efforts are as follows:

- o Fishery Resources Program - 8 FTE
- o Habitat Resources Program - 22 FTE

PROGRAM DESCRIPTIONS

Fishery Resources Program

Research and Development

Objective

To collect, collate, and interpret diverse information on fish species, populations, and habitats in order to provide information, methodology and materials to assist fishery managers in decisions about protection, enhancement and utilization of resources. Research will address specific needs of the Service and, when feasible, respond to the needs of other Federal agencies, Indian tribes, State agencies, and international groups.

Base Program

To assist in attaining Fishery Resources Program goals and objectives, the Service operates one national fishery research center consisting of 5 satellite research laboratories, 4 other major laboratories, and 28 field stations. An intensive research effort involving 74 projects and 250 subordinate work units is scheduled for FY 1984 in the two major areas of fish husbandry/aquaculture and fish ecology.

Fish ecology research involves three primary areas: fish population dynamics and assessment, the relationship between fish species and their habitat or environment, and fish control methods. Results of this research enhance the understanding of the effects of man-made and natural environmental changes on fish populations and their habitats, and are used in predicting impacts of changes resulting from management or land and water development decisions or actions.

The Great Lakes Fishery Laboratory, Ann Arbor, Michigan, conducts resource assessment, ecology, and contaminant studies on important sport and commercial fish species and their forage base in all five of the Great Lakes. Key marine pollution-related components of these studies center on the following:

1. Investigations of physiological and behavioral responses of desirable fish species and their forage bases to physical and chemical alterations of the habitat.
2. Investigations of nutrient loading and altered water quality on the productivity of the plankton-benthos community, and the effects of changes in community composition on fishery productivity.
3. Sample collection, quality assurance and contaminant analysis in conjunction with the cooperative U.S./Canadian "International Great Lakes Fish Contaminant Surveillance Program."
4. Documentation of the effects of water-use practices on fish communities and production leading to development of water-use regulations that insure protection and enhancement of Great Lakes fishery resources.

Milestones:

- o Determine structure and productivity of fish communities in the St. Clair-Detroit River ecosystem - 1982.
- o Perform cross-check analysis of contaminants in fish tissue samples for the International Great Lakes Fish Contaminant Surveillance Program - 1983.
- o Isolate and identify attractant pheromones in lake trout - 1984.

- o Conduct comparisons of condition and survival of fry hatched from eggs of Lake Michigan lake trout - 1984.
- o Describe and assess effects of precipitation-borne fallout, tributary inflow, and resuspension of lake sediments on nutrient loading and water quality in the Great Lakes and their connecting waters - 1984.
- o Describe the effects of nutrient loading and altered water quality on the productivity of the plankton-benthos community in Great Lakes waters - 1984.
- o Describe the utilization of the plankton-benthos community by fish, and the effect of changes in availability and composition of that community on fish productivity - 1984.
- o Perform GC/MS scans of 1982 fish samples - 1984.
- o Further verify GC/MS tentative identifications in 1977 and 1982 samplings - 1984.
- o Evaluate fish spawning and nursery habitat in Great Lakes nearshore waters - 1985.
- o Determine effects of power plant ash on fish habitat and productivity in Great Lakes nearshore waters - 1986.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$705	\$661	\$658	\$658

\* Presidential budget submission.

Program Contact

Dr. Robert E. Stevens  
 Chief, Division of Fishery Research  
 U.S. Fish and Wildlife Service  
 Washington, D.C. 20240  
 Telephone (202) 653-8772

Habitat Resources Program

In FY 1983, an organizational change within the Fish and Wildlife Service created a new entity known as Research and Development. Portions of the previously reported (FY 1982 UPDATE) subactivities known as Biological Services and Environmental Contaminant Evaluation became program elements under this new R&D subactivity. Biological Services now functions as a division within R&D. The Monitoring and Field Operations

components of the contaminant evaluation entity are now identified as the Resource Contaminant Assessment element under the Field Operations Sub-activity. The Research Component of the contaminant evaluation entity is now identified as the Research program element under the Habitat Resources Activity, Research and Development Subactivity.

### Biological Services

Biological Services was established to supply scientific information and methodologies on key environmental issues that impact fish and wildlife resources and their supporting ecosystems. The mission is:

1. To develop, synthesize, and transfer ecological information to Federal, State, and private users, to address fish and habitat and resource issues of national and regional importance, and to minimize and mitigate the effects of development on those resources.
2. To develop and apply tools, methods, and technologies to improve the collection, storage, and analysis and display of ecological information used in management of fish and wildlife habitats and resources.
3. To provide technical assistance and training to resource managers and other decisionmakers who use ecological information and tools to effectively manage fish and wildlife resources and their habitats.
4. To develop and maintain computerized natural resource information management systems, data management systems and data bases, and training and instructional material for Service personnel and other Federal agencies and State and private users.

Projects have been initiated in coastal areas to determine changes in important fish and wildlife wetland habitats, to minimize the impacts of development on coastal fish and wildlife resources and their habitats, and to support the Departmental accelerated offshore oil and gas leasing program. New approaches have been developed to characterize the coastal areas to better understand, predict, and compensate for multiple impacts of development on fish and wildlife resources. Particular emphasis is being placed on potential impacts on coastal birds, endangered species, and high-value habitats.

### Milestones:

- o Complete Gulf Coast Ecological Inventory - 1983.
- o Complete Mississippi Deltaic Ecological Characterization - 1983.
- o Complete Texas Barrier Island Ecological Characterization - 1983.

- o Complete Ecological Characterizations of Northeastern Gulf of Mexico and Southwestern Florida - 1985.

Field Operations: Resource Contaminant Assessment

Pesticide and Toxic Chemical Monitoring

The objective is to determine Nationwide trends by location (geographical differences) and over time (differences through years) of selected environmental contaminants in representative species of fish and wildlife. The base program involves Fish and Wildlife Service participation in the National Contaminant Biomonitoring Program (NCBP) by monitoring environmental contaminants in selected species of fish and wildlife. The program documents contaminant burdens and trends in those species and detects new chemical hazards in the environment.

Contaminant Field Operations

Objectives of this portion of the program are to respond to changes in pollution levels in the environment by locating, identifying, and correcting sources of contamination through field appraisals and investigations of fish and wildlife losses. The base program provides technical assistance on pesticide use and potential effects of pollutants on key fish and wildlife communities, appraisals of direct contaminant impacts in the field, assistance and expertise concerning spills of oil and other hazardous substances when fish and wildlife might be affected and investigations of fish and wildlife mortality related to environmental contaminants.

Research and Development: Contaminant Research

The objective of the research portion of the program is to identify fish and wildlife populations and ecosystems of high national interest that are adversely affected by environmental contaminants and evaluate the impacts of contaminants on these living resources. Corrective measures are recommended to reduce exposure of fish and wildlife to environmental contaminants. The base program consists of combined field and laboratory research which evaluate the effects of environmental contaminants on fish, wildlife and their habitats. The basic research strategy is identification and prediction of contaminant impacts on fish and wildlife resources, documentation of adverse effects, tracking recovery of populations, and maintaining surveillance of populations once recovery has occurred.

During FY 1983 research was conducted on the effects of contaminants on wildlife in estuarine, marine, and freshwater (Great Lakes) environments. Research on contaminant effects on wildlife in marine and estuarine environments is conducted at the Patuxent Wildlife Research Center, Laurel, Maryland, and includes consideration of ecological effects of contaminants on wading birds, brown pelicans and associated estuarine birds, rails, shorebirds, bald eagles, and ospreys. Experimental appraisals assess exposure and effects of oil on birds. Impacts of environmental contaminants on Alaskan birds are being assessed also. Research on contaminant effects

on aquatic species of the Great Lakes is conducted at the Great Lakes Fishery Laboratory, Ann Arbor, Michigan, and includes the determination of the identity, severity, distribution, and changing trends of contaminants that are a potential threat to fish and fisheries of the Great Lakes. Research on contaminant effects on striped bass as well as contaminant surveys along the Texas coast is conducted by the Columbia National Fisheries Research Laboratory, Columbia, Missouri.

Results of the National Contaminant Biomonitoring Program (NCBP) on fish reflect declines in contaminant residues of concern such as DDT, polychlorinated biphenyls (PCBs) and lead from 1978-79 to 1980-81. Striped bass research has revealed that early life stages exposed to simulated field concentrations of organic and inorganic contaminants can decrease survivability. Bloater chubs collected from the Great Lakes in 1982 were analyzed for DDT, PCBs and toxaphene. Results show no significant change from the 1980 collections. All concentrations were below the FDA action level for human consumption.

Milestones:

- o Fish samples collected from the NCBP in 1982-83 will be analyzed to confirm earlier detection of unknown contaminants - 1984.
- o Laboratory and field investigations of contaminants effects on striped bass will continue - 1984.
- o Analysis of bloater chubs collected (1983) from the Great Lakes will be completed - 1984.
- o Investigations of the effects of acid precipitation on salmonids (Atlantic salmon) will continue - 1984.

Estimated Funding (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$2,197	\$1,701	\$1,621	\$1,596

\* As a result of the reorganization in FY 1983, funding reported under the Biological Services and Environmental Contaminants Evaluation Programs in the FY 1982 Program Summaries Update have been combined and reported under the Habitat Resources Program.

\*\* Presidential budget submission.

Program Contact

Dr. Edward T. LaRoe  
 Chief, Division of Biological Services  
 U.S. Fish and Wildlife Service  
 Washington, D.C. 20240  
 Telephone (202) 653-8723

DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY

MISSION

The U.S. Geological Survey (USGS) was established on March 3, 1879, and assigned the responsibility for "classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain." Over the years, Congressional and Executive directives have expanded the Survey's geological mission to include topographic mapping, and hydrological investigations of water in streams and underground. In compliance with this broad mission for earth science research and application, a few programs related to ocean pollution research, development, and monitoring are carried out by the Geologic Division and Water Resources Division.

PROGRAM DESCRIPTIONS

Water Resources Division Program

The Water Resources Division (WRD) has the principal responsibility for providing hydrologic data on surface and ground water, and for satisfying water information needs at all levels of government. The Division also performs those research studies that are needed to assure competent hydrologic investigations. Programs of interest to COPRDM include the long-term operation of downstream gages on major rivers and streams (yielding both quantity and quality data), and site specific investigations of estuarine circulation, geochemistry, and ecology.

Estimated Funding (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$6,113	\$3,758	\$3,700	\$3,500

\* Some projects listed in FY 1982 were not included in subsequent years due to a reevaluation of program pollution studies.

\*\* Presidential budget submission

Program Manager

Robert Schoen  
U.S. Geological Survey  
Water Resources Division  
(703) 860-6834

Earth Sciences Applications Program

The role of the Office of Earth Science Applications (ESA), within the U.S. Geological Survey, is to develop, encourage, coordinate, and implement the transfer of earth-science information related to land and

resource planning to planners and decisionmakers. It is the aim of the ESA program to assure maximum value of studies conducted by the Geological Survey's Divisions for local and State management decisions. ESA supports the oil spill trajectory analysis activity which provides information regarding possible landfalls of any petroleum spilled during OCS development.

The Earth Sciences Applications Program was terminated at the end of FY 1982.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u>
\$504	\$0	\$0	\$0

Program Manager

John E. Jones  
 U.S. Geological Survey  
 Office of Earth Science Applications  
 (703) 860-6857

Geologic Division Program

In 1879 much of the national domain was frontier. Today the Nation's geographic frontiers primarily lie beneath its surrounding waters. By Presidential proclamation in 1983, the national domain for seabed resources has been extended to 200 nautical miles offshore. This United States Exclusive Economic Zone (EEZ), a marine domain surrounding the continental United States, Hawaii, and United States-related islands, constitutes an area about one and two-thirds larger than the size of the onshore area. In this vast domain lie resources of immense importance to the Nation. Through marine geologic surveys, key aspects of this region can be studied.

The marine program has three major elements: (1) Regional Geologic Framework; (2) Marine Deposits and Sedimentary Dynamics; and (3) Formation of Marine Energy and Mineral Deposits. Studies of interest to COPRDM occur in the elements (2) and (3). Because none of these elements focus on ocean pollution, only estimates of relevant content can be given for assessment of resources applied to COPRDM activities.

Estimated Funding (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$3,935	\$1,372	\$1,855	\$1,872

\* Some projects listed in FY 1982 were not included in subsequent years due to a reorganization and transfer of some projects. This program was not included in the National Marine Pollution Program in FY 1982 and was not reported in the FY 1982 Program Summaries Update.

\*\* Presidential budget submission

Program Manager

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U.S. Geological Survey, Geologic Division  
(703) 860-6431

## FEDERAL PERSONNEL AND FACILITIES

In FY 1983, the U.S. Geological Survey employed 35 full-time equivalents who were assigned exclusively or substantially to marine pollution programs.

The R/V POLARIS, 90 ft. LOA, spent approximately 150 ship days studying pollution-related processes in and around the San Francisco Bay. These studies involved coastal-estuarine light geophysics studies and water sampling.



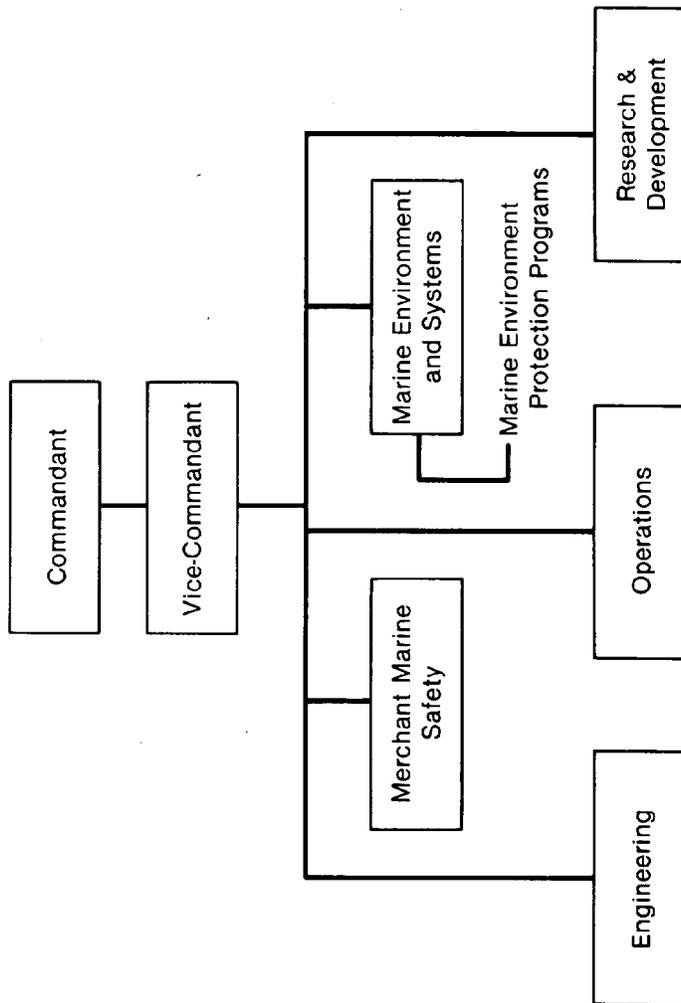
DEPARTMENT OF TRANSPORTATION

U.S. COAST GUARD

CONTENTS

	<u>Page</u>
ORGANIZATION CHART.....	VII-ii
FUNDING SUMMARY.....	VII-iii
FUNDING EMPHASIS GRAPH.....	VII-iv
MISSION STATEMENT AND LEGISLATIVE MANDATES.....	VII-101
FEDERAL PERSONNEL AND FACILITIES.....	VII-102
PROGRAM DESCRIPTIONS.....	VII-102
Marine Environmental Response Program.....	VII-102
Port and Environmental Safety Program.....	VII-103

DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD



DEPARTMENT OF TRANSPORTATION  
U.S. COAST GUARD

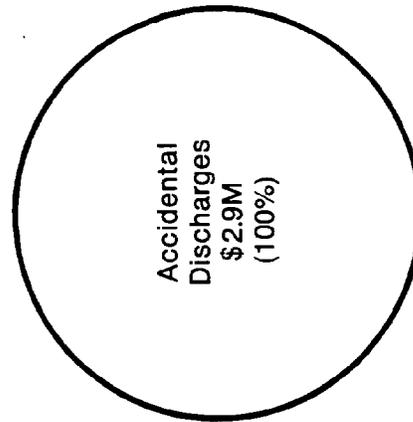
PROGRAM FUNDING SUMMARY  
RELATED TO OCEAN POLLUTION RESEARCH, DEVELOPMENT AND MONITORING  
HISTORICAL BUDGET AND ESTIMATED OUT-YEAR FUNDING  
FISCAL YEARS 1982-1985

(In Thousand Dollars)

	FY 82 (Estimated)	FY 83 (Estimated)	FY 84 (Estimated)	FY 85 <sup>b</sup> (Presidential)
Marine Environmental Response Program	460	645	408	965
Port and Environmental Safety Program	<u>3,000</u>	<u>2,300</u>	<u>800</u>	<u>0</u>
U.S. Coast Guard Total	3,460 <sup>a</sup>	2,945	1,208	965

<sup>a</sup> The funding reported by the Coast Guard for FY 1982 differs from that reported in the FY 1982 Program Summaries Update. See the program descriptions in this section for details.

**DEPARTMENT OF TRANSPORTATION  
U.S. COAST GUARD  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY1983 ESTIMATES**



DEPARTMENT OF TRANSPORTATION

U.S. COAST GUARD

MISSION STATEMENT AND LEGISLATIVE MANDATES

Listed below are the U.S. Coast Guard missions and legislative mandates supporting those missions related to ocean pollution research development and monitoring.

<u>Duty</u>	<u>Legislative Mandate</u>
(1) Safe construction and maintenance of U.S. Flag vessels	- Port and Tanker Safety Act - Federal Water Pollution Control Act as Amended
(2) Safe movement of all vessels on U.S. navigable waters and adjacent high seas	- Port and Tanker Safety Act - Federal Water Pollution Control Act as Amended
(3) Quality of the marine environment (related to transportation of oil and hazardous polluting substances in U.S. waters)	- Dangerous Cargo Act - Marine Protection, Research and Sanctuaries Act
(4) Preventing pollution from oil and hazardous substances and their transportation related feasibilities	- Federal Water Pollution Control Act as Amended
(5) Mitigating discharge of oil/hazardous substances	- Federal Water Pollution Control Act as Amended
(6) Mitigating pollution as it affects natural resources	- Fisheries Conservation and Management Act of 1976

In addition, the U.S. Coast Guard is the United States representative to the Inter-governmental Maritime Consultative Organization (IMCO) and the United Nations for improved safety and pollution prevention at sea.

The majority of the Coast Guard efforts are in the active reduction of the potential for pollution with a smaller effort directed toward the COPRDM related activities of ocean pollution research, development and monitoring. The operating program areas that are involved at various times in COPRDM activities are Marine Environmental Protection, Commercial Vessel Safety, Port Safety, and Security. These operating programs can draw upon the support program areas of Research and Development and of Engineering.

## FEDERAL PERSONNEL AND FACILITIES

The U.S Coast Guard does not have any staff who are specifically assigned to marine pollution programs nor does it have any facilities, vessels, or equipment that are specifically designated for support of such programs.

## PROGRAM DESCRIPTIONS

Previous editions of the Agency Program Summaries have included Coast Guard projects whose activities were beyond the scope of COPRDM. This year only those projects closely related to COPRDM activities are included. This stricter interpretation is reflected in the reduced funding levels being reported as compared to previous years.

Coast Guard programs overall are concerned with accidental discharges. They include research in finding better ways to detect spills of polluting materials, trace these spills and prevent spills. The Coast Guard is also researching means to lessen the effects of spills and other transportation related pollution. Two major programs which reflect the COPRDM areas of interest are the Marine Environmental Response Program and the Port and Environmental Safety Program.

Marine Environmental Response Program

The Marine Environmental Response (MER) Program research, development and monitoring activities fall into four categories: Hazardous Chemicals; Arctic Pollution Response; Offshore Pollution Response; and Disposal of Spilled Oil and Hazardous Chemicals. The Coast Guard Diving Program, which is managed by the MER Program, is incorporated into projects under the above categories. The program has personnel involved in coordinating each general category and managing the programs research and development efforts overall. The program expends approximately one man year per calendar year on these functions. The above categories are presently divided into two projects, Oil Pollution Response and Hazardous Chemical Discharge Amelioration.

The oil project is divided into two sub-projects: Arctic and Offshore Pollution Response, with Arctic being the priority of the two. The offshore portion of this project is limited at this time to strictly monitoring domestic and international industry and government state-of-the-art developments, and maintaining our current response capability.

The Hazardous Chemical Discharge Amelioration Project is divided into six categories. Of these, most have little or no impact on the marine environment as they are directed toward personnel protection and chemical identification. The projects related strictly to the marine environment are primarily included in the Containment, Treatment, and Recovery Project. The elements of this project deal with developing methods of containing, treating and recovering chemicals that mix, sink or float on water.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$460	\$645	\$408	\$965

\* Presidential budget submission

Program Contact

CDR Donald H. Van Liew  
 U.S. Coast Guard Headquarters (G-DMT-3/54)  
 2100 2nd Street, S.W.  
 Washington, D.C. 20593  
 (202) 426-1013

Port and Environmental Safety Program

The Port and Environmental Safety Program is responsible for coordinating the activities of all government and private port entities to provide a high level of port safety, port security and environmental protection. This program is administered locally by Captains of the Port and Marine Safety Offices. This mission is accomplished by inspecting and surveying waterfront facilities and vessels, monitoring liquid and bulk cargo transfer operations at shore facilities and vessels, boarding and controlling the access of Communist bloc vessels to our ports, developing contingency plans for port emergencies, and surveillance and investigation of oil spills and other pollution problems.

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$3,000	\$2,300	\$800	\$0

\* Presidential budget submission

Program Contact

CDR Donald H. Van Liew  
 U.S. Coast Guard Headquarters (G-DMT-3/54)  
 2100 2nd Street, S.W.  
 Washington, D.C. 20593  
 (202) 426-1013

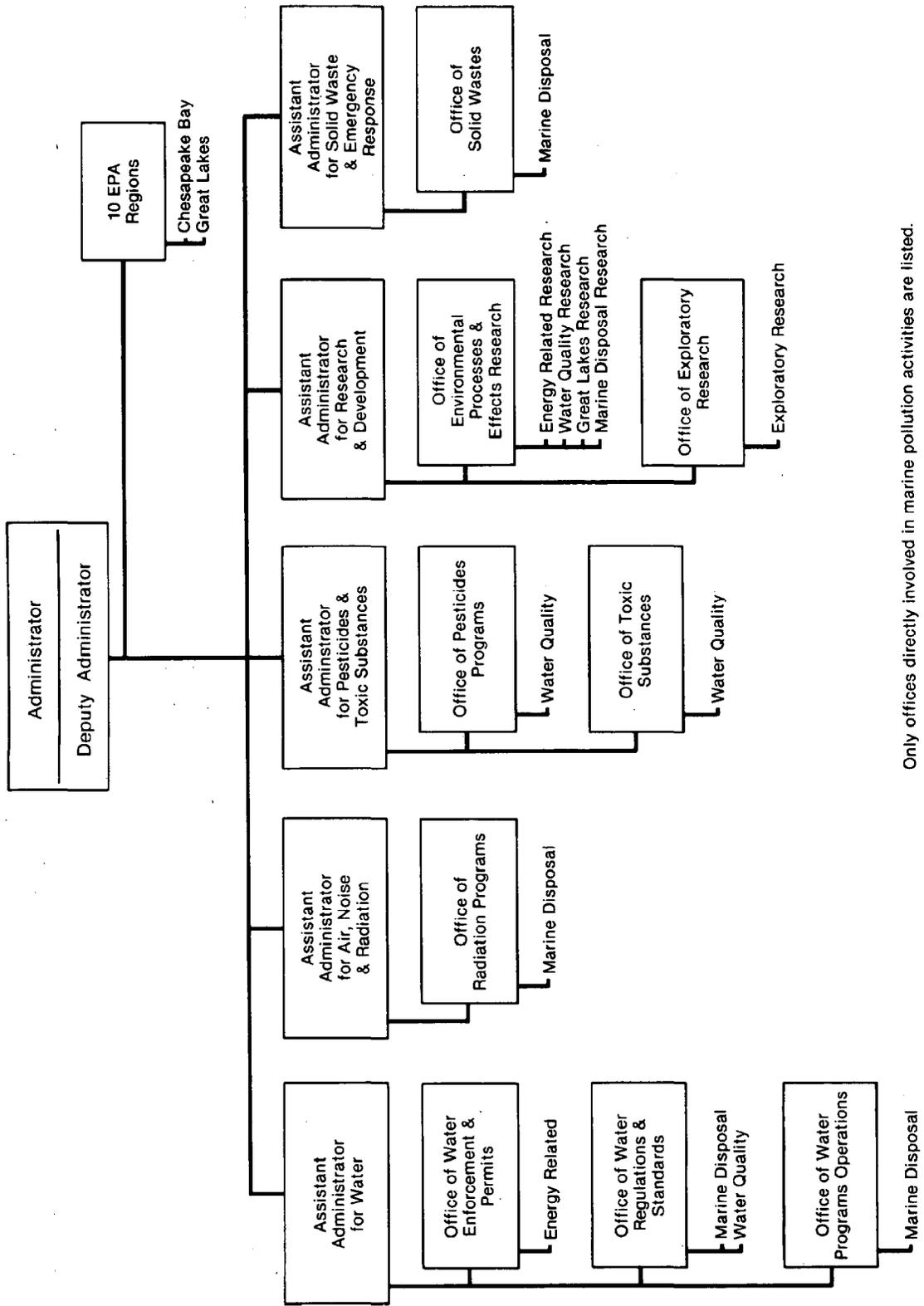
VIII. ENVIRONMENTAL PROTECTION  
AGENCY

ENVIRONMENTAL PROTECTION AGENCY

CONTENTS

	<u>Page</u>
ORGANIZATION CHART.....	VIII-ii
FUNDING SUMMARY.....	VIII-iii
FUNDING EMPHASIS GRAPH.....	VIII-iv
MISSION AND MANDATES.....	VIII-101
FEDERAL PERSONNEL AND FACILITIES.....	VIII-104
PROGRAM DESCRIPTIONS	
Marine Disposal Research.....	VIII-105
Ocean Dumping.....	VIII-106
Ocean Outfalls.....	VIII-108
Deep Sea Mining.....	VIII-110
Low-Level Radioactive Waste.....	VIII-110
Energy Related Research.....	VIII-116
Water Quality Research.....	VIII-118
Priority Pollutants.....	VIII-118
Toxic Substances.....	VIII-118
Pesticides.....	VIII-121
Carcinogens.....	VIII-122
Great Lakes Research and Monitoring Programs.....	VIII-131
Large Lakes Research Program.....	VIII-131
Great Lakes National Program Office.....	VIII-132
Chesapeake Bay Program.....	VIII-135
Exploratory Research.....	VIII-138

# ENVIRONMENTAL PROTECTION AGENCY



Only offices directly involved in marine pollution activities are listed.

U.S. ENVIRONMENTAL PROTECTION AGENCY

FEDERAL AGENCY PROGRAMS

RELATING TO OCEAN POLLUTION RESEARCH, DEVELOPMENT AND MONITORING  
HISTORICAL BUDGET AND ESTIMATED OUT-YEAR FUNDING  
FISCAL YEARS 1982 - 1985

(in Thousand Dollars)

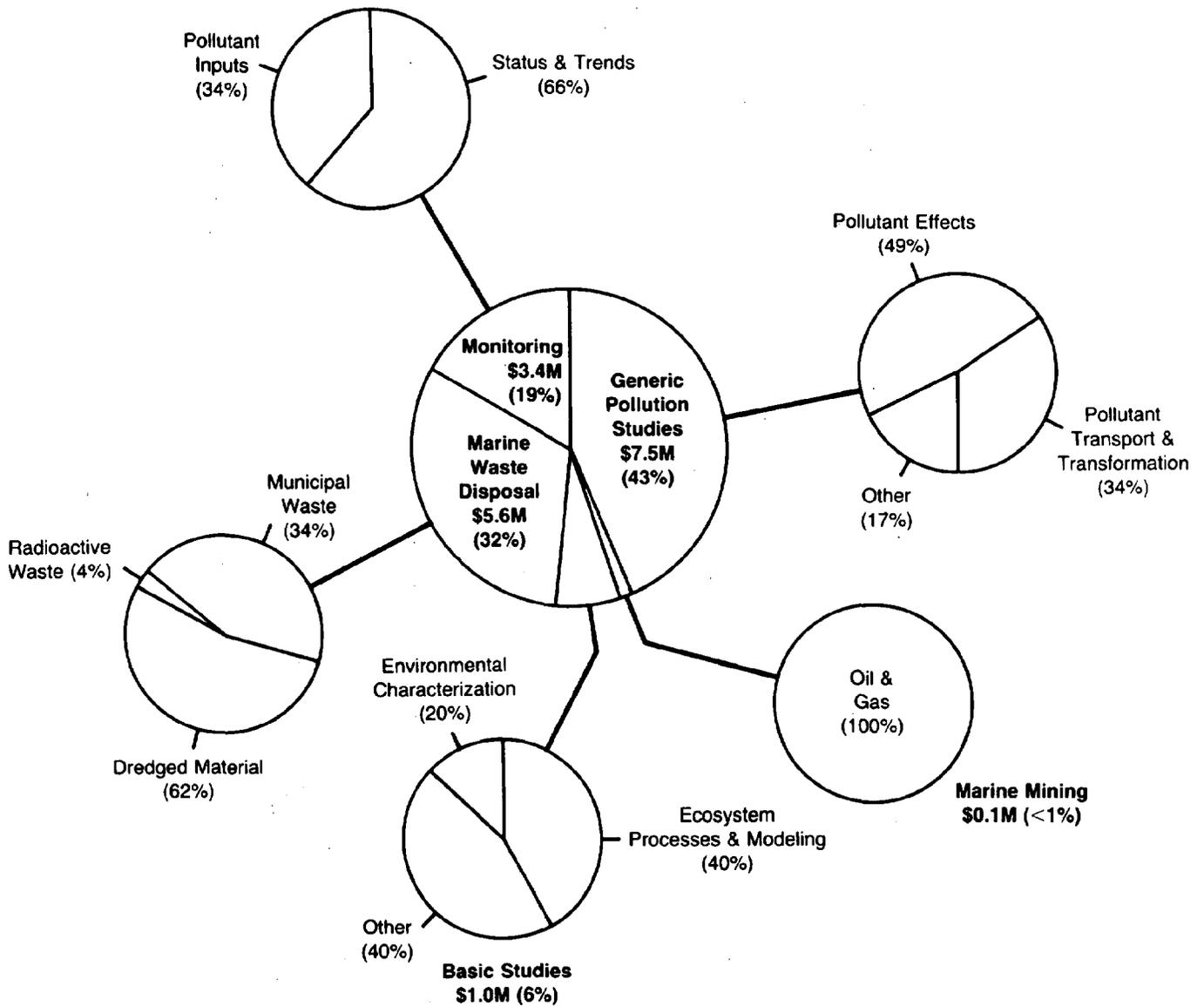
	FY 82 (Estimated)	FY 83 (Estimated)	FY 84 (Estimated)	FY 85 (Presidential)
Marine Waste Disposal Program	6,265 <sup>a</sup>	5,607	6,189	6,808
Energy Related Research	375	165	275	150
Water Quality Research	5,730	4,062	4,024	4,212
Great Lakes Research <sup>b</sup>	6,300	5,900	5,700	4,200
Chesapeake Bay Program <sup>c</sup>	2,000	900	---	---
Exploratory Research	<u>1,450</u>	<u>953</u>	<u>1,586</u>	<u>1,356</u>
ENVIRONMENTAL PROTECTION AGENCY TOTAL	22,120	17,587	17,774	16,726

<sup>a</sup> The amount reported for this program in FY 1982 differs from that reported in the FY 1982 Program Summaries Update. See the program description in this section for details.

<sup>b</sup> This program includes funding from the Great Lakes National Program Office (see the text for description).

<sup>c</sup> Funding for this program ended in FY 83.

**ENVIRONMENTAL PROTECTION AGENCY  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY 1983 ESTIMATES**



U.S. ENVIRONMENTAL PROTECTION AGENCY

MISSION AND MANDATES

The U.S. Environmental Protection Agency (EPA) assumes lead responsibility in the Federal Government for identifying, evaluating, and controlling environmental pollutants. In broad terms, priority elements of the EPA mission are as follows: reduce public exposure to harmful pollutants; protect sensitive ecosystems; and improve management of environmental regulatory programs.

The purview of EPA includes freshwater, estuarine, coastal, and oceanic pollution. Specific EPA mandates are derived from various laws, including the following:

- Federal Water Pollution Control Act (PL 92-500, as amended)
  - Assigns general responsibility to EPA for the maintenance and recovery of water quality in U.S. surface and groundwater.
  - Identifies the Great Lakes as a specific area of water quality research, technical development, and management (Sections 104(f) and 108).
  - Requires EPA to promote studies of the nation's estuaries and to report to Congress on the state of the nation's estuaries at least once every six years (Section 104(n)).
  - Assigns to EPA responsibility for providing guidelines for preparation of areawide waste treatment management plans, and for review of such plans (Section 208).
  - Describes EPA responsibility in establishing effluent limitation standards for non-conventional pollutants (Section 301(g)).
  - Provides EPA authority, under certain conditions, to issue permits waiving secondary treatment of sewage effluent from a publicly owned treatment works discharging into marine waters (Section 301(h)).
  - Requires EPA to establish and publish criteria for water quality (Section 304).
  - Describes EPA involvement in the prevention and control of spills of oil and hazardous materials (Section 311).
  - Describes EPA authority relative to thermal discharges.
  - Assigns to EPA authority for the issuance of permits allowing pollutant discharge into surface waters (Section 402).
  - Requires EPA to establish criteria for discharge of pollutants into the territorial sea, the waters of the contiguous zone, and the oceans (Section 403).

- Requires EPA to establish guidelines for dredge and fill activities and to identify disposal sites for dredged material (Section 404).
- Describes EPA responsibility for regulating the disposal of sewage sludge (Section 405).
- Federal Insecticide, Fungicide, and Rodenticide Act (PL 92-516, as amended).
  - Assigns to EPA responsibility for pesticide registration and classification based on associated health hazards and environmental effects (Section 3).
  - Requires EPA to conduct or administer research and monitoring programs to assist in the evaluation of health and environmental effects (Section 20).
- Deep Seabed Hard Mineral Resources Act (PL 96-283).
  - Describes EPA role in environmental protection during deep ocean mining to include environmental assessment and biological, geological, and physical studies (Section 109).
- Ocean Thermal Energy Conversion (OTEC) Act (PL 96-320).
  - Gives EPA authority to regulate discharges from OTEC facilities under the National Pollutant Discharge Elimination System (NPDES).
- Marine Protection, Research, and Sanctuaries Act (PL 92-532).
  - Identifies EPA as responsible for issuing permits for the ocean dumping of any material (except dredged material) (Section 102).
  - Assigns to EPA the task of establishing criteria for the review of ocean dumping permit applications (including dredged material) (Section 102 and 103).
- Toxic Substances Control Act (PL 94-469).
  - Assigns to EPA responsibility for regulation of hazardous chemical substances and mixtures (Section 6).
  - Identifies EPA as the agency responsible for obtaining adequate data on health and environmental implications of potentially toxic substances (Section 10).

EPA Organization

EPA is headed by an Administrator. Reporting to the Administrator are Assistant Administrators responsible for each of the following offices:

- Administration
- External Affairs
- Water
- Policy & Research Management
- Solid Waste and Emergency Response
- Air, Noise and Radiation
- Pesticides and Toxic Substances
- Research and Development
- Enforcement

In addition, there are ten regional offices that implement EPA policy on a regional and local level, including the review of permit requests. The Office of Research and Development (ORD) plans, conducts and manages research in support of the other EPA offices. Within ORD there are a number of laboratories that conduct research and manage extramural research. Those laboratories most involved in ocean pollution research are located in Gulf Breeze, Florida; Narragansett, Rhode Island; and Newport, Oregon. The Duluth, Minnesota research laboratory and the Chicago, Illinois, Region V Office are responsible for pollution research on the Great Lakes. The Region III office, Philadelphia, Pennsylvania, is responsible for the Chesapeake Bay Program.

The information needed to implement EPA regulatory programs is the focus of most EPA research and development activities. To improve communication and coordination between ORD and program offices, several EPA research committees have been established, consisting of representatives from ORD and the appropriate EPA program offices.

Overview of Programs

EPA ocean pollution research activities range from mission-oriented endeavors concerned with specific problems faced by the Agency to basic research concerned with achieving a general understanding of marine ecosystem structure and function. The following organization has been adopted for this program summary:

- Marine disposal research
  - Ocean dumping
  - Ocean Outfalls
  - Deep Sea Mining
  - Low-level radioactive waste disposal
- Energy related research
  - Offshore oil and gas drilling

- Water quality research
  - Priority pollutants
  - Toxic substances
  - Pesticides
  - Carcinogens
- Great Lakes research
- Chesapeake Bay program
- Exploratory research

In addition, general technical assistance is provided to EPA program and regional offices when requested. These activities can include serving as expert witnesses in court cases, assisting in development of regulations, review of permit applications, and serving as co-project officers on studies funded by program offices or regions. Time spent on these activities are not typically considered research, they are not discussed in this program summary nor are the funding allocations given.

#### FEDERAL PERSONNEL AND FACILITIES

The EPA's marine pollution-related research is conducted at four EPA laboratories (Gulf Breeze, Narragansett, Newport, and Grosse Ile), and aboard the research vessels ANTELOPE and RODGER SIMONS.

##### Narragansett

The Narragansett Laboratory employs 58.7 FTEs: 39.5 FTE, Scientific Professionals; 9.8 FTE, Technicians; and 9.4 FTE, Secretarial/Administrative Support. Equipment of the Narragansett Laboratory includes 5 chromatographs (gas, gas dual flame, and liquid), 1 gas chromatograph/mass spectrometer, 2 spectrophotometers, 2 liquid scintillation counters, 1 electron microscope, 1 ultracentrifuge, 1 elemental analyzer, 1 absorbance detector, and computer systems.

##### Gulf Breeze

The marine pollution research at the Gulf Breeze Laboratory includes programs in biochemistry, bioassay, radiochemistry, histology, and marine toxicology. The laboratory employs approximately 46 FTEs: 24.5 FTE, Scientific Professionals; 11.0 FTE, Technicians; and 10.5 FTE, Secretarial/Administrative Support. The Gulf Breeze Laboratory has 50,338 ft<sup>2</sup> of facility space. Two of the laboratory facilities house equipment used exclusively for marine research including 2 gas chromatographs, 1 ultracentrifuge, 2 liquid scintillation counters, 1 spectrophotometer, 1 electron microscope, 1 mass spectrometer, and computer systems.

Newport

The marine pollution research at the Newport Laboratory includes programs directed at physical-chemical interactions, benthic ecology, and bioaccumulation. This laboratory employs approximately 24 FTEs of which 16 are scientific professionals and 8 are technical and administrative support personnel. The laboratory occupies approximately 10,000 ft.<sup>2</sup>, and its equipment includes two gas chromatographs, one gas chromatograph/mass spectrometer, one liquid scintillation counter, and a hydraulic model for plume research. This laboratory also has three 20-foot research vessels.

Grosse Ile

EPA's Grosse Ile Laboratory conducts studies on pollution problems in the Great Lakes. This laboratory employs 3.8 FTEs, two of whom are scientific professionals. It occupies approximately 30,000 ft.<sup>2</sup>, and its equipment includes four gas chromatographs, two atomic adsorption spectrophotometers, several auto-analyzers, and a computer system.

ANTELOPE

The ANTELOPE is an 165 ft. ocean survey vessel equipped and manned to conduct offshore scientific data collection. Operation and maintenance of the vessel are carried out under contract, which includes providing the Master, ships crew, and shore support. The ANTELOPE is capable of accommodating a scientific team of 15 plus a crew of 15. Laboratory space occupies 350 ft.<sup>2</sup> and includes wet, microbiology, and chemistry laboratories and a computerized survey control room. Scientific equipment on board includes 1 rosette water sampler, 2 spectrophotometers, 1 CDT and a computer system.

RODGER SIMONS

The RODGER SIMONS is a 122 ft. WAGL-TYPE vessel operating in the Great Lakes Region. Equipment on board includes 3 technician auto analyzers II for nutrient analysis, 1 rosette water sampler and water pump, and 2 spectrophotometers. Personnel on board include 12 ship crew members who are contracted on standby and 4-5 scientists who are also contracted on standby.

## PROGRAM DESCRIPTIONS

Marine Disposal Research

The U.S. Environmental Protection Agency (EPA) is charged with regulating waste disposal activities in the marine environment. Among these activities is the dumping of sewage sludge and industrial wastes. Other activities include the discharge of municipal and industrial wastewater through ocean outfalls. The scope of this usage and the short-range and ultimate long-range impacts on the marine environment and our society are the questions we need to prepare to answer. EPA must have a

scientific base for the criteria and standards that are the basis for regulating these activities. EPA's marine disposal research program is designed to address these issues and can be divided into the following activities: ocean dumping, ocean outfalls, deep sea mining and low-level radioactive waste.

### Ocean Dumping

Both liquid and solid domestic and industrial wastes are often proposed for ocean dumping. These include dredged material, sewage sludge, industrial wastes and materials from manufacturing operations. Ocean dumping research efforts are focused on the following areas:

- Protocols for dumpsite selection
- Assessment methods for ocean dumping
- Procedures for dumpsite monitoring
- Dumpsite surveys

The objective of this research is to develop or perfect techniques, methods, guidelines and assessment approaches that will provide the information necessary for implementing an ocean dumping permit program as authorized in the Marine Protection, Research and Sanctuaries Act.

EPA ocean dumping research is conducted in coordination with other Federal agencies such as the National Oceanic and Atmospheric Administration and the U.S. Army Corps of Engineers. The National Oceanic and Atmospheric Administration is responsible for conducting research relevant to ocean use management decisions, including fishery resources and the long-range effects of pollutants.

EPA research involving dredged material disposal is coordinated with the U.S. Army Corps of Engineers through the Environmental Protection Agency/Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material. The Committee acts as a focal point for coordinating research and disseminating results related to regulatory functions pursuant to the requirements of Section 404 of the Clean Water Act and Section 103 of the Marine Protection, Research, and Sanctuaries Act.

Existing ocean dumping sites are those, for the most part, which have been used historically for the disposal of wastes. Although these dumpsites have been characterized, they have not often been selected to minimize the impact of dumping. If the ocean is to be a viable disposal option, dumpsites must be carefully selected to minimize the impacts from dumping. In the future, it might be possible to match dumpsites with wastes to be dumped (e.g., dump an acid waste at a site with high dispersion or dump a heavily contaminated dredged material at a site with little or no dispersion or heavy sedimentation to cover the dumped material). Procedures to select and characterize ocean dumping sites are being developed. By using these protocols to select ocean dumping sites the appropriate dumpsites can be identified for a selected waste to minimize the impact of ocean dumping.

Research related to assessing the impacts of ocean dumping can be categorized as follows: procedures for evaluating a waste proposed for ocean dumping, development of a hazard assessment protocol to evaluate ocean dumping impacts, develop techniques to evaluate impacts of dredged material disposal, and evaluation of alternative sludge treatment technologies for ocean dumping.

The ocean dumping permit program needs screening tests, e.g., bioassays, that can be used to evaluate wastes proposed for ocean dumping. Although some screening procedures exist, there is a need to revise (simplify, make more accurate and cost-effective) these procedures and relate the results of the tests to impacts observed at dumpsites. The goal of this research is to develop/revise short-term physical, chemical and biological screening procedures for characterizing the toxicity, persistence and bioaccumulative potential of pollutants in wastes to be ocean dumped. These procedures must be verified to assure that the results obtained from these tests relate to impacts in the field.

Hazard assessment protocols are needed to provide the manager with predictive methodology, including decision criteria and integration and interpretive guidance which is coupled to exposure data to allow a judgement on risk. This information is needed to determine the relative safety of ocean dumping and to provide a basis for comparison for various disposal strategies for establishing future ocean dumping policies. The goal of the hazard assessment research is to develop protocols to permit better evaluation of impacts due to ocean dumping of waste. These protocols will consist of procedures for estimating the severity of ecological changes (effects assessment) and procedures for determining the transport and fate of ocean dumped wastes (exposure assessment).

Procedures to evaluate dredged material prior to ocean dumping need to be developed, revised and/or field validated to provide an adequate set of tests for the ocean dumping and Section 404 permit programs. As the transport and fate characteristics of pollutants common to contaminated sediments play a major factor in determining availability and these factors are not well understood, this information needs to be developed to permit better assessments of impacts from ocean dumping of contaminated sediments. The goal of this research is to develop, revise and field validate procedures to evaluate toxicity (acute and chronic) and bioaccumulation potential of contaminants in sediments for use in the Section 404 and ocean dumping permit programs. In addition, the transport and fate characteristics of pollutants common to contaminated sediments will be studied.

Alternative sludge treatment technologies may have an impact on the quality of the municipal sludge to be ocean dumped. Research is being conducted to evaluate alternate technology options and their potential impact following ocean dumping.

Provisions of the Marine Protection, Research and Sanctuaries Act require monitoring of the environment at a dumpsite to determine the long-term effects of the dumping allowed there. This monitoring also acts as feed-back to see if the predictions made about the impacts of an ocean

dumping action are accurate. Exposure and effects monitoring methods for coastal and deepwater application are being developed and tested in support of ocean dumping activities. Special attention is being given to those procedures to be used on permit and surveillance requirements and for hazard assessment application.

Under the Marine Protection, Research, and Sanctuaries Act, EPA is mandated to designate sites for the ocean disposal of dredged material, sewage sludge, chemical wastes, and low-level radioactive wastes. As a result of this mandate, EPA's Marine Protection Branch, Office of Water Regulations and Standards, is conducting a site-specific assessment of approximately 40 potential ocean disposal sites. About 35 of the sites under investigation would be used for dredged material disposal, the rest are under consideration for disposal of sewage sludge or industrial waste. For each of the 40 sites, the evaluation consists of a complete biological, water, and sediment survey followed by an assessment of the environmental effects that would result from use of the site.

EPA controls ocean incineration of liquid hazardous wastes under the Marine Protection, Research and Sanctuaries Act. To date, EPA has not had specific permitting regulations for the ocean incineration program. However, the Agency has committed to the Congress to publish permitting regulations. Hence, EPA must make numerous policy and procedural decisions for this program in the near future. To assist in this effort an assessment of incineration of hazardous liquid waste is being carried out.

Major milestones in the ocean dumping research program can be found on Table 1.

Contact:

Sam Williams (RD-682)  
Office of Research and Development  
U.S. Environmental Protection Agency  
401 M Street, SW.  
Washington, DC 20460

Commerical (202) 382-5979

Ocean Outfalls

The authority of EPA to place limits on effluents discharged to surface waters is contained in Section 301 of the Federal Water Pollution Control Act as amended (Clean Water Act). Under the provisions of Section 301(b)(1)(B), the minimum allowable treatment of effluents to be discharged from publicly-owned treatment works is secondary treatment. However, under Section 301(h), modification of this requirement is allowed for discharges into marine or estuarine waters if it can be demonstrated, among other provisions, that such modified discharges would not "interfere with the attainment or maintenance of that water quality which assures protection...and propagation of a balanced, indigenous population of shellfish, fish and wildlife, and allows recreational activities in and on the water."

EPA must have a scientific basis for determining whether a modification of the requirement for secondary treatment should be allowed and what effluent limitations are appropriate for each site-specific discharge in place of the secondary treatment standards. EPA must establish permit conditions when waiving the requirement for secondary treatment for ocean outfalls. Research emphasis is on providing adequate information and procedures necessary to determine the effects of ocean discharges and to predict the effects of proposed waivers on the requirements for secondary treatment. Research activities are focused on:

- Procedures for conducting sediment toxicity surveys near ocean outfalls.
- Bioenergetic models of pollutant uptake from water, food, and sediment near ocean outfalls.
- Relationship of effluent discharge concentrations to observed levels of priority pollutants in edible fish.
- Effects of pollutant interactions on sediment toxicity.
- Persistence and fate of pollutants in marine food webs.

Monitoring the effect of a discharge is required if a waiver of the requirement for secondary treatment is granted by EPA. Research is underway to determine the type of monitoring that must be carried out by discharge permit recipients. The approach is to use current monitoring data to determine if predictions of effects are correct. Research areas include:

- Benthic-pelagic transfer of energy and pollutants near ocean outfalls.
- Response of benthic communities to effluent water quality improvements.
- Field verification of predictions of ecological recovery near outfalls based on monitoring data.

Correlation of type of treatment vs. environmental quality are being developed for use in determining what level of treatment is appropriate for specific marine environments.

Major milestones for the ocean outfall research program can be found on Table 1.

Contact:

Donald Baumgartner  
Marine Division  
U.S. Environmental Protection Agency  
Newport, Oregon 97365

Commercial (503) 867-4041

Deep Sea Mining

Disposal of waste sediments and materials resulting from deep sea mining must be regulated by EPA under the authority of the Deep Seabed Hard Mineral Resources Act. Since this industry is in its infancy and is unlikely to undertake any significant activity in the next several years, EPA has no current research underway on this issue.

Contact:

William Beller (WH-585) Commercial (202) 245-3154  
Office of Water Regulations and Standards  
U.S. Environmental Protection Agency  
401 M Street, SW.  
Washington, DC 20460

Low-Level Radioactive Waste

Disposal of low-level radioactive wastes in the ocean must be regulated by EPA through a permit program. There must be a scientific basis for establishing and administering such a program. Technical support for this program is being undertaken by the EPA Office of Radiation Programs. Areas of research emphasis are similar to those for other types of wastes: fate and effects of low-level radioactive wastes in marine ecosystems, dumpsite designation, and dumpsite monitoring. In addition, research in packaging of the waste prior to disposal is being conducted. This is a problem specific to low-level radioactive waste disposal. Major activities include:

- Radioactivity transport processes from the deep ocean to man.
  - Determining physical, geological, chemical, and biological processes involved in the movement of radioactive material away from a dumpsite.
  - Develop transport models, including food web components.
  - Identify critical information needs.
- Development and testing of a device for measuring the critical threshold erosion velocity of deep sea sediments.
- Survey of bioaccumulation factors for radionuclides in marine organisms.
  - Areas affected by fallout.
  - Areas adjacent to existing radioactive waste disposal sites.
  - Artificial and naturally occurring radionuclides.
- Identify key deep sea (>400m) invertebrates and develop benthic biological monitoring requirements.

- Utility of sister chromatid exchange induction as a method to determine the biological response of a marine polychaete worm to low-level ionizing radiation at dumpsites.
- Methods, assumptions and information needs required to provide radiation dose-risk estimates that may result from ocean disposal of low-level waste.
- Evaluate the concept of a test or control site to establish baseline conditions at depths of 400m or greater.
- Testing of dumpsite selection criteria.
  - Identify dumpsite selection criteria and apply them to identify candidate disposal areas.
  - Determine oceanographic information needed to characterize the baseline at those sites.
- Develop performance criteria for deep sea disposal of packaged low-level radioactive wastes and evaluate contaminant and waste solidification materials and techniques.
- Review of technology required for retrieval of waste packages from deep sea radioactive waste dumpsites.
- Measurement of deep sea currents, Eh, and pH at the Atlantic 3800m low-level radioactive dumpsite.
- Determine the rates and processes for transport of radium, as a representative of naturally-occurring radionuclides, in a marine ecosystem.
- International program support.
  - Analytical support to the Nuclear Energy Agency.
  - Review disposal operations at the northeast Atlantic dumpsite.
  - Generic evaluation of transport and fate of radioactivity in the marine environment.

Major milestones for the low-level radioactive waste program can be found in Table 1.

Contact:

Robert Dyer  
Office of Radiation Programs (ANR-61)  
U.S. Environmental Protection Agency  
401 M Street, SW.  
Washington, DC 20460

Commercial (202) 557-7380

Estimated Funding for Marine Disposal Research (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85**</u>
\$6,265	\$5,607	\$6,189	\$6,808

\* The FY 1982 funding estimate for this project reported in the FY 1982 Program Summaries Update was incorrect. The figure presented here is the correct funding estimate for this project for FY 1982.

\*\* Presidential budget submission

## ANTICIPATED MILESTONES IN MARINE DISPOSAL RESEARCH

Milestone	Fiscal Year			
	83	84	85	86
OCEAN DUMPING				
<u>Procedures for Dumpsite Designation</u>				
106-mile site characterization report	X			
Preliminary site characterization technical guidance document.	X			
Ocean dumping site surveys	X	X	X	X
<u>Protocols for Evaluating a Waste Proposed for Ocean Dumping</u>				
Report on waste evaluation of sewage sludge		X		
Report on waste evaluation of dredged material		X		
Report on waste evaluation of industrial wastes			X	
User manual for evaluation of a waste proposed for ocean dumping				X
<u>Hazard Assessment Protocol to Evaluate Ocean Dumping Impacts</u>				
Report effects of selected contaminated sediments on field and laboratory colonized benthic communities.	X			
Report on exposure assessment component of dredged material disposal case study (Black Rock Harbor).		X		
Report on evaluation of effects assessment methods for dredged material.		X		
Preliminary hazard assessment for waste disposal at the 106-mile site.			X	
Report on correlation of laboratory and field data on bioaccumulation of pollutants from contaminated wastes.			X	
Final report on hazard assessment methods for evaluating ocean dumping impacts.				X

Milestone	Fiscal Year		
	84	85	86
<u>Dumpsite Biomonitoring Procedures for Long-Term Effects</u>			
Report on field assessment of monitoring techniques for dredged material.	X		
Report on monitoring of coastal marine dumpsites.		X	
Report on correlation of laboratory results to site monitoring results.			X
Report on monitoring strategy for deepwater dumpsites for dredged material.		X	
<u>Techniques to Evaluate Impacts of Dredged Material Disposal</u>			
Report on comparative evaluation of bioaccumulation procedures including species, techniques and short-cut predictors.		X	
Report on multi-species flow-through approach for predicting ecological impacts of dredged material disposal.		X	
<u>Evaluation of Ocean Incineration</u>			
Report on assessment of incineration of liquid hazardous wastes.		X	
OCEAN OUTFALLS			
<u>Assess Impacts of Ocean Outfall Discharges</u>			
Report on relationships of publicly owned treatment plant effluent concentrations to levels of priority pollutants in edible fish.	X		
Report on the effects of pollutant interactions on sediment toxicity.	X		
Report on ocean outfall effluents: Discharge conditions to protect marine ecosystems.			X
Final report on impact assessment of ocean outfall discharges.			X
<u>Field Verification of Outfall Impacts</u>			
Report on response of benthic communities to effluent water quality improvement.		X	
Report on field verification of Section 301(h) predictions of ecological effects near outfalls.			X

Milestone	Fiscal Year			
	83	84	85	86
Report on field verification of outfall impacts to marine biota.				X
LOW-LEVEL RADIOACTIVE WASTE DISPOSAL				
Reports on scientific results of the surveys at the U.S. radioactive waste dumpsites in the Pacific at the Farallon Islands		X	X	
Report on development and evaluation of a device for measuring the critical threshold erosion velocity of deep sea sediments.			X	
Reports on scientific results of the surveys at the U.S. low-level radioactive waste dumpsite at 2800 meters in the Atlantic.	X	X		
Reports on scientific results of the survey at the U.S. low-level radioactive waste dumpsite at 3800 meters in the Atlantic.		X	X	X
Report on utility of sister chromatid exchange induction method to determine the biological response of a marine polychaete worm to low-level ionizing radiation at dumpsites		X	X	
Report on information needs for providing radiation dose-risk estimates resulting from ocean disposal of low-level wastes.		X	X	
Report on development of a test site concept for monitoring of deep sea low-level radioactive waste dumpsites.			X	
Updated report on packaging performance criteria for deep sea disposal of packaged low-level radioactive wastes.			X	
Reports on materials and methods for packaging low-level radioactive waste for deep sea disposal, and identification of information needs.			X	X
Report on technology used to retrieve low-level radioactive waste packages from deep sea waste dumpsites.			X	
Report on the survey at the Massachusetts Bay low-level radioactive waste disposal site.		X		
Combined report on dumpsite selection criteria with application to the deep sea off the East and West coasts of the U.S.		X		

Energy Related Research

Under the provisions of the Clean Water Act and the Outer Continental Shelf Lands Act, EPA must issue permits for the discharge of waste materials for offshore oil and gas drilling and production platforms. Principal among these discharges are fluids used during well drilling, commonly called drilling muds. Regional and headquarters enforcement personnel require a technically correct data base on this subject in order to make the necessary permitting decisions. The goal of this research is to provide technical information on the potential impact of drilling muds on the environment.

Major milestones in the energy related research program can be found on Table 2 . Funding for offshore oil and gas drilling research activities is as follows:

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$375	\$165	\$275	\$150

\* Presidential budget submission

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## ANTICIPATED MILESTONES IN ENERGY RELATED RESEARCH

Milestone	Fiscal Year			
	82	83	84	85
<b>OFFSHORE OIL AND GAS DRILLING</b>				
<u>In-situ Plume Studies</u>				
Report on plume dispersion		X		
Report on effects on corals and benthic organisms		X		
<u>Laboratory Studies of Drilling Muds</u>				
Report on chemical analyses of trace metals and aliphatic and aromatic hydrocarbons		X		
Report on biological testing of effects on coral, mysid and grass shrimp, and hard clams		X		
Report on adaptive environmental assessment model				X
Report on used fluid effects on seagrasses and seagrass communities		X		
Final report on hazard assessment of drilling muds				X

### WATER QUALITY RESEARCH

Water quality research includes research activities that relate to establishing limits on specific substances which are to be discharged into the marine environment. A general mandate for EPA participation in water quality research is contained in the Clean Water Act. Mandates are also contained in the Toxic Substances Control Act, and the Federal Insecticide, Fungicide, and Rodenticide Act. Research is carried out on: priority pollutants, toxic substances, pesticides and carcinogens.

#### Priority Pollutants

National water quality criteria are based on laboratory tests. Toxicological information obtained from laboratory tested species may not be applicable to species in specific water bodies due to differences in species composition, chemical and physical water quality variables, and other physical factors such as flow and substrates. Research is needed to develop and translate the national water quality criteria to site-specific conditions. The EPA and states need this information to develop water quality standards in implementing the Clean Water Act. This research will develop and improve national water quality criteria and field test a range of methods which can be used to establish site-specific water quality criteria. The feasibility of integrating single pollutant criteria and complex effluent approaches for site-specific water quality regulatory application will be determined.

Major milestones for the priority pollutant research can be found in Table 3.

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#### Toxic Substances

The Toxic Substances Control Act and the Clean Water Act mandate EPA to evaluate hazards and risks associated with toxic and hazardous materials that may be released into the environment. The goal of toxic substances research in the marine environment is to gain information on the fate and effects of toxic substances and hazardous substances as defined in the Clean Water Act and the Toxic Substances Control Act. Most research efforts are focused on developing and validating screening methods and mathematical models for use in predicting the transport, transformation, fate, and effects of chemicals in the environment. These techniques will provide information for use in carrying out hazard assessments, which consist of exposure assessments and effects assessments.

Research on structure-activity relationships (SAR) is also being conducted. SAR is vital for review and screening of premanufacture notification (PMN) chemicals, for use in determining PMN exemption, and for use in selecting appropriate laboratory tests for existing chemicals. The goals of this research include: generation of environmental fate and effects data on typical PMN chemicals; documentation of test results on PMN analogs; and development of SAR methodologies and other estimation techniques. This effort includes data base compilation, testing of chemicals, and SAR model refinement.

Effects research includes studies on aquatic toxicology, comparative toxicology, system-level effects, and validation of hazard assessment techniques using microcosms and field sites. New, improved and validated tests are needed for defining the hazard of toxic chemicals to aquatic ecosystems, especially to fill knowledge gaps where single-species methods are necessary in the development and promulgation of TSCA testing guidelines for marine and estuarine environments. Many existing methods need to be tested in laboratory and field situations in order to define environmental parameters for hazard assessment and increase the cost-effectiveness of tests. Specifically, toxicity tests for marine benthic organisms, macro-algae toxicity, and toxicity tests for snail and crayfish will be developed and validated.

Comparative surrogate bioassay methods are needed in the development of specific testing guidelines under Section 4 of TSCA to provide more cost-effective methodology for compliance. Comparative toxicology research will determine the specific species and testing problems to assess the effects of chemicals on estuarine and marine species in order to determine when the data from one surrogate species can be extrapolated to another. The comparative toxicology bioassay methods program will evaluate existing toxicity data and will generate data where gaps exist. The evaluation will focus on developing comparative toxicology correlations. Promising correlations will be further developed and validated. Data will be evaluated by comparing results from laboratory (domesticated) species with those from wild species, by testing fish as surrogate species for mammals, and by comparing single-species assessment protocols with microcosms and field studies.

Past research efforts, focusing on the development of single-species bioassays, gave little attention to the effects of toxic chemicals on basic, interrelated ecosystem processes supporting these species. Estimates based upon single-species data may not accurately define the hazard to community support systems. System-level effects research will define the resiliency and recovery of ecosystems perturbed by toxic chemicals and identify appropriate environmental end points. In order to define chemical hazards under TSCA, system-level and community-level methods are required. Bioassay methods are being developed, improved, and validated for defining toxicity of chemicals to multiple species and at the community level. The impact of toxic chemicals on aquatic ecosystems will be documented by establishing criteria for judging the usefulness and validity of system-level test results, improving system-level process tests, evaluating acute tests to define risk associated with sediment-bound toxic chemicals, and field evaluating the effects in marine systems.

Hazard information is critical in estimating risk to ecosystems, and laboratory-based tests must be validated in microcosms and field situations to determine applicability of the laboratory bioassay methods for use by the Office of Toxic Substances (OTS) in developing testing guidelines under Section 4 of TSCA. Microcosms and field ecosystems are being developed, tested, and validated. They will be used to evaluate existing laboratory-developed methods and to assure that laboratory bioassay data are applicable to regulatory use. This field program will evaluate and test microcosms at estuarine field sites and will validate multi-species, laboratory, bioassay test methods to predict effects of chemicals. Microcosms will be used to test these methods under field situations.

Exposure research will focus on the development and evaluation of exposure assessment methods. Environmental concentration data are critical for estimating exposure of humans and biota to toxic chemicals and for estimating environmental risk as a result of exposure. Data generated by these predictive methodologies will be used by OTS for performing risk assessments on toxic chemicals. This research will develop methodologies for conducting exposure assessments of chemicals in estuarine/marine waters. The models will be based upon source, exposure pathways, exposed populations, and concentration levels. Work will focus upon inclusion of identified transport and transformation processes, pathways of exposure, population characteristics, and environmental features. Stress also will be placed on development of models using dynamic chemical input, and development of methods, necessary data bases, and scientific support documents for defining the limits of applicability of models.

Methods for measuring or predicting environmental transport and fate of chemicals, and models for estimating chemical concentrations or assessing exposure to toxic chemicals must be evaluated under simulated or actual use conditions to prove their applicability and to increase the scientific basis of regulatory decision making. This research will evaluate the fate test methods, estimated data, and exposure assessment models under representative environmental conditions in order to improve the precision and predictability of laboratory-derived methodologies. Microcosms will be used to simulate the natural environment under cost-effective, laboratory conditions for evaluating exposure assessment models and for testing transport and fate methods. Greater emphasis will be given to employing actual field sites for confirming laboratory-derived data, test methods, and models under field conditions, and for verifying the applicability of laboratory methodologies to the natural environment.

Major milestones for the toxic substances research can be found in Table 3.

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Pesticides

Mandates for EPA involvement in pesticide activities are contained in the Federal Insecticide, Fungicide, and Rodenticide Act, which requires EPA approval of pesticide products prior to commercial marketing. The goal of EPA marine-related pesticide research is to provide information on the fate and effects of pesticides that may enter the estuarine or marine environment. Current activities in marine-related pesticides research are on: field validation for hazard assessment techniques and the development of effects measurement methods and predictive techniques for environmental exposure.

Most of the data/information that the Office of Pesticide Programs (OPP) uses in the regulatory process is derived in laboratory settings. OPP needs to know and to be able to evaluate the potential hazards of pesticides when they are applied in the field and to know if their present hazard assessment criteria need to be revised. This research will provide answers for these needs. Field-site studies will be conducted to determine if laboratory-derived methodologies and results accurately reflect environmental responses under natural pesticide use conditions. Investigations will focus on representative estuarine field sites and will consider pesticide dose exposure, effects, and functional alterations at the species/population levels. Non-target organisms (e.g., fishes, invertebrates, crustaceans) effects will be quantified in terms of mortality, reproduction rates, and resiliency. This includes residue analysis and population censusing (pre- and post-treatment) information. Through extensive field sampling, data collection and analysis and simulated exposures the field findings will be compared to laboratory findings. Final evaluations will indicate to OPP if lab results are comparable to field results and if hazard assessment criteria are adequate to prevent adverse environmental pesticide impacts.

OPP must prescribe and/or revise testing guidelines to be used by industry to generate appropriate registration/pre-registration data for biological control agents (BCA's) and chemical pesticides. Secondly, the office must be able to evaluate which agents and toxicity/infectivity levels may adversely effect non-target organisms. This research supplies testing protocols, toxicity data where information gaps exist and recommendations on which organisms are the best indicators of pesticide disturbances. Bioassay methodologies for determining the effects on/in non-target receptors will be developed or improved including procedures to culture and/or identify the agents. Additionally this research will measure the toxic effects of selected chemical pesticides on important indicator biota. Methods will be developed or improved and toxicological bioassays will be conducted using indicator species and specific BCA and chemical pesticides to determine dose/response. This includes exposure techniques, biochemical and genetic probes to detect biorationals, culturing of test organisms and determination of appropriate life-cycle test stages. Recommendations and reports to OPP will include suggested modification(s) of testing guidelines and effects toxicological evaluations.

Techniques are needed to follow and measure pesticides in the environment and to determine the likelihood of unwanted accumulations which impair important properties and functions and which endanger desirable

biota. This research supplies techniques, data, application guidance and the scientific expertise to conduct assessments and interpret results for OPP. Techniques will be developed, including mathematical models and information on pesticide transport, degradation, residuals and fates and will provide direct technical support (exposure assessments) and guidance on technique application to OPP. Various tasks will contribute exposure information on such parameters as sorption kinetics in sediments, pesticide transformations, biodegradation and movement. Most of this information is designed to be factored into models which are calibrated and used in conducting exposure evaluations applicable to both aquatic and multi-media assessments.

Major milestones for the pesticides research can be found in Table 3.

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Carcinogens

EPA, through an interagency agreement with the National Cancer Institute (NCI), is studying the fate and effects of carcinogenic pollutants in the environment. The research has examined species of marine fish and shellfish to determine which are good indicators of the effects of carcinogenic agents in the environment. Research objectives are as follows:

- Determine fate and effects of carcinogens, mutagens, and teratogens in aquatic species.
- Determine role of aquatic species and systems in actual or potential exposure of man to carcinogens, mutagens, or teratogens.
- Develop aquatic species as bioindicator, sentinel, and model systems for use in study of risks of carcinogens, mutagens and teratogens in the environment.

Two research approaches have been followed: pathobiological methods, and biochemical methods. Pathobiological methods research has focused on fish toxicology, histopathology of induced lesions, and development of a carcinogen assay system. Biochemical studies have involved the exposure of mullet, killifish, flounder and sea catfish to inducers of microsomal mixed-function oxidase activity.

Major milestones for the carcinogen research can be found in Table 3. The NCI/EPA collaborative project concluded in October 1982. During FY 83 research projects underway ended.

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FY 1983 UPDATE

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Estimated Funding for Water Quality Research (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$5,730	\$4,062	\$4,024	\$4,212

\* Presidential budget submission

## ANTICIPATED MILESTONES IN THE WATER QUALITY RESEARCH PROGRAM

Milestone	Fiscal Year			
	83	84	85	86
<b>PRIORITY POLLUTANTS</b>				
<u>Site-Specific Water Quality Criteria</u>				
Report on evaluation of short-term integrative organism responses as predictors of organism health.		X		
<b>TOXIC SUBSTANCES</b>				
<u>Structure-Activity Relationships</u>				
Report on biodegradation of different phthalate ester structures in fate/toxicity screening system.	X			
Report on using SAR for predicting toxicity of organic and organometallic chemicals to marine/estuarine organisms.				X
Report on verification of relationship between chemical structure and biodegradability.				X
<u>Effects Assessments</u>				
Report on the evaluation of use of a marine fish as carcinogen and teratogen assay subject.			X	
Report on development of methods for assessing effects of toxic chemicals on larvae of estuarine animals.			X	
Report on techniques for evaluating effects and uptake of sediment-associated toxic chemicals by benthic marine species.				X
Report on comparative toxicological relationships demonstrated in early life-stage tests with marine fish.			X	

Milestone	Fiscal Year			
	83	84	85	86
Report on methods for measuring responses of benthic communities to toxic chemicals.				X
Report relating responses of single species and benthic communities to toxic chemicals.				X
Report on statistical comparisons of toxic stress on field and laboratory systems.		X		
Report on laboratory-to-field extrapolation of toxic stress on estuarine macrobenthic communities.			X	
Report on use of persistence limits as a management strategy for regulating toxic chemicals in marine ecosystems.			X	
Report on influence of scale in marine microcosms perturbed by toxic chemicals.			X	
Report on field validation of fate and effects of selected toxic chemicals derived from lab microcosms.			X	
Workshop report on biodegradation of toxic chemicals.		X		
Report on macroalgae ( <i>Champia</i> ) test verification.		X		
Report on SAR models for use in predicting toxicity of organic compounds to selected marine biota.		X		
Report on short-term assay to define ecological risk associated with sediment-bound toxic chemicals.		X		
Report on in-vitro screening assay as a predictor for reproductive system effects in aquatic species.		X		

Milestone	Fiscal Year			
	83	84	85	86
<u>Exposure Assessments</u>				
Final report on chloro-organic chemical body burden predictions in marine fishes based on input of contaminants.		X		
Final report on exposure assessment in estuarine systems including food-chain model calibration and toxicity modeling framework.				X
Final report on biodegradation predictions from micro-cosm fate screening and eco-core systems compared to field.				X
Report on the suitability of biodegradation information from fate screen tests for predicting fate in microcosms.				X
Report on effect of concentration of organic chemicals on biodegradation.		X		
Report on environmental biodegradation of organic pollutants.		X		
PESTICIDES				
<u>Field Validation for Hazard Assessment</u>				
Report on hazard evaluations and relate field to lab data with proposal on how to test limits of applicability.				X
<u>Effects Measurement Methods Development</u>				
Report on Subpart M data requirements for testing the safety of biological control agents.		X		
Progress report on pathologic, biochemical and genetic probes developed to detect BCA's in non-target host.				X
Progress report on laboratory exposure of non-target aquatic animals to insect viruses.				X
Report on early-life test methods for antherinid fishes and other organisms.		X		

Milestone	Fiscal Year			
	83	84	85	86
Report on spawning cues and culture of <u>Menidia peninsulae</u> and <u>Menidia beryllina</u> .		X		
Report on critical responses of populations of crustaceans to toxicants.				X
Report on reproductive biology of <u>Menidia peninsulae</u> .			X	
Final report - methods manual for spawning, culturing and testing of atherinid fishes.				X
<u>Predictive Techniques for Environmental Exposure</u>				
Report on pesticide accumulation by selected aquatic animals in conjunction with field studies.		X		
Report on effect of sediment associated micro-organisms on pesticide biodegradation in estuarine sediments.		X		
Report on role of bioturbation in controlling transport and biodegradation in estuarine sediments.			X	
Report on field validation of mathematical descriptions for biodegradation in estuarine environments.				X

Milestone	Fiscal Year			
	83	84	85	86
CARCINOGENS				
Symposium report: Marine fishes as carcinogen assay subjects			X	
Aquatic animals as indicators of environmental exposures		X		
Symposium report: Mouse vs. minnow: The future of fish in carcinogenicity testing			X	
Symposium report: Usefulness of <u>Cyprinodon variegatus</u> and <u>Fundulus grandis</u> in carcinogenicity testing			X	
Thesis: Development of a marine bioassay system for priority pollutants using larvae of the gooseneck barnacle, <u>Pollicipes polymerus</u>			X	
Book chapter: Chemical carcinogenesis in fish			X	
Symposium report: Usefulness of the hermaphroditic marine fish <u>Rivulus marmoratus</u> as a test animal for carcinogenicity testing			X	
Journal article: The effects of depuration, size and sex on trace metal levels in bay mussels			X	
Journal article: Seasonal variations of arsenic and other trace elements in bay mussels			X	
Journal article: The induction of proliferative lesions in the sheepshead minnow with benzidine dehydrochloride			X	
Book chapter: Histopathological methods			X	
Journal article: A summary of tissue lesions in aquatic animals induced by controlled exposures to environmental contaminants, chemotherapeutic agents and potential carcinogens			X	
Symposium report: Utilization of bivalve mollusks for monitoring carcinogenic polynuclear aromatic hydrocarbons in estuarine environments			X	
Report: Polynuclear aromatic hydrocarbons in bivalve mollusks from Oregon estuaries			X	
Symposium report: Polynuclear aromatic hydrocarbons in bay mussels from Oregon			X	

Milestone	Fiscal Year			
	83	84	85	86
Journal article: Cellular proliferative disorders in bivalve mollusks from contaminated marine environments		X		
Journal article: Benzo(a)pyrene concentrations in somatic and gonad tissues of bay mussels		X		
Journal article: Concentrations of unsubstituted polynuclear aromatic hydrocarbons in bay mussels from Oregon		X		
Journal article: Uptake and accumulation of naphthalene by the oyster, <u>Ostrea edulis</u> , in a flow-through system		X		
Journal article: The effects of naphthalene on glucose metabolism in the European flat oyster, <u>Ostrea edulis</u>		X		
Journal article: Stimulatory effect of naphthalene on glucose transport in the oyster		X		
Journal article: The pathways of glucose metabolism in the oyster, <u>Ostrea edulis</u>		X		
Journal article: A method for determining environmental levels of polycyclic aromatic hydrocarbons in bivalve mollusks by reverse phase liquid chromatography		X		
Journal article: Comparative metabolism of polyaromatic hydrocarbons in marine organisms		X		
Journal article: Kinetic product patterns and mechanistic pathways of benzo(a)pyrene metabolism in Aroclor-treated mullet		X		
Symposium report: Mixed function oxidase inducibility and polyaromatic hydrocarbon metabolism in mullet, sea catfish and gulf killifish		X		
Symposium report: Metabolites of benzo(a)pyrene in Aroclor 1254 treated mullet		X		
Journal article: A simple gas chromatographic method X for the study of organic solvents: moisture analysis, hyroscopicity, and evaporation		X		
Journal article: The lethal and sublethal effects of ionizing radiation on juvenile Pacific oysters		X		

Milestone	Fiscal Year			
	83	84	85	86
Report: A prospective study of infectious and non-infectious diseases in fishes and oysters in relationship to pollutant activity in three Gulf Coast estuaries			X	
Final report: Effects of carcinogens, mutagens, and teratogens on non-human species (aquatic animals).			X	

GREAT LAKES RESEARCH AND MONITORING PROGRAMS

The Environmental Protection Agency addresses the pollution problems of the Great Lakes through two inter-related and coordinated programs.

- o Large Lakes Research Program (research and development)
- o Great Lakes National Program Office (monitoring, abatement, control)

The mandates for these programs are contained in the Clean Water Act; Sections 104(f) and 108 (a) and the U.S. Canada Great Lakes Water Quality Agreement of 1978.

The Large Lakes Research Program is administered by the Office of Research and Development through its Environmental Research Laboratory, Duluth, Minnesota. The research is carried out by the EPA Large Lakes Research Station, Grosse Ile, Michigan. The Great Lakes National Program Office (GLNPO) is headquartered in Chicago with program responsibility for Great Lakes waters in EPA Regions II, III, and V.

Large Lakes Research Program

In the Large Lakes Research Program, research is conducted on water quality criteria, eutrophication and ecological assessment in order to provide technical support to the International Joint Commission (IJC) and the U.S. Canada Water Quality Board for the Great Lakes.

This research will develop and test methods to measure, describe and predict the distribution, movement and effects of pollutants on nearshore environments of the Great Lakes. Major focus will be on "in place" polychlorinated organic chemicals such as PCBs and dioxins and special emphasis given to fishery resources. This research will provide field-validated techniques for use by the IJC, GLNPO, Regional and Program Offices, and States in conducting environmental hazard and risk assessments. Field studies of geographical areas of concern designated by the IJC will be conducted. Intensive study of the Raisin and Fox River harbors will be used to: (1) develop a modeling framework for estuaries and nearshore areas of the Great Lakes that integrates fate and transport of chemicals in the water column and sediments (exposure), food chain uptakes and of chemicals and chemical mixtures and measurements of toxic effects (toxicity); (2) develop procedures to determine allowable loading of toxicants to Great Lakes estuaries and nearshore areas; and (3) to understand and predict effects of pollutant loads to nearshore areas during storm events.

Major milestones for the Large Lakes Research Program can be found in Table 4.

Great Lakes National Program Office

The Great Lakes National Program Office was established in Region V, Chicago, to focus attention on the significant and complex natural resource represented by the Great Lakes.

GLNPO implements a multi-media environmental management program drawing on a wide range of expertise represented by universities, private firms, State, Federal, and Canadian governmental agencies, and the International Joint Commission. The goal of the GLNPO program is to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes system. GLNPO also coordinates U.S. actions in fulfillment of the Agreement between Canada and the United States on Great Lakes Water Quality of 1978. GLNPO is divided into three major components to support the Agreement: (1) Monitoring; (2) Program Support and Oversight; and (3) IJC Water Quality Board. The Program Summary describes only the monitoring segment of the GLNPO effort.

The design of the Great Lakes Monitoring Program is based on meeting the requirements of the 1978 Great Lakes Water Quality Agreement, specifically, Annex 11, and Annex 12, and as specified by the International Joint Commission and agreed to by the Parties in response to additional concerns which have developed since 1978. These requirements are:

- o Surveillance shall be undertaken for:
  - Compliance monitoring.
  - Achievement of general and specific objectives.
  - Evaluation of water quality trends.
  - Identification of emerging problems.
  
- o The program shall include baseline data collection, sample analysis, evaluation and quality assurance programs to allow assessment of:
  - Inputs from tributaries, point source discharges, atmosphere and connecting channels.
  - Whole lake data; nearshore, harbors, bottom sediments, Cladophora growth areas, open waters, fish contaminants and wildlife contaminants.
  - Outflows including connecting channels, water intakes and outlets.

To carry out these requirements, the EPA monitors loadings of nutrients to the Lakes and the Lakes' chemical and biological response to these loadings. The major theme of data analysis is to develop a capability to predict the response of the Lakes to remedial and preventative program policies, both in place and proposed. The responses of the Lakes and the loadings to the Lakes are monitored on a continuous basis. In addition to nutrient loadings there is increasing concern about toxic substances and our capability to monitor toxic substances within the Lakes. GLNPO monitoring seeks to detect new substances and to assess the effectiveness of bans,

EPA

FY 1983 UPDATE

controls or other remedial programs designed to reduce or remove these substances.

Funding for the EPA research and monitoring in the Great Lakes is as follows:

	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u> *
Large Lakes Research Program	\$2500	\$2500	\$2500	\$2500
Great Lakes National Program Office **	\$3800	\$3400	\$3200	\$1700
Total	\$6300	\$5900	\$5700	\$4200

\* Presidential budget submission

\*\* This is the initial effort to describe this EPA program office and its funding in the Program Summary. Due to the recent acquisition of the GLNPO information, the budget data has not been incorporated into all of the funding analyses presented in the introductory section of this document, including the funding matrices (Appendices 1 and 2).

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TABLE 4

## ANTICIPATED MILESTONES IN GREAT LAKES RESEARCH PROGRAM

Milestone	Final Year			
	83	84	85	86
Report on methodology/protocol for field exposure/effects assessment of a Great Lakes area of concern.				X
Report on chronology of organic contaminant accumulation in sediment cores taken from Great Lakes class A area.		X		
Report on bioaccumulation of organic contamination in larval fishes in a Great Lakes class A area (Raisin River).		X		
Report on seasonal distribution of metal/organic contamination in a Great Lakes class A area (Raisin River estuary).			X	
Report on site-specific correlation analysis of sediment organochlorines with those bioaccumulated by sediment forage.		X		
Users guide for in-situ bioassay for assessment of site-specific modification of national water quality criteria.			X	
IJC Science Advisory Board annual report.			X	
Report on evaluation of site-specific criteria guidelines for a Great Lakes site.			X	
Feasibility report of "generic toxicity" approach under site-specific conditions in Great Lakes.			X	
IJC Water Quality Board annual report.			X	
Documentation of Great Lakes models.				X

CHESAPEAKE BAY PROGRAM

In 1976, Congress directed the Environmental Protection Agency (EPA) to conduct an in-depth five year study of the environmental quality and management of Chesapeake Bay resources. EPA's Office of Research and Development, in conjunction with the Region III office in Philadelphia, initiated the Chesapeake Bay Program (CBP) to assess the principal factors adversely impacting the Bay's water quality, direct and coordinate research to address them, improve data collection and storage, and determine and improve coordination among government agencies with resource management responsibilities.

EPA established a local office in Annapolis, Maryland, as an arm of its Environmental Research Laboratory in Narragansett, Rhode Island and its Region III headquarters office in Philadelphia. This office coordinated the EPA funded research of 40 principal investigators from more than 30 agencies, research institutions, and citizen organizations.

The CBP was designed to complement the existing research by evaluating the ongoing research and initiating new research where needed. EPA also established a series of policy, management, and advisory committees and working groups to involve state agencies in all areas of program planning, technical support, data compilation and processing, scientific planning and technical program development and implementation.

The main research goal of the program was to coordinate pollution research in Chesapeake Bay by accomplishing the following:

- Identifying sources, transport, fate, and physical properties of pollutants affecting Chesapeake Bay.
- Evaluating pollution control alternatives.
- Directing all phases of data management.

Research activities of the Chesapeake Bay Program have included the following areas: toxic materials; submerged aquatic vegetation; nutrient enrichment; and synthesis and integration of overall research effort.

In addition, activities have been carried out involving data management and public participation.

Major milestones for the Chesapeake Bay Program can be found on Table 5. Technology transfer of program findings, models and data bases to the states has taken place. This includes the following: computerized data base of bay sediment and water quality; and computer models of bay hydrodynamics and a nutrient land run-off and transport model.

Funding for the research component of the Chesapeake Bay Program is as follows:

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>Research Program Ended*</u>
\$2,000	\$900	

Contact:

Dr. David A. Flemer  
Office of Research and Development (RD-672)  
U.S. Environmental Protection Agency  
401 M Street, S.W.  
Washington, DC 20460

Commercial (202) 382-5981

\* Although the Chesapeake Bay research program mandated by Congress was terminated in FY 1983, a new implementation phase of the Chesapeake Bay Program was initiated by the EPA at the beginning of FY 1984. The implementation phase is managed by EPA's Chesapeake Bay Liaison Office in Annapolis, Maryland, and is intended to assist the governments of states in the watershed of the Chesapeake Bay in their efforts to improve environmental quality in the Bay. Although the focus of the new program is primarily environmental management through cost sharing with state governments, some research and monitoring will be conducted to support management efforts. In FY 1984 the implementation phase of the Chesapeake Bay Program is funded at \$4.25 million. Three million dollars of the total funding has been allocated to state governments under the cost sharing arrangement for the purpose of supporting cleanup efforts. The Chesapeake Bay Liaison Office will use \$900 K of the remaining funds to support environmental monitoring, system modeling, and data management activities. It is estimated that in FY 1985 the new Chesapeake Bay Program will have a total budget of about \$10.0 million. Additional information about this program may be obtained from:

Ms. Virginia Tippe  
Technical Director  
Chesapeake Bay Program  
839 Bestgate Road  
Annapolis, Maryland 21401  
Phone: (301) 922-3752

TABLE 5

## ANTICIPATED MILESTONES IN CHESAPEAKE BAY PROGRAM

Milestone	Fiscal Year			
	82	83	84	85
Report: Description of the Chesapeake Bay ecosystem		X		
Technical synthesis of the results of each major research area				
- Toxic materials		X		
- Submerged aquatic vegetation		X		
- Nutrient enrichment		X		
Chesapeake Bay environmental characterization			X	
Bay management study			X	

EXPLORATORY RESEARCH

As part of its exploratory research effort, EPA has established eight Centers of Excellence through cooperative agreements with competitively selected universities or university consortia. The focus of Center programs is on long-term research that provides a link between basic and applied research as related to EPA's mission. The Marine Ecosystems Research Laboratory of the University of Rhode Island is the EPA-designated Marine Center of Excellence. A limited amount of additional marine research is also conducted through EPA's Research Grant Program.

The Marine Ecosystem Research Laboratory is using large outdoor microcosms (13,000 liters) to study the fate and effects of pollutants in simulated marine ecosystems. Studies in previous years have determined that the microcosms are reasonable analogues of the adjacent Narragansett Bay ecosystem. Research currently underway include the following:

- Effects of nutrient loading on estuaries.
- Systems of ocean disposal of wastes.
- Assimilative capacity of estuaries for nutrients.
- Effects of chronic inputs of petroleum hydrocarbons on estuaries.
- Historical record of change in estuaries.
- Environmental benefits associated with cleaning polluted estuaries.

Reports that will be published from the EPA Research Grants Program include:

- Habitat selection in benthic marine invertebrates: Relation to community patterns near waste discharges.
- Interaction between microbiota and persistent pollutants in marine sediments.
- Toxicity of priority pollutants on tropical oceanic plankton.
- Microbial transformation rates and fate of polycyclic aromatic hydrocarbons in estuarine sediments.
- Qualitative environmental impact analysis: Marine plankton communities.
- Population dynamics in estuarine nurseries.

Funding for exploratory research activities is as follows:

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$1,450	\$953	\$1,586	\$1,356

\* Presidential budget submission

Contact:

Herbert L. Wiser  
Office of Exploratory Research (RD-675)  
U.S. Environmental Protection Agency  
401 M Street, SW.  
Washington, DC 20460

Commercial (202) 382-7449

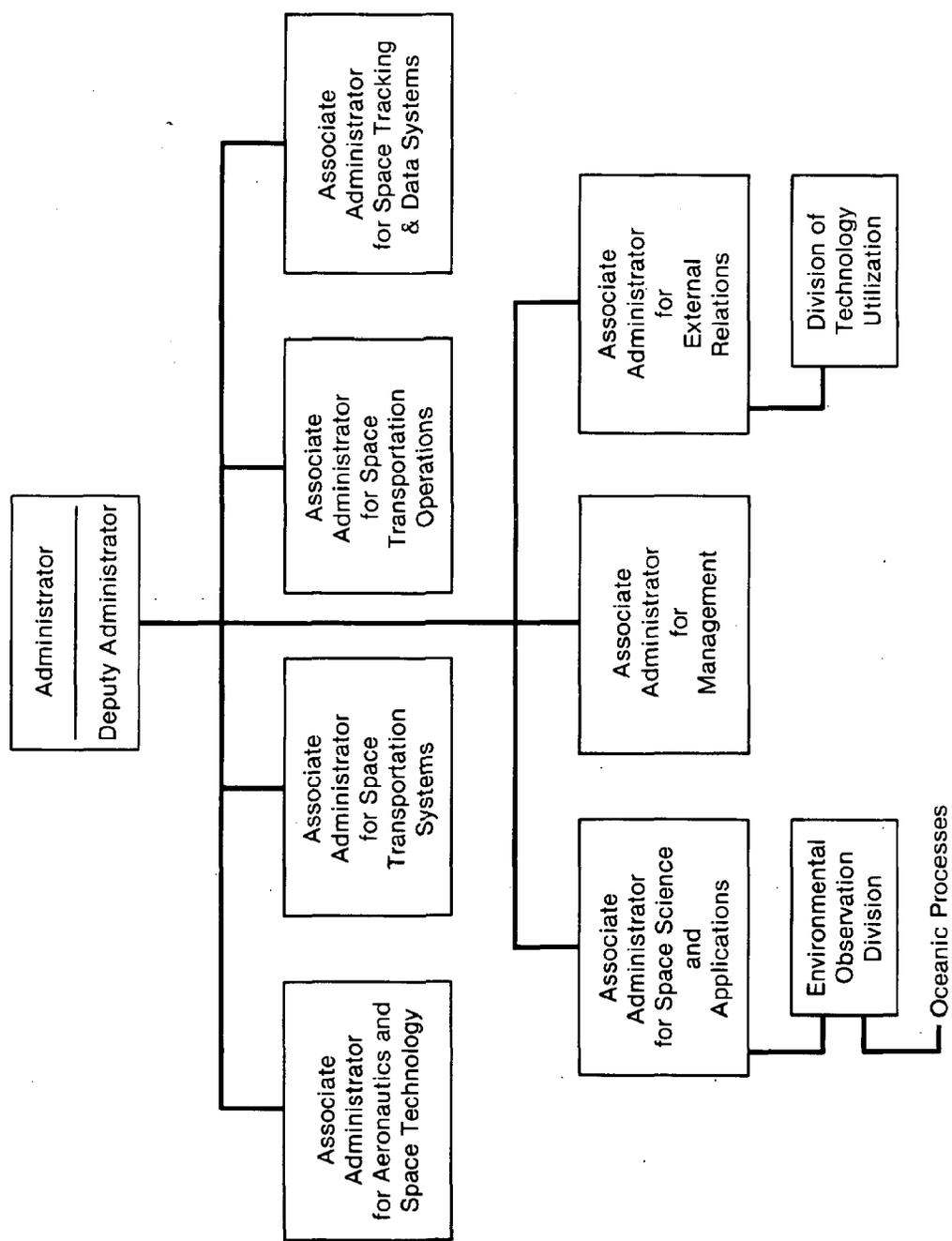
**IX. NATIONAL AERONAUTICS AND  
SPACE ADMINISTRATION**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONTENTS

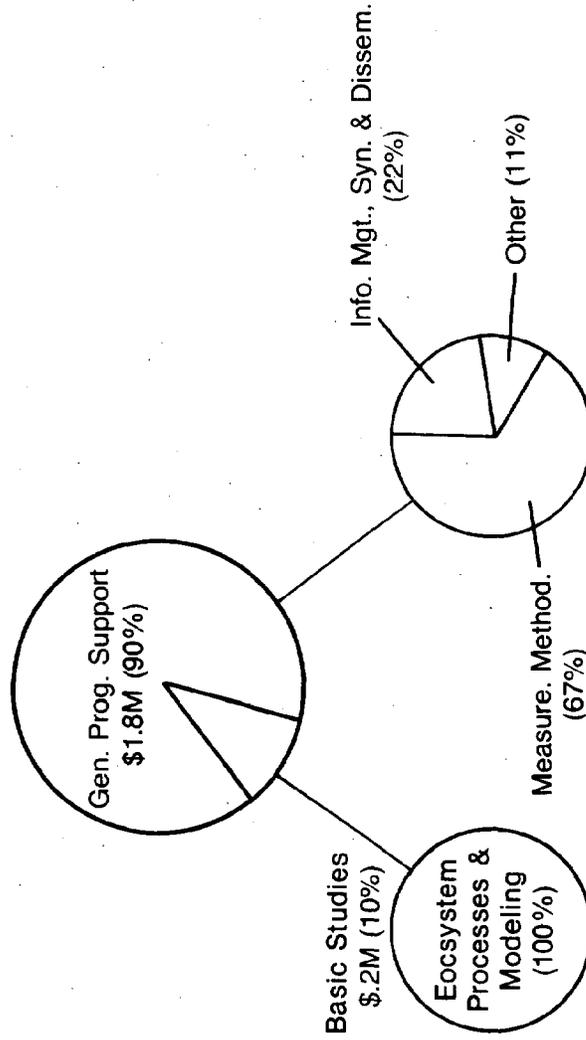
	<u>Page</u>
ORGANIZATION CHART.....	IX-11
FUNDING EMPHASIS GRAPH.....	IX-111
FEDERAL PERSONNEL AND FACILITIES.....	IX-101
PROGRAM DESCRIPTION	
Remote Sensing Program.....	IX-101
LEGISLATIVE MANDATE.....	IX-103

# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION



Only offices directly involved in marine pollution research are listed.

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 OCEAN POLLUTION RESEARCH AND MONITORING  
 FUNDING EMPHASIS  
 FY1983 ESTIMATES**



## NATIONAL AERONAUTICS AND SPACE ADMINISTRATION \*

Due to severe budgetary constraints, NASA brought to completion those research efforts directly dealing with ocean pollution research, development, and monitoring in FY 1982. The following represents those efforts indirectly related to ocean pollution research, development, and monitoring. Although NASA does not have any direct statutory responsibilities for ocean pollution research, development, and monitoring, NASA presently supports and sponsors research projects that seek to satisfy the needs of other Federal, State, and regional governmental agencies for new or improved methodologies for ocean pollution research, development, and monitoring data or information acquisition.

## FEDERAL PERSONNEL AND FACILITIES

NASA does not have any staff who are specifically assigned to marine pollution programs nor does it have any facilities, vessels, or equipment that are specifically designated for support of such programs.

## PROGRAM DESCRIPTION

Remote Sensing Program

Those projects indirectly related to ocean pollution research, development, and monitoring fall under two categories. The first includes the development of spaceborne techniques and the evaluation and application of these techniques to advance our understanding of the fundamental behavior of the oceans. These elements are conducted by the Ocean Processes Program in the Environmental Observations Division of the Office of Space Science and Applications. The second includes programs which make possible the utilization of proven technologies and methodologies to other government agencies and industries for use in on-going programs. These efforts are conducted by the Division of Technology Utilization in the Office of External Relations.

Development of Remote Sensing Technology

This portion of the NASA program has been focused on remotely measuring marine environmental parameters that provide signals which are not site specific or subject to ambiguous interpretation. The water quality activities have evolved into research directed toward measurement of water bio-optical properties of concern in biological and fisheries oceanography, such as ocean color measurements of chlorophyll, and remote laser stimulated measurements of chlorophyll fluorescence, chlorophyll fluorescence yield, and phytoplankton fluorescence from aircraft, ships, and buoys. The ultimate

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\* No information was submitted by NASA for inclusion into the Agency Program Summaries, FY 1983 Update. The information provided here was extracted from the FY 1982 Update.

goal of this research effort is a much better understanding of global oceanic primary productivity and phytoplankton distribution, reasons for observed spatial and temporal variability, how these are influenced by ocean physics and circulation, and the impacts on living marine resources and global carbon and nitrogen cycles.

Accomplishments so far include the following:

- o Chlorophyll concentration measurements from space (Nimbus-7 Coastal Zone Color Scanner) from 0.05 - 10 ug/l, accurate to within + 50%.
- o Airborne Oceanographic Lidar development and measurement of chlorophyll fluorescence yield and phycoerythrin fluorescence.
- o Time series of chlorophyll concentrations for the entire Southern California Bight using the Coastal Zone Color Scanner.

Estimated Funding (in thousand \$)

	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
P.P.	\$ 1900	\$ 2050	\$ 2200	\$ 2200
W.Q.	\$ 0	\$ 0	\$ 0	\$ 0

\* Presidential budget submission

Program Manager

Dr. Wayne E. Esaias  
 Primary Productivity Program Manager  
 Environmental Observations Division  
 Office of Space Science and Applications  
 NASA Headquarters  
 Washington, D.C. 20546

Transfer of Remote Sensing Technology Programs

The primary objective of this program is to promote the transfer of space technology and related methodologies to other agencies for their use in operational OPRDM programs. Through FY 1982, NASA will continue to maintain liaison with Federal agencies responsible for operational OPRDM programs to keep current on their needs for new or improved instruments for pollutant studies, and for water quality monitoring. Should NASA identify space technology based instruments which have the potential of serving the needs of another agency, NASA will bring this information to the attention of that agency. If that agency expresses an interest in accepting the transfer of the space technology based instrument, NASA will seek to enter into a transfer of the technology. The agreement will cover a cost-sharing joint effort under which NASA will adapt and suitably package the instrument for use by the agency in a field demonstration of the instrument in an operational

OPRDM program. The agency, in turn, will agree to assume the responsibility for the procurement and deployment of additional instruments in its OPRDM programs. NASA will provide technical assistance to ensure that agency personnel become familiar with the instrument operation and maintenance, and will also provide advice to that agency regarding procurement of additional instruments.

Definitive milestones for the accomplishment of the space technology transfer objective are not specified in advance. However, NASA is currently involved with the following technology transfer efforts:

- o EPA/X-ray fluorescence scatterometer for water quality monitoring; remote water quality monitoring device for helicopter, deployment, a neutron-gamma ray activation system for underwater quality research; and a laser system for the detection of virus in water using activated fluorescence.
- o NOAA/expendable aircraft deployable dissolved oxygen profiler using solid state sensors and sonic tracking technology; and the demonstration of the application of advanced microwave radiometer and scatterometer techniques to oil spill monitoring.
- o U.S. Army Corps of Engineers (USACE)/Water Quality Recording system for field operations.

Program Manager

Charles R. Eastwood  
Terrestrial Applications  
Technical Utilization and  
Industry Affairs Office  
Office of External Relations  
NASA Headquarters  
Washington, D.C. 20546

LEGISLATIVE MANDATE

National Aeronautics and Space Act of 1958 (P.L. 85-568).

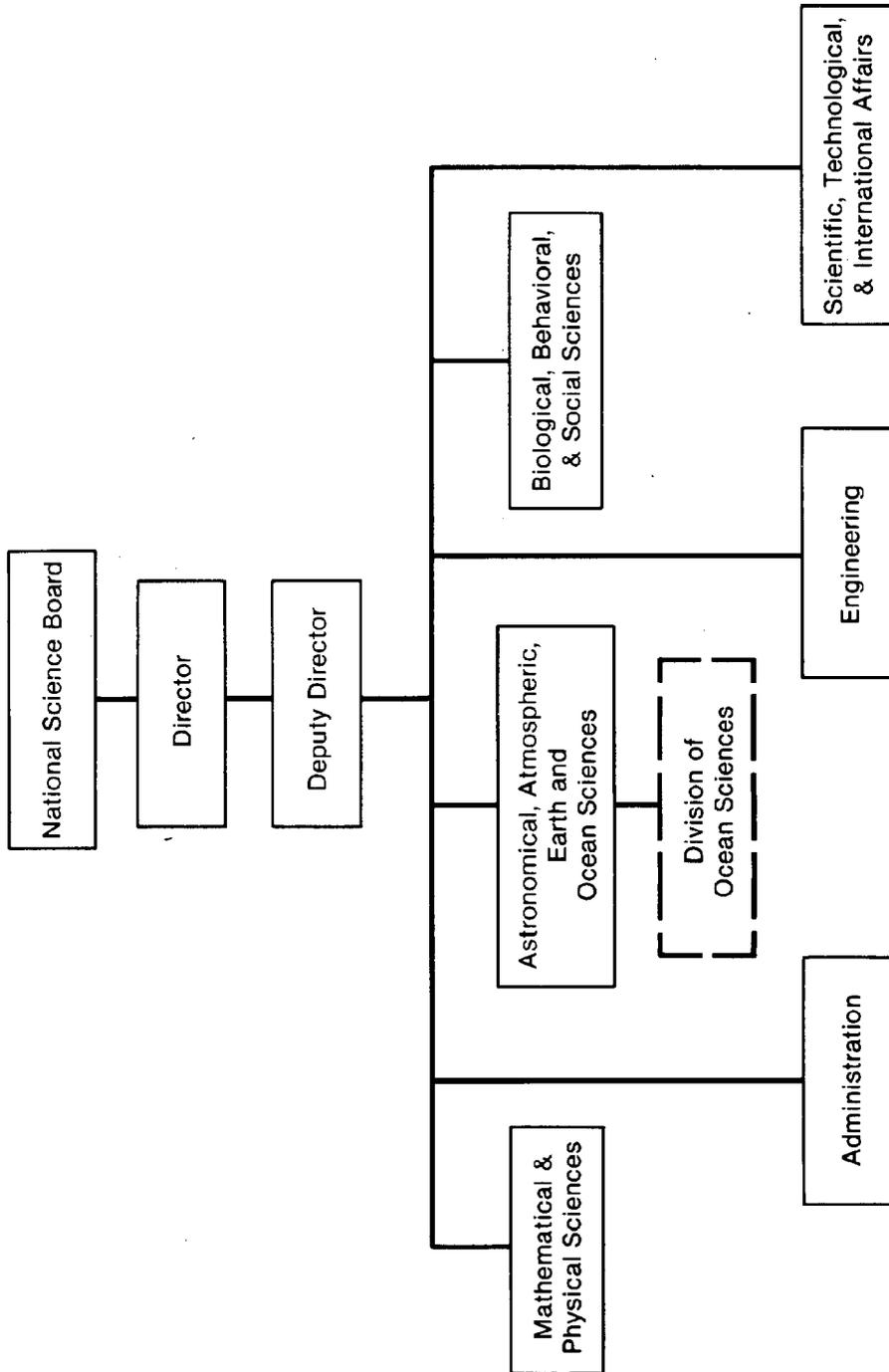
X. NATIONAL SCIENCE FOUNDATION

NATIONAL SCIENCE FOUNDATION

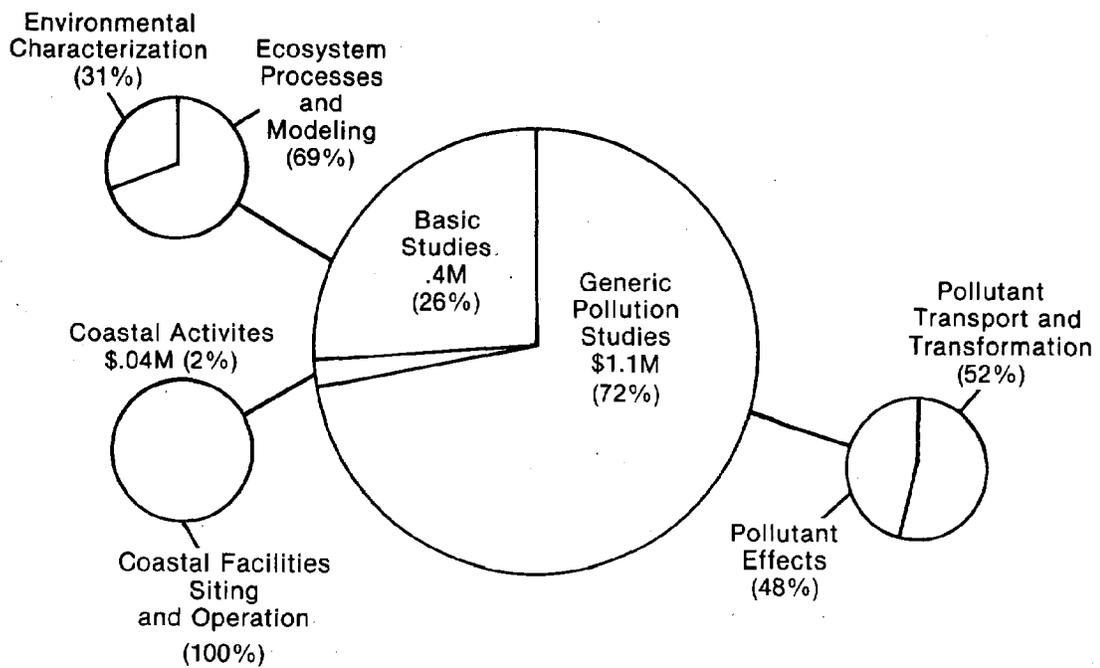
CONTENTS

	<u>Page</u>
ORGANIZATION CHART.....	X-11
FUNDING EMPHASIS GRAPH.....	X-111
MISSION STATEMENT.....	X-101
FEDERAL PERSONNEL AND FACILITIES.....	X-101
PROGRAM DESCRIPTION	
Division of Ocean Science.....	X-101

# NATIONAL SCIENCE FOUNDATION



**NATIONAL SCIENCE FOUNDATION  
OCEAN POLLUTION RESEARCH & MONITORING FUNDING EMPHASIS  
FY 1983 ESTIMATES**



## NATIONAL SCIENCE FOUNDATION

## MISSION

The National Science Foundation (NSF), under authority of the NSF Act of 1950 (as amended), has the mission to support scientific research to maintain and increase the Nation's vital ability to advance in scientific and technological areas. NSF does not itself conduct research, but provides funding for scientists in the private sector, mostly in academic institutions. Unsolicited proposals are received, evaluated through peer review, and funded if of sufficiently high scientific merit. The objectives, methods, ultimate goals, and pace of the research are all determined by the scientists proposing the research.

## FEDERAL PERSONNEL AND FACILITIES

NSF does not have any staff who are specifically assigned to marine pollution programs nor does it have any facilities, vessels, or equipment that are specifically designated for support of such programs.

## PROGRAM DESCRIPTION

Division of Ocean Science

The Division of Ocean Science is the principal administrative unit supporting research relevant to questions of marine pollution. When compared to "mission agencies," NSF does not have a marine pollution effort, because there are no activities which are narrowly focused by internal mandates or policy. Most of the research supported can be categorized as basic research. However, in the marine sciences the distinction between applied and basic research is not clear cut. Because so little is known about the ecological dynamics of all parts of the marine ecosystem, and the pollution problem is so pressing, basic findings usually make a contribution to other studies more directly applied. Much of the new understanding of marine systems gained through NSF supported research now forms the basis for much marine pollution research currently supported by mission agencies. During the Decade of Ocean Exploration, environmental quality was a specifically targeted objective. This initiative, however, had come to an end by 1980.

The programs within the Ocean Sciences Division are divided along disciplinary lines: Physical Oceanography, Marine Chemistry, Submarine Geology and Geophysics, and Biological Oceanography. Within the Division there are essentially two categories of research. There are specific study areas in which a variety of individual projects may be supported, and there are multicomponent projects involving larger numbers of investigators addressing a specific set of goals. During FY 1983, the total of all grants awarded by the Ocean Sciences Division was about \$80 million. Only a fraction of this total, \$1,566K, was awarded to support research that could be linked directly to ocean pollution issues.

NSF

FY 1983 UPDATE

Estimated Funding (in thousand \$)

<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85*</u>
\$2,496	\$1,566	\$1,100	\$400

\* Presidential budget submission

Program Contact

Dr. Rodger W. Baier  
Program Director of Chemical Oceanography  
National Science Foundation, Room 611  
1800 G Street, N.W.  
Washington, D.C. 20550  
(202) 357-7933

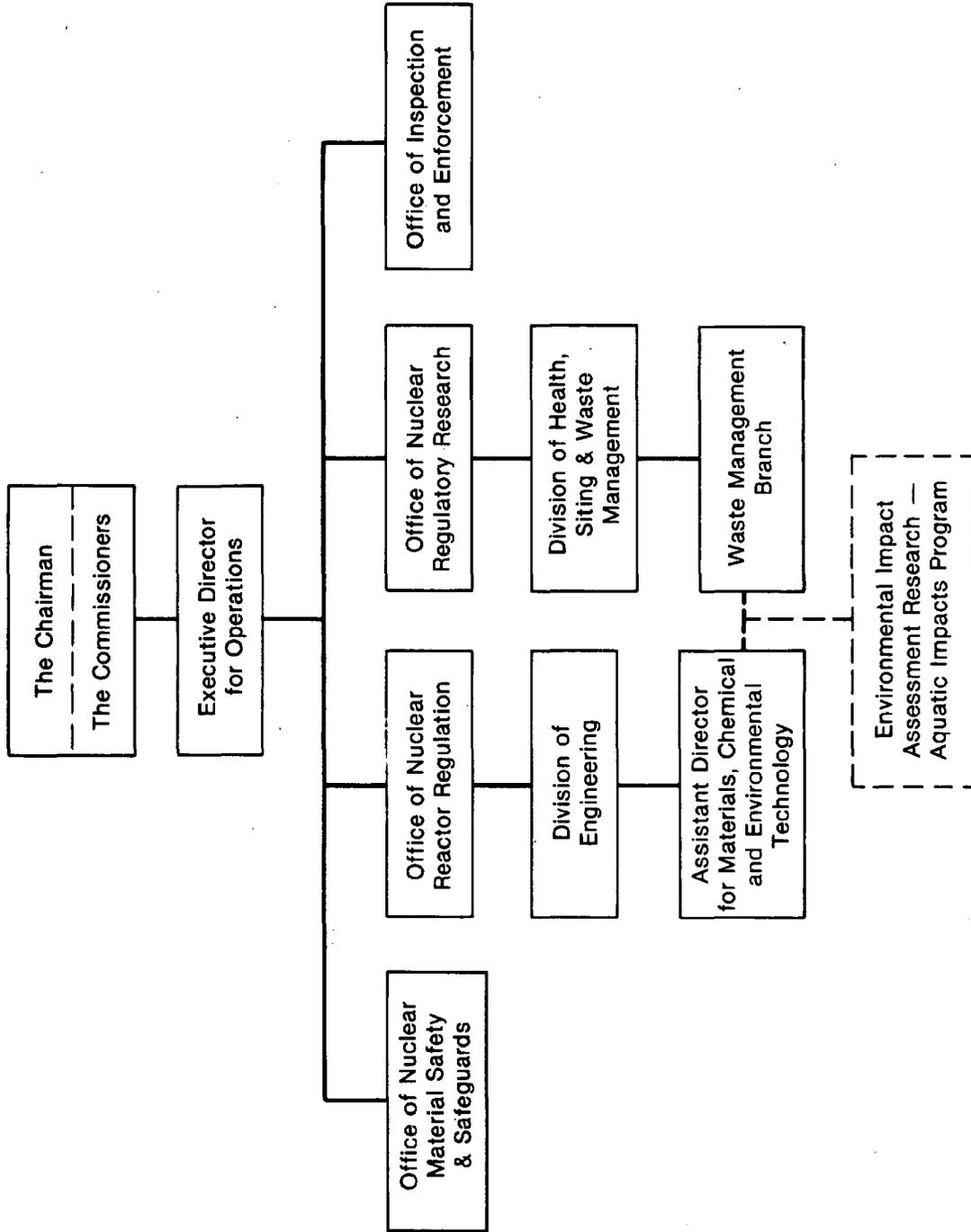
XI. NUCLEAR REGULATORY  
COMMISSION

NUCLEAR REGULATORY COMMISSION

CONTENTS

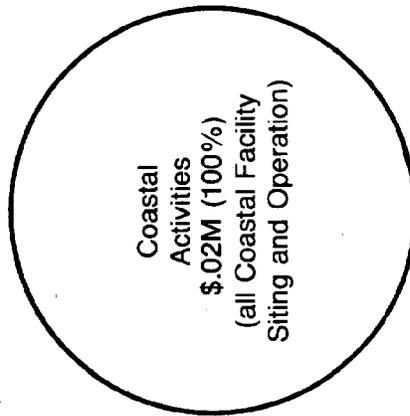
	<u>Page</u>
ORGANIZATION CHART.....	XI-ii
FUNDING EMPHASIS GRAPH.....	XI-iii
MISSION .....	XI-101
FEDERAL PERSONNEL AND FACILITIES.....	XI-101
PROGRAM DESCRIPTION	
Environmental Impact Assessment Research Nuclear Plant	
Aquatic Impacts Program.....	XI-101
AGENCY MANDATES.....	XI-103

# NUCLEAR REGULATORY COMMISSION



Only offices directly involved in marine pollution research are listed.

**NUCLEAR REGULATORY COMMISSION  
OCEAN POLLUTION RESEARCH AND MONITORING  
FUNDING EMPHASIS  
FY1983 ESTIMATES**



## NUCLEAR REGULATORY COMMISSION

## MISSION

The mission of the Nuclear Regulatory Commission (NRC) is to assure that civilian activities involving the use of nuclear facilities and materials are conducted in a manner consistent with the protection of public health and safety, environmental quality and the national security and with antitrust laws. The NRC carries out this mission through regulatory functions which include licensing, rulemaking and inspection and enforcement. For each major rulemaking and licensing action, the NRC conducts an environmental impact assessment in accordance with the National Environmental Policy Act (NEPA).

Research to support NRC's regulatory functions is organized within three major areas of identified informational needs: (1) Reactor Safety Research, (2) Safeguards, Fuel Cycle and Environmental Research, and (3) Systems and Reliability Research. Those research activities within the purview of the Committee on Ocean Pollution Research, Development and Monitoring fall within the second area and, more specifically, address informational needs in the sub-area of environmental impact assessment research.

## FEDERAL PERSONNEL AND FACILITIES

The NRC does not have any staff who are specifically assigned to marine pollution programs nor does it have any facilities, vessels, or equipment that are specifically designated for support of such programs.

## PROGRAM DESCRIPTION

Environmental Impact Assessment Research  
Aquatic Impacts Program

As part of its licensing review function, the NRC assesses the potential aquatic impacts due to construction and operation of proposed nuclear plants. Applicants for nuclear plant construction permits are required to describe, in quantitative terms, the physical, chemical, biological and hydrological characteristics for surface water bodies and groundwater which may be affected by construction or operation of the plant. These aquatic data and plant design features are considered in the NRC staff's independent assessment as presented in the Environmental Impact Statement (EIS). Research activities within the Aquatic Impacts Program support the staff's licensing review function through development of analytical methods and confirmatory data.

Goal

The goal of the aquatic impacts program is to provide technical bases for assessing the environmental impact of the construction and operation of nuclear facilities, with emphasis on effects of intake and discharge structures, routine effluents, and accidental releases of radioactive material.

Objectives

The broad objectives of this research program are to ensure: (1) that NRC can make acceptably accurate, independent assessments of the projected environmental impacts of radiological and nonradiological aquatic effluents from proposed nuclear plants; and (2) that there is an acceptable body of knowledge upon which to base operational technical specifications. An immediate, specific objective is to provide verified data, valid predictive models, and follow-on confirmation of predictions which will facilitate NRC compliance with the National Environmental Policy Act.

Current Program Elements (Projects)

1. The Effects of Nuclear Power Plant Operations on Populations of Boring and Fouling Organisms

The objective is to quantify the effects of thermal regime changes on the species composition and population dynamics of marine borers and fouling organisms in an estuarine system. Economically positive or negative changes wrought by invading species are of particular concern.

FY82 - \$85K (Complete) FY83 - \$0K - \$ 0K

2. Products, Pathways, Effects, and Fate of Chlorination By-products

The objectives are: (1) to measure and identify those chemical compounds formed when chlorine is added to fresh water and to marine and estuarine waters, (2) to develop methods for detecting concentrations of chlorinated hydrocarbons in the effluents discharged to receiving water bodies from nuclear plants, (3) to investigate the acute and chronic toxicity of several chlorinated by-products on freshwater and marine species, (4) to characterize the pathways of chlorinated by-products in aquatic organisms, and (5) to analyze for biomagnification of chlorinated hydrocarbons in aquatic species.

FY82 - \$100K FY83 - \$20K FY 84 - \$0K

3. Chemical Effluents from Nuclear Power Plants: Copper

This program is designed to: (1) characterize the chemical form and behavior of copper discharged into surface waters in effluents from nuclear power stations, (2) obtain data and information on the behavior of copper in the sediments of receiving water bodies at nuclear station sites, (3) determine the magnitude of the impact of copper on representative species, and (4) develop models suitable to NRC applications for predicting and assessing environmental impacts of copper released from nuclear power stations.

FY82 - \$100K (Complete) FY83 - \$0K FY84 - \$0K

Milestones

FY 83-87

Environmental impact assessment for planned light water reactors will be largely completed by the end of FY 1984. Present indications are

that licensing activities centering on other aspects of the nuclear fuel cycle will be increasing. To accommodate information needs for licensing and to maintain adequate standards, programs to identify and analyze types of environmental impacts stemming from fuel reprocessing and low-level radioactive waste repositories will be undertaken. Where existing environmental impact assessment methodology for reactors is not transferrable, research and standard-setting activities will be started in FY 1984 and completed by FY 1988.

No projects within the purview of COPRDM have been identified for funding during the period, FY84 to FY88.

Estimated Funding (in thousand \$)

<u>FY82*</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u>
\$285	\$20	\$0	\$0

\* In the FY 1982 Program Summary Update, funding for this program in FY 1982 was reported as \$265K. The amount reported here is a more accurate estimate of FY 1982 funding for this program.

Information Source

Dr. Charles W. Billups, Aquatic Scientist  
 Division of Engineering, P-314  
 U.S. Nuclear Regulatory Commission  
 Washington, D.C. 20555  
 (301) 492-8118

AGENCY MANDATES

The NRC was established as an independent regulatory agency under provisions of the Energy Reorganization Act of 1974 and Executive Order 11834 of January 15, 1975 which transferred all licensing and related regulatory functions formerly assigned to the Atomic Energy Commission by the Atomic Energy Act of 1954. The NRC also has responsibility under the National Environmental Policy Act of 1969 to assess the environmental impact associated with issuing licenses and to balance these impacts against the expected benefits. In addition, the NRC requires assurance that all licensed facilities meet the requirements of the many Federal and State laws that are administered by other agencies.





# NATIONAL MARINE POLLUTION PROGRAM FUNDING EMPHASIS BY POLLUTANT

FY 1983 ESTIMATES (thousands of dollars)

POLLUTANTS  FEDERAL PROGRAMS	Petroleum & Petroleum Products	Synthetic Organic Chemicals	Halogenation Products	Microorganisms & Pathogens	Nutrients & Other Biostimulants	Metals & Inorganic Chemicals	Artificial Radionuclides	Habitat Modification & Sediment Deposition	Miscellaneous	Not Pollutant Specific	TOTAL
	<b>DEPARTMENT OF AGRICULTURE</b>										
Effects of Agricultural Practices		66			65			65			196
<b>DEPARTMENT OF COMMERCE</b>											
<b>NATIONAL BUREAU OF STANDARDS</b>											0*
Center for Analytical Chemistry											
<b>NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</b>											
Coastal & Estuarine Assessment	708	1066	31	861	655			68	60	3755	7204
Ocean Use Impact Assessment	60	383		127	16	1432		85	61	1519	3687
Strategic Assessment	25								250	1099	1374
Hazardous Materials Response	100								95	1110	1305
National Marine Pollution Program										692	692
Deep Seabed Mining Environmental Research						150		441			591
Ocean Thermal Energy Conversion									288		288
Chesapeake Bay	25	100						125			250
Measurement Systems Development & Engineering Services		10									10
National Marine Sanctuaries		7			7			6		91	111
Coastal Zone Management	53				35			52		210	350
Ship Support										6349	6349
Environmental Research Laboratories Ocean Pollution Studies		382		232	394	216		249		295	1768
Environmental Research Laboratories Great Lakes Pollution Studies	234	336			555	6	50	7		1012	2262
Sea Grant Ocean Pollution	190	493	29	490	127	161		85	111	210	1797
National Fishery Ecology	882	462		264	222	1073		472	65	1370	4811
Microconstituents	120	120									240
Ocean Pollution Data & Information Network										560	560
<b>DEPARTMENT OF DEFENSE</b>											
<b>ARMY CORPS OF ENGINEERS</b>											
Coastal Engineering								110		830	940
Flood Control & Navigation								240		125	365
Environmental Quality	138	55	27	28		27		1730		2582	4587
Satellite & Surveying Applications								180			180
North Atlantic Division								413		275	688
New England Division								560		240	800
South Atlantic Division								565			565
North Pacific Division								172		73	245
North Central Division		332						221			553
Lower Mississippi River Division								15		35	50
Pacific Ocean Division								2			2
South Pacific Division								300			300
Southwest Division								70		30	100
<b>U.S. NAVY</b>											
Environmental Protection Technology		288				467			250	120	1125
<b>DEPARTMENT OF ENERGY</b>											
Ocean Thermal Energy Conversion									750		750
Regional Marine						1133	262	67		4460	5922
Radioecology										100	100
Physiological Ecology	50	186		18	44	662			65	281	1306
Strategic Petroleum Reserve									3960		3960
Subseabed Disposal							5650				5650
<b>DEPARTMENT OF HEALTH AND HUMAN SERVICES</b>											
<b>NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SERVICES</b>											
Intestinal Research		309									309
Extramural Program		60								540	600
<b>FOOD AND DRUG ADMINISTRATION</b>											
Shellfish Sanitation				572						1628	2200
<b>DEPARTMENT OF THE INTERIOR</b>											
<b>MINERALS MANAGEMENT SERVICE</b>											
Washington D.C. Office	230			13		24		14		1575	1856
Atlantic OCS Regional Studies	1879					319		225		5415	7828
Gulf of Mexico OCS Regional Studies	274				274					4933	5481
Pacific OCS Regional Studies	775								258	4134	5167
Alaska OCS Regional Studies	2377								1849	8981	13207
<b>U.S. FISH AND WILDLIFE SERVICE</b>											
Fishery Resources		173			180			203		105	661
Habitat Resources	315	768				552		66			1701
<b>U.S. GEOLOGICAL SURVEY</b>											
Water Resources Division										3758	3758
Geologic Division	514					343				515	1372
<b>DEPARTMENT OF TRANSPORTATION</b>											
<b>U.S. COAST GUARD</b>											
Port and Environmental Safety	2300										2300
Marine Environmental Response	387					77				181	645
<b>ENVIRONMENTAL PROTECTION AGENCY</b>											
Marine Waste Disposal	112					112			1290	4093	5607
Energy Related Research									165		165
Water Quality Research	121	1706				366		245		1625	4063
Great Lakes Research		1145			25	758		12		520	2500
Chesapeake Bay	30	165		15	15	15		60		600	960
Exploratory Research		791				162					953
<b>NATIONAL AERONAUTICS AND SPACE ADMINISTRATION</b>											
Remote Sensing										2050	2050
<b>NATIONAL SCIENCE FOUNDATION</b>											
Division of Ocean Science	171	125		57	145	682			135	251	1566
<b>NUCLEAR REGULATORY COMMISSION</b>											
Environmental Impact Assessment Research			20								20
<b>TOTAL</b>	12070	9591	67	1757	2965	9432	7316	7385	9901	68327	128812

\*This program shows no funding because support is provided from other agencies on a reimbursable basis.

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