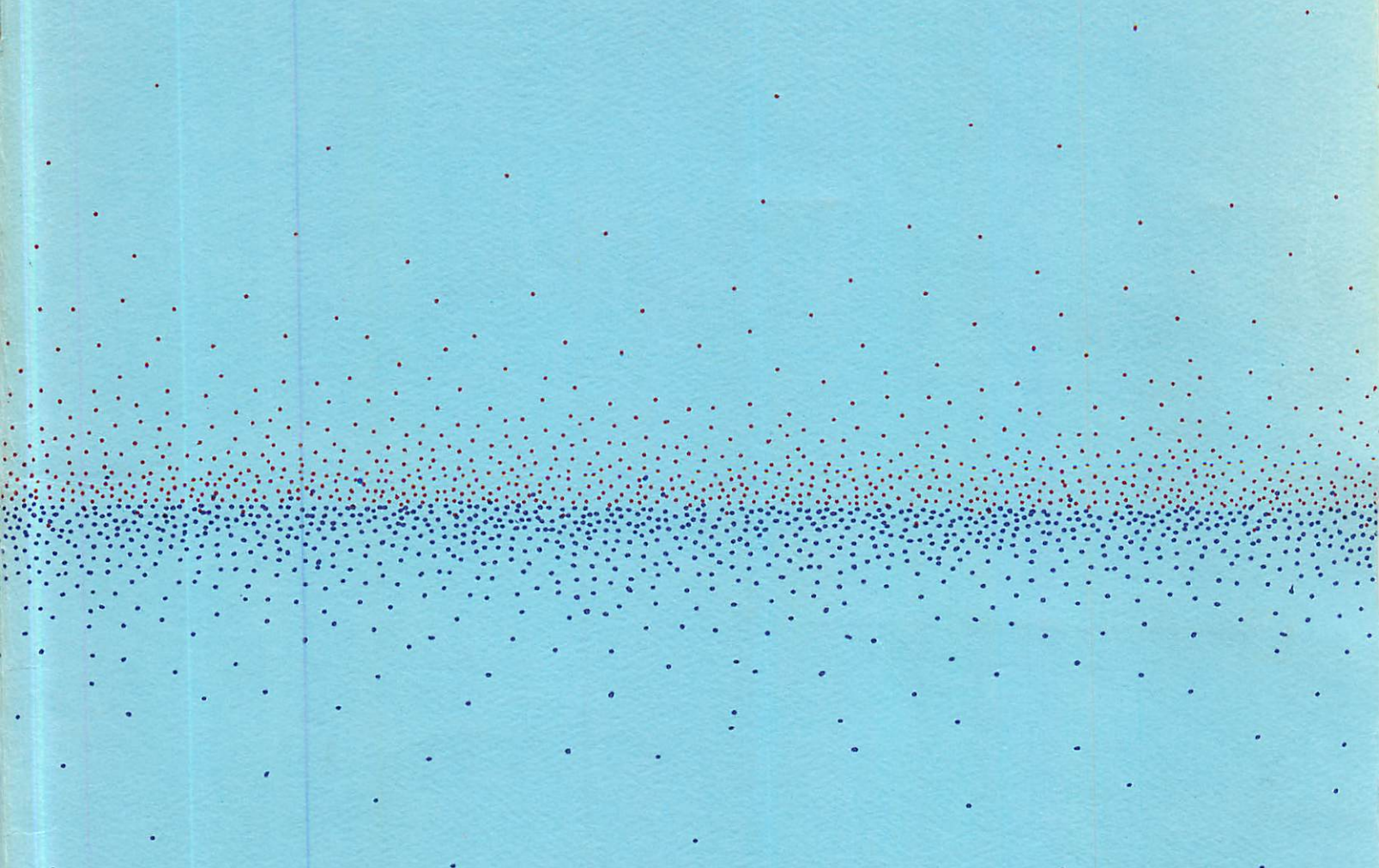
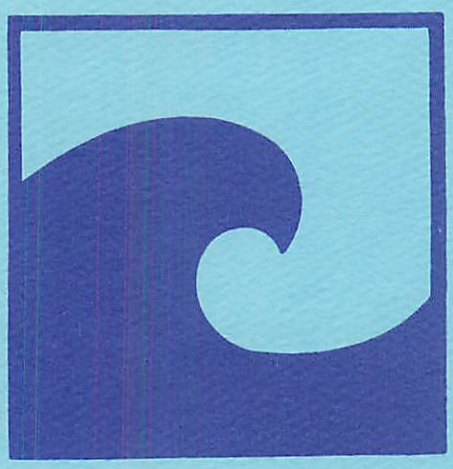
State University of New York
and
Cornell University

New York Sea Grant Institute



Annual Report 1973-1974

A Report on the New York State Sea Grant Program from October 1973 to November 1974



NEW YORK SEA GRANT INSTITUTE

State University of New York
99 Washington Avenue
Albany, New York 12210
518/474-5787

Cornell University
Fernow Hall
Ithaca, New York 14853
607/256-2162

ANNUAL REPORT CREDITS

Frances Richardson, Orville Terry *writers/editors*
Mimi Kindlon *cover design*
Suzanne Servis *maps and diagrams*
Graphic Arts *production*
Central Administration Print Shop

Introduction

NYS Dept of Commerce

Transatlantic piers, Hudson River, New York City

This annual report covers the third successive year of institutional support to the State University of New York/ Cornell University consortium under the New York Sea Grant Program. During this year New York Sea Grant matured in three important ways:

1) Expanding productivity of the research program was demonstrated by increasing numbers of publications important to governmental agencies and industry;

2) Our Advisory Service program broadened its base and now has a full complement of regional offices. This was accomplished without sacrificing the quality of the program or its personnel. Under the able leadership of Bruce Wilkins, our Advisory Service is now one of the finest in the nation;

3) The success of the consortial relationship between the campuses of the State University system and Cornell University, the land grant college of the state, was marked by the authorization of the Boards of Trustees of both institutions to create the New York Sea Grant Institute.

These accomplishments are the results of the efforts of a large number of persons whose contributions are easily lost in the swirl of activity of our lives. It is important to record these contributions, for they represent the strength of the Program and the dedication of all involved in its development and guidance. Paramount to the success of the New York Sea Grant Program has been the contribution of its Atlantic Advisory Council under the chairmanship of Claire Stern and of its Great Lakes Advisory Council under the leadership of Thomas Dyer. These councils have guided the Program and spurred its leaders on to making it responsive to the needs of the state, its citizens, and its industries.

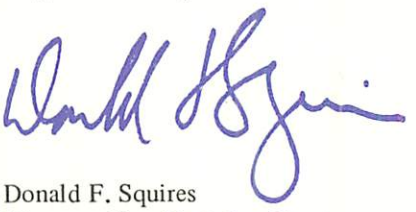
We have also been fortunate in having a Governing Board composed of thoughtful academic administrators who have not succumbed to the blandishments of conventional university wisdom, but who have reacted imaginatively to the opportunities presented by Sea Grant in New York to create a wholly new academic enterprise. At all times the Governing Board has required responsiveness of Program leaders to the guidance of the Advisory Councils, and has insisted on highest-quality research.

Finally, our continuing search for the best people in the university community who would turn their thoughts to the problems of the coastal zone has been fruitful; our researchers have begun to produce studies of great importance to the region. The integration of these researchers and Advisory Service personnel has been particularly effective in translating research results into immediate action. The energy of our Advisory Service specialists in getting out and meeting with the public and with representatives of government and industry forms the final linkage in the system by which Sea Grant delivers new ideas and concepts to the community.

We have not yet completely and effectively closed the communication loop between those in industry or the community with a "need to know" and those in the university who can provide the required knowledge, but a propitious beginning has been made. The accomplishments of the Program are now demonstrable and Sea Grant is, indeed, a presence in the state – a presence that we hope will continue to serve people. This is the role Congress saw as the ultimate objective of the National Sea Grant College and Program Act of 1966.

To those unfamiliar with the intricacies of academic structure, the transition of Sea Grant from a "program" to an "institute" may be confusing. Briefly, what has occurred is that process known as "institutionalization" – the change from an ad hoc state to one of permanency. The formation of the Sea Grant Institute accomplishes the objectives of recognition and structural refinement. By resolution of the respective Boards of Trustees, the chancellor of the State University of New York and the president of Cornell University were authorized to create an organization to be known as the New York Sea Grant Institute, which would be a recognized entity of both universities. The two institutions would share responsibility for the Institute and participate equally in its governance. This is indeed a significant accomplishment: a public and a private institution have agreed to share resources in attaining a common goal – in this case, improving the marine resources of New York State.

While those close to the Sea Grant Program have been aware of its considerable growth and achievements, these have not gone unnoticed externally. On January 18, 1975, shortly after the period covered by this annual report, Chancellor Ernest Boyer of State University and President Dale Corson of Cornell were notified by US Secretary of Commerce Frederick Dent that under the terms of the National Sea Grant Act, the SUNY/Cornell program qualified for designation as the eighth Sea Grant College in the nation. Secretary Dent's letter stated: "The State University of New York and Cornell University in three years of operating as coequal partners under the Sea Grant Program have mounted very strong programs of applied research, education and training, and advisory service in marine affairs, of which you can be very proud." Designation as a Sea Grant College is the highest form of recognition by the federal government of a Sea Grant program. It was the appropriate culmination of an exciting year of challenge and development.



Donald F. Squires
Director, New York Sea Grant Institute

Cooperative Arrangements of the NY Sea Grant Institute

AGENCIES AND GOVERNMENTS PARTICIPATING

Federal Departments and Agencies

US Army Corps of Engineers
Council on Environmental Quality (CEQ)
Environmental Protection Agency (EPA)
US Coast Guard
National Marine Fisheries Service – Woods Hole
National Marine Fisheries Service – Mid-Atlantic Fisheries Center
Atlantic Oceanographic and Meteorological Labs
National Science Foundation – Oceanographic Section
Marine Eco-Systems Analysis (MESA)
US Geological Survey – Woods Hole
Brookhaven National Laboratory

State Departments and Agencies

Public Service Commission (PSC)
Office of Parks and Recreation (OP&R)
Department of Environmental Conservation (EnCon)
Office of the Scientific Adviser, NYS Assembly
Office of Planning Services (OPS)
Department of Commerce
4-H Office
NYS Historical Association
Port of New York and New Jersey Authority
Pennsylvania Cooperative Extension Service
Office of General Services

Regional Groups

Long Island Environmental Council
Nassau-Suffolk Regional Planning Board, Regional Marine Resources Council
Suffolk County Department of Parks and Recreation
Erie–Niagara Counties Regional Planning Board
Genesee/Finger Lakes Regional Planning Board
Allegany State Parks Commission
Chautauqua County Department of Planning
Erie County Planning Board
Southern Tier West Regional Planning Board
Dunkirk–Fredonia Regional Planning Board
Buffalo Chamber of Commerce
Fire Island Association, Inc.
Niagara County Farm Bureau
St. Lawrence–Eastern Ontario Commission
Long Island Fisherman's Association
NYC Department of Environmental Protection

International Entities

Canada Centre for Inland Waters
Ontario Ministry of the Environment

INDUSTRIES PARTICIPATING

Direct Participants

Palmer's Fish Market
Rochester Gas and Electric Company
Shelter Island Oyster Company
Wright Malta Corporation
Saratoga Associates
Wallerstein Company
Seneca Food Corporation
Long Island Oyster Farms, Inc.
Cooper's Fish Products, Co.
Niagara Mohawk Power Corporation
Frank M. Flower & Sons, Inc.

Members of Advisory Councils

Hutchinson's Boat Works, Inc.
Fredonia Products, Inc.
Moran Towing and Transportation
Grumman Aerospace Corporation
Oceanographic Fund, Inc.
O'Brien and Gere Engineers, Inc.
Reilley, Like, Schneider
Great South Bay Farmer's Cooperative Association, Inc.
Long Island Lighting Co.
Bluepoint Company

Governing Board and Advisory Councils

GOVERNING BOARD

Albert M. Ammerman
President, Suffolk County Community College

Albert W. Brown
President, State University College at Brockport

W. Donald Cooke
Vice–President for Research, Cornell University

Bruce Dearing, *ex officio*
Vice–Chancellor for Academic Programs, State University of New York

Henry Diamond
Commissioner, NYS Department of Environmental Conservation

J. Sherwood Dunham
Vice–President for Academic Affairs, State University College at Oswego

E.K. Fretwell Jr.
President, State University College at Buffalo

S. Stewart Gordon
Vice–President for Long-Range Planning, State University at Binghamton

W. Keith Kennedy, chairman
Dean, NYS College of Agriculture and Life Sciences at Cornell University

Robert Ketter
President, State University at Buffalo

Neal L. Moylan
Commissioner, NYS Department of Commerce

Daniel Murray, *ex officio*
Provost for Graduate Studies and Research, State University of New York

T. Alexander Pond
Executive Vice–President, State University at Stony Brook

ATLANTIC ADVISORY COUNCIL

Lawrence A. Bertholf
Great South Bay Farmers Cooperative Association

John Binner
Sportsmen's Council

Thomas Bishop
Moran Towing and Transportation

Matthew Cardaro
Long Island Lighting Company

Robert Cook
NYS Department of Environmental Conservation

Leo Geyer
Grumman Aerospace Corporation

Harry Kilthau
Long Island Waterfowlers Association, Inc.

Lee E. Koppelman
Nassau–Suffolk Regional Planning Board

Stephen Lane
Bluepoints Company

Irving Like
Reilley, Like, and Schneider (attorneys-at-law)

Edward Miller
Marine insurance

Richard Miller
Long Island Fisherman's Association

G. Stanley Platt
Oceanographic Fund, Inc.

Claire Stern, chairwoman
Long Island Environmental Council

GREAT LAKES ADVISORY COUNCIL

Leonard T. Crook
Great Lakes Basin Commission

Stuart Denslow
Genesee/Finger Lakes Regional Planning Board

Thomas Dyer, chairman
Attorney-at-Law

Irene Gossin
Supervisor, Town of Penfield

Gordon Haseley
Niagara County Farm Bureau

Keith R. Hopkins
Niagara Frontier, NYS Parks and Recreation Commission

Royal LaLonde
Hutchinson's Boat Works, Inc.

W. Mason Lawrence
NYS Department of Environmental Conservation

Paul H. MacClennon
Buffalo Evening News

Dennis Rapp
NYS Public Service Commission

G. Keith Rodgers
Canada Centre for Inland Waters

Leonard Starr
Fredonia Products, Inc.

William A. Steggles
Ontario Water Resources Commission

Joseph C. Swidler
NYS Public Service Commission

William E. Tyson
St. Lawrencce–Eastern Ontario Commission

Marjorie Vesley
Lake Erie Basin Committee, League of Women Voters

Samuel Williams
O'Brien and Gere, Inc. (consulting engineers)

Focus on Coastal Planning

A primary theme of Sea Grant in New York has been making people more aware of their coastal zone and helping state government develop a coastal zone management plan. New Yorkers have historically neglected coastal problems. Sea Grant has therefore engaged in "consciousness-raising," and will continue to do so, among citizens and governmental bodies. This activity takes diverse forms: developing public awareness of the coastal region's potential as a recreational resource with real economic value, a major project of Advisory Service; and working closely with state agencies and the state legislature to encourage state go-ahead with coastal zone management initiatives, a major project of the research program.

Sea Grant continued its emphasis on developing awareness in Year III, now that the state has moved officially toward coastal zone planning. Sea Grant people have interacted closely with state agencies and also with local governments and communities. In a decentralized government such as New York's, this is the best practical strategy to follow. Only by patient explanation and full discussion can people's and governments' fears of state encroachment on their tradition of "home rule" be allayed. Effective coastal planning will necessarily incorporate local concerns, perhaps representing them even better than the traditional forms of decision-making have in the past.

Coastal Zone Task Force

Keynoting the 1973 Sea Grant Coastal Zone Conference, former state Assembly Speaker Perry Duryea invited Sea Grant's participation in preparing New York's response to the federal Coastal Zone Management Act of 1972. Sea Grant's Coastal Zone Task Force – led by Paul Marr, Richard Nunez, and Joseph Heikoff – accepted that invitation and have been actively helping coordinate the state's own work on a coastal zone program and doing necessary background research. Much of their most effective and important work has consisted of intangibles – arranging and attending meetings, conferring with state, federal, and local officials, and with the public – but among tangible results is a series of papers on three crucial aspects of the coastal zone problem.

OUTLINE OF A COASTAL ZONE PROGRAM FOR NEW YORK STATE

Paul Marr of the Department of Geography, SUNY at Albany, outlined the general context within which a New York coastal zone program will have to evolve.

The Coastal Zone Management Act of 1972 has a long list of significant antecedent federal legislation, from the Rivers and Harbors Act of 1899 to the Stratton Commission, created in 1966. The 1972 act was passed, fittingly, as an amendment to the legislation creating that commission. Emphasis in both the commission's report and the act was on implementation, as distinct from planning – the word used was "management." The act finds present management policies inadequate and goes on to identify state authority, in cooperation with federal and local governments and other interests, as the key to future effectiveness.

State implementation of the act is in two phases: program preparation and administration, both funded up to two-thirds from federal sources. Through its Office of Planning Services (OPS), New York was awarded a grant of $550,000, effective November 1, 1974, for the first year of work. This year, and succeeding years of developmental work, will be directed toward six requirements:

1) Identify boundaries of the coastal zone
2) Define uses that have an impact on the zone
3) Inventory areas of particular concern in the zone
4) Identify means by which the zone will be managed
5) Set priorities for uses of the zone
6) Describe an organizational structure for zone management.

Major participants in the work are the state agencies, regional planning commissions, local governments, and the academic community (including Sea Grant). Special projects will be carried out by particular agencies and especially by local government. Sea Grant's role will be twofold: to coordinate and meet research requirements in the physical and social sciences, and to open communication lines between management efforts and the public through its Advisory Service.

The geographical focus of coastal planning is something new: it will include not only the traditionally planned upland but also previously unplanned water areas. New information will be required, and also a new way of working with local government, which has a history of opposition to higher-level interference with home rule. OPS is conscious of local sensitivity to these changes and realizes the necessity of including local interests in the planning process; grant funds are therefore being shared with local and regional agencies to encourage their participation.

The 1972 act is certain to have an impact on coastal planning regardless of how it's implemented. Localities

will be forced to accept state decisions that they themselves have customarily made. The state will have to realize its broad policy responsibilities in the coastal zone, while maintaining flexibility and considering local interests.

Cataloging Coastal Jurisdictions

The Coastal Zone Management Act is relatively new, but governmental programs that affect the coasts are long established and complex. Coastal planners and researchers are confronted by a variety of programs, from fisheries management to water pollution control to port development. At present, New York's coastal zone has over 75 international, federal, interstate, state, and regional agencies operating on the Great Lakes and marine shorelines.

This maze can hinder work on comprehensive coastal management. To clarify responsibilities of the myriad agencies, Paul Marr and Eugene Schuler compiled a quick-reference document, that summarizes the legal authority of each governmental program, the geographical extent of its jurisdiction, its functions, and other information of interest to planners, researchers, and public interest groups.

Agency activities are continually changing in response to new executive and legislative initiatives. Therefore, Marr and Schuler expect to be revising this study periodically.

EXISTING LEGAL STRUCTURE

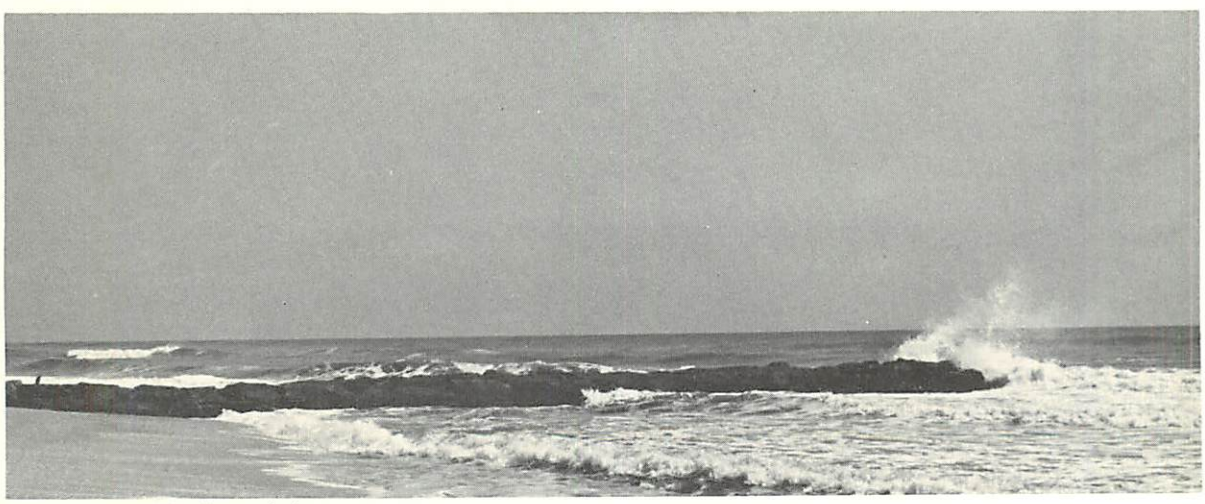
Richard Nunez and Peter Bluhm of SUNY at Albany's Graduate School of Public Affairs have summarized the legal structure that currently regulates coastal zone matters in New York State. This is the foundation upon which new coastal management legislation must build.

They found a profusion of unique laws supporting local shoreline control, many dating back through earliest colonial times to the common law of England. Water and shore rights were matters of great practical importance to the colonists, and the legal mechanisms that evolved to insure these rights have survived, often beyond their real usefulness.

Based on 200-year-old English common law, the courts distinguished a series of naturally defined zones at the edge of tidal waters: "underwater lands" (continuously submerged), "foreshore" (between mean low and mean high water lines), "dry sand area" (between mean high and extreme high water), and "uplands" (never inundated at normal water levels, unless in the most severe storms). At the natural boundaries between these zones, the rights of government and of private landowners change significantly. Not all government lands are owned in the traditional sense; some are held under common law restrictions. Thus the phrase "state land" is imprecise.

The foreshore is the zone that has aroused the most litigation. Rights there fall into three classes: 1) *jus publicum,* the rights of the public to use the foreshore; 2) *jus privatum,* the rights of the owner; and 3) "riparian rights," the rights of the adjoining upland owner to water access. *Jus publicum* rights include navigation at high tide and access at low tide for "lawful purposes." Whether these navigation rights extend to non-navigable waters is a complex matter still not fully resolved. *Jus privatum* rights in the foreshore are subject to *jus publicum* and riparian rights. The courts have often extended New York riparian rights to include the building of structures such as docks out to adjacent deep water.

There are further complications in foreshore ownership. Shorelines are dynamic, not static. Beaches erode or accrete, storms alter the shape of the land, and over a period of years the entire shoreline may gradually rise or fall relative to the level of the water. Because of the complex interplay of rights and uses in the foreshore zone, the doctrine of "adverse possession" can affect ownership. This doctrine means that under certain conditions a person (or the public) can claim ownership of land simply because he



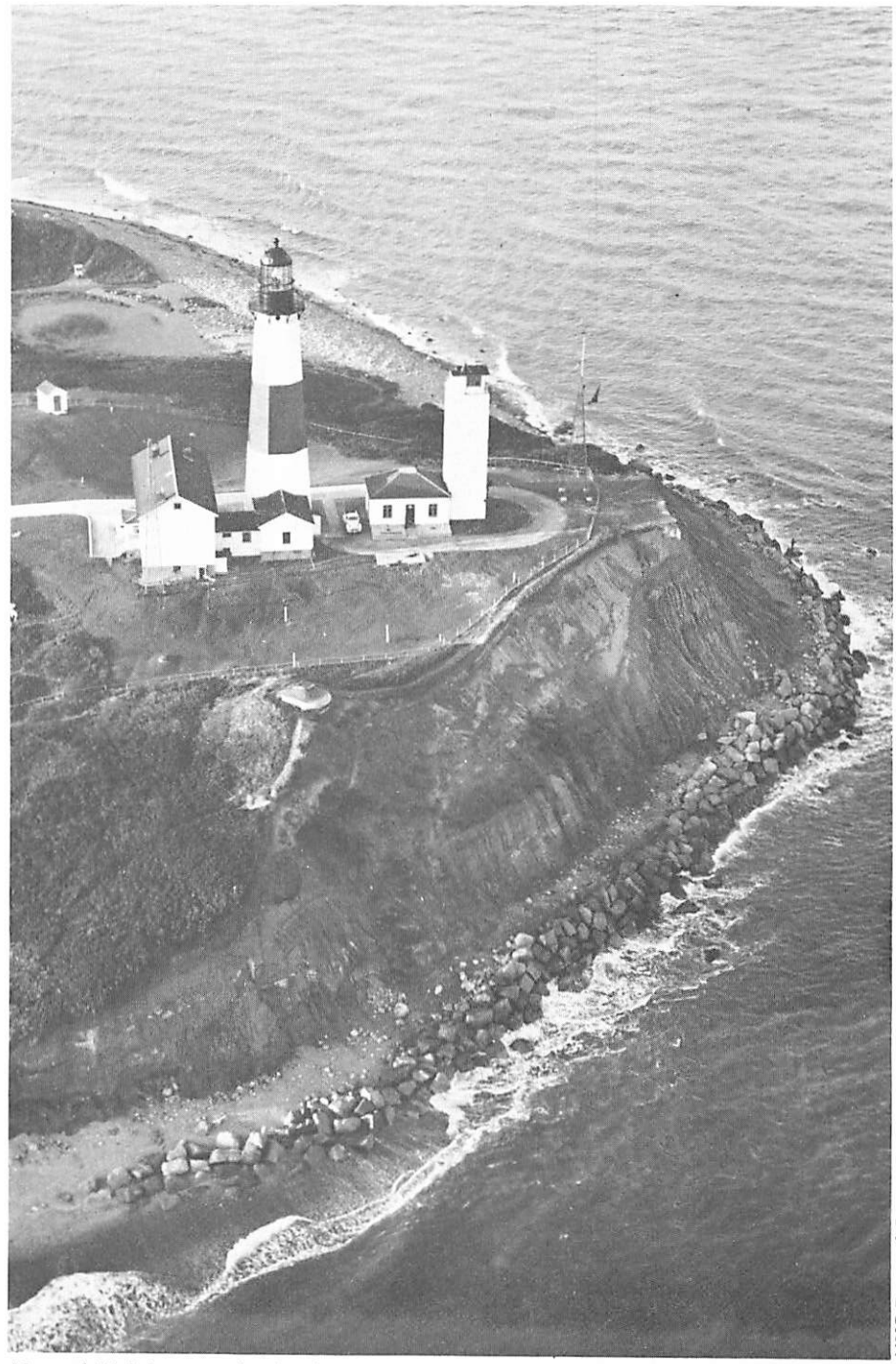
Groin on Long Island's south shore

has used it regularly for a long time. Adverse possession does not generally apply to land owned by the state as a public trust, however. In New York's coastal zone there is still considerable uncertainty as to the precise nature of municipal ownership based on the original colonial patents, although such ownership is generally assumed to have been retained by the town.

The rights of local government, including special rights in the shore zone, are based on articles of New York's constitution, yet court interpretations and 1963 constitutional revisions suggest that home rule is unlikely to interfere seriously with the functions of a coastal management agency.

The NYS Department of Environmental Conservation (EnCon) is statutorily charged with carrying out the environmental policy of the state. This role naturally includes pervasive powers in the coastal zone. The 1973 Tidal Wetlands Act further strengthened these powers, as have federal water pollution laws. EnCon has also been given a number of specific powers, such as classifying waterways and determining standards for discharges into them, inspecting privately owned facilties, seeking criminal convictions and levying fines. These powers were derived from the Conservation Law, the Public Health Law, the Agriculture and Markets Law, and the Executive Law.

Nunez and Bluhm conclude that there are confusing and apparently conflicting laws dealing with the relationship among the various governmental levels. Political considerations are sure to have a significant bearing on the implementation of any changes in coastal management practice. But the researchers feel that local government cannot effectively challenge the state's authority to institute coastal zone management if it ultimately chooses to exercise that authority.



NYS Dept of Commerce

Montauk Lighthouse at the tip of Long Island guards the shipping lanes to New York Harbor.

EROSION ON WESTHAMPTON BEACH: A CASE OF INTERGOVERNMENTAL CONFLICT

Passage of the 1972 Coastal Zone Management Act accelerated a national trend in land-use management policy away from the old private-property-oriented attitudes. One rationale for this change, and for the act, was that higher levels of government are thought likely to recognize a larger public interest, which may differ from parochial concerns of local groups.

Recent public concern for the environment and its intelligent preservation has also been a powerful motivating force toward change.

A classic example of conflict among governmental agencies, each with its own interest in the coastal zone, has arisen in the management of Long Island's seashore. Erosion control and beach preservation are far from exact sciences, but geologists and engineers now know a great deal about the processes involved and their interactions. The controversies over shore and beach management arise less out of technical disagreements than out of clashing interests in the outcome of any given management decision. Even different groups within a single governmental level have locked horns.

Man's influence has produced well-documented changes in the eroding Westhampton Beach on Long Island's south shore. We know that jetty-stabilized inlets trap sand, removing it from the drift system. We also know that stabilizing beaches temporarily with groins prevents natural erosion, but at the expense of the downdrift beaches whose sand supply is thus intercepted.

There are two main reasons why vested interest groups oppose allowing natural beach erosion and rollback to continue on the south shore. First, owners of private homes and public facilities in the beach zone have a personal interest in diverting natural erosion from their own area to some other section of beach. Second, the inlets are used constantly as boat channels. Building jetties and dredging to maintain these channels benefits boat users but usually at the cost of increased erosion on the beaches.

Joseph Heikoff of SUNY at Albany's Graduate School of Public Affairs has made a study of the complicated sequence of governmental actions aimed at controlling erosion at Westhampton Beach. A Corps of Engineers proposal for beach protection on the south shore by constructing groins and rebuilding the beach has stirred almost unlimited controversy – and very limited action – among governmental agencies. Naturally, each protagonist has attempted to buttress his position with all possible technical arguments, but the real dispute is one of interests and values.

Heikoff's study traces the plans and proposals for south shore management. He shows how they have been modified by each of the governmental bodies whose approval is required for the plans to be carried out. One principal driving force for "interference" (protective?) construction seems to have been the availability of federal funds and the mandate of the Corps of Engineers to "protect." State and local input became possible because the enabling federal legislation now requires matching state and local funding and other political commitments. To obtain these commitments the original Corps plan was almost unrecognizably distorted and its technical foundation severely diluted. The outcome, predictably, has been continuing beach erosion and still more controversy.

Heikoff hopes an analysis like his will lead to better evaluation of existing institutional arrangements and identification of possible directions for improvement. Effective management of the coastal zone may very likely require more state control, although successful centralization should still involve local participation in policy-making.

1974 NEW YORK STATE COASTAL LEGISLATION

Marsha Bird, an intern at the Sea Grant Program office, sat by during the 1974 session of the NYS Legislature and summarized all bills relating to New York's marine and coastal resources. The purpose of her work was to give citizens across the state a clearer understanding of what directions the legislature is taking as it works to solve the pressing problems of development, preservation, and use of the state's coasts.

A major piece of coastal legislation introduced in the senate but not acted on by either house was a freshwater wetlands bill to parallel the Tidal Wetlands Act of 1973, which protects saltwater marshes only.

For the sport or commercial fisherman, legislation was passed and signed into law protecting shortnose sturgeon and blue pike as endangered species, and creating a menhaden sanctuary. A bill was introduced but not passed that would have begun a striped bass management program.

Businessmen and residents along the state's waterways will be affected by a floodplain insurance bill that became law, and by a new law raising the fines for water pollution.

Coastal land-use planning and its future was discussed in relation to a groups of bills on floodplain management, coastal zone management, and bistate coastal study. Not just environmentalists are involved: sport and commercial fishermen are at odds – a schism reflected in some of the legislation. Several bills tried to initiate solid fisheries management programs, but opponents seemed to feel the bills discriminated against either commercial or recreational fishing.

A HISTORY OF SUFFOLK COUNTY WETLANDS

Preserving the state's wetlands has been a major concern of conservation groups and planning agencies in New York State for a number of years. Various surveys reveal a high rate of destruction of these areas, mainly for commercial or housing development. Unfortunately, until the last decade or two, wetlands were regarded by the general public and by their elected representatives as a sort of wasteland. So the loss is not really surprising.

As a result of recent public consciousness-raising, however, protective legislation has started to appear. A 1973 amendment to the Conservation Law provides for state regulation of all tidal wetlands, an

inventory of these wetlands, and a moratorium on further destruction until the inventory is completed.

Important management and ownership questions remain. Local jurisdictions still have control in varying degrees. Besides, effectiveness of any law depends as much on the vigor and philosophy of its enforcement as on the wording of the statute (which is itself open to serious criticism in the case of wetlands law).

Asking who regulates a local wetland brings on immediate confusion; the town board, town trustees, zoning board, highway department, environmental protection department, planning board, and their county counterparts all may have some jurisdiction. Circumventing local confusion by appealing to the state does not eliminate the conflicts entirely. Planning for wetlands management requires a sound understanding of existing legal/political/administrative arrangements and jurisdictions as much as technical and scientific information.

Keith Kavenagh of SUNY at Stony Brook's Institute for Colonial and Intercultural Studies has just completed an in-depth study, a book on the legal history of Suffolk County wetlands acquisition and the present status and jurisdiction of federal and state agencies with respect to wetlands. Kavenagh's study is in three sections: 1) a description and analysis of the pattern of settlement by the 17th century English colonists; 2) an analysis of the histories of seven representative Long Island wetlands with respect to ownership, occupation, and use; and 3) the English and American court decisions and laws that circumscribed or extended public or private use of wetlands.

Kavenagh notes that although it took nature at least 3,000 years to create the Long Island wetlands, it has taken man less than 300 years to obliterate most of them, much of this occurring in the last 75 years (and most markedly within the past 20). In 1954, over 20,000 acres of wetlands were counted. In 1971, only half remained.

The population explosion has taken its toll of wetlands, especially under the once-prevailing philosophy that all land should be dedicated to obtaining the maximum possible private profit. Attesting to this are the histories of specific wetlands in areas like Huntington Harbor and Great South Bay. The former has almost no traces of its once-extensive wetlands; the latter is a 27-mile-long assortment of industry, private waterfront property and marinas, and just a few remaining wetlands, preserved largely by historical accident.

Only in the last 15 years has real opposition cropped up: from conservationists who proved that wetlands are a vital link in the food chain, that they act as storm barriers and absorb flood tides, that they are important to the county's environment.

So on one side are the traditionalists – trustees, town board and zoning board members, the construction trades, private property owners, and other defenders of the free enterprise system; opposing them are the conservationists – looking beyond past and present to an increasingly documented future disaster if traditional practice continues unabated. Locally, wetlands preservation is a topic hotter and more controversial than religion or politics. After all, conservationists are attacking a very sacred cow: the sanctity of private property. But which faction is using history correctly, if in fact either one is? Each has been acting in defense of his own perceived interests. At present, mainly because of the Tidal Wetlands Act of 1973, conservationists seem to be gaining the upper hand, but the battle is by no means over.

"Asking who regulates a local wetland brings on immediate confusion; the town board, town trustees, zoning board, highway department, environmental protection department, planning board, and their county counterparts all may have some jurisdiction."

SOCIOLOGICAL PROBLEMS OF CZM ON NEW YORK'S GREAT LAKES

Coastal management initiatives almost inevitably entail some shifting of legislative authority from local bodies to higher levels of government. Such change disturbs long-established patterns of administration. Even more important, it disrupts attitudes, priorities, and customs on the local level. New responsibilities are added at higher levels, though usually with less upset.

At SUNY at Buffalo, Robert Ford has looked into sociological problems of such a transfer of power. His research focused on the jurisdictions of the Erie–Niagara Counties Regional Planning Board and the Genesee/Finger Lakes Regional Planning Board, which include the Buffalo and Rochester metropolitan areas. Questionnaires and interviews of officials there uncovered some unexpected flexibility toward possible transfer of power.

The interviews also revealed that county and regional authorities are uncertain of their future role in coastal planning and protection. Local coastal planning efforts vary from one rural township with a laissez faire attitude about its shoreline to the surburban township that has instituted a whole slew of restrictions on coastal development. Serious disagreements remain over appropriate interrelationships among state, regional, county, and local governments.

Ford asked officials if they thought coastal areas should receive special attention. Almost everyone said yes. Those from the more populated areas felt especially strongly.

How pressing are coastal problems? Nearly all questioned said problems in their localities were severe and likely to worsen in the near future. Again, people in urban communities were most concerned. Lake Ontario people felt more threatened by coastal problems than did those on Lake Erie – probably because growth has been more intensive on Lake Ontario recently, with nuclear power plants and increasing property values on its shores.

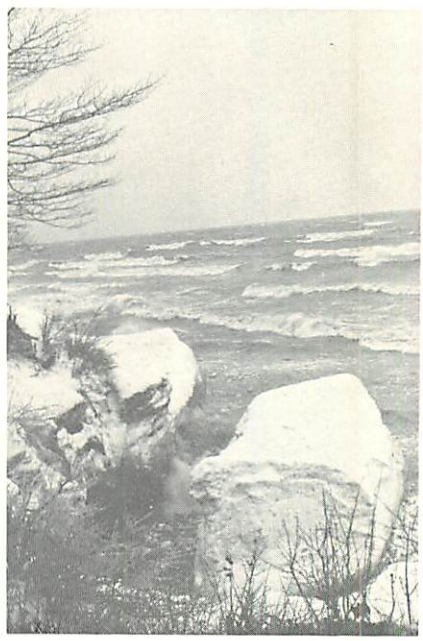
What is the nature of coastal problems? Erosion topped the list of immediate concerns. Second were the consequences of uncontrolled shore development. Other concerns: poor water quality, nuclear power plants, limited public access to the coast, and the proliferation of docks and unsightly and poorly constructed coastal facilities.

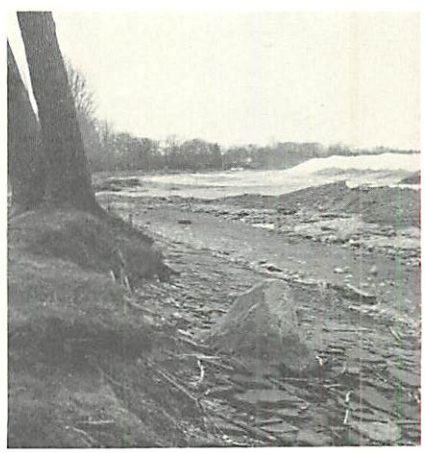
How successful are current management procedures in dealing with coastal problems? Surprisingly, most interviewees agreed that such procedures weren't coping with the problems. Local governments readily admitted that their zoning laws hadn't successfully produced orderly development. They complained of lack of money and manpower. County and regional government complained of their limited legal capacity to respond to the problems. Nearly all cited lack of coordination among federal, state, and local authorities as a major problem.

It was surprising, Ford said, how willing these officials were to have the federal government and New York State play a role in regulating their shore areas. While all agreed they want to keep a hand in the shaping of their coastal zones, they clearly realized that what they are dealing with along the Lake Ontario and Lake Erie coasts is not just a local problem; it applies statewide and nationally.

CHAUTAUQUA COUNTY PROPERTY VALUES

In most parts of the United States, waterfront property has increased tremendously in value over the past 20 years, largely due to the demand for recreational access to the water. Houses and vacation cottages near the water have become popular with the affluent American public. Waterfront parks, marinas, campsites, motels, and resorts are more crowded than ever.





Three views of Lake Erie. Top to bottom: Waves overtopping breakwall at Dunkirk city pier, typical winter storm, erosion problem at Point Gratiot City Park.

The pattern is a little different along Lake Erie, almost certainly due to the lake's polluted condition. Ever since the 1950s, right up until recently, people have stayed away in droves. One Sea Grant team has been looking at the economic impact along Erie's shores.

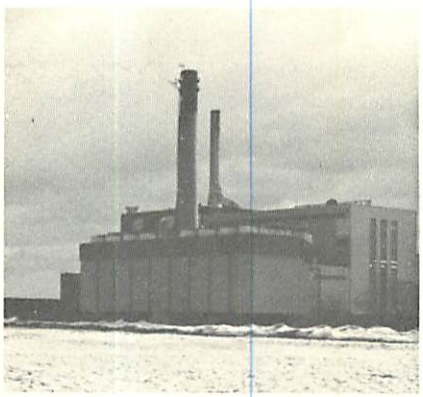
Warren Fisher, Norman Starler, and Ann Fisher, all of SUC Fredonia, have just completed a study to determine 1) the extent to which economic and environmental decay are related in Chautauqua County and 2) the specific impact of changes in Lake Erie on incomes, employment, land values, and public revenues.

The most reliable measure of changes in the lake communities is employment. The researchers analyzed lake-related jobs and industries like marinas, restaurants, gas stations, and bars – in all about 1,000 firms between Buffalo and the Pennsylvania state line. Employment in 1973 was down 10 percent compared to the rest of the state (the 10 percent is a severe understatement because the firms studied are those still in business – the many businesses that folded recently were not included). The biggest losers were the restaurants, down 20 percent, although bars prospered. When lake-related jobs get scarce, so does indirect income: the unemployed cook leaves, so there is one less person to buy shoes and pay rent.

Fisher, Starler, and Fisher's pilot study of lakeshore property values showed a 26 percent drop between 1956 and 1966, although values have been relatively stable since 1968. By relating changes in land value (and therefore the tax base) to pollution control measures taken during 1973, the researchers will be able to predict further tax base changes. In this way local towns and cities can find out in terms of hard dollars what they have to gain by cleaning up the lake or locating more lake-related businesses nearby. It's possible they will need outside assistance or coordination with other municipalities to reap the maximum benefits from pollution control measures.

The Fisher/Starler/Fisher study surveys 1950-1973 Chautauqua County property values by township and by type of property: 1) waterfront property, 2) "lakeside" property (accessible to the lake but not right on it), and 3) upland property. Using 1968 as a base year, they looked at samples of property that changed ownership. Between 1968 and 1973, Lake Erie waterfront properties increased in value by 16 percent, but properties on Chautauqua Lake rose by over 50 percent for the same period. These figures support the hypothesis that pollution tends to depress shoreline property values. Mixed results for 1971-1973 Lake Erie waterfront property values could reflect a noticeable improvement in the quality of the lake relative to Chautauqua Lake, but it is still too soon to know if this is a major reversal of the earlier trend.

Siting Power Plants



Niagara Mohawk coal-fired power plant at Dunkirk harbor entrance

To obtain the vast quantities of water needed for once-through cooling, power plants have had to be located on the coast or on large rivers. Since coastal regions are often already under heavy development pressure, appropriate sites are increasingly hard to find. When they can be found, serious environmental questions arise. The environment, once largely ignored by utility companies, is now taken seriously. Sensitized by environmental controversies, the public tends to oppose the choice of *any* site – but continues to demand power and to expect the utilities to deliver it as needed.

Legislation regulating the site selection process is generally too recent to judge its effectiveness. Yet the need for evaluation is evident. Site selection is far too important for a wait-and-see approach. What's needed is intensive scrutiny of all evidence as soon as it becomes available, with full recognition of continuing changes in our basic assumptions in the nuclear power field. Year III work again stressed broad cooperation among physical and social scientists in close contact with actual events and the people responsible for them.

SOCIOLEGAL PROBLEMS IN POWER PLANT SITING

Only recently has nuclear power surpassed the burning of wood as a source of energy in the United States – despite confident earlier predictions that by the mid-1970s nuclear energy would be a major power source. Why has the development of nuclear power failed so dismally to live up to expectations? Robert Ford of SUNY at Buffalo's Department of Sociology investigated this question, interviewing utility and regulatory personnel, and emphasizing the social and organizational aspects of plant siting and their apparent shortcomings.

Designing, authorization, and construction of nuclear power plants are complex procedures; each has been responsible for substantial delay in getting plants on line. Recent legislative changes at the state level (NYS Power Plant Siting Act of 1972) and national level (replacement of the

Atomic Energy Commission [AEC] by the Nuclear Regulatory Commission and the Energy Research and Development Agency) have introduced complicating factors. The worldwide energy crisis and accompanying recession have had opposing effects on the nuclear power industry: while tending to improve the competitive position of nuclear power by making fossil fuel power generation more expensive, they have held back the normal, expected increase in consumption to such an extent that demand projections have become shaky. Finally, the technology of nuclear plants is so new and in such rapid flux that reliable predictions of cost and performance are rare.

Ford believes that the 1972 New York act has reduced costs and delays for the utilities but hasn't been so effective in stimulating citizen participation (though he sees some improvement, especially in the Lake Ontario region). Citizen groups, counted upon to monitor siting procedures, are active but not yet strong enough. At this stage of the game, most experts in nuclear science are already attached to government or industry. Expert neutrals are not easy to find.

The replacement of the AEC by its two successor agencies has at least eliminated the AEC's former roles of advocate *and* judge of nuclear power development. It is too soon to assess performance since the change. Also on the federal level, citizen and environmentalist groups have found it extremely difficult to present the still poorly defined but awesome "true cost" factors in nuclear development (like radiation effects).

The complex delays in construction mean that inflation has more time to work and its effects are more difficult to predict. Besides, before a utility company is willing to borrow enormous sums of money (currently a single plant and associated transmission facilities can mean a $1 billion investment), it needs solid forecasts of future power demand.

Nuclear science and engineering are such rapidly evolving fields that to a significant extent each new plant is unique and experimental. This means that costs are difficult to estimate (and likely to be underestimated). Environmental impacts may not correspond to those of ostensibly similar plants. Most important, if plant efficiency falls short of expectations, costs go up even more.

Ford makes two main suggestions for improving at least the regulatory aspects of plant siting. He would like to see a fully subsidized devil's advocate helping citizen groups mount an effective review at siting proceedings. In this way the difficult issues of nuclear safety and environmental impact would be adequately explored.

Recent court decisions have demanded great care in plant siting; every site application now has to be accompanied by voluminous evidence. Ford's second suggestion is that a statewide "environmental accounting" provide background information on the state's environment which would apply to all proposed sites. This would save money and, even more important, time.

New York's Atomic and Space Development Authority (ASDA) was intended to implement this type of planning, choosing and purchasing sites and conducting long-range environmental testing, but according to Ford, it has not been able to carry out its mandate. The utilities saw ASDA as a competitor for choice sites, and its function has gradually been shifted to emphasize research and non-controversial services. Now the utilities are hoping to obtain such a centralized siting function, and incidentally to share the cost uncertainty burden, by means of a single state generating company controlled directly by them.

ELECTRIC POWER USAGE AND REGIONAL ECONOMIC DEVELOPMENT

Utility companies expand their generating facilities on the basis of estimates of future demand. But demand depends to some extent on the price of electricity to the consumer. As the price goes higher, he naturally tries to use less. The utility must take this into consideration when it plans new construction. It can estimate the cost of electric power produced by the new plant, but it cannot easily forecast how much power will actually be used at that price.

The purpose of James Savitt's study is to determine the impact of electricity prices on key economic variables in the Buffalo area. One of these variables is obviously the demand for electric power. Year III work was aimed mainly at developing a model that would accurately reflect the relation between demand and price.

Savitt, a graduate student at SUNY at Buffalo's School of Management, used the Buffalo Standard Metropolitan Statistical Area (SMSA) as a laboratory to see the impacts of environmental protection costs and alternative siting policies on the demand for power and on regional growth. Buffalo, the second largest metropolitan area in New York State, is a major industrial center, especially dependent on cheap electric power. An already-existing computer model of the SMSA helped Savitt determine regional industrial output, personal income, employment, and population for the major sectors of the regional economy.

Savitt is studying the different use patterns for the three major classes of consumers – residential, industrial, and commercial. Residential demand varies with the price of electricity, the price and amount of gas used (as a substitute for heating and cooling), the amount of disposable income, and the stock of electric and gas appliances. A large portion of energy costs go to heating and lighting.

Industry uses power in a different way: most of its energy use goes into production. Industrial output varies with the amounts of labor, capital, and electricity in the production process.

Commercial establishments (e.g., business firms, retail stores) exhibit elements of both residential and industrial usage.

Savitt is devising equations to account for the different specifications of these three types of electricity users, and he plans to plug these equations into the Buffalo SMSA model. By changing one variable – price structure of electricity, for example – he will be able to see effects on the other variables in the model.

MULTIPLE–USE CONCEPT

The public has become acutely aware of the immense quantities of land dedicated to transmission rights-of-way, power generating sites, and distribution yards. They have generally been opposed to these uses because urban and suburban open spaces are a rare commodity. The aesthetics of new high-voltage lines and towers has had additional negative impact.

Transmission line corridors could supply networks of open paths to use as "recreation-ways," providing non-motor connections between urban and rural land as well as between densely settled areas. Current land costs make this idea attractive. Corridors, unlike tracts, don't have to be bought or leased; all that is needed is an easement.

A Bikeways Network Plan in Suffolk County has opened up multiple-use opportunities along Lilco's transmission corridors. This countywide plan is turning out to be an excellent example of open space resource planning. In the rest of the state, however, multiple-use concepts haven't been catching on as fast. Several utility companies suffered fiscal disaster in 1974, and innovation is not being encouraged.

Stephen Wilson and Ron Stewart looked into possible multiple uses of the zones and corridors surrounding sites and rights-of-way. Stewart visited a number of sites proposing to use waste heat from power plants in aquaculture and agriculture. He participated in several meetings with greenhouse owners, who consider heating costs a major problem.

Stewart and Wilson began working with an ecological planning consultant, citizens, local governments, and the Rochester Gas and Electric Company to develop the most intensive multiple-use plan on Lake Ontario shores – this for the proposed Sterling site. Included were proposals for hiking, skiing, and bicycle trails as well as for picnic and swimming areas. Plant construction was halted, however, and further discussion of this plan has been delayed.

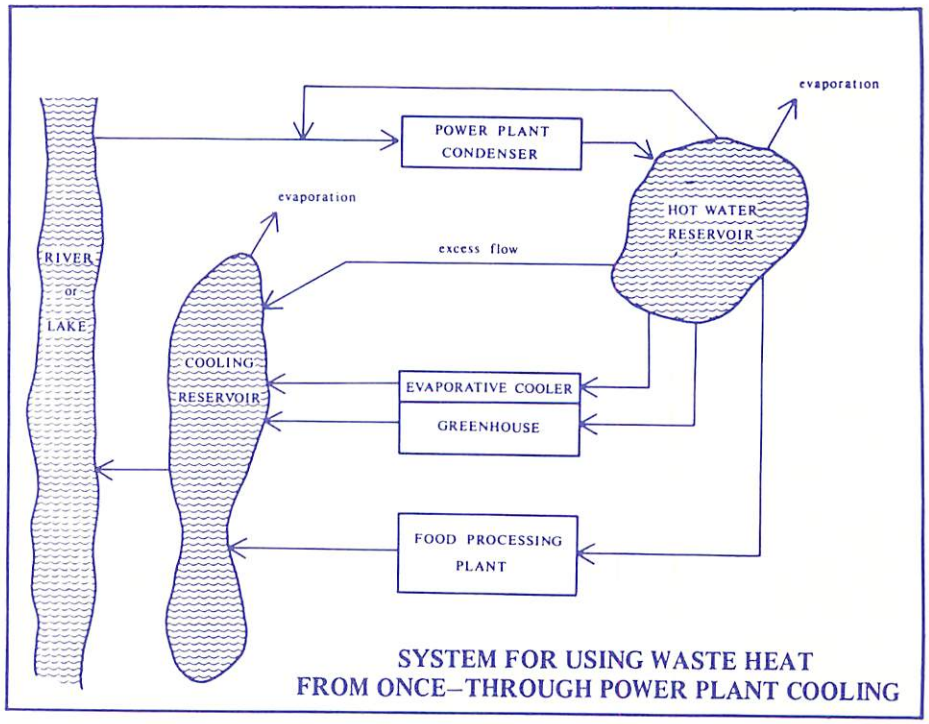
WASTE HEAT COULD WARM OUR GREENHOUSES, HELP PROCESS OUR FOODS

Once-through cooling can waste a lot of heat energy – about 6 billion BTUs per hour from a single modern power plant. Practical ways to use some of this heat could help ease an energy shortage, replacing the heat from a conventional source. This would save fuel and reduce thermal stress on the water source.

Don Price of the Agricultural Engineering Department, NYS College of Agriculture and Life Sciences, has designed and analyzed a system to use the waste heat from once-through power plant cooling (see flowchart). Although many studies of possible beneficial uses have been conducted, few full-scale applications have resulted. Previous investigations stopped short of comprehensive analysis of system reliability, environmental impact, economic potential, or simply the institutional aspects of multiple use. Price used computer simulation to derive this type of information for a postulated system that could utilize all the condenser flow of a large power plant.

Price's model emphasizes the use of cooling ponds, which have financial and environmental advantages over traditional cooling methods. His system envisages commercial fish production in such ponds, combined with waste water treatment or recreation.

Water used by power plants can also be an economical heat source for buildings. Some of the heat could be used for greenhouse heating (or cooling) and food processing. Ranging up to 120°F, the low heat would be just right for preheating foods and cans before sterilization, for sealing cans and bottles, and for bread production, grain drying, chocolate processing, and some freeze-drying processes.



SYSTEM FOR USING WASTE HEAT FROM ONCE–THROUGH POWER PLANT COOLING

NEARSHORE SURFACE TEMPERATURES IN LAKE ONTARIO

The heated waste water from power plants pours out in a "plume" distinct, sometimes visibly so, from ambient (surrounding) water. Depending on local currents, it often rises to the surface and forms a "pool." New York State law specifically limits the size and temperature elevation allowed for thermal effluent plumes and pools. The rationale for these limits was that they would help minimize any environmental damage from plumes, although such damage wasn't (and still isn't) very well understood. Legal guidelines have not been actively enforced, partly because enforcement techniques haven't been worked out. But the law remains on the books, even though it doesn't apply retroactively to older plants.

From 1969 to 1973, meteorologists Eugene Chermack and Thomas Galletta of SUC Oswego's Department of Earth Sciences measured nearshore surface temperatures and thermal effluent pools at four sites in southeastern Lake Ontario. They used an infrared thermometer mounted on a single-engine aircraft in a series of low flights during the four-and-one-half-year research period.

Their original purpose was to monitor the outflows from power plants to assess their conformance with the legal criteria, but in measuring plume and pool size, they discovered that it was difficult to find a definite ambient water temperature against which plumes and pools could be measured. They had to make subjective estimates, but in general these showed that the plume size was unexpectedly large, far above legal criteria, and each plume had great variations in size, shape, and temperature elevation from one observation to another.

Because of the problems encountered in measuring the lake's ambient surface temperature, Chermack and Galletta made a detailed study of natural surface temperature variability. The patterns of temperature they obtained are quite complex.

One set of measurements followed surface temperatures from shore directly outward over the lake for about 2.5 kilometers. The temperature change in the 2.5-kilometer strip averaged strongly negative in late spring (it got colder the farther out they went – up to 3.5°C colder in May) and positive in late fall (+1.5°C in December). Not surprisingly, nearshore temperatures were higher in summer and lower in winter than offshore temperatures, but the extent of the difference was surprising.

When these observed temperature gradients are plotted individually (as contrasted with monthly averages), startlingly wide variations are evident. Sometimes individual gradients reversed the monthly trend, and in a few cases, very high gradients – up to 13.5°C in one case – were found. Some of these natural gradients exceeded 7° per kilometer.

Gradients expressed as degrees per kilometer were on the average almost twice as steep in the shore-to-0.5-km zone as over the entire shore-to-2.5-km zone measured.

Chermack and Galletta concluded that such sharp nearshore surface temperature gradients, which can occur temporarily in all seasons, minimize the possibility of selecting any single ambient lake temperature against which to measure pools and plumes. Consequently, the present New York State guidelines for the regulation of power plant thermal emissions raise more questions than they answer.

BIOLOGICAL IMPACTS OF POWER PLANT DISCHARGE

Plankton "entrainment" in the flow of water through the condensers of once-through power plant cooling systems has resulted in heavy plankton mortality. Yet there are indications that these cooling systems also have some compensating effects which tend to restore – or even enhance – plankton productivity. It may even be possible to alter power plant design so as to increase or decrease plankton production, as desired.

In 1974 Madelyn Glase and Donald McNaught measured primary productivity (rate of aquatic plant growth), population size, and nutrient concentrations around the Nine Mile Point plant. They compared samples from the outfall to samples from the intake, and samples downstream of the plume to samples from an upstream control. They found that primary productivity was reduced 37 to 50 percent by plant passage. But the same loss occurred when the plant was refueling and pumping water without heating it. Heat by itself, they concluded, had no discernible effect.

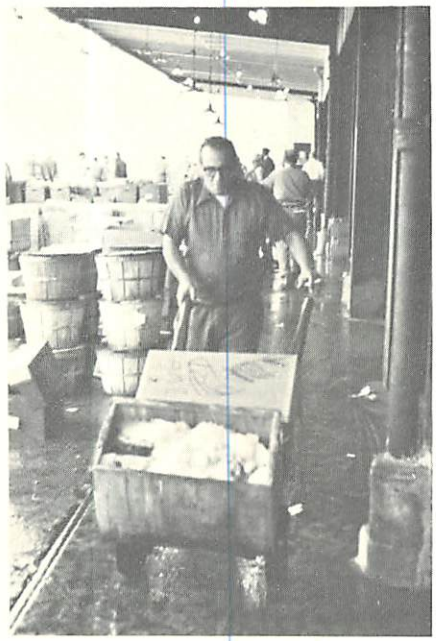
Chlorophyll concentrations, used to estimate population size, appeared to be reduced by passage through the condenser.

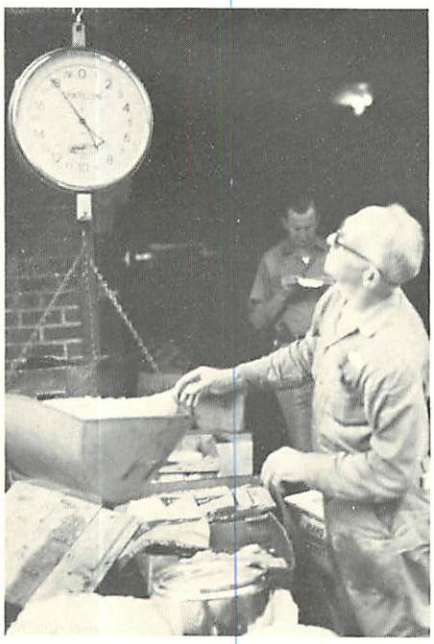
Total phosphorus concentration, used to measure nutrient supply, was unchanged after condenser passage. However, there was a shift to a different form, more available to microorganisms.

Algae excrete significant amounts of photosynthate (photosynthesized organic material) directly into the water. The amount excreted usually goes up sharply when the algae are stressed. Glase and McNaught measured excretion rates and found that any excretion observed in ambient water was not observed in the effluent – in other words, algae didn't seem to be undergoing any stress. They appeared to be temporarily inactivated by condenser passage.

In their 1973 research, Glase and McNaught recorded a net stimulation of productivity in the thermal plume following condenser passage. Even though many of the plankton organisms were inactivated by entrainment, those that survived grew faster – fast enough to more than make up for losses.

Studies in Resource Management





Two views of Fulton Fish Market, New York City, largest wholesale fish market in the United States

Resource management is essential to coastal zone management; the acute coastal problems that generate the need for a coastal zone plan are usually resource problems. Much more than resource inventories may be needed to solve them, but an appropriate research base is at least a good starting point. Precisely because New York's coastal resources have not always received adequate emphasis and support, the existing research base is spotty. The projects in this section fill some of the gaps in that base. Consequently, they range widely in scope, form, and subject matter.

Coastal erosion is a long-standing fact of life on Long Island and Great Lakes shores. A great deal of money has been spent on attempts at direct control – and not so much on research into the natural forces involved. The emphasis is shifting, but considerable practical work lies ahead.

Most of New York's commercial fisheries are becoming prime examples of a ruined resource. Some argue that this is a *fait accompli,* irreversible, and not that important anyhow, as recreational fishing expands to fill some of the void. The present vigor of the hard clam commercial fishery is one bright spot in a generally gloomy outlook. The clam industry brings substantial income to southern Long Island. Its prominence not only justifies systematic research support but also argues for a second look at New York's other commercial fisheries. Previous research has been insufficient, in part from lack of funding but probably more from lack of perspective and proper fisheries management.

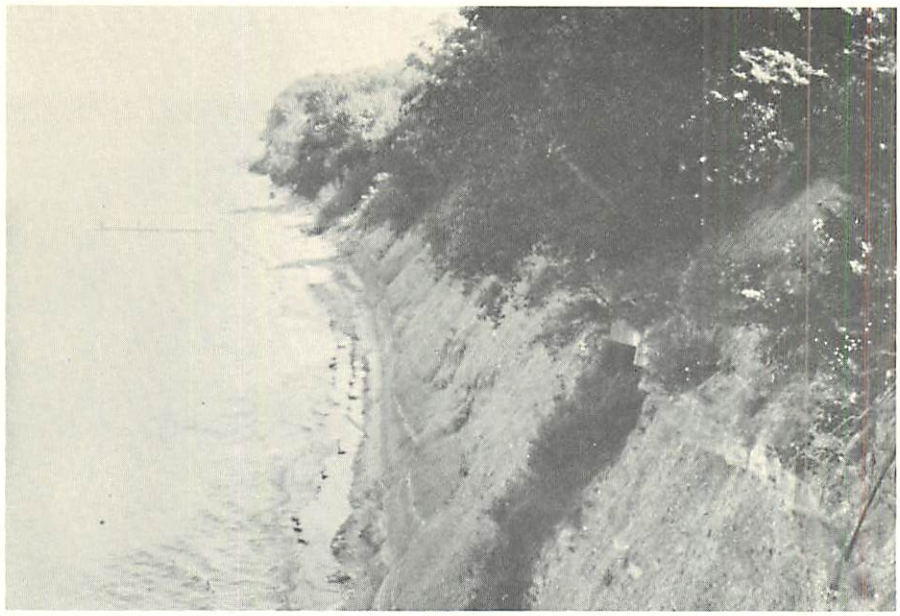
The issue of wetlands preservation in New York has been widely publicized and even legislated. Political action has run well ahead of the research base. We know little about some of the ecological roles of wetlands and even less about rational management of this important resource.

The concept of recreation as an industry is recent; even newer is the idea of the recreational environment as a resource. Here, the confrontation between public and private interests promises to intensify. A marina is a private business depending in a public resource (the environment), providing a public service (water recreation), sometimes by destruction of a public resource (wetlands). The values need sorting out; this requires some numbers.

Should the question of offshore oil drilling be left to the oil companies? The coastal populations, their elected representatives, and the environmentalists are not ready to allow this. Energy interests and environmental interests are about as far apart on this issue as they can be. Most of the obvious sources of information are biased one way or the other. Local groups are beginning to realize that what they need most is an unbiased analysis.

EROSION STUDY OF NEW YORK'S GREAT LAKES

During the past couple of years, the water levels of Lake Erie and Lake Ontario have been abnormally high and have caused severe erosion along parts of the coast and general flooding elsewhere. Cliffs and beaches have receded rapidly. Transportation and utility services have been disrupted. Even though it is believed that the peak is now past, concern over the high-water situation has led to a series of widely publicized proposals for shoreline stabilization projects, some as radical as one local official's suggestion that old World War II Liberty ships be sunk offshore to form a breakwater.



Lake Erie bluffs

Along the Lake Ontario coast, man-made protective structures range from the large, well-engineered sea wall around Oswego Harbor to small, makeshift structures like trash-covered bluffs. The sea wall constructed near the mouth of the Little Salmon River (near Mexico, New York) in 1964 seems to be an effective structure. A comparison of 1938 and 1964 aerial photos reveals that this area receded at a rate of about six feet per year during that interval; without the sea wall, it would have receded even more rapidly after 1964, since the bluff material has very low resistance.

Less effective are the 30-foot-long limestone jetties at the mouth of Catfish Creek near the Salmon River. A marina operator built them out into the lake from both sides of the stream to protect his marina and keep the stream mouth open. But the stream mouth still has to be dredged each May. And ironically, erosion is undermining the bluff on which the marina office is situated.

Various misuses continually endanger the extensive wetlands along the eastern shores of Lake Ontario. Besides the dredging operations of marina owners, there is a problem of wave erosion because the high dunes which normally protect wetlands are being excavated as a commercial source of sand.

Many homes have unwisely been built on the easily erodible bluffs or in areas subject to periodic flooding. Homeowners are quick to blame the Corps of Engineers or the International Joint Commission for property damage because they allowed the lake to stand at "abnormally" high levels. In fact, the lake had reached these levels several times before the IJC-controlled St. Lawrence Seaway was constructed.

Before people introduce any more alterations into the system, we need to understand the natural erosional/depositional balance and the shoreline processes in the region. This isn't the first high-water period on these 12,000-year-old shores; such periods may be a factor in their long-term equilibrium.

Geologists Parker Calkin and Gordon Connally and civil engineer Robert Apmann, all of SUNY at Buffalo, are conducting a cooperative, interinstitutional shoreline study of Lakes Erie and Ontario. The project is aimed at predicting how much erosion will occur along certain portions of the Erie and Ontario shorelines, at what places damage is most likely to occur, and which areas are relatively safe.

Once this five-year study is completed, it should be possible to advise a landowner or governmental agency whether a sea wall or groin (a structure, usually a pile of rocks, extending out from a beach to protect it from erosion) would effectively protect a particular shore site. Maybe some other structure – or no structure at all – would be better.

A critical part of the shoreline study has been coordinating activities that cover such a large geographic area. Close liaisons were formed with several scientists, among them Robert Nugent of SUC Oswego's Department of Earth Sciences, who is studying bluff stability and recession along the eastern shore of Lake Ontario; Robert Fahnestock, geologist at SUC Fredonia, supervising stream sediment discharge studies on both lakes; and Robert Adams, geologist at SUC Brockport, in charge of local beach and bluff studies on the south shore of Lake Ontario.

Fahnestock received a grant from the Corps of Engineers to investigate sediment discharge and distribution at the mouth of Cattaraugus Creek (the Corps is interested in the feasibility of breakwater construction at the mouth of the nearby Buffalo River). The team also has the close cooperation of

the Canada Centre for Inland Waters in Burlington, Ontario.

Besides implementing these liaisons, Calkin's group has completed three subprojects: 1) intensive data-gathering, and assembling all data on erosion/deposition of the lakes to put into a predictive computer model; 2) a general environmental inventory of the New York parts of the Lake Erie and Lake Ontario shorelines; and 3) detailed studies of selected beaches and bluffs on both lakes.

Nugent's work at the mouths of Deer Creek and the Salmon River, financed by the Eastern Ontario-St. Lawrence Commission, has already yielded complete profiles of the local sediments. Both outlets are important because they are being considered as sites for new salmon hatcheries.

On the two lakes, Calkin's group is calculating and analyzing long-term erosion of bluffs by comparing aerial photos and maps provided by federal agencies. Bluff composition, slope angle, and liability to erosion are being studied, as well as how bluffs are affected by frost and movement of groundwater and surface water. These data will be used in conjunction with historical records to identify areas with high rates of bluff recession.

Graduate student Tom Ostrye surveys beach as part of Great Lakes shoreline study.

Beaches are extremely mobile, changing from day to day. The Calkin group has to figure out how given sets of conditions affect beaches so they can predict what will happen under certain climatic and wave patterns. Beaches act as buffer zones between the water and shoreline bluffs; the narrower a beach, the greater the wind and water damage to the bluffs. And once they are gone, the bluffs never come back.

SOUTH SHORE STUDIES

Long Island's south shore is one of the most heavily populated coastlines in the United States. Much development is on or near the beaches, which are undergoing serious and extensive geomorphic change. The processes involved in these rapid profile changes are not well understood, and the cost of ignorance has been high: lots of private and public money spent on groins and other projects that haven't turned out well, property washed away, homes diminished in value, dunes eroded because people have been driving around on them. The effects of man-induced changes can't be correctly assessed until we better understand the characteristics of natural processes. Is the erosion part of a natural cycle? What is storm-induced erosion/deposition and how much is "normal"?

To answer these and other questions, Donald Coates and Marie Morisawa of SUNY at Binghamton headed an environmental geomorphology team that studied a variety of south shore problems.

One study by Donald Ash concerns the degree of equilibrium and change occurring along the beaches on the ocean side of the barrier islands, separated from Long Island's south shore by the shallow Great South Bay. He is determining drift in the shore zone, calculating the sand budget (the erosion/deposition balance), and documenting changes in the environment through time. He is also evaluating the effects of artificial nourishment at Gilgo Beach, where the Corps of Engineers has been filling with bay dredges for the past two years. Beach nourishment has been unsuccessful in a number of places there; rapid erosion continues. Ash believes this is because particles from the dredgings are too small – the beach profile depends on particle size.

Ash is also doing an "energy budget" study, calculating the amount of energy brought onto beaches by wind and waves and how it is dissipated on shore. A reliable energy budget for a given beach helps in predicting the effectiveness of beach protection measures.

Ron Lynch is doing sediment studies of the bottom materials in Great South Bay. His work is in direct response to a request by the Regional Marine Resources Council of the Nassau–Suffolk Regional Planning Board; shellfisheries will be able to use his results to fill a large information gap and plan for their future.

Back on shore, many areas of accelerated erosion and places liable to property damage have been "protected" by coastal defense projects like groin-building. Stephen Gilje studied the effects of groin field construction at four locations on the south shore and found that they actually accelerate erosion downdrift while causing accretion at the groins themselves. This is what has happened with the groin fields at Fire Island, Westhampton Beach, and East Hampton Beach. In fact, Gilje could find no groin on the entire south shore that did what it was built to do. A group led by Morisawa is doing a continuation study of beach profiles in groin areas to recheck Gilje's conclusions.

Within the bays of the south shore, wetlands have been eroding up to 10 feet per year. In response to a request by the NYS Department of Environmental Conservation (EnCon), the Coates group has been analyzing the wakes of motorboat traffic to see how much they aggravate erosion in the

wetlands; they appear to be undermining wetland edges, which subsequently slough off into the bay or ocean.

One thing they learned: ditching as a form of mosquito control can damage wetlands. This is because the mosquito trenches are cut in straight lines and at right angles to each other – not along the natural meanders of tidal inlets. The structures that least damage the environment, they found, are those that conform fairly closely to the original configuration of the land.

Coates is monitoring beach vehicular traffic to determine its environmental effects – a study requested by the Town of Islip and the National Park Service. He has given court testimony in two lawsuits over ordinances prohibiting most vehicles from traveling on the dunes and beaches. Private property owners say these ordinances infringe on their constitutional rights, but Coates showed that paths and roads cut into the dunes have greatly diminished the dunes' resistance to high water levels. Washovers – waves carrying sand from the ocean side over the dunes to the bay side – occur frequently in such places. In storms during March of 1962, for example, half of the 95 washovers of the dune line occurred in places where people had made paths or roads through the dunes.

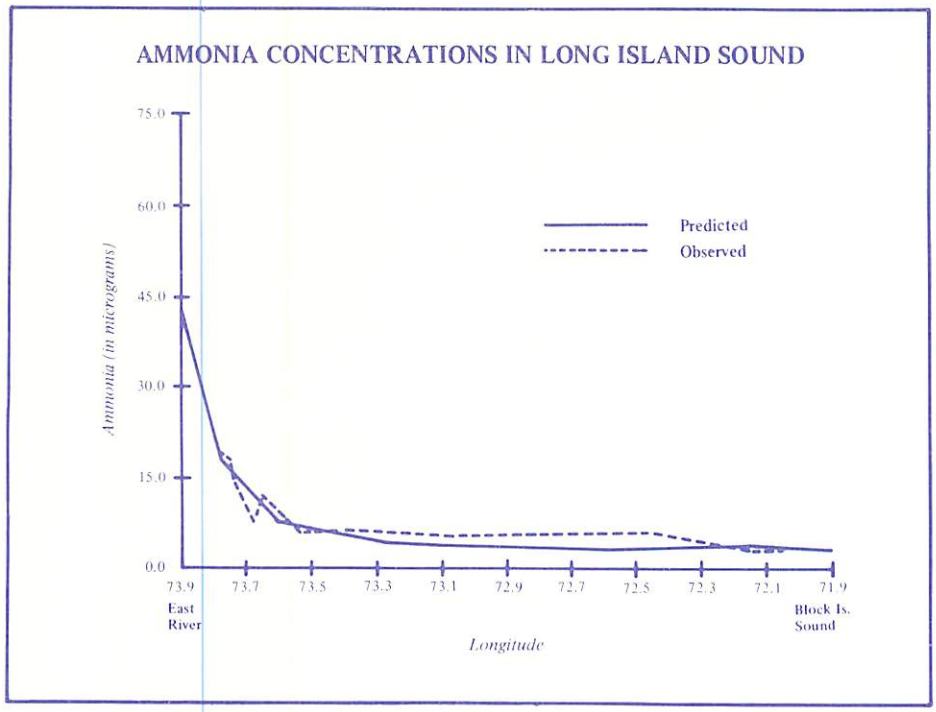
Coates is also collecting data on tire track impacts on dunes and on the beaches. He is finding out, for example, just how much more sand moves oceanward as the result of a 2,000 pound vehicle being driven over the beach. This will be the first such documentation, and his results can be used to back up legislation.

A MODEL OF WESTERN LONG ISLAND SOUND

Some 1.4 billion gallons of untreated or partially treated sewage are dumped daily into the waters around New York City. If the western end of the Sound is ever to be cleaned up, there must be an improved understanding of the water movements that disperse these wastes.

Year III saw further refinement of the Long Island Sound hydrographic model created by Malcolm Bowman and the oceanography group at the Marine Sciences Research Center, SUNY at Stony Brook. Their model represents the first solid figures on how much effluent actually gets out into the Sound from East River sewage plants. Low-salinity water entering from the East River mixes with the high-salinity flow from Block Island

This beach on Fire Island is receding 20 feet per year. Erosion is caused partly by groin in background, built to help protect the water tank.



Sound. The difference in density of these two opposing flows, typical of estuaries, creates a massive nontidal transport system along the length of the Sound. With adequate data on salinity *v.* depth along the whole Sound, Robert Wilson of MSRC was able to calculate the volume transported in each direction by this estuarine system at various points along the Sound. He concluded that the total volume of transport ranges from 5,000 cubic meters per second near the East River to 30,000 cubic meters per second near The Race.

One important consequence of this two-layered estuarine circulation system as it affects the western Sound: although net transport of both water and salt is westward into the East River, net transport of the fresher surface layers – and most of the effluent – is eastward. As much as 400 million gallons per day (MGD) of effluent may reach the Sound in this way. This volume is 70 percent of the entire output of the four large sewage plants on the upper East River; it is also nearly 32 percent of total effluent, direct and indirect, into the Sound. All other effluent sources west of Eatons Neck, including land runoff, contribute only 110 MGD to the Sound's pollution load.

Bowman used the mathematical model to predict concentrations of pollution-derived nitrogen compounds like ammonia (see graph) along the Sound. To test the model, he compared calculated concentrations with observed concentrations; these agreed in almost all cases. The high concentration at the western end drops rapidly east of Eatons Neck and continues dropping, more slowly, to the eastern end. The steep decrease in water quality between Willets Point and Eatons Neck has decimated the recreational and shellfishing resources of the western Sound; its effect on finfishing is still largely unknown.

Bowman and Paul Moskowitz wrote up a review of the considerable literature on tides and currents in Long Island Sound. The Sound's circulation, as noted above, is definitely estuarine, but with a unique difference: it has two openings – the main one at the east to Block Island Sound and a second one at the west to the East River. The latter considerably modifies tides and currents in the Sound and affects the hydrography and salt balance of the entire estuary.

Together with David Jay, Bowman studied the hydrography and circulation of New York Harbor as its affects the water quality of the Sound. Sixty-year studies show that in 1909 dissolved oxygen levels in the water were low – an indicator of pollution – over much of the harbor. They decreased further over the following 25 years, then began a slow recovery as sewage treatment plants were built and put into operation from about 1935.

Since then, seasonal and year-to-year variations have been great, but the overriding influence on water quality is the sewage output into New York Harbor waters from the 15 million people of the New York metropolitan area. During rainstorms the combined storm and sanitary sewer systems deliver a very heavy untreated flow directly into the harbor. A large (unknown) volume of industrial wastes also pours into the sewers daily.

In a separate study out in New York Bight, Bowman, Duedall, and other members of the MSRC group collected water samples from the area of the notorious sewage sludge dump site and analyzed them for ammonia content. Their results suggest that the direct effects of sludge dumping are very pronounced in the immediate dump area, but that they do not persist very far in either time or space.

NO FAULT IN THE ST. LAWRENCE

A high incidence of seismic (earthquake) activity has been noted repeatedly along the St. Lawrence River and extending across Lake Ontario and even as far as Missouri. Until recently, this suggested to investigators that there might be a major fault system located along this axis. If true, it would be crucial to plans for locating nuclear power plants on the shores of the St. Lawrence. Surprisingly, no one had initiated an investigation until Sea Grant picked up the problem.

To test for the presence of a major fault, geologists Frank Revetta, John Cardinal, and William Lilley spent the summer of 1974 conducting a detailed magnetic survey of the St. Lawrence. They took magnetic measurements at close intervals all along the river between Massena and Oak Point, New York. The magnetic anomalies they found turned out to be caused by Precambrian basement rocks. If there is any large fault, it is located elsewhere; in any case, the zone studied is not along a fault of considerable lateral displacement, as had been previously thought.

Sea Grant staff inspecting Frank Revetta's magnetic map of part of the St. Lawrence River

LAKE ONTARIO FISH NURSERY

The nearshore zone of Lake Ontario, including marshes and the mouths of streams, harbors benthic organisms in great plenty. Previous studies in the Oswego area show that the extensive *Cladophora* beds there support large numbers of fish eggs and larvae. Any number of situations could make such a nearshore nursery less desirable for fish spawning: dredging and dumping, shore erosion, thermal effluents, modifying lake nutrient budgets (the balance between nutrients like phosphates and nitrates – used for food by plants – coming into or going out of the lake), or harvesting *Cladophora.* This could mean population changes in economically important species (mostly perch) as well as in fish like alewife, primarily eaten by introduced Lake Ontario salmonids.

In Year III, Ronald Engel's group from the Rice Creek Biological Station, SUC Oswego, sampled fish larvae at five locations along the shore zone between Oswego and Little Sodus Bay to measure use of the nearshore zone for spawning and feeding. Engel used several larval sampling devices, including a net towed behind a boat, handnets, and a suction device operated by scuba divers. He found 12 species of larvae, with alewife, a native species, heavily predominant.

Engel measured potentially modifying conditions like water temperature, wave height, cloud cover, and wind velocity. Data gathered were intended to be preliminary, and so no conclusions were drawn except that the shore zone between Oswego and Fair Haven is a diverse habitat and does not harbor the same quantities of larvae along its entire length.

LAND–USE DILEMMA: BIOLOGICAL PRODUCTIVITY *V.* WATERFRONT ACCESS

The eastern Lake Ontario/St. Lawrence wetlands are valuable not only as spawning habitats for fish; they provide breeding space for migratory waterfowl, and food and shelter for animals living there. Perhaps unaware of what is being lost, man continues to modify the shoreline by building marinas and vacation homes, bulldozing for golf courses and tent and trailer campsites, and creating landfills in the wetland area. A recent survey found only 12,000 acres of marsh vegetation left.

New York needs guidelines to assess the biological importance of the wetlands as support systems valuable to wildlife. James Geis of the Department of Forest Botany and Pathology, SUNY College of Environmental Sciences and Forestry, is doing a comprehensive study of wetland community dynamics. He has been gathering quantitative data on successional trends as they are influenced by environmental factors like siltation, wave action, the nature of substrate and sediments, dissolved nutrients, and water levels.

Geis selected Campbell Marsh and Black Pond Marsh (see vegetation map) as representative of the range of wetland conditions along the Lake Ontario shoreline. Both are being considered for purchase by EnCon as part of a wetlands preservation project. The former is next to a tributary stream, and the latter is on the edge of a shallow pond separated from the lake by a barrier beach. He inventoried vegetation and measured environmental variables affecting plant community composition, taking color aerial photos and validating results in the field after each flight. From this work, Geis developed an inventory/classification system of wetland vegetation, which can be applied to all 77 shoreline wetlands along eastern Lake Ontario and the St. Lawrence. He has already applied it to McCrae and Delaney marshes on Grindstone Island near Clayton, New York. The 1,200 acres that include these two marshes are being considered by the US Department of Commerce for designation as an estuarine sanctuary.

In a related study, Geis has developed techniques to document the extent of high-water damage to emergent plant communities, using fieldwork and aerial photography. He plans to follow future alteration in these communities as water levels continue to change. When enough basic information has been accumulated, Geis

will be able to formulate community models, to group communities by physiognomic classification, and to describe zonation and successional changes by environmental conditions.

The wetlands selected are the same for both Geis's project and Robert Werner's studies of pike spawning, so Werner and Geis are cooperating closely.

NORTHERN PIKE USE OF WETLANDS

Robert Werner of the Department of Zoology, SUNY College of Environmental Sciences and Forestry, is determining what characteristics most influence the value of a lakeshore wetlands as a spawning area for important fish like the northern pike and muskellunge. In 1974, Werner and James Marean examined seven test marshes in Jefferson County, New York, to measure northern pike activity and to correlate this with environmental data they and James Geis had gathered previously.

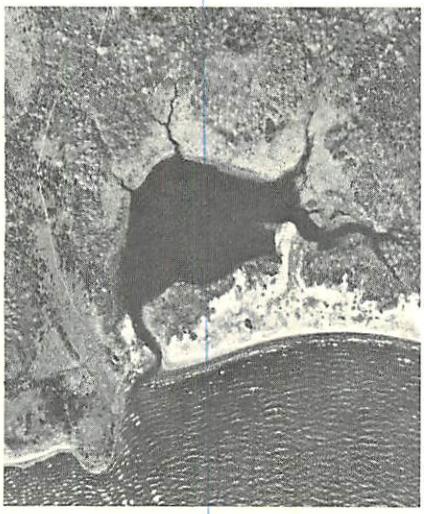
They counted the spawning adults entering each marsh by trapping them temporarily with a fyke net (a long bag kept open with a series of hoops) laid across the marsh entrance during the spawning run. After the eggs hatched, the researchers used a fry trap at the mouth of each marsh to estimate the number of outmigrating fry.

Werner and Marean consider their results preliminary and hesitate to draw conclusions until they have collected additional data. However, they do report several interesting apparent relationships. There was a significant difference in the numbers of spawning adults using each marsh; not all marshes were equally attractive (or accessible) as spawning sites. Curiously, pike fry numbers didn't correlate significantly with adult pike using each marsh. There seem to be important local influences on pike spawning success in the different wetlands. One of these is the number of fathead minnow fry, which correlated positively with number and density of northern pike fry and with spawning success. This suggests that they young pike may be feeding on the minnows.

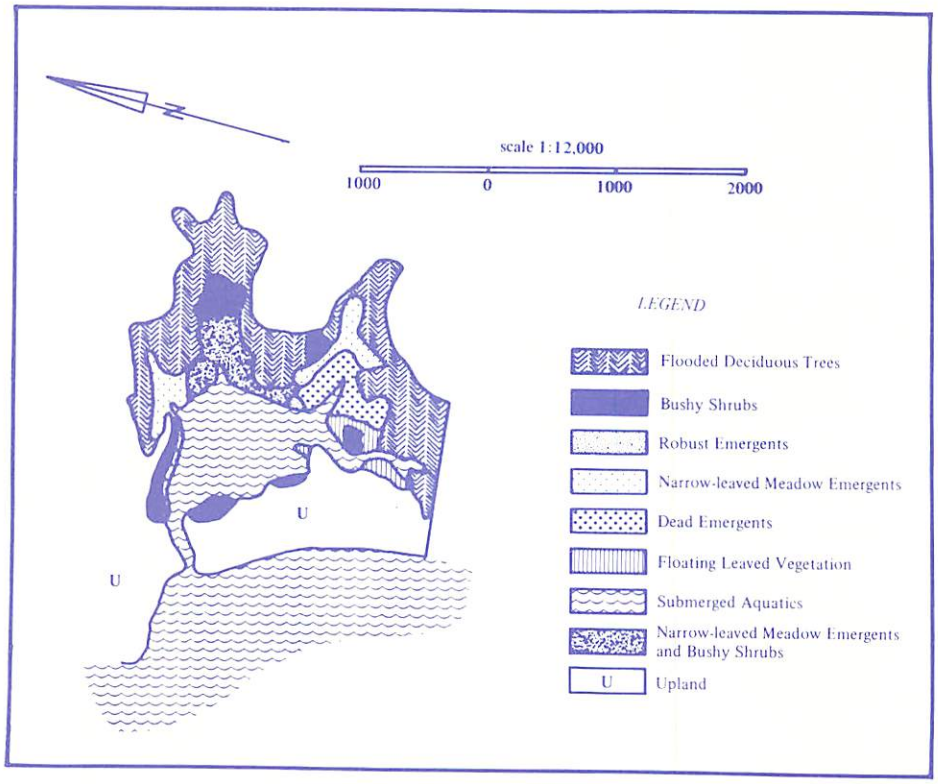
Water level fluctuation is another possible influence: Werner and Marean report that great variation may not be good for spawning – if the water level should drop suddenly, for example, eggs would be stranded. When the water level is already low, the pike – a large fish – could find the constricted area undesirable for spawning.

From a series of depth soundings to estimate underwater topography, the two men discovered that the pike seem to prefer marshes with flat, regular floors over marshes with bumpy, irregular floors. Another observation: fry density was low in those marshes experiencing wide temperature variations.

If confirmed by further investigation, these observations should result in environmental parameters that can be used to estimate the pike spawning value of any marsh. That should help, if a town is thinking of filling in a wetland that turns out to be a pike favorite.



Aerial photo and vegetation map of Black Pond marsh area



NYS Dept of Commerce

Learning about the salmonid-stocking program, Cape Vincent Aquarium

COHO SALMON IN LAKE ONTARIO

In 1968, following a successful salmonid-stocking program in Lake Michigan, EnCon launched what is known as the coho salmon project in Lake Ontario (the department also stocked chinook salmon, lake trout, brown trout, and splake). In cooperation with the Province of Ontario, EnCon has spent much time and money on lamprey control and on rearing salmonid fingerlings for introduction into Lake Ontario. The sportfishery is just starting to develop, and prospects look good for success. To receive continued federal support, EnCon asked Sea Grant as a neutral outsider to document the results of the project and assess it. Tommy Brown of Cornell's Department of Natural Resources has been doing the research, now in its third year, working closely with EnCon's Cape Vincent fisheries station.

Year III studies focused on Oswego County because the Salmon River there has been stocked most heavily and is expected to show effects from the salmon project first. Brown is investigating the impact of the project on both recreational fishing activity and the economy of local communities. Using a creel census that he and others designed, Brown analyzed the 1973 fall salmon run and came up with a total of almost 15,000 angler trips, about half originating outside Oswego County. These fishermen spent $62,000 altogether; bait/sporting goods/marina costs represented 40 percent of the total. Each angler trip averaged only 0.06 salmonids caught. This sound low, but it was the first year with any significant catch, and also the first year the effects of lamprey control were noticeable.

The salmon runs extend the season for campgrounds and marinas (traditionally these operations are financially marginal); the salmon fishing season starts after Labor Day, ordinarily a slack time for these facilities as well as for area restaurants and hotels.

Brown and EnCon cooperated in writing and sending out a questionnaire to 5,000 licensed 1973 anglers all over the state to determine inland water use, species caught, expenditures, and interest in salmonids. Preliminary analysis showed that 47 percent statewide knew about the Lake Ontario salmonid-stocking program – impressive for a completely new program in its initial stages. Although only 14 percent of New York's anglers had ever fished for salmon, most of those questioned (84 percent) were in favor of the program, 14 percent were undecided, and only 2 percent opposed it.

Future studies after the fishery has peaked will seek to determine its statewide economic impact at that time. Success will depend to some extent on whether the state approves construction of a new hatchery, and whether there is sufficient investment in the Harbors of Refuge Program (cosponsored by the NYS Office of Parks and Recreation [OP&R] and the Corps of Engineers) to provide improved access for lake fishing.

A REPORT ON NEW YORK BOAT OWNERS

New York ranks third in the nation, after Michigan and California, in number of registered pleasure boats. The state total is estimated at 500,000; this figure has been increasing at the rate of about 10 percent per year. OP&R is concerned with providing adequate facilities and services throughout the state, but it doesn't want to add public facilities where they will compete with private marinas. Therefore, a group led by Tommy Brown conducted a survey cosponsored by OP&R to identify problems of boaters and marina operators and to make sure that public

and private enterprises do not overlap in supplying facilities to the New York boater. The group surveyed some of the state's commercial marinas, consulted local governments caught up in policy conflicts on marina development, and questioned some 5,000 New York boat owners.

Brown found it difficult to analyze the economics of the marina industry. The greatest reason – and probably the most important discovery made in the survey – was that marinas sorely need a better accounting system. A marina operator in New Hampshire and his accountant/manager recently devised a new accounting system. Brown explained this system to Advisory Service staff, who will be relaying the information to New York firms.

Research associate Dick Noden analyzed the survey of New York boat owners. Apparently in hopes of expanding its market, the boating industry has suggested that the average boater comes from the blue-collar ranks; he actually fits the upper-middle-class stereotype more closely, according to Noden's findings. Professional/technical people, managers, officials, and proprietors accounted for almost half of all boaters (and over half of nonretired boaters). Their median 1973 income was $16,000. Twenty-three percent of boaters owned more than one boat.

Many owners said they had trouble finding pumpout facilities (dockside tanks that hold sewage pumped out of boats), emergency facilities (for quick repairs, rescue, and first aid), docking space, and launching ramps. Noden and Brown are doing another analysis to pinpoint the geographical areas in greatest need of these services.

In response to questions on how boating changed between 1968 and 1973, owners ranked congestion due to increased boat traffic as the main undesirable change. Other problems were increased boating expenses, the inconsiderateness of other boaters, and decreases in the quality of facilities. Only boat design and performance rated higher than in 1968.

How do owners feel public moneys could best be spent to improve recreational boating? They think the highest priority should be given to better enforcement of safe-boating laws and to licensing of boaters. Other suggestions include additional launching ramps, better pollution control, and more dockage space.

New York boaters spent $189 million for boating services in 1973. The average boater spent $900 – $185 for dockage, $155 for repairs, $144 for storage, $127 for fuel, $116 for insurance, $74 for supplies, $61 for hauling, and $40 for launching. Brown and Noden are now studying the effects on 1974 boating and marina operations of petroleum shortages, higher prices, and lower disposable income.

PAST, PRESENT, AND FUTURE OF NEW YORK'S MARINE FISHERIES

The New York State fisheries have been going downhill in the last 90 years. (The hard clam is one of the few exceptions.) Finfisheries have all nearly collapsed, and the oyster industry has declined to minor status. The level of total annual landings has been kept up only by constantly shifting from one resource to another as the stocks of each have in turn declined. New York is a classic example of what happens to a coastal fishery that has no positive and effective management program.

Although it's popular to blame foreign fishing for the ills of the domestic industry, this competition actually impinges on few of the state's resources. The major problems are domestic management problems. Policy is heavily oriented toward immediate issues, and official actions tend to treat symptoms rather than causes.

The marine fishery program at SUNY at Stony Brook, under the leadership of J.L. McHugh, is completing an historical inventory of the various marine fisheries, their fluctuations and trends in production, and any attempts at management. Fishery resources can be classified based on how easily New York State could manage them unilaterally. Categories could range from *endemic* to *oceanic* (see table). This might be a useful guide for developing management policy and program priorities.

Anne Williams's research on foreign fishing shows that the United States has prohibited foreign fleets in areas where there are resources important to this country, adopted catch quotas, and tried to persuade other nations to do their fishing off the ocean bottom, so that they will take resources of minor value to American fishermen, like herring, mackerel, and squid. We shouldn't be complacent about foreign fishing, says McHugh, but if these fleets all left tomorrow, the basic problems of our domestic fisheries would remain.

William Knapp surveyed the history of marine commercial fishing in New York on the basis of the kinds of gear used. Commercial fishing as an organized industry was a relative latecomer to New York and began in earnest only after the Civil War. From this beginning until about 1931 the most important gear was the pound net – a net hung on stakes driven into the bottom in shallow water. After 1931, otter trawls, large nets towed in deep water, began to dominate the fishery. They made new stocks of fish available and also intercepted migratory species before they moved close to shore. In the process, they of course reduced the supply of fish to the pound nets and to all inshore fishermen.

By about 1962, rising costs and changes in species abundance began to reverse the trend and to favor inshore fishing over the trawler. In the last decade, haul seines, gill nets, and pound nets have regained some of their earlier importance. Increased commercial activity close to shore has led to growing conflicts with marine sport fishermen, whose numbers also have increased substantially.

Perhaps no conflict between sport and commercial fishing interests has

YEAR II 1972-73

YEAR III

FOCUS ON COASTAL PLANNING

New York Coastal Zone Management, *Marr/Heikoff/Nunez* — *1*
Coastal Zone Management of Lake Erie, *Ford* — *C2*
Power and Decision-Making, *Dommermuth* — *T*
Impact of Changes in Lake Erie on Income, *Starler/Fisher/Fisher* — *1*
Port-Related Activities, *Crow* — *C*
Management Problems on the Great Lakes, *Dworsky/Allee/Gates* — *C3*
Analysis of . . . TV Spot Commercials, *Halselman/Holtman* — *T5*
Public Opinion of the Use of the South Shore, *Collver* — *C3,5,4*

Siting Power Plants

Siting Policy: Present and Ruture, *Crow/Blankenship/Ford* — *1*

Evaluation of Existing Thermal Criteria, *McNaught/Chermack/Czapski* — *1,2,4*

Multiple Use of Thermal Discharge, Buffer Zones, and Corridors, *Stewart/Mathur/Scott/Wilson* — *4,5*

STUDIES IN RESOURCE MANAGEMENT

Sediment and Water Characteristics, Eastern Long Island, *Brennan* — *C2*
Coastal Inventory of Peconic Bays, *Roberts (Eisel)* — *C2*
Environmental Geomorphic Study of the South Shore, *Coates/Morisawa* — *1,3,5*
Historical Aspects of Wetlands Management, *Kavenagh* — *C1*
Wetlands Redevelopment, *Terry* — *C2*
Disposal Sites as Wildlife Refuges, *Sweeney/Rumer/Korn* — *C3*
Fisheries of New York State, *McHugh* — *1,3*

Impact of Coho Salmon upon New York, *Brown* — *1*

Marina Businesses and Users in New York, *Eiler/Brown* — *1*

Management Model for Long Island Sound, *Duedall* — *1*
Radiocarbon Dating of Lake Ontario Wetlands, *Marsh* — *C*

MARINE PRODUCTS AND TECHNOLOGY

Pilot Projects in Aquaculture, *Terry/Smith/Chanley* — *1*
Use of Clam By-Products, *Shallenberger* — *1,4*
Removal of Mercury from FPC, *Schrier/Tunis* — *C2,4*
Useful Constituents of Cladophora, *Judd/LaLonde* — *1,2*
Potential Uses for Marine Weeds, *Leopold/Marton* — *C3*

Developing a Competency in Seafood Technology, *Baker* (NI) — *1*

EDUCATION AND TRAINING PROGRAMS

Scientific Advisory Internships, *Chapman* — *3*
Development of an Underwater Habitat, *Herman* — *2*

FOCUS ON COA

New York Coastal Zone Management, *Marr/He*
Governmental and Community Strategies in Pl
Impact of Changes in Lake Erie on Income, La
Legal, Administrative Issues in Wetlands Acqui

Siting F

Coastal Zone Power Plants: Environmental Pro
Power Plant Siting in NYS: An Assessment of
Sociolegal and Organizational Dilemmas in Pov
Analysis of Thermal Plumes and Criteria, *Cher*
Modeling Biological Impacts of Thermal Discha
Multiple Use of Power Plant Buffer Zones and
Modeling and Analysis of System to Use Heate

STUDIES IN RESOU

Spawning Northern Pike in Wetlands, *Werner*
Erosion/Deposition Balance, Great Lakes Shor
Coastal Erosion, Stabilization, Use of South Sh
Larval Fish of the Nearshore Zone of Lake On
Dynamics of Freshwater Plant Communities al
Lake Ontario, *Geis*
Fisheries, NYS: Policy Formulation, Economi
Impact of Salmonid Introductions upon New
Marina Users and Businesses in New York Stat
Management Model for Long Island Sound, *Bo*
Continental Shelf Oil and Gas Resources: Eco
Possible Biological Impacts of Opening Ironde
Critical Analysis of Containment and Collectio
Surface, *Rumer/Glattly* (NI)
Magnetic Survey of a Portion of the St. Lawre

MARINE PRODUCT

Shellfish Culture and Nutrition, *Terry/Scott*
Use of Clam By-Products, *Shallenberger*
Diseases of Shellfish, *Leibovitz*
Useful Constituents of Cladophora, *LaLonde/*
Developing a Marine Pathology Competency,
Use of Filleting Waste from Flounder Processi
Harvesting and Processing Procedures Designe
Stouffer/Morris (NI)
Preliminary Investigations on the Genetic Diff
the Hard Clam, *Koehn* (NI)

EDUCATION AND

Scientific Advisory Internships, *Chapman*
Support for Ocean Engineering Student Proje
Developing a Coordinated Marine Science Edu

NI	*new initiative*	*1*	*progress report*
C	*completed*	*2*	*final report, unpublished*
T	*terminated*	*3*	*final report, published*
----		*4*	*scientific article or book*
		5	*popular publication*

FISH AND SHELLFISH IN THE NEW YORK BIGHT AREA CLASSIFIED BY MIGRATORY HABITS

Classification	*Definition*	*Major Species*
Endemic	Remain within 3 miles of shore (within state or local jurisdiction), for all practical purposes, and don't migrate in significant numbers into waters of adjacent states.	Oyster Hard Clam Bay Scallop Tautog White Perch
Anadromous or Catadromous	Spend most of life in sea but ascend rivers to spawn (or vice versa).	Alewife Striped Bass Shad American Eel
Creatures of the Continental Shelf	At the harvestable stage, are immobile on or under the seabed, or normally move in constant physical contact with the seabed or subsoil.	Rock Crab Surf Clam Northern Lobster
Coastal Migratory	Migrate between waters of adjacent states but never enter international waters in significant numbers.	Menhaden Weakfish Northern Puffer
Oceanic Migratory	Migrate between waters of adjacent states and also in territorial and international waters.	Bluefish Butterfish Atlantic Cod Summer Flounder Haddock Red Hake Silver Hake Atlantic Herring Atlantic Mackerel Scup Black Sea Bass Squids
Oceanic	Migratory, but seldom or never enter the 12-mile zone.	Yellowtail Flounder Swordfish Tilefish Bluefin Tuna Witch Flounder Sea Scallop

been more bitter than the striped bass issue. The battle, documented by Walter Retzsch, has been especially vitriolic in New York, where most commercial bass fishing is done with the haul seine, a highly visible type of gear. Haul seines usually operate from the same beaches that recreational fishermen cast their lines from, and the commercial catches are often large. To the lone fisherman who takes one fish at a time, the sight of literally tons of fish landed on the beach beside him can be enraging.

Recreational striped bass fishermen have therefore been campaigning to outlaw commercial fishing for the species. Yet available data suggest that the total recreational catch of striped bass along the coast is several times as large as the total commercial catch. This is just one of several anomalies that need to be examined rationally and clarified as a guide to legislators and administrators.

William Wise is doing a related evaluation of the status, history, and future of the other Long Island Sound fisheries. In helping the New England River Basins Commission complete its intensive Long Island Sound study, he discovered there was little solid information on the commercial and recreational fisheries and fishery resources of the Sound. This finding has led the research team into an intensive search for information from both sides of the Sound.

ECONOMIC ISSUES IN LEASING THE OUTER CONTINENTAL SHELF

Last year's oil embargo and the accompanying price hikes for imported crude oil and petroleum products alerted us to our growing dependence on foreign energy supplies. Increasing imports are a direct reflection of the declining production from our existing reserves of oil and natural gas.

Some believe that 35 to 50 percent of all remaining domestic oil and natural gas resources are located in our Outer Continental Shelf (OCS) region.

There is serious controversy over the advisability of drilling for oil on the Atlantic Outer Continental Shelf (AOCS). AOCS land is only 15 percent of total OCS land, but its strategic location (near high oil-use regions) makes it important. The energy industry, economic expansionists, and many government officials have pressed for immediate extension of federal offshore leasing to the Atlantic. Opponents – environmentalists and many concerned citizens – aren't sure such a move is ecologically safe or, assuming the AOCS is a rich source of oil and gas, that expanded use of domestic resources (as opposed to conservation measures) is a good way to deal with the energy crisis.

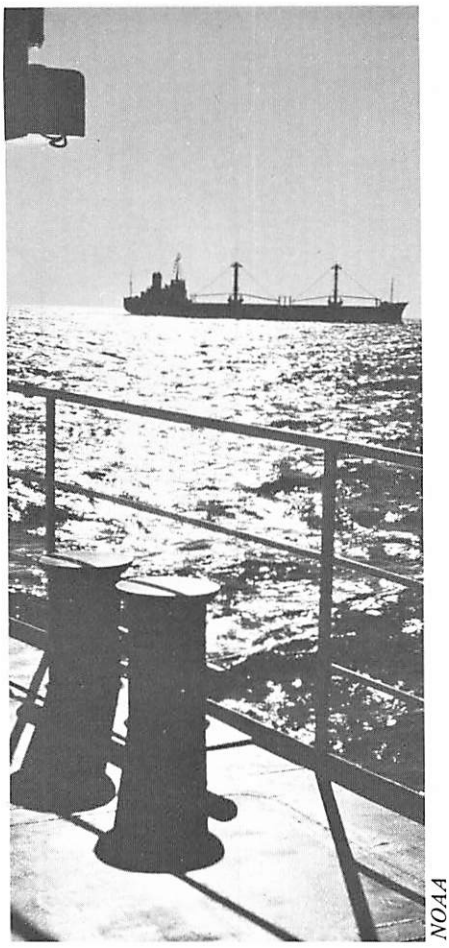
But AOCS leasing is almost certain to happen. In the spring of 1975, the US Supreme Court ruled against the suit filed by New York and 12 other East Coast states which claimed the mineral rights of adjacent continental shelf lands. Nassau and Suffolk counties have a separate suit pending to keep the US Department of the

Interior from granting drilling leases off Long Island, but it is now considered unlikely to be successful.

Developing a policy on Atlantic oil and gas reserves means considering numerous national, regional, and local interests and a multitude of viewpoints. Improved information on all economic implications of oil and gas production is critical to arriving at appropriate tradeoffs. The economic incentive/environmental impact argument has tended to be confined to one area at a time, in this case, the AOCS. It would be more realistic to look at the overall energy requirements of the United States and to consider the relative environmental impacts of developing alternative energy resources like coal and oil shale. Exploiting *any* form of hydrocarbon resource will have some environmental cost.

Robert Kalter of the agricultural economics department at Cornell is investigating expected economic impacts of exploiting offshore Atlantic energy resources on New York State. The Nassau–Suffolk Regional Planning Board requested the study, enlisting the cooperation of the US Department of the Interior, the Council on Environmental Quality, and the Environmental Protection Agency.

Using a computer model that he created, Kalter is evaluating alternative federal, state, and local policy options regarding AOCS drilling, considering



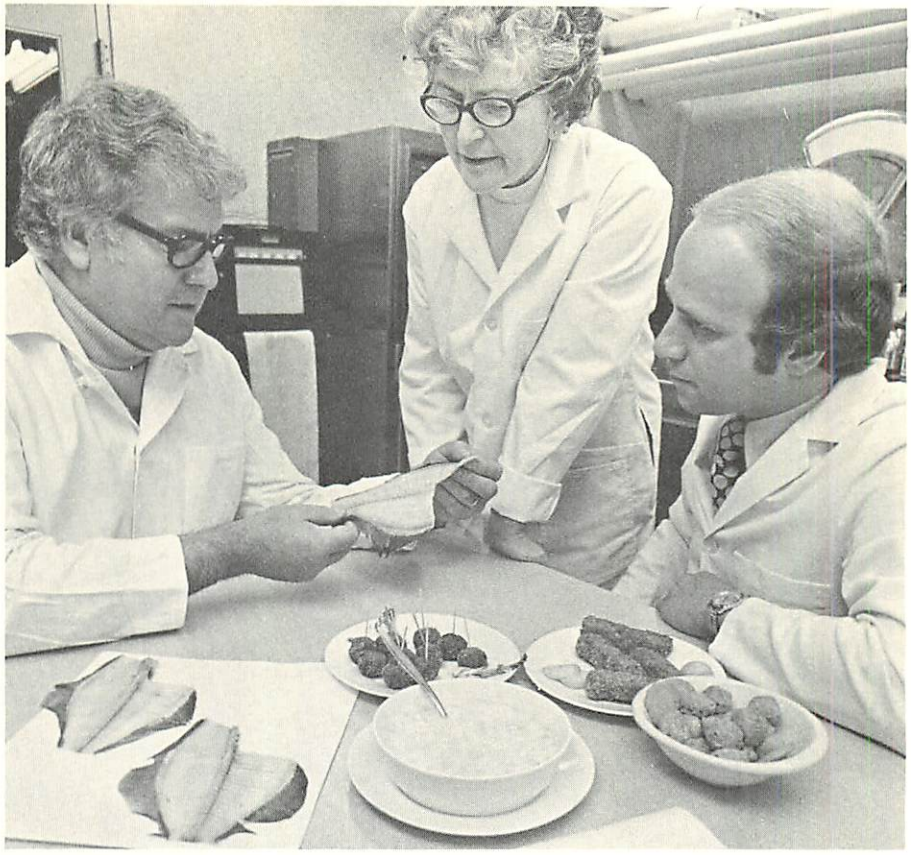
NOAA

the implications of each option for consumer prices, rate and timing of energy production, investment requirements, government revenue, onshore impacts, and eventual amount of resource recovery.

Kalter and his associates have analyzed possible alternative OCS bidding systems (e.g., cash bonus *v.* royalty) and forecast AOCS conditions to show impacts of each system on 1) alternative social objectives, 2) the timing and magnitude of acreage allocations, and 3) production costs and technology. This analytical approach can also be used to evaluate leasing alternatives in non-OCS areas.

Such analysis identified the tradeoffs implicit in various leasing strategies. It showed some decided advantages in the present cash bonus plus royalty leasing system, as used in the Gulf of Mexico and the Pacific. (Companies make competitive cash bids to be paid to the government immediately. The highest bidder develops the leased tract, and if and when oil is found, it pays the government a royalty of 16 2/3 percent of the gross.)

Even full production from the AOCS will not make the East Coast self-sufficient in either oil or gas. Kalter says that reducing present uncertainty about AOCS reserves will help in intelligent, long-term planning for use of alternative energy sources.



Robert Baker, June Darfler, and Robert Gravani confer in front of foods made from filleting wastes: (left to right) a plate of flounder crispies, a bowl of fish chowder, a plate of fish sticks, and a bowl of gefilte fish.

Marine Products and Technology

Changing economic conditions and stringent limitations invoked by an environmentally concerned government can bear heavily on traditional marine product industries. Getting rid of wastes and obtaining fuel have been real problems. It is easy to say that the answers lie in modernized technology but not so easy to fit needed improvements within economic constraints. These industries have the potential to make an important contribution to our dwindling food resources. Among many possibilities are developing new products and new uses for old products, especially those now largely discarded.

New York State ranks 13th nationally in the number of fish-processing firms. Most are located in New York City or on Long Island and share common problems: marginal profits, incomplete recovery of potential revenue because of only partial use of raw material, and increasing costs of waste disposal.

The New York fishery's most successful product, the hard clam, supplies about half the total United States crop of this species. With recent development of hatchery methods to increase shellfish populations, the oyster industry and the clam industry are adopting a culture technology. There is good opportunity for research in cooperation with industry, not only to promote aquaculture based on present shellfish culture facilities, but also to meet some of the acute problems of the conventional marine food processors. Several of the local firms engaged in fish and shellfish production and processing are interested in promoting such research.

The long-term objective of this group of projects is to improve the economic health of the fisheries and aquaculture industries of the state and to expand their production of marine foods and other useful products. Some of the most promising research areas are aquaculture of finfish and shellfish, improved hatchery and off-bottom culture methods for bivalve shellfish, and the development of new uses for nonutilized and underutilized fishery products.

FOOD FROM FLOUNDER FRAMES

Fish filleting companies in the New York City area produce in excess of 8 million pounds of filleting waste per year. One plant in Greenport, Long Island, turns out about 450,000 pounds of flounder racks (what's left of the fish after filleting) in a year, in addition to an equal amount of other waste – heads and viscera. This waste, now sold as mink feed, pet food, and fertilizer at three cents per pound, could be put to much more profitable use.

Fish waste and "trash" fish have been a concern to the New York fishing industry, but they represent quite an opportunity: making use of a waste product and possible contaminant, and increasing the supply of usable, palatable protein.

Only 35 to 40 percent of the weight of the yellowtail flounder, for example, goes into filleting (see chart). Marketable human and pet foods made from flounder waste from all the filleting houses in the New York City area could add $1 million to fishermen's income.

Another example: at least one-third of the catch of Great Lakes fishermen is classified as underutilized or trash fish. Unless additional sources of revenue become available through new uses for these fish, commercial fishing on Lake Erie may face extinction.

Considerable work has been done on mechanical deboning, both of whole fish and of racks. The deboned fish has been used in Japan for years to manufacture sausages and fish cakes. Other known products include fish spreads, a frozen minced-fish block (sold to processors to saw up into fish sticks), canned fish, and fish frankfurters, as well as fish croquettes, casseroles, and loaves.

Members of the Food Science section of the Poultry Science Department at Cornell are uniquely equipped to develop new products from filleting wastes and underutilized species. The research team headed by Robert Baker has successfully developed 35 new poultry meat and egg products and market-tested 23 of these. The group's prior experience with poultry has already proved a real asset for their new subject, fish.

The project shifted into high gear with the installation of a Beehive Vari-Speed Deboning Machine in June 1974. The frames (racks less viscera and heads) or whole (gutted) fish go through a series of augers (as in a meat grinder) and the separated flesh is pressed out through small openings in a cylinder. The resulting material is a finely minced fish product.

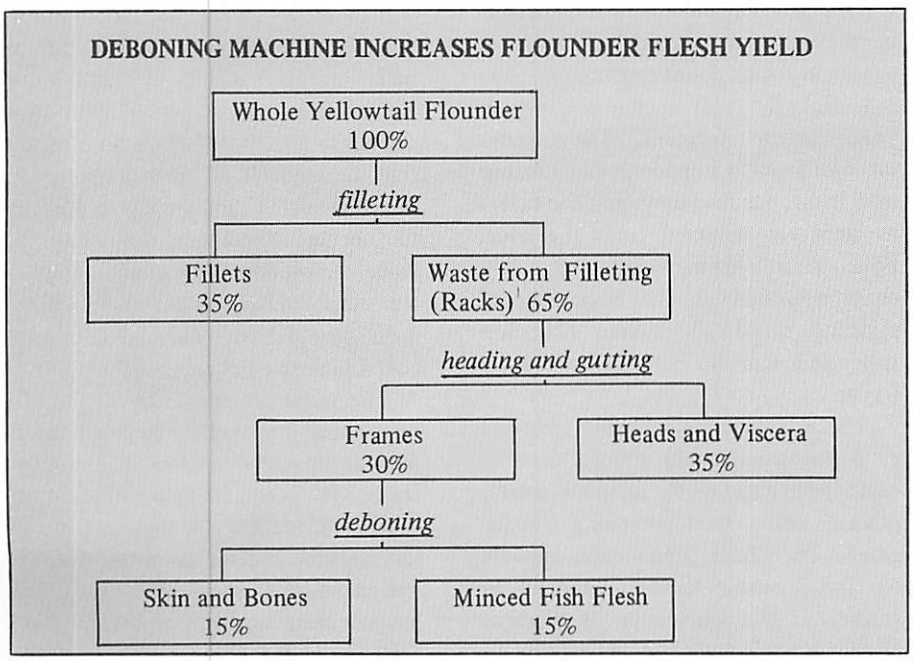
Beyond the 35 percent of a whole yellowtail flounder that goes into the fillets, another 15 percent, traditionally wasted, can be recovered from the frames in the deboning process. From the whole fish, about 50 percent can be recovered.

Fish from several catches have been deboned by machine and analyzed chemically. The minced fish contains much less fat and more moisture than poultry, for example. A storage study showed no problem with rancidity for at least two months, if the product is properly protected. Analyses also showed a high level of protein with seasonal variations in the amount of fat. Tests confirmed that the emulsifying capacity is not as good as that of chicken or red meat; textural alterations will be necessary before satisfactory hot dog or bologna products can be manufactured.

Baker and his associates have concocted a wide variety of fish products and developed prototypes. They have already tested fish sticks, fish chowder, gefilte fish, flounder crispies, sweet-and-sour fish balls, Swedish "meatballs," seafood chowder, and fish balls and crispies made from underutilized fish – some from Lake Erie (sucker, sheepshead, carp) and some from the Atlantic (skate, hake, ocean pout, and spiny dogfish).

The Food Interest section of the Cornell Campus Club liked the flounder crispies. They also overwhelmingly preferred an experimental fish stick made from minced flounder to a commercial product made from minced pollock; they rated the former superior in flavor and texture.

Tasters (ordinary consumers) were enthusiastic over the sweet-and-sour fish balls. This recently formulated product, which has no strong "fishy" flavor, shows great promise as one use for underutilized fish – as an economical substitute for pork, in this case.



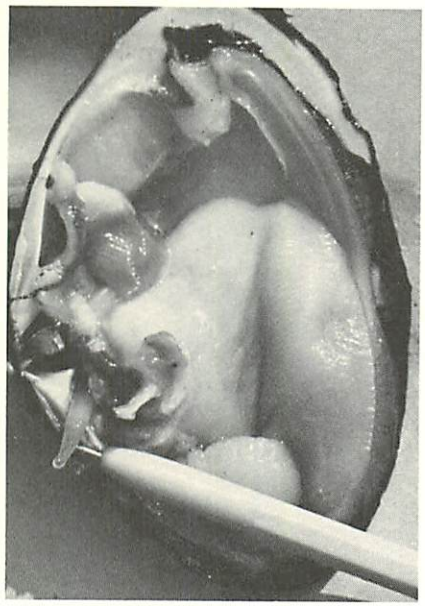
Baker has utilized heads, viscera, skin, and bones left over from deboning in making pet food. Preliminary tests show that pets find it tasty. He will be doing nutritional analyses and formula variations next.

Although obtaining a reliable supply of good-quality fish and racks continues to present some difficulties for the Ithaca-located project, more new products are planned for the coming year. Current products will be further refined, and work will begin on the next steps in the merchandizing chain – packaging, labeling, and actual market-testing.

A USEFUL ENZYME FROM THE CLAM

The shellfish-processing industry in New York State harvests some 3.5 million pounds of surf clams *(Spisula solidissima)* every year. About 20 percent of the clam, mainly the digestive system, is removed before processing for food products like breaded fried clams. This discarded part of the clam is sometimes used as fish bait and has a limited potential as feed for cultured marine organisms, but in general it has been a waste product. To control pollution, authorities are clamping down on ocean dumping, the traditional way to dispose of marine wastes. So the pressure to find practical uses for seafood "leftovers" is mounting.

Enzyme chemist Robert Shallenberger of Cornell's Agricultural Experiment Station in Geneva, New York, working on one angle of the problem, reasoned that the clam must have digestive enzymes not found in terrestrial animals, because clams can digest sea plant carbohydrates, while humans and land animals can't. Sea plant carbohydrates, structured differently from most of those in land plants, have a *1,3 linkage* holding their sugar units together; occasionally, though, a land plant carbohydrate will be structured with this linkage. These carbohydrates tend to accumulate when such plants – as potatoes – are



Surf clam with the crystalline style (at the tip of the pen) exposed

processed, just because they have the stubborn 1,3 linkages. They become "decay-resistant fractions," clogging filters and being a general nuisance in many processing plants.

Shallenberger discovered that the clam enzyme, called *laminarinase,* could break down these 1,3 linkages in land carbohydrates just as it does in the sea plants the clam eats. Hence, he found a new way to dissolve many stubborn land carbohydrate wastes.

One way the enzyme can be used is in brewing beer. Barley, essential in producing malt, contains considerable 1,3 linkage polysaccharides which yeast cannot ferment. These polysaccharides also impede beer filtration operations because they clog the filters as they are removed from the beer. Pilot plant brews with the clam enzyme added at the beginning of mashing saved 25 percent filtration time and had no adverse effect on flavor.

The enzyme is also being screened as a toothpaste additive to prevent cavities; it seems to dissolve dental plaque. Other uses are being investigated. The crude preparation appears to have anti-leukemia activity, in studies at the University of Western Michigan at Kalamazoo. According to one theory, the carbohydrate-protein complex of the cancerous cell wall has the unusual 1,3 linkage.

The latest possible use suggested is to dissolve the mycelia of a mold that develops in the blood vessels of severely burned persons. This mold grows despite the drugs used to control gangrene, and can lead to death unless counteracted. The mycelia are made up of 1,3 linkage carbohydrates.

Besides extracting clam styles for their enzymes, we may be able to use the entire clam viscera as fertilizer for salt-tolerant crops like table beets. Beets respond well to this fertilizer and are not inhibited by its high sodium chloride content.

SHELLFISH CULTURE AND NUTRITION

Nutrition is an important factor in lobster culture. Even when a diet has been found which seems to support good survival, growth, and reproduction, there remain problems of cost, convenience, reliability of supply, and adaptability to a particular project's culture routine.

There is evidence that diet affects lobster behavior. Since cannibalism in lobster culture arises from a behavioral trait, it is possible that it can be controlled by proper diet. Up to now, most lobster culture has depended on such "natural" foods as mussels and clams, often supplemented with brine shrimp or fish, but there is no evidence that these meet all nutritional needs. Besides, such foods are often difficult to obtain, expensive, and hard to store. A prepared food analogous to the commercially available fish chow diets should have many advantages in cost and convenience.

The main problem is to formulate a reasonably priced, storable, "artificial" feed comparable to trout and chicken feeds. It could supplement natural foods, or replace them where necessary. Other lobster projects agree on the need for such feed, but they haven't come up with any satisfactory formulated diet.

In New York, Milton Scott of the Department of Poultry Science, NYS College of Agriculture at Cornell, has initiated work on a lobster feed formula which may eventually be adaptable to other cultured marine species. It's made of seafood waste products plus one or more binders – for seawater stability. He designed a detailed, sophisticated diet and arranged for its formulation by Ziegler Bros., a commercial producer of animal feeds, and the water-stabilization of a part of the initial run by the American Maize Company. The feed was tested on the lobster culture project being conducted by Orville Terry of SUNY at Stony Brook's Marine Sciences Research Center, and then on projects of Anthony D'Agostino of the New York Ocean Science Laboratory and John Hughes, director of the Massachusetts State Lobster Hatchery on Martha's Vineyard.

Hughes, the most experienced and knowledgeable lobster scientist in the country, found the Scott feed promising. D'Agostino noted that test lobsters grew somewhat more slowly than did those raised on natural food and that there was some loss of pigmentation. He also freeze-dried lobster tissue samples for amino acid profile determinations and calcium and phosphorus measurement. Information from these analyses will help him identify the biochemical changes in his pale lobsters and will help Scott improve the feed formula.

Terry found the feed unsuitable for young planktonic lobster larvae (this was not unexpected). But juvenile lobsters from both the 1973 and 1974 hatch survived fairly well on the Scott formula, though not as well as the control group. Some growth occurred, and he noted no pronounced color change.

A marine animal feed must also be water-stable for a "suitable" length of time. For the lobsters that Terry is raising in trays, this period can be short because the laboratory compartments are small. In its present form the uneaten food loses its appeal in a few minutes anyway. If the feed can be made to keep its attractiveness longer, the stability requirement may change. Terry's team is also investigating the practicality of installing a self-feeder device that would minimize accumulations of uneaten food.

A sudden pump failure in Terry's closed culture system subjected the juveniles to extreme stress. All animals on the Scott diet died, while the controls all survived – even those in the same trays with the Scott lobsters. The exact cause of death is unknown, but some nutritional deficiency in the Scott diet may have made the lobsters more vulnerable to stress conditions.

In another experiment, Terry transferred some juveniles to an outdoor open raceway at the Shelter Island Oyster Company's pond area in Southold, New York. With access there to natural foods, including spilled juvenile scallops from the company's culture trays, these lobsters thrived, and those that were recaptured at the end of the summer had far outgrown their littermates indoors. Cannibalism may have been a factor, but the research team believes that the mixed natural diet was most important, and it hopes to experiment further with improved natural diets.

Stony Brook graduate student Joseph Andrea is conducting an elaborate study of the use of natural food by lobster larvae in D'Agostino's laboratory. To feed captive lobsters, we need to know better what wild lobsters normally eat. Andrea's investigation will help answer this question.

SHELLFISH DISEASE CONTROL

It is probably fair to characterize present Long Island shellfish "hatcheries" (laboratories where bivalve shellfish larvae are hatched and grown to stocking size) as little more than marginally feasible. The basic operating techniques have been known for years, but serious problems remain. On top of this, the industry as a whole has its share of such difficulties as increasing pollution, marketing uncertainties, and a less-than-adequate knowledge bank on the basic ecology of bivalve growth in the field. Much needs to be done, especially in the realm of disease control.

As with marine food merchandising (Robert Baker's project), there is an impressive background of basic knowledge on the disease problems of terrestrial animals that can be applied to marine animal disease. Louis Leibovitz and Stephen Hitchner of the NYS College of Veterinary Medicine's Department of Avian Diseases have initiated a study of bivalve shellfish pathogens, specifically those which cause larval mortality in hatcheries. In a situation where mass larval death from unknown causes is almost commonplace, they have begun to identify causal agents of disease and to develop control methods. The basic approach was by regular collection of samples from four Long Island oyster hatcheries – Frank M. Flower and Son Oyster Company, Shelter Island Oyster Company, Bluepoints Oyster Company, and Shellfish, Inc. – and microbiological testing of the samples. Standardizing an appropriate test regime is one important objective of the work.

Bacterial isolates from samples of laboratory water, larvae, and food algae cultures were tested on sample larvae cultures for pathogenicity, and efforts were made to standardize this procedure. Gradually the lethal combinations of temperature, pH, larval density and age, types and conditions of algal food, water and media characteristics are being identified and the influence of therapeutic drugs investigated.

Initial observations indicate that mass mortalities can result from heavy infestations of almost any of the common bacterial contaminants of hatchery cultures. The first step toward reduced mortalities may therefore be a concentrated program of decontamination of larval cultures and their food algae cultures, using standard anti-bacterial procedures. Leibovitz and Hitchner are developing

standard tests to monitor the effectiveness of such a program.

There is at present little information on whether shellfish viruses cause disease problems in hatcheries. To study such viruses effectively it is necessary to have a test regime – a system in which the viruses can be grown. This would normally be a cell or tissue culture, grown aseptically, into which virus can be inoculated. Since standard shellfish tissue cultures are not available, Leibovitz and Hitchner have begun a study of methods and appropriate media for producing and maintaining such cultures. They removed tissues from oysters and placed them in three different culture media; none of these media was successful. No significant tissue growth was noted and all cultures except heart tissue showed microfloral contamination. Cultures from oyster larvae were equally unsuccessful due to early contamination.

To continue and expand these studies, what's needed is a regional shellfish laboratory located near the industry. Such a laboratory could conduct research more effectively, monitor conditions in the hatcheries, and educate the hatchery operators in disease control procedures. Many other aspects of hatchery culture technology, such as the effects of organic material in cultures and other aspects of water quality, need study. Strains of disease-free or bacteria-free shellfish stock are badly needed for studies of pathogenicity. These would be valuable in hatchery culture as breeding animals and would provide tissue culture material.

GETTING RID OF TWO PESTS AT ONCE

The nuisance created by the green alga *Cladophora* is only too familiar to lakefront property owners in the lower Great Lakes basin. It washes up on the beaches in huge amounts. It smells bad. It has been a political issue in New York because citizens know it's related to nutrient pollution of the water.

Cladophora piled up on Lake Ontario shore

But *Cladophora* may have a beneficial effect: it releases metabolites (substances secreted through metabolism) that inhibit mosquito larval development. Active fractions of these have been isolated, but no one knows the precise identity of the pure active constituent(s) yet. Capacity to inhibit larval development seems directly related to the concentration of the active substance. What's even more important is that the substance is selective: the natural habitats of *Cladophora* have a varied and abundant fauna including fish, tadpoles, snails, and predatory aquatic insects, but they are free of all mosquito larvae.

The purpose of chemical research by the Robert LaLonde team at the SUNY College of Environmental Sciences and Forestry, Syracuse, was to develop the insecticide potential of *Cladophora:* 1) the alga could be used in lakes and wetlands to suppress mosquito populations, or 2) the active constituent(s) could be extracted for use or, once identified, be synthesized and manufactured commercially.

LaLonde's group confirmed earlier reports that mosquito larvae fail to metamorphose into adults when they eat food containing *Cladophora* extracts. Breaking down the extract, they found that hexane-soluble and acetone-soluble fractions were effective against *Aedes aegypti,* their standard test organism. Then they fractionated these fractions to isolate and identify the larvicidal components. They found three "active" components but have not yet completely identified them. Further purification work should show if all three components are in fact active, and whether activity truly comes from these components or from some other still-undertermined substance masked by them.

The mosquito problem must be faced by local and state health officers if they are to maintain wetlands for recreation or at least minimize the nuisance potential there. Saltwater marshes, for example, are the primary mosquito-breeding locations in Suffolk County on Long Island. Present methods of mosquito control are either environmentally objectionable or of limited effectiveness. *Cladophora* extract might avoid both of these criticisms. Once *Cladophora* is established as a mosquito killer, it can be harvested from the Great Lakes beaches, to the relief of the property owners, and the algae or their larvicidal component(s) can be the pest-specific (and biodegradable) control agent.

Advisory Service

New York's Sea Grant Program has always given high priority to a strong Advisory Service effort. It is a realistic quick-response link with the ultimate user of Sea Grant research. By putting the Program and the community – or the coastal industry, or the fisherman – in direct touch, instead of two or three removes from each other, Sea Grant hopes to turn around the skepticism of New Yorkers into enthusiasm. The Institute in turn hears from the community through Advisory Service staff.

To expedite this feedback, Advisory Service offices are strategically located on several State University campuses along the coastal zone – Stony Brook, Potsdam, Oswego, Brockport, and Fredonia – as well as in New York City and in Ithaca. The usefulness of such a setup has been demonstrated over and over. One example: in the Rochester area, local government and citizens' groups were debating the proposed Corps of Engineers dredging of the outlet from Irondequoit Bay to Lake Ontario. The Irondequoit Bay Policy Committee contacted the A/S Brockport office for technical advice on the effects of opening the bay. This resulted in a quick-response research project by Clarence Gehris and two graduate students at SUC Brockport. They gathered enough biological, chemical, and geologic data to demonstrate that the Corps project wouldn't improve the water quality of the bay, but the proposed eight-foot-deep channel would be adequate to make it a harbor of refuge. Dredging would have localized, short-term effects, including destruction of rooted aquatic plants, elimination of benthic organisms, and possible fish kills. But once dredging was completed, reestablishment of these communities would probably be rapid.

Advisory Service is also Sea Grant's most effective weapon against immediate problems. The above-normal rainfall in the Great Lakes Basin which brought high-water levels to the Great Lakes is a case in point. A research project might not have yielded results for months, but an Advisory Service specialist was deployed immediately to work with communities and citizens on the high-water problems.

Bill Walters (left) and Dale Baker (center) talk with William Cahill, Lake Ontario's only remaining full-time commercial fisherman.

Staff Revisions. Two A/S specialists left New York Sea Grant at the end of Year III. Dick Gross returned to the US Bureau of Outdoor Recreation after having been on loan to A/S for two years, and Dale Baker is now heading the new Sea Grant Advisory Service program in Minnesota. To replace these friends and to give more depth to the New York program, six new staff members were added. Their names, offices, and specialties are: Norman Bender, Stony Brook, marine economics, recreation, business management; Stephen Brown, Oswego (Potsdam in 1975), recreation planning and economics; Robert Patten, Fredonia, marine recreation, power plant siting on Lake Erie, coastal zone management; Richard Raymond, New York City, urban youth education, marine foods; Peter Sanko, Stony Brook, marine geology, engineering, coastal processes and regulatory processes; and Richard Sojda, Brockport, salmonid fishery and outdoor recreation planning.

Fredonia Office Opened. Advisory Service opened a new office at SUC Fredonia in 1974. The office is a cooperative effort between Pennsylvania State University and New York Sea Grant; the staff is working with people in both states who are involved with the Lake Erie coast.

Initially, A/S specialists Rob Patten and Sandy Schuman explored ways Sea Grant could help industries and communities stimulate the coastal economy, prevent or mitigate high-water damage, and extend youth education. Their most immediate challenge was to convince the public that Lake Erie is far from a "dead lake," a characterization handed down by the national press. While it is true that the pressures of industrialization and urbanization have taken their toll, findings suggest that we should take another look at our "late" friend.

Fishing in Lake Erie is on an upward surge. The consensus of lifelong residents of the lake region is that the water today isn't as clean as it was in the good old days before 1950, but it sure is a lot cleaner than it was five to ten years ago.

Research done by Fisher, Starler, and Fisher (see "Focus on Coastal Planning") showed that people had stopped thinking of Lake Erie as a resource. They didn't even know when the parks were open. Rob Patten, recognizing that the Fredonia office's main job would be to get people to think again in terms of using Lake Erie, created a daily recreational report, the first of its kind in the region, broadcast 10 to 15 times a day over three radio stations in Dunkirk and Fredonia and in Erie, Pennsylvania.

Response was very good. One state park superintendent noted unusually high occupancy of his campsites beginning the day campsite reports were included in the broadcast. The Coast Guard Auxiliary appreciated having its boating safety tips in the report. Local community officials used the report to publicize special waterfront activities and to keep local fishermen informed of progress on public access.

The success of the Fredonia report has spurred the Brockport office to work on similar spots for a radio station in Rochester, possibly tying in with stations in Syracuse and Buffalo.

St. Lawrence Office Established. Plans were finalized to open another A/S office in January 1975, this one at SUC Potsdam, with Steve Brown at the helm. He will be working with communities along the St. Lawrence River, a region increasingly important as a center of recreation and tourism. Future projects are to focus on environmental education, a resort management institute, and programs relating to the Bicentennial celebration, one called "Lake Ontario: A Mirror of Our Heritage and Future." The St. Lawrence office completes the planned A/S network in New York State.

Salmonid Program. The NYS Department of Environmental Conservation (EnCon) is committed to developing a major recreational salmonid fishery on New York's Lake Ontario. Through a series of popular meetings and videotapings, Sea Grant publicized New York's new fishery resource and discussed possible social and economic impacts on Lake Ontario communities from the introduction of the coho salmon. Dick Gross headed the project to encourage these towns to prepare for the expanding salmonid sportfishery. At one meeting in Pulaski, one-sixth of the town showed up. These gatherings have led to citizen/local government/state government input for developing a recreational program for the region and accommodating the numbers of fishermen the coho salmon will attract.

Village of Pulaski center. Some people fish from the bridge (left), although most fishermen stand in hip boots in the water below and try to snag fish.

The culmination of Year III work was an Oswego A/S-sponsored September trip for 30 New York community leaders to Manistee, Michigan – a tour to see the impact on a small city of the successful salmonid-stocking program there. Michigan not only supplied the New Yorkers with reports on past efforts, but it has loaned "salmon experts" to New York to share ideas and experiences. The trip resulted in a raft of publications, radio programs, slide series, meetings, and agreements to cooperate with Michigan. One more result: Niagara County has created a fisheries development board to guide the county in meeting the needs of a developing fishery.

Since October is salmon month on Lake Ontario, salmon cleaning and cooking demonstrations there attracted much attention. Taking the program to where the people are, A/S staff and Oswego County Cooperative Extension agents coproduced an outdoor workshop series that featured filleting, canning, pickling, smoking, and handling techniques. These demonstrations were held on weekends in cooperation with EnCon and the Board of Cooperative Education Services.

Marina Conference. The first statewide marina conference was held in Year III. Marina operators learned of Sea Grant research findings and were instructed in business management and government regulations. Several agencies cooperated in the conference: the Office of Parks and Recreation (OP&R), the Corps of Engineers, EnCon, and the Rhode Island Marine Trade Association. The Syracuse conference defined some industry problems and disclosed new ones (e.g., insurance, liability, concern for information on legislative matters), sparking new directions for Sea Grant marina-oriented programs. So much interest was generated that two conferences, one each for upstaters and downstaters, were scheduled for Year IV. Three upstate marina groups talked about organizing statewide; this is on its way to becoming a reality.

Advice and Service to Commercial Fishermen. Year III saw A/S tangling with the problem of fuel allocations among New York's fishermen, fish retailers, and fish-processing firms. Last year's energy shortages hit New York commercial fishermen and baymen hard. A number of Long Island fishermen and processing firms were able to get adequate fuel through

procedures worked out by A/S specialist Bill Walters. His data on energy requirements of commercial fishermen have been incorporated in a statewide report on agricultural energy needs.

Walters worked with South Fork fishermen to band together and form the East Hampton Seafood Producers Cooperative. This was a breakthrough because fishermen traditionally operate independently. The coop will increase their bargaining power, and it will allow them to share information, get health insurance, and accomplish what they can't as individuals.

Norm Bender showed commercial fishermen how to save tax-free money for new or reconstructed boats under the Capital Construction Fund administered by the National Marine Fisheries Service. In response to numerous requests for information on this fund, Bender wrote a pamphlet, the first of the A/S Insight Series, telling how eligible fishermen can invest money in an interest-bearing trust fund; their taxable income for the year is then reduced by the amount deposited.

As one of the leading shellfish-producing states, New York is participating in a USDA-funded Northeastern Regional Clam Study. Under this study, several states are looking into alternative management strategies for the Atlantic coast clam industry, analyzing the industry's current structure, and assessing harvesting, handling, and processing, and present and future supply and demand. Norm Bender is representing New York on the study committee. He has collected shellfish regulations from all 13 towns on Long Island, and he is keeping researchers, baymen, the clam industry, and town and state regulatory agencies informed on the progress of the study.

There was one new development in lobster gear. Bill Walters demonstrated and publicized a new, reusable lobster bait bag of Vexar plastic, which will cost only 10 to 12 cents. Henry Moeller of the New York Ocean Science Laboratory invented the bag and tested it in cooperation with a Montauk lobsterman. Field trips showed that the bags fished as well or better than bait hung in the traditional way, on wires.

Oyster boat, Greenport, Long Island

EnCon

Marine Foods. Bill Walters on Long Island and Rob Patten in Fredonia are actively involved in Sea Grant-sponsored research at Cornell's Institute of Food Science and Marketing (see "Marine Products and Technology"). Patten supplied Robert Baker's group with underutilized Lake Erie species, mostly suckers, in their quest to develop marketable products from these fish.

Walters acted as liaison between Robert Cooper's seafood plant and the Shelter Island Oyster Company so that Cooper could process a trial batch of surf clam bellies into meal. Researcher Robert Shallenberger arranged for the Cornell Vegetable Research Station on Long Island to conduct field trials using this meal as organic fertilizer.

At Cornell, Walters and media specialist Linda Camp organized a week-long in-service training course on marine foods for Cooperative Extension home economists. Out of this seminar came slide sets, a videotape, and several publications, which will enable the people taking the course to train others in county meetings throughout the state.

Rick Raymond held a workshop for staff from the Expanded Food and Nutrition Education Program (EFNEP), which works part-time with youth. EFNEP, pleased with the results, requested further workshops for their aides on the buying, care, and preparation of seafood. In 1975, Raymond will be training people in the South Brooklyn, East Harlem, and South Bronx offices.

Students dissecting a shark, as part of the youth education program in New York City

Urban Youth Education. Marine education of minority youth has been enthusiastically received in New York City. As part of a seashore awareness project, Rick Raymond took 200 South Bronx students on a series of field trips – to Jones Beach, Orchard Beach, the South Street Seaport Museum, and the New York City Aquarium. Raymond provided their school with instructional materials, seashore guidebooks, water-testing kits, nets, buckets, and thermometers. On the beach trips they took water samples, measured air and water temperatures, collected seaweed, rocks, and shells, and seined for fish. Classrooms were fitted with aquariums containing ocean fish, crabs, and clams – a unique variation on the traditional freshwater aquarium stocked with goldfish.

Sea Grant was awarded 4-H funds for its minority youth urban fishing program on the Great Lakes. This led to Sandy Schuman's two pilot programs for teenagers. The first, "Let's Go Fishing," teaches fishing skills to youth, gets them outdoors, and cultivates an appreciation of the aquatic environment. The program started in the summer of 1974, with 250 kids from the cities of Buffalo and Niagara Falls. Additional funding has allowed program expansion: in 1975 there will be 1,500 to 2,000 kids involved. Senior citizens have volunteered to do some of the teaching. Rick Raymond is adapting the program for New York City. In fact, 4-H staff are now using "Let's Go Fishing" in every county in the state.

Schuman's second program, "The Question of Cobbler's Cove," is a game about a fictional place on the Great Lakes. It explains environmental impact statements and shows how citizens can participate in environmental conservation.

In a related venture, Roger Allbee, Rick Sojda, and Sandy Schuman will be teaching a course for adults on water resources, using "The Question of Cobbler's Cove" as source material. Through student involvement, the course will examine human interaction with water resources and expose and challenge the students' ethics and perspective on resource management. The course will be given in cooperation with the School of Science and Man at the Rochester Museum and Science Center.

High–Water Levels. High-water levels were of continuing concern on the Great Lakes in 1974. Roger Allbee served as liaison with the Great Lakes Basin Commission and Federal Regional Commission; he distributed a summary of their report, "A Strategy for Shoreland Damage Reduction," which specifies alternatives for reducing damage – the most promising is zoning or structural control at the local level. He disseminated information on casualty loss deductions for property owners to all Great Lakes town supervisors, local, county, and regional planning boards. Allbee's widely distributed "Shoreline Protection Bibliography" lists free publications giving valuable information on how to deal with or prevent flooding.

Responding to concern over possible continuing high water, Allbee organized a seminar and a series of call-in TV shows on predicting lake levels. The shows featured Frank Quinn, chief hydrologist at the NOAA Lake Survey Center.

At a public hearing in Rochester, there were many calls for citizen representation on the International Joint Commission. In contact with the IJC, Allbee proposed a structure for coastal homeowner involvement.

Coastal Processes. The Sodus Bay Waterways Association, together with the towns of Huron and Sodus, wants the Corps of Engineers to survey the Sodus Bay area to determine if a navigation project there – involving groin construction – is causing accelerated erosion on shore. A/S and the association are jointly getting together the documentation for presentation to the Corps.

"Our Everchanging Shoreline," a Sea Grant film produced in 1974, focuses on the problems of erosion and deposition on the New York shores. It explains the natural coastal cycle of destruction and rebuilding and how misunderstandings of this process have led to all kinds of mismanagement.

Pete Sanko compiled a "Shoreline Protection Guide for Property Owners" for those faced with coastal erosion problems. This guide, the second of the Insight Series, describes for the layman the effects of wind and

waves, currents, littoral drift, and tides, and points out the benefits and drawbacks of different forms of shore protection – mechanical structures, beaches, dunes, vegetation, and wetlands.

Coastal Zone Management. A/S has been working on raising people's awareness of what's involved in "coastal zone management" and why it's important to them: for one thing, it includes coastal protection.

To dispel confusion the Wayne County supervisors expressed over coastal zone legislation, Roger Allbee compiled a synopsis of all bills and proposals and distributed it to coastal town supervisors, local and regional planning boards, and county Cooperative Extension agents. He also instituted a periodic "Coastal Zone Management Update," which has been very well received. Bill Walters distributed Allbee's synopsis and "Update" to the local governments in Suffolk County after a survey of town supervisors there pointed up their unawareness of coastal zone management proposals.

When some of the Rockland County wetlands were filled in, the Rockland Conservation Association took action and asked Walters to speak to them on marine wetlands protective programs. The county wanted such programs to extend upriver to their tidal wetlands, so Walters helped the county Environmental Management Council draw up a resolution to protect the Hudson River shoals as a valuable wetlands area. In November 1974 the county legislature unanimously passed the resolution.

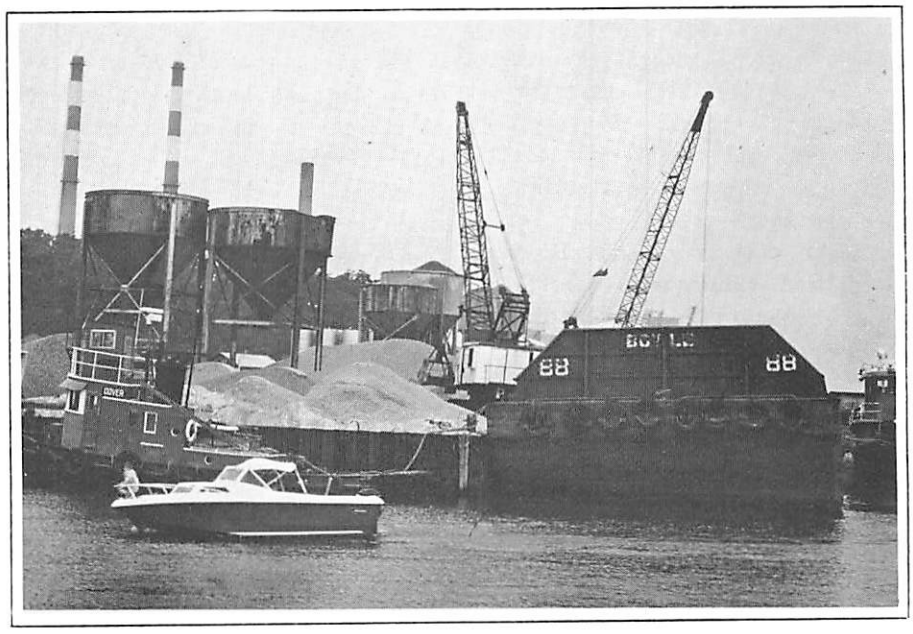
Aquatic Weeds Program. The Fair Haven Bay Betterment Association asked for Sea Grant help to control aquatic weeds. Because of nutrients in the water, the weeds have grown so thick that boats cannot get through. Dale Baker explored management techniques to control these weeds; the alternatives were killing them with chemicals or mechanically harvesting them. He organized a meeting at Sandy Pond to present the pros and cons of the two options; coastal property owners voted for harvesting.

Power Plant Siting. The Sterling site, near Oswego, has been proposed as a power plant location. To discuss this siting in terms of innovative multiple use, A/S brought together representatives of federal, state, and local agencies, the public utilities, and those interested in land-use management, especially for outdoor recreation. Sea Grant's neutral position is important in controversial activities like this.

Dale Baker also worked closely with Niagara Mohawk, studying the entire decision-making process on power plant siting. He then suggested research areas for Sea Grant to consider, including energy conservation, utilizing waste heat from power plants, the effects of clustering power plants in a small area like Nine Mile Point, the possible effects of a nuclear accident, and new sources of power like wind power.

Sand and Gravel Mining. New York State, as owner of offshore lands, requested Sea Grant assistance in putting together a policy on leasing offshore sand and gravel. Mining has been carried on haphazardly up to now, with no consideration for the environment or for New York Harbor ship channels. Sand and gravel mining will exceed 10 million cubic yards in 1975. Pete Sanko has been working with representatives of state, federal, and local agencies in stimulating research on sand and gravel mining. At meetings that Sanko organized to discuss this mining, the NYS Department of Transportation offered to contribute to Sea Grant research by providing lab testing and evaluation of materials. EnCon asked for a direct link with Sea Grant. And the dredging companies will contribute their data on sediment cores. These companies stand to benefit from any improvements in the field, and their cooperation will help hold down research costs.

Sand and gravel loading facilities, Port Jefferson, New York



Education and Training Programs

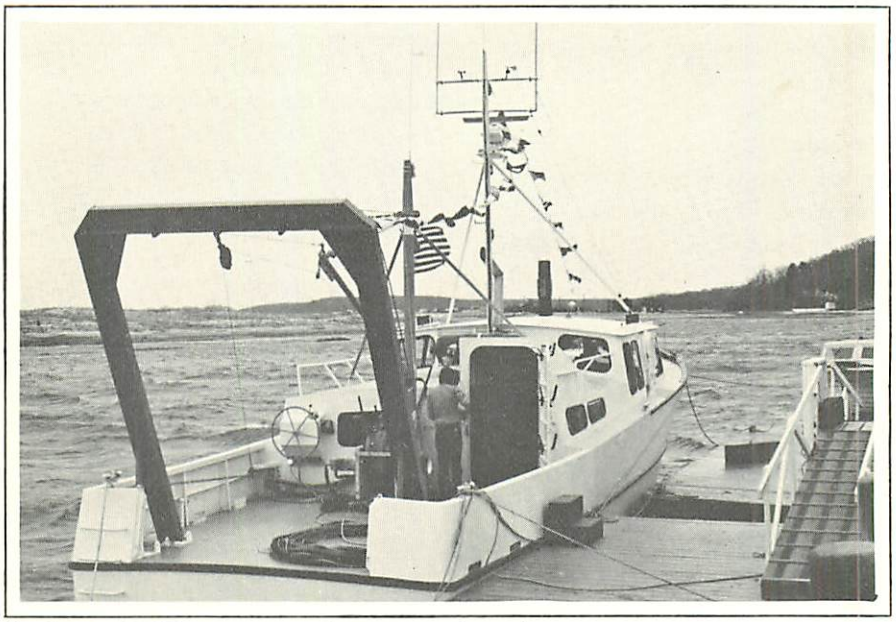
Most of Sea Grant's educational activities come under the aegis of Advisory Service, but the Institute also has a new role in formal education in New York State. Higher educational institutions, public and private, have for several years been planning a regional integration unprecedented in the United States. Sea Grant is becoming involved in this project, surveying marine programs in the Long Island region to see how they can best be integrated.

MARINE HIGHER EDUCATION ON LONG ISLAND

Nassau and Suffolk counties are the largest net exporters of college students in New York State. The two counties themselves seem underdeveloped in higher educational opportunities. Marine-related higher educational resources on Long Island are geographically spread out; moreover, little exchange or sharing of faculty and facilities has taken place thus far. Marine programs at public and private institutions could be greatly enriched by a system for interinstitutional cooperation.

By request of SUNY's Office of the Vice Chancellor for Academic Programs, Daniel Brennan of the Department of Geology, SUC Cortland, inventoried marine educational resources in Nassau and Suffolk counties. He read through catalogs, sent out a questionnaire, and toured campuses, finding a wide variety both of marine-related coursework and of marine research taking place on Long Island.

Specialized facilities include SUNY Maritime College's huge, 489-foot training ship *Empire State IV;* The New York Ocean Science Laboratory's *Kyma,* a 65-foot research vessel on loan from the National Oceanic and Atmospheric Administration; and SUNY at Stony Brook's new research craft called the *Onrust.* These vessels have been used primarily by the owner institutions, but outsiders can arrange to charter them.



The Onrust, *SUNY at Stony Brook's new research vessel*

For work in protected waters, Dowling College and Southampton College people use floating platforms which look like barges and can be towed or propelled by outboard motor. Hofstra's airboat – a very shallow draft boat moved by airplane propeller – is excellent for use in marshes like the one at Flax Pond on the north shore, where Stony Brook's Marine Sciences Research Center has a research facility. Adelphi University and Southampton have their own marinas and labs right on the waters of the south shore. And the New York Ocean Science Laboratory at Montauk has a particularly large and well-equipped oceanographic lab and a pier extending out into Fort Pond Bay.

Most places offer biology-oriented courses, probably a reflection of the ecology movement. Only Stony Brook teaches the legal-political-sociological aspects of the marine zone. Queens College, C.W. Post Center, and Southampton emphasize geology. Ship-oriented engineering studies are concentrated at SUNY Maritime, the US Merchant Marine Academy, and the Webb Institute of Naval Architecture. C.W. Post and Stony Brook offer more general engineering courses.

Brennan recommends direct state support to develop cooperative efforts in the areas of faculty exchange, instrumentation, travel, boat costs, shore facilities, faculty communication, a

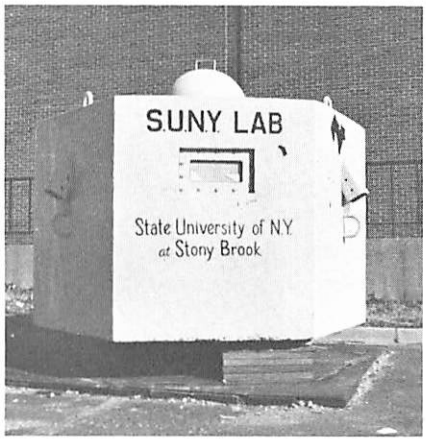
marine lecture series, and cross-registration. He points out that it would also be valuable to establish a mariculture research farm, and a marine industrial engineering task force to increase the efficiency of shipyards. Cooperation with institutions not in the immediate area would be worthwhile – an example is Lamont–Doherty Geological Observatory, on the bluffs above the Hudson River, with its deep-sea capability. One thing we do not need, concludes Brennan, is any additional marine biology programs – at least until manpower needs in that field increase.

UNDERSEA RESEARCH LAB

It is always most efficient to gather data at the test site itself, with instruments at hand. In marine research this is hard to do because of the ocean environment. An underwater laboratory/habitat would make better use of, and even extend, underwater working time in deep water with little increase in the decompression requirement. Divers could use it as a place to rest, a source of power, a base to store equipment, and a laboratory for experiments and time-lapse photography.

SUNYLAB, a student-designed, low-cost underwater research lab constructed from available materials with a little Sea Grant funding, was painted, welded, outfitted, and is now completed after exhaustive safety studies. Its core is a discarded cement-mixer drum, encased in cement and fitted with window ports, a Plexiglas dome, and steel and concrete legs. The 116-cubic-foot interior will provide shelter and some degree of comfort to two divers (in a sitting position) for several hours while they conduct marine research and experiment with their freshly collected samples. Air and power will be supplied from a dock or ship, once the lab is sunk (installed underwater) 30 to 40 feet below the surface.

All design computations and construction were carried out by senior students at the College of Engineering, SUNY at Stony Brook, under the direction of Herbert Herman. The lab is designed to be easily transported to other sites, launched, anchored, and retrieved. It has potential use in all kinds of marine fields, including ocean fish farming, aquaculture (to observe shellfish behavior, for example), pollution studies, materials science (particularly studies of underwater corrosion), chemical sampling, sea-floor construction, and even physiology and psychology (to find out what happens to a person who's been confined underwater for long periods).



SCIENTIFIC ADVISORY INTERNSHIPS FOR THE NYS ASSEMBLY

New York's legislative history on coastal resources and management problems is scanty. The Assembly Scientific Staff, established in 1971 by former Speaker Perry Duryea, supplies state lawmakers with scientific and engineering expertise and brings coastal problems to their attention. Under the direction of the Scientific Advisory Staff and faculty advisers, graduate students have conducted research relevant to proposed legislation. Over 26 such studies have been initiated with funds from the NYS Assembly, National Science Foundation, and Sea Grant.

Effects of Foreign Fishing

One of these interns, Anne Williams, conducted a study on the effects of foreign fishing on United States catches. Her work, mentioned under "Studies in Resource Management" (see "Past, Present, and Future of New York's Marine Fisheries"), concluded that foreign fishing is not as much a threat to United States fishermen as they fear. Although foreign fleets used to take large quantities of haddock, cod, and flounder – traditional American fishery resources – various international controls have limited catches in the last few years.

Effects of foreign fishing have been severe on the haddock resource, but haddock has been of minor importance in New York since the middle 1940s. Also hard-hit are the alewife, Atlantic herring, and Atlantic mackerel populations, but these, too, are insignificant in the American fishery.

By the mid-1960s, silver hake and red hake had been overfished, partially due to foreign catches, but international controls and recent successful spawnings have improved the situation; domestic catches have increased in the last five years.

Foreign catches of bluefish have been only incidental, and northern lobster catches are small compared to domestic landings. Decreases in United States catches for these two species are probably due to domestic overfishing and natural environmental change.

Marsh Grass Isn't a Good Tide Indicator

A major problem in implementing wetlands legislation is establishing boundary lines on the marsh. The boundary between public and private property, according to most court rulings, is mean high tide or mean high water (MHW). The technical definition of MHW is the average high tide over an 18.6-year cycle. For years, Long Islanders have used the natural boundary between two species of marsh grass, *Spartina alterniflora* and *Spartina patens,* as a visual indicator of MHW.

Lorraine Lagna's research, done under the direction of Orville Terry, studied the relationship between the two *Spartinas* and tidal heights by actually measuring tides and marsh surface elevations and comparing them to plant distribution at five locations on Long Island. There was no close correlation of the boundary between the two species with any specific tidal elevation. In some areas, Lagna found *S. alterniflora* growing well above MHW, though it was commonly thought that this species grows only below MHW. She also found *S. patens* growing below MHW as well as above it.

Since the observed tidal elevation limits for *S. alterniflora* and *S. patens* varied so widely in different locations, Lagna concluded that factors other than tide elevation must contribute significantly to plant zonation. Vegetation is therefore not a good indication of the MHW line. If MHW is to be used as a boundary line, it will have to be defined with more precision (probably from tide records) than is possible by looking at *Spartina* zonation.

What Happens to an Oil Spill?

In the last 10 years, destructive oil spills have badly polluted our aquatic resources. Officials have been hard pressed to find, and legislate, a good cleanup procedure that doesn't damage the ecosystem.

Bacteria are the primary natural disposers of oil and petroleum hydrocarbons, but the process is slow. Only with a thorough knowledge of this natural degradation process will it be possible to make sensible judgments about how to deal with an oil spill.

Roy Ventullo and his adviser, Parmely Pritchard of SUC Brockport, developed an experimental laboratory model to study the microbial degradation of oil in aquatic ecosystems. The model allowed them to observe the fate of a mini-oil spill under environmental conditions that closely mimicked those of Lake Ontario. Bacterial attack followed a consistent pattern of slow emulsification and dispersion of the oil and significant alteration of the oil's chemical composition. The model verified that when oil disappears from the surface of a body of water, this doesn't necessarily mean that it's been completely degraded. Ventullo also found that the oil degradation process in the model could be readily slowed down by adding simple organic pollutants and detergents.

Ventullo and Pritchard found the process too complex to "seed" oil spills successfully with commercial oil-eating bacterial preparations. Their evidence also indicated that partially degraded oil may be toxic to aquatic organisms. Basically, the research showed how important it is to know not only how bacteria remove oil from sight but also how they affect the oil once it becomes dispersed.

New Initiatives

The National Sea Grant Program has had the foresight to provide the directors of the state programs with limited discretionary funds to undertake projects unforeseen in the development of the annual program of research. In Year III, $8,695 was made available for such special projects.

A grant was made to Richard Koehn, Department of Ecology and Evolution, SUNY at Stony Brook, to initiate studies on genetic differentiation of the hard clam, *Mercenaria mercenaria.* In the past, Koehn has conducted distinguished research on the biochemical identification of genetic difference between races of various marine species. Behind his present feasibility study was the need for tracing the various races of the hard clam in Great South Bay. Through the years, hard clams from Long Island Sound and other areas of New England and the middle Atlantic have been introduced into Great South Bay in attempts to increase productivity through stocks that might have better reproductive potential. The difficulty has been in measuring the success of these introductions, for spawn of all races, both native and introduced, look the same. Using his biochemical techniques, Koehn found it possible to "tag" the introduced clams genetically. His research should provide a tool for future management of the hard clam in Great South Bay by identifying stocks which have the best growth and survival rates.

Clarence Gehris, Department of Biological Sciences, SUC Brockport, received a grant for an investigation by his students of the possible biological impacts of opening Irondequoit Bay to Lake Ontario. For the results of this research, see the "Advisory Service" section.

Robert Morris, a graduate student at Cornell University, did a study of mechanisms to reduce the urea content of the dogfish shark. This species, though frequently caught by Long Island fishermen, has no commercial value because of its high urea content. Morris conducted his research in conjunction with the Woods Hole Biological Laboratory.

Frank Revetta, Department of Geology, SUC Potsdam, conducted a detailed magnetic survey of the St. Lawrence River. Revetta's research, described in the "Studies in Resource Management" section, is being used in the map collection of the NYS Geological Survey. New York State is also adding Revetta's work to information on power plant siting in the St. Lawrence region.

Under the joint direction of Ralph Rumer and Gordon Hall of the College of Engineering, SUNY at Buffalo, graduate student James Glattly conducted a comprehensive study and critical analysis of containment and collection equipment and techniques used to treat oil spills on the ocean surface. This study complements Sea Grant-sponsored investigations by interns to the NYS Assembly Scientific Advisory Staff on microbial techniques of oil spill degradation, and early studies by intern Seth Low on oil spill contingency plans on Long Island Sound. Glattly's review should be useful to potential purchasers of containment and collection equipment. His report confirms what is widely known at the present time – unless such equipment is brought quickly to the site of a spill, containment and collection are difficult, if not impossible. He also finds that most existing equipment functions satisfactorily only when the sea is calm.

Special Projects

NEW YORK BIGHT ATLAS

The *MESA New York Bight Atlas Monograph* series and the *Atlas of the Marine Environment of New York Bight* are to be among the first products of a seven-year study of New York Bight now being conducted by NOAA's Marine Ecosystems Analysis (MESA) program. Both publications, cooperative efforts of MESA and the New York Sea Grant Institute, have entered final stages of preparation. The monographs are being published throughout 1975 (see monograph series list); they are now available for sale.

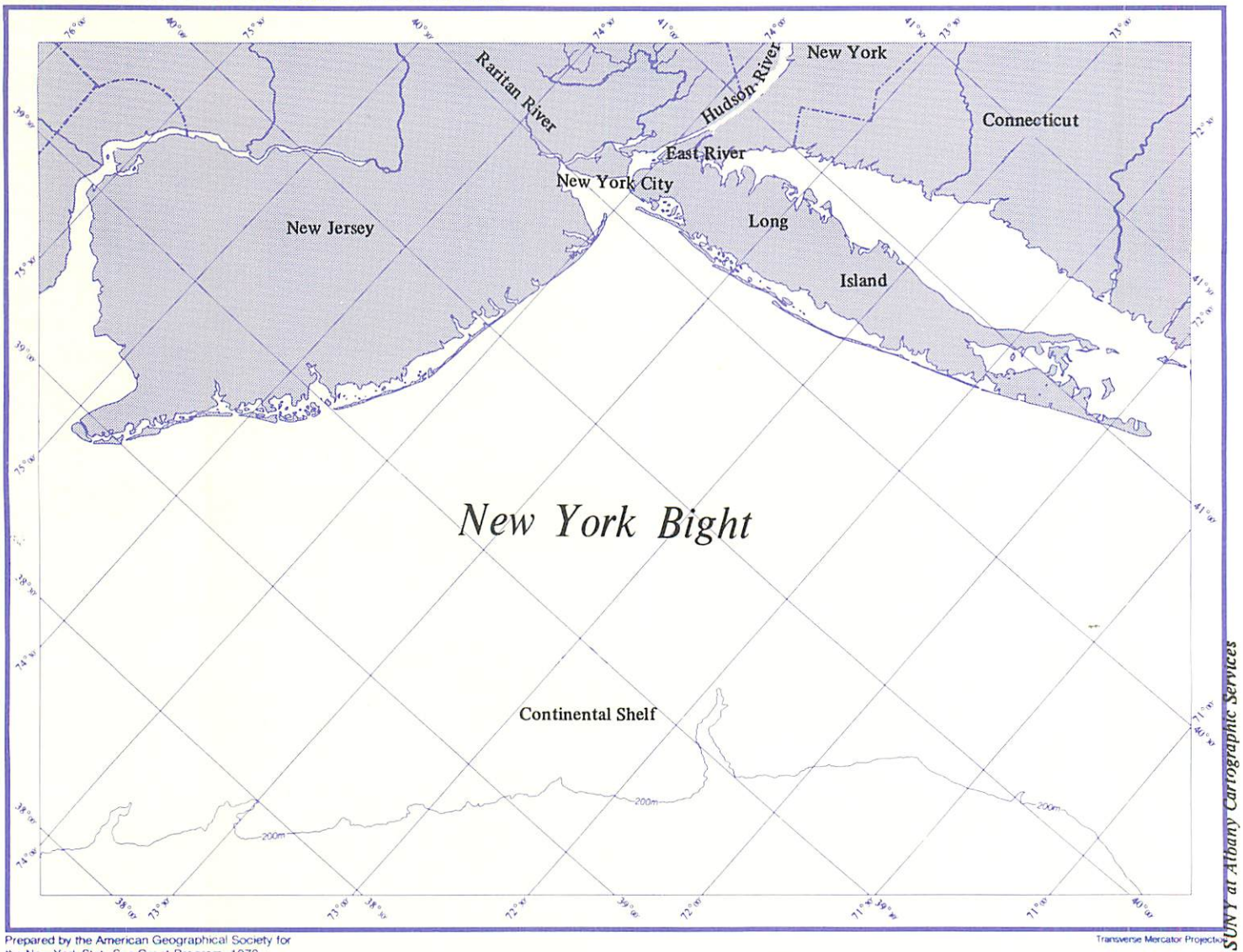
MESA NEW YORK BIGHT ATLAS MONOGRAPH SERIES

1 **Temperature, Salinity, and Density** Malcolm J. Bowman and Lewis D. Wunderlich, Marine Sciences Research Center, SUNY
2 **Chemical Properties** James Alexander and Elizabeth Alexander, New York Ocean Sciences Laboratory
3 **Circulation** Donald Hansen, Atlantic Oceanographic and Meteorological Laboratories
4 **Tides and Sea-Level Changes** R.L. Swanson, MESA New York Bight Project
5 **Wave Conditions** Willard J. Pierson, University Institute of Oceanography, CUNY
6 **Storm Surge** N. Arthur Pore and Celso S. Barrientos, National Weather Service
7 **Marine Climatology** Bernhard Lettau, Atmospheric Sciences Research Center, SUNY, William A. Brower, Jr. and Robert G. Quayle, National Climatic Center
8 **Regional Geology** John E. Sanders, Columbia University
9 **Gravity, Magnetics, and Seismicity** James R. Cochran and Manik Talwani, Lamont-Doherty Geological Observatory
10 **Surficial Sediments** George Freeland and Donald J.P. Swift, Atlantic Oceanographic and Meteorological Laboratories
11 **Beach Forms and Coastal Processes** Warren E. Yasso, Columbia University, and Elliott M. Hartman, Jr., Westchester Community College
12 **Plankton Production** Charles S. Yentsch, Bigalow Laboratory for Ocean Sciences
13 **Plankton Systematics and Distribution** Thomas C. Malone, City University of New York
14 **Benthic Fauna** John B. Pearce and David Radosh, National Marine Fisheries Service
15 **Fish Distribution** Marvin D. Grosslein and Thomas Azarovitz, National Marine Fisheries Service
16 **Fisheries** J.L. McHugh, Marine Sciences Research Center, SUNY, and Jay J.C. Ginter, NY Sea Grant Institute
17 **Aquaculture** Orville W. Terry, Marine Sciences Research Center, SUNY
18 **Artificial Fishing Reefs** Albert C. Jensen, NYS Department of Environmental Conservation
19 **Recreation** E. Glenn Carls, SUNY College at Cortland
20 **Port Facilities and Commerce** Alfred Hammon and L.M. Krieger, The Port Authority of New York and New Jersey
21 **Sand and Gravel** John S. Schlee, US Geological Survey, with a section by Peter T. Sanko, NY Sea Grant Institute Advisory Service
22 **Governmental Jurisdictions** Paul Marr, SUNY at Albany
23 Demographic Patterns
23 **Demographic Patterns** Charles Koebel and Donald Krueckeberg, Rutgers University
24 **Transportation** Richard K. Brail and James W. Hughes, Rutgers University
25 **Electricity Generation and Oil Refining** H.G. Mike Jones, Harold Bronheim, and Philip F. Palmedo, Brookhaven National Laboratory
26 **Waste Disposal** M. Grant Gross, Chesapeake Bay Institute, Johns Hopkins University
27 **Water Quality** Peter W. Anderson and Richard T. Dewling, US Environmental Protection Agency
28 **Air Quality** Volker A. Mohnen, Atmospheric Sciences Research Center, SUNY
29 **The Lower Bay Complex** Iver Duedall, Harold O'Connors, and Robert Wilson, Marine Sciences Research Center, SUNY
30 **Industrial Wastes** E.G. Altouney and Charles G. Gunnerson, Environmental Research Laboratories

The Bight – 15,000 square miles of the coastal Atlantic Ocean bounded by Long Island on one side, New Jersey on the other, and stretching to the edge of the continental shelf – is the front yard of New York City, the nation's busiest port and largest city. There are fish for sport and commercial use. The miles of beach and sea offer an ocean playground for the millions of people of the metropolitan area. But the Bight is also a major dumping ground for sewage sludge, construction rubble, dredge spoils, industrial and acid wastes. Pollutants flow into the Bight down the Hudson, Raritan, and East rivers and through a multitude of discharge pipes. It may not be long before offshore power plants, oil drilling rigs, and sand and gravel dredges dot the Bight's waters.

The Marine EcoSystems Analysis program was created in 1973 to pursue intensive investigations of certain coastal areas. New York Bight was selected for MESA's first comprehensive study because it is heavily impacted by population growth and industrial development; it is one of the most intensively used coastal areas in the world. Those making critical management decisions affecting the Bight region are acutely aware that they need much more data than is now available on the physical, chemical, and biological processes of the Bight, and about the human impact on those processes. The basic purpose of the MESA project is to get the information required to understand the Bight's intricate ecological interworkings – this to help plan effective

NEW YORK BIGHT ENVIRONMENTAL ATLAS



Prepared by the American Geographical Society for the New York State Sea Grant Program, 1973.

Transverse Mercator Projection

10 0 10 20 30 40 50 STATUTE MILES
10 0 10 20 30 40 50 60 70 80 KILOMETERS
10 0 10 20 30 40 50 NAUTICAL MILES

Dan Cole, SUNY at Albany Cartographic Services

resource management and rational interaction between man, the coast, and the sea.

The monograph series and the atlas are preliminary work, intended to provide interim information pending completion of the MESA project. The monograph series consists of 30 technical papers – basic information inventories on the New York Bight in the fields of geology, oceanography, marine biology, human patterns, and environmental monitoring. Just as important as the knowns are the unknowns in each area of environmental concern; the monographs identify questions that cannot be answered from available data. Each monograph serves as a state-of-the-art summary and a jumping-off point for further research.

The atlas will be designed to discuss sensitive environmental questions and to advance planning/action priorities. Fundamentally, it will look at the Bight as a dynamic system – a complex interplay among myriad physical, biological, and human elements, and between coastal processes and deep-water conditions. The information from the monographs is being interwoven in narrative and visual sequence to comprise the atlas, slated for manuscript completion in 1975. This book is designed to have predominantly visual impact on a nonscientific audience of concerned citizens. It will be a beginning for understanding environmental actions and reactions and the significance of man's presence in and around the Bight.

ENDEX – THE ENVIRONMENTAL SCIENTIST'S YELLOW PAGES

The growing mass of environmental data could present an increasingly complicated labyrinth to data users, without some simple key. Now that key is available from the National Oceanic and Atmospheric Administration (NOAA), in the form of a one-stop environmental data and information referral service, as close to a data user as his telephone. Called ENDEX (Environmental Data Index), the new system was devised and put into operation by the Environmental Data Service of the US Department of Commerce.

ENDEX provides scientists, legislators, and the general public with rapid, easy-access referral to up-to-date environmental data banks of NOAA, other federal agencies, state and local governments, universities, research institutes, and private industry. Subject areas include aerial photography, cartography, climatology, coastal erosion and coastal zone management, environment-related engineering, geodetic surveying, hydrology, hydrography, marine geology and biology, meteorology, oceanography, fisheries, wildlife, limnology, zoology, mineral resources, and space and solar science.

Each computer-searchable data file on a piece of research contains the parameters, methods of analysis, number and location of stations, frequency of measurement, duration of the study, restrictions on data availability, publications, funding agencies, source of the information, and cost of obtaining the data. In addition, each file includes an abstract of the research project.

A limnologist doing research on Great Lakes biology identifies his major subject and the geographic area of concern – "benthic animals in Lake Ontario," for example. Then he calls an Environmental Data Service Center to request information on this subject. An environmental data specialist evaluates his request, does a search, and provides the required information.

In developing this system the Environmental Data Service seeks out and documents selected files of environmental data and research results. The one-step-at-a-time approach began with easily accessible collections pertinent to current national problems, e.g., coastal zone collections needed in connection with possible offshore oil drilling. EDS aims to complete a comprehensive nationwide inventory by 1980.

At present, over 2,000 environmental data files are referenced. These pertain largely to research on the New York Bight, Chesapeake Bay, Delaware Bay, and the Great Lakes areas. New York Sea Grant became part of the program in 1973, cataloging the files within New York State. Since then, we have expanded our portion of the ENDEX program, seeking out and documenting Ohio and Pennsylvania files on the above regions plus the Baltimore Canyon region – also important to offshore drilling considerations.

Current Year Publications

FOCUS ON COASTAL PLANNING

Public Images and Coastal Zone Management by O.A. Collver: 24 pp. January 1974.

Public Images and Coastal Zone Management. Part Two: Technical Progress by O.A. Collver: 12 pp. January 1974.

A Program for the Great Lakes by R.W. Gross. *The Conservationist:* pp. ii-iii. October-November 1973.

Land Management in the Lake Ontario Basin by J.M. Wolf: 55 pp. December 1973.

The Regional Shoreline – Resources and Management Conference Proceedings. Rochester, New York, September 28, 1973. Genesee/Finger Lakes Regional Planning Board. 34 pp. June 1974.

1974 Legislation Relating to New York State's Coastal and Marine Resources by M. Bird. 12 pp. July 1974.

Siting Power Plants

Meteorological Effects of Spray Cooling in the Great Lakes Climate by R. Stewart. *Proceedings of the 16th Conference of the International Association of Great Lakes Research,* 1973: pp.603-614. March 1974.

Helping Power to Be a Good Neighbor by R. Stewart. *NOAA,* 4:2, pp. 18-23.

STUDIES IN RESOURCE MANAGEMENT

Marine Fisheries Conservation in New York State: Policy and Practice of Marine Fisheries Management by J.J.C. Ginter. 70 pp. January 1974.

A Catalog of Marine Fisheries Legislation in New York State by J.J.C. Ginter. 89 pp. January 1974.

Biological Consequences of Alternative Regimes by J.L. McHugh. Reprinted from *Fisheries Conflicts in the North Atlantic: Problems of Management and Jurisdiction* (1974). 22 pp. April *1975.*

Commercial and Recreational Fishery Landings in the New York Bight Area by J.L. McHugh and A. Williams. 120 pp. In Press.

Trends in Pound Net and Otter Trawl Fisheries of New York State by W. Knapp. In Press.

A Rational Model for Langmuir Circulations by A.D.D. Craik and S. Leibovich. To appear in *Journal of Geophysical Fluid Dynamics.* Accepted May 1974. Ms. 40 pp.

The Economics of Outer Continental Shelf Energy Resource Allocation Policy by R.J. Kalter and T.H. Stevens. To appear in *American Journal of Agricultural Economics.* Accepted May 1974. Ms. 30 pp.

The Economics of Outer Continental Shelf Leasing by R.J. Kalter, T.H. Stevens, and O.A. Bloom. *American Journal of Agricultural Economics,* 57(1975). 18 pp. In Press.

Atlantic Outer Continental Shelf Oil and Gas Resources: Background and Policy Issues by T.H. Stevens and R.J. Kalter. Cornell Agricultural Economics Staff Paper, No. 74-3. 28 pp. January 1974.

Atlantic Outer Continental Shelf Energy Resources: An Economic Analysis by R.J. Kalter, W.E. Tyner, and T.H. Stevens. Cornell Agricultural Economics Staff Paper, No. 74-17. 87 pp. November 1974.

Disposal Policy for Energy Resources on Public Lands by R.J. Kalter and W.E. Tyner. In *Energy Supply and Government Policy,* ed. R.J. Kalter and W.A. Vogely, Cornell University Press.

Atlantic Outer Continental Shelf Energy Resources: Economic Implications for Long Island by R.J. Kalter and W.E. Tyner. Cornell Agricultural Economics Staff Paper, No. 75-1. 76 pp. March 1975.

Environmental Changes in a Portion of Lake Ontario Following Pollution Abatement by J.H. Judd and J.G. Bocsor. To appear in *Verh. Int. Ver. Limnol.,* 19(1975). 14 pp.

Possible Biological Impacts of Dredging the Existing Channel from Irondequoit Bay to Lake Ontario in Rochester, Monroe County, New York by C. Gehris, F.W. Stoss, and A.E. Robb, Jr. 36 pp. December 1974

Physical Model Study of Circular Patterns in Lake Ontario by C.-Y. Li, K.M.Kiser, and R.R. Rumer. To appear in *Limnology and Oceanography.* Accepted January 1975. Ms. 41 pp.

Monitoring Systems and Their Users: Is There a Relationship? by D.F. Squires, In *Proceedings of Seminar on Methodology for Monitoring the Marine Environment,* pp. 407-411. US Environmental Protection Agency, October 1974.

Sewage Sludge and Ammonia Concentrations in the New York Bight Apex by I.W. Duedall, M.J.Bowman, and H.B. O'Connors. To appear in *Journal of Estuarine and Coastal Marine Science,* August 1975. Ms 13 pp.

Present and Potential Ecological Status of the Diked Disposal Sites in Buffalo Harbor by R.A. Sweeney. 27 pp. January 1975.

A Detailed Magnetic Survey of the St. Lawrence River by F. Revetta, J. Cardinal, and W. Lilley. 20 pp. June 1975.

MARINE PRODUCTS AND TECHNOLOGY

Inexpensive Modular Habitats for Juvenile Lobsters *(Homarus americanus)* by M.H. Chanley and O.W. Terry. *Aquaculture,* 4(1974), pp. 89-92.

The New York Acquaculture Program – Past, Present, and Future by O.W. Terry. 18 pp. November 1974.

Laminarinase Activity in the Crystalline Style of the Surf Clam *(Spisula solidissima)* by R.S. Shallenberger, C. Searles, and B.A. Lewis. *Experientia,* 30(1974): pp. 597-598.

Nature's Immobilized Enzyme by R.S. Shallenberger, S.M. Herbert, and B.A. Lewis. *New York's Food and Life Sciences Quarterly,* 7:4, pp. 16-18. October-December 1974.

Papermaking Potential of Zostera and Cladophora, Two Marine Weeds by B. Leopold and R. Marton. 12 pp. May 1975.

Mercury Removal from Fish Protein Concentrate Made from Lake Erie "Trash" Fish by E.E. Schrier. 3 pp. January 1975.

ADVISORY SERVICE

New York Marina Management Conference. Proceedings, Syracuse, New York, March 28-29, 1974: 114 pp. June 1974.

Power Plant Siting. Proceedings of a Conference, Oswego, New York, May 10, 1972: 57 pp. March 1974.

The Capital Construction Fund by N. Bender. Insight Series No. 1. 8 pp. November 1974.

Shoreline Protection Guide for Property Owners by P. Sanko. Insight Series No. 2. 24 pp. February 1975.

Our Everchanging Shoreline, film: 16 mm, color, 15 minutes.

Our Everchanging Shoreline, film brochure.

What's-It?, a flyer identifying New York salmon and trout.

Marine Foods Bibliography and Resource Listing: 6 pp. Mimeographed.

Shoreline Protection Bibliography: 1 p. Mimeographed.

Tips on Cooking Lobsters: 1 p. Mimeographed.

Present Status of the Great Lakes Salmon and Trout Fishery in New York: 4 pp. Mimeographed.

Fishing for New York Salmon and Trout: 2 pp. Mimeographed.

New York Coastal Zone Management Legislative Update: 1 p. Mimeographed.

Seafood Fits Your Budget by National Marine Fisheries Service. Slide set: @ 30 slides, color, script in Spanish and English. August 1974.

Fish Handling And Preparation. Slide set: @ 40 slides, color, script. August 1974.

ADVISORY SERVICE

Let's Go Fishing. Three slides sets, color. March 1974:
1) **Fishing Basics.** @ 50 slides.
2) **Care, Cleaning, and Cooking.** @ 50 slides.
3) **Fish Families.** @ 60 slides.

Coastal Consciousness. Slide set: @ 50 slides, color. March 1974.

Social and Economic Impact of Salmonid Fishery Development. Slide set: @ 40 slides, color. October 1974.

Let's Go Fishing. A four-lesson program for urban youth in basic fishing. Includes film, slide sets, handouts.

The Question of Cobbler's Cove. A three-part learning package on coastal awareness and the need for public participation in environmental decision-making. Includes slide set, decision-making game, and presentation.

EDUCATION AND TRAINING PROGRAMSsB+6,

The Relationship of *Spartina alterniflora* to Mean High Water by L. Lagna. 54 pp. January 1975.

Effects of Foreign Fishing on the Coastal Marine Fisheries of New York State by A. Williams. In Press.

Coordination of Marine-Related Higher Education in Nassau and Suffolk Counties by D.J. Brennan. 78 pp. April 1975.

The Microbial Degradation of Oil in Continuous Culture in Freshwater Ecosystems by R.M. Ventullo and P.H. Pritchard. 71 pp. January 1975.

Legal Mechanisms to Rehabilitate the Hudson River Shad Fishery by W. Medeiros. 65 pp. April 1974.

Feasibility of Giant Bypassing on the South Shore of Long Island by D. W. Ash. 14 pp. March 1974.

SEA GRANT INSTITUTE PUBLICATIONS

Sea Grant Program: Suny-Cornell Consortium on Coastal Resources by D.F. Squires. *Chronica,* 8:6, pp. 1-5. June 1974.

New York Sea Grant. Heightening Awareness for Coastal Planning (Part I: Legislation, Enforcement, and Economic Growth Rate) by J.M. Hopkins and O.W.Terry. *the News* (State University of New York), 4:1, pp.4-5. September 1974.

New York Sea Grant (Part II: Wetlands, Long Island Shores, Fisheries, and Siting Power Plants) by J. M. Hopkins and O. W. Terry. *the News* (State University of New York, 4:2,pp. 6-7. December 1974.

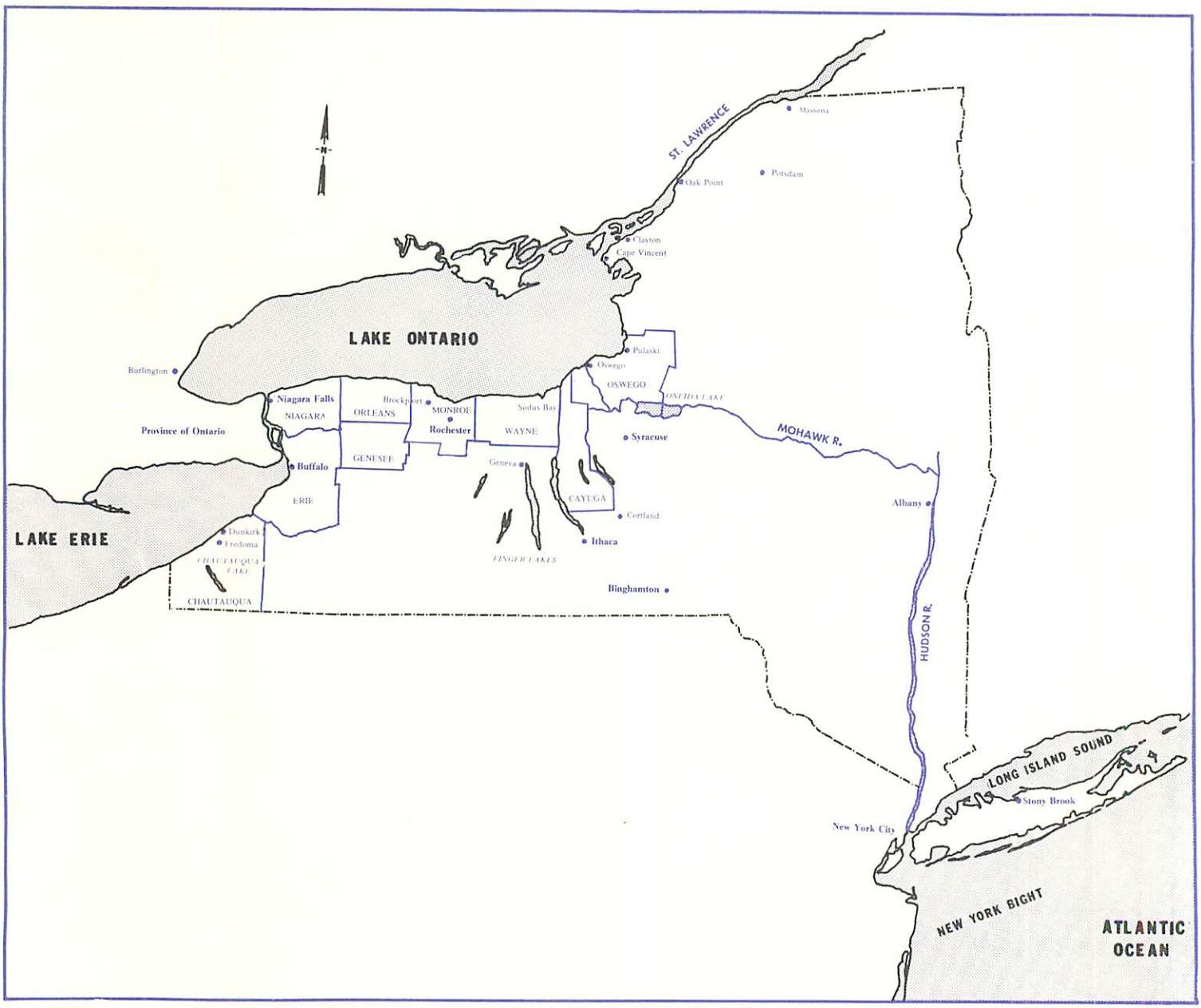
New York's Sea Grant Program. About 150 pp. Available around January of each year, current year only.

Annual Report. About 40 pages. Available around April of each year.

Sea Grant in New York by L.J. Camp. *Environs,* 2:4, pp. 4-6. Winter 1975.

New York State

showing locations mentioned in this annual report



PROGRAM STAFF

Donald F. Squires	*Program Director*
John H. Judd	*Executive Officer*
Jean M. Hopkins	*Editor*
Orville W. Terry	*Science Editor*
Frances G. Richardson	*Associate Editor*
Suzanne J. Servis	*Administrative Assistant*
Douglas Bacon/Donna DiFiore/Herbert Dell	*Financial Assistant*
Patricia O'Shea/Elizabeth Gallagher	*Secretary*
Marc Helsinger	*Research Assistant*

ADVISORY SERVICE STAFF

Bruce T. Wilkins (on leave 8/1/74-8/1/75)	*Associate Director*	Ithaca
O. Cleon Barber	*Acting Program Leader for Advisory Service*	Ithaca
W. Dale Brown	*Acting Assistant Program Leader*	Ithaca
Barbara Kirk	*Administrative Assistant*	Ithaca
Linda J. Camp	*Media Specialist*	Ithaca
William Walters	*Marine Specialist (Biology)*	Stony Brook
Peter T. Sanko	*Marine Specialist (Geology)*	Stony Brook
Norman K. Bender	*Marine Specialist (Resource Economics)*	Stony Brook
Roger N. Allbee	*Marine Specialist (Resource Economics)*	Brockport
Richard Gross	*Marine Specialist (Recreation)*	Brockport
Richard S. Sojda, Jr.	*Marine Specialist (Recreation)*	Brockport
Dale Baker	*Marine Specialist (Environmental Engineering)*	Oswego
Stephen Brown	*Marine Specialist (Recreation)*	Oswego
Sandor Schuman	*Marine Specialist (Youth Education)*	Fredonia/Oswego
Robert B. Patten	*Marine Specialist (Recreation)*	Fredonia
Richard B. Raymond	*Marine Specialist (Youth Education)*	New York City

PROGRAM EXPENDITURES*

Program Area	*NOAA Funds*	*Matching Funds*	*Total*
Marine Resources Development	38,688	29,947	68,635
Socioeconomic and Legal Studies	66,543	23,819	90,362
Marine Technology Research-Development	63,893	35,441	99,334
Marine Environmental Research	254,659	131,089	385,748
Marine Education and Training	31,359	10,401	41,760
Advisory Service	200,767	96,471	297,238
Program Management	94,091	91,085	185,176
Special Projects			
New York Bight Atlas	48,100	–	48,100
EDBD	39,618	–	39,618
	837,718	**628,502**	**1,658,962**

*This summary is not a final fiscal report. Expenditure figures are only approximate. Program areas listed are federal activity categories.

Year III Principal Investigators and Associates

Cornell University

Robert C. Baker, Department of Food Science
Tommy L. Brown, Department of Natural Resources
June M. Darfler, Department of Food Science
Dana Goodrich, Department of Agricultural Economics
Robert Gravani, Department of Food Science
Stephen Hitchner, NYS Veterinary College
Robert J. Kalter, Department of Agricultural Economics
Louis Leibovitz, NYS Veterinary College
Donald R. Price, Department of Agricultural Engineering
Milton Scott, Department of Poultry Science
Robert Shallenberger, NYS Agric. Experiment Station, Geneva
J.R. Stouffer, Department of Animal Science

SUNY Albany

Madelyn Glase, Department of Biological Sciences
Joseph M. Heikoff, Graduate School of Public Affairs
Paul D. Marr, Department of Geography
Donald C. McNaught, Department of Biological Sciences
Richard Nunez, Graduate School of Public Affairs
Jon T. Scott, Department of Atmospheric Sciences
Ronald Stewart, Department of Atmospheric Sciences

SUNY Binghamton

Donald R. Coates, Department of Geological Sciences
Marie Morisawa, Department of Geological Sciences

SUNY Buffalo

Robert P. Apmann, Department of Civil Engineering
L. Vaughn Blankenship, Department of Political Science
Parker E. Calkin, Department of Geological Sciences
G. Gordon Connally, Department of Geological Sciences
Robert Crow, School of Management
Robert E. Ford, Department of Sociology
Gordon Hall, Department of Mechanical Engineering
Robert I. Reis, School of Law and Jurisprudence
Ralph Rumer, Department of Civil Engineering

SUNY College of Environmental Science and Forestry

James W. Geis, Department of Forest Botany
Robert T. LaLonde, Department of Chemistry
Charlie Morris, Department of Entomology
Chun-Juan Wang, Department of Chemistry
Robert G. Werner, Department of Forest Zoology

SUNY Stony Brook

Malcolm Bowman, Marine Sciences Research Center
Iver W. Duedall, Marine Sciences Research Center
Herbert Herman, Department of Materials Science
W. Keith Kavenagh, Institute for Colonial Studies
Richard Koehn, Department of Ecology and Evolution
John L. McHugh, Marine Sciences Research Center
Orville W. Terry, Marine Sciences Research Center

SUC Brockport

Robert W. Adams, Department of Geology
Clarence Gehris, Department of Biological Sciences
Parmely Pritchard, Department of Biological Sciences

SUC Cortland

Daniel J. Brennan, Department of Geology
E. Glenn Carls, Department of Recreation Education

SUC Fredonia

Robert K. Fahnestock, Department of Geology
Ann Fisher, Department of Economics
Warren Fisher, Lake Erie Environmental Program
Norman Starler, Department of Economics

SUC Oswego

Eugene E. Chermack, Lake Ontario Environmental Lab
Ronald A. Engel, Rice Creek Biological Field Station
Robert Nugent, Department of Earth Sciences

SUC Potsdam

Frank Revetta, Department of Geology

Syracuse University

Ary Lamme III, Department of Geography

Albany Learning Center of Empire State College

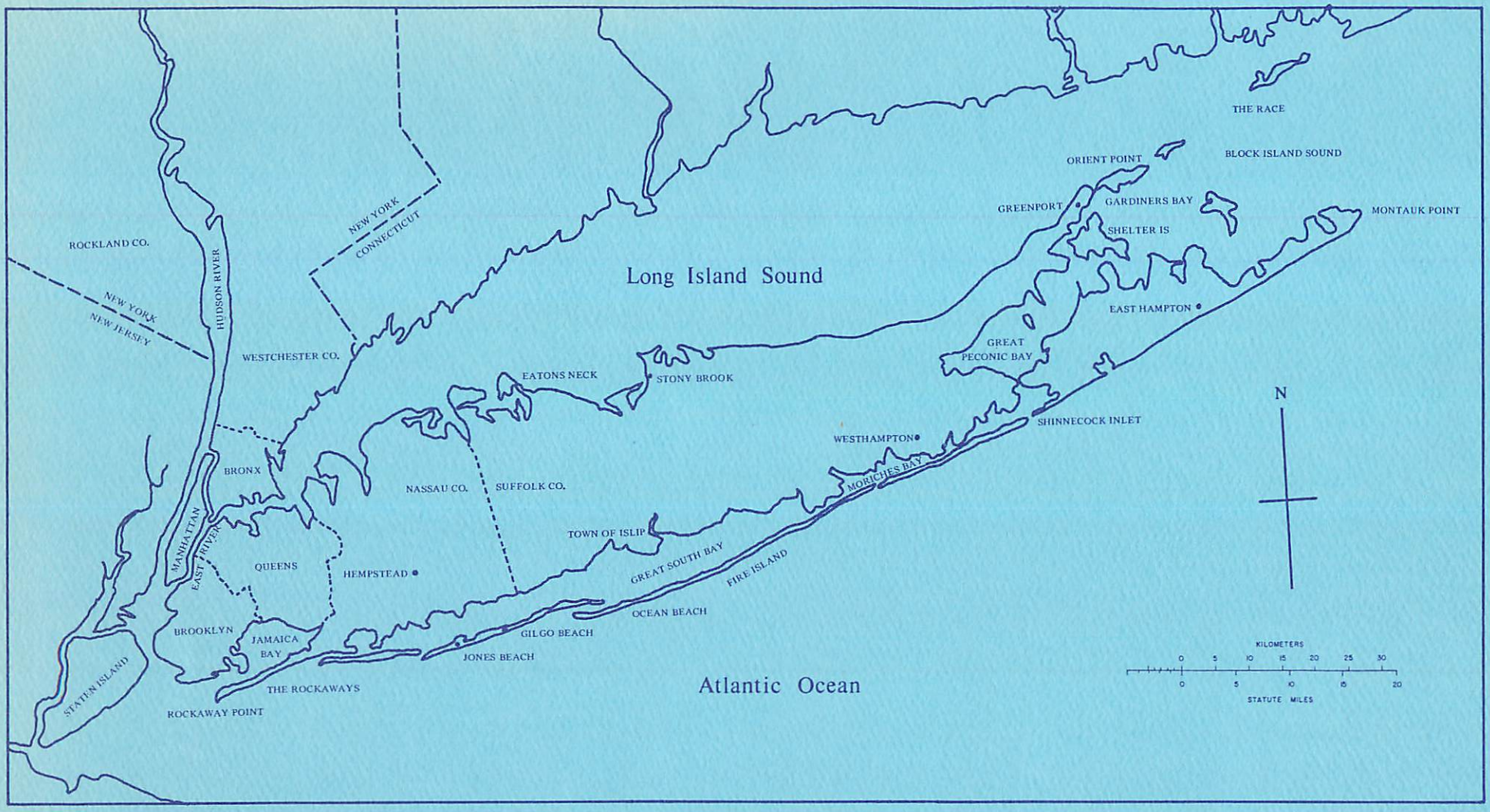
Stephen O. Wilson, Mentor

Assembly Scientific Staff

Seville Chapman, Director
Glenn Stevenson, Principal Scientist

Pennsylvania State University

Terry Rader



Long Island Area