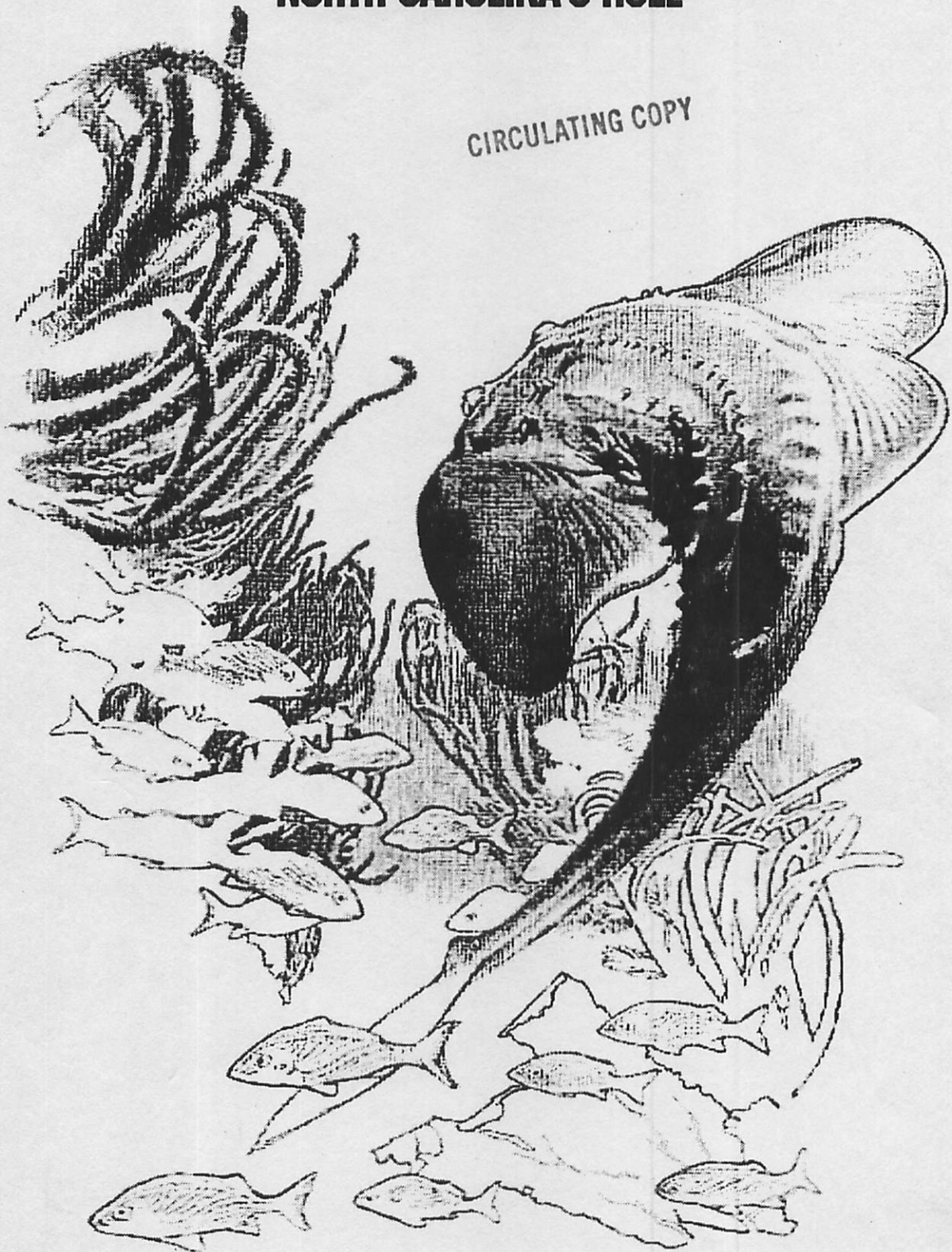


MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

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**A PROCEEDINGS FROM A CONFERENCE HELD
MAY 20-21, 1993
UNIVERSITY OF NORTH CAROLINA AT WILMINGTON**

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MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

A PREFACE

The conference, "Managing the Coastal Ocean for the 21st Century," was part of a larger effort by the state to develop a comprehensive ocean resources management plan. Ocean resources planning is one of four priority areas that is targeted for improvement under a Coastal Zone Enhancement Grant from the National Oceanic and Atmospheric Administration, an agency of the U.S. Department of Commerce. Other priority areas are cumulative and secondary impacts, wetlands and special area management planning. Improvements developed for each priority area will be incorporated into the state's federally approved coastal management program, which is administered by the N.C. Division of Coastal Management.

The conference objectives, which were developed to complement the state's ocean planning efforts, were: to define the boundaries and significant natural resources of North Carolina's coastal ocean; to identify the status of and potential risks to coastal ocean resources; and to identify current resource management strategies, use conflicts, informational gaps and future directions.

The conference sponsors were the N.C. Division of Coastal Management, N.C. Office of Marine Affairs, N.C. Council on Ocean Affairs, N.C. Sea Grant College Program and the University of North Carolina at Wilmington.

The N.C. Ocean Resources Task Force, comprised of scientists, state and federal agency resource managers and ocean users, was established in early 1993 to develop the ocean plan. In addition to the coastal ocean conference, other first-year activities supported by the federal grant include an independent analysis of the state's ocean management regime, a needs assessment for incorporating additional ocean resource data into the state's geographic information system (GIS) and digitization of existing hardbottom data.

Tasks identified for the second year of the grant include prioritizing data needs for the state's GIS, holding public "scoping" meetings to identify key ocean management issues and resource management problems, developing an outline for the ocean plan.

The final ocean plan, which is expected to be completed in 1995, will consist of the following major components: 1) the ocean management study; 2) maps and other data in GIS format about important ocean conditions, uses and resources; and 3) enforceable policies for resource and use issues such as marine fisheries, marine pollution, offshore energy development, marine recreation, hard minerals mining, shipping and navigation, and marine

education and research. These policies will provide the basis for improving state, local and federal agency program coordination for managing specific ocean resources and uses.

The proceedings from this conference is intended to provide direction to the task force, state resource agencies and the public on how the state can protect the long-term values and benefits of ocean resources and uses. The conference participants, who are experts in their respective areas of fisheries, hard minerals, ocean users, ocean policy, etc., each brought a unique perspective and insight on ocean resource management. Their presentations and the panel/audience discussions should prove invaluable during the ocean planning process.

Kim Crawford
Outer Continental Shelf Program
N.C. Division of Coastal Management

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

JONATHAN HOWES — AN INTRODUCTION

Jonathan Howes earned his bachelor's degree in history from Wittenberg University, a master's of regional planning from the University of North Carolina at Chapel Hill and another master's degree in public administration from Harvard University. He has served as the deputy director of program development and as director of state and local planning assistance for the U.S. Department of Housing and Urban Development. Howes has acted as director of the Urban Policy Center in Washington, D.C. and director of the Center for Urban and Regional Studies at UNC-Chapel Hill. Howes is currently secretary of N.C. Department of Environment, Health and Natural Resources. He's also a fellow of the National Academy of Public Administration and a former mayor of Chapel Hill.

I am pleased to join the N.C. Division of Coastal Management and the newly formed N.C. Ocean Resources Task Force as they take their first steps to initiate comprehensive ocean resources planning. I'm pleased because the coast and the ocean are special to me personally and professionally. I serve the governor as secretary of the department that can and should provide strong leadership towards the wise use and preservation of our valuable coast and ocean resources.

Today I want to share with you this administration's commitment to coastal and ocean management. The state's interests do not end three miles offshore at the dividing line between state and federal jurisdiction. It doesn't end because many offshore activities, such as fishing, boating and drilling for oil and gas can leave direct and indirect impacts on shore. This administration recognizes the need to protect ocean resources and to wisely manage competing ocean uses. I recently spoke to the N.C. Coastal Federation where I shared the N.C. General Assembly's findings of 20 years ago. They're still relevant, and I'd like to share some of them with you now.

Considering the question of coastal management, they said:

"North Carolina's coastal lands and waters are among the state's most valuable resources. The coastal area and its estuaries are among the most biologically productive regions of this state and of the nation, providing almost 90 percent of the most productive fisheries on the East Coast. In recent years, the coastal area has been subjected to increasing pressures that are the result of often conflicting needs of a society expanding in industrial development, in population and in the recreational aspirations of its citizens. Unless these pressures are controlled by coordinated management,

the varying features of the coast that make it economically, aesthetically and ecologically rich will be destroyed."

The result of these legislative findings is the Coastal Area Management Act of 1974.

Going back to the statements of 20 years ago, legislators said: "In recent years the coastal area has been subjected to increasing pressures which are the result of conflicting needs." Obviously this refers to the growth of the 1960s. But this statement is even more striking today as we look at the rapid growth of the 1980s and the increasing level of conflicting demands on the valuable finite resources of our coast. In addition, national growth has led to the exploration and production of offshore resources to meet the increasing demand for energy and other raw materials.

What we perhaps did not fully appreciate 20 years ago was the importance of the coastal and open ocean. We did not anticipate the development of demands for resources that few of us realized we had off our shore. We also did not foresee the development of conflicts over resource use or the problems of overharvest of ocean resources. Clearly, there is a need for reaffirming and strengthening our resolve to be better stewards and managers of our valuable coastal and ocean resources.

To underscore this administration's commitment to strengthening and improving our state's coastal and ocean management capabilities, I want to remind you of what Gov. Jim Hunt was doing in 1974. When CAMA was passed, Gov. Hunt was the lieutenant governor presiding over the N.C. Senate during the intense and bitter debate on the issue of coastal management. His leadership and commitment were among the important forces that resulted in the act's passage in the senate. The N.C. Coastal Management Program was approved by the federal government in 1978 while Hunt was governor.

Gov. Hunt has been very quick to show his interest in strengthening coastal and ocean management. Last month he addressed the North Carolina Ocean Outfall Forum in Atlantic Beach, where he underscored his commitment on environmental issues. He also stressed that we can have a healthy environment and economic development if we plan for growth. That is a hallmark of this administration — the notion that you can have a robust and healthy economy and a healthy environment.

We'll soon celebrate an anniversary — 20 years of the Coastal Area Management Act, 20 years of accomplishments and some disappointments. Although we must

carefully reflect on the past, we must also clearly focus on the future. What is our vision for the coastal region and how can we achieve that vision?

Gov. Hunt will soon announce that 1994 will be "The Year of the Coast." In addition to celebrating the coast, the governor will formally appoint a N.C. Coastal Futures Committee to assess where we have been and where we should head. A former congressman and distinguished judge, Richardson Pryor, will serve as chair of that committee. At the department level, I pledge to continue our commitment to the future of the coast.

The Division of Coastal Management has developed a strategic plan for coastal and ocean management — a four-year strategy for making significant program improvements regarding cumulative and secondary impacts on wetlands, special area management planning and ocean resources management. That's why we are here today. This conference is a starting point for the state's efforts to develop a comprehensive ocean resources management plan.

Recently a consortium of oil and gas companies submitted a plan to explore federal waters off our coast. That exploration proposal is still in the federal appeals process, and the government is also completing environmental, social and economic studies related to offshore drilling. The issue is not dead. Another lease sale is scheduled off our coast in 1996. We must continue to monitor activities occurring on the outer continental shelf (OCS), and to play an active role in the federal OCS Program.

This conference will also address other important ocean resource management issues — fisheries, protection of marine animals, and habitat and use conflicts. Stresses on the state's marine environment are increasing. They include pollution, water quality degradation, habitat decline, overfishing and sea turtle mortalities. Additional stresses could result from oil and gas exploration and production, hard minerals mining and ocean waste disposal.

There are also conflicts among various ocean uses including swimming, boating, sailing, jet skiing, commercial and recreational fishing, research and military activities. This points to the need for the state to more clearly define its ocean management goals and policies and to improve state agency coordination and enforcement.

We must expand our capabilities to effectively manage our ocean and coastal resources. As mentioned earlier, a

task force composed of state and federal resource managers, scientists, and interest groups has been formed to develop a comprehensive ocean resources management plan. This plan, which will be developed over the next few years, will help protect the long-term values and benefits of ocean resources and uses, ensure the wise use and management of ocean resources, and improve the coordination of state, local and federal agency management decisions.

The final plan will consist of three main components. An independent analysis of the state's current ocean management regime is being conducted by N.C. Sea Grant. Also, we need maps and other geographic data about important ocean conditions, resources and uses that can be used by resource managers and policymakers. A needs assessment for this project is currently being conducted. Finally, the plan will include enforceable policies for resource and use issues, such as marine fisheries, marine pollution including oil spills, offshore energy development, marine recreation, hard minerals mining, shipping and navigation, marine education and research.

This ocean planning effort is crucial to the future of our coast. What happens this year and over the next decade will be the legacy that we will leave for our children and for generations to come.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

GENE HUNTSMAN — LIVING RESOURCES: FISHERIES

Gene Huntsman received his bachelor of science from Cornell University and his master's and Ph.D. in fisheries biology from Iowa State University. Since 1967, Huntsman has been with the Beaufort Laboratory of the National Marine Fisheries Service, working with menhaden and reef fish. He is also an adjunct professor of zoology at North Carolina State University. Huntsman has served as the president of the Southern Division and Marine Fisheries Section of the American Fisheries Society.

For my discussion of the status of fisheries of the coastal ocean of North Carolina, biological reality forces me to describe the conditions of the various fish populations over their entire range. Overall, I will be discussing a region extending from New England to Key West, Fla.; although few species occupy the whole area. For instance, the Atlantic stock of king mackerel ranges from Cape Hatteras to Key West. Other species range north to New Jersey.

In this description of the status of fisheries, I have grouped species by ecological similarities, and, because of limited time, I will present only a one- or two-word indication of status for most.

HEALTHY: Stock in balance with harvest

DEPLETED: Stock reduced; in danger of overfishing if harvest not reduced; an environmental problem reducing harvest

OVERFISHED: Harvest too large; continued reduction in population likely without remediation; major loss in yield resulting from excessive fishing (sometimes in combination with environmental problems)

Brief discussions will occur for some of the most interesting changes in status or management strategy

ANADROMOUS SPECIES (Adults live in ocean; spawn in rivers)

River herrings	<i>Alosa pseudoharengus</i> <i>A. aestivalis</i>	overfished
American shad	<i>Alosa sapidissima</i>	depleted
Hickory shad	<i>Alosa mediocris</i>	depleted
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	overfished
Shortnose sturgeon	<i>A. brevirostrum</i>	federally endangered, harvest prohibited

River herring were once a tremendous resource for eastern North Carolina as a shoreside fishery when the fish traveled up the rivers. Heavy fishing by foreign interests in

the 1960s in the open ocean depleted the stock, and for various reasons, probably environmental as well as others, those stocks did not recover.

COASTAL DEMERSALS

Atlantic croaker	<i>Micropogonias undulatus</i>	overfished
Spot	<i>Leiostomus xanthurus</i>	depleted
Southern flounder	<i>Paralichthys lethostigma</i>	healthy
Summer flounder	<i>P. dentatus</i>	overfished
Weakfish	<i>Cynoscion regalis</i>	overfished

Coastal demersals live on the bottom offshore. These fish share a common lifestyle and spend a portion of lives in the estuary. Either they spawn in estuaries and grow to adulthood there, or, like the croaker and spot, they spawn in the open ocean but spend their first year of life in the estuary before moving just offshore. A number of these species have problems. Catches of summer flounder along the North Carolina coast are declining. But in recent years, other indicators of stock status tell us summer flounder are rebounding. Catches, of course, aren't the only indicators of population.

Recruitment to the weakfish, or gray trout, population dropped precipitously here in the late 1980s and continued to drop into the 1990s. Recruitment is the addition of young fish to the population. The spawning stock is in good shape, but we're not getting any entry into the population. That's bad news; when there's no young ones there eventually won't be any adults.

NORTHERN DEMERSALS (Oceanic bottom fish with southern limit at Cape Hatteras)

Black sea bass	<i>Centropristis striata</i>	overfished (northern subpopulation)
Scup	<i>Stenotomus chrysops</i>	overfished

The population of black sea bass is divided into two sectors — one north of Hatteras and one south. The population north of Hatteras is in modest trouble; the catches have dropped considerably in recent years because of fishing mortality. Fishing mortality is in the range of 1.2 to 1.4. Normally, we see natural mortalities in the range of .2 to .3. So we're killing black sea bass by fishing at about four to five times the rate that they would die from natural causes. In a healthy fishery, fishing mortality is about equal to natural mortality.

OTHER COASTAL SPECIES

Red drum	<i>Sciaenops ocellatus</i>	overfished
Striped mullet	<i>Mugil cephalus</i>	unknown

Some fish are nonconformists. Their life histories don't fit any convenient category. Striped mullet is a good example. Mullet is a popular eating fish in North Carolina and Florida, the only two places I know where people eat it out of choice. There was not a market for mullet in the world until recently. There is now a Japanese market for roe, and buyers will pay a dollar or more per pound for mullet of mixed sex in the round. Suddenly you have an established market and an incentive for exploitation. No one is certain what the increased harvest intensity will have on the mullet population.

For red drum, our state fish, the fishing mortality rate is very high for young fish. We have bag limit on bigger fish. Therefore the mortality rate drops for older, larger fish. But when fishing mortality rates range as high as 1.5, that's very, very high.

CRUSTACEANS

Blue crab	<i>Callinectes sapidus</i>	healthy
Shrimp	<i>Penaeus</i> spp.	healthy

Our crustacean fisheries are in good shape. It does not appear that there's a fishery impact. Destruction of habitat has reduced the production of crabs and shrimp some, but, for the most part, these populations are doing well. It has to do with the life history of these fish. It's very resilient.

COASTAL PELAGICS (Nearshore fish that live in the water column; highly migratory)

Atlantic menhaden	<i>Brevoortia tyrannus</i>	healthy
Spanish mackerel	<i>Scomberomorus maculatus</i>	healthy
King mackerel	<i>S. cavalla</i>	healthy
Bluefish	<i>Pomatomus saltatrix</i>	depleted? normal variation?
Little tunny	<i>Euthynnus alletteratus</i>	healthy; unharvested

Coastal pelagics are highly resilient because of the way they live. These fish are very important to North Carolina economically, and the populations are in good shape. However, some people think bluefish are in some trouble. I think that's arguable. I don't think that anyone knows what's happening with bluefish. They roam the world's

oceans, and we're not sure of the relations of the stock from one side of the Atlantic to the other.

Spanish mackerel were very abundant here in the 1960s, then dropped. Management was imposed in the mid-1980s, and populations increased tremendously. Managers like to claim credit for this. Spanish mackerel populations are about as high as they've ever been in North Carolina now.

The Atlantic stock of king mackerel was never in serious trouble. The South Atlantic Fishery Management Council, which manages that population, has been debating how to reallocate the catch for the increased population.

The Atlantic menhaden was in trouble in 1965. After 1967, it started rebounding, and this continued into the 1970s. Now the population of menhaden is in good shape for a rather extraordinary reason. It has to do with regulation but not in the usual way. As N.C. Senator Marc Basnight demonstrated, menhaden fishing is more or less socially unacceptable. It's an industrial fishery with huge vessels and huge nets. Menhaden are harvested close to shore, usually in the front yards of well-living people who can't understand the need for killing all these fish. They think menhaden ought to be food for king mackerel. The social problems of managing Atlantic menhaden are tremendous. Not only are there the problems I just mentioned, but there are questions about the processing plants. Most plants along the Atlantic Coast are very old and can't meet current environmental standards. The plants, once located from Fernandina, Fla, to Point Judith, R.I., have been reduced to Reidsville, Va., and Beaufort, N.C. They're not operating in Maryland, New Jersey and New York. We have a fishery that's been reduced and controlled by social perceptions.

The bluefish fishery goes up and down, and no one knows what that means. I don't think managers are too worried about bluefish. They'll just keep watching the population, which incidentally is worldwide.

SHARKS

Small coastal sharks	healthy to slightly overfished; uncertain
Large coastal sharks	overfished
Pelagic sharks	healthy to slightly overfished; uncertain

(Multiple species in each category)

Sharks are interesting — little known, little under-

stood. Social pressures created the need to develop a fishery management plan for sharks. It was done by the National Marine Fisheries Service rather than a fishery management council. The plan is short on data but provides some answers. Shark fisheries are believed to be fragile because sharks have low fecundity. Many give live birth, with only a few pups per year rather than millions of eggs as other fish. In other parts of the world, shark populations have collapsed quickly in the face of intense fishing. We have circumstantial evidence of the problems that result when sharks are intensely exploited.

Yet let's look at the sharks of the Atlantic coast and those off North Carolina. They're divided into three groups. There are small coastal sharks, such as dogfish and spiny dogfish, and pelagic sharks. There seems to be little concern about the first two groups. But large coastal sharks are intensely fished, perhaps overfished. There are about 20 species of them. To manage these species, we've chosen to reduce fishing mortality by about 30 percent. This should give us a 5 percent growth in population per year.

MOLLUSKS

Calico scallop *Aequipecten gibbus* Irregular occurrence; occasionally absent; sometimes abundant

North Carolina has one open ocean mollusk fishery for calico scallops. It's presence off North Carolina depends upon the settling of larvae from the big, more or less, permanent calico scallop beds off St. Augustine, Fla. Occasionally, a batch of larvae will get caught in the currents and deposited southeast of Cape Lookout. We'll have a good calico scallop fishery for a year to 18 months, about the life span of the mollusk. Then they're either all be caught or they'll die naturally. Within another decade, we'll likely get another set of calicos. It's an interesting fishery that's unmanageable from the North Carolina point of view.

SARGASSUM

Sargassum fluctuosus, *S. notous* healthy, little fished

Sargassum is a brown algae that floats endlessly in warm ocean waters. It is a major visual constituent of blue water region. In the open ocean and gulf stream, it is estimated that there are 10 million metric tons of standing sargassum. A Beaufort, N.C., company sporadically

harvests sargassum to extract chemical products. It harvests 10 metric tons per year or .0001 percent of the total standing crop. This harvest probably does not threaten to the sargassum.

Sargassum is the home to larval fish and adult fish of numerous kinds. Larry Settle of the NMFS Beaufort Lab recently studied sargassum to see what's living there. He identified 104 kinds of organisms using it as a principal habitat. Dolphins find sargassum grass intrinsic to their life history. Scientists have never found more than one or two red porgy larvae when sampling open ocean water. Red porgy were once one of the region's most abundant and important reef fish. Yet when Settle looked at sargassum, he found more than 16 red porgy larvae. Maybe we've discovered where red porgy larvae live. It's conceivable, therefore, that the overharvest of sargassum could imperil resources on which we depend, including endangered sea turtles. Settle's work did show fewer larvae per unit of sargassum as you move offshore and fewer larvae as the season progressed from spring to winter. Therefore it is conceivable one could design a harvest scheme to take sargassum to whatever limit the market requires without necessarily endangering a lot of fish. But that's speculation.

PELAGIC FISH

Blue marlin	<i>Makaira nigricans</i>	overfished
White marlin	<i>Tetrapturus albidus</i>	overfished
Sailfish	<i>Istiophorus platypterus</i>	healthy
Swordfish	<i>Xiphias gladius</i>	overfished
Dolphin	<i>Coryphaena hippurus</i>	healthy
Yellowfin tuna	<i>Thunnus albacares</i>	healthy to slightly overfished
Bluefin tuna	<i>Thunnus thynnus</i>	overfished
Bigeye tuna	<i>Thunnus obesus</i>	overfished

Pelagic fish live offshore in blue water. Some are important because of the volume of protein produced, and others are important recreationally. At least formerly, marlin and bluefin tuna were principally the target of the well-heeled and politically franchised. These people wielded more than the ordinary influence on fishery management policies. Consequently, we knew more about blue marlin 20 years ago than we did about red porgy even though more people were catching red porgy.

A number of these pelagic fisheries seem to be in trouble. Of course, the standard of population quality for

fish such as marlin is hard to determine. The standard for optimum yield in the marlin fishery is the highest number of marlin that you can catch. That's the standard; you can't exceed it. By definition you're almost always going to be operating less than that standard.

Swordfish is strictly a commercial pelagic species. It's in trouble as are blue and white marlin. There are remarkable changes in bluefin tuna population. The population of adults has collapsed. Many credible people argue that endangered species status ought to be applied to the western Atlantic population of bluefin tunas. There are some pelagic fish populations in good shape — sailfish, dolphin, the yellowfin tuna.

REEF FISH

As a group (many families, many species) overfished
There are more than 300 species of reef fish along the South Atlantic. Nineteen of those have been chosen for special management consideration because they are providers of the largest part of the catch: greater amberjack, lane snapper, red grouper, yellowtail snapper, mutton snapper, black grouper, black sea bass, gag, tilefish, gray triggerfish, scamp, speckled hind, vermilion snapper, white grunt, snowy grouper, gray snapper, red porgy, red snapper and warsaw grouper. If you look at the group as a whole you can see they're in trouble. The South Atlantic Fishery Management Council says that any species whose spawning stock status is less than .3 is overfished.

Of those 19 species, about 11 have spawning stock ratios that are lower than the overfishing criteria. Of those 11, most are species that are the important to North Carolina. They are gray triggerfish, scamp, speckled hind, vermilion snapper, white grunt, snowy grouper, red porgy, red snapper and warsaw grouper. Some are extremely overfished. There's tremendous change in the mean weight of ten of the species over the last 20 years. The mean weights of snowy groupers are about 20 percent of what they were two decades ago. The same is true for the speckled hind. Twenty years ago, 10-pound fish were the average; now we're getting 2-pound fish on average. You expect some degradation of a fishery, but not that much. The speckled hind certainly meets the criteria for endangerment as proposed at a recent fisheries meeting.

MANAGEMENT OPTIONS

I used to have people come in my office and say: "I'm a

commercial fisherman and I want to catch a resource that's not being harvested." Not many people come anymore. The word is out that those resources that haven't been developed in the open ocean are scarce. I don't know of any, to be honest. But I came up with a few wild shots. There are thousands of cockle shells at Atlantic Beach, so there must be tons of cockles in the ocean somewhere. But no one knows exactly where. There are sea robins and lizard fish. But there's not much of a market for them. They're very expensive to harvest because they are so dispersed. They might be a latent resource if we established an industrial fishery. Little tunny, a coastal pelagic, is the fish anglers jokingly call plank fish. You nail the fish to the plank and cook it, then you throw the fish away and eat the plank. It's a tuna that's abundant, but almost no one fishes for it. It's taken incidentally as a sport fish. At times there are lots of them, and there are ways of preparing them so they're edible. They may be the only true latent resource left in the western Atlantic Ocean.

What is the aggregate picture of fishery resources on the Atlantic coast? If we counted the fish groups that I discussed by category, you'd find that more fish are in trouble than are healthy. But let's not grade ourselves by majority vote in terms of fishery management; let's use the academic approach. To get an "A," at least 90 percent of our stocks should be in good shape. Just to pass the course, 70 percent of our stocks should be doing well. In truth, less than 50 percent of the stocks that I've been describing today are in good shape. The other half are overfished or nearly so. There are major problems in the coastal oceans.

On the bright side, we've instituted management of many fisheries, using the usual planning schemes — bag limits, quotas and size limits. For most of our marine fisheries, we've developed these schemes through the fishery management councils and interstate compacts.

For my remaining time, I want to talk about the pattern of fishery management and its evolution in North Carolina. It's important to see how we're moving and where we've been. There are four words that describe our path to effective management: finitization, deparochialization, privatization and communitization. I'm going to talk about each briefly.

Finitization. I think we've finally realized that marine fishery resources are finite. That was not necessarily the case 20 years ago when I came to work in Beaufort. It was taught in many fishery curriculums that open ocean resources were so resilient that fishing would not affect

them. We've proven ourselves wrong on that. But as recently as the late 1960s, some people thought when a population such as Atlantic menhaden declined it was because most of the fish were on the eastern side of the Gulf stream. You don't hear that argument anymore. We've come to the conclusion that we can reach the limit of a marine resource.

Deparochialization. Most states no longer think they own a piece of the open ocean resource and can manage it without dealing with neighbor states. Through actions embodied in the Magnuson Act of the 1976 and the interstate compacts such as the Atlantic States Marine Fishery Commission, we now have management measures that look at the whole population in the way it has to be if you want to manage it.

Privatization. Privatization implies a change in how we manage marine fisheries in the United States. We're doing it now. Wreckfish is a grouper-like fish that lives on the Blake Plateau, about 1 1/2 miles offshore. It's hard to catch, and there's very few people who fish for it. It's a candidate for individual transferable quotas (ITQs). Fishermen net 2 million pounds of wreckfish each year; that 2 million pounds is divided along the fishermen in the fishery. They buy the right to catch and sell a certain portion of the overall catch. They can choose to catch their portion or not. They can catch their wreckfish early in the season, late in the season or whenever. But each fisherman can only catch his allotment. So we have a fishery formerly in the public domain that's been transferred to private ownership. And this privatization avoids the overuse typical of common property resources.

ITQs are proposed for snowy grouper too. There are other ways to privatize our resources. Reef fish like oysters are highly residential. Fishermen could lease tracts of the ocean bottom and manage the stock that live there. This is done with terrestrial resources and in the estuary with shellfish.

The new movement in fishery management — the ultimate in the evolution — is what I call communitization. That's looking and managing fisheries as communities. North Carolina has inadvertently done this through the establishment of primary nurseries and outstanding resource waters. They are protecting whole communities of estuarine organisms. Another proposal that's being discussed in the South Atlantic would establish reef reserves. The reef reserves would be areas of no fishing for reef fish. It would preserve a minimum spawning stock that

could not be touched. It could produce adults that would migrate and serve as a reservoir for fisheries outside the proposed areas. Most importantly, these fish would produce larvae that would be carried outside this system to maintain the overall populations. And it would preserve the native community that produces reef fisheries. Further, the reserves could preserve the genetic structure of the fishery population. When you have fishing mortality operating at two to four times the level of natural mortality, the potential exists for redesigning species. Inadvertently, you are selecting for earlier maturity, for faster growth and for smaller fish, changing with certainty the genetic nature of fish. Reef reserves are, to say the least, very controversial. But I'll point out that the United States is behind the rest of the world in approaching reef fisheries as a community. Reef reserves have been in place for about 1 1/2 years along about 2,000 miles of the Great Barrier Reef in Australia.

There is one final aspect of fishery management that I think we ought to be aware of. I call it "the slippery slope of lesser expectations." Now North Carolina reef fisherman think the fish they catch are nice fish. But if they evaluated them against what fishermen were catching 20 years ago, they wouldn't be so happy. They don't recognize what a population can produce; they're satisfied with the fishery as it is now. They're unwilling to pay the price of managing the fishery to return it to a better state. The needed sacrifices look like too big a price to pay because they can accept the 20-inch size limit on red snapper. But 20 years ago, a 20-inch red snapper was a common animal.

In fact, we did an experiment in the 1970s where we had to use small red snapper, under 12 inches. We couldn't find small red snapper in North Carolina; they weren't here. Twelve-inch snapper are about the largest size caught how, and people think that's what a red snapper should look like. That's not true. Red snapper are supposed to be big fish. We have a creeping deterioration of the mental image of what our fisheries should be and an unwillingness to pay the cost of restoration.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

DAVID WEBSTER — LIVING RESOURCES: TURTLES AND MARINE MAMMALS

David Webster received his B.S. in biology from the University of North Carolina at Wilmington, his M.S. in zoology from Michigan State University and a Ph.D in zoology from Texas Tech. Webster is currently a professor of biology at UNC-W, acting as coordinator of the Environmental Studies Program.

I was asked to talk about important nonconsumptive resources in the coastal environment. The species that I will focus on are all protected by law.

In North Carolina, there are five species of sea turtles: loggerheads, Kemp's ridleys, greens, leatherbacks and hawksbills. Of these five species, the loggerhead is the most abundant. They account for about 99 percent of the nests that occur in North Carolina. Looking at the stranding data for 1990 and 1991 as a measure of seasonality in a species, you'll see that the majority of the strandings are loggerheads. Then we have Kemp's ridleys, greens and leatherbacks. There are only six records for the hawksbill, all offshore. But it is a resource, just not a very common one.

Loggerheads are inshore and offshore. In the Cape Fear River, the majority of strandings, live or dead, are loggerheads, then Kemp's ridleys, greens and leatherbacks. If we compare that to the strandings reported along the beaches immediately adjacent to the Cape Fear River, we see primarily loggerheads and a few leatherbacks and greens. We're now learning that inshore waters are a wintering area for Kemp's ridleys, the most endangered of all the sea turtles.

Looking at seasonality, loggerheads again dominate in the Cape Fear River, primarily in the late spring and early summer months. The leatherbacks come in with the cabbage-head jellyfish in the spring. Kemp's are seasonally scattered. On the adjacent beaches, it's primarily loggerheads. Leatherbacks and greens come in early in the nesting season.

The recovery plans for the green, the leatherback and the Kemp's ridley sea turtles have recently been completed. The projected recovery costs are \$145.7 million for the green sea turtle, \$6.74 million for the leatherback and \$600,000 for the Kemp's ridley. Approximately 50 percent of that funding has been allocated towards actions that will take place in the marine environment and not the acquisition of land or nesting beaches.

Populations of these sea turtles diminished. Along the Mexico beaches 50 years ago, it was not unusual for 40,000 a season to nest. That's just females. Now the estimated population size ranges from 400 to 600. The olive ridley is a species not found in North Carolina waters. Mexico has harvested 25,000 to 75,000 olive ridleys per year for more than 50 years. Japan, until last year, imported 30,000 hawksbills to make jewelry. They also imported olive

ridleys for leather and greens for meat and fat. There's a tremendous amount of exploitation of these species, and these are the adults. This does not include exploitation of the eggs.

In the last 50 years, the Kemp's ridley population has dropped from 40,000 to between 400 and 600. There's only one known nesting beach — Rancho Nuevo in Tamaulipas, Mexico. There is Head Start Program that's jointly run by the Instituto Nacional de Pesca of Mexico and the U.S. Fish and Wildlife Service. They catch the females as they come to beach at Ranch Nuevo, wrap a plastic bag around their cloacas and allow them to lay their eggs in the bag. The eggs never touch Mexican sand. The eggs are packed in Texas sand in styrofoam boxes, flown to Texas and incubated. When the eggs hatch, the hatchlings are briefly allowed on the beach at the Padre Island National Seashore so they will imprint that location as their beach of birth. Biologists believe female sea turtles return to their beach of birth to lay their own eggs. The turtles are recaptured and taken to an aquarium, where they are kept about one year or until they reach dinnerplate size. Then the Kemp's ridleys are set free. By removing predation in the hatchling stage and the first year of life, it was thought you would enhance the likelihood of the turtles reaching sexual maturity.

However, during the first five years the Head Start Program operated, the eggs were incubated at relatively cool temperatures. Nobody understood that turtles had temperature-dependent sex determination. Entire clutches were masculinized, and only males were produced. Now the process is better understood, and eggs are incubated at variable temperatures to get males and females. But there's a lot of debate as to whether this Head Start Program is worth the investment. It's estimated that only one in 1,000 sea turtles reach sexual maturity, which takes from 15 to 20 years. When I started attending sea turtle meetings 10 years ago, that figure was one in 500. Now it's one in 1,000, and I hear some people talking about one in 10,000. Certainly the odds against a hatchling reaching sexual maturity are staggering. Because of that, pumping millions of dollars into the Head Start Program might not be a very judicious way to use those funds.

One of the problems that we have managing the sea turtle is that it is jointly protected. In the water, turtles are under the National Marine Fisheries Service jurisdiction; on land, they're under Fish and Wildlife jurisdiction. Any time you get duplication in effort then you sometimes run into conflicts within institutions. It gets confusing.

Moving on to marine mammals, there are 32 species found along North Carolina shores. These include the harbor seal, the manatee and 30 species of cetaceans —

right whales, fin whales, sei whales, minke whales, humpback whales, bottlenose dolphins, spotted dolphins, common dolphins, two species of pilot whales, killer whales, sperm whales, harbor porpoises and many species of beaked whales.

There is stranding data for 27 of those species. The strandings tend to increase in March, April and May. Then they drop off and tend to be very low during the summer months.

Of the 32 species of marine mammals, 15 are year-round residents. Eleven can be considered Yankees that come to or through North Carolina during the winter and spring before returning north in the warmer months. Six other species come north during the summer then retreat to the south when waters cool.

About 68 percent of the total marine mammal strandings in our state are bottlenose dolphins. The majority of strandings occur in March, April and May. Whether this means that there are more dolphins here that time of the year or not is debatable. There might be increased mortality during this particular time of the year, and it's during this time frame that northern populations move south and augment our resident populations.

I'd like to call your attention to August, September and October 1987. There was a die-off of dolphins that was caused by what some biologists believe was an algal bloom that weakened the mammals. Then the dolphins suffered secondary bacterial and viral infections, an AIDS-like condition. The jury's still out on what actually was the cause of the die-off, but a similar die-off is occurring now on the Gulf Coast.

The threats that these animals face are sometimes not under our control. The process of temperature-dependent sex determination in sea turtles is an interesting case. With local temperatures rising and North Carolina being the northern limit of the nesting range, one would hypothesize that we would produce about a 50/50 sex ratio to sustain a stable population. Our studies have shown that actually it's about 35 percent female. But the rises in temperatures that have occurred since the late 1800s portend that we will be feminizing the eggs. Whether that means the range of sea turtles will shift northward is something that we'll just have to wait and see. But it certainly affects the local demographics, and that's something that needs to be examined and compared.

Likewise, we can't control weather patterns. We lose a lot of sea turtle nests during northeasters and hurricanes. Beachfront development is a problem. What's good for the house isn't good for the turtle. Beachfront lighting is another issue. If you walk on Wrightsville Beach or Atlantic Beach at night, the amount of light pollution is staggering.

For a turtle hatchling that orients on very low levels of light, it gets very confused, crawling over the dunes and into roads and parking lots where they get run over by cars. With increased human presence, we get loss of habitat, vehicles driving on the beach, recreational equipment on the beach, and debris and exotic vegetation imported by people that casts shade and alters the sex ratios of turtles.

Beach nourishment is another issue. In our state, we don't allow hardened structures such as seawalls or groins. Instead we encourage beach nourishment. However, we don't know what affect nourishment has on hatchling survivorship or the ability of the young to go through the 60-day incubation period.

Offshore, pollution is a problem. A two-year-old sperm whale washed ashore at Wrightsville Beach in December 1993. When I got down to the beach about 7 a.m., the whale was still alive, and its mother and a sibling were 50 yards offshore calling to it, trying to get it back into the water. It was extremely emaciated, and it came up on the beach and died. People from the stranding network at the N.C. Aquarium at Fort Fisher came after the animal died about 7:30 a.m., and they performed a necropsy. There was an empty clorox bottle completely blocking the intestines. The animal starved to death. They also found about 30 feet of rope attached to a fisherman's buoy. A lot of these mammals eat jellyfish, and plastics look very much like jellyfish in the water. Turtles do the same thing.

I've got some figures from 1989, 1990 and 1991 for sea turtles. Sea turtles showed an increasing incidence of death due to ingestion of marine debris: 2.1 percent, 2.3 percent and 5.2 percent. During that same time, the incidence of entanglement in nets rose from 1.4 percent to 1.8 percent. Also death due to collisions with boats rose from 8.2 percent to 13 percent. These figures account for about 20 percent of the turtle strandings during those three years.

There are documented cases due to nets, purse seines, hook-and-line, longlines, gill nets, pound nets, trawls and traps. A few years ago, the N.C. Marine Fisheries Commission had to close the flounder fishery during November and December because 55 turtles, mostly Kemp's ridleys, washed ashore on the back side of Pamlico Sound. Turtle excluder devices, or TEDs, are now mandatory for the shrimping industry despite protests from fishermen.

Seagrass bed degradation, loss of habitat and harvest of sargassum are all potential problems for marine mammals and sea turtles. Oil-and-gas exploration has received a lot of attention, particularly along the Gulf Coast. Underwater explosions and artificial lighting are associated with this exploration. We don't know how these things affect marine mammals or sea turtles, although it's being studied now.

Animals that are protected by the Endangered Species Act have the same level of protection and designation of endangerment at the state and federal level. In our state, the loggerhead is listed as threatened, and the other turtles are listed as endangered. Marine mammals are protected under the Marine Mammal Protection Act, and all baleen whale are afforded protection under the Bonn Convention that deals with migratory species. Under the Kelly Amendment, the president can deal with countries such as Japan that continue to import turtle or marine mammal body parts. And the Magnuson Act has also been used occasionally to apply pressure.

In terms of current resource management strategies, most of the research is focused on identified stocks. We still don't know a lot about many of these noncommercially important species. We don't know from a genetic standpoint about interbreeding, and you can selectively force a species to become something that nature hasn't intended it to be. Research at the University of Georgia indicates that the loggerhead population in North Carolina is a separate stock from the one in Florida. I jokingly tell my colleagues that a lot of our boy sea turtles go south for spring break and don't come back when they see the high percentage of females in Florida. Where it's been documented, males are the ones that do the disbursing.

We know very little about home range and migration patterns in marine mammals and sea turtles. We know little about habitat requirements. We know a little bit about the nesting habits for sea turtles. But we know little about local demographic parameters and the reproductive biology of local populations.

Recovery plans have been drawn up for four species of sea turtles and most of the baleen whales such as the right and humpback whales. The recovery plans will provide help to direct our research and determine how we can help these animals recover. All the threats that I've mentioned, with the exception of natural causes of mortality such as predation, parasitism and abiotic causes like erosion from northeasters or hurricanes, are man induced. As man continues to exploit the marine environment, we can expect these conflicts to intensify rather than become abated. Our work certainly is cut out for us.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

STAN RIGGS — NONLIVING RESOURCES

Stan Riggs received his B.S. in geology from Beloit College, his M.A. in geology from Dartmouth University and his Ph.D in geology from the University of Montana. Riggs has been a professor of geology at East Carolina University since 1967 and has worked on mineral resources and coastal systems throughout the world. In 1983, he was recipient of the Oliver Max Gardner Award which is presented by the University of North Carolina Board of Governors to a faculty member who has "made a great contribution to the welfare of the human race."

In North Carolina, exploitation of our shallow coastal ocean is in its early stages. Thus, we have the opportunity to learn from areas such as the North Sea, where development is in more advanced stages. To optimize usage, maximize yields and minimize environmental degradation, we must first have a sophisticated and interdisciplinary understanding of the composition, dynamics and processes of our coastal ocean system. I come to you as an educator and a scientist who has worked in and partially understands our coastal ocean system; I am not an advocate presenting biased data. As we begin the complex task of managing the coastal ocean for the next century, we must dramatically change our approach to one that considers the task from an oceanic and a systems perspective.

The nature of our society demands that we develop our coastal resources, but we must understand them to utilize them and manage them wisely. If coherent management policies are to be devised for the exploitation of living and nonliving resources, it is imperative that we accomplish and incorporate the following.

1. Our shelf sea is a dynamic interactive system that has physical boundaries — the land and the Gulf Stream; fluxes across these boundaries must be known and understood.
2. Measurement of the effects of exploitation depends on a sound knowledge of the preanthropogenic conditions and processes of the seabed, the water mass and biota. This requires a coordinated and integrated approach that would involve basic research, baseline studies and time-series monitoring.
3. All exploitation plans must incorporate the true cost that includes: restoration of habitat and biota, minimization of interference with other users, subsequent clearing of seabed sites, the buildup and rundown of adjacent shore-based facilities and economies, etc.

In considering the future physical utilization and exploitation of our shallow coastal ocean environment, we

must define the mass balance. That is, identify the interactions and impacts between the contamination and destruction of resources, the loss of nonrecoverable resources, the natural ability of recoverable resources to reconstitute their preanthropogenic conditions, the environmental stress of resource extraction, and problems associated with multiple utilization. By developing this mass balance, we can then begin to define the maximum sustainable yield of our coastal ocean.

The nonliving resources of the Carolina Margin can be grouped into three general categories.

1. Petroleum resources. Oil and gas are the major sources of energy.
2. Mineral resources. Phosphate is a critical ingredient in fertilizer. Sand and gravel are essential for beach nourishment and construction aggregate. Heavy minerals are a major source for exotic metals for the steel and chemical industries.
3. Hardbottom resources. Hard substrates that occur across the continental shelf form biologic habitats for critical benthic production.

I will briefly discuss each of these groups of nonliving resources, except for the heavy minerals, which have a low potential in the North Carolina coastal system.

ENERGY RESOURCES

Let's start with the petroleum resources. We have a society that is totally dependent on energy and an economic system which is structured around the availability of abundant and cheap energy. If we plot U.S. energy consumption (in billion barrels of oil equivalent) versus key economic indicators such as our Gross National Product (GNP in billions of 1972 dollars) and employment (in millions of the population), we see that there is an absolute correlation. This integral relationship between energy use and our economy is increasing as our economy grows.

This graph shows the changing pattern of U.S. energy consumption between 1850 and the present. Notice that industrial growth began with the use of coal. Petroleum became important after World War I. Also, notice the dramatic increase in the use of petroleum after World War II. Today, a steady 20 percent of our energy needs are supplied by coal resources. But growth continues to expand in petroleum resources with 64 percent of our energy needs coming from oil and gas resources. The additional 16 percent is supplied by primarily by nuclear and hydroelec-

tric power with minor sources from wood. Of these three sources, only nuclear has a significant future potential for expansion.

The growth and development of petroleum as a critical part of our economy started in 1900 with development of the internal combustion engine. Through the late 1960s, the production capacity in the United States exceeded demands and we were an exporting country. In the late 1960s, our producing capacity leveled off while our economic growth and associated petroleum demands continued to increase at very high rates. By the early 1970s, the United States became dependent on imported oil. OPEC closed down the world's oil supply, and we found ourselves standing in gas lines with an energy crisis that, to some extent, is still with us.

U.S. oil production capacity is dropping very fast. In 1956, F. King Hubert of the U.S. Geological Survey produced an oil production curve for the United States based upon past history and the known oil reserve base. Hubert drew this bell-shaped curve projecting future production, with peak production occurring about 1970 and followed by a rapid decline. This projection was not well received by the federal government. A plot of the same data in 1985 demonstrates that the 1956 projected curve of Hubert was correct and actually realized with only a slight variation. Peak U.S. oil production took place in the late 1960s and has been on a serious downhill slide since. This graph also shows that 10 to 15 years from now, we will have used 80 percent of the potential oil resource base in the United States. Today's news had an announcement with new figures on the U.S. budget deficit for 1993; a large proportion of this deficit is due directly to the import of foreign energy.

Another graph shows the world oil situation. We have the exact same bell-shaped curve. The production figures are bigger and the curve is shifted slightly higher in time with the projected peak production occurring in the 1990s. Worldwide, we're not so close to running out of oil as in the United States. The United States is a small producer compared to the OPEC countries and the former Soviet Union, the world's largest oil producers. Russia and associated countries have potential resources that are as big or bigger than the resources of the Middle East. All of these countries will continue to be major players in the world political arena for the near future.

In 1973, the United States was importing almost 75 percent of our energy resources, and we stood in gas lines.

By the late 1970s, U.S. energy demands were down, with imports as low as 25 percent because a major energy program was underway. In 1980, President Ronald Reagan eliminated our energy program. Now we're importing 48 to 49 percent of our oil again. That's where we were when we went into the Gulf War in the early 1990s; in the near future, we will probably be at war again over energy resources. This scenario underscores the fact that the United States is increasingly dependent on foreign imported oil, and we do not have a viable, long-term energy program in this country.

This brings us back to the North Carolina coastal ocean. Three major sediment basins occur offshore on the Atlantic continental margin, all of which contain potential petroleum resources. However, the oil industry has drilled more than 55 exploratory holes in several Atlantic basins during past decades, and no petroleum discoveries have occurred. The last basin that will be explored is the one directly off of North Carolina — the Carolina Trough. One thing that resource industries do not do is save the best for last; they always go for the cream first. Thus the Carolina Trough was held until last because it has the lowest potential and is the most difficult to explore and develop.

Many problems are associated with petroleum exploration of the Carolina Trough. The potential area is along a very high energy portion of the coast, is in very deep water and is located on a steep and unstable portion of the continental slope. Another major problem is the proximity of the Gulf Stream, a major oceanographic current that runs through the area of the proposed exploration. The dynamics of the Gulf Stream are not well-known. There is also a major public concern over the possibility of an oil spill associated with exploration drilling. However, most oil spills have nothing to do with either the drilling or production of petroleum; but rather, they come from shipping. More than 90 percent of all oil spilled each year is a direct result of oil transport and handling either by shipping or pipelines. The Northeast is a major user of petroleum resources, but they produce almost none. Most of their petroleum energy resources come by foreign tankers with dubious safety requirements moving up and down the East Coast. Remember, the North Carolina coast has a high energy coast commonly known as the "Graveyard of the Atlantic." It is just a matter of time before we have a major oil spill that has nothing to do with exploratory drilling for oil or gas.

The petroleum companies have had difficulty deter-

mining what resource might be there. Consequently, nine oil companies formed a consortium to drill a single hole into the Carolina Trough to obtain basic geologic information essential for determining the potential of the hypothetical resource within the basin. Until there is a preliminary hole drilled, this hypothetical resource remains totally unknown. Unless you're lucky, it usually takes many drill holes to find an oil or gas field. For example, the Hybernia field off Newfoundland was only discovered after 55 holes were drilled into that basin.

However, the federal and state governments decided to manage this hypothetical resource before the potential was determined. Considering the role that energy plays in our society and economy, the decision not to allow an exploratory hole for geologic information was a mistake. I am not a proponent of the oil companies or of oil development. But for the long-term future management of our society, we must know if there is a resource in the Carolina Trough. We can not manage something that is unknown.

Some of the largest and least explored sedimentary basins in the world occur within the Exclusive Economic Zone (EEZ) and along the U.S. continental margin. However, in the last few years, 86 percent of all the regions within the U.S. EEZ have been locked and are now unavailable for energy exploration. Various types of legislative moratoriums have been assigned to stop exploration. That leaves only 14 percent of our EEZ, including Alaska, Texas, Louisiana, Mississippi and Alabama, available for energy development. Thus, we will continue to increase our dependence on foreign oil; some economists, geologists and resource analysts say that this increasing dependence upon foreign oil is a "kiss of death." This is America's energy dilemma.

MINERAL RESOURCES

On July 7, 1986, the world population reached 5 billion people. Sometime during 1993, there will be 5.5 billion people, and by the turn of the century, we will exceed 6 billion people. Today, we can almost feed all of these people. The world has a great capacity for food production; however, this capacity is totally dependent on two things. First, energy resources are essential for driving tractors and the machines that run big agriculture. Second, large-scale food production is dependent on chemical fertilizers. The United States is one of the breadbaskets of the world because we have good soils and use a lot of fertilizers to

maintain high levels of organic production on these soils. However, food production is a severe problem in developing nations of the world where the soils are often poor, climatic conditions are marginal and the population growth is often out of control. According to a recent American Geological Institute Report, "a five-fold increase in fertilizer use will be necessary in developing countries by the year 2000 if the world's population is to be fed".

What does all of this mean to North Carolina? One of the world's largest mines to recover phosphate sediments from land is adjacent to the Pamlico River in Beaufort County. This mine supplies about 6 million tons of phosphate per year for the manufacture of chemical fertilizers. The mining of lands adjacent to the Pamlico River estuarine system is controversial. The mining company has applied for a permit to mine over 3,000 acres of coastal wetlands during the next 20 years. With increasing world demands for fertilizer and food production, the pressures on the North Carolina phosphate resources will increase, not just from the present mine, but for other potential phosphate resources.

The phosphate in North Carolina occurs in an extensive geologic unit called the Pungo River Formation, which is Miocene in age and formed on the N.C. continental shelf between 23 million and 12 million years ago. The Pungo River Formation underlies the eastern half of the Coastal Plain, where it occurs everywhere in the subsurface. At the phosphate mine on the Pamlico River, the ore bed is about 40 feet thick and occurs below approximately 100 feet of overburden sediments. To the east, the Pungo River Formation becomes thicker and deeper; to the west, the formation rises, thins and completely pinches out. To the south, the Pungo River Formation passes underneath Bogue Banks and onto the continental shelf, where it actually crops out and forms the sea floor over much of Onslow Bay.

Major phosphate deposits occur in the Aurora region, where it is presently being mined. Two additional known deposits occur on the continental shelf in Onslow Bay. The deposits in the Aurora area are deeply buried, but the ones in Onslow Bay occur right at the surface. You can dive to the sea floor and pick up samples of the phosphate-rich sand. Where this phosphate-rich bed crops out on the sea floor, the associated limestones often form hardbottom reefs. The underlying sediment is fairly soft and almost pure phosphate sand. An analysis of the phosphate-rich portion of this sediment would produce an analysis of 20

percent P_2O_5 , which is as rich or richer than anything that is currently mined in Aurora.

The preliminary resource evaluations that have been done for the N.C. continental shelf suggest that there could be up to 10 billion tons of phosphate resource within the two known deposits in Onslow Bay. However, these beds occur beneath 25 meters of ocean water. What does that mean? In 1987, the U.S. Minerals Management Service had an economic study done to determine if "the submarine phosphate resources in Onslow Bay are potentially economic?" At the time of the study, the phosphate market was depressed; in spite of this, they determined that there was economic potential and that these deposits could potentially be mined at a profit, either through dredging or subsurface borehole mining. As the land-use pressures increase within the Aurora phosphate district, which includes the resources below the estuaries and associated wetlands, then society may determine that it would be better to acquire the essential phosphate resources from the continental shelf.

HARDBOTTOM RESOURCES

Hardbottoms are an essential structural and functional component of fisheries habitats. Hardbottoms provide variable habitat for prolific benthic communities, which in turn attract economically significant reef fishes. In 1988, reef fish constituted 18 percent, by weight, of the total commercial and 16.5 percent of the total recreational finfish landings in North Carolina. The estimated value of this reef fish resource to the North Carolina economy is between \$100 million and \$200 million per year. However, the populations of most reef fish are in serious decline due to overfishing. In an effort to increase these fishery resources, North Carolina has developed an active program to construct new artificial reefs and enhance existing reefs.

Let's take a look at natural hardbottom reefs on the North Carolina continental shelf by using our magical "fish-finder," which is nothing more than a bottom-sounding fathometer or depth recorder. We leave from port running the fish-finder across miles of flat hardbottom surface that is interrupted by a series of vertical scarps in the sea floor. We see many schools of bait fish on the fish-finder that occur as fuzzy masses in the water column above the scarps. So let's anchor up and fish. A SCUBA dive to the sea floor would provide us with an image of the bottom topography, which is the same as that of the coastal

plain; the only difference is that the leading edge of the ocean has flooded the outer portion of the coastal plain to form our present continental shelf.

A side-scan sonograph image provides a picture of the sea floor that has been produced utilizing sound waves instead of light; however, we can still see many of the same things. This image displays a broad area of flat hardbottom above the scarp with minor, but highly variable amounts of sand; a major scarp structure cuts across the area with a broad zone of large (up to 5 to 10 meters across) rock-rubble blocks that have broken off the hardbottom. A broad area below the scarp is characterized by mega-rippled gravelly sand. The scarp and associated rubble ramp are extremely important. They supply the necessary hard substrate, high relief and abundant surface area away from the moving sands that is essential for development of hardbottom reef communities. Such hardbottoms become prolific habitats for the growth of macroalgal meadows with all of the associated benthic organisms such as sponges, corals, clams, etc. This forms the framework habitat for the economically important reef fishes.

We've learned that most of Onslow Bay consists of hardbottom habitats; however, less than 10 percent are highly productive hardbottoms. Throughout most of the bay, the hardbottoms have thin layers of mobile surface sand that prevents the macro-benthos communities from becoming established on the bottom. Consequently, these bottoms look a lot like a desert with only scattered clumps of benthic organisms, along with abundant microalgae, burrowing worms, crustaceans and vagrant grazers, all of which are important to the overall dynamics of the benthic habitat.

Composition of the hardbottom rock, as well as the morphology, are very important in determining the benthic community structure. Many different rock types form hardbottoms on the N.C. continental shelf; each type attracts its own community of organisms. Some rocks, such as dolomites, quartz sandstones and mudstones, don't attract much life, but others such as limestones attract abundant and varied groups of organisms.

On the sand flats away from hardbottom scarps, the biomass decreases significantly; however, even though these sand flats superficially look like deserts, they are not devoid of life. Since the sand is mobile and readily moves in response to storm waves and currents, the sand flats have significantly different biomass and fish association. Most flat hardbottoms, and in specific situations the rubble

ramps and scarps, may be completely buried by these mobile sands to form extensive sand ramps. When this happens, the effected hardbottoms are completely removed from the realm of significant bioproduction and replaced by the less significant, but poorly understood soft-sediment bioproduction, with little relationship to reef fishes.

Maybe we can remove some of this surficial and mobile sand, re-expose the hardbottom scarps and rubble ramps, and actually improve the quality and volume of bioproduction on the hardbottoms. This would also result in a sand resource that is then potentially available for beach replenishment and construction. Is it possible that the recovery of a nonliving resource could actually create or improve the associated living resources? Can dredging of sand for beach nourishment or phosphate recovery increase the availability and surface area of hardbottom habitats for increased biomass production? The answer is an emphatic yes. The next important question is what kind of biomass production do we want or need for development of certain types of fisheries?

On land, this kind of habitat modification and management is called farming. We manage the farm by cultivating the soil in different ways to grow various kinds of biomass. In the ocean, sea floor morphology, composition and sediment dynamics are critical to the kinds of biomass that are able to live and grow. Maybe we can create grouper grounds if we better understand the shape of the habitat and associated food sources that the grouper require.

I believe that with some additional studies we could remove sand and successfully plow the presently unproductive flat hardbottoms in a way that would actually create grouper farms. However, none of this is possible if we don't understand the dynamics of this complex and very important ecosystem.

BEACH NOURISHMENT RESOURCES: SAND AND GRAVEL

Now, let's consider beach nourishment resources. At Topsail Island and Onslow Beach on either side of New River Inlet are a series of rock hardbottom scarps that occur on the inner continental shelf and in front of the two beaches. These rock ridges actually intersect the two beaches and control the geometry, as well as the erosion and accretion patterns, on each of the islands. These hardbottom scarps occur in 30 feet of water and actually rise to within 15 feet of the ocean surface in places. In addition, these rocks contain a major and luxuriant benthic

community and associated reef fish habitat. Also, rapid bioerosion of the limestone scarps produces a large volume of rubble that represents an important source of new sediment for the adjacent beaches.

Topsail Island and Onslow Beach have some severe shoreline erosion problems with average erosion rates up to 20 feet/year. Consequently, there is ever increasing pressure to harden the shoreline, to build jetties or groins, or to artificially nourish the beach. What will happen to these productive hardbottoms if either of these islands pump sand onto their beaches?

To find out what happens when a beach is nourished, let's take a look at Wrightsville Beach. Approximately 7 million cubic meters of sand has been placed on Wrightsville Beach since 1934, 5 million cubic meters between 1965 and 1990. Most of the renourishment sediments were fine-grained muddy sand from the estuarine environments behind the island. In 1979, my graduate students and I did a project that suggested all of the sand that had been put on Wrightsville Beach since the 1930s was now on the inner continental shelf. This is contrary to the U.S. Army Corps of Engineer's model for beach nourishment that defines a "closure zone" beyond which no sand is exchanged. In other words, there is no sediment interaction between the beach and the inner continental shelf. Our results, along with many other geological researchers working on modern coastal systems, suggest that the Corps of Engineers model is not correct. Subsequent mapping by Cleary, Theiler and myself on a NOAA-funded project off Wrightsville Beach has produced extensive results demonstrating that the sediments do exchange beyond the closure point. Most of the sand pumped onto the beach through the years has now buried extensive hardbottoms on the inner continental shelf. These hardbottoms were once prime fishing spots; today, these reefs are buried with two to six inches of sand and are now out of production.

The business of beach nourishment and hardbottoms represents a very serious conflict, and a problem that's going to get much bigger. For example, between 1955 and 1991, 12 million cubic yards of sand were pumped onto Carolina Beach. This represents 13 different projects over a 36-year period. If the sand stayed on the beach, there would be little need to replenish it over and over again. The Corps of Engineers finally acknowledges this, and no longer claims a 30-year life for beach nourishment projects. Recent studies have demonstrated that the rocks that crop out on

the beach at Fort Fisher extend across the shoreface and form a vast complex of inner shelf scarps and hardbottoms that are not only being buried, but trap the sand and prevent it from returning to the beach. Recently, increased concern over these hardbottoms have resulted in almost weekly phone calls wanting to know what is going to happen to these important features when they begin a new renourishment project along this stretch of the beach.

As more houses fall in the ocean, there is increasing pressure for more beach nourishment projects. Carolina Beach has another project on the drawing boards for the near future. This raises another serious problem that concerns the source of sand for beach nourishment. The Corps of Engineers now acknowledges that they need a better sand source for Carolina Beach. They have proposed an alternate source from the continental shelf. Some of these shelf sands are, in part, the sands that have already been put on the beach once before. Hopefully, some of the new sand supply contains better sand for beaches, but if it is the same sand that was previously on the beach, there is a good reason why it is now offshore. As for the productivity of the associated hardbottoms, many of them are already buried.

Serious shoreline erosion problems also occur along the northern N.C. beaches. Shoreline erosion rates north of Oregon Inlet, between Coquina Beach and South Nags Head, range up to 10 to 20 feet per year. These rates have been consistent for decades. Most of the first row of houses have already fallen into the ocean; if the people who own the third row of houses are patient, they will soon have oceanfront property.

Oregon Inlet has been migrating southward and eroding the southern inlet shoreline at the rate of 200 to 300 feet per year since it opened in the 1840s. This erosion rate would ultimately jeopardize the Oregon Inlet bridge that was built in 1962. In 1989, North Carolina officials did an environmental assessment that found "no significant impact" for the construction of a jetty that was necessary to protect the base of the Oregon Inlet bridge as the inlet continued to migrate southward. However, any large and solid structure built in the inlet of a mobile beach system will change the geometry and the sediment dynamics of the ebb-tide delta system with appropriate downstream responses. The barrier islands from Pea Island to Rodanthe, just downstream from this recently constructed jetty, are now having severe erosional problems, including the loss of large segments of N.C. 12. The state is now spending

large sums of money to save that portion of the barrier island where there would be "no significant impact."

A significant difference exists in the size of the present Oregon Inlet jetty to protect the bridge and the proposed dual jetties that are planned to permanently stabilize Oregon Inlet. What do you think the upstream/downstream consequences of these dual two-mile jetty structures will be? Every coastal engineer and coastal geologist in the country would agree that there will be massive upstream/downstream consequences in response to the proposed jetties. The U.S. Department of the Interior, which manages the land around the inlet understands this, and that is the prime reason the jetties have not yet been built.

The state and federal governments are talking about spending hundreds of millions of dollars to build and maintain these jetties. But we have very little information about the sediment budget and sand dynamics within this powerful coastal system. We have lots of theoretical models based on numerous assumptions as to the way the coastal engineers think things will happen, but we have precious little hard-core scientific data about the physical dynamics and the sedimentological and biological responses during storm conditions within this high energy inlet system.

In 1991, the Dolan Commission told the Corps of Engineers that they would have to accept the fact there will be upstream and downstream consequences. Recently, the Corps of Engineers released a new sand management plan that finally acknowledges that there will be upstream and downstream consequences. They have now produced a map that indicates a 6-mile zone around the inlet where there will be "significant and unavoidable alteration," a 12-mile zone where there will be "permanent and measurable changes," and a 20-mile zone where there will be unknown changes.

In an effort to get approval for construction of the Oregon Inlet jetties, the Corps of Engineers have now accepted full responsibility for managing the effected upstream and downstream beaches forever, no matter what the problems. However, no one has any idea where the potential sand resources are located, to say nothing about whether there are adequate supplies to maintain this vast coastal system for perpetuity. Myself and a few other coastal researchers have examined some of the inner shelf portions of the North Carolina coast; in most places, there does not appear to be adequate sand resources available to support long-term barrier island nourishment projects. With some basic research, additional supplies may be

located, but this must be done before the management decisions are made to hold the line on the barrier islands. Yet the state and federal governments are committing to long-term projects without any knowledge of the potential nourishment resource base to maintain them. I think this approach is very dangerous.

The recovery of beach nourishment sand, like dredging for phosphate or channel maintenance, is a form of mining. The processes of sediment removal and the environmental consequences are similar. In our management of these resources, we can't conclude that one is bad and the other is good; we must consider each commodity in the same context of resource value and environmental consequences.

CONCLUSIONS

Petroleum, phosphate, hardbottom and sand resources are important nonliving resources that are becoming more critical to our society. However, we have in the past and continue to put a paltry amount of financial resources into scientific studies that are essential for understanding these resources and the complex coastal ocean of which they are a part. We cannot properly manage something that we don't know or fully understand. That's a fact.

The conflicts between resource utilization in our coastal ocean are as great as the conflicts between the sand castle built on the ocean beach and the subsequent rising tide. I realize that there is a critical need to do something now with respect to management of the coastal ocean. However, we had better not forget that good management comes on the heels of good science, which we must have first and foremost. To optimize the development, utilization and management of any resource, it is imperative to first have a knowledge and understanding of its occurrence and distribution and of the processes controlling the natural system of which it is an integral component.

QUESTIONS

RAVI SINHA, ELIZABETH CITY STATE UNIVERSITY. Regarding drilling offshore of North Carolina, I was wondering if you were aware of a symposium that was attended by the majority of the energy companies where it was concluded that we should move away from carbon-based energy.

STAN RIGGS. I am aware and agree that this is an excellent idea. However, to move away from carbon, which presently supplies about 84 percent of our energy needs,

will require changing our entire economic structure. This would first necessitate alternative energy sources and would require the formulation and implementation of a major energy program. There are many alternative energy sources, but we as a country, as a society, are not addressing those very readily. In the late 1970s we started. We developed the U.S. Department of Energy, and we began to put research money into alternative energy resources. Then we seemed to have a basic understanding about the collision course we were on. However, as a society and within our government, we have since forgotten the lessons of 1970s.

There is a tremendous gap between the science of the resource business and public understanding about energy and resources. People do not realize that oil comes out of a hole in the ground since they don't pull up to an oil rig to fill up the gas tanks in their cars. We as a society demand and expect the gas to be available at the gas pump; the minute that it is not cheaply available, it's a catastrophe. We have an economy that is dependent on energy. Unless everybody is ready to permanently park their cars, we have no choice but to deal with the energy resource crisis that still exists. Politicians are trying to deal with the budget deficit; the biggest component of this deficit is imported energy. We're not going to solve the deficit problem until we change our energy consumption habits.

JOHN LEONARD. I'd like to point out that the current administration is talking about using natural gas as a bridge to the future energy needs. We do have a lot of natural gas in Texas and the Gulf of Mexico. And I understand that the drilling has begun in Baltimore Canyon. What is the possibility for natural gas in the Carolina Trough? There is more gas than oil.

STAN RIGGS. That's right. There is a lot more natural gas than oil. Most of our existing petroleum resources in this country are in the form of natural gas. But we're not running our cars off natural gas yet, and I'm not sure we're making much progress in that direction. Of the holes that have been drilled on the East Coast, there's only been one or two up in the Hudson Canyon that resulted in a show of natural gas. The prospect is that the Carolina Trough off North Carolina has a higher probability for containing a significant natural gas resource than an oil resource. But until an exploratory hole is drilled, this is all speculation.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

JOHN MAIOLO — USE CONFLICTS

John Maiolo is a professor of sociology at East Carolina University. He received his B.A. from Lycoming College and his M.A. and Ph.D in sociology from Pennsylvania State University. He taught at Pennsylvania State University and Notre Dame University before moving to Indiana University and later to East Carolina University in 1975. Last year, he became the director of the N.C. Socioeconomic Studies Program.

In the late 1800s, North Carolina's Outer Banks were described as drifting sand bars that didn't serve much of a purpose other than to fence out the Atlantic Ocean. They should see it now. North Carolina's Outer Banks and coastal zone are rich in land and water resources, providing opportunities for a variety of human activities and uses. Recreational uses include fishing, hunting, boating, sailing, swimming, surfing, hang gliding and more. The commercial uses continue to be fishing, agriculture, forestry, mining, possibly offshore drilling and recreational businesses. There are the military uses — the training bases for land and air warfare. Conservation uses include land and water set aside for parks, wildlife and ecological reserves.

It shouldn't be news to anyone that the comparatively mild weather in combination with a modest cost of living have produced increased recreational activity and the construction of permanent housing for working and retired people all along our coast. Neither should it be news to you that the variety of activities I have described are not always compatible. I was given the assignment today to talk about managing the conflicts in the coastal zone.

A number of state and federal regulatory agencies have to manage our coastal zone in the best interest of all parties. That management of our coastal zone and ocean resources is the allocation of those resources. Resource conservation is the ultimate goal of any allocation scheme. Separating the users in time and space has become an important basis for many allocation schemes. If you talk to any resource manager for very long, you will find that conflict and its management are high on their list.

I'm going to address the issue of competition and conflict in the management of our coastal zone and ocean resources from a sociological perspective. I'm going to limit myself to living marine resources, mainly fisheries, because that's where I have most of my experience. However, other coastal zone social policy issues will be discussed, some of which are based on my current research.

What I want to do is talk about the terminology first. Before we can catalog the nature of the source and the types

of competition and conflict, we have to know what we're talking about. In an earlier paper, I tried to demonstrate how conflict was often used when the term competition would be more appropriate. This is a very critical distinction because the definition is what is conflict will drive a management activity in the attempt at its resolution. For example, if two fishing domains, such as commercial and recreational fishing, are seeking the same resource, at the same location and at the same time, this does not constitute conflict.

However, if one party attempts to prevent the other from pursuing the fish and does it in a destructive manner, that's conflict. In economics, the term "interference competition" is used. This is a common occurrence in fisheries because of competition for space on the same fishing grounds and because the fish are defined as common property. But most of the activity we label conflict in fisheries management is, in fact, competition. It is crucial that we make this distinction. Once it is made, another important issue becomes what constitutes the legitimate and reasonable mission of the resource manager. Should the manager be held responsible for managing what is essentially competition?

If you look to other sectors of the U.S. economy for guidance, we find that the basis of the economy and the role of government in it is to promote competition. Thus many governmental regulations are designed not to eliminate competition in the private sector but to assure that it happens. Why should the coastal zone or fishery manager not only be legislatively empowered, but often enjoined, to regulate competition? Is it because the presumed stewardship of natural resources creates unique problems which require unique management schemes? If so, why wouldn't the same principles pertain to other natural resources, such as farming, logging or mining, where they are not applied?

The fact is that we don't have a clear ideological basis for managing competition for our coastal and ocean resources. Indeed, it could be argued that if the rest of the nation ever found out what was going on in fisheries management, it might be brought to a screeching halt. Nevertheless, attempts to manage competition will occur. We should turn to specific examples and look for further clarification.

No one would argue that activities intended to harm others or their property can be labelled conflict. But how should it be handled? Fisheries management has had less

success in resolving problems of this nature than anything else. Typically, regulations aim at strategies to make gears less profitable, increase costs or lower efficiency, or they limit entry to reduce the number of participants to reduce the likelihood of competition or conflict. This is the equivalent of raising the price of cars or restricting drivers licenses to reduce the number of vehicles involved in accidents. Another strategy is to stagger fishing seasons to mediate competition for space.

Time is wasted in examining public hearing testimony. I'm not saying we shouldn't have public hearings. But there's scientific evidence to show that testimony from public hearings is a very unreliable source of information. It neither defines the problem or the direction of the people who are trying to get the manager's attention. It doesn't square with reality.

Are there better ways to deal with competition and conflict? Our answer is that it depends on their bases and the forms they take. Separating different domains of fishermen in time or space pursuing the same or different species is difficult but doable. Even the separation of different fishermen using different gear in the same domain is reasonable to accomplish. This is relevant since managers typically display more concern about competition and conflict for the factors of production, fish, than other regulatory agencies. Most strategies attempt to regulate by designating preferred gear types and disposition of the catch, commercial versus recreational, with conservation-based rationales such as bycatch and size selectivity attached. Economic impact arguments are often used that would be called industrial policy and unacceptable in other areas.

I would argue that the focus of management should be the conservation of the resource not the solution of a social problem. Set specific standards that allow or force participants to determine their own solutions to meet the standard. Or, like Florida, regulate competition in the state legislature by elected officials.

Many conflicts that occur are the result of deeply embedded cultural practices, deep-seeded rivalries or shore-based human events that have little to do with fishing. Unless the manager is a trained sociologist or anthropologist in the field of conflict resolution, the public is asking too much to solve these types of problems. Criticism should be directed elsewhere. But the manager, by the same token, is not being publicly responsible by accepting the task of managing competition and conflict.

Much of the activity that qualifies as conflicts is already the responsibility of other agencies, namely law enforcement. It's absurd to ask a fisheries manager to develop a solution within a fishery management plan to deal with fishermen deliberately destroying life or property while they pursue their livelihoods. Call the U.S. Coast Guard or other law enforcement agencies. Laws are already on the books for these problems. Destruction of property is destruction of property. The fact that it occurs on the water shouldn't make it different.

The users of our living marine resources and the managers of them realize that although most of the resources are renewable, they are also finite. Overfishing can seriously jeopardize the capability of a fishery to reproduce itself.

Fishery resources suffer from intense competition between the principal domains, commercial and recreational, but also from competition within those domains. Fishermen compete for the same space and resource at the same time. Other times they compete for the same space but different resources. There are other types of competition too. All are a portent of things to come as we expand our land-based coastal zone activities.

The chief source of competition is the commercial domain. All fishermen are trying to make a living. Each claims that right on the basis of open access to common resources and historical practice. To these commercial fishermen, their right to pursue these resources is perceived to prevail over the recreational pursuit of those same resources. This brings commercial and recreational fishermen head-to-head over resources and space.

Both commercial and recreational fishermen actively pursue king and Spanish mackerel in North Carolina. As an important commercial activity, the harvest of mackerel is an important part of our fishermen's annual rounds. Those same fish are an important part of North Carolina's tourist industry. Pier, bank and boat fishermen spend millions of dollars for housing, food and fuel in harvesting these mackerels. Tournaments, such as the Hardee's King Mackerel Tournament, bring hundreds of thousands of dollars to Carteret County in one week's time.

In the early 1980s, the Gulf of Mexico and South Atlantic Fishery Management Councils concluded that both fisheries were under stress and needed harvesting quotas. Assessments of stocks indicated that regulations were needed throughout the Gulf and South Atlantic regions. Historic catch rates were used to determine the allocations

between commercial and recreational fishermen. For king mackerel, the current allocation is 62.9 percent for recreational fishermen and 37.1 percent for commercial fishermen. Spanish mackerel is allocated 50 percent for each. Recreational fishermen are subject to bag limits, minimum size limits and potential seasonal closures for both species. Commercial fishermen are subject to licensing requirements, quotas, size limits, seasonal closures, gear restrictions and vessel trip limits.

In defining the problems in the fishery, the management councils list 10 items involving lack of proper catch statistics, state/federal coordination, crucial biological information, etc. Also mentioned are intense conflicts and competition between recreational and commercial users and between commercial users employing different gears. Reference is also made to recreational fishermen selling their catches and to the competition between full-time and part-time commercial fishermen. Nowhere in the discussion of the objectives is conflict defined. Neither is there an explanation of why competition is harmful. Further, no proposed actions are related to solving these problems.

The plan has rather elaborate mechanisms to measure the biological health of fisheries. Yet, while three of the 10 original problems identified have to do with fishermen, not a single sentence is devoted to explaining data requirements, needs or gathering mechanisms. An appropriate methodology would be to scientifically define and assess the competition/conflict issues, to develop specific measures to deal with them and to monitor progress. Why hasn't this been done? We can only speculate. Some of the reasons have to be a lack of understanding of the nature of the problem, the councils' level of expertise for handling these type of problems and the councils' willingness to pay for additional studies. The result will probably be that our grandchildren may be reading plans well into the future that try to define and solve the same problem.

North Carolina's coastal zone has become the arena which competition and conflict for space and resources have gone beyond our fisheries. Historically, our coastal communities have seen seasonal spurts of people seeking a variety of coastal recreational activities. During the past decade, however, the demography of our coast has changed dramatically as more people migrated here for permanent residence, many of whom are retired. This has created two very important trends.

The first is the gentrification of the fisheries. Many of these retirees supplement their incomes by commercial

fishing. This puts them squarely at odds with the traditional commercial fishermen who have been fishing all of their lives. The second trend is the development of a preservation ethic among the new coastal residents. They want to maintain the perceived historical treasures or the perceived traditional way of life in combination with selected modern conveniences. A specific example in the northern coastal zone is the prospect of drilling for oil and gas 45 miles off of Cape Hatteras. Research currently underway indicates that a preservation ethic has become embedded in the northern coastal communities, and not just among recent immigrants. Oil and gas exploration and development are seen as major threats to the most treasured of the coastal zone resources.

Both of these trends will bring groups into direct competition over land and water resources. Fishermen will see increasing competition for aquatic resources from those watermen perceived to be interlopers. Both old and new coastal residents will see further development as a threat to their way of life. And all will see the prospect of oil and gas exploration as a threat, although the strength of the threat may vary across communities and user groups.

As competition intensifies, it will become politically necessary to look for answers in Raleigh. Politicians and policymakers should be careful to define gaps where new legislation and management are needed and to use existing frameworks and legislation when possible. It will be tempting to redefine and reinvent issues, policies and practices. But lessons from fisheries management should be heeded. Often the conflicts that appear are between and among the regulators not the regulated. Time and money are wasted, and often the solutions are worse than the problems. Care must be taken to set realistic objectives, clearly distinguishing between normal competition and conflicts that need attention. Then, those assigned to "fix" problems should be trained and have the ability to be effective. In my view, there is no other choice.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

RICK DUNFORD — ECONOMICS IN OCEAN RESOURCE MANAGEMENT

Rick Dunford earned his B.A. in economics from the University of Missouri at Columbia, an M.A. in economics and M.A. and Ph.D. in agricultural economics from the University of Wisconsin at Madison. He was a member of the Department of Agricultural Economics at Washington State University and joined Research Triangle Institute in 1986. There, he acts as the assistant director of the National Resources Damages Program in the Center for Economics Research.

My task is to discuss the role of economics in the management of ocean and coastal resources. Before that, I want to provide information about Research Triangle Institute. It is a nonprofit research organization in the Research Triangle Park. We have about 1,500 researchers and support staff that perform research in physical, natural, engineering and social sciences covering a broad spectrum of topics. I am the assistant director of a group of economists who estimate the dollar value of damages to the environment and natural resources as a result of oil spills and hazardous substance releases. We work with scientists, attorneys and other economists trying to reach a determination of monetary values surrounding such instances. We have worked on 10 oil spills, including the Exxon Valdeze.

Today I want to cover five basic topics. I want to start by discussing some important economic concepts that are critical to understanding ocean and coastal resource management. I'll introduce natural resource services. It's really natural resource services that economists try to value. We focus on the services that these resources provide at various times. I'm going to talk about the basis for valuing these services. Then I'll discuss the methods that we use for valuing certain natural resource services. In particular, I'll focus on public-use services and nonuse services. Finally, I'll share information about an experiment that we conducted two years ago. We tried to estimate values that people would have for reducing environmental damage in the coastal areas.

There are three concepts that I think are particularly relevant for resource management decisions. The first is willingness to pay. Economists believe that the monetary value of all goods and services is based on what people are willing to pay for them. That's not necessarily what those goods and services cost. There's a distinction between what things cost and what things are worth. This is especially important when establishing values for uses of natural resources.

For example, many people like to surf fish along the

coast. Once you've purchased a rod and reel, it costs very little to go surf fishing, particularly if you live near the coast and have low transportation costs. Does that mean that surf fishing isn't worth much to you because it doesn't cost you much? No, not necessarily. The amount of your expenditures on surf fishing is not necessarily a good indicator of what that activity is worth to you.

As another example, suppose you're walking along the beach and you see porpoises swimming offshore. Seeing those porpoises didn't cost you anything because you're already at the beach. Yet you may value the opportunity to see them. What goods and services are worth to people is an important concept but separate from what things actually cost.

One factor that may affect your willingness to pay or your value for goods and services is the availability and cost of substitute goods and services. For example, your value for a can of Sprite may be influenced by the cost of other soft drinks. Likewise, your value for visiting a particular beach may be substantially affected by the availability or lack of availability of similar beaches nearby. It's a matter of uniqueness or substitution possibilities. Are there similar resources available or is this a unique resource?

Finally, all dollar values are not created equal because of the time value of money. This is important from a resource management perspective. For example, suppose I offer to give you \$100 five years from today. What is that offer worth to you today? It's certainly something less than \$100 because you have to wait five years to get it. Approaching this from another perspective, how much money would you have to put in the bank today for it to grow with interest to \$100 in five years? Let's say it's \$80. That amount is the present value of having \$100 five years from now. The dollars that are going to be paid or received in future years are not worth as much from today's perspective. They're worth something less than their face amount, and that's important to keep in mind. It's important in comparing different streams of benefits and costs.

Suppose there is one management alternative that provides almost no returns in the first few years but relatively high returns in later years. You don't get much now but you get a lot later on. The other alternative gives smaller returns sooner and for a longer period of time. Which is the best deal? That's hard to say even if you insert actual amounts. With discounting, it's relatively easy, however, to determine which of those alternatives is best.

You take both alternatives, convert those returns into their present value, and determine which one has the highest present value. Discounting can help you recognize that dollars in future years are not worth as much today or help you make decisions from a present-value perspective. It also helps when you need to select from different options in terms of their payouts.

Let's talk about natural resource services. These are the physical and biological functions that are performed by natural resources. These include uses of natural resources directly and indirectly by people. For example, fishing is a service provided by fish in the ocean. Sailing and motor boating are services provided by the Intracoastal Waterway. They're uses of resources. But it doesn't stop there. It also includes functions that one natural resource may provide for another natural resource. For example, wetlands may provide nesting habitat and food for migratory waterfowl. These are services that wetlands provide for migratory waterfowl.

There are three types of natural resource services provided by ocean and coastal resources. There are commercial uses such as commercial fishing. There are uses of resources by the public that include an array of recreational uses — sportfishing, boating, swimming, etc. A third category includes services such as food chain connections, waste assimilation, biodiversity and other ecological functions. Sea grass provides services for benthic organisms. We call these nonuse services because they don't involve any direct use by people.

An important job of natural resource and environmental economists is to try and put a value on these natural resource services. Why is it important to try to put dollar values to on these resource services? It's important because the goal of management decisions should be to maximize the value of natural resources to society. That requires putting dollar values on natural resource services. For now, I'm setting aside the arguments about the inherent right of resources to exist regardless of whether people use them or not. I'm going to focus just upon economics and what that has to contribute to management decisions. I think it's worth restating that we should try to maximize the value of natural resources and their services to society.

What are the benefits and costs of various management alternatives? We might want to value the benefits and costs of a potential new project. There's a proposal by a few coastal counties to build a pipeline to flush treated wastewater into the Atlantic Ocean off the continental shelf. We

should consider the benefits and costs associated with that project. There's lots of regulatory decisions that government agencies make that have important benefit and cost considerations.

There's discussion now of possible restrictions on commercial fishing along the Outer Banks. We should look at the tradeoffs of that type of decision. What are we going to get and what are we willing to give up?

In addition to benefit/cost analysis of natural resource services, federal law requires government agencies to assess the monetary damages to natural resources from oil spills and hazardous substance spills. Economists try to estimate the dollar value of the reduction in natural resource services as the result of releases. That's what I do for a living.

In summary, there are a number of reasons why we would want to determine values on the uses and services that resources provide. What is the basis for estimating the values? That depends upon the services that you're valuing. The basis for valuing commercial uses of natural resources is the net income that's received by the owners of those commercial activities and by the people that work for them. But the basis for valuing public uses and nonuse services of natural resources is called consumer surplus. What is consumer surplus? Consumer surplus is the most that people will pay for a natural resource service minus the amount that they actually pay for it. It's the most that you would pay for something rather than do without it minus the amount that you actually paid. It's a monetary measure of the satisfaction of well-being that people receive from natural resource services over and above what they paid for them. You might say: "Why over and above what they paid for them? Why don't we count what we paid for these services as part of this valuation process?"

There are several reasons. First, what people spend on food and lodging, for example, in using a natural resource contributes to the net income of the restaurants or hotels. We'd be double counting if we included that spending under public uses and commercial uses. Secondly, spending on lodging really reflects people's preferences for lodging not the natural resource service. For example, there's no reason to believe that someone who stays at an expensive hotel near the beach has a higher value for beach activities than somebody who stays at a cheap motel. Finally, let's say you can't go to your favorite beach because there's an oil spill and the beach is closed. What have you lost? You haven't lost the money that you would have spent to go

there. That's still in your wallet. What have you lost? You've lost the satisfaction and well-being over and above what you would have spent to go to that beach and have a good time. That's your consumer surplus in the jargon of economists. Using consumer surplus as a measure of value is required by federal law on assessing damages to natural resources.

Measuring the net income associated with commercial uses of natural resources is straightforward. But to measure public use values, such as the value of a day spent surf fishing, is more challenging. Economists use two methods to estimate public use values. One is called the travel cost method and the other is the contingent valuation method.

The travel cost method uses a survey to get information on travel costs and visitation patterns from a substantial number of people that use these resources. That information is used to statistically estimate maximum willingness to pay for the activities that occur at a particular site. Then you subtract people's actual expenditures from this statistically estimated amount. The difference is our measure of consumer surplus.

This technique was developed more than 30 years ago and has undergone a lot of refinements and improvements. Studies comparing this method to actual cash payments have shown that this approach produces reliable estimates of people's values for recreational activities. By reliable, I mean plus or minus 25 percent.

The contingent valuation method takes a different approach. Contingent valuation tries to correctly elicit a consumer surplus estimate for natural resource uses directly from the people that use the resources through carefully designed and pretested surveys. When you get information on people's uses of resources, you're going to get information about their expenditures on those uses. You ask, "What's the most that you would pay to go fishing in this area before you would decide to go to another location or do another activity?" Let's say that you are spending \$25 a day to fish in an area. The question would be: "How high could that go before you would decide to do something else and go somewhere else?"

This method is newer than the travel cost method. It was developed in the mid-1970s and became popular in the 1980s, despite its hypothetical approach. It generally produces reliable estimates of use values. We've done a number of tests and experiments that evaluate this method against travel cost estimates and cash transactions. It does a good job arriving at the values people place on the use of

resources. People have experience with these natural resources and spend money on using them. Therefore they can estimate the most that they'd be willing to spend on their uses in a particular area.

But we have more trouble and it's more controversial estimating nonuse values. We can't use the travel cost method because there is no observable behavior associated with most nonuse services. We don't have to visit the estuary to have a value for the service it provides. You don't have to see whooping cranes, blue whales or bald eagles to have a value for endangered species. You don't have to do anything or spend any money to get satisfaction from the existence of endangered species, unique natural phenomenon or services provided by an estuary or a wetland. There's no travel associated with these services; so you can't use travel costs. The only method we can use is contingent valuation. You ask people the maximum amount they'd be willing to pay for these services.

Typically, the survey provides detailed information about the services. Then you ask the valuation question and try to understand how people arrived at this value or what it represents to them. You ask demographic questions to understand more about the responses that you get from people. For example, you would expect to find higher values coming from people who are members of an environmental organization.

This technique, as I've indicated before, works well when you're talking about use values and resources that people are very familiar with, that they are experienced with and that they've spent money on before. But it's not so easy when you start talking about nonuse values. This subject is causing controversy in the damage assessment area now. The controversy is focused on the reliability of the values that you get. Do these values make sense? Do they estimate what resources and their services are worth?

My perspective is that it does not do a very good job estimating values for nonuse services. People don't have any experience putting monetary values on the existence of an endangered species. They don't know how to weigh the tradeoffs between the existence of a species and the money that they use to go to a movie or eat in a restaurant. They may feel strongly that preserving endangered species is important, but they have trouble translating that feeling into dollars and cents. That's a very hard thing to do. In fact, some people are actually offended when you ask them to put a monetary value on endangered species.

Let me get a little more specific and mention three or

four questions that sometimes arise in determining dollar values for ecological services and preservation of endangered species. The first question concerns, as I indicated earlier, asking people to provide a dollar value for something that they don't know much about. How much information, then, should we give them? What kind of information should we give them? Do we provide visual aids — videos, maps? In what sort of context should we provide information and how should we convey it to those we're surveying? They're not scientists. They don't know technical terms or scientific names.

The second question focuses on the hypothetical nature of this technique. For example, you ask people their willingness to pay for an endangered species. They indicate an amount. But if asked to contribute that amount, would they give it? Or would they say, "Oh, I didn't know you were going to actually want that money. Let me think about this again." Unfortunately, no one has completed any good experiments on that issue. One experiment was attempted, but problems occurred. However, when these researchers tried to collect the dollar amount people stated on their surveys, they only collected six percent. That's not a great track record.

The third question asks: Do these nonuse values make sense from an economic perspective? Let me give you a concrete example. It's a basic economic tenet that people will pay more for five gallons of gasoline than they will pay for one gallon of gasoline. You will pay more to get more. That occurs for most services that we buy. Then it seems reasonable to assume that people would pay more to protect two miles of the ecologically sensitive shoreline than they would pay to protect a half a mile. But they won't necessarily pay in a strict multiple sense. Two is four times more than a half, but that doesn't mean they're willing to pay four times the amount. They're just willing to pay more.

The last question involves the more technical aspects of the contingent valuation approach. Are these values sensitive to how you ask the question? There are two popular ways of asking a valuation question. One is called open-ended. You fill in the blank with a dollar value that signifies what this resource is worth to you. The other approach is called the yes/no approach. I would ask if you would pay \$25 to protect this endangered species? All you have to tell me is yes or no. Do those two approaches give comparable estimates of nonuse values? If they don't, which one is the most accurate? Which one is the closest to

the true value?

Two years ago, we conducted an experiment at RTI to examine these last two questions. Are people willing to pay more to get more nonuse services? And do you get comparable answers from open-ended vs. yes/no approaches?

Here's our experiment. We were trying to get values for reducing environmental damage from oil spills in coastal areas. In our survey, we described a proposed federal program to create oil spill response centers that would help reduce environmental damage from oil spills. In half of our questionnaires, we described local response centers that would be located in every U.S. port that loads and unloads oil. These local response centers would have the staff and the equipment to mobilize and clean up small spills, under 50,000 gallons, in their port area to minimize environmental damage. But, we stated in the surveys that the centers would not handle larger spills.

In the other half of the questionnaires, we described a proposed government program to set up local response centers in U.S. ports that handle spills under 50,000 gallons and regional response centers at four locations to handle spills of 50,000 gallons or larger. We call this scenario our all-spills treatment because people were asked to value a program that reduced environmental damage from small and large spills. The other group was asked to value a program to protect the environment from small spills. But notice that our small-spills treatment is completely self-contained within the all-spills treatment.

We told respondents that oil companies would pay for the response centers and pass the cost to consumers in the cost of their products. This scenario would increase the price of most things that people buy. Then we asked respondents to tell us the maximum amount they would pay each year for reducing environmental damage from oil spills.

To test our second question, we split our sample. Half of our respondents got an open-ended valuation question. The other half got the yes/no format. We had six dollar values ranging from \$10 to \$1,000 a year, and we randomly assigned these six values. In total, we had four versions of this questionnaire: small-spills open-ended, small-spills yes/no, all-spills open-ended and all-spills yes/no.

I'll talk briefly about the questionnaire development because it's key to this process. There's an art to developing these questionnaires. We spent three months using focus groups, one-on-one debriefings and pretests to develop the questionnaires. We wanted to make sure they were under-

standable, had no biases and provided information people needed to make decisions.

Respondents self-administered the questionnaires. It took about 12 minutes. We recruited our respondents in two upper scale shopping malls in suburban Atlanta. People were asked if they would be willing to participate. They were led to a table and asked to complete the survey.

Why Atlanta? It's an inland city so we felt their willingness to pay would reflect nonuse values even though they may go to the beach as part of their summer vacation. Why survey at malls? If we had been trying to come up with a national value for protecting the environment from oil spills, it would not have been appropriate to use two shopping malls in Atlanta. But that wasn't our goal. Our goal was to test differences in willingness to pay for oil spill cleanup and prevention. In fact, we felt we had our best chance of finding differences in willingness to pay with more educated, higher income people.

We surveyed nonstudents over the age of 19. We wanted to select adults who were in a position to make household decisions. We had 400 respondents for each treatment. There were 1,600 respondents in total during a three-week period.

Using our open-ended survey, the distributions of the willingness to pay was very similar for our all-spills and small-small scenario. Interestingly, we found people were willing to pay more to prevent environmental damage from the small spills than from large spills. That just doesn't make sense.

What did we get from the yes/no approach? We statistically analyzed the results and found no difference in values for the all-spills and small-spills scenarios. There are several possible explanations for our results. First, maybe people don't have any extra value for trying to protect the environment from large spills. I don't believe that, and I don't think too many other people do either. Another alternative is that our surveys still had bugs in them. Finally, maybe we were not getting values that precisely tie to environmental damage. What I think we got were people's general attitudes towards environmental damage from oil spills. They're not really values.

We did a companion experiment using a real scenario, asking people to value the protection of 2,000, 20,000 and 200,000 migratory waterfowl. Every year, thousands of ducks and geese die after landing in waste-oil holding ponds that are left open after gas and oil drilling. They die when they get oil in their feathers. We got this information

from the U.S. Fish and Wildlife Service. As part of experiment, we varied how many birds died and asked respondents to value a program that would put net covers over the ponds to keep out the birds. On one survey form, we told people 2,000 birds were dying and asked what they would be willing to pay to save them? Another questionnaire said 20,000 birds; another survey, 200,000 waterfowl. We got the same values for all three. It was very similar to oil spill results. Again, we got a general value, not something specific to the injury.

What about our tests of differences in values between the open-ended and yes/no format? In the open-ended format, we had 4 percent of our respondents give us a value of \$1,000 a year or higher for the oil spill program. That's a lot of money. These people had a mean income between \$25,000 and \$30,000 a year. So \$1,000 is a very large proportion of their income. What percentage of people do you think said "yes" to \$1,000 in our yes/no format? 34 percent. At the lower amounts, the values were similar. But as the amounts increase, you get bigger differences between the open-ended format and yes/no format.

Our issue here, however, is which one's right? Which one provides a value that's closer to the true value? I don't know. But I doubt that a third of our respondents would pay \$1,000 a year for a proposed program to reduce the environmental affects of oil spills. It seems highly unlikely. But this yes/no format is the most popular way to determine these values, and it's the one being used in damage assessment and benefit cost analyses.

I think the bottom line here is that improvements are needed in the methods that economists use to value nonuse services. For now, the contingent valuation is the only approach we have. Recently, the National Oceanic and Atmospheric Administration (NOAA) convened a panel of economists headed by two Nobel prize winning economists. Their conclusion was that contingent valuation was the only game in town. It's not so much that we need a new method, but we have to improve the one we've got.

Economics should not be the sole criterion for making resource management decisions. But I think economics should play an important role because it focuses on tradeoffs associated with various alternatives. To make good decisions, we need to know what we're getting and what we're giving up when we make management decisions. Not every little decision we make needs to be subjected to economic analysis. But for major decisions, I

think economics has an important place in helping to select among various alternatives.

QUESTIONS

WALTER CLARK: I have a question that has to do with willingness to pay. Wouldn't the willingness to pay be affected by the economic health of the country? Would people be more willing to pay when they have more disposable income? How would that impact the value of these natural resources?

RICK DUNFORD: I think you're right. Generally, we find that higher income people often are willing to pay more for nonuse services than folks who are worried about paying the mortgage. I think, however, we're trying to determine a value from the social perspective. We have to have some method. We must have some grounding in the willingness of people to pay. The economic health of the country can have an impact, and I know this can be troubling if you're looking at developing countries. That troubles me too. But I have yet to see a better approach for trying to determine the value of these nonuse services.

GENE HUNTSMAN: I have a question about discounting. Many natural resource scientists are uneasy about discounting. It seems to lead to decisions that allow permanent degradation of resources. Could it be the discounting concept is flawed when applied to resources. It works well for an individual who foregoes a benefit now to get a payoff later. But when you transfer that concept to society, the society that gets the benefit is not the society that makes the payment. If I make a king mackerel decision today, it will be my children that achieve the benefit. We know that governments regularly make these kinds of decisions where they transfer benefits to future generations. War is a prime example. People give up their lives to preserve systems and values for the future. It's the ultimate investment in which you don't expect the return to improve the generation that gives it up. I call this intergenerational altruism. Can a discounting rate other than zero be applied to natural resources, given that society seems to be willing to demonstrate intergenerational altruism with respect to natural resource management?

RICK DUNFORD: That is a long question, and it had lots of different components. In general, society has a lower discount rate than individuals do because society has a longer time horizon and broader considerations than

those of an individual. I believe there is a lower social discount rate for social decisions than for private industrial decisions. But should that lower social discount rate be zero? I think that discounting works well within a given generation or within a given planning horizon — 25, 30 or 40 years. It starts to break down, however, when you compare across generations. As you're aware, discounting past 50 years in the future has a zero value in the present day. This is partly why I said that strict economic criteria don't provide the whole picture for many decisions. It should be included, but their may be other aspects of decisions that need to be considered. If, for example, you're considering an endangered species that may become extinct, you're making decisions now that will affect all future generations. I would say that discounting is not necessarily the answer or, at least, not the only one to consider.

Years ago, a resource economist suggested that a concept called the safe minimum standard be used as an appropriate basis for making these types of decisions. Using this concept, the economist rationalized that if it doesn't cost too much to thwart possible extinction or halt changes to potentially crucial resources, then do it. It's sort of an insurance policy. If your premium isn't too much, you want to pay it and be protected. Or for a resource, conserve it in case you really need it or it provides the cure for cancer 20 years from now. .

BOB KNECHT: Back to the willingness to pay question. Isn't it that the people who got the closed-ended questionnaire and committed themselves to the program had no choice but to check the \$1,000 amount? Either you're on board at a \$1,000 or you're not in the program. In effect, two-thirds of the people abandoned the program, and one-third stuck with it in spite of the high price tag?

RICK DUNFORD: I don't know if I agree with that. I think when we asked people yes or no to a \$1,000 a year, the amount became an implied value cue. Respondents decided that \$1,000 meant this was a valuable program. They said I'm a good citizen and I'll do my part by checking yes. But this implied value bothers me.

There's a tendency for people in this format to say yes.

BOB KNECHT. Therefore it seems that your open-ended format would more likely lead to reliable data.

RICK DUNFORD: I would agree, but two Nobel economists favor the yes/no approach. It's much easier to respond to the yes/no values than to determine your own values in the open-ended format. I guess they feel that if it's

easier than it's better. I think that the open-ended format forces people to think, scratch their heads and ask, "What is this worth to me? How many dinners at Wendy's am I going to give up for this?" Maybe people who go through that exercise and give it more consideration provide better responses than the responses you get from the simple yes/no format.

The controversy about the open-ended format comes from the "noise" in the responses. You get values that are outrageous, or people don't provide a value. You have people called protestors, who for one reason or another reject the scenario. They say, "I shouldn't have to pay anything for this. Those oil companies ought to pay. This is not my problem. I didn't create it." They would put down a zero. They weren't valuing the environmental damage. They were rejecting our whole scenario, and we threw them out of our analysis. We had other people give us numbers that were more than 25 percent of their annual income. Sorry, I didn't believe that, and we threw those out. Those are some of the controversies that come with this open-ended format.

MARK MESSURA: I have a question about the differences between the small-spill and all-spill treatments. It struck me that 50,000 gallons may seem like a lot to folks. Was that distinction made in the survey and in the focus groups?

RICK DUNFORD: Yes. We never used the terms small or large. We found that people didn't like that. We provided a page of information in the questionnaire about oil spills, saying that more than 99 percent of the oil spills were under 50,000 gallons. There are about 26 oil spills a day in the United States, 6,000 to 8,000 a year. Almost all of them are very small. They occur when a coupling comes loose or isn't tightened on a ship, and a hundred gallons spills out.

MARK MESSURA: What kind of difficulty does perception create when you start valuing natural resource services on a large scale? What happens when you talk about two miles of coastline compared to a quarter mile? Do you find or do you feel that people really understand those differences on that scale and that you can get meaningful information and values?

RICK DUNFORD: That's something that you have to test for in focus groups and pretests to determine how to best convey the information to the respondent. More importantly, people bring into your survey misconceptions and incorrect information that they use to

determine their values. That can be a real problem. You may provide factual information in an understandable form, but they don't believe it. They say to themselves: "I've read about oil spills, and I know that their impacts last for 50 years. The area's never the same." There's a certain amount of "baggage" that folks bring with them to these surveys, which makes it difficult to get them to focus on considering this information and this situation.

There are a few books that have been written on how to do contingent valuation surveys. It's very expensive and hard to develop a questionnaire. This isn't a Harris Poll that you crank out every week. It's very difficult to put these surveys together.

ANDY WOOD: Are you familiar with the surveys being done by some national environmental groups that list a number of points about the value of a forest, for example. At the end, it asks you if you would be willing to spend "X" number of dollars to protect this forest. Or it asks how much would you be willing to donate to our organization to ensure that particular habitat is protected?

RICK DUNFORD: No, I haven't seen one of those.

ANDY WOOD: I'm wondering if these surveys would be biased because they're selecting names that they've gotten from other mailing lists.

RICK DUNFORD: I think it would have problems. You wouldn't be able to extrapolate and say the American people have this value for X, Y or Z because this survey is not a representative sample of the country. Alaska conducted a nationwide contingent valuation survey on the nonuse values that were lost as a result of the Exxon Valdez oil spill. That study cost about \$2.5 million and took about three years to complete. It came up with a nationwide value of between \$3 billion and \$10 billion dollars. That's the most prominent study that's been done in recent times that has actually been used for damage assessment purposes.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

WALTER CLARK AND JOE KALO — OCEAN POLICY AND MANAGEMENT

Walter Clark has a master's in regional planning from the University of North Carolina at Chapel Hill and his J.D. from Wake Forest University. For two years, he worked in the N.C. Division of Coastal Management as an attorney, planner and section chief. For the last eight years, Clark has worked as the ocean and coastal law specialist for the N.C. Sea Grant College Program. Among other publications, Clark has recently published "A Pilot Study for Managing Multiple Use in the State's Public Trust Waters."

Joe Kalo is a professor of law at UNC-Chapel Hill. His B.A. is from Michigan State University and his J.D. from the University of Michigan. He has worked as a judicial law clerk for the 2nd Circuit Court of Appeals and with a private law firm in Maine. He was co-director of the University of Michigan Law School Clinical Program. Since arriving at UNC-Chapel Hill Law School in 1972, Kalo has also taught continuing legal education programs with the National Institute for Trial Advocacy and served as the southern regional director for that National Institute for Trial Advocacy. Kalo is also a member of the Ocean Affairs Council, one of the sponsors of this conference.

WALTER CLARK

North Carolina has a strong tradition of coastal management. Our Division of Coastal Management is considered one of the most progressive in the country. Yet aggressive management of our coastal zone has stopped a few hundred feet seaward of the ocean shoreline. This is really no great revelation. In a 1979 conference sponsored by the Coastal States Organization entitled "Options for the 80s," it was said "that most coastal zone management programs have a land-planner bias and pay insufficient attention to the 'wet' side of the coastal zone." The Coastal States Organization suggested that the reason for this trend is a "lack of knowledge about aquatic and ocean environments and their uses." I would certainly agree but would add that it is also a symptom of a history of few conflicts. Perhaps the two unfortunately go together — few conflicts and a lack of incentive to understand and learn.

North Carolina has seen few conflicts in its coastal ocean. The exceptions are the conflict and concern over the potential impacts of Mobil Oil's gas and oil exploration, a few conflicts surrounding nearshore development and conflicts in the arena of fisheries management. When it comes to the coastal ocean, we are a crisis response state. We consider new management agendas only when difficult situations require action. Hopefully, this study will provide

the fuel for us to become more prospective in our coastal ocean management approach.

One of the principal objectives of this ocean planning study is to assess North Carolina's ability to manage ocean resources. I have been given the task of developing an inventory of the existing policies, laws and regulations that pertain to ocean resources. The inventory, to be completed by the end of the year, will conclude with suggestions that the task force will use in recommending improvements for ocean management programs.

Before getting into specifics, I want to begin with a few basic premises that I feel are important to the overall project. First, since politics will be politics and many would argue that we already have an overabundance of law and regulation, our aim is to recommend a plan that calls for as little as possible in the way of new legislation. We hope to use existing frameworks to recommend such things as rule changes, enhanced enforcement and ways for divisions, agencies, departments and users to work more closely together. I believe most of the legislative power we need is in place, and, with some refinement, we can develop a good ocean policy strategy for the state.

Second, where there is a need for new legislation or where current authority needs stronger support, we need to recognize the crucial role of science. A sound scientific understanding and justification is not only important with regard to having enforceable law and policy in state waters, it can play a significant role in whether the state can influence what happens in federal waters.

Third, for any ocean management plan to work these days, it must build a partnership between local, state and federal governments. In the past, it has been easy to ignore local government, particularly in the arena of aquatic resource management. This is no longer true or wise. The trend in this state and nationally is to give local governments a greater voice in resource management. We also need to pay greater attention to the state's interaction with the federal government and with international law. Jurisdictions in the ocean overlap, and this coupled with the physical fluidity of the sea makes cooperation between all levels of government imperative.

Over the last decade, several states have developed ocean policy reports. Even though these reports have been replete with recommendations, few have been implemented. Critics identify at least two reasons for this failure. One, the reports and their recommendations have been too esoteric and have not dealt with specific conflicts and

issues in ways that lend themselves to solution. Two, they have failed to look at the concept of holistic ocean planning and how the different levels of government (and ocean users) can play a role in a planning process. We hope to avoid these mistakes.

Before going any further, we need to stop for a few moments and talk about the legal jurisdictions found off of North Carolina's coast.

JOE KALO

The waters off our coast are divided into distinct zones for domestic and international purposes. This idea of zoning waters is not something new. It's something that has existed for some time in international law.

Although the same terms are used for international purposes and for domestic purposes, those terms don't always mean the same thing. Let me give you an example of how the meaning of the term can change. For international purposes, the United States has a 12-mile territorial sea. That's not the result of a Congressional Act. That's the result of 1988 presidential proclamation signed by President Reagan.

However, for some domestic purposes, the Food and Water Act for example, the territorial sea is defined as that three-mile belt that's labeled "state." Sometimes the same terms are being used, but they may have different meanings for different purposes. You have a 12-mile territorial sea for international purposes, and a three-mile territorial sea for some statutory purposes. Fortunately Congress is gradually changing the federal statutes that refer to a three-mile territorial sea and substituting language that calls that three-mile belt "state waters."

Let me give you another illustration of the same term being used for international and domestic purposes yet meaning something slightly different. For international purposes, we have a 200-mile Exclusive Economic Zone (EEZ). Again, this is not the result of any act of Congress. This was another presidential proclamation signed by President Reagan in 1983. But for domestic purposes, the EEZ may mean something slightly different. For example, under the Magnuson Fishery Conservation and Management Act, the EEZ is defined by statute as that area that begins at the outer limits of the three-mile state waters and extends out 197 miles. That's called the EEZ for some statutory purposes.

For our purposes, I think we can simplify everything. The important thing is that the three-mile nearshore belt is

state waters. That's an area over which the state has primary authority over fisheries and other activities. We can regard the area seaward of the outer limits of that three-mile belt as federal waters, the area over which the federal government has the primary authority to control activities.

The federal waters are managed under a number of different statutory schemes. For example, oil and gas development is managed under the Outer Continental Shelf Lands Act by the Department of Interior through the Mineral Mining Service. Fisheries are managed by the Magnuson Fishery Conservation and Management Act by the Department of Commerce and the National Marine Fisheries Service.

There's a very complex body of statutes and a number of agencies involved in managing the resources in those federal waters. You need to keep that in mind because in some situations those distinctions are going to be important.

WALTER CLARK

As Joe said, state waters extend out to three miles. All state laws are applicable in this area. It is treated as if it is dry land belonging to the state.

As I said earlier, I have been given the task of developing an inventory of existing policy, law and regulation. To date, I have focused on the issues of coastal management, ocean mining, marine fisheries, ocean outfalls, boating and boating safety. Rather than going through each of these issue areas and outlining all the applicable management structures, I want to mention some areas where I think we should make an effort to improve the way we manage our coastal ocean.

To make this understandable and interesting, I decided to use as an example the issue of coastal management as it relates to ocean mining. I chose this for several reasons. It's an issue I know something about. Mining is a likely future activity in our coastal ocean. And most importantly, I think it illustrates the relationship, or potential relationship, between our coastal management program and other state laws managing uses in the coastal ocean. It is through understanding these relationships that inadequacies and gaps can be identified in the current management system.

I will be talking about state law only. Joe will outline federal law and policy and its potential relationship to state law later. Let me begin with coastal management. The story begins in 1972 with the passage of the Coastal Zone Management Act (CZMA). That act, among other things, established basic coastal management guidelines and promised coastal

states monetary incentives to develop their own management programs if they conformed with federal guidelines. The act also promised the states a potential voice regarding activities in federal waters through its "consistency provisions."

North Carolina took the bait in 1974 and passed the state's Coastal Area Management Act (CAMA). CAMA was envisioned by many to be the umbrella legislation for managing coastal activities. It quickly became apparent that there were other laws, regulations, departments and agencies with management authority operating autonomously from coastal management and wishing to remain that way. It also became apparent that the law itself had certain limitations. I will mention some of these limitations in a moment. But first a little more about the act.

CAMA presents a two-prong management approach — regulatory and planning. Both approaches begin with the identification of a regulatory jurisdiction. In North Carolina, this area consists of 20 of state's coastal counties and the coastal ocean to the end of state jurisdiction at three miles. Within this area, called the coastal zone, we have identified environmentally fragile areas called Areas of Environmental Concern (AECs). There are several AECs in the coastal zone, but two are particularly important regarding the coastal ocean. They are the estuarine waters and public trust AECs.

The Coastal Resources Commission is charged by CAMA with developing regulatory standards for all AECs. The act requires that the standards be consistent with two primary, yet seemingly inconsistent, goals identified in the act: (1) the protection, preservation and conservation of natural resources including water use, fish and wildlife; and (2) the economic development of the coastal area.

Development cannot occur within an AEC without a CAMA permit. Permits are issued or denied based largely on the regulatory standards found under the AECs. Before a permit for development can be issued, all other state and federal laws and regulations must be satisfied. These may be in addition to CAMA.

So what does all this mean for managing North Carolina's coastal ocean? It means that any activity in the coastal ocean will be regulated under CAMA if the activity takes place within one of CAMA's AECs and if the activity meets the definition of development and is not exempt. If the activity is regulated under CAMA, it may be approved if it does not violate the requirements/regulatory standards for the AEC within which it occurs and it satisfies the requirements of other permitting entities.

What are CAMA limitations and weaknesses regarding the management of the coastal ocean from a regulatory perspective? First, I see no weakness regarding geographical jurisdiction. Any activity within North Carolina's coastal ocean will be in the coastal zone and will fall within an AEC. Both the estuarine and public trust waters AECs extend to the end of state jurisdiction.

Second, and perhaps a weakness, is that many activities occurring within the coastal ocean and within one of the AECs do not meet the definition of development. Consequently, they are not covered by CAMA's regulatory requirements. Some might call this a weakness in jurisdiction based on definition. For example, certain fishery harvest techniques — some of which can disturb the ocean floor and injure aquatic plants and animals — do not fall within the definition of development. Clam kicking is a good example. Third is the fact that the current regulatory guidelines used to evaluate development activities within the estuarine and public trust waters AECs were written with a land-based and nearshore bias. These regulations were written with coastal rivers and sounds in mind because that's where the conflicts were at the time. We need to think about the types of development activities that are likely to occur within the coastal ocean and re-evaluate these regulations to be sure they are adequate/applicable.

Now let's turn to ocean mining and its relationship to CAMA, particularly in terms of CAMA's strengths and weaknesses. Any mining of submerged lands in state ocean waters would be a development activity requiring a major development permit under CAMA. Consequently, the regulations pertaining to the estuarine waters and public trust AECs would be applicable. But let's look back at the state Mining Act. Does the Mining Act and its regulations contain sufficient provisions for an adequate review of the impacts of a mining operation to remove phosphate or sand and gravel from submerged land under the coastal ocean? In reading the act, it is clear that it was written with land-based mining as its focus. There is little attention given to the mining of submerged lands. The act does require that no mining shall be carried out without reasonable provisions to protect the environment and to reclaim the area affected. The act also states that the department may deny a mining permit if it finds the operation will have an unduly adverse effect on wildlife or freshwater, estuarine or marine fisheries.

Besides giving little attention to the potential impacts of sea mining, the act contains some glaring weaknesses. I'll mention just a few. First, areas of one acre or less are

excluded from the definition of mining and consequently escape permit requirements. This practice may work for land, but I have my doubts when it comes to the water. Second, exploratory operations do not require a permit. Removal of ore is exploratory as long as ore is not sold. Third, priority consideration is given to applicants who submit evidence that the proposed mining will supply materials to the N.C. Board of Transportation. Sand and gravel would fall within this category, and it is one of the materials available from the submerged land of the coastal ocean. This type of priority status may not be wise for ocean mining. Fourth, the act requires that a "reclamation plan" be submitted to the Division of Land Resources. The requirements for these plans are not tailored for aquatic mining. Finally, the act requires that a performance bond be posted before mining can occur. The regulations determine the amount of the bond based on the material being mined and the acreage involved. The bond amounts were clearly set with land-based mining as a point of reference.

If the Mining Act or any other law or regulation applicable to development in the coastal ocean is not adequate, then the CAMA review process and the AEC regulations for ensuring the consideration of all impacts become all the more important. That is why it is so important that these regulations be reconsidered in light of activities that might occur in the coastal ocean. As I said earlier, I think CAMA's regulatory standards for public trust and estuarine waters are deficient when it comes to addressing potential ocean development activities.

What about other policies, laws and regulations that manage activities within the coastal zone? There are a multitude of activities that take place in North Carolina's coastal ocean that, because they do not constitute development, fall outside the definitional jurisdiction of CAMA. They include ocean dumping, most commercial and recreational fishing activities, marine special area protection, protection of archaeologically significant sites, navigation and navigational safety, oil spills, etc. These are all important.

A current fisheries dispute in Dare County provides an example of this type of activity. This dispute grew from a conflict between local government and the menhaden fishing industry. Claims are being made that menhaden boats fish too close to the shoreline and that this practice is detrimental to the sportfishing industry and tourism. Local officials want to restrict how close fishermen can come to shore. But in 1965, the state took away the power of local

governments to pass fishery restrictions and abolished all existing local fishing acts. The legislature took this action recognizing that marine and estuarine resources belong to all the people of the state and are best managed on a statewide basis rather than by a multitude of local acts. However to confuse matters, the law says that local governments can act in some instances where the incidental effect may impact fishery management but the objective is not to regulate or to control marine or estuarine resources. The N.C. Marine Fisheries Commission gave the director of the Division of Marine Fisheries the power to zone nearshore waters to resolve these types of conflicts. It is clear from the statute prohibiting local governments from direct fishery regulation that action should come from either the Marine Fisheries Commission or the General Assembly. However, there are situations where jurisdictional authority is not exercised or is unclear.

This is one of many examples of the type of "nondevelopment" conflicts — conflicts that fall outside of CAMA — that are beginning to arise in North Carolina's coastal ocean. It is also an example of the need to more holistically manage the coastal ocean. We must come to a better understanding of the relationship between all our policies, laws and regulations and how that relationship can be improved. Is zoning the answer? Perhaps. But only if it is holistic and not done in a vacuum.

I would like to reiterate some areas where I think we need to focus our sights over the next few months. First, we need to look at those types of coastal ocean activities that constitute "development" under CAMA. We need to examine CAMA and its rules for the estuarine and public trust waters AECs to determine whether the rules are adequate for these activities. As stated earlier, CAMA has been administered as a land-based/nearshore program even though it clearly has direct authority in the coastal ocean for three miles. We need to look at activities — ocean mining, ocean outfall, jetties, navigation channels and port activities — to ascertain whether current CAMA regulatory guidelines are adequate to address the impacts of these activities. As with the ocean mining example, we need ask whether current CAMA guidelines are sufficient. We also need to examine to what extent local governments should be involved in management.

Even in those situations where CAMA provides for overriding review of development activity, it is still important to review other specific laws and regulations for inconsistencies and gaps. This is particularly true for laws

and regulations, such as the Mining Act with its provisions for a "reclamation plan" and a "surety bond," that attempt to manage ongoing activities.

Second, we need to examine the laws and regulations that govern activities that do not constitute development under CAMA but that do take place in state waters and do impact the coastal ocean. Examples include laws and regulations governing state fishery management, navigation and navigational safety. We need to ask questions. Do current fishery management rules adequately protect marine habitat such as offshore reefs? Do current fishery laws and rules provide an adequate structure to address the ongoing conflict between recreation and commercial fishermen? Do we need to zone North Carolina's coastal ocean? To what degree can/should local governments be involved with fishery management, marine navigation and navigational safety?

Third, we need to look at those instances where federal law reaches into state waters to solely manage activities or to manage activities in partnership with the state. For example, how does state law regarding oil pollution and liability dovetail with the federal Oil Pollution Act of 1990? The Endangered Species Act, the Fisheries Conservation and Management Act and the Clean Water Act are all scheduled for reauthorization this year by Congress. We need to monitor changes to these acts and examine state law in response.

Finally North Carolina needs to assess how it can best influence what happens beyond our state waters, particularly in federal waters. How can we best use the consistency provisions found in the CZMA to ensure that activities in federal waters are consistent with our idea of good coastal management? An important key lies in the strength of our own state laws and regulations. For example, it may be the strength of our CAMA regulations that will dictate to what degree we can influence mining activities beyond our jurisdiction. And its not only state laws and regulations that manage development activities that are important, our coastal management plan references all other state laws and regulations that manage coastal and ocean resources as enforceable policies. From a federal consistency standpoint, they all are important.

JOE KALO

We're concerned about how the state can influence federal decisions about activities that are taking place in federal waters. There are lots of statutes that might allow the

state to have some voice in a decision that's being made by the federal government about an activity in federal waters. But I want to limit my discussion to one significant way, at least in my opinion, that North Carolina can influence the type of decisions made about activities in federal waters. The legal mechanism I want to discuss is the consistency requirement of the CZMA. Under certain conditions, this consistency requirement allows North Carolina to veto activities that are planned for federal waters when those activities are inconsistent with the state's federally approved coastal management plan. As Walter has said, that really is more than just CAMA. That includes the plan that we submit to the federal government and all of the statutes that are identified in that plan as part of our coastal management scheme.

This isn't an absolute veto. The federal government doesn't give up control over activities that are of federal concern. That just doesn't happen; there's always a safety valve. If the state vetoes a federal activity, the veto could be overridden under certain circumstances. So there is limitation in this consistency requirement. Despite that obvious limitation, the consistency requirement is important. If the legal climate is right, the state can veto the activity, and it will not occur unless it conforms with the requirements of the state.

This is directly related to the thoughtful development of ocean policy plans. One thing that we ought to think about in an ocean policy plan is how to make the possible future veto of federal activities an effective one? Now, the CZMA dates back to 1972 and was amended and strengthened in 1990. For our purposes, this act and the section that is really crucial, Section 307, can be divided into three different parts. There's Subsection C1, Subsection C-3A and Subsection 3-CB.

Subsection 3-C1 is directed at federal activities — the military or the U.S. Army Corps of Engineers. Outer continental shelf lease sales by the Department of Interior are controlled by section 307C-1. Subsection 307C-3A is directed at activities that require federal licenses or federal permits, such as a Section 404 Permit or a Section 403 Permit. Section 307C-3B is a special section that's directed at oil and gas activities that occur in federal waters.

There are differences in these sections since they're directed at different types of activities. But there's also a common core. That common core is important because it is related to the state's ability to have an effective voice in decisions about activities in federal waters. All three of

these subsections apply to activities taking place within federal waters. But don't be misled. Not all activities within these three groups are going to be consistent with state policies and laws. For an activity to be regulated by state laws and policies, there must be a nexus between the activity in federal waters and the state's coastal zone. Specifically, the activity must affect a land use, water use or natural resource of the coastal zone, including that area offshore within the three-mile limit of state waters.

Now the question that arises is how close of a nexus must there be between an activity in federal waters and the state's coastal zone? The word used in the statute is "effects," but there's no federal regulation that defines that term.

However, the second report that accompanied the 1990 amendments to the CZMA said that the nexus requirement is satisfied if the activity affects or will lead to effects on the coastal zone. The report further stated that the effect standard should also include later effects that might occur.

Therefore for North Carolina to affect what happens in federal waters it must have sufficient concrete data. Experts, such as Stan Riggs, must be able to testify that there is a relationship between a proposed activity in federal waters and a natural resource, water use or land use in the coastal zone.

The state will be able to get some scientific information from the environmental impact study being done in connection with certain proposed activities. But that's reactive information and may not allow the state to protect its legitimate interests. North Carolina may not have sufficient enforceable policies in place to react with that scientific information.

There is another limitation too. Purely economic impacts may not be subject to the consistency requirement. If the impact of the activity in federal waters is entirely an economic one, then arguably that's not enough. The statute says that the activity must affect a land use, water use or natural resource of the coastal zone.

For example, New Jersey objected to a proposed outer continental shelf lease sale on the grounds that the exploration and development would pose a potential threat to tilefish and their habitat in the Baltimore Canyon. They also said that development of oil and gas in Baltimore Canyon would interfere with commercial fishing activities and have adverse economic impacts on the shoreside coastal businesses that provide support for commercial fishermen.

The situation that New Jersey faced is one that is not

unlike the one North Carolina may face. Doesn't it sound like the type of concerns that were raised in connection with the Mobil Oil project? We are concerned about interference with commercial fishing activities and possible adverse economic consequences to North Carolina shore-based businesses.

But does that count when the federal activity has only pure economic effects on the coastal zone? There is an argument that it does not because the statute says it must affect a land use, water use or natural resource. In the New Jersey case, the court said that unless there was a connection between a particular water use or natural resource in the coastal zone, then the consistency requirement did not come into play.

The CZMA affords protection to the state's coastal natural resources such as wetlands, beaches, dunes, fish, wildlife and habitat. Although the CZMA refers to the fishing industry and other commercial interests, there is nothing in the act that protects the economic health of an industry unless it is affected by adverse impacts on natural resources in the state's coastal zone. That's the argument that the New Jersey court accepted.

I think it's important that we acquire social economic data about the relationships between activities in federal waters and our coastal zone. There is another plausible argument for which you can find support in a decision by the commerce secretary about a proposed oil project off the California coast. The decision infers that spin-offs of adverse effects of activities in federal waters that economically impact coastal zone businesses are relevant for consistency purposes. These economic impacts will have an impact on land-use decisions.

On the other hand, pure economic effects may be enough to invoke the consistency requirement and may establish the necessary nexus between an activity in federal waters and the state's coastal zone.

When consistency is required, the federal agency or permittee only has to be consistent with the state's enforceable policies. Enforceable policies are legally binding and applicable to the state's coastal zone. A federal agency or licensee need not adhere to advisory policies — essentially recommendations that carry no legal teeth.

What are enforceable policies and how do they relate to developing an ocean policy plan? Again, no federal regulations define what an enforceable policy is. But let me suggest a few criteria for enforceable policies.

First of all, what are we talking about? We're talking

about activities in federal waters. Remember if the activities are in federal waters, North Carolina has no authority or control over them unless the federal government gives it to us. There are no enforceable policies with respect to those activities in the absence of any federal act. What does the CZMA do? It gives North Carolina some authority and control over activities in federal waters.

Secondly, it treats those activities that are subject to the consistency requirement as if they were taking place within state waters. The enforceable policies then are the ones that the state would use to decide if an activity similar to one that's proposed for federal waters be allowable for state waters. It's almost as if the CZMA hypothetically moves those activities into state waters. It says if this activity were taking place in state waters, what state laws would apply to determine the manner in which that activity would be conducted.

For example, if phosphate mining were proposed for federal waters, the enforceable state policies would be those that apply to permit decisions to mine phosphate in state waters. If North Carolina would deny the permit to mine phosphate in state waters, then that's an enforceable policy for purposes of the federal consistency requirement. If that activity is subject to the consistency requirement, then it's going to have to conform to those state laws.

Therefore, if the state policy for mining, isn't adequate, North Carolina may be handicapped in the future in influencing decisions concerning ocean phosphate mining in federal waters. The ocean policy planning process should revisit and assess how state laws affect activities in state waters with an eye toward how they also affect activities in federal waters. If we don't want certain activities to take place in federal waters because they might be harmful to the state, then we have to think about prohibiting or limiting those activities in state waters.

QUESTIONS

STAN RIGGS: Is dredging included in state Mining Act? If not, is recovery of sand for beach nourishment by dredging excluded from the act?

WALTER CLARK: The state mining law says any activity that is less than an acre would be excluded, but some dredging activity may be larger than that. There's a state dredging bill act which has been incorporated with CAMA, which regulates dredging. So CAMA's standard would apply. Since you're not dredging or removing ore to sell, the Mining Act would not apply.

UNIDENTIFIED MALE: Dredging is not exempted. In fact, there's a number of regulatory acts in mine enforcement. Dredging is covered by that.

STAN RIGGS: Does sand recovery for Carolina Beach have to have a mining permit? Does the Army Corps of Engineers need a mining permit?

UNIDENTIFIED MALE: It has not been applied to channel dredging for navigation for federal dredging projects.

STAN RIGGS: Right. But in the project they're preparing to do now off Carolina Beach, they plan to dredge sand from the continental shelf, which is not a channel, specifically for beach nourishment. Does the Army Corps of Engineers need a state mining permit?

UNIDENTIFIED MALE: I think they probably would.

MIKE ORBACH: Do they have one?

UNIDENTIFIED MALE: We haven't received the application.

MELVIN SHEPPARD: Mr. Clark, we've made several comments about the menhaden bill presently in the N.C. General Assembly. The N.C. Division of Marine Fisheries will say that the menhaden fishery is in as good a condition as it has ever been. That bill was introduced into the N.C. Senate. It was introduced because a hard-hitting, wealthy, well-heeled individual wanted that done. It went through the Senate on a voice vote. Now, you haven't heard the turmoil that's going to happen in the House. The scandal is being investigated. This is going to turn into a real donnybrook, and it has nothing to do with the research. The media needs to know that it's not a "fish on the beach" issue, and it's not an issue of resource. This is an altogether different thing. It's a real scandal.

WALTER CLARK: This issue points out the fact that we do have these types of conflicts. Some of them are resource conflicts, and some of them may have other hidden agendas.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

ROBERT KNECHT — MULTIPLE-USE MANAGEMENT

Robert Knecht received his bachelor of science in physics from Union College in New York and master's in marine affairs from the University of Rhode Island. He did some graduate study at Cambridge University in England. Knecht represented the U.S. Secretary of Commerce in the Law of the Sea negotiations in 1979 and 1980. He has directed the Ionus Ferric Propagation Laboratory, been the deputy director of the National Oceanic and Atmospheric Administration's Environmental Research Laboratories and headed the NOAA Office of Minerals and Energy. Knecht was implementing director of the National Coastal Zone Management Program in the 1970s until 1979. He left the government in 1981. Knecht is presently at the University of Delaware as a professor of marine studies in the College of Marine Studies and the co-director of the Center for the Study of Marine Policy. He also holds joint appointments in the College of Urban Affairs and Public Policy and the Department of Urban Science.

North Carolina is one of my favorite places, especially Wilmington. A dozen years ago, I co-authored an article in the *Journal of the Institute of American Architecture* on Wilmington. It seems to me an unusual combination of urban renewal, historic preservation and waterfront restoration. I love this state, and I love the coastal zone. It's good to be back.

It's nice to be here to share some ideas on my favorite topic: ocean management. Actually my talk is not going to bear much resemblance to what's in the program — multiple-use ocean management. I don't think many state's do that yet, and Walter Clark probably comes the closest in some of his pioneering work.

What I want to talk about is the exercise that North Carolina is initiating with this meeting. That's the preparation of an ocean resources management plan. I think that's the first step towards rational multiple-use ocean management. Primarily I'll talk about that process and offer some suggestions and observations.

I think North Carolina has a splendid window of opportunity to make some real gains in the field of planning for rational ocean management. I'll try to develop that argument along the way. I want to divide my remarks in four brief parts and leave some time for discussion. First I'd like to share some thoughts on how to think about the task before you. Secondly, I'd like to look briefly at the steps in the process of developing an ocean resources management plan. Third, I'd like to examine several different strategies for putting an ocean resources management plan into

action. And lastly, I'd like to look at two realities that I think you need to bear in mind as you tackle the exercise.

First, some comments on how to think about the task, at least from my perspective. You're concerned with the coastal ocean and North Carolina's relationship to the coastal ocean. One key question is what resources are out there and how might North Carolina use them? We've heard good information on that today. But there are at least five other questions that bear reflection. For example, what resources are out there and how might others seek to use them? Another one: What activities might North Carolina wish to undertake in the coastal ocean aside from resource activities? Similarly, what activities might others wish to undertake in North Carolina's coastal ocean? Finally and most importantly, what does North Carolina's coastal ocean constituency presently see for the future of their ocean?

It seems to me that two points follow from these observations. Since North Carolina does not and will not have complete control over its coastal ocean, you've got to be concerned with outside interests and their potential for impacts on your ocean. Secondly, you have to be concerned about the attitudes, the feelings and the values of the people who feel that this is their ocean.

I would urge you, therefore, to try to take as holistic an approach as possible to the task. Clearly, you have to start with a sector-by-sector approach. But I think you have to consciously not allow the sector-by-sector approach to constrain or shape the thinking of your activities.

Early on you need to confront certain questions. How far does North Carolina's coastal ocean extend? How much ocean space does it embrace. How much of the ocean adjacent to the state do the people of North Carolina wish to extend stewardship over?

Any real stewardship over North Carolina's ocean must come from the state, its local communities and its people. Federal agency concerns formed in Washington are fragmented and apply on a resource-by-resource basis. One agency is concerned with oil and gas; another, fish. Certainly it cannot be said that the sum of all the concerns of various federal ocean agencies results in coherent and sustained stewardship over an ocean area. There's one exception — National Marine Sanctuaries where the objective is to provide stewardship over long-term ocean management.

In this spirit, I urge you to forget the legal jurisdictions that Joe Kalo and Walter Clark defined for the time being. Ultimately, of course, they're important. But I don't want

you to get hung up on legal jurisdictions and dividing lines between state and federal governments.

In my view, your state's interests and concerns bear virtually no relationship to three-mile state territories or federal 12-mile territories. Rather, your interests should follow the range of the fish, the length of a day's sailboat ride, the trajectory of an oil spill, the distance to the horizon or whatever else you want to put in there.

I'd like to now look at the process of creating a comprehensive ocean resources management plan. There are three basic steps. One is the data and information collection and analysis phase; I think we are in the process of that now. Second is the determination of state interests in North Carolina's ocean. Third is the development and implementation of strategies to protect and enhance those identified interests.

The data and collection analysis phase you're in now is critically important, and this was emphasized by many people earlier today. You have got to have a scientific base on which to base rational policy management. In undertaking data collection, synthesis, analysis and interpretation, I think your state has a lot going for it. You've got one of the most extensive, varied and richest coastal ocean areas of any of the states. It's hard, for example, to get my state of Delaware, with its 24-mile shoreline, motivated to do ocean management.

Second, you have an earlier ocean policy study upon which to build the present study. You also appear to have an enlightened set of state officials ready to help and support such an effort. You've got a well-grounded and seasoned coastal zone management program to anchor your ocean thinking and to connect your ocean planning to the coastal zone.

Finally, you've got a few real issues to add to the necessary reality of the exercise. If this was an abstract exercise done far in advance of any pressing problems, you could get detached. But you've got the continuing Mobil Oil matter; you've got the question of ocean outfalls. The Albemarle-Pamlico Sound Comprehensive Conservation Management Program is about to be merged. There are a few public trust concerns. So there are some real problems that can add liveliness and relevance to the study.

Determination of state interests in the North Carolina ocean is perhaps the key aspect of your task. To determine the interests, it's important to get out of the academic halls and state office buildings to define, identify, interrogate and understand the North Carolina ocean constituency. I don't

think there are many of those people here. I've seen a recreational fisherman and a commercial fisherman. But all of us are middlemen; we work for the state, federal government or academia. We serve the users, but the users have to be in this process and in it substantially.

I would guess that the people who live in coastal North Carolina are here because of the ocean. Certainly visitors that come to this beautiful coastal zone come because of the ocean. I would argue that these relationships between the people and the adjacent sea need to be much better understood and would become an important component of North Carolina's ocean interests.

Another reason for identifying North Carolina's ocean constituency is to get them involved. The ultimate success or failure of your exercise probably will be directly dependent on the extent to which a feeling of ownership develops between this constituency and the ocean plan. I realize that public participation has always been an important part of North Carolina's public policy activities. But that kind of public participation is generally in connection with specific projects. What is needed here is effective public involvement regarding the vision of North Carolina's coastal oceans.

Now, I'll comment briefly on development strategies for protecting enhanced state interests of the ocean. Or, how do you achieve the goals of your ocean plan once it is developed?

An oversimplified view of the problem is say that the state has few tools to achieve its purposes beyond the three-mile limit, and little can be done beyond that. You heard from Joe Kalo a good explanation of the federal consistency rule that gives the state some reach beyond three miles, and it's a very effective tool. But I'd like to look at some other possibilities and strategies to achieve state goals in the coastal ocean.

Four states have devoted some 309-project funding to ocean resources planning. North Carolina is one. There are three others: Oregon, Hawaii and Massachusetts. I think there's some learning that can take place from these other states.

Oregon is demonstrating what can be done by means of an assertive state effort. Oregon's legislature passed legislation mandating the development of an ocean resources management plan some years ago. The coordination was done by the governor's office during a two- or three-year period. All ocean user groups were involved. Importantly, Oregon had state legislation that authorized

the development of this ocean plan. That plan was given a legal stamp. It also was mandated that it be included in the state's coastal management program so that it would come under the aegis of federal consistency.

Oregon developed what they call the Oregon Ocean Stewardship Zone. They defined clearly on a map an ocean stewardship zone that bears no relationship to their three-mile jurisdictional limit. It reaches to the edge of the continental shelf and embraces the resources and the part of the ocean that is of direct and immediate interest to the people of Oregon. And Oregon has developed policies for that ocean stewardship zone. They didn't wait for authorization from the federal government. They developed policies and did their homework. Now that plan exists. It will be sent to Washington as an amendment to their coastal zone management program. Then the federal government will have to decide how to react to it. That will probably open a whole new chapter in state-federal relations.

Hawaii has developed an ocean resources management plan very similar to Oregon's. They used the Oregon legislation, but they removed the teeth before they adopted it. The plan adopted by Hawaii had no legal status, had no approval process and was not mandated to be a part of the coastal zone management program. Therefore, the exercise has not been as effective as it could have been.

Hawaii is using its 309 money now to take the plan and particularize it to fit the ocean region in the Hawaiian islands. They're trying to use a regional ocean management plan as a first step toward implementation. But the Hawaii process has been a less vital one.

Massachusetts is using its 309 money to develop ways to manage offshore aquaculture. They have proposals for offshore aquaculture miles offshore. They have no regulatory framework for that. Massachusetts has used ocean protected areas as one of the key tools in their approach to ocean management. They have a series of state ocean sanctuaries, and now they have a National Marine Sanctuary in federal waters to protect an important part of Massachusetts Bay. So Massachusetts is different and less comprehensive and has relied on marine protected areas.

I'd like to add one more state as an example here. Florida has singled out the Keys as their primary area in need of ocean management. They obtained a very large National Marine Sanctuary that encompasses the Keys and the ocean about 20 miles offshore, including federal waters. Now there's a gigantic federal-state effort to develop a

management plan for this 2,600-square-mile sanctuary. Florida has decided to get into bed with the federal government and use the federal device, the marine sanctuary, applied at large over this entire area to approach a broader kind of ocean management. I'm anxious to see how that works.

One other state I'd like to mention is Alaska. Alaska asserts that it should have control over all resources adjacent to their waters. They've already got three miles, but they want control 12 miles to the newly expanded U.S. territorial sea. They claim they have more expertise than the federal government with regard to activities in their region of the world and that they deserve to have this extended jurisdiction. But it's simply asserted. There is no ocean resource management plan. There is no policy exercise to back up that assertion. And I haven't seen much progress using this method.

From these cases, I draw the following conclusions. You have to do the serious job of homework if you want to make progress. You must have an open development process involving all of the potentially affected constituencies. You've got to make full use of opportunities to collaborate with ongoing federal activities and capitalize on them. And finally, you've got to have some legal standing for the project. The project really should have a legislative basis.

I want to elaborate a bit on a few of these points. One is the importance of a fully open process for developing an ocean plan. It complicates things. It slows down things. You learn everybody has their own pet projects that you have to tolerate and hear for the thirteenth time. A fully open process will not broaden the ownership of the resulting product, but you'll learn limitations that you might not have considered. You may learn some new ideas and new approaches. There's a danger that without a fully open process the leadership will go too far too fast. Nobody wants to slow things down. But if you get too far out in front of the constituency, the exercise will become an abstract one that winds up on the shelf with a lot of others.

I remember reading Theodore White's book about making a president. He said the essence of political leadership is knowing how far to be in front. He likened it to a wagon train crossing the mountains. The leaders must be far enough in front to see the promised land and to bring back reports of encouragement. But if they are too far in front they don't realize the problems the rest of the train may be experiencing — broken wheels, lack of food and

illness. Getting the leadership distance right is important. Unless you have a fully open process with all the affected interests involved, you may be too far out in front. Then the exercise becomes purely an academic one.

I mentioned collaborative approaches in the federal government. There are a lot of things that can be used to advantage. Let me just tick off some ways in which this state is involved with federal counterparts in developing components of ocean management planning. There is the coastal zone management program and its federal consistency; we've heard about that. Nonpoint source pollution compounded for the coastal zone management program is another. The National Estuarine Research Reserve system is a federal and state partnership to set aside estuarine areas for research. The marine sanctuary program offers some tools that could be used and applied. The National Estuarine Program with EPA and its resulting management plan for Albermarle and Pamlico sounds can be an element and ought to be. The 319 program is another component of EPA that will probably get additional funding as a result of reauthorization of the Clean Water Act. Fishery management plans are developed by regional councils with state involvement and by the U.S. Marine Fisheries Council, which is getting more teeth and becoming more effective. All of these represent opportunities to carry forward some related activities, often with federal funding and federal technical support.

I would argue that the states are in a much better position to integrate all of these activities and harmonize them toward a set of ocean objectives than the federal government. But the state must have its act together to integrate these activities. North Carolina starts off way ahead by having a single Department of Environment, Health and Natural Resources. With the right kind of leadership, you have the potential to harmonize these activities and have them play a supporting role in this overall ocean planning effort.

Lastly, the legal standing of the ocean plan is essential. Legislation would legitimize the activity with regard to ocean resources and the plans. Unless your policies are expressed as official state policies that have been duly called for or sanctioned by the legislature, you won't have what is needed to play the role you need to play with regard to Mobil Oil or other such activities.

There are a few realities that are important to remember as you embark upon the process. The leadership in ocean planning management for the foreseeable future has

to come from the state. I don't see any sign that the federal government is going to provide coherent leadership in coastal or ocean policy across the various departments in Washington.

There are a few things that would press the federal government in the direction of being more integrated. The Law of the Sea Treaty was signed in 1982. It adopted an international constitution for the oceans and will enter into force when 60 nations have ratified it. That number is now up to 55 or 56. We're approaching the time when that substantial international agreement on the oceans will enter into force. At that point, it seems that the federal government will realize that it's got to undertake more coherent planning with regard to its coastal ocean.

Now, there is no coherent national planning for offshore ocean areas. But when the Law of the Sea Treaty is ratified and the Exclusive Economic Zones take on additional significance, the government may realize that it has to guide this country toward a delicate balance between rational management and sustainable development, between EEZ resources and high seas navigation. We have got to manage our 200-mile zone as an example to other nations of how you can have sustained development, rational management and free navigation. It's a delicate thing.

Ocean management must connect fully and totally with coastal zone management. These are not two separate entities. These have to be seamlessly connected. Indeed, at the Rio de Janeiro summit last June, we heard there's a new concentration at the international level on integrated coastal management. All nations are called upon to do a better job of integrated coastal management.

This kind of management involves four kinds of integration. First is geographic integration from the upper regions of estuarine watersheds to the ocean. Next is intergovernmental integration. You've got to have a program that fully incorporates federal, state and local government views. You've got a head start with CAMA, which has created a partnership between the counties and the state.

Third is intersectoral integration. In the beginning, coastal zone management was thought of as shoreline-use planning and management. Other sectors — water quality, fisheries and coastal hazards — have to be added if we're going to have sustainable coastal development over the long term.

Lastly, there's interdisciplinary integration. The

emphasis so far has been on regulatory approaches to shoreline management. I think as we move beyond that, you need to incorporate expertise in economics, anthropology and sociology. Interdisciplinary integration is eventually going to develop. This is how things are evolving in terms of integrated coastal management.

In closing, North Carolina has a window of opportunity to do some creative ocean planning and management. You've got great intellectual resources in the university system and in the Sea Grant Program. You've got an excellent base with the coastal management program to build upon and extend your involvement in all federal programs.

It's critically important to get out in front of ocean development. In the Mobil Oil case, I think the state was not ahead of that proposal, and some ad hoc scurrying had to take place to fully represent state interests.

But things are set for the state to succeed in its ocean planning. The anniversary of the CAMA legislation also offers an opportunity to celebrate 20 years of achievement and to look ahead to develop some future thinking with regard to the coastal zone and the ocean.

QUESTIONS

JOHN COSTLOW: I like your analogy about the wagon train.

With the Albemarle-Pamlico Estuarine Study, which is now in its sixth year, we have had problems sustaining the long-term interest of citizens and maintaining continuity of policy. In the six years, we have had two governors, three terms of Congress, three state legislative terms, two terms for the county commissioners in all the coastal counties and two senate terms. You can't get too far ahead of the wagon train. But how is that possible? What do you do about those other problems?

BOB KNECHT: You pose some good questions. The problem of politicians that turn over frequently is apparent in our kind government. It seems to me one way to deal with it is by having a solid, technically sound basis for what you want to do — a well-documented, well-supported ocean resources management plan. And you try to convince the legislature and the local governments that it's the right thing for the state no matter what. If you have a solid foundation for that, it shouldn't change with politicians.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

ROGER SCHECTER — COASTAL MANAGEMENT PERSPECTIVE

Roger Schecter holds two Masters degrees from the University of North Carolina in ecology and planning/public administration. He has 24 years of experience in environmental planning and management with consulting firms and governmental agencies. In the N.C. Department of Environment, Health and Natural Resources, he has served as assistant director of the Division of Planning and Assessment and as director of the nationally recognized Pollution Prevention Program. Schecter was appointed director of the Division of Coastal Management in 1990.

I'm very impressed, not only with the participation, but the interest level and knowledge that I heard yesterday in terms of helping the state try to address what ocean resources management is. And more importantly, where it's going in the future.

I think we are at a very unique turning point. We will by next year have 20 years experience in coastal management. We have an opportunity to reflect on those 20 years. But more important than reflecting is what do you do the next 20 years?

I think Secretary Jonathan Howes outlined for you yesterday his commitment and that of Gov. Hunt to see some real coastal management improvements. They have a high level of expectation about what the department and other officials in the state can do to achieve that. Gov. Hunt's Executive Order establishing the Year of the Coast and the Coastal Futures Committee are another indication of the level of vision and the level of expectation that's placed upon us as individual citizens, as state agency people, as scientists and as users of North Carolina's precious coastal and ocean resources.

The commitment in the department is a particular key. In the Division of Coastal Management we have an opportunity to put together a four-year strategic plan. We want to develop a long-term integrated plan for the coast and ocean. We see major program improvements in wetlands and how we deal with cumulative and secondary impacts. We want to identify areas with high impact that warrant a special area management plan. We want to look at coastal water quality and nonpoint source runoff in our watersheds and river basins. We want to take an important next step and integrate what we do on the shoreline and estuarine areas with ocean resources. There's not a line that says this is coastal and this is ocean. It's all related.

This conference is partially sponsored by taxpayers' dollars that went to Washington and came back to North

Carolina through a grant from the Federal Office of Ocean and Coastal Resources Management. We are using this conference as a kickoff for an ocean resources management plan for North Carolina. We want that plan to be based on the resources that we have, on scientific evidence, on what people think is important and on what they realistically think needs to be done. We want to protect the long-term values and benefits of the ocean resources and make sure that what we do on the land and in the ocean supports that. We want to ensure that there's wise use and conservation as well as management for those resources. We want to improve communication and coordination between not only state, local and federal agencies, but the research community and the users of the resources too.

We do have a task force that puts the users of our resources in communication with state officials who need a reality check on issues, conflicts and problems. That group numbers 20 and includes scientists, state and federal agency resource management representatives, commercial fishermen, recreational fishermen, divers and environmentalists. This group is going to help us identify other users, other needs and other expectations so that we can put together a sound resource management plan.

I think we do have a very important window of opportunity. We have state leadership from the executive office, the legislature and the state agencies to help us realize an integrated vision for coastal and ocean resources management. It's not so important for me to stand and tell you what the plan will cover as it is for me to understand from you what the plan needs to cover and to work with you to make sure it does indeed become reality.

MANAGING THE COASTAL OCEAN FOR THE 21ST CENTURY: NORTH CAROLINA'S ROLE

A PANEL DISCUSSION

GENE HUNTSMAN: I do have some comments on how we might cope with fisheries and fishery management in the coastal ocean, particularly in the federal ocean. I want to speak specifically about the cost of managing fisheries.

I see that fisheries management has five or perhaps six levels of cost involved. The first is data collection. Second, we have to analyze that data. Third, the management process itself consumes resources. Fourth, the fishing public has values foregone as we manage and rearrange the taking of fishery products, and there's a cost for public education as we try to explain to them why they need to make the sacrifice. Finally, we must enforce whatever regulations that are in place. Of these, only one is adequately funded. We seem to be able to afford all the means it takes to manage fisheries. That's the only one that has the ability to get the job done.

There's one that's the basis for all others; that's data collection. One would think that at least we knew what we were taking from the ocean. That's not true. We do not know what's caught. We don't know the sizes or the ages of what's caught. We don't know attributes of reproduction or growth. Now, this isn't absolutely true, but in the big picture it is.

None of these rather simple-minded aspects of descriptive biology are currently fashionable in funding circles. Today's top funding proposals do not include a description of the growth rate of a snapper. Yet, we cannot develop a master plan for a snapper without knowing how fast they grow.

The fourth thing one needs to know are community relationships. What are the ecological factors framing the production of fishery products? That really is significant.

So we have none of the bases for understanding and supporting fisheries management. The reason we don't is that no one seems willing to pay for those. That's interesting to me because we are extracting a product from the public domain which has value. Yet there is no user fee that's in any way significant that returns to the management of the product. For virtually every other public resource, especially in the federal domain, there is a user fee — grazing, petroleum, timber and waterfowl. Federally owned lands all have significant under-priced fees attached to them. Yet fisheries are a publicly owned product that we give away, and the extractor has only the cost of hauling it home. That's not

trivial. That's not to understate the hazards and hardships of fishing, but it certainly puts fisheries in a different category in terms of management than all these other resources.

If we're going to understand and manage these resources so they're sustainable, we must pay for the acquisition. If we cannot extract a user fee, then the populace as a whole must bear the cost. And yet, recent administrations have seemed unwilling to make that contribution. The Reagan administration repeatedly sent a National Marine Fisheries Service budget of zero to Capitol Hill each year. That's serious. Congress would then rebuild the next budget to keep us in business.

If we're going to have adequate fisheries management as a part of managing the coastal ocean, we must have a way to pay for the data collection needed to manage fisheries.

MIKE ORBACH: Where's the money going to come from for this? Let's presume that Gene is right, that it takes more money to proceed in a rational way to satisfy all the interests and conserve the resources to the level that we think they should be conserved. Where's it going to come from? Let's assume that's going to take more than we have now. Should we reduce fishing? Should we eliminate waste? Let's assume we've done that and are an order of magnitude below the resources we need to manage. Where should that come from?

MELVIN SHEPARD: For years, we've collected a tariff on gill net netting coming into this country and a double duty for those who could not fairly compete with U.S. manufacturers of that product. Where is that money going? A tremendous amount of seafood coming into the United States competes unfairly with products that we are limiting. I don't know why there cannot be a tariff on seafood from other countries that competes directly with ours. I think it needs to be explored.

MIKE ORBACH: What do you think people would be willing to consider, assuming they knew that the money was going to go to a productive use?

MELVIN SHEPARD: Our clammers are in a terrible situation. Almost 50 percent of our shellfishing areas were closed during the first 90 days of the year because of stormwater runoff. We have 377,000 acres of product in North Carolina permanently polluted. I use the term "permanent" in quotation marks.

Our clammers say, "Pay us to move these clams from polluted areas from a fund that we have created."

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JOHN MAIOLO: We were losing about 5,000 acres of shellfish a year to pollution. We looked at relay as an alternative. As an interim measure, it works. But we found that with an increasing permanent population and increased pollution there may soon be no place to relay shellfish that's not polluted. In the last decade, all shellfish waters were closed two or three times. We have got to reverse this process because soon there won't be any place that's not polluted.

MELVIN SHEPARD: On Wednesday night I told the CAMA folks to stop doing surveys and to stop asking what other states are doing. Let's look at our scorecard. Our score card is we're losing marshland. We do it every day. We're filling wetlands every day. We're losing our assets every single day. Let's do something about that, and we need to do it in a hurry.

The analogy I used Wednesday night was a 10 percent tolerance on clams. Clammers could have 10 percent undersized clams or 25 out of that 250 in every bag. From now on a clammer is allowed what? Zero. We allow the development, and I'm not anti-development. We tell developers in advance how much marsh they can fill. Why can't that be zero? If there are circumstances that these people need some help on, why can't that be taken up as a single exception? But we've got to stop that encroachment.

Gov. Hunt asked for citizen involvement. Unfunded, we have started an Adopt-A-Creek Program much like Adopt-A-Stream. Very shortly, we'll have somebody watching every single creek in the state. When that happens, we're not going to be happy when we see somebody filling a section of marsh. Division of Coastal Management and the Division of Environmental Management are going to have a lot of heartburn. I think we have to do that because what I hear from every division in the state is we don't have the manpower. But we're going to supply that. We want the state to stand behind its regulations.

MIKE ORBACH: I think that point about what citizens can do without government involvement or funding is a real important one. At East Carolina University, we've had a citizens' water quality monitoring program. There is a group called the Surf Rider Foundation that's created a task force to monitor water quality while they are recreating. I think there's a tremendous need for that.

GENE HUNTSMAN: If I'm not completely mistaken, there is a tariff on imported fishery products called Kennedy

Tariffs that have been in place since the 1960s. Funds are collected and devoted to the development of fisheries, often product development. It's not that we don't have a tariff; it's just being used in a different way than you proposed.

RICK DUNFORD: If indeed new funds are needed for developing the type of management plan that we think is going to be needed, it seems that we have two choices. One would be to reallocate the existing funds that we have in the public sector into this type of work. As we know, that's a difficult task because there are so many good uses of limited public funds that are available. The other alternative is to increase the funding in some way and have it earmarked. Again, that's a difficult prospect. Nobody likes to talk about tax increases or user fees. But if you were going to look at that second alternative, it makes some sense to look at who benefits from any coastal ocean resources. That would include commercial users as well as the public who come to the coast and use the services. There may be fees associated with rentals of properties or other sorts of uses with the services of these resources.

WALTER CLARK: There's a name for our state's assets — public trust assets. Public trust is a very big issue. We're dealing with whether or not we should have leasing fees in the state. We do have some leasing fees now for using public trust land and waters for aquaculture. We don't have any leasing fees for other uses of public trust waters, such as the beach. People argue that they do the same thing. They disturb public trust resources. Why shouldn't they be paying a fee? Fish are public trust resources. It may be that we come to a point when we look at fish and say we do need a user fee.

Public trust as an issue that the state needs to give more thought to, in terms of its lands, its waters and the resources in the waters. The state needs to develop common sense policies to gauge whether or not we need to charge people who get an advantage from using these public resources. That's something we need to put some thought into in the near future.

ROGER SCHECTER: The data used about the loss of filling in coastal wetlands underscores the need to have sound data based on real field conditions. Coastal marshes are highly regulated by the state and federal government. It's easy to get good data on land-based estuarine resources. But we haven't agreed as to why we need that data and how we're going to manage it. We're very

good at what I call one-dimensional management. We manage septic tanks. We manage discharge. We manage coastal development. We manage fisheries. We need to manage all those things together a little better than we're doing now. I think that is a challenge to all planners. You must manage a resource in the context of others. I'm not just doing coastal management. I'm dealing with other people, individual citizens as well as federal programs.

RICH CARPENTER: I want to respond about the relay of shellfish from the public waters. The Division of Marine Fisheries presently undertakes a very limited relay program during the spring for oysters and clams. To have any large-scale relay system, you have to have a closed season on a particular species. We do have a closed season on oysters. We do not on clams. There's a very large resource there that could be used. I think we'll soon see a closed season on clams.

MELVIN SHEPARD: Several people have mentioned the outer coast. As far as fisheries and fishermen are concerned, let's go real deep. The biggest qualm I have with the Magnuson Fisheries Management and Conservation Act is that they omitted a uniformed data collection system for all states. Now they're angry and quarrelling with each other. In North Carolina, we're having a hard time pushing a data collection system through the General Assembly. Some people do not want it. We don't have the information. I think everybody agrees with that, and it's absolutely necessary. We cannot manage without it.

MIKE ORBACH: Karen (Gottovi), one of the issues that comes up regarding funding is the issue of dedicating funds to certain purposes. From my reading of the General Assembly, they've been historically reluctant to create dedicated funds from money. Can you comment on that from the General Assembly point of view?

KAREN GOTTOVI: In general, fees go to support programs; fines go to the general fund. That's because fees are more certain than fines. We're not very good about fining people and making those fines stick. We tend to be very lenient with people who pollute and destroy resources. But I think that it's fair to say that fees can be dedicated to support certain programs.

MIKE ORBACH: What about the replacement problem? When a program becomes fee-supported, does it no longer receive general fund appropriations? Is there any way to deal with that or do you do it on a case-by-case basis?

KAREN GOTTOVI: Every agency is responsible for developing a budget that takes care of the needs of that program.

But fee-supported programs usually aren't self-sufficient. That's true in a lot of agriculture programs and labor programs. We've been raising fees this year in the budget process. You've also got to have some advocates for these programs among the legislators. It does take people who know something about the program and who believe in it to make sure that the programs are funded adequately.

DAVID WEBSTER: I think we've made a lot of progress here. We've talked about things that are important to resolving the conflicts that will arise and have arisen the last few decades. I think it's increasingly important that we include constituencies of the state in all deliberations. I'll give you an example of why that is important.

The U.S. Fish and Wildlife Service wanted to reintroduce red wolves in the Land Between the Lakes in Tennessee and Kentucky a few years ago, and they didn't get the local people involved. The process fell apart.

— The Division of Marine Fisheries wanted to start using turtle excluder devices. They didn't include the inshore fishermen in those deliberations. It caused concern and legal problems that postponed the implementation of TED usage for a few years.

It's not as if there is no relationship between turtle mortality and shrimping. It's very evident as I ride Wrightsville Beach, Masonboro Beach and Bald Head Island. I see the shrimpers within a mile of shore; and I see dead turtles on the beach. I roll them over and step on their plastron; foamy water comes out of their nostrils. They've drown. We had a dolphin and two turtles on Topsail Beach this week that were shot. There are still conflicts that have to be resolved relative to these examples.

The five species of sea turtles, the 30 species of cetaceans, the harbor seal and the manatee range beyond North Carolina borders. But we're obligated to deal with those species because they're all protected by some law of the federal government. Since they have broad distributions, most of the research funding on those species has come from federal level and not from the state level. We know a fair amount about many of these species. There are some unresolved issues that need to be studied, and some are very important in how we decide to manage them. But we know enough, I think, to begin the process.

As a scientist, I have sometimes been reluctant to

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publish a paper. I wanted to wait another year to gather more data, but somewhere we have to say enough is enough. I think in many cases we have enough data. That's not to mean that more data isn't needed. It certainly is, particularly with certain species. But in many cases, we already know the situation and see the overall trend — the AIDS-like calamity with the dolphin die-off in 1987 and 1988 and the emancipated sperm whale that washed up at Wrightsville Beach.

About impacts, I think they are very appropriate, but I'm reluctant to limit them just to the users. We need to come on shore. We need to work with people who are impacting these environments but aren't directly using them. I think of agricultural runoff and nonpoint pollution. I think of drilling wells in maritime forests. We have no idea what kind of effect that's going to have on the hydrogeology of those communities. Although we're dealing primarily with the ocean, particularly the nearshore and inshore waters, these areas are impacted directly by what goes on in upland environments. We can't just limit it to wetlands too. We need to go beyond that.

We need to develop an environmental ethic during the next decade. Then we will not only be able to resolve these problems but will be able to come to a better understanding among our colleagues about what the problems are and how to deal with them. This is all a very obtainable goal. It's just going to take some level heads and some time.

MIKE ORBACH: I worked with the public involvement portion of the Albemarle-Pamlico Estuarine Study. We did bumper stickers, radio talk shows, posters, presentations in schools and public meetings, and "Open Net" television programs. But after five years, people still say, "Nobody knows about this program." How do we get the public involved in things like this? This is going to be critical for this ocean task force. It's going to be very important because most people don't get out in the ocean. How do we do that? Does anybody have any thoughts or experience?

ANDY WOOD: A quote comes to mind: "When in doubt, do something." We're in doubt, and we're not doing anything. The public is not aware. We need to increase awareness. Until people are aware that our ocean and coastal resources have problems, they're not going to understand. And until they understand, they're not going to appreciate them. We suffer from diminishing

expectations in a community that deals with the resources we have. America and its citizenry live a life of luxury compared to the rest of the world. We can afford to do something. We can afford to support Dave Webster's work with turtles.

In Central America, who are we to tell them not to eat a sea turtle? We can afford not to eat a sea turtle.

We have the second largest estuarine system in the country, but we don't have the protective rules that states with smaller systems have. We take what we have for granted because of its size.

How do we get the public involved? The quickest way to involve the public is to have a crisis. We can wait until a crisis and seek public involvement. Or we can tell the legislature that we want to dedicate funds to certain coastal needs and that we want to fine violators of coastal regulations significant fines.

MIKE ORBACH: Andy, telling the legislature implies that somebody knows and cares about the issue. The question is how do you get people to that point? Maybe the answer is everyone is educated enough, and they simply don't care. If so, we get what we deserve, right? Is that the answer?

RAVI SINHA: I have been a teacher at UNC-W for 20 years. We produce students who know about wetlands and marine biology. They can educate the public. Journalists write about the environment. But I don't see students writing about it. I don't see professors writing it. They should, in my opinion. We need more environmental forums to increase awareness, so the public is cognizant of why we need funding to do certain coastal projects.

KAREN GOTTOVI: The Greater Wilmington Chamber of Commerce has invited the legislature to Wilmington and Wrightsville Beach this weekend. The papers have called this a big waste of money. I think it's a tremendous investment. There will be more than 70 here. They will learn about the ports and about the marine science program here at UNC-W. The Society for Masonboro Island will be distributing brochures. The Wrightsville Beach town council will be talking about their problems too. This is a tremendous investment, and I hope you see it as such. It's coming out of private funds, but this is what has to happen. We have to get people to the coast to understand the dynamics of what's going on, and we have to tell them what they're seeing.

MIKE ORBACH: I'm really pleased to hear about that. The best public education comes from the school system and

things such as the aquariums. We do, however, need to reach people who are out of school and don't come into the aquariums.

PETE COLWELL: I think a lot of the users of our resources are not North Carolinians. They're investors and vacationers from out of state. How do you teach these people about the value and importance of our resources and our attempts to want to protect them? Until they run afoul of our regulations, most are ignorant of them. We have a lot of passive educational forums — the aquariums, the parks and others. We need more active educational programs. We need to go to tourist bureaus, builders, realtors and people who are actively in contact with these users. We need to explain the importance of wetlands, coastal management, ocean setbacks or other issues. We can possibly educate these folks through the people they contact when they come to invest or rent.

MIKE ORBACH: Some states, for example Maine, has a law that says if you buy property or a business in a coastal area then you get a consent form. It states environment conditions and asks if you understand them.

DAVID WEBSTER: I want to respond to Pete's suggestion. We've been contacting realtors and asking them to provide information about sea turtles to their renters. We want renters to remember to turn off their lights at night so that the hatchlings won't crawl into the highway. It hasn't worked. They usually don't read that material until they go home. Then it's too late. And when they leave, they leave all the floodlights on outside.

RICK DUNFORD: I was wondering if we could take lessons from the recycling folks. That's a big success story. A few years ago there were very few people, almost a fringe element, who were recycling. It seems today that almost everybody is doing it. You feel like a social outcast if you don't. Your neighbors are all doing it. You better do it or else you may be in trouble.

Three key elements made that program a success. One is educating people on why it's important for them. Why should they do it? Why should they care? Secondly, we need specific action items that people can do to help. Thirdly, there has to be a partnership formed with government. Local governments have made it easy to recycle. They bought special trucks that come by to pick up bottles or cans. There's been a partnership that's formed.

ROGER SCHECTER: If I can use your analogy, let's remove the word recycling and insert ocean research management in

its place. Five or six years ago a lot of people were talking about recycling. It was wonderful. They had to do it because it was good, and it made you feel good. We pulled together the legislature, state agencies, individuals, municipalities and private industry to implement recycling. Now, people are actually doing it. People are striving for the same goal, and we have a state law that requires a percentage of our waste be recycled. We have a state executive order that requires state agencies to recycle. There was disagreement about what is recycling and what is it not. But eventually there was a consensus.

If recycling is a good analogy, we have to get specific. Recycling is one source. For ocean resources and coastal management, it is very difficult to get a consensus on what the problem is, much less the solution. But we're at a point in North Carolina where we have that level of interest — where we have roles that people can play to pull this together much the same way as recycling.

GENE HUNTSMAN: Twenty years ago, I encountered the evolution of public involvement. I, under the mistaken assumption that it would be fun, agreed to be on the N.C. Coastal Resources Commission. Little did I know that I would be subjected to years of soliloquy and parables by the great champion of public involvement, David Stick. Dave was a wonderful man, who thought public involvement was the way to go. We took the coastal management program through an extensive series of hearings, making all the towns and counties have them. The effect was zero. The only successes were towns that gave away free barbecue dinners. They got people to come. But we discovered you can only educate and lead so far. As with recycling, you've got to push and put in some rules that hurt. Then the real education process began. How do we get people to deal with the APES plan? When the APES plan has some teeth in it, people will learn what it is you were trying to tell them. Until you're ready to take the heat to get your program out and have people to respond to it, I doubt that you're going to have an effective program. You've got to get to the implementation phase, and that's where the real education occurs.

MELVIN SHEPARD: During the budget crunch for the Division of Marine Fisheries, one of the first things that was eliminated was The Tarheel Coast, a paper that informed fishermen about things they might expect to happen and public hearings. Now there's a void of information, and

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we're set in an adversarial position.

JOHN COSTLOW: I recently saw the results of a survey that I find very disturbing. It suggests that we have failed in our efforts to educate the public. This particular study offered people on the street a chance to associate a variety of issues. I saw the results of this study. People are confused. They don't see any relationship between expanded population growth and land use or sewage problems. If we're going to educate the public on the issues addressed here, we need determine what we've been doing wrong and come up with some new ideas.

MIKE ORBACH: We often don't know what the public is thinking because we only hear from a small part of the constituents.

MARIAN MCPHAUL: One way to find out what people are thinking is to access the media. What if you began a weekly environmental program as a service of public television. If you had a call-in show, people would get involved. Secondly, I think you should have an 800 number where people can report things. They don't know whom to call. They call one agency who says it's another agency's responsibility. Thirdly, we should get Carolco to produce a movie.

MIKE ORBACH: The Division of Marine Fisheries has an 800 number, doesn't it? But we need to let people know what that is.

MARIAN MCPHAUL: Make that 800 number more broad-based so that anyone with environmental concerns could call. Have a screening process and acknowledge the calls. I think you would have a lot more input.

WALTER CLARK: We haven't really used the media as well as we could. Remember the anti-litter commercial with the Native American crying. Those commercials were very effective, and they did a lot to curb littering in the state. I think we need to look at those media tools that reach large audiences and with some emotion. Perhaps we need some advice from the media themselves about how to do a better job.

JOHN LEONARD: No one has developed a coordinated marketing strategy and put an umbrella over what we're trying to do here. That's what they did with recycling. We need to develop our message and market it. Also, state and federal agencies don't always market themselves and what they're doing as well as the private sector. We have an ocean constituency, but it's very small. We need to develop a marketing strategy to reach them and to energize them.

ROGER SCHECTER: When Gov. Hunt signed the executive order declaring this the Year of the Coast, that seemed to open the door for celebration, questions, education, science and opinion forming under an umbrella that would educate people and arrive at solutions in the summer of 1994. I was encouraged by the participation. It's not just coastal leaders looking at the North Carolina coast. Everyone is going to be focusing on the coast, and that's good.

JOAN WELD: I was appalled to learn that there is no public information office at the Division of Marine Fisheries. Although our budget is tight, it will be the first new position that we will create, and we're going to look for someone creative to take that position.

ANDY WOOD: North Carolina is unique in that it has three public aquariums dedicated to increasing public awareness and understanding of aquatic resources. North Carolina is set up with a program to do exactly what we're talking about — educating the public about aquatic and marine resources. Other ways to do that is through the media. Big Sweep is a classic example of the success of working with the media.

I would suggest that we would turn the focus around on some of the issues. Instead of whales, let's talk about brill. That's what I do in my programs. I don't talk about largemouth bass; I talk about mosquitoes. Without mosquitoes, there would be no largemouth bass. Without mosquitoes, there would be no mosquito fish, no Bass Anglers Society and no multimillion dollar industry based on largemouth bass.

The fiber optics network in North Carolina is going to be instrumental in promoting our message.

But despite technology, we need to keep our message simple. If we get too complex, we're going to lose people.

STAN RIGGS: There are lots of pots of gold at the end of the rainbow in our coastal ocean. As a society we are getting to the point where the pressures are building, and the needs for utilizing these resources are increasing significantly. Any management plan has to take into consideration all resources — living and nonliving. It's critical to understand the trade-offs and the consequences associated with management and exploitation of any nonliving resource. This is an interactive system, and everything is interdependent. We have to understand the system. We can't take it out component by component. We can't deal with turtles without dealing

with beaches. We can't deal with fish without dealing with rocks and nutrient fluxes. It is a single interactive system, and we have to manage the whole system, not a piece of the system.

To optimize the development, utilization and management of any resource, it is imperative that we have a knowledge and understanding of its occurrence, its distribution and the properties controlling the ecosystem of which it's an integral component.

When we develop these management plans, we have to think ocean. We can't think land. We're a land-based society. We have to start thinking wet. If we're going to manage them, we're going to understand them. When we talk about beaches and beach dynamics in my class, I ask the students to pretend they're a little sand grain in the surf zone. I think we have to do that in all aspects of our ocean system. We have to think from an ocean-based point of view, not a land-based point of view.

Consequently, if coherent management policies are to be devised that exploit living and nonliving resources, it is imperative it be accomplished and incorporate the following.

Our shelf sea is a dynamic interactive system with physical boundaries that begins in the rivers and estuaries and continues seaward to incorporate the dynamics of the Gulf Stream. The fluxes across these boundaries must be known and understood. The movement and flow through the inlets is important to all aspects of fisheries and nutrient production.

We must understand that the measurement and the effects of the exploitation depend on a knowledge of any preanthropogenic or prehuman involvement. We have to understand what was there in the beginning. This requires a coordinated, integrated approach that involves basic research, baseline studies, time studies and monitoring, all of which take money and time. You don't manage something unless you understand it, and I think we've got a poor understanding of our system at the moment.

In North Carolina, exploitation of our shallow coastal ocean is in its early stages. Therefore, we have the opportunity to learn from areas where development is in more advanced stages, such as in the North Sea where things have been in a disastrous state.

To optimize usage and maximize yields and to minimize environmental degradation, we must first

have a sophisticated, interdisciplinary understanding of the composition, dynamics and processes of our coastal ocean environment. The nature of our society and the economic structure we are dependent upon demands that we use our coastal ocean resources. As time increases, the pressures will increase. But we must understand them to utilize them and to manage them wisely with minimum environmental degradation.

DEBORAH SAWYER: You didn't comment on the discharges that will be part of that exploratory drilling of wells.

STAN RIGGS: I think the problems associated with the discharge of contaminants is nothing compared to what we're doing now with dredging, dredge disposal and waste disposal. Our inlets are like massive sewers. I think it's a drop in the bucket, and I think we need to keep things in perspective. I'm not saying it's not a potential problem, but it's minimal compared to the other things that we're dumping in there.

Most of the things that are discharged from a drilled well are chemically inactive. Most are natural sediments.

Speaking of oil, I'd like to say the state missed an opportunity to wring money for research and education from the oil companies. They were in the driver's seat until they made the decision to develop an adversary relationship with the industry. Any nonliving resource should pay its way. There are ways that we can get funding out of the value of that resource. We should not be subsidizing industry. Taxpayers are subsidizing the research and environmental studies that are taking place out there now. I think the industry ought to pay for that. And I think the state could have learned more about the dynamics of the ocean had we approached it differently.

ROGER SCHECTER: I feel compelled to make a few comments. We don't ever want to find ourselves in the situation that the state, citizens, scientists and industry found itself in with Mobil Oil. We need to plan ahead. We need to figure what we want to know and how we can know that. We will have to make decisions and live with them.

MIKE ORBACH: We must decide what our relationship with the environment is going to be. That's changed over time, and it's going to have to change in the future. It's not just a matter of being aware; it's a matter of deciding how we want to relate to the environment. That raises all kinds of interesting questions.

JOHN MAIOLO: Several people in the audience and several

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speakers commented on the need for connecting user perceptions to policy. East Carolina University is conducting an impact assessment. One of the components is a section called a value perception of risk study. A variety of methods were used to elicit perceptions, evaluate components in communities and derive from them a "source of a change" in our coastal communities.

Data for this study was gathered in the coastal communities from Morehead City to Nags Head. The study also includes selected inland communities whose economies depended in some way on the coast. And we surveyed groups as far inland as Greensboro that depend on the coast for recreational activities.

We wanted to know how various constituents see the coast, how they relate to it and what they know about it. One interesting thing about the study was that for a variety of reasons we were not able to conduct the research in the typical survey fashion.

My worry, however, is not so much that we have the data. I think social science has done a good job in the last 15 years producing information on our coastal zone and fisheries management. I worry about how the data is used. Some of the remarks made the last few days indicate that we're not getting our message out, and we need to do something about that.

My charge was to address the question of conflict and separate that from what is acceptable competition. We've got to find ways to assess damages, establish standards and enforce them. I'm concerned about the funding requirements for the data and the policies we need. Also, we need to mobilize people within and outside the state to take a greater interest in our coast. Otherwise, five years from now we'll be in exactly the same place we are now.

MIKE ORBACH: What people think about the environment and public policy is really the crux of all of this. An example I'd like to use is whaling. When the United States was lobbying the International Whaling Commission to put a moratorium on commercial whaling, a study of environmental attitudes was done. People were asked, "If there is no danger to the species and if the products are fully utilized, would you favor allowing commercial whaling?" What percentage of the public do you think responded yes to that question? Seventy-two percent of a random survey of 4,000 people. At the same time, our negotiator to the International Whaling Commission was saying the American public demands a

full ban on commercial whaling. You have to be careful. The environmental groups are always being busted for creating a crisis to get membership. There are many organizations that create perceptions of crises to drum up support. Are we willing to do that? Do we need to do that? I think that's something to address.

JENNIFER STEELE: There seems to be basic agreement among everyone here that we have to begin managing the system as a whole. The need to integrate seems to be a very common theme here. Integration will help us be effective and cost efficient and to fill in some gaps that have been identified. We have most or many of the components already in place for an integrated system. We have a number of good solid laws. We have the commissions in place. We have division directors. We have dedicated staffs for those commissions. But how do we link these groups to arrive at an integrated ocean policy? We have fisheries management, coastal management, environmental management and wildlife resources management. What's missing is a larger umbrella tying them together and pulling them all, to use the wagon train analogy, in the same direction. I think when they begin to be pulled in the same direction, these gaps in data, education and efficiency will be filled automatically.

WALTER CLARK: When North Carolina passed CAMA, it envisioned that it would provide an umbrella for coastal activities. But it became apparent quickly that there were other commissions and agencies that had responsibilities, duties and legal mandates. There are jealousies in state government, believe it or not, to protect those responsibilities and duties. It would be difficult, for example, for the Marine Fisheries Commission to send its regulations to the Coastal Resources Commission to see if they met the CAMA standards. Maybe that's what needs to happen. But there would be a lot of fighting in state government about setting the Coastal Resources Commission as a super coastal agency.

The question is a great one. It's one that we need to explore, and hopefully our plan will lead to some answers or conclusions about how we can connect these seemingly independent packages together and derive a consistent holistic policy.

RICK DUNFORD: The key to a meaningful and useful comprehensive plan is that we integrate the information that is available and whatever new information that we can get. The presentations yesterday were very informa-

tive. But they were disconnected. Unless we get the different disciplines communicating and working together on this plan, it's not going to be successful. It's not going to be the stepping stone to implementation and integration. You have integrated resources, and unless this plan is an integrated plan we're going to miss an opportunity.

I work on damage assessments, and there are three steps to the process. There's the injury determination that is almost exclusively the domain of the physical and biological scientists. Next there is a determination of the effects of those injuries on the services provided by the resources and their uses. Typically, economists and the scientists work together to determine this. Finally, economists come up with dollar values to go along with the services. We hammer on the linkages to make sure that the scientists are doing studies that are needed to link with what the economists are going to do. By the same token, the economists identify gaps that the scientists need to fill for this process to link.

That's really the key. It's very hard to do because the sciences are crossed, particularly social sciences and hard sciences. There are a lot of different perspectives and approaches that are used. That's the challenge that we need to concentrate on.

I can virtually guarantee that we're not going to have all the data that we would like to have for ocean resources management. I've seen a few, not a great many, comprehensive plans. They're very good at saying what we do know. But they don't say much or don't acknowledge what we don't know, and there's a lot that we don't know.

Consequently, there are going to have to be assumptions made. And I think it's extremely important that the assumptions be made exclusive. They should be stated with whatever caveats are necessary. "We're not sure about this," or "We could use some information on x, y and z." But we have to make a decision. We have to move forward, so we've got to make an assumption.

It is very important to follow up our assumptions with a sensitivity analysis. You can go through individually or maybe in combinations and vary the uncertainties and assumptions and determine what's important and what's not. Clearly, at some point in these plans, we're going to have to focus on some priorities. We can't do everything. There isn't money to do everything. What should we focus on?

Also, by stating assumptions and what we don't know, it identifies the important gaps in the information base. If additional funding becomes available or if we can reallocate existing funding, what do we want to do? We'll get the biggest bang for the buck, if you will, by looking at the gaps we've got and the information we need to do a better job in coastal resource management.

STAN RIGGS: In response to the comment that we never have enough data, that's absolutely right. My demand for information really doesn't mean just collecting more data. We're making management decisions every day on projects and development plans. For example, they're pumping sand on Carolina Beach, spending millions of dollars. But at no time did we determine the consequences of doing that until there's a crisis.

Let's go back to Oregon Inlet. We're talking about spending hundreds of millions of dollars at Oregon Inlet, and nobody seems to care. The public does not seem to care about the long-term consequences of that management decision. If we're going to spend hundreds of millions of dollars, we ought to be able to spend a few paltry pennies to understand the long-term consequences of these management decisions. The same is true for fisheries. We respond to a crisis because we don't understand the system. We wait until the grouper are gone, and then we try to understand them. As a public, we need to demand that a certain portion of our investment go into understanding that system before we implement management plans. Otherwise, we end up fighting crises and fires all the time.

MIKE ORBACH: I was with NOAA when the Fishery Conservation Management Act was implemented. We tried to require fishery management plans to monitor and assess the affect of what they had done. The management councils lobbied wildly against that, and it was taken out as a requirement, which I always thought was interesting.

I teach all my students that courts are a natural part of our resource management system. The issue is how do people reach a consensus on these issues, and that's what courts resolve. The courts also play a role in determining if there is enough data. When people feel they've been injured because a management decision is incorrect, unfair or wasn't properly gauged, then the court decides if there was enough data. In the end, the standard for whether there is enough data is applied by the court. I think we need to realize the court is the

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ultimate arbiter of our resource management decisions and treat it as a natural part of the system.

GENE HUNTSMAN: In my earlier years of coastal management, there was a constant fear that we would be sued. Nothing better ever happened to CAMA. We had a suit within the Carteret County Superior Court that ended in the state Supreme Court. Once it was out of the way, then we proceeded with the plan.

WALTER CLARK: Sometimes it's a double edged sword.

Sometimes they give you answers you like; sometimes they give you answers you don't like. But they give you answers nonetheless.

MIKE ORBACH: But like it or not, the courts make decisions, and those decisions are binding.

WALTER CLARK: They give some sort of pathway to follow and some direction.

MIKE ORBACH: It does resolve bickering and allow you to move forward even if you don't like the exact framework.

WALTER CLARK: I'm going to start by answering the question raised earlier about drilling rights. I want to say basically that two wrongs don't make a right. Stan is correct when he says that there's a lot of environmental damage that occurs in North Carolina regarding dredging. Maybe we need to look at our laws and regulations that manage and regulate disposal of dredge waste, but you can't use that as a reason to say that we should drill. We cannot ignore the impacts of drilling. What you have to ask is: "Are the laws that deal with disposal of waste applicable to the drilling of oil and gas?"

I want to get back to what Bob Knecht said last night. He said to ignore legal jurisdictions and think about what you want to do as a state. How much ocean does North Carolina want to influence? What sort of activities do we want to allow? What are the pots of gold that we want to go after? Do you want to have ocean mining? Do you want to manage fisheries more strictly? That's important. But you have to get back to the laws because laws are how we manage those pots of gold and the activities that are involved in achieving them.

I am proud of our coastal management program. Yesterday, I may have seemed critical of it, but I think we have an excellent coastal management program in this state. I think it provides us with a very good opportunity to delve into the arena of coastal ocean management. CAMA gives North Carolina the authority to reach out into the coastal ocean and manage activities. It's an

excellent model; one I think we can use.

But there's still the issue of other laws, other regulations and other conditions. How do we bring those in or should we bring those into the coastal management program? That's going to be difficult, but I think that's one key to explore. Perhaps we need an intercommission between the commissions that manage marine fisheries, environmental management, water quality and coastal development. Unless there's cooperation in trading information, these commissions are going to continue to act in a vacuum.

I want to mention a few weaknesses that I have encountered in my coastal management work which need to be addressed.

One is predictability. I did a study for the Albemarle-Pamlico Estuarine Study. One of the reasons for doing that study was to provide information on how our waters are used. There are areas where you may not want to engage in certain activities because there's going to be significant environmental harm. But for other areas, this activity may not have an environmental impact. The idea was to draw this information together and create a management zoning program so that people could predict what activities would be allowed where. I think that's important for the ocean too. We need a policy that will provide predictability for ocean users. Without that, our planning process will be weak.

I think we need to look at our state commissions and what they do. We have three main commissions that deal with the coastal ocean. Those commissions are making regulations and affecting people from different walks of life. I think maybe it's time that we revisit those laws, look at those commissions and see if that system is working as it should. Perhaps that's the opportunity for an intercommission.

But in the end, you must have enforcement. You can have a wonderful management program, water-use and ocean zoning and commissions that work together. But unless you can enforce the positions of those commissions, everything fails because there's no mechanism driving it. A plan is important and necessary, but the mechanisms to make it work are also crucial.

DAVE ADAMS: I'd like to make four brief comments. First, I'd like to thank the people that put this conference together. I've been to a lot of conferences, and I think that this has been outstanding. The information presented has been

very factual and direct.

There's been a lot of discussion about the need for education. I'd like to make the distinction between education and advocacy. An educator provides facts and information to people in hopes that it will precipitate some type of action. An advocate, on the other hand, has a position to relay and a specific response in mind. When an educator becomes an advocate, the data sometimes becomes biased. When this happens, the cost of correcting misinformation is far greater than the cost of getting the correct information in the beginning. And often correcting misinformation comes at the cost of getting out new information.

Third, there's the relationship between agencies and citizens. Bob Knecht said that people who are formulating the plans and implementing them are agents of the people. They have an obligation to get and consider input from citizens. But no one mentioned citizens supporting the agencies. In resource management, people seem to constantly berate agencies instead of supporting them.

Finally, how do you stick all these pieces together? One of the least cost-effective exercises in government is reorganization. It's the most disgraceful use of resources that I can think of. The problem is not one of organization. The problem is one of administration. The answer is not one of planning a better organization for the government. But, instead, insist that administrators, particularly at the higher levels, do their jobs.

ROGER SCHECTER: I think leadership, commitment and more importantly, tenacity is what we need. We've got to have consensus of what we want, not total agreement, but consensus and the leadership to carry out the plan that addresses the end point that we want. I don't believe in statutory enforcement and reorganization. It's commitment, tenacity and leadership.

RICH CARPENTER: As far as diversity of fisheries, North Carolina is well situated because you get northern and tropical species. But it compounds management problems. So it's essential to increase cooperation and participation in regional fisheries management activities.

In the last 10 years in the fisheries in North Carolina, we've seen more effort and impact in the ocean. As managers, we need ways to reduce pressure on the resources that we're managing. And that can come in a variety of tools and information.

There was talk about the lack of information as far

as management. We need economic impact information. We need to know how decisions will affect fishermen economically. We don't have that detailed information. The other pressing issue that we talked about is a licensing structure. That would be a vehicle to obtain better insight on the impact that we do have on the fishery resources.

It would be nice to have a system that did a better job of anticipating problems, but unfortunately we don't have that. So you employ various tools to deal with those problems. Sometimes you use traditional tools such as size and catch limits; other times, you use new tools such as limited entry. Also, we need to do a better job of doing what was alluded to yesterday — manage on a community scale rather than individual species. Another tool is spacial separation or zoning. Our commissioners recently gave the director the authority to zone to try to reduce the competition conflict.

But the most pressing need is for information to give our commissioners to make better decisions.

MIKE ORBACH: Someone said yesterday that the western wall of the Gulf Stream could be one boundary of our stewardship area. But how do you define the northern and southern boundaries? If you define it by fish, migrations would be Nova Scotia to Florida. That's not counting billfish and large sharks which reach to the Azores in Spain and Africa. It's going to be tough defining a stewardship area for our resources here in North Carolina.

DONNA WIETING: I wanted to comment on one of the opportunities that we really haven't focused on here for state and public participation and influence on federal activities. That's the National Environmental Policy Act. Any time a federal agency does any action — the Corps of Engineers issues a permit or the National Marine Fisheries Service issues an amendment — they have to do an environmental assessment or impact statement. There has to be public participation in those activities. That's the way interested people and environmental groups can affect fishery management decisions. It's a great way for many public groups to get involved and to weigh in on federal activities.

WALTER CLARK: There's also a state environmental policy as well that is used for the same purpose.

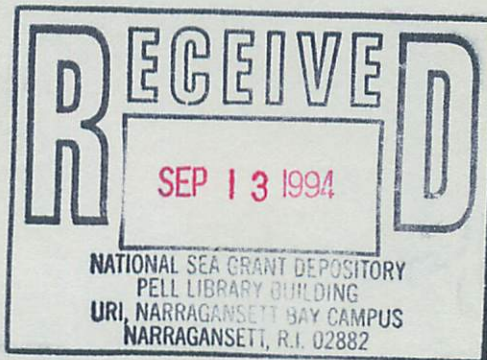
JOHN MAIOLO: As a member of fisheries commission, what do you see is the commission's role or the agency's role is in dealing with competition?

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MIKE ORBACH: The federal law and other states fishing laws specify that social and economic factors as well as the biological are justifiable bases for management regulations. North Carolina's law is not so specific or clear. Although we are getting more readings from the attorney general's office that we can do that.

I insist that people separate a conservation issue from an allocation one. In many cases, people will mean one thing and call it the other for a variety of reasons that can lead to problems. For example, there's gamefish status. Gamefish means you declare a certain fish off limits for any commercial take. It's only available to recreational users. It depends on why you want to do that. If you have a concern for the stock, that may be a reason to do that. But if you don't control recreational activity, you're not solving the problem. But often people do it for a different reason — to allocate those fish to one user group or the other. We can do either. But I demand that you know which objective you're addressing, and we state it. Some things the commission may simply decide not to use its authority to do. And if the General Assembly would like to have them done, then they're going to have to do them.

ROGER SCHECTER: I would like to congratulate the organizers as well as the participants in this conference. We've now held two conferences about controversial issues — ocean outfalls and ocean resources management. In these conferences, I've heard people talk about what the problems are and what the solutions are. That's extremely encouraging, and I hope that will set the tone for honest and effective problem solving for coastal and ocean resources policy.



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