MARINE SCIENCES RESEARCH CENTER
STATE UNIVERSITY of NEW YORK
STONY BROOK, N.Y.

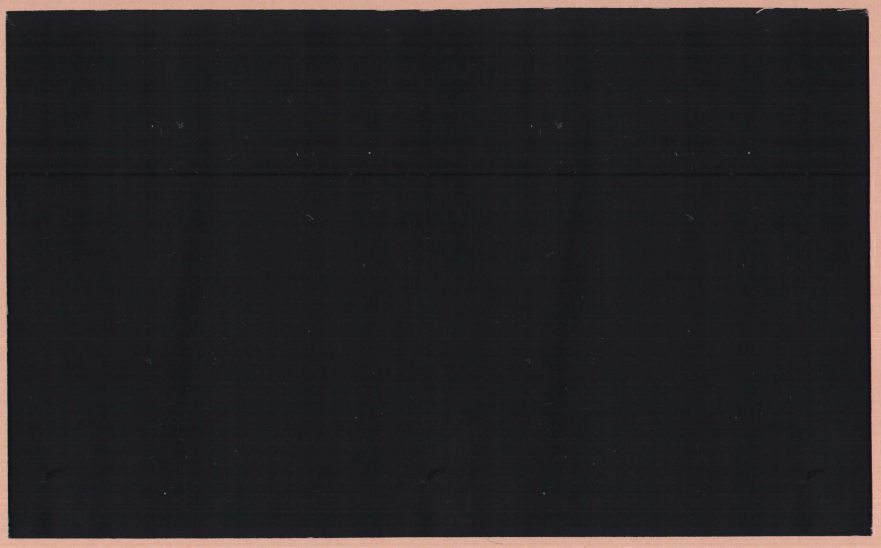
Critical Problems of New York's Marine Coastal Zone

A Preliminary Selection

7 March 1990

J.R. Schubel
Project Director

Doreen M. Monteleone
John M. Olin Fellow



Critical Problems of New York's Marine Coastal Zone

A Preliminary Selection

7 March 1990

J.R. Schubel
Project Director

Doreen M. Monteleone
John M. Olin Fellow

Co-Sponsors

COAST Institute
Marine Sciences Research Center
The University at Stony Brook

New York Sea Grant Institute

Division of Marine Resources
New York State Department of Environmental Conservation

Working Paper No. 44
Ref. No. 90-9

Approved for Distribution

J.R. Schubel

Preface

This report is the first step in a process to identify important problems -- existing and incipient -- of New York's coastal marine environments; problems that are not receiving adequate attention. We solicit your help in identifying other problems for inclusion in the next report.

We invite you to submit problem statements following the format used in this report. Please send them to

J.R. Schubel, Director
Marine Sciences Research Center
The University at Stony Brook
Stony Brook, New York 11794-5000

Deadline for Submission: 15 July 1990

INTRODUCTION

New York's coastal zone is an environment that has been altered by human's presence for over 300 years. Because the bulk of our population is concentrated along the coastal regions society's impact is felt heavily in these areas. This impact has culminated into failures of fisheries and loss or impairment of critical natural habitats due to polluted waters and extensive development. There is an urgent need for research and management to conserve New York's natural resources and to prevent further deterioration of the coastal marine environment and their living marine resources.

On 2 March 1990, scientists and environmental managers attended a workshop sponsored by the COAST Institute of the Marine Sciences Research Center, New York State Sea Grant Institute and New York State Department of Environmental Control to discuss issues they considered critically important to the conservation of the marine resources of New York State; issues that have not been adequately addressed by existing programs. As an admission ticket to this Mini-forum, each participant had to provide a 1-2 page statement of what they thought was a critical problem in this region's coastal zone which was not receiving an appropriate level of attention. Many of the issues were identified by several individuals. The issues can be sorted into broad categories: (1) understanding and maintaining local fisheries;

(2) assessing and managing the impact of people on the coastal environment; and (3) the need for a comprehensive data management/information system.

This report is a composite of the revised statements presented and reviewed at the COAST mini-forum. Duplicate statements have been combined. They are offered as guidelines for future research and management of the coastal marine environments of New York State.

TABLE OF CONTENTS

Page

PARTICIPANTS

Henry Bokuniewicz, Marine Sciences Research Center, SUNY

Bruce Brownawell, Marine Sciences Research Center, SUNY

Malcolm J. Bowman, Marine Sciences Research Center, SUNY

Gordon C. Colvin, New York State Department of Environmental Conservation

David O. Conover, Marine Sciences Research Center, SUNY

Nicholas Fisher, Marine Sciences Research Center, SUNY

Darcy J. Lonsdale, Marine Sciences Research Center, SUNY

Robert E. Malouf, New York State Sea Grant Institute

Doreen M. Monteleone, COAST Inst., Marine Sciences Research Center, SUNY

Cornelia Schlenk, New York State Sea Grant Institute

J. R. Schubel, Marine Sciences Research Center, SUNY

R. Lawrence Swanson, Waste Management Inst., Marine Sciences Research Center, SUNY

Mario E. C. Vieira, Marine Sciences Research Center, SUNY

William Wise, Living Marine Resources Inst., Marine Sciences Research Center, SUNY

Charles R. Wurster, Marine Sciences Research Center, SUNY

SECTION I. UNDERSTANDING AND MAINTAINING LOCAL FISHERIES

MAINTAINING NEW YORK'S INSHORE SHELLFISH INDUSTRY

Gordon C. Colvin
New York State Department of Environmental Conservation
Stony Brook, New York 11794-5000

PROBLEM: Inshore shellfish harvesting areas continue to be closed or restricted due to coliform contamination resulting primarily from rainwater runoff and discharges from vessels. As important harvesting areas are lost, the shellfish industry suffers a loss of available resource, an increase in poaching, and lost consumer confidence from the attendant publicity.

IMPORTANCE: The State's inshore shellfish industry, particularly the fishery for the clam and oyster half shell market, faces elimination over the next two decades.

APPROACH: Determine cost effective long-term mechanisms which would allow continuation of shellfishing for the half shell market consistent with public health requirements, industry needs, and the ability of the public and the industry to pay for the programs.

Outbreaks of human illness caused by consumption of raw or steamed hard clams and oysters continue to occur in the State and throughout the metropolitan region. Reports from Law Enforcement officers and follow-up investigations of individual outbreaks lead to the conclusion that illegal harvest from closed areas is the principal cause of the outbreaks. Continued publicity of such outbreaks will likely result in widespread consumer rejection of raw shellfish, thereby effectively destroying the industry.

As development of Long Island's shores continues, more and more inshore shellfish harvest areas are being closed due to failure to meet established coliform standards. While, historically, point source discharges and CSOs in New York Harbor, western Long Island and Westchester County were the principal cause of shellfish closures, this is no longer the case. In recent years, the effects of stormwater runoff have been the principal cause of shellfish closures around marinas will lead to further closures where marinas and mooring areas exist proximate to certified shellfish harvest areas.

While it is not possible to forecast the proportion of New York's shellfish harvest areas that will remain closed or become closed in the future, it is clear that closures will increase. It is likely that all harbors or enclosed tidal creeks and embayments will be at least partially closed due to failure to attain coliform standards during wet weather and/or during warm weather seasons. Since the National Shellfish Sanitation Program Manual of Operations requires that water quality samples be taken under the most unfavorable conditions, areas which do not meet standards seasonally or following wet weather must be closed to shellfish harvesting.

One alternative to the permanent closure of shellfish areas is to pursue the option of allowing them to be open to shellfish harvest during dry weather and/or during seasons of the year (usually the winter) when coliform concentrations meet standards. In the past, the Department of Environmental Conservation has operated conditional harvest programs during winter months on a limited basis, with considerable assistance from the Towns in water quality sample collection and administration of conditional harvest operation. Seasonal certification has been undertaken in limited circumstances where staff and financial capability permitted an assessment of seasonal water quality trends.

In addition, shellfish relay and depuration operations have also been permitted in areas which fail to meet standards, even conditionally or seasonally. In relay operations, clams are immersed for not less than 21 days in fully certified shellfish harvest areas during times when water temperatures exceed 50 degrees Fahrenheit. In depuration, shellfish are harvested from waters which meet established standards which are less stringent than standards for unconditional certification, and are then exposed to sterilized sea water in excess of 50 degrees Fahrenheit for a period of 48 hours.

Given the certainty of substantially increased closure of certified shellfish harvest areas due to seasonal or meteorologically influenced events, a substantial increase in demand for the establishment of special management areas is foreseeable particularly conditional, seasonal and depuration certification. The cost of undertaking such operations will be enormous. Meeting the requests for conditional certification we can reasonably anticipate on a year round basis, and for winter seasonal requests, would cost substantially in excess of an additional $1 M per year. In the future, this cost will increase significantly. If this cost if to be met, planning and documentation of justification must commence immediately. Justification needs to examine program cost in light of the economic and social value of the shellfish industry.

Alternatives must be considered. One alternative might well be the establishment of mandatory depuration of all shellfish harvested from New York State's waters of from some defined portion thereof. Upon analysis it may prove more cost effective to simply require that shellfish be subject to depuration through private or government-run depuration facilities. This option would also have the benefit of providing the greatest level of potential consumer health protection and rendering it more difficult for illegally harvested product to reach a consumer. Such a benefit is formidable given strong negative consumer reaction to publicized reports of recurring shellfish illness outbreaks nationally and in New York State.

Detailed long term assessment of the potential future for certification of shellfish harvest areas, along with the costs and benefits of an array of options for maintaining harvest possibilities in the future, is urgently required in order to enable the State to plan a strategy which addresses the industry needs in a most cost effective manner.

ACTIONS TO HELP OUR VULNERABLE SEAFOOD INDUSTRY

Robert Malouf[1], Cornelia Schlenk[1] and Ken Gall[2]
[1]New York State Sea Grant Institute
[2]New York State Sea Grant Extension
State University of New York
Stony Brook, New York 11794

PROBLEM: New York's seafood industry suffers unwarranted impacts from increased public focus on environmental degradation.

IMPORTANCE: Public response to media coverage of marine pollution issues has caused seafood businesses to face decreases in sales that threaten the viability of this valuable industry.

APPROACH: Adopt a three-pronged approach to address this situation that includes an expansion of efforts in risk assessment and communication, establishment of state agency coordination, and assistance to the industry in its efforts to help itself.

The seafood industry in the marine district of New York is large and diverse. It has been estimated to have an annual economic impact of more than $1 billion, and its components include five major sectors: harvesting, first or dockside buying, processing, wholesaling, and retailing. This industry has been experiencing a period of significant change, however. Declines have been observed in various sectors of the industry at the same time that the demand for seafood was increasing. During the last decade, a relatively vigorous marketplace for seafoods has provided opportunities for economic growth for the reduced number of businesses that have remained active.

In 1988, however, the favorable conditions in the seafood marketplace began to change. Although no new or significant safety concerns relative to seafood products could be identified, the extensive media coverage devoted to marine pollution began to have a significant, negative impact on seafood sales. Businesses found it was particularly difficult to rebound from such impacts given the region's current, general economic climate. Also, it became increasingly difficult to convey a rational message to the public that could help put safety concerns into perspective.

Although New York State agencies involved with seafood issues mobilized their staffs to discuss and try to coordinate their respective activities, this effort would have been more effective if such dialogue has occurred earlier.

Three specific actions are needed to help remediate this situation, since crises of public confidence are likely to continue as environmental issues gain prominence. First, reliable and consistent information regarding seafood safety concerns, risk perception, and benefits needs to be generated (where unavailable) and disseminated to the public. This action would require appropriate research and education efforts. Second, a "body" of representatives from appropriate agencies should be established to provide a mechanism for coordinating the State's efforts and policies related to the seafood industry. This action would require commitments of staff time and cooperation from state agencies. Third, the industry must be encouraged and assisted in its efforts to help itself, as it has been in other states and as have other commodities in New York (e.g., the wine/grape industry). As a first step, the newly-created Marine Products and Resources Council (a seafood industry organization established to mount a coordinated regional marketing and promotional program) should be assisted in its exploration of public and industry options that could be used to generate salary funds for a director.

NEW YORK'S FINFISHERIES -- THE NEED TO IMPROVE BASIC UNDERSTANDING OF FLUCTUATIONS IN FISH STOCKS

David O. Conover[1], Robert E. Malouf[2], Cornelia Schlenk[2], William Wise[1] and Gordon Colvin[3]
[1]Marine Sciences Research Center
[2]New York Sea Grant Institute
[3]New York State Department of Environmental Control
State University of New York
Stony Brook, New York 11794

PROBLEM: Many of New York's marine finfish have declined in abundance. We need to develop effective management strategies, but to do so requires convincing evidence of the causes of decline and the beneficial effects on stock size of management.

IMPORTANCE: The commercial fishing industry is in jeopardy, the recreational fishermen want a bigger piece of what's left, and pressure for shoreline development continues. Managers need solid evidence to justify strategies to conserve stocks that may be politically unpopular.

APPROACH: Research concerning the fundamental reasons for rises and declines in the abundance of resource species needs more emphasis. Management is much more likely to be successful over long time periods than it will be in solving an immediate crisis. The importance of studies to help us to develop long term objectives and approaches to resource management needs increased recognition.

The fisheries of any particular region and the stock market are similar in a number of ways. First, they are both composed of individual "stocks" that go up and down more or less independently of one another. Second, the past history of trends in stocks is the only information known with certainty, but it is no guarantee of future trends. Third, mathematical models are used to predict future patterns based on various scenarios or assumptions about future or present conditions, but these work only in an approximate way, and are sometimes inaccurate. Fourth, the bottom line is that despite the use of various restraints on swings in "stocks", they are inherently out of our control.

Fifth, despite so much risk and uncertainty, stock managers must make decisions. Finally, by taking a long term view that averages gains and losses over an extended period, risk and uncertainty is minimized, and the probability of success is maximized.

By necessity, much of the attention of fishery managers and scientists is focused on reaction to this year's emerging trend in landings or environmental crisis. Unfortunately, our understanding of the causes of rises and declines of most resource species is weak. In addition, fish stocks are known to vary greatly in abundance due to natural causes. We therefore have little ability to convince either the general public or specific user groups that we know how to solve a particular resource crisis. This situation is not surprising, however, because the science of managing marine fisheries is still at a very early stage of development. In fact, given that dramatic fluctuations in abundance is an inherent characteristic of most stocks, there is little reason to expect that the effects of management strategies will even be measurable over a short time frame. Management strategies should therefore be evaluated for their potential to enhance the resource over the long term, and applied for a long enough period to learn their effectiveness.

The same standard for evaluation to should apply to research: i.e., the potential for research contribute to our ultimate understanding of the resource. The causes of fluctuations in resource abundance are probably both numerous and variable among species, habitats, and time periods. Such problems are likely to be understood only by long-term research programs. What problems would we like to have definitely solved 25 years from now? Here are a few. What is the relationship between natural environmental conditions and stock size? What is the effect of shoreline development (or other habitat alterations) on fisheries? Will habitat restoration enhance populations? Can marine finfish stocks be enhanced by planting of hatchery-reared fish? What is the major cause of resource decline, overfishing or degraded habitat quality? What is the most effective way of managing fishing effort? How should fisheries be allocated between commercial and recreational users? What levels of spawning stock size must be maintained to assure population stability? What levels of fishing mortality and size at entry will maximize fishery yield? How will stocks in this region respond to reduction in mortality, a change in size limits, or other management measures employed in the regions and/or on a coastwide basis?

Long-term research programs aimed at improving the underlying knowledge upon which management is based needs more emphasis. Such programs might focus on one or two of our most important species, or some subset of the questions outlined above. Investment in such a program will ultimately improve our ability to act as responsible stewards of our fishery resources.

SECTION II. ASSESSING THE IMPACT OF PEOPLE ON THE COASTAL ENVIRONMENT

PEOPLE, BEACHES, AND BIRDS: CONFLICT WITH BIRDS THE LOSERS

Charles F. Wurster and Malcolm J. Bowman
Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

PROBLEM: Increasing human usage of beaches, especially with off-road vehicles, is driving at least two avian species, the least tern and the piping plover, toward extinction.

IMPORTANCE: Biodiversity suffers another blow.

APPROACH: Refuges that provide the habitat and resource requirements of these birds, and that cannot be violated by special human interests, are required for protection of the nesting sites of these species. More broadly, the United States needs an effective national wildlife refuge system.

The least tern and the piping plover are colonial nesting birds that lay their eggs and raise their young on sandy beaches, usually about 50 to 100 feet above the high tide line. They build no nest, instead depending on camouflage of the flecked, grayish eggs within a small indentation in the sand or gravel. The chicks are similarly camouflaged; they "freeze" on the approach of potential danger.

These birds are extremely vulnerable to human disturbance at their nest sites, disturbance that increases as human use of beaches increases. People inadvertently trample on eggs and chicks, since they are usually oblivious to the presence of the birds. People bring cats and dogs to the beach, which they prey on the birds. Human activities chase the adult birds into the air, leaving eggs and chicks frying to death in the hot sun, or unprotected against predation by gulls or night herons.

Off-road vehicles often represent the greatest of all human impacts. The trampling factor of wide wheels driving the length of the beach is many-fold greater than hundreds of human feet. Fisherman often drive onto the beach at one location, causing untold damage to nesting birds along the way. Many people merely enjoy driving vehicles on beaches.

As a result of this disturbance, populations of both the least tern and the piping plover have been reduced to a shadow of their former abundance. Both species are on the endangered list. Both species have diminished to one thousand or fewer pairs for the entire East Coast. The disturbances described above occur not only on public beaches, but within wildlife refuges as well.

Solution to this problem would initially appear to be simple; the birds need inviolate sanctuaries that provide their resource requirements where they can raise their young in peace. But even the birds do not cooperate with this simple concept. Frequently they change beaches from one year to the next, abandoning a site protected for their use only to appear at another, unprotected beach the following year. It is probable, however, that ideal beach locations could be identified that would attract the birds year after year.

Refuges must be carefully chosen, based on the requirements of the birds, and given vigorous protection, with all human activities excluded from the area. Vehicles must be strictly prohibited. People walking on the beach below the high tide level would do no damage, but it is unlikely that human activities could be restricted only to that level.

The plight of these two avian species raises a much larger environmental issue: the United States needs, but does not have, an adequate and effective national wildlife refuge system. Most national wildlife refuges are individual laws unto themselves, designed to provide for special human interests first and foremost, with wildlife protection coming second.

Many wildlife refuges allow hunting and fishing, consumptive uses of wildlife that are incompatible with wildlife protection as a primary goal. Many concentrate on management of the refuge for the purpose of raising ducks and geese for hunters to shoot, rather than managing a total, natural ecosystem. Off-road vehicles are frequently encouraged, as are motor boats, water skiing, swimming, and other human recreational activities that are incompatible with the requirements of wildlife. Some wildlife refuges are even used for target practice and as bombing ranges by the military.

The United States should be mature enough, sophisticated enough, wealthy enough, and sufficiently concerned with the protection of its wildlife refuge communities to have a truly effective national wildlife refuge system. We do not now have

such a system, even though appropriate lands are already under Federal ownership. New Federal legislation will probably be needed to make the current system effective. Achievement of this goal will not be an easy task, for such legislation will be strenuously opposed by the makers of guns, ammunition, off-road vehicles, fishing gear, motor boats, camping equipment, certain segments of the travel industry, and other financial interests involved with recreational activities currently active on wildlife refuges.

HOW DOES COASTAL DEVELOPMENT IMPACT THE MARINE ENVIRONMENT?

Doreen M. Monteleone, R. Lawrence Swanson and William Wise
Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

PROBLEM: The assimilative capacity of New York's waters are unknown, yet we continue to develop coastal areas with little regard to impact on the aquatic environment

IMPORTANCE: New York's coastal waters are important spawning areas for trophically, recreationally and commercially important finfish and shellfish.

APPROACH: Population stress on the coastal waters must be assessed and this information would lead to appropriate limitations on land use.

Throughout the world, the first order indicator of marine water quality is that of population density -- the greater the population density the poorer the water quality. Thus, as population increases toward eastern Long Island there is evidence of a gradual decreased in the general character of water quality and loss of aquatic habitat.

Major issues that must be addressed if we are to maintain or improve water quality and limit habitat destruction and alteration in New York coastal waters are 1) a sufficient understanding of the assimilative capacity of the estuaries to process pollutants and the effects these pollutants have on the ecology of aquatic organisms and 2) the impact continued development may have on the coastal environment.

Man has been developing New York since the 1600s. The population surrounding New York's coastal waters, including New York City, may be as great as 15 million people by the year 2000. The overall population growth for the period 1980-2000 might not be very large, however, with regard to the impact on coastal waters it is the redistribution of population that may be of more concern than the growth. Development will continue to move away from the central city to more suburban counties. Also, redevelopment of previously developed areas, such as the west side of Manhattan, poses other problems of further altering environments which have already been impacted.

To aid in the formulation of meaningful land use planning, it is important to understand the ability of the water bodies to advect, disperse, neutralize and assimilate wastes that are purposely and inadvertently introduced into them. Unfortunately, it is the biological organisms that provide indicators of degrading water quality. Dissolved oxygen is essential to life in estuaries. Massive die offs of benthic organisms, also known as "fish kills", often occur in areas where biological oxygen demand is high due to decomposing sewage wastes. Shellfish can no longer be taken from shellfish beds in increasing areas because of high coliform counts induced by human sewage, urban runoff and storm water.

New York's coastal areas present an extreme gradient of development patterns and types, from the completely urbanized New York City region to the relatively undisturbed portions of Long Island's barrier beach. Pressure for new coastal development or redevelopment is present throughout New York's marine coast. Our inability to project the impact of this development on the environmental quality and integrity of coastal waters has recently been highlighted in the context of issues such as pile-supported and platform construction in the New York-New Jersey Harbor and increased mixed-use development of coastal fringes on the eastern end of Long Island.

There are four major bar built estuaries on the south shore of Long Island which lie along the strong development gradient. Jamaica Bay is within the boundaries of highly urbanized New York City. East of Jamaica Bay is Great South Bay whose western end is highly developed and eastern end is more suburban. Moriches Bay follows next along the gradient and is in an area which is less developed. Shinnecock Bay lies furthest east and is impacted the least by coastal development. Parameters such as salinity and temperature sediment, coliform bacteria, nitrogen, phosphorous, dissolved oxygen, hydro carbons, PCBs, lead, mercury, etc. are dependent on the degree and type of land use vary tremendously.

However, little information exists on the actual impact man has had on the physical, chemical, geological and biological characteristics of these bays exists. Only in the 1950s was any effort been made to examine the water quality and productivity of the south shore bays. Even then, the potential these water bodies have as spawning and nursery grounds for commercially, recreationally and trophically important fish had not been examined.

Though many fish species have been caught by fishermen, it was unknown whether the bays were successful nursery grounds for these same fish. Hard clams, scallops, winter flounder, bay anchovy, Atlantic silversides, and other fish are known to spawn in the bays. They all have commercial, recreational and trophic importance. Only for Great South Bay does recent data (from the 1980s) exist on the growth and survival of early life stages of bay anchovy. This is unfortunate as trends caused by increased population pressure cannot be examined.

Yet, because these bays lie along such a development gradient, they provide an ideal macrocosm to study man's effects on the environment. By selecting key indicator species and comparing their abundance, growth and survival in the 4 bays it may be possible to determine how future development around the more eastern bays could affect the bays' productivity.

If man's impact is degrading water quality to the extent that the ecology of the bays is altered it may be necessary to increase restrictions on development of coastal areas through land use planning. But, land use planning is only effective to the degree that it is implemented. Implementation appears to be the weakness in the process. Political leaders must be convinced amd prepared to take firm stands with regard to coastal development.

Purchasing of land by the public sector is extremely expensive. Effective zoning must be in place for most lands. The zoning process must be more rigidly enforced if we are to achieve reasonable water quality.

In conclusion, we need to investigate the impact of development on our estuaries for several reasons:

* we have little knowledge about how various development activities, individually or in aggregate, alter the physical, biological, geological or chemical systems and processes characterizing our coastal waters;

* we can't properly assess pollutant loadings such that concentration-based criteria can be converted to acceptable mass loading for individual bays and for the larger bodies such as Long Island Sound and New York Bight;

* we don't know much about what habitat types, and what aspect(s) of these habitats, are critical to key resources or forage fishery species;

* we are frequently unable to differentiate between natural variability in the marine environment and that resulting from development activities in coastal areas;

* the integrity and diversity of land use and development activity throughout much of New York's coastal region is so great that identifying the environmental consequences of specific development activity types is difficult.

WILL THE DIVERSION OF THE HUDSON RIVER WATER HAVE ANY IMPACT ON COASTAL DYNAMICS AND BIOLOGY

Darcy J. Lonsdale and Mario E. C. Vieira
Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

PROBLEM: Increased water demand by New York City area residents will be addressed by diversion of Hudson River waters. There will continue to be extensive investigations of the physical and biological impact in the Hudson River. Some study emphasis, however, should be directed at modeling the potential physical effects on the surrounding coastal waters.

IMPORTANCE: Changes in the rate of freshwater flow have the potential to alter circulation patterns in the surrounding coastal waters. Alterations in the delivery of nutrients and changes in the salinity regime could also impact the biota.

APPROACH: Use numerical simulations as an exploratory tool to begin assessing the possible repercussions on the western Long Island Sound. Likely sources of data would be the NOS 1980-81 circulatory survey and the LISS 1988 study.

If diversion of freshwater from the Hudson River has any impact on the New York coastline, it most likely will be on western Long Island Sound and its shorelines as opposed to the south coast of Long Island. The water plume from the Hudson River normally travels southward along the New Jersey coastline whereas the East River functions as a source of freshwater to Long Island Sound and to the northern coast of Long Island. A reduction in the freshwater flow may allow a greater introduction of the Bight waters into the Sound than at present. This may decrease to some "small" degree the intensity of the estuarine circulation of the Sound. An alternate scenario would be that little physical change would occur in the Sound if increased sewage outflow at the eastern side of Manhattan offsets the expected physical changes from diversion.

The likely impact of freshwater diversion on nutrient loading in the western Sound is uncertain. The Hudson River does not serve as a major nutrient (pollutant) source to the SOund. Thus, diversion of River waters <u>per se</u> likely would have no direct

effect on the biota in the western Sound. Alterations in the physiological state and genetic structure of marine populations and in community dynamics could occur if salinity was significantly increased. To better judge whether the biota would be impacted, however, it would be judicious to first predict the magnitude of physical changes which would occur under various diversion schedules.

INPUTS OF TOXIC ORGANIC POLLUTANTS TO NEW YORK COASTAL WATERS

Bruce J. Brownawell
Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

PROBLEM: The importance of various sources of potentially toxic organic components to New York coastal waters cannot be adequately estimated, largely because of uncertain atmospheric inputs.

IMPORTANCE: Contaminants, such as PAHs' PCBs and pesticides, can have a number of adverse effects on marine organisms and potentially on human consumers of seafood. Effects of waste management strategies on toxic contaminant loads is an important component of integrated policy assessment.

APPROACH: Research is needed to estimate direct and indirect atmospheric inputs of organic contaminants in New York Bight and western Long Island Sound.

Potentially toxic organic compounds such as DDT, PCBs, and polycyclic aromatic hydrocarbons (PAH) have been the focus of substantial concern and study due to demonstrated effects on marine bird populations, numerous potential toxic effects on marine organisms, and because many of these chemicals are suspected human carcinogens. Hydrophobic organic pollutants associate to a large extent with particles and occur in high concentrations in sediments proximate to large urban and industrial areas. Low energy marine environments are particularly susceptible.

The lipophilicity and persistence of these types of compounds create special problems. Organisms can concentrate these chemicals from seawater by factors of 10^3 to greater than 10^6; depuration of these chemicals is very slow, such that food chain transfer, in addition to direct uptake from water, can be an important process, especially for highly mobile species. Harbor and coastal sediments act as long term repositories for these chemicals. Continued inputs may increase sedimentary inventories, and make worse the long term release of toxic contaminants to the water and biota.

New York Bight and western Long Island receive inputs of organic contaminants from many sources, which include: municipal wastewater effluent; other sources to the Hudson-Raritan Bay Estuary and other rivers; runoff from storm drains, tributaries, and agricultural lands; CSOs; sewage sludge dumping at DWD-106; transportation operations and accidental spills; landfill leachates; and atmospheric inputs. Atmospheric inputs are both direct deposition to the ocean surface and indirect runoff of contaminants deposited in the watershed. The latter ultimately show up in sewer systems, runoff, or CSO discharges. With the exception of sewage sludge and possible sewage effluent, there is little data available to estimate the magnitude of fluxes for the other important sources of organic contaminants. Inadequate understanding of atmospheric inputs is perhaps the most difficult and important gap to fill in assessing the magnitude of various inputs. Estimations of atmospheric inputs is basic to evaluating the need for waste reduction and the effects of waste management treatment strategies (e.g., secondary treatment, ocean dumping, of CSO control) on contaminant loading to New York coastal waters.

Atmospheric deposition occurs via scavenging and removal of organic compounds in precipitation, by dry deposition, which is the settling and surface impaction of aerosol-associated contaminants in the absence of precipitation, and exchange of vapors across the air-water interface. The magnitude and relative importance of the three processes depends on the source and properties of the organic chemicals, the concentration and size distribution of atmospheric particles in the atmosphere. The enhancement of organic pollutant deposition near urban environments can be much greater than that for metals because of the changes in partitioning of organic compounds between vapor and particulate phases in the atmosphere.

Basic research needs to be conducted to estimate atmospheric inputs of potentially toxic organic compounds to coastal waters in the vicinity and downwind of metropolitan and industrial regions of New Jersey and New York. Both fundamental studies of the important deposition processes and actual flux estimates are needed. A comprehensive approach would include studies of precipitation fluxes, high volume air and surface water measurements, and collection of meteorological data. Measurements of organic compounds in peat cores from high marshes may be a valuable method to estimate the geochronology of atmospheric fluxes to New York coastal waters. Only after direct atmospheric inputs can be estimated, can the indirect atmospheric sources (i.e., reaching the ocean from runoff and sewer systems) be evaluated.

The atmospheric inputs of metals and nutrients (N and P) are also significant for New York coastal waters. Predictions of fluxes of these pollutant classes from existing data are also met with large uncertainties, but are better understood and more reliable than estimates for organic contaminants. It is recommended that atmospheric inputs of other pollutant classes by studied in conjunction with, or following, studies of the organic contaminants.

ARE POLLUTED SEDIMENTS CONTAMINATING MARINE FOOD CHAINS?

Nicholas S. Fisher
Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

PROBLEM: Many sediments in New York's coastal waters are contaminated with high levels of toxic substances. These substances may ultimately leave the sediments and appreciably contaminate marine organisms.

IMPORTANCE: Trophic transfer of toxic chemicals in marine food webs could lead to the closure or decline of important local fisheries.

APPROACH: Research should be conducted to determine whether contaminants associated with marine sediments are available in significant amounts for accumulation in marine organisms.

It has now been well established that the sediments in many of New York's coastal regions are substantially contaminated with toxic substances. These chemicals include toxic metals (e.g., Ag, Pb, Cd, Cu, Sn, etc.), toxic organic compounds (PAH's, PCBs, etc.) and probably toxic organo-metallic compounds (particularly of Hg and Sn). Should we be concerned with elevated levels of contaminants in these sediments or regard the sediments as essentially final repositories of these materials? Should we consider the sediments as a source of contaminants as well as a sink? To a large extent, this will be a function of the release rate of the contaminants from the sediments into the overlying water or into the pore water. If the contaminants are essentially irreversibly bound to the sediments then they may never appreciably enter marine food chains. Can we measure these release rates? To what extent do the various contaminants desorb from marine sediments in bioavailable form? What factors (e.g., physical turbulence, sediment resuspension, temperature salinity, bioturbation, DOC, bacterial activity, etc.) play prominent roles in influencing the mobilization of contaminants from sediments?

These questions are readily testable in the laboratory using controlled experimentation. Using microcosms or mesocosms, we could directly assess the extent to which select pollutants mobilize from different sediment types and ultimately determine the degree to which the mobilized contaminants accumulate in

marine organisms. Phytoplankton, because they serve at the base of the food chain, and select invertebrates such as bivalves and perhaps zooplankton (as important components of the food chain leading to fish) should be examined. A cost-effective and sensitive methodological approach would incorporate the use of radiotracers to monitor the mobilization and biokinetics of the contaminants in the experiments.

The implications of these studies are far-reaching. They may tell us, for example, about the advisability of dredging certain polluted sediments. The results may further indicate the probability of fisheries becoming contaminated in systems in which the sediments are polluted.

COMPREHENSIVE SPILL RESPONSE PLAN FOR THE NEW YORK-NEW JERSEY-CONNECTICUT

J. R. Schubel and Mario E. C. Vieira
COAST Institute
Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

PROBLEM: There is no comprehensive spill response plan for this region. If a spill of oil or other hazardous material were to occur, we would be worse off than Alaska following the Exxon Valdez incident because of the number of overlapping jurisdictions. A comprehensive plan needs to be developed and maintained so that in the event of a major spill, appropriate actions would be taken within the first few hours.

IMPORTANCE: Failure to respond quickly and effectively to a major spill of oil or other hazardous material could spell an environmental catastrophe for New York, New Jersey and Connecticut shores. New York's commercial and recreational fishing industry, the tourism industry and the fragile wetland environment could be destroyed. The economic impacts could run into the hundreds of millions of dollars.

APPROACH: The MSRC would carry out the study through its Waste Management and COAST Institutes and in collaboration with the Center for Regional Policy Studies. The approach will be similar to that used in developing the comprehensive floatables management plan. All appropriate governmental groups will be involved through a series of workshops.

Over the past year, there have been a number of oil spills in U.S. waters. The largest and most publicized of these was the grounding of the Exxon Valdez in Alaska. Two spills occurred in the coastal waters of the northeast United States; one of these was in Long Island Sound.

In each case, the human dimension played the primary role in causing the accident. In each case, and in the case of the Exxon Valdez in particular, the inability to respond quickly and decisively because of jurisdictional ambiguities and the lack of a spill contingency plan contributed to the magnitude of the impacts.

A spill in the Bight or in the Sound will generate a disaster whose financial and ecological consequences will bear heavily on Long Island shores and its communities. Near-shore New York waters are rich in sword fish, tuna, marlin, squid, mackerel and other fin and shellfish, making up a fishery which supports a multi-million dollar commercial and recreational industry. Beaches on the shores of Long Island provide the basis for a thriving tourism industry and a healthy outlet for millions of people. Wetlands line the estuarine coastal lagoons in which the shores of Long Island are prodigal. These extremely sensitive environments are essential to the chain of life in aquatic systems, since they act as nurseries, and spawning and breeding habitats for all kinds of marine organisms.

If a large accidental release of oil or other chemical were to occur in New York's coastal waters, would we be any better off than Alaska? Could we respond quickly, decisively and effectively to minimize the spread of the material and its environmental impacts? Probably not. In the New York region, there are multiple, overlapping jurisdictions -- even more than in Alaska -- and no up-to-date, comprehensive spill response contingency plan exists. It should.

New York needs a spill response plan which identified explicitly (1) the actions that should be taken in the event of an accidental release of materials into different segments of the region's coastal waters, (2) who is responsible for taking these actions, (3) on what schedule, and (4) what reporting is required. The plan should also identify the locations, characteristics, capabilities and conditions of dispersants, and equipment to contain and clean up spills of different materials. The plan must be developed with the full participation of all agencies with jurisdictional responsibility for spills of hazardous materials, it must have the appropriate endorsements so that it carries the necessary authority, and it must be current so that the key individuals can be identified and contacted without delay.

Stony Brook's Marine Sciences Research Center has experience in developing such plans through its Coastal Ocean Action Strategies (COAST) Institute and its Waste Management Institute. In 1980, COAST Institute and Waste Management Institute staff worked with all relevant federal, regional, state, county and local agencies to develop a comprehensive management plan to deal with floatable and medical-type wastes on the region's economy during the summer of 1988. The plan identified specific actions and agencies responsible for taking these actions to deal with the problem in the short term and over the longer term.

The University at Stony Brook now has another unit that can make a major contribution to the development of a comprehensive chemical spill contingency plan. The unit is the Center for Regional Policy Studies, directed by Lee E. Koppelman, Director of the Long Island Regional Planning Board. It was under Dr. Koppelman's leadership that oil spill response plans were developed for south shore inlets.

The Marine Sciences Research Center, through its COAST and Waste Management Institutes, proposes to work with the Center for Regional Policy Studies to develop a comprehensive spill response contingency plan to deal quickly, decisively and effectively with any accidental releases of oil or other potentially harmful substances into different segments of the coastal waters of the New York-New Jersey-Connecticut area. An integral component of the project will be to test the plan by stimulating spills and evaluating the efficacy of the responses. The estimated cost of the project is $100,000. It would take 8-12 months to complete.

SECTION III. DATA MANAGEMENT/INFORMATION SYSTEMS

THE DEVELOPMENT OF AN ENVIRONMENTAL DATA MANAGEMENT SYSTEM AT THE MARINE SCIENCES RESEARCH CENTER, STONY BROOK

Mario E. C. Vieira
Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

PROBLEM: Large quantities of oceanographic observations exist for New York marine waters and adjacent coasts. This wealth of data has never been put together and archived in an orderly and useful fashion; it is in risk of being lost forever. There is no mechanism to transform the data into timely information that decision makers need.

IMPORTANCE: These data represent many years of efforts by numerous institutions, agencies, organizations and individual investigators; many hundreds of thousands of dollars went into acquiring these materials. The availability of historical oceanographic data is essential in monitoring efforts and studies of the marine environment.

APPROACH: The MSRC will create a central repository for oceanographic data relative to New York State's marine waters. An Index of all existing data will be developed and updated on an ongoing basis. An Information Storage and Retrieval System will be established, capable of providing synthesis, interpretation and conversion of the data into informational products tailored to the needs of environmental managers.

Knowledge about the ocean, estuaries and waterways that comprise the network of coastal areas in the State of New York, as well as the neighboring coasts of Connecticut and New Jersey, is vital to the interests of local governments and managers of a whole spectrum of natural resources. The application of modern marine technology to solve economical, social and environmental problems relies, however, on the availability of oceanographic information.

The collection of marine data mobilizes sizable resources in terms of labor, know-how, infrastructures and financial support. Oceanographic data must therefore be considered an expensive commodity whose storage and preservation must be guaranteed for the benefit of present and future users.

Large quantities of oceanographic observations exist for New York marine waters and adjacent coasts. These data represent many years of efforts by numerous institutions, agencies, organizations and individual investigators. This wealth of information has never been put together and archived in an orderly fashion. It can be safely stated that much of these data risk being lost forever, unless they are recovered and made secure. Furthermore, ongoing studies (e.g. the Long Island Sound Study) and future projects will provide previous information on the region's marine waters and environment; the usefulness of the results will be maximized by keeping them accessible and up-to-date. Clearly this is a need for a system that will keep track of the data collected until now and to be acquired in the future, carefully assess and assure their quality and maintain an up-to-date Index indicating to the user what data are available and how they can be obtained. This system will also provide information on past and ongoing research and monitoring projects, names of investigators, objectives and status; it will offer help on requests for reports, theses and publications.

Furthermore, there is an urgent need for a facility capable of converting marine environmental data into timely information tailored to the specific demands of managers and decision makers. Requests for managerial tools such as maps, charts, graphs, lists and statistical summaries should be handled on a real time basis. The results of environmental monitoring activities are chronic victims of underutilization, out of proportion to the large financial resources mobilized to obtain them, at present there is no established mechanism, to process and transform data into products of immediate use by managers and executives.

Stony Brook's Marine Sciences Research Center has the resources and the staff to initiate this enterprise, which is within the scope of its mandate. The implementation of the Environmental Data Management System should be done in several stages:

*First year: Development of a central Index of recent (e.g. Long Island Sound Study) and on going research and acquired data. The Data Base software might be ORACLE (already available within SUNY), installed on the MSRC VAX 8530 minicomputer and reachable through dial-up access by any PC user. MSRC's participation in the INTERNET network will facilitate accessibility. The Index will be updated on an ongoing basis, will contain descriptions of the data, their perceived quality, instructions on how to obtain them and lists of related published documents. The maintenance of such a facility is simple and does not require hardware beyond MSRC's current capacity. The estimated costs for the first year is $75,000.

*Second and third years: Extension of the Index to historical data. Development of an Information Storage and Retrieval System for the previously indexed data. The data will now be archived at the facility. Some types of output, resulting from data synthesis and transformation, will be available to users. Human resources and hardware requirements will increase. Estimated costs between $150,000 and $300,000 per year.

*Full development: Implementation of Geographic Information System (GIS) capability. Members of the faculties of MSRC and Hunter College are already cooperating in projects dealing with GIS application to the marine environment. This is state-of-the-art research into a field of great promise: that of transforming oceanographic data into products of immediate interest to policy makers and managers of marine resources. A strong candidate, in terms of software is the ARC-INFO package, which can be coupled to the ORACLE data base system. Projected costs might be on the order of $800,000 to $1 Million per year.

AN ACCESSIBLE, COMPREHENSIVE COASTAL INFORMATION SYSTEM

Robert E. Malouf[1], Cornelia Schlenk[1],
Jay Tanski[2] and Henry Bokuniewicz[3]
[1]New York State Sea Grant Institute
[2]New York State Sea Grant Extension
[3]Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794

PROBLEM: Coastal decision-making is not centralized administratively or technically due to the multitude of jurisdictions and levels of government involved. As a result, decision-making is often inconsistent and not always based on the best available information.

IMPORTANCE: Coastal managers, government officials and resource users are being faced with increasingly complex and difficult decisions regarding problems associated with coastal processes that could have severe economic and environmental impacts.

APPROACH: Although the political jurisdictions probably cannot be centralized, a centralized database containing information about coastal conditions and processes on Long Island should be developed and made available to appropriate decision-makers, as well as the public, to help New York more effectively manage its marine coastline.

Many federal, state, and local agencies have responsibility for pieces of the management of New York's marine coastal--zone. Unfortunately, consistency between these management elements is not always automatic for two main reasons. First, there are variations in policies and regulations (and their interpretation) between, as well as within, these agencies. This situation is unlikely to change in the near future. Second, the different agencies involved are not necessarily working from the same technical database and often have incomplete information which leads to conflicting decisions. This problem would be alleviated, however, through the development and use of a centralized, comprehensive database of Long Island's coastal conditions and processes.

The situation at Westhampton Beach provides a one example of the disastrous consequences that can result when a coastal project is implemented without an adequate knowledge of the local processes operating in an area, the range of alternatives available, or the most basic environmental information. Improper design and siting of a groin field at Westhampton Beach has actually exacerbated erosion in adjacent areas. In the face of a $70 million lawsuit, federal, state, and local officials are presently debating over which of a number of options (ranging in cost from $25 million to $160 million) should be used to provide interim relief until a long-term solution can be found. Uncertainty and disagreements over potential impacts of the various options resulting from inadequate data on coastal processes at the site have prevented these group from reaching a consensus on an appropriate course of action. This and similar situations elsewhere cause commercial and recreational opportunities to be lost, further increases in economic losses, and intensified antagonism between coastal resource users and regulatory agencies.

Unfortunately, a number of observed trends indicate that problems associated with coastal processes in New York will become even more severe in the near future. The trends (which include predicted increases in the rate of sea level rise, a shift in responsibility for implementing and funding erosion control and dredging projects from the federal to the state and local level, continued reliance on tourism in some sections of the coastal economy, an increased demand for coastal facilities and the development of shoreline areas, and a growing environmental awareness of these areas) mean coastal managers and resource users will be faced with increasingly complex and difficult decisions regarding coastal processes and erosion control. They will require a more comprehensive knowledge of the coastal system and reliable data in order to make informed decisions.

An accessible, comprehensive coastal information system should be developed and implemented to compile, maintain and provide access to collected physical data, information on coastal protective structures, and dredging and beach nourishment activities. One or more persons located at an independent facility could provide the best available data and an unbiased interpretation thereof for a particular site and/or scenario upon request. Construction of a modeling tool to facilitate its interpretive and predictive abilities, workshops to familiarize decision-makers with its capabilities, and its use to identify information gaps are a few of the additional activities that would also be associated with the system.

In New York, a coastal information system could be established as a division of the University's Northeast Environmental Data System which is presently being established at the Marine Sciences Research Center (MSRC). Both the computer facilities and the technical expertise are available at the MSRC, and scientists there have a long history of research in Long Island's coastal zone.

In Florida, such a database (or archive) has been established and is used extensively by government agencies, planners, consultants, developers, engineers, tax assessors and insurance companies. It is funded as a line item in the state budget. Because of its relatively applied and site-specific nature, the availability of federal funds to carry out this work is severely limited; in New York, funds from state or local sources would be necessary to initiate and maintain this effort. Even in view of current budgetary constraints, there is little doubt that the potential benefits of such a system would greatly exceed the required costs.

DATE DUE

			Printed in USA