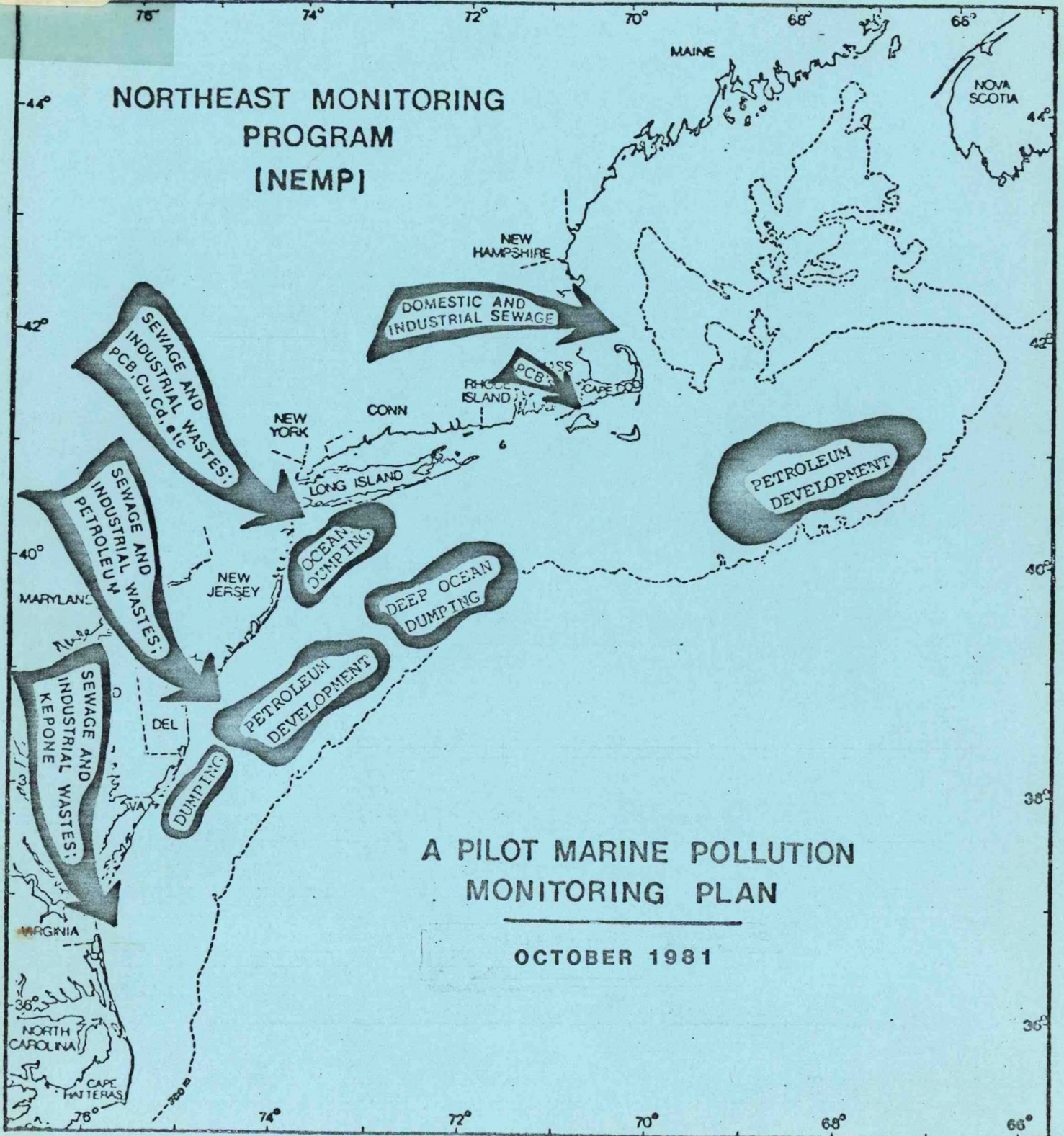


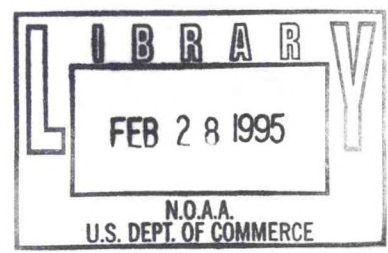
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NORTHEAST MONITORING
PROGRAM

A PILOT MARINE
POLLUTION MONITORING PLAN



OCTOBER 1981

EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration, as the Nation's principal civilian ocean agency, has a logical and legal commitment to determine the effects of man's activities on coastal and estuarine waters, the ecosystems contained therein, and their resources. Part of this commitment must be to develop a data base, through long-term monitoring, that will assist in assessing the effects of pollutants on ecosystems and resources, and will enable early detection of and response to significant environmental changes. Present urgency derives from catastrophic consequences of land-based toxic material disposal and limited but highly-visible consequences of ocean disposal which require ocean pollution monitoring and research information to support policy development.

Three Major Line Components (MLC's) of NOAA--National Marine Fisheries Service (F), Research and Development (RD), and Oceanic and Atmospheric Services (OA)--have developed this plan, drawing on funding, facilities, and expertise in existing programs. The plan provides for a system of physical, chemical, and biological monitoring to be carried out at selected stations in waters of the northeast continental shelf from the Gulf of Maine to Cape Hatteras. Monitoring approaches include standard measurements of physical-chemical factors, including contaminant levels, as well as newer approaches to biological effects monitoring, using behavioral, physiological, biochemical, pathological, and genetic criteria.

The National Marine Fisheries Service has been designated as the lead group for program management and operations, with substantial contributions by the other two MLC's. The program will integrate Ocean Pulse (F), New York Bight Monitoring (OA), and components of Ocean Dumping (RD). The integrated program will be constructed to meet the totality of NOAA's marine pollution monitoring needs for this area. This includes broad-scale, resource-oriented data required under the Fishery Conservation and Management Act, and intensive site-specific dumpsite data required by Section 201 of the Marine Protection, Research and Sanctuaries Act, as well as the general requirement to monitor and assess the health of the marine ecosystem. Various user groups will have need for different categories of data from broad scale to site specific. The present plan emphasizes the development of products essential to meeting the objectives of state/Federal programs concerned with fisheries and fisheries habitat management as well as with general marine environmental quality and coastal zone management.

The plan provides for fisheries resource assessment and pollution monitoring at approximately 140 stations along the continental shelf from Cape Hatteras to the Gulf of Maine. Special emphasis is given to nearshore stations affected by waste discharges. Projected program costs are approximately \$2 million per year. This level of funding will be maintained through the first 5 years, or pilot phase, of the program, i.e., through FY 1984.

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1.0 INTRODUCTION

This document is a strategic plan for a pilot Northeast Monitoring Program (NEMP), in response to a decision memorandum on marine pollution program funding approved by the Deputy Administrator, NOAA, on October 1, 1979. It represents the combined thinking and planning of a working group drawn from NOAA's National Marine Fisheries Service (NMFS), Oceanic and Atmospheric Services (OA), and Research and Development (RD). The program represents an integration of ongoing and planned NOAA marine pollution monitoring activities in the Northeast. The program has been designed to obtain the maximum amount of useful data in the most cost-effective way.

Pollution monitoring is defined¹ as the systematic, time-series observations of predetermined pollutants in pertinent components of the marine ecosystem over a length of time that is sufficient to determine the (1) existing levels; (2) trends; and (3) variations in the water column, sediments, and biota. Operational pollution monitoring is that subset of monitoring which is used for environmental or resource management by means of extant technologies and organizations. For example, monitoring of the levels of heavy metals in sediments, water, or tissues may indicate need for quarantining a fishery. In contrast, biological effects monitoring is the use of behavioral, physiological, biochemical, pathological, genetic, and ecological changes to detect the consequences of pollutant stresses. For example, observation of cytological effects could provide a clue to future diminution of a fishery and may indicate a need for regulatory or management steps to protect the fishery.

A major effort is required to address the marine pollution monitoring problems of the Northeast region. The best and most practical approach is to build on present NOAA programs in the area. Several programs within the aforementioned MLC's are presently in place and are gathering baseline assessment data in polluted and uncontaminated areas off the Northeast and Middle Atlantic States between the Gulf of Maine and Cape Hatteras. In addition, through the NMFS resource assessment and environmental assessment programs, relatively unpolluted reference areas are being evaluated in regard to habitat quality. The programs are summarized in the Technical Development Plan (a separate document). Accordingly, the first phase of the monitoring and research program for the northeastern region should be a pilot endeavor developed through integration and redirection of the activities of three ongoing NOAA marine environmental programs into a single comprehensive monitoring program. These activities are: Marine Pollution Monitoring Program of OA with initial emphasis on the New York Bight monitoring activities, Ocean Pulse Program of NMFS, and Ocean Dumping Program of RD. Redirection commenced in FY 1980, with full integration planned for FY 1982.

¹P.L. 95-273 Task Force Report - Subcommittee on Monitoring

An important feature of the program is the use of biological effects monitoring parameters. The monitoring of pollution in the sea is carried on throughout the world for a variety of purposes and by a wide range of local, national, and international bodies. A substantial volume of data is accumulating on the distribution and amounts of certain contaminants, particularly with regard to residues in the flesh of fish and shellfish and the concentrations in water and sediments. A primary stimulus for such work is, of course, public health. However, concern for adverse effects on living marine resources and their habitats is also an important motive; and, in this context, the possibility of using a more direct approach by looking for effects on living organisms in the field is clearly attractive and has not received appropriate attention. It is not sufficient for fisheries management purposes to know simply the amounts of contaminants or toxins in the environment; we must know the effects of these on living marine resources. Moreover, changes in the well-being of fish and invertebrates often are the first clue to environmental degradation. Unless such changes are revealed early, through monitoring, long-lasting, extensive damages will occur and preventive measures unduly delayed. By conducting contaminant and water quality monitoring in conjunction with biological effects monitoring, it is possible to detect both changes in the condition of the fisheries habitat as well as effects on several levels of biological organization.

2.0 URGENCY

Conventional practices for land disposal of toxic wastes have resulted in catastrophic environmental damages; dischargers are looking to contained or dispersed ocean disposal as an alternative. In contrast, regulated long-term ocean dumping of sewage sludge, dredge material, chemical wastes, and other materials has resulted in generally limited, though highly visible, damage; regulatory agencies are requiring consideration of land-based technologies for disposal of these materials. Federal ocean pollution monitoring and research activities are increasingly expected to provide the technical basis for governmental and industrial waste management decisions.

In the northeastern coastal environment, critical levels of degradation are found. Specific indicators of the degree of degradation of the Middle Atlantic Bight area include: apparent increase in frequency and intensity of algal blooms; abnormal depletion of summer dissolved oxygen concentrations in bottom waters of dumpsites; increase in heavy metals in surf clams, sediments, and water; closure of surf clam/quahog beds because of bacterial contamination; and closure of lobster, shellfish, and finfish fisheries because of PCB's in the Hudson River estuary and at New Bedford, Massachusetts. In addition, there are significant differences in prevalences of certain fish and crustacean diseases in polluted and unpolluted regions of the Bight and a stimulation of phytoplankton and zooplankton productivity by riverborne nutrients emerging from riverine systems such as the Hudson and the Delaware.

There is typically a time lag of several years between the exposure of toxic levels of contaminants in coastal/estuarine waters and their detection. There is often a further time lag between the detection of even single hazards to ecosystems, or to public health, and decisive governmental reaction. It is quite possible that ecological or public health hazards off the northeast coast could result from multiple causes, making such hazards even more difficult to detect and ameliorate. It is urgent, therefore, to monitor for any such effects in order to implement remedial action before ecosystem effects become irreversible or public health is affected; research alone is unable to detect the long-term trends which provide evidence of contaminant effects. However, research must be an active contributor to the monitoring program, by determining cause-effect relationships and by testing and evaluating the monitoring program. The synergistic interaction between monitoring and research must be carefully fostered by NEMP management; and lines of rapid, clear communication must be established and maintained between these activities throughout NEMP and other appropriate elements of NOAA.

Baseline research and monitoring of pollutant sources, pathways, fates, and effects provide a necessary data base for governmental action. Monitoring is a logical followup of major NOAA research and baseline projects such as the MESA New York Bight Project, the Ocean Dumping Program, and the NMFS Marine Resources Monitoring Assessment and Prediction Program (MARMAP) and Habitat Protection Programs. Such coastal and shelf monitoring will be complemented by major estuarine projects such as the proposed Hudson-Raritan Estuary Project (HREP), and the research and monitoring efforts being conducted by academia, state, and other Federal programs.

Every year that a monitoring program is delayed means another year during which inadequate responses will be made to environmental problems as well as to requests from municipalities, states, Federal agencies, and conservation groups for information important to management decisions. This is principally because baseline information is inadequate in many areas and is required for most management decisions concerned with regulating discharge, dumping, and other sources of contaminants. In the Northeast, however, a preliminary data base does exist. NOAA should take advantage of it by investing in a long-term assessment and monitoring program and by continuing to expand the data base, building on the results of research and monitoring.

3.0 JUSTIFICATION

An ocean pollution monitoring program in the Northeast is needed because the municipal and industrial wastes from 30 million people are discharged there, and because these wastes impact upon the marine environment and living resources which are of local, national, and international importance. Effective control of all sources of pollution is needed because the capacity of the ocean to assimilate wastes and render them harmless and the ocean's ability to regenerate natural resources are limited. Effective technological and governmental responses to ocean pollution require scientific and technological baseline and monitoring information on pollution sources and effects.

Among the many problems that should be addressed by an ocean pollution monitoring program are those that involve marine resource species and ecosystems. The following problem areas have occurred in the Northeast, are poorly understood at present, and clearly deserve surveillance:

1. Changes in biological productivity and fish distribution and consequent loss of living resources.
2. Degradation or loss of benthic habitats.
3. Diminished economic value of fish and shellfish because of:
 - a. contaminant burdens in flesh;
 - b. human pathogens in seafood, sediments, and water; and
 - c. areas closed to fishing.
4. Diminished aesthetics.
5. Unknown efficacy of regulatory actions and pollution abatement activities in terms of improving the health of the Northeast coastal environment.
6. Unknown impacts of coastal and offshore development.
7. Lack of supporting information needed for coastal zone management.

The majority of ocean pollution monitoring being carried out by the Federal Government is funded by agencies other than NOAA. This monitoring, for the most

part pertains to specific activities for compliance with set guidelines or for assessment of impacts. Presently, none of these efforts are conducted to monitor the cumulative long-range effects of pollution over a large geographic region. NOAA has determined that a monitoring program is needed in order to proceed with responsible assessment of the marine pollution problems of the region.

The responsibility of NOAA for development of this program is based on several statutory mandates. The most recent mandate, the National Ocean Pollution Planning Act of 1978 (P.L. 95-273) directs NOAA to "establish within the Administration (NOAA) a comprehensive, coordinated, and effective ocean pollution research and development and monitoring program." The pilot monitoring program for the Northeast Atlantic coastal waters is NOAA's initial response to this mandate. The legal basis for NOAA's involvement in this region (other than P.L. 95-273) is derived from the following statutes:

o The Marine Protection, Research, and Sanctuaries Act of 1972
(P.L. 92-532)

Gives the Secretary of Commerce (and by delegation, NOAA) the responsibility for conducting research and monitoring on the effects of ocean dumping (Section 201), and research on the long-range effects of pollution and other man-induced impacts on the ocean ecosystem (Section 202).

o The Fishery Conservation and Management Act of 1976
(P.L. 94-265)

Requires the Secretary of Commerce, inter alia, to initiate a comprehensive program of fishery research to further the purposes of the Act and which shall include, but not be limited to, biological research concerning the interdependence of fisheries or stocks of fish, the impact of pollution on fish, and the impact of wetland and estuarine degradation upon the abundance and availability of fish (Section 304(e)).

o Fish and Wildlife Act of 1956

Provides, in part, for assistance to be provided to the fishing industry in order to ensure economic and technical development, resource conservation, and resource management to assure the maximum sustainable production for the fishery (Section 742a).

o Fish and Wildlife Coordination Act of 1958

(NOAA responsibility via Reorganization Plan #4 of 1970.) The Secretary (of the Interior) shall make investigations to determine the effects of domestic sewage, mine, petroleum, industrial wastes, erosion silt, and other polluting substances on wildlife. Such studies shall include methods of obtaining and preventing pollution (16 USC 665).

o Sea Grant Improvement Act of 1976 (P.L. 94-461)

The Secretary of Commerce shall identify specific national needs and problems with respect to ocean and coastal resources. The Secretary (and by delegation, NOAA) may make grants or enter into contracts with respect to such needs or problems (Section 206(a)).

o Deepwater Port Act (P.L. 93-627)

Environmental review criteria are to be established by the Administration (Section 1505). Such criteria shall include the assessment of the potential polluting possibilities of the proposed port. Designation of an adjacent coastal state shall also be made by NOAA (Section 1508).

o Migratory Game Fish Study Act of 1959 (P.L. 89-359)

Directs the Secretary of Commerce to undertake a comprehensive study of the migratory fish of recreational importance (both catadromous and anadromous). The study shall include research on natural and artificial environment influences, including pollution (Section 706(e)).

o Anadromous Fish Conservation Act of 1965 (P.L. 89-304)

Requires research and recommendations regarding the reduction of pollutants injurious to fish and wildlife in interstate or navigable waters (Section 757 (a) and Section 757(b)).

o Coastal Zone Management Act of 1972 (P.L. 92-583), as amended in 1976

Authorizes the Secretary of Commerce (and by delegation, NOAA) to conduct a grant program which will: (1) encourage and assist the states to develop and implement coastal zone management programs, (2) foster Federal-state cooperation and joint participation carrying out the purposes of the Act, and (3) promote broad participation in the development of state coastal zone management program planning and execution. The law also authorizes coastal state grants toward the costs of acquisition, development, and operation of estuarine sanctuaries which would serve as natural field laboratories to study and gather data on the natural and human processes occurring within the estuaries.

o Endangered Species Act of 1973 (P.L. 93-205)

Authorizes the Secretary of Commerce, with respect to any species over which program responsibilities were transferred pursuant to Reorganization Plan Number 4 of 1970, to engage in research in order to determine whether such species should be listed as endangered or threatened (Section 1533(a)).

o The National Environmental Policy Act of 1969 (P.L. 91-190)

NOAA has three basic responsibilities under the Act: (1) to use all available means to assure "productive and enjoyable harmony" between man and the environment and to promote efforts which will prevent or eliminate damage to the environment (Section 101); (2) to prepare a statement of environmental impact for any agency project that significantly affects the quality of the human environment (Section 102(c)); and (3) under the same section, to comment on EIS's issued by other agencies in those areas in which NOAA has jurisdiction by law or special expertise.

o Federal Water Pollution Control Act of 1972 (P.L. 92-500),
as amended by the Clean Water Act of 1977 (P.L. 95-217)

Although EPA has the responsibility for implementing this Act, other Federal, state, and local agencies are expressly encouraged to cooperate in establishing national programs for the prevention, reduction, and elimination of water pollution. This includes research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of pollution (Section 104(a) (1)). Section 104(a) (5) requires EPA, in cooperation with other Federal agencies and the states, to establish, equip, and maintain a water quality surveillance system for the purpose of monitoring the quality of the navigable waters and ground waters and the contiguous zone, and the oceans, utilizing, to the extent practicable, the resources of NOAA, USGS, and the Coast Guard. Section 301(h) authorizes modifications to the requirement for secondary treatment and discharges into marine waters, provided it can be shown that such action would not result in harm to the marine environment. NOAA is assisting EPA in the review of applications for modifications and the establishment of the marine environmental data base for both application and monitoring data.

NOAA has responsibility as the manager and trustee of marine and estuarine natural resources for the assessment of environmental impacts of programs and activities associated with oil and gas development. This role has been explicitly defined in P.L. 95-373, the OCS Lands Act, Title 3, Section 303(b) (3). This role was further defined in Executive Order 12123, February 26, 1979, (Federal Register 11199 1-1) which states that the Secretary of Commerce is responsible for the protection of those natural resources for which it has assigned responsibility, *viz.*, living marine resources and habitats. In this role, the Secretary is responsible for assessing damages and claims pertaining to the injury, or destruction of, or loss of use of living marine resources.

P.L. 95-273 designated NOAA as the lead Federal agency for preparing a comprehensive 5-year plan for Federal ocean pollution research and development and monitoring programs, in order to provide for planning for coordination of the dissemination of information with respect to such programs within the Federal Government.

The Northeast coast has been identified in the "Federal Plan for Ocean Pollution Research, Development, and Monitoring for FY 1979-1983" as an area with highest priority for monitoring. Also, the Northeast has been identified² by an interagency subcommittee on ocean monitoring as follows:

"Coordinated regional plans and new monitoring activities, as the first phase of a National Ocean Pollution Monitoring Program, should be implemented in FY 1981. Because of the critical pollutant stress conditions, public and institutional support, and the existence of a sufficiently complete research base, the new monitoring efforts should be in the northeastern Atlantic coast and Great Lakes region."

Monitoring of ocean pollution has been underscored as a high priority need in the 5-year Federal plan. Based on known conditions and the results of monitoring and ocean research to date, it has been determined that the northeastern Atlantic coastal region is the most heavily stressed of all coastal areas of the United States. Therefore, the conclusion of the Monitoring Subcommittee that a comprehensive monitoring activity should be undertaken off the northeastern coast is most warranted.

4.0 GOALS

The Northeast Monitoring Program has the following goals that are consistent with those stated in the Federal Plan for Ocean Pollution Research, Development, and Monitoring.

- o Maintain an assessment of the health of the coastal ecosystem of the Northeastern United States.
- o Provide information necessary to ensure present and future protection of human health and the safety and wise management of the living marine resources of the Northeast.
- o Develop a prototype pilot program of monitoring in order to determine cost effectiveness, user requirements, and potential applicability of monitoring methodologies to other U.S. coastal areas.

5.0 OBJECTIVES

To attain the Marine Pollution Monitoring Program goals, the following objectives must be met by NEMP:

- o Determine or confirm the existing levels, trends, and variations of contaminants in water, sediments, and biota and their effects on living marine organisms.

²Report of the Subcommittee on Ocean Pollution Monitoring, Interagency Committee on Ocean Pollution Research and Development and Monitoring, May 4, 1979.

- o Establish and maintain an interactive archive of data resulting from other marine pollution monitoring programs in the Northeast and foster cooperation and coordination of estuarine/shelf environmental monitoring and research efforts off the Middle Atlantic and New England States.
- o Summarize, in collaboration with other responsible agencies, information on pollutant inputs to estuarine and coastal waters.
- o Provide data and relevant information, in a timely manner for planning and management, to regulatory organizations and the general public.
- o Determine the effects of major activities such as offshore drilling, dumping, and toxic waste disposal on the coastal marine environment and its resources.
- o Detect, and provide appropriate and early warnings of, severe or irreversible changes in the coastal marine ecosystem and in its resources. This would include interaction with agencies responsible for coordination of both routine and crisis response activities (oil spills, harmful waste and toxic chemical discharge, etc.).
- o Develop and apply standard methodologies for monitoring and evaluation of monitoring effectiveness.
- o Determine users and their needs.
- o Determine which elements of coastal monitoring are most cost effective.
- o Determine applicability of marine pollution monitoring methodologies to other United States coastal regions, including the Great Lakes.

The Program Technical Development Plan will be structured according to the above objectives.

6.0 BENEFITS

The Program benefits include:

- o Improved resource management decisions, including those relating to coastal zone management.
- o Contribution to fishery management plan development under the Fishery Conservation and Management Act (FCMA) and within state/Federal territorial water programs.

- o Allowance for optimum timing of public sector investments in measures for cleanup, enforcement, and protection of public health.
- o Essential environmental data for decisions of regulatory agencies (FDA, EPA, etc.).
- o Information on the potential impacts of siting of ocean mining, dredging, and other extractive operations.
- o Broad-scale, nonsite-specific data and information on biological problems that occur in diverse areas (e.g., fin rot) to many management groups.
- o Protocols for a broad monitoring program under the auspices of the Clean Water Act and other mandates to coastal states, and to assist the coastal states in developing related monitoring programs.
- o A mechanism for quality control and intercalibration of measurements when individual states commence monitoring of estuarine and coastal habitats.
- o Information useful to international legal/regulatory and scientific groups, e.g., London Dumping Convention, Law of the Sea, International Council for the Exploration of the Sea (ICES), and the Intergovernmental Oceanographic Commission (IOC), involving the current pollutant loading being released by the United States into international waters and its effects.
- o Useful information and experience in developing marine pollution monitoring programs.

7.0 USERS

The major concern of the Northeast Monitoring Program is to obtain information about changes in the marine environment that may be harmful to human health or to marine ecosystems. Users include the public, public interest groups, regulatory agencies, and local governmental units concerned with coastal and shelf resource habitat quality as well as NOAA/NMFS management elements and the fisheries councils. They must have timely and accurate information for decision-making and responses. Data collected must stand the test of adjudication; they must hold up in the courts as well as in regulatory and legislative hearings. Statistically significant characterization of environmental conditions, trends, and deviations must be made available to environmental managers. The program should be responsive to the world's ocean pollution monitoring requirements, as well as to the immediate needs of U.S. citizens. It must be able to contribute, in short and long term, to habitat protection, mitigation, and enhancement measures as required under the Fishery Conservation and Management Act of 1976. An overview of user needs and application of monitoring data are provided in Table 1, and Federal agency mandates in meeting users' needs in Table 2.

Table 1. Monitoring Users and their Needs and Applications

<u>USER GROUPS</u>	<u>NEEDS AND APPLICATIONS</u>
State and Local Governments; State/Federal fisheries and habitat management programs in coastal and territorial waters	Environmental data and reports of status concerning fisheries, habitats quality, ecology, public health, and waste disposal within or impacting on their coastal jurisdictions, including assessments of environmental episodes occurring in the areas of interest.
Regional Commissions and Authorities	Similar to state and local needs, but on a broader scale, including concerns with planning, management, and regulation of waste disposal and coastal development.
Federal Environmental Management, Protection, and Enforcement Groups Concerned with Pollution, Resources, and Health	Environmental data summaries, interpretations, projections, and warnings, keyed to specific pollutants or impacts over a wide range of areas and time periods.
Resource Industries Including Petroleum, Mining, Fishing, and Energy	Summaries and reports of the status and variations in pollutant concentrations, ecological impacts and abundance and well being of biota, for use in meeting regulatory and management requirements.
General Public and Interest Groups	Reports of Status and Outlook regarding environmental quality (including health and aesthetics) and resources.
Environmental Research	Summaries and interpretations of environmental data to be used in research efforts.

TABLE 2

Users of Federal Monitoring Data, Responsible Agencies, Legislative Mandates, and Products required to Fulfill these Mandates

Category of monitoring	Types of User groups	Agencies Responsible	Authorizing Activity	Product
I. Effluents and other sources of pollutants, and compliance/permit actions	Compliance monitoring & regulatory agencies	COE DOD DOE EPA MRC USDA	92-500 Sec. 402 Sec. 404 92-532 Sec. 102 Sec. 103	Issuance of violation Citations, authorization of loading permits enforcement actions, criteria development & environmental impact statements
II. Ecosystems health & ambient water-quality	Planning & research groups, international groups & resource use groups (e.g., municipal water supply bodies)	BLM EPA NASA NOAA NSF USCG USGS	92-500 92-532 Sec. 201 Sec. 202 FCMA CZMA	Annual reports, load allocations, development & refinement of planning & 1a 208 & determination of status of nonpoint-source input
III. Fish & shellfish	Market place consumers, resource, assessment groups & fishing industry	DOI EPA FDA HEW NOAA	Sampling FDA mandate National Shellfish Sanitation Program	Restricted use of areas & corrective action
IV. Hazardous materials	States, fishing industry & public interest groups	EPA NOAA USCG Inter-agency	National Oil & Hazardous Substances Pollution Contingency Plan	Damage assessment reports & short-term effects to reduce long-term damage

8.0 THE PROGRAM

For several years three NOAA Major Line Components (MLC) have had elements of a monitoring program in the Northeast. In recent years certain of these efforts have been enhanced or reduced in scope. At present, the NOAA/MESA New York Bight Project, working with an accumulated data base, is in the data analysis, interpretation, synthesis, and publication phase. The NMFS Ocean Pulse Program has just entered its third year of testing and expansion of new monitoring approaches, and the MARMAP assessment program has collected monitoring data on the distribution and abundance of resource species for almost a decade. The ocean dumping research, now done by RD at dumpsites, is in its fifth year. With this background of NOAA research and monitoring endeavors, it is timely to enter a unified monitoring phase; to meet this need, NOAA MLC's have combined funds in FY 1980 and FY 1981 to develop a unified program.

The pilot Northeast Monitoring Program (NEMP) is an integration and redirection of existing and planned NOAA pollution studies in the Northeast designed to acquire periodic physical, chemical, and biological data relevant to the health of coastal/estuarine waters. Selected pollution-related activities of three NOAA MLC's--Fisheries, Research and Development, and Oceanic and Atmospheric Services--are joined in a single program to determine both environmental effects and biological effects.

8.1 Scientific Rationale

Numerous agencies and organizations are involved in measuring, in a variety of ways and accuracies, inputs of pollutants to riverine, estuarine, and coastal ecosystems (see 8.10). In certain areas, e.g. the New York Bight, attempts have been made to quantify total loading and seasonal transport (Mueller, Jervis, Anderson, and Hughes 1976³) and to develop mass balance models. To date, the latter efforts have had only limited success, even in circumscribed areas. There is, therefore, a recognized need for monitoring; and research which will reveal (1) the total amounts and distributions of certain recognized contaminants and variables (see section 8.5) in coastal and shelf waters and (2) the findings of the effects of the various levels of contaminants on organisms in the water.

Selected stations in impacted and unimpacted locations on the Northeast continental shelf are being visited periodically (seasonally or annually, depending on the variable to be measured); and data from sampling and observations are being assembled on physical and chemical measurements, including levels of pollutants in the environment and in animals. Effects of pollutants on biological characteristics--behavior, physiology, biochemistry, pathology, and genetics--are being examined as standard monitoring techniques.

³Contaminant Inputs to the New York Bight. NOAA Technical Memorandum, ERL MESA-6, Marine Ecosystems Analysis Program Office, Boulder, Colorado.

The data base is then analyzed by NEMP personnel for existing pollutant impacts and for changes with time. Assessments of effects will be made annually by NEMP and contractual workers; public information releases in relation to sudden or drastic changes in environmental factors are an important product.

The annual assessment of the state of health of the Northeast marine habitats will be developed by the program's management team and principal investigators. The pilot program will be evaluated by NOAA Assistant Administrators each year, with a full-scale evaluation and review after 3 years.

8.1.1 Program Continuity

The NEMP is a pilot pollution monitoring program, and as such it should have a definite time span for implementation and evaluation. The pilot phase and subsequent evaluation of the program should be completed within 5 years. With favorable evaluations of the pilot phase, it may evolve into a long-term program.

Monitoring programs, by definition, must be considered long term, but with provision for modification when and where required. Recent changes in energy requirements and use, as well as the continued growth of industrialization and urbanization in the coastal zone, with resultant effects on ecosystems of the continental shelf, dictate that pollution monitoring programs must be projected in terms of decades. Annual program performance evaluation will provide evidence of its usefulness, relevance of products, and cost effectiveness.

In addition to long-term activities, there will be important short- and intermediate-term outputs such as data reports, statistical analyses, manuals of techniques and protocols, and red flag reports of sudden or chronic changes in habitat quality and concomitant responses of living resources. Also, the monitoring program will be able to identify areas where research is needed to understand better the causes and effects of pollution on the marine environment.

8.2 Organizational Integration

Organizational integration of Northeast pollution monitoring activities is shown in Figure 1. This represents a departure from the conventional MLC boundaries; planning, funding, ship time, laboratory and field data management, information validation and exchange, and research proposal evaluation activities are combined within the unified program management. Assistant Administrators for OA, RD, and F will constitute a Board of Directors for programmatic and policy guidance and direction. This Board will review periodically the functions and effectiveness of the program and its management and will ensure that the needs of all participating MLC's are met. Its principal functions are to ensure that the NEMP (1) is carried out as an integrated NOAA program, (2) goals and objectives are met, (3) is cost effective, and (4) has sufficient funding and personnel to accomplish its objectives. These functions will be ensured through periodic meetings with the Program Management Team during which the broad goals and objectives and accomplishments of the Program are assessed and evaluated.

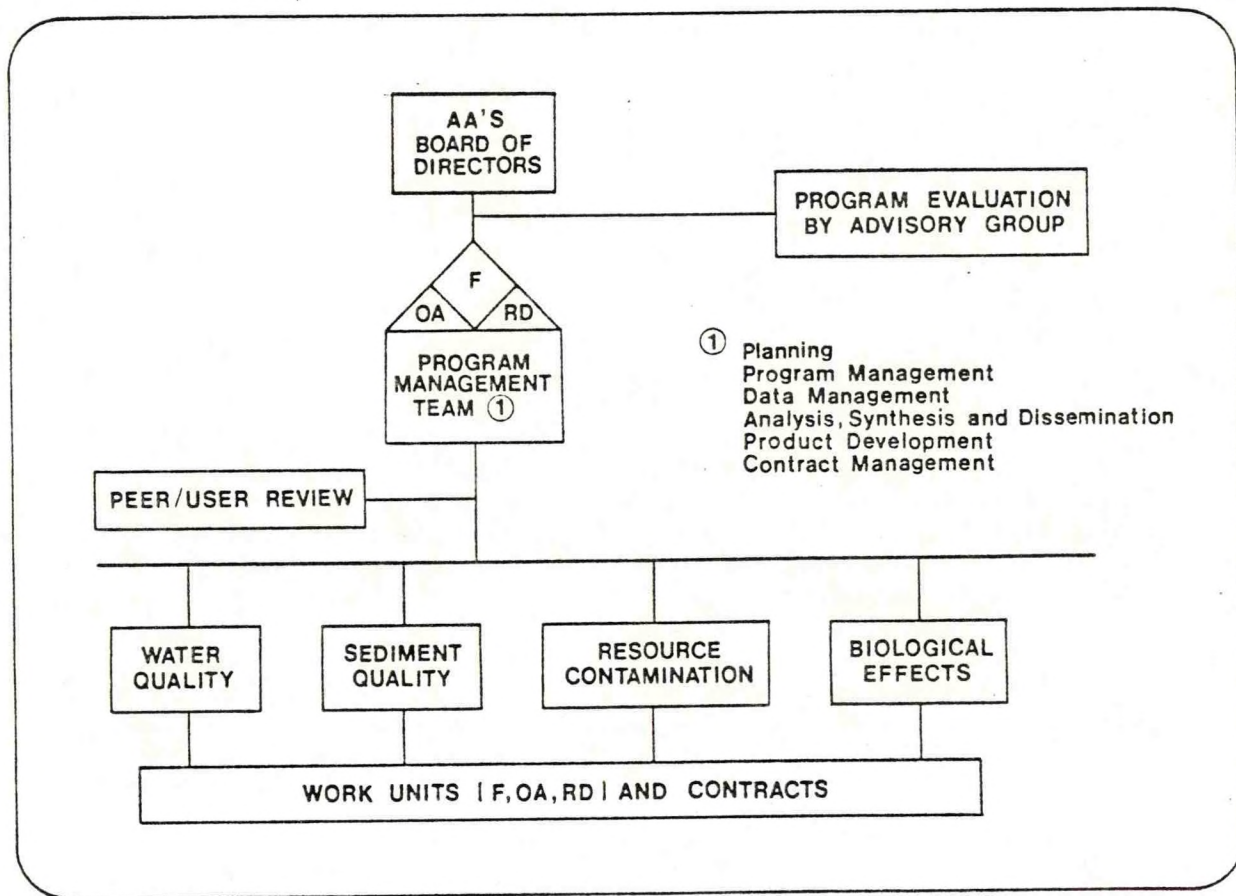


Figure 1. Schematic diagram indicating the general organization of the Northeast Monitoring Program during 1980-1 including functional activities of the Management Team.

Management of the operational aspects of the program will reside in NMFS (F). The Program Manager will be based at the NMFS Sandy Hook Laboratory. He will exercise overall administrative and programmatic control, which may include redirection of field efforts, product development, and interactions with all user groups. The Program Manager will be assisted by Assistant Program Managers from OA and RD. The Assistant Program Managers will be the field program leaders of the MLC program. The Program Manager and the two Assistant Program Managers form the Management Team.

8.3 Funding Integration

Funding commitments from each MLC were outlined in an RD decision memorandum approved by the Deputy Administrator of NOAA on October 1, 1979 (see section 9.1).

For FY 1980, some commitments to contractors were already made by the individual MLC's, although some proposals were still in a stage that could be and were reviewed and commented on by representatives of the other MLC's prior to award.

Planning for FY 1981 spending and evaluation of FY 1980 programs will be made by the Program Management Team. Beginning in FY 1981, planning and implementation of tasks will be based on the total funds available to the program even though funds will remain in the MLC bases. Based on the planning and evaluation activities, decisions will be made by the Program Manager, in concert with the other members of the Team and with the advice of in-house and outside peer groups, about how the total funds will be spent most effectively. Proposals will then be solicited and funds assigned to specific contractors and in-house groups.

For FY 1982, planning will be started early in FY 1981, based on evaluation of results and projected program funding. Decisions will be made by the Program Manager in concert with the other members of the management team on distribution of all FY 1982 funds (considered to be a single pool available to the Program).

8.4 Operational Integration

Geographical distribution of activities is shown in Figure 2. Scientific and technological integration and redirection include but are not limited to: (1) changes in sampling strategies and locations in the New York Bight and (2) expansion and redesign of the Ocean Dumping Program into a long-term program of systematic marine pollution research and monitoring at the 106-mile site, the Philadelphia sewage sludge site, and the Chesapeake Bay dredged material dumpsite. Details of the redirected activities are presented in the Technical Development Plan.

Initial integration of scientific efforts will begin with the coalescence of ongoing projects in the Ocean Pulse Program of NMFS, the Ocean Dumping Program of RD, and the marine pollution monitoring activities of OA. The budgets of the contributed activities in FY 1980 amount to a total of about \$2.38 million. Proposed activities in the following years will be reviewed by the NEMP Management Team and modified, if necessary, to meet evolving program

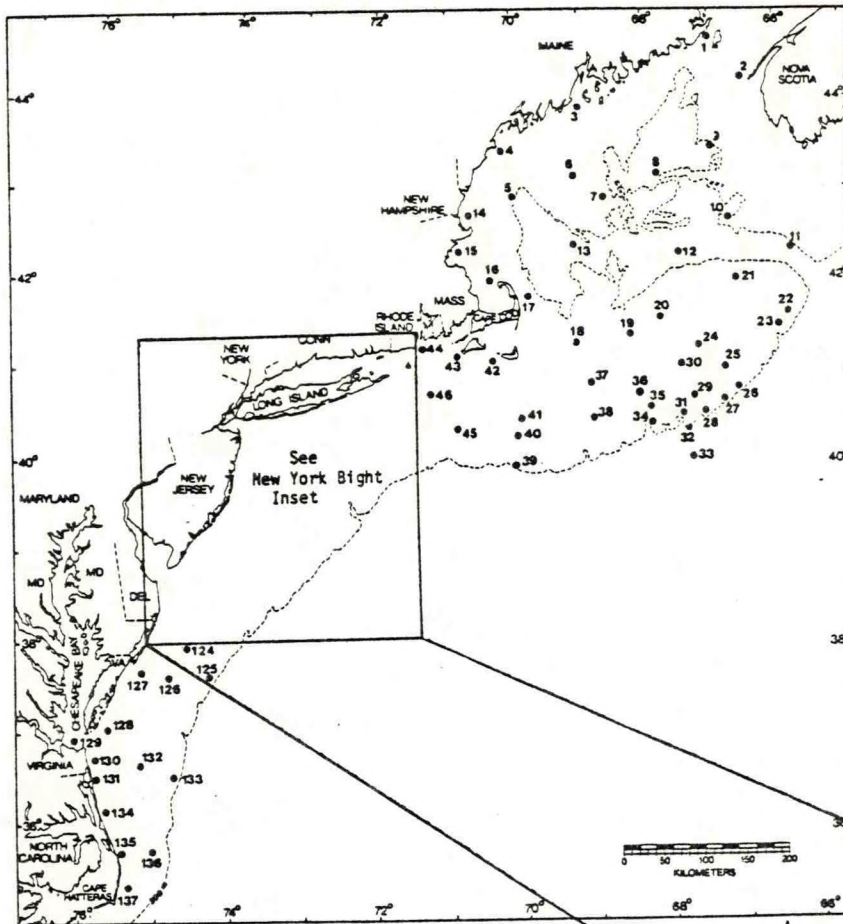
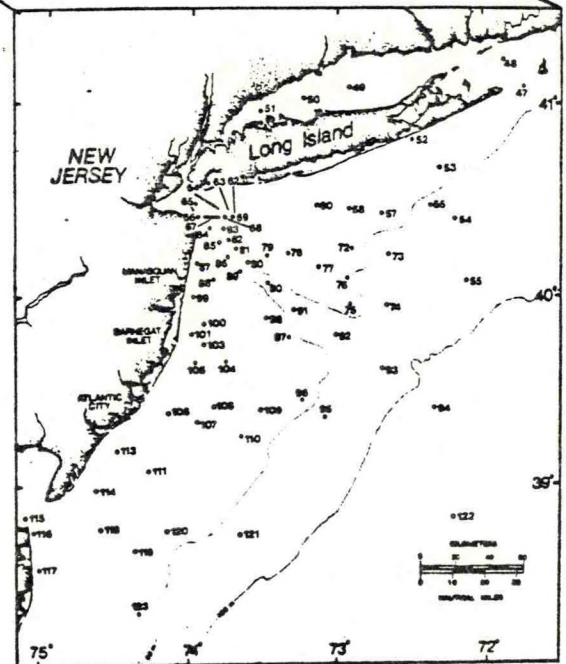


Figure 2.

These charts indicate the location of the Northeast Monitoring Program stations in the Middle Atlantic Bight and the New York Bight (inset) which will be occupied by NEMP personnel and cruises in FY 1980 through 1982.

The stations relate to strata which had been earlier delineated for the Ocean Pulse Program, as well as individual stations and transects which had been developed in relation to the Ocean Dumping Program and the MESA New York Bight monitoring program.

Details in regard to the activities to be performed at each individual station are provided in the NEMP Technical Development Plan.



objectives. Methods used for sampling and analysis will be standardized or intercalibrated among the participating programs, aiming toward complete unification in all practical aspects by FY 1982. A data quality assurance program will be an integral element of the program design.

Joint cruises among the three MLC's will be planned to accomplish the objectives of NEMP. Previously scheduled cruises of the Ocean Pulse, Ocean Dumping, and MESA New York Bight programs are being reexamined and adjusted to accommodate NEMP objectives. For example, the ocean dumping research cruises scheduled for the 106-mile site (also an Ocean Pulse site) in May and August 1980 will be reprogrammed to include certain NEMP activities. Also, in July 1980 an NEMP cruise will cover the Ocean Dumping Program study sites as well as about 80 other NEMP stations and will involve scientists from NMFS and OA. Further program integration in FY 1980 will involve joint efforts at MESA (RD) monitoring stations in New York Bight.

Because separate monitoring efforts by the three MLC's will cease as early as possible in FY 1980 and will be replaced by the integrated program elements, unified data management will be implemented as quickly as possible. All monitoring data will flow to the Program Office, and thence to the MLC's and user groups.

Special data requirements of particular MLC's that cannot be handled by the joint monitoring cruises will continue to be the responsibility of individual MLC's, but as far as possible all monitoring data needs should be met by the integrated program.

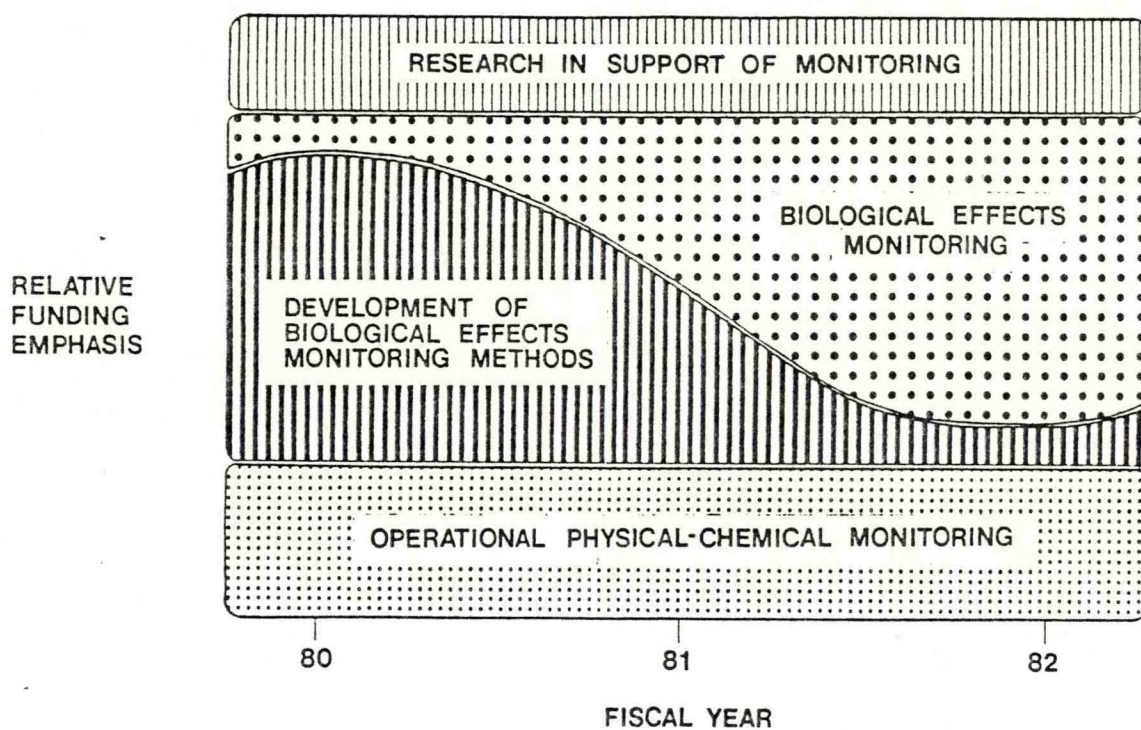
Particular attention will be directed to the immediate reorientation of MLC programs to pollution monitoring in the Northeast as well as to the longer term program that may evolve. The initial response will be a modified "layering" of MLC programs, with full integration and unification by FY 1982.

An integral component of the program should be the development of effects monitoring approaches and their refinement as standard measures of environmental contamination to be made available for routine monitoring. There is presently a substantial research component in the effects monitoring approaches which is a part of the present NMFS Ocean Pulse program. To clarify the relationships of NOAA's pollution monitoring activities, three categories can be identified:

- (1) operational physical, chemical, and geological monitoring;
- (2) biological effects monitoring and refinement of effects monitoring methodology; and
- (3) research in support of monitoring.

From FY 1980 on, there will be changing rates of funding allocated to categories 2 and 3. Category 3 will diminish as new methods become operational, while categories 1 and 3 should remain relatively stable (Figure 3).

Figure 3. Changing ratios of funding with time, for various categories of activities related to monitoring.



8.5 Field Measurements

A critical aspect of the program is the selection of a proper array of variables to be monitored. Several Federal, regional, state, and local agencies have in the past recommended monitoring activities for site- and problem-specific reasons. Moreover, such recommendations were highlighted as priority needs in the Federal Plan for Ocean Pollution Research, Development, and Monitoring, as well as by task forces within CEQ. The variables listed in Table 3 have all been selected either because of their impacts on resource organisms or human health, or because they serve as indicators of contamination or processes leading to it. Many of the variables selected were recommended by the MESA program following consideration of the results of several years of research and monitoring in the New York Bight, and by the International Council for the Exploration of the Sea (ICES) workshop on monitoring of biological effects of marine pollution (Rapports et Proces- Verbaux de Reunions - Volume 179, ICES, 1980). Undoubtedly the list will be modified as the significance of additional variables or indicators is understood, and it will be shortened if experience shows some variables to be less important or sensitive than anticipated. Interaction between research and monitoring components of the program will provide the principal guidance for addition or deletion of variables.

In addition to the selection of proper variables to be monitored, it is important that monitoring be conducted at appropriate locations and time intervals. Monitoring sites of NEMP that are located inshore, especially in the offings of major estuaries, are fixed sites at which specific contaminants such as heavy metals, PCB's, petroleum hydrocarbons and other toxic substances are monitored on a regular basis. Since it is known that values for heavy metals in sediments and water can vary seasonally, it is important that such variables be monitored at fixed stations, and at least quarterly. Guidance provided by discipline review committees has suggested that ecological measurements involving benthic community structure should be made only twice a year. Plankton measurements must be made frequently to understand temporal and spatial variability, and this is being done on NMFS-NEMP and MARMAP cruises held approximately monthly and covering shelf stations from the Gulf of Maine to Cape Hatteras.

International and national workshops and discipline review committees have suggested that initial biological effects monitoring measurements should be made at least quarterly, and for certain parameters, more frequently.

Stations that are located offshore over the continental shelf are selected to represent certain habitat types. The locations of such stations are indicated in Figure 2. Measurements made at these stations reflect the general dispersion and movements of low levels of contaminants from the coastal zone to the shelf and beyond. Since, however, only limited information exists on the generalized patterns of movement of specific contaminants, such stations initially have been selected within bathymetric strata.

Because the general patterns of movements of contaminants within and from major estuarine systems are generally understood, fixed stations will be used inshore and at offings of major estuaries. Stratified sampling locations may be applicable to offshore sites that have not been demonstrably impacted by point sources of contaminants or seaward movement of plumes with entrained materials.

Table 3. This table indicates the variables that are being measured at stations shown on Figures 1 and 2. The components of the ecosystem in which the variables are being measured are indicated by X's in the matrix. As is noted in the footnote, other variables will be added as their significance is determined or as new toxicants are identified in coastal and estuarine ecosystems. The variables are discussed in greater detail in the Northeast Monitoring Program Technical Development Plan (TDP).

ENVIRONMENTAL CONCERNS				
Quantitative ¹ Variable	Water Quality	Sediment Quality	Biological Effects	Resource Contamination
Dissolved O ₂	X			
Nutrients (N)	X			
Turbidity	X			
Bacteria/Viral Indicators	X	X		
Temperature	X			
Salinity	X			
Plankton	X			
Mercury		X		X
Lead		X		X
Cadmium		X		X
Copper		X		
Total Organic Carbon		X		
PCB's		X		X
Polynuclear Aromatic Hydrocarbons		X		
Grain Size		X		
Biochemical Abnormalities			X	
Genetic Abnormalities			X	
Physiol./Biochemical Abnormalities			X	
Disease Incidence			X	
Behavioral Modification			X	
Species Abundance			X	
Community Structure			X	
Pathological Bacteria				X

¹ Other variables will be added as their significance is determined and monitoring methodology is developed.

An exception to this would be the vicinity of the DWD 106 site which is located offshore and may be affected by dumping.

8.6 Data Validation and Management

Criteria for analytical quality control in monitoring are being developed from the existing NEFC and MESA research data bases. Variables selected for monitoring will be only those which are needed, can be routinely determined by a number of laboratories, and for which analytical quality control measures are available. During FY 1980 and 1981, a provisional set of criteria will be identified and tested for application during FY 1982 and following years.

Capabilities for developing a working data base are presently available at NEFC, MESA-NYB, and EDIS. Further development will be conducted within NEFC, with the support of OA's EDIS, to provide criteria, methods, and institutional arrangements for handling the increasing quantity of data resulting from ocean pollution monitoring.

A single, fully integrated project data management system for Northeast pollution monitoring will be operational under direct control of the Program Manager, who will be responsible for the entire data flow and will assure that the data and related information will be forwarded to NOAA's Environmental Data and Information Service.

8.6.1 Data Operations

The various NEMP work units are routinely generating large quantities of data. These data will be supplemented by historical information, and by data from other monitoring and research programs, in order to document conditions and trends in northeastern coastal marine ecosystems. To integrate effectively its multidisciplinary studies in assessing environmental health, it is essential that the NEMP have the capability to systematically store, manipulate, update, merge, and retrieve data sets (Figure 4).

For this to be possible, data collected at the work unit level will be recorded on formats compatible (1) with each other for later integration of data sets; (2) with the automated data processing system of Sandy Hook Laboratory, NEFC, the center of the NEMP data system, to permit direct data entry; and (3) with requirements of the Environmental Data and Information Service, which will ultimately receive copies of all data sets. In most cases, data will be keypunched and verified, then entered onto magnetic tape at Sandy Hook. This will also apply to data produced by outside investigators working under contract to NEMP who do not already submit their data on magnetic tape or digital forms. Historical data sets and subsets of data files held by EDIS and other facilities may be reformatted where necessary to facilitate integration with data from ongoing monitoring that are incorporated in the NEMP "working data base."

The NEMP data management scheme will rely on a developed data base management system to meet its processing requirements. The system will be a general purpose data management system in which the user can create, update, and maintain large data bases and will feature a fast retrieval capability and a comprehensive report writer. It will be convenient to use for both conversational time sharing and batch production mode applications, and will simplify handling

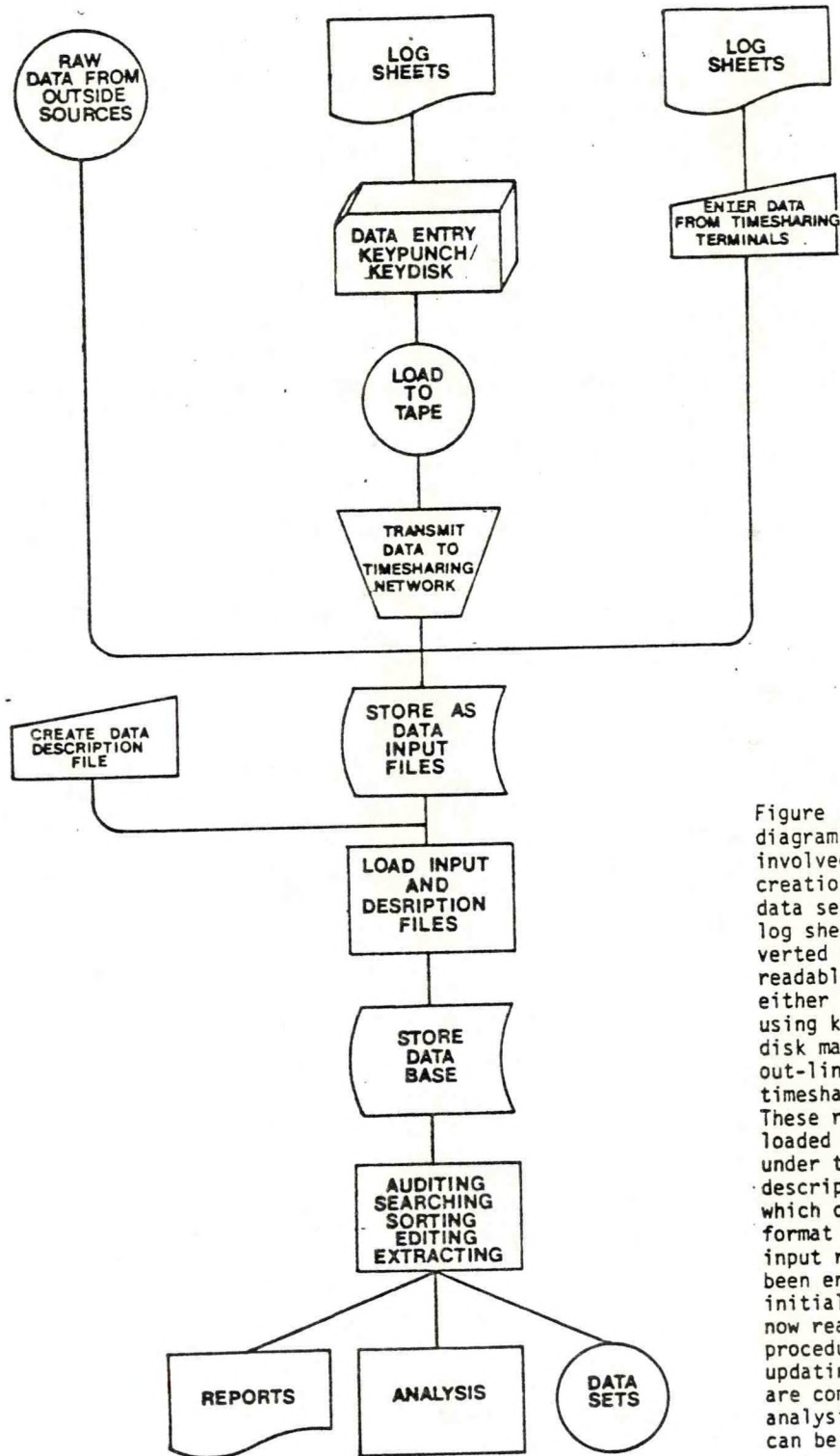


Figure 4. The flow diagram traces the steps involved with the creation of the NEMP data sets. The data log sheets are converted to machine-readable records, either in a batch mode using keypunch or key-disk machines, or in an out-line mode, using timesharing terminals. These records are then loaded to a data base under the control of description files, which contain the format in which the input records have been entered. The initial data base is now ready for auditing procedures. After updating procedures are completed reports, analysis and data sets can be produced

large or complex data bases by insulating the user from the physical structure of the data and removing the burden of programming the data management functions.

The system will organize data into a common and centralized data base. The data base will be an independent resource not tied to a particular application, particular program, or particular access language, and will be organized by related data elements such as cruise, station, and sample number. The files are then accessible by the content or relationship of these elements.

The data base is structured to provide relatively efficient access and update based on data content and data relations. In order to supply this capability, two structures are necessary--a physical storage structure and a logical storage structure. The presence of a logical structure is an important factor in differentiating data base systems from file oriented systems. The logical structure is the means of achieving several of the requirements of a data base system, the requirements being flexibility, independence, and limited redundancy.

Data base management systems provide a means of storing data on an external device in an efficient manner and in a form so that it can be retrieved by a control program or a processing program. Thus, the emphasis is not only on storing and retrieving data but organizing it as well. Both the use and the software programs view the data logically, but these data must be stored physically.

8.7 Data Analysis and Assessment

Baseline data exist for physical, chemical, and biological conditions in the New York Bight--particularly in the heavily impacted Apex area--as a result of studies by NOAA and other agencies. Acquisition of new data from the Bight and other areas through monitoring will enable early detection of possible changes in any of the measured conditions.

Effects on ecosystems or on resource species can be determined through use of monitoring data, augmented by information from resource surveys and assessments and experimental studies. Of great significance are the acquisition and analysis of enough data to enable separation of effects of natural environmental changes from those resulting from man's activities.

Responsibility of initial analysis and assessment of data acquired through the monitoring program will rest with the Program Manager, with due regard to the needs and priorities of each MLC. The Program Manager will also be responsible for any scientific and public dissemination of analyses or interpretations of monitoring data.

The National Oceanographic Data Center, as Program Manager for Section 8 (Dissemination of Information) of P.L. 95-273 will continue work with NEMP management to assure the compatibility of NEMP data and information with the broader requirements of the statute.

8.8 Product Development

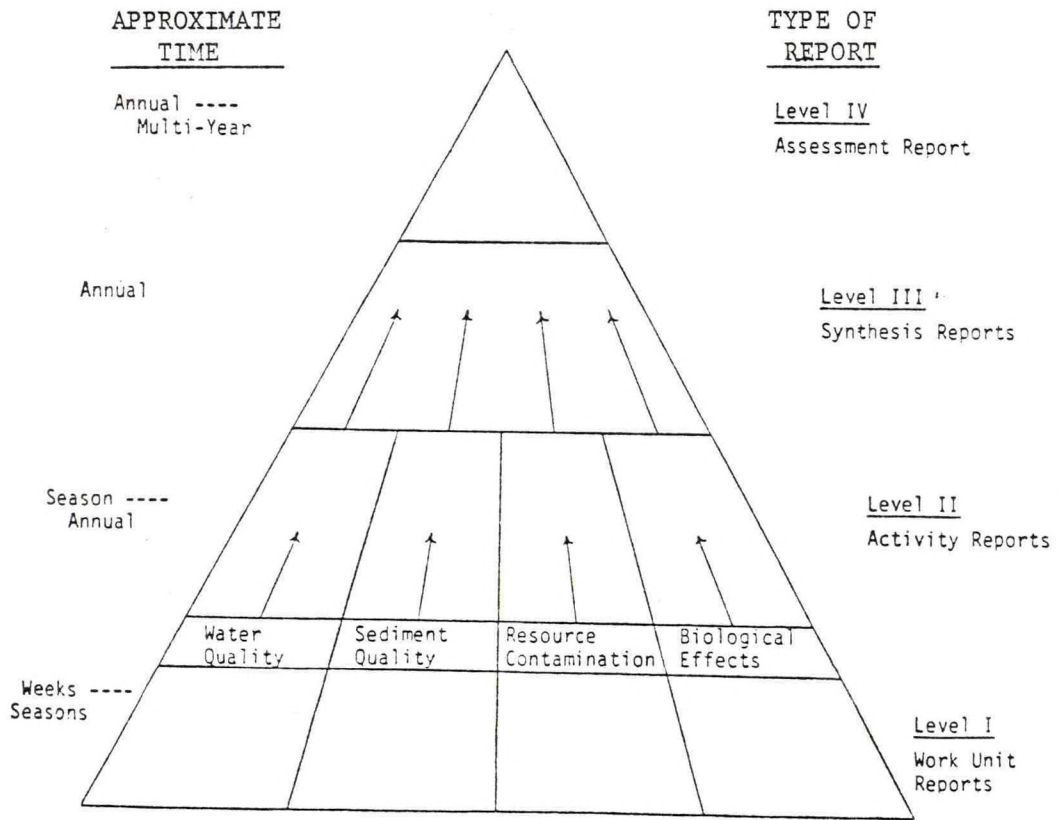
Product development will involve interaction with local, regional, and national users so that data output, analysis, synthesis, and products will meet their needs. A series of regional ocean pollution research, development, and monitoring workshops is being convened by the National Marine Pollution Program Office (NMPPPO) to consider national and regional monitoring needs. Immediate objectives of the workshops are to (1) ensure local and regional scientific, technological, and policy participation in the development of a national framework and logic for ocean pollution research, development, and monitoring and (2) provide scientific and technological input to statements and assessments of ocean pollution research, development, and monitoring needs and priorities in the comprehensive Federal Plan as mandated by P.L. 95-273. A list of users and needs is outlined in Table 1. Products to meet these needs include, but are not limited to:

- o Continuously updated inventory of private industry, local, state, and Federal pollution monitoring programs (possibly contracted to states or included in Sea Grant programs).
- o Regional (local) and national marine pollution monitoring data archival systems.
- o Technical (analytical/assessment) reports addressing management issues related to marine pollution.
- o Unscheduled reports and news releases on apparent consequences of significant environmental and habitat changes of potential pollution crises, and other pollution-related information on an "as-needed" basis.
- o Periodic reports on specific dumpsites and other areas of environmental concern.
- o Annual reports on the state of the coastal marine ecosystem, its resources, and the status of the program.

The NEMP findings must be made available promptly to Government agencies, public interest groups, and academic and industrial groups. The nature of some marine environmental problems dictates that interpreted monitoring results be made available to agencies which are required to take action, and to the public and public interest groups with strong concerns about an issue. In some cases, it may be appropriate to keep these users informed on a daily or weekly basis as monitoring of an event progresses. This demands prearranged communications. More formal interpretive reports of more long-term interests will be made to collaborating agencies and institutions.

As indicated in Figure 5, there will be generally four types or "levels" of reports produced by the monitoring program. Individual program work units will be responsible for preparing the lowest level of report. This will consist of a routine data report. The second level reports will consist of a summary and analyses on a particular topic. The monitoring program as it currently exists has four such areas: water quality, sediment quality, resource contamination,

Figure 5. THE MONITORING LEVEL REPORTS



and biological effects monitoring. Thus, the level two report would be a merger of the level one (work unit) reports.

Level three reports will be a "synthesis" and integration of lower level reports. At this level, information from two independent activities would be combined; also at this level, information from other programs (both NOAA and other agencies) would be incorporated into the NEMP data base and combined with the NEMP data as necessary.

Finally, the level four reports will be the annual assessment of marine environmental quality based on the previous year's field activities. The information flow provided by these level one through four reports, as outlined in Figure 6, will facilitate scientific and management decisionmaking at all levels in the program.

8.9 MLC Responsibility

In FY 1980 three NOAA MLC's combined their activities into a single, unified monitoring program (NEMP). The Office of Fisheries will be the lead MLC for management of the program. Planning, work unit definition, and the preparation of the Technical Development Plan (TDP) will be the responsibility of the Program Manager. The Manager, in consultation with Assistant Program Managers appointed by NMFS, OA, and RD, will solicit and oversee the review of proposals from outside academic and private contractors. Work units from components of F, RD, and OA are also reviewed, appraised, and recommended for funding in a similar fashion. The Program Manager will, in consultation with the Assistant Managers, develop appropriate in-house and outside peer review panels.

Monitoring of contracts will be the responsibility of the Program Manager. In consultation with the Assistant Program Managers, funded contracts and in-house work units will be the responsibility of COTR's appointed by the Program Manager. The NEMP TDP will indicate the designated reporting dates for contractors and work unit principal investigators, as well as the other information required for orderly reporting and dissemination of information to user groups.

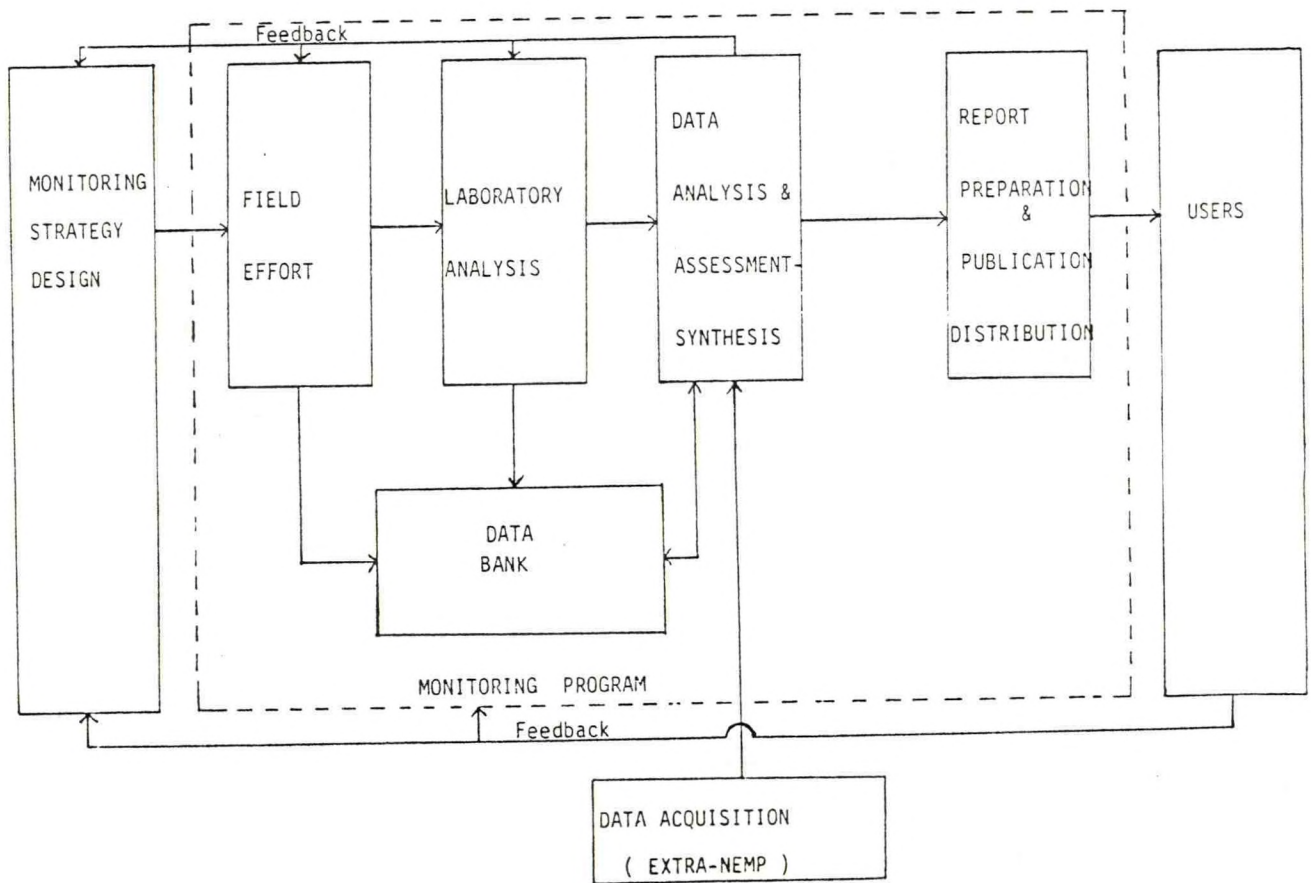
The Program Manager is responsible for liaison with other agencies, but will delegate certain efforts to the Assistant Managers. The Program Manager is responsible for ensuring that proper coordination and communication exist between the overall NEMP and various user groups. This will be expedited through quarterly progress reports, new releases, and management and scientific presentations.

The Program Manager will also be responsible for ensuring that coordination and communication exist among the NEMP elements. Liaison between the NEMP and other Government agencies (local, state, Federal, and international) will be the responsibility of the Program Manager and the NEMP Management Team. The actual interactions will depend on the situations at hand and the needs of a user agency. Appendix I indicates interactions that have occurred with various categories of user groups and monitoring data sources during the development of the Ocean Pulse Program.

Figure 6.

This schematic indicates the sequence of planning; field and laboratory activities; data analyses and syntheses; assessments and predictions; and product dissemination to user groups.

NORTHEAST MONITORING PROGRAM - FUNCTIONAL APPROACH



To ensure appropriate coordination with Sea Grant efforts, the Program Management Team will be responsible for communications with Sea Grant institutions in the Northeast. Moreover, the Management Team will ensure that every attempt is made to take advantage of measurement and monitoring protocols developed for other aquatic pollution monitoring programs.

The Program Manager has the responsibility for the data management aspects of NEMP. Inputs of raw data from personnel working under contracts and from in-house work units will be accessioned in the Sandy Hook Laboratory (SHL) (NEFC/NMFS) computer facility. Data verification and analysis will be overseen by the NEMP Management Team with the assistance of the appointed contract monitors, contractors, and EDIS. Data storage and retrieval will be expedited at the SHL facility.

Data will be sent to EDIS for archiving. Special emphasis and priority required for NEMP data processing and retrieval will have to be supported with project funding.

The Program Manager will have lead responsibility for ensuring the analysis, synthesis, and interpretation of data in conjunction with the Assistant Program Managers. The compilation and dissemination of bimonthly and annual interpretive reports will also be the responsibility of the Program Manager.

Policy oversight and annual review of the program will be the responsibility of the Marine Pollution Board of Directors made up of the Assistant Administrators of F, OA, and RD.

8.10 Interactions with Other Agencies

Successful implementation and continuation of the monitoring program require coordination and close interaction with a large number of Government agencies and nongovernmental institutions concerned with the coastal marine environment of the Northeast. This interaction is required to gain relevant information developed outside NOAA and to transmit monitoring results efficiently to appropriate groups.

For site and problem-specific reasons, several Federal, regional, state, and local agencies already conduct some monitoring activities over limited geographical areas and, often, for only a few parameters. Monitoring activities, ongoing or planned, are being identified so that the NEMP activities can be designed to complement them and, to the extent practicable, to incorporate their results in assessments and syntheses. This will allow NEMP to take maximum advantage of the information available to assess the overall health of the coastal marine ecosystem.

The NEFC and EDIS are conducting an inventory of the monitoring efforts now underway in the northeastern coastal region. Preliminary results indicate that the number of state and local activities that can be classified as pollution monitoring exceeds original estimates. Generally, these activities are riverine, estuarine, or nearshore and concentrate on standard measures of water quality, particularly coliform bacteria and dissolved oxygen concentrations. Arrangements will be made with these agencies to incorporate, on a timely basis, relevant data from these monitoring programs into the NEMP data base. This

offers an opportunity to summarize monitoring observations into a broad perspective for the entire Northeast.

Among the most important interactions will be those with agencies responsible for monitoring contaminant inputs to estuarine and coastal waters. These inputs include domestic and industrial wastes, dredge materials, and urban and rural runoff. Several agencies at all levels of Government are responsible for surveillance of contaminant loadings and are accumulating data which must be aggregated and summarized over the entire Northeast coastal zone. Knowledge of trends in these loadings is essential to continual redefinition of the most appropriate suite of contaminants to monitor and to provide management with knowledge of relationships between changing contaminant loadings and levels in the environment and ecosystem.

These arrangements are exceptionally important because environmental and ecological degradation typically occur first in the estuarine and nearshore coastal regions within the primary purview of these agencies. Interaction with these agencies will include encouragement and assistance in developing effective and efficient monitoring strategies which are comparable to those of adjacent jurisdictions. The NEMP also presently offers the only mechanism for integrating the findings of these many regional and local monitoring programs to provide a broad perspective for the entire Northeast. Recent regional meetings chaired by NEMP personnel have served to coordinate, integrate, and focus several programs, especially in the context of the use of remote sensing activities for pollution monitoring and research.

The NEMP findings must also be made available promptly to governmental agencies, public interest groups, and the public. The nature of some marine environmental problems dictates that interpreted monitoring findings be made available to agencies which are required to take action and to the public and public interest groups with strong concerns about the issue. In some cases it may be appropriate to keep these users informed on a daily or weekly basis as monitoring of an event progresses. Such rapid and efficient communication demands prearranged communications. Formal interpretive reports of more long-term interest will be made to collaborating agencies and institutions.

9.0 FUNDING AND RESOURCES

By redirecting and integrating existing programs within F, OA, and RD, it is possible to effect a total increase in monitoring and research activities, because of the complementary interaction which results when these activities are combined into the Northeast Monitoring Program. The following paragraphs indicate the total resources available to NEMP, stating the present and potential funding, facilities, vessels, and personnel available in each case.

9.1 Funding

The NMFS Ocean Pulse program, which is the principal component of NEMP in FY 1980 and 1981, was funded in FY 1979 at \$250K and in FY 1980 at \$1,280K for monitoring and research. Funds have been provided from RD and OA to support the program in FY 1980, and also in FY 1981. Total FY 1981 funds available to NEMP are \$2,030K. Funds for NEMP will remain in MLC bases. The planned funding beginning in FY 1980 permits an adequate test phase for the program, development and testing of effects monitoring approaches, and a "scale-up" to pilot

operational status in FY 1982. The level of funding at approximately \$2,000K is expected to remain through the 5-year pilot phase of the program, i.e., through FY 1984.

9.2 Facilities

The NOAA facilities available to NEMP are extensive, diverse, and provide for the support of the proposed pilot pollution monitoring and research program. The following paragraphs list the facilities available from the principal NOAA MLC's.

Oceanic and Atmospheric Services (OAS)

There are several organizations within OAS that would provide for support necessary to NEMP. The first is the Test and Evaluation Laboratory (T&EL), in Washington, D.C., which provides for testing and other services necessary to the development of hydrographic measurement programs. This facility is particularly important to users of current meters and similar hydrographic instrumentation.

The Engineering Development Laboratory (EDL), Rockville, is a developmental facility which has capabilities for designing new instrumentation which would be used in pollution monitoring and research programs. This facility has already been involved with the development of new collecting and measuring devices which can provide for in situ measurements for certain contaminants in marine sediments. Both T&EL and EDL are a part of the Office of Ocean Technology and Engineering Services.

Another OAS facility important to the NEMP is the Atlantic Marine Center (AMC) located at Norfolk, Virginia. This is the principal berthing and staging area for the NOAA Atlantic Fleet and offers excellent support opportunities, especially for major investigations and cruise activities in and off Chesapeake Bay.

The Environmental Data and Information Service (EDIS), especially the National Oceanographic Data Center (NODC) and the Center for Environmental Assessment Services (CEAS) will provide support to the NEMP in the areas of data management, analysis, and assessment.

National Marine Fisheries Service (NMFS), Northeast Fisheries Center (NEFC)

The NEFC consists of six major laboratories. Each laboratory has been established with emphasis on particular research and monitoring activities.

The Gloucester Laboratory (Gloucester, Massachusetts) is a fishery technology laboratory with considerable expertise in analytical chemistry, especially organic constituents. The laboratory has sophisticated instrumentation required for rapid analyses of environmental contaminants, including PCB's, DDT, petroleum hydrocarbon toxicants, and other possibly toxic organic substances. The laboratory is capable of dealing with tissue from biological specimens as well as environmental materials such as marine sediments and seawater.

The Woods Hole Laboratory (Woods Hole, Massachusetts) is the NEFC headquarters and the lead laboratory for fishery assessment activities. Data resulting from fishery assessment cruises are processed so that information on

the abundance and distribution of important commercial fisheries can be made available to management groups concerned with fishery allocations and other matters. Data and information report formats are being developed so that fish abundance and distribution information can be easily analyzed in conjunction with habitat quality data.

The Narragansett Laboratory (Narragansett, Rhode Island) is the lead Center facility for plankton research and ecosystems analyses and is the center for experimental work on larval and juvenile finfish. This includes both physiological and biochemical research activities which are being developed to provide tests useful in biological effects monitoring.

The Atlantic Environmental Group is collocated with the Narragansett Laboratory, with a principal mission in monitoring and climatology of the marine environment off the Atlantic and Gulf coasts of the United States. The group also participates in studies of the oceanography of Deepwater Dumpsite 106, in support of the Ocean Dumping Program of RD. The group has the capability to access, process, analyze, and interpret time series sets of marine environmental data to yield portrayals and interpretations of natural variations.

The Milford Laboratory (Milford, Connecticut) specializes in aquaculture and physiological and biochemical studies. The physiological and biochemical monitoring and research activities are conducted under the NEFC Division of Environmental Assessment. New biological effects monitoring techniques are being developed and tested at the Milford Laboratory for inclusion in the NEMP plan.

The principal investigators for genetic studies are located in the Aquaculture Division, Milford Laboratory. In addition to aquaculture research, these investigators deal with the effects of contaminants on chromosomal aberrations, mutagenesis, and cytological changes.

The Sandy Hook Laboratory (Highlands, New Jersey) is the center for ecological, behavioral, microbiological, and larval fish studies ongoing within the NEFC. Benthic research, as well as water column productivity research concerned with the effects of contaminants on biota and biological productivity systems, are centered at Sandy Hook Laboratory. In addition, the Sandy Hook Laboratory is a center for processing, management, and dissemination of environmental data and information.

The Oxford Laboratory (Oxford, Maryland) specializes in pathobiological studies concerned with disease in marine organisms and the development of disease syndromes that are associated with pollution of estuarine, coastal, and shelf waters.

9.3 Research Vessels

Vessels of a range of displacements and configuration are available to the NEMP, ranging in size from 35-foot utility boats to Class II NOAA research vessels. The following is a list of vessels available to the NEMP:

R/V MT. MITCHELL (Class II)

FRV ALBATROSS IV

FRV DELAWARE II

KYMA (65-foot T-boat; Sandy Hook Laboratory)

SHANG WHEELER (45-foot utility; Milford Laboratory)

XIPHIAS (35-foot utility; Sandy Hook Laboratory)

U.S. Coast Guard vessel (200-foot)

LAIDLAY (Office of Ocean Technology and Engineering Services)

Vessel requirements for the program through the pilot phase (FY 1984) are approximately 106 days per year and are allocated according to the following breakdown:

- | | |
|---|----------------------|
| o Four cruises of approximately 8 days each for water column chemistry monitoring in April, June, July, and September | Total 32 Days |
| o Four cruises of approximately 16 days each for regional biological monitoring quarterly in March, June, September, and December | Total 64 Days |
| o One cruise of 10 days for sediment sampling in the New York Bight area | <u>Total 10 Days</u> |
| | Total 106 Days |

The above activities can be performed aboard a vessel of Class II or III with capabilities for stern trawling in the case of the biological monitoring. In addition, a limited number of days are required aboard smaller vessels which can operate on a day-boat basis for nearshore and dumpsite monitoring.

9.3 Personnel

Through redirection and integration of activities in the three MLC's, a varied group of scientific talent has been brought together to be involved with monitoring activities. The scientists to be involved with the NEMP are indicated by MLC.

Program Management:

- F Manager - Fishery Biologist
- Deputy Manager - Oceanographer
- Data Manager - Statistician
- Data Management - Statistician
- Data Management - Data Entry Clerk
- Chief Scientist - Fishery Biologist
- Program Clerk - Clerk
- Information Specialist - Fishery Biologist

- OA Coordinator for Monitoring
Staff Contribution (Assistant Manager)
Physical Oceanographer
Ecologist
- RD Staff Contribution:
Assistant Manager (Ecologist or Oceanographer)
Coordinator for Monitoring (Ecologist or Oceanographer)

Scientific and Technical Personnel (From all Participants):

Biological/Chemical Technician
Fishery Biologists/Microbiologist
Oceanographer
Chemist/Biochemist
Ecologist

9.5 Ongoing Programs

The three principal ongoing NOAA marine pollution programs in the Northeast are:

9.5.1. Marine Ecosystems Analysis (MESA) Program -- New York Bight Project.

The New York Bight Project is a multidisciplinary research and monitoring effort to identify and improve understanding of the physical, chemical, geological, and biological processes within the New York Bight which encompasses the continental shelf ocean region south from Montauk Point to a line east of Cape May, New Jersey. The program consists of a series of integrated and coordinated interdisciplinary projects redesigned for implementation by a number of NOAA elements, other Federal agencies, and academic institutions.

Users of the program data and information include other Federal agencies, such as EPA, DOE, DOI, and USCG; state and local agencies; local governments; industry; environmental groups; and the general public.

9.5.2. Ocean Pulse Program. NOAA, specifically NMFS, has the sole responsibility for the conservation and management of living marine resources and the protection of their habitats. These responsibilities are contained within the statutes P.L. 94-265 and 16 USC 665 described above. To fulfill the needs for information on the status of fisheries populations and habitats in the Northeast region, the Northeast Fisheries Center developed the Ocean Pulse Program. The principal goal of this program is to provide information to resource managers, viz., the regional fishery councils, state/Federal programs, and the NMFS/NOAA Directorate, on the effects of marine pollution on the intrastate and interstate fisheries of this area and their supportive environment. Due to the continued degradation of fishery habitats, the escalating loss of fishing areas, and demonstrated increases in toxicant levels in biota and sediments, the monitoring of long-term trends in populations and pollutants was recognized as essential for determining the economic fate of the Northeast fisheries. The approach would be through the development of an innovative system of biological effects monitoring. This approach would allow for better assessment of the cumulative effects of complex pollutant sources, both present and anticipated. Examples of secondary needs to be fulfilled by the program include corroboration of FDA guidelines, assessment of impacts of Georges Bank oil and gas operations,

direction of research into the fate and effects of pollutants, and provision of information to regulatory agencies, viz., EPA and COE.

9.5.3. Ocean Dumping. The Ocean Dumping Program was established to carry out a comprehensive and continuing program of research and monitoring on the effects of the dumping of waste materials in the ocean. This responsibility is mandated by Section 201 of the Marine Protection, Research, and Sanctuaries Act, as amended.

The current program consists of interdisciplinary scientific research efforts in four specific study areas:

1. Research and monitoring at two deep-ocean industrial waste disposal sites, one about 90 miles east of Cape May, New Jersey, and the other 40 miles north of San Juan, Puerto Rico;
2. Dredged material dumpsite studies in the New York Bight and Chesapeake Bay entrance;
3. Sewage sludge dumping effects and recovery studies at the Philadelphia dumpsite; and
4. Complementary research designed to investigate nonsite-specific chemical toxicity characteristics and toxicant-biota interactions.

The deepsea site projects represent continuations of studies carried out since 1974 at Deepwater Dumpsite 106 and since 1978 off the north coast of Puerto Rico. Research emphasis includes the advection and diffusion of waste plumes, the chemical integration of waste within the marine environment, and the nature of biological responses to waste.

Dredged material studies began in 1978, in cooperation with the Corps of Engineers and the Environmental Protection Agency, in response to specific needs for studies at dumpsites where particular problems exist. The studies combine predumping investigations, experiments during dumping, and examination of cumulative effects.

The Philadelphia sewage sludge dumpsite has been studied by EPA since 1973. Dumping activities should terminate there in September 1980. NOS began work in April 1979 to determine how rapidly recovery takes place.

The complementary studies program began in FY 1979 and is designed to address questions about waste additions to the ocean which cannot be answered by dumpsite-specific studies. It concerns the mechanisms by which various types of contaminants in dumped material can affect ecosystems.

Users of program data and information include a number of Federal agencies such as the EPA, COE, USCG, and FDA; state health and natural resource agencies; the various industry groups involved with ocean dumping; various environmental groups; and the public.

EPA, USCG, and the COE rely on NOAA for assessments of actual or potential harm to marine organisms as a result of a specific dumpsite activity.

10.0 Technical Development Plan Summary

Operational and biological effects monitoring includes measurements which involve observations, experiments, and analyses performed simultaneously within a number of disciplines. Since NEMP has been designed to reveal both short- and long-term effects of pollutants on living resources, it is essential to be able to develop the necessary baselines inherent in responses at several levels of the hierarchy. As previously noted, NOAA has developed several baselines; and the early operational test phase of Ocean Pulse has demonstrated the relative efficacies of biological effects monitoring using behavioral, biochemical, ecological, genetic, pathobiological, physiological, and other measurements.

The core of NEMP is the use of standard measurements of physical-chemical environmental variables and development and use of biological effects measurements. These serve as a data base for indices of ocean health. The file program includes measurements of both kinds of variables at a selected series of stations and strata, at stated time intervals.

The Technical Development Plan (TDP), a separate document, includes: (1) descriptions of the habitats of concern, the resources and their uses, the ultimate impacts of pollution on the resources and human users and a brief overview of the status of knowledge about the habitats and resources; (2) detailed work unit descriptions for in-house and contract tasks as well as information on funding and milestone; (3) discussion of the overall management of the program, as well as the day-to-day management activities concerned with the individual work units, and the details related to data analysis, reporting and dissemination of results; and (4) references to national and international reports and papers concerned with the implementation of marine pollution monitoring programs and the protocols and standard methods necessary to the conduct of operational and effects monitoring.

Appendix I. In the development of the NEFC Ocean Pulse monitoring and research program, numerous user groups and providers of data have been interviewed in regard to their data needs and the nature of the program which should evolve as a result of planning for long-term operational and biological effects monitoring.

The table indicates the range of participants involved in seminars and important exchange activities, but is by no means inclusive of all individuals and organizations contacted to date.

● Commitment-funds
○ Tentative Commitment

○ Commitment-no funds
▲ Interested (proposal)

△ Tentatively interested

Organization	Project Leader(s)	Support \$	Sampling Area	Research Subjects	Type of Cooperation
EPA-Narragansett ●	E. Schneider	EPA	Northeast coast continental shelf	Mussel Watch - CESS water quality	Exchange of data
EPA-Region III ▲	L. Manganeria	EPA	Chesapeake Bay	Eutrophication, toxic algal blooms	Coop with Oxford Lab (NEFC) and Ches. Res. Cons.
EPA-Corvallis, OR ○	R. Swartz	None	Coastal area off Fire Island, NY	Benthos	Will supply baseline data - O.P. has already picked up area as sampling site (Apr '78)
HEW-FDA ●	J. Verber J. Gaines	FDA	New York Bight	PCB's in shellfish near dumpsites	Vessel support and exchange of data
U.S. Navy Oceanographic Research Lab, Wash., DC ▲	J. Hanon	U.S. Navy	Continental shelf	Primary produc- tivity/pollution	Exchange of data
U.S. Army COE, Phila. Distr. △		U.S. Army COE	Delaware River and Bay	Water quality	Exchange of data
U.S. Army COE, N.Y. Distr. ▲	D. Suszkowski	U.S. Army COE	New York Bight apex dredge spoil dumpsites	Heavy metal burdens in fish and shellfish, also pesticides and other con- taminants	Exchange of data
N.J. DEP ●	F. Tackas R. Tucker P. Hamer	N.J. DEP	N.J. coastal waters	Phytoplankton population Chemical compo- sition Fisheries	Past and current exchange of data; future exchange of data
Interstate Sanitation Commission △		N.J./N.Y.	Estuaries and rivers	Water quality	Exchange of data
Univ. Mass., Dartmouth ▲	J. Sears	NOAA-MUST (?)	Jeffries Ledge	SCUBA monitoring of benthic communities	Coop. with R. Cooper
Univ. Conn. Mar. Adv. Ctr. ▲	L. Stewart	NOAA	Long Island Sound	Benthos - SCUBA	Offered to organize O.P. coop. research in Long Island Sound
Univ. Conn. ▲	S. Feng	proposal	Long Island Sound	Heavy metal burdens in fauna	Past coop.
Univ. R. I. ▲	E. Anderson	NOAA-MUST (?)	Long Island and Jeffries Ledge	SCUBA monitoring of benthic communities	Coop. with R. Cooper, Woods Hole (NEFC)
SUNY Stony Brook △	L. McHugh	proposal	East coast	Long-term fishery trends related to water quality	Contract or con- sultant if O.P. funding available

SUNY Stony Brook ▲	C. Wooster M. O'Connor J. Schubel	\$3K NMFS + other proposal	Long Island Sound and other coastal and estuarine areas	PCB's trophic effects/phyto- plankton	When more \$ become available this could be O.P. PCB's monitoring group
Bigelow Lab Maine ▲	P. Larsen		Gulf of Maine	Benthic ecology	Possible Gulf of Maine O.P. coop. organizer
Brookhaven Nat'l. Lab. ▲	F. Barvenik J. Walsh		Middle Atlantic Bight	Microbiology phytoplankton, prod. systems	Proposal available for funding
N.Y. Zool. Soc. Osborn Lab ○	P. Burn	Vessel- NMFS \$(?)	Coastal area of NE region	Parasitology of flatfish - as related to environmental stress	Exchange of data - use of vessel and equipment
N.J. Mar. Sci. Consort. Highlands, N.J. ●	S. Koepp S. Cheng J. Weis	N.J. DEP Contract	N.J. estuaries and coastal bays and rivers - 41 sites	Heavy metals and organic contami- nants in aquatic fauna, esp. fish and shellfish	Mutual exchange of data; if DEP \$ dries up may be contractual support
N.J. Mar. Sci. Consort. Highlands, N.J. ●	G. Moulter	N.J. Sea Grant	Hackensack River, N.J.	Heavy metal enrichment of sedi- ment and fauna/ oil in sediments	Mutual exchange of data
Chesapeake Bay Res. Consort. ▲	E. Cronin	proposal	Estuarine and coastal areas	Flexible	Will submit proposals if funding becomes available
Exxon ●		Exxon	New York Bight - Raritan Bay	Petroleum contamination	Past coop.
CCNY New York City ▲	J. Tietjen J. Lee E. Small	proposal	New York Bight	Meiofauna	Past coop.
Rutgers Univ. N. J. ●	C. Litchfield	proposal	Raritan Bay - New York Bight	Microbiology	Past coop.
Univ. of Del ▲	D. Maurer L. Sick J. Wethe	none - proposal	Georges Bank, Delaware Bay and "offing"	Assoc. of oceanog. frontal system and trace metal distribution/ nutrient flux and sec. prod. of benthos	O.P. could fund proposal when \$ become avail- able to do this
Old Dominion Coll. ●	H. Marshall	none - proposal	Coastal and oceanic east coast	Phytoplankton - population shifts related to water quality	Proposal avail- able for funding - past history of NMFS coop.

● Commitment-funds
○ Tentative Commitment

() Commitment-no funds
▲ Interested (proposal)

△ Tentatively Interested

Organization	Project leader(s)	Support \$	Sampling Area	Research Subjects	Type of Cooperation
NOAA-NMFS-NEFC Narragansett Lab ●	G. Lawrence	NOAA-NEFC	Laboratory study	Physiology of larval fish	O.P. participants
NOAA-NMFS-NEFC Milford Lab ●	A. Calabrese	NOAA-NEFC	All OP strata	Physiological response of marine organisms to environmental stress	O.P. participants
NOAA-NMFS-NEFC Milford Lab ●	R. Greig	NOAA-NEFC	All OP strata	Chemistry of stressed environments	O.P. participants
NOAA-NMFS-NEFC Milford Lab ●	A. Longwell	NOAA-NEFC	All OP strata	Mutagenetics	O.P. participants
NOAA-BNFS-NEFC Sandy Hook Lab ●	B. Olla	NOAA-NEFC-ERDA	New York Bight	Behavior	O.P. participants
NOAA-NMFS-NEFC Sandy Hook Lab ●	W. Phoel	NOAA-NEFC	NE continental shelf	Seabed oxygen consumption	O.P. participants
NOAA-NMFS-NEFC Sandy Hook Lab ●	R. Reid	NOAA-NEFC	NE continental shelf	Benthic community response to environmental stress	O.P. participants
NOAA-NMFS-NEFC Oxford Lab ●	A. Rosenfield	NOAA-NEFC	Chesapeake Bay, NE continental shelf, New York Bight	Pathology	O.P. participants
NOAA-NMFS-NEFC Sandy Hook Lab ●	W. Smith	NOAA-NEFC	NE continental shelf	MARMAP ichthyoplankton survey	O.P. participants
NOAA-NMFS-NEFC Sandy Hook Lab ●	J. Thomas	NOAA-NEFC	NE continental shelf	Primary productivity	O.P. participants
NOAA-NMFS-NEFC AEG Narragansett Lab ●	M. Ingham	NOAA-NEFC	East coast	Long-range oceanographic-meteorological relationships	O.P. participants
NOAA-NMFS-NEFC Woods Hole Lab ●	B. Brown	NOAA-NEFC	East coast	Resource assessment of fisheries stocks	O.P. participants
NOAA-NMFS-NEFC Woods Hole Lab ●	R. Cooper	NOAA-NEFC/MUST	Continental shelf	Diving as research tool	O.P. participants
NOAA-NMFS-NEFC Woods Hole Lab ●	G. Kelly	NOAA-NEFC/DEA	Georges Bank, Gulf of Maine	Fisheries, water quality	O.P. participants
NOAA-NMFS-NEFC Woods Hole Lab ●	R. Wright	NOAA-NEFC	Georges Bank	Oceanography, currents	O.P. participants
NOAA-NMFS-NEFC Narragansett Lab ●	J. Casey	NOAA-NEFC	NE continental shelf	Apex predators	O.P. participants
NOAA-NMFS-NEFC Gloucester Lab ●	L. Ronsivalli	NOAA-NEFC	NE continental shelf	Heavy metal burdens in organisms	O.P. participants
NOAA-MESA New York Bight Project ●	L. Swanson J. O'Connor	NOAA	New York Bight	DO - hydrography - nutrients, metals, sediment, coliform, benthos (NMFS), faunal contamination	This project will be nested within, and be a part of OP participants
NOAA-NOS ●	T. O'Connor	NOAA-NOS	DWD 106	Disease, chemistry, genetics, physiology, plankton, sediments, benthos	Integration and exchange of data
NOAA-NOS ○	A. Malahoff	NOAA (\$2.5 x 10 ⁶)	Coastal and oceanic coast	Physical/chemical oceanography	Integration and exchange of data