

NORTH CAROLINA COASTAL FEDERATION

Vol. 20 No. 4
Autumn 2002

COAST

STATE OF THE

REPORT



A SPECIAL REPORT OF THE COASTAL REVIEW

Cover Photo :
NC Maritime Museum

COAST

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NCCF's Eighth Annual State of the Coast Report

The intent of the **State of the Coast Report** is to provide citizens who care about our coast with a tool to better understand the issues, challenges and solutions that are key to our coast's health. We hope this publication will move you to participate in the restoration and protection of our coast. To learn more, call the NC Coastal Federation at 252-393-8185. The opinion expressed in the **State of the Coast Report** represent the views of the NC Coastal Federation.

Acknowledgements

The publication of the **State of the Coast Report** requires a major effort that combines the expertise of many people. Special thanks go to NCCF's summer interns who did much of the research for this year's report: Ian Byrne of the *Duke University School of Law* and Sarah Gannon and Greta Hawkins of the *Nicholas School of the Environment at Duke*.

We are also grateful to the following people who contributed time and effort: Joan Giordano, *Albemarle-Pamlico Estuarine Study*; Wes Newell, *Backwater Environmental*; Jule Wheatly, *Beaufort Fisheries Inc.*; Glen Hargett, *City of Jacksonville*; Don Stanley, *ECU Coastal Institute of Marine Science*; Cheryl Oakes, *Forest History Society*; Dollie Carraway, Mel Gus and Rodney Kemp, *local historians*; Lisa Schell, *NC Clean Water Management Trust Fund*; Kelly Williams, *NC Division of Coastal Management*; Bill Swartley, *NC Division of Forest Resources*; Don Hesselman, Mike Marshall, Trish Murphey, Fritz Rhode, Lee Sabow and Sarah Winslow, *NC Division of Marine Fisheries*; John Dorney and Rich Gannon, *NC Division of Water Quality*; Connie Mason, *NC Maritime Museum*; George Gilbert and Patti Fowler, *NC Shellfish Sanitation Section*; Marc Basnight, *NC Senate*; Mitch Woodward, *NCSU College of Agriculture*; Deanna Osmond, *NCSU Soil Science Extension Service*; Jay Levine and Pat Donovan-Potts, *NCSU College of Veterinary Science*; Marian Smith, *Neuse River Foundation*; Bernice Rice, *oyster fisherman*; John Preyer and George Howard, *Restoration Systems*; Suzanne Godley, *Roanoke Island Festival Park*; Will McDowell, *Southern Environmental Law Center*; Chuck Bisette, *T.D. Eure Construction Co.*; Hans Paerl, Charles "Pete" Peterson, Shawn Powers, Hal Summerson, *UNC Institute of Marine Sciences*; Chuck Wilson, *US Army Corps of Engineers*; Tracy Rice, *US Fish and Wildlife Service*; and Ed Mitchell, *Weyerhaeuser Real Estate Co.*

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Citizens Working Together for a Healthy Coastal Environment

For more than two decades, the NCCF has worked with citizens to help restore and protect North Carolina's coastal environment. As the state's largest nonprofit coastal conservation organization, NCCF serves more than 7,500 members and 200 affiliated groups. The NCCF focuses on three main areas of work including habitat restoration and protection, environmental education, and the encouragement of sound environmental programs and their enforcement. To learn more about NCCF call 252-393-8185 or come by the NCCF headquarters located at 3609 Highway 24 in Ocean between Morehead City and Swansboro. Headquarters are open Monday through Friday between 8:30 am and 5:00 pm. The NCCF's gift shop, nature library, Patsy Pond Nature Trail and Weber Seashell Exhibit can also be found at this location.

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North Carolina Coastal Federation

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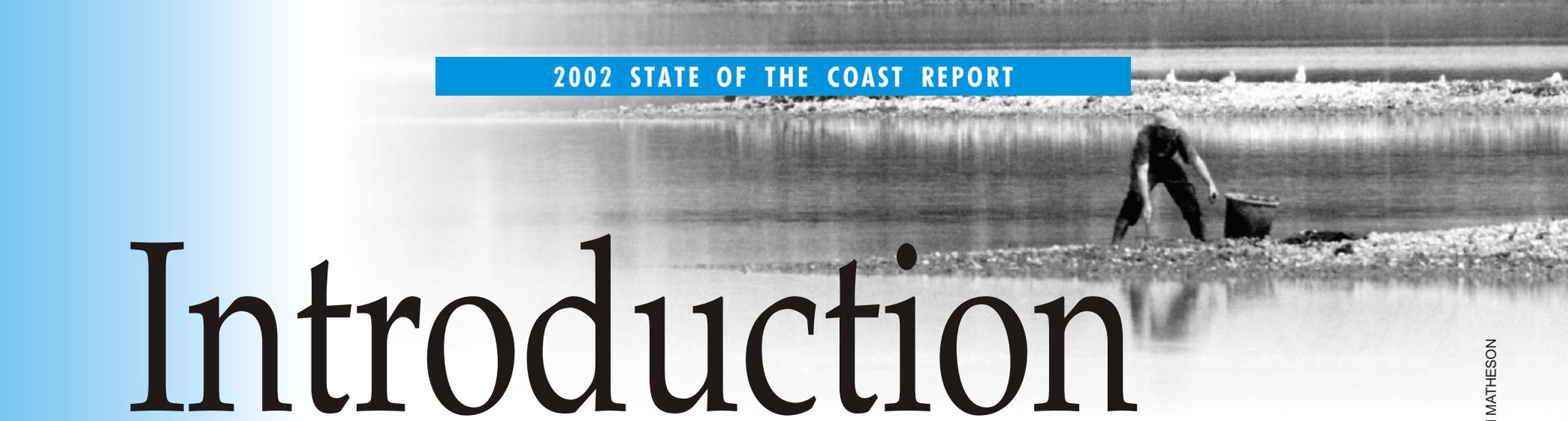
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Introduction

**By Todd Miller, Executive Director
North Carolina Coastal Federation**

ELTON MATHESON

*Why do oysters matter? For me, the answer is simple – I love to eat them raw, steamed or fried. But most people don't spend much time worrying about where they'll get their next oyster. They may even think oysters are a nuisance because they cut your feet and make it harder for your child to play in the water without getting hurt. But even if you're one of those people who can only eat an oyster by stuffing your mouth full of crackers and hot sauce, it's probably safe to assume you care about keeping the coast a healthy place to swim, catch fish, and watch egrets and herons. Oysters are the proverbial canary in the coal mine. What happens to them could happen to us. That's why in this **State of the Coast Report** you'll hear from real estate developers, fishermen, an owner of a menhaden plant, a state senator and others from a broad spectrum of coastal interests who think restoring oysters equates to saving our coastal heritage.*

The American Oyster is one amazing creature. Not only can it sometimes turn a speck of dirt into a pearl, but since the mid-19th century it has been an important commercial asset for waterfront communities from New Brunswick, Canada, to the Gulf of Mexico.

It thrives in coastal sounds, bays, and rivers helping sustain the economic and gastronomic vitality of waterfront communities.

This jewel of the coast grows underwater through much of its geographic range. However, from the Newport River in Carteret County to the east coast of Florida, it grows in dense beds along shorelines in the zone between high and low tide.

Vast reefs of oysters teem with sea life. You might find foraging on raw or steamed oysters one of life's simple pleasures. For reef dwelling fishes, crabs and shrimp, oyster rocks provide essential habitat as a refuge and source of food.

Almost 5,900 oysters, or 4.5 bushels, can grow

in an area of one square yard on intertidal reefs or rocks. These dense living rocks influence how water circulates within estuaries, directing tides thus stabilizing shorelines and fringing salt marshes.

Just one oyster can purify almost 1.5 gallons of water an hour extracting nutrients and sediment as they filter feed. When oysters were at their peak, they filtered and cleansed the entire volume of water on our coast every few days.

Oysters are great indicators of the overall health of the coast. It's a simple rule of thumb that any coastline with vast quantities of unpolluted oysters is in great ecological shape.

In other words, what's good for the oyster is good for the coast – as well as the people who reside on and visit its shores.

That's why it's particularly worrisome that since the start of the 20th century, oysters and the reefs they create have declined by over 99% in our state. This startling bleak statistic combined with pleas for help from watermen has caught the attention of Marc Basnight, president pro tem of the NC Senate. He recognizes the importance of oysters, and that their decline means that our coastal way of life is in real jeopardy.

There is serious talk by Basnight, other legislators, fishermen and scientists about a major new campaign to revitalize oysters.

This could be welcome news for the entire coast.

That's why we're focusing this year's **State of the Coast Report** on the amazing oyster and what it will take to restore it to our state's waterways.

While oyster restoration efforts are still in their infancy, it's critical to make fundamental decisions that will be the foundation for a successful recovery effort.

In this report, we examine what's happening to oysters in North Carolina, and even more importantly, what must now happen for them to recover.

Rebuilding healthy populations of oysters mean restoring and protecting our coastal ecosystem. This can't be accomplished by simply planting more oysters in hopes that they'll grow.

Oysters are dying because our coastal ecosystem is grossly out of balance. We've altered salinity patterns with ditching and paving. Stormwater runoff is polluting our waters with nutrients, bacteria, and heavy metals. Hundreds of miles of shoreline are now bulkheaded with walls of poisoned wood. The oxygen in coastal creeks, rivers and sounds is all too frequently depleted, creating dead water that is inhospitable to oysters and other sea life that can't move out of the way.

Like a sailboat that's turned over because it lost its keel, getting our coastal ecosystem righted and back into balance requires more than just tinkering with the sails.

The damaged ecosystem must be made whole again. This can only be accomplished by working watershed by watershed, creek by creek, sound by sound.

The blueprint for action to restore oysters is multifaceted and full of important priorities. It includes involving communities in rebuilding oyster reefs, and in restoring and preserving lands vital to healthy estuaries. Shorelines must be managed in a way that protects shellfish beds and fringing salt marsh. Contaminated stormwater runoff must be stopped. And, a shellfish hatchery is needed.

Within the following pages, we've detailed this blueprint and provided suggestions for how you can help restore North Carolina's oysters and the coastal environment.

In some parts of the world, oysters are treasured because they contain valuable pearls. Even though precious pearls aren't typically found in the American Oyster, the oyster itself is one of our coastal environment's most valuable gems.

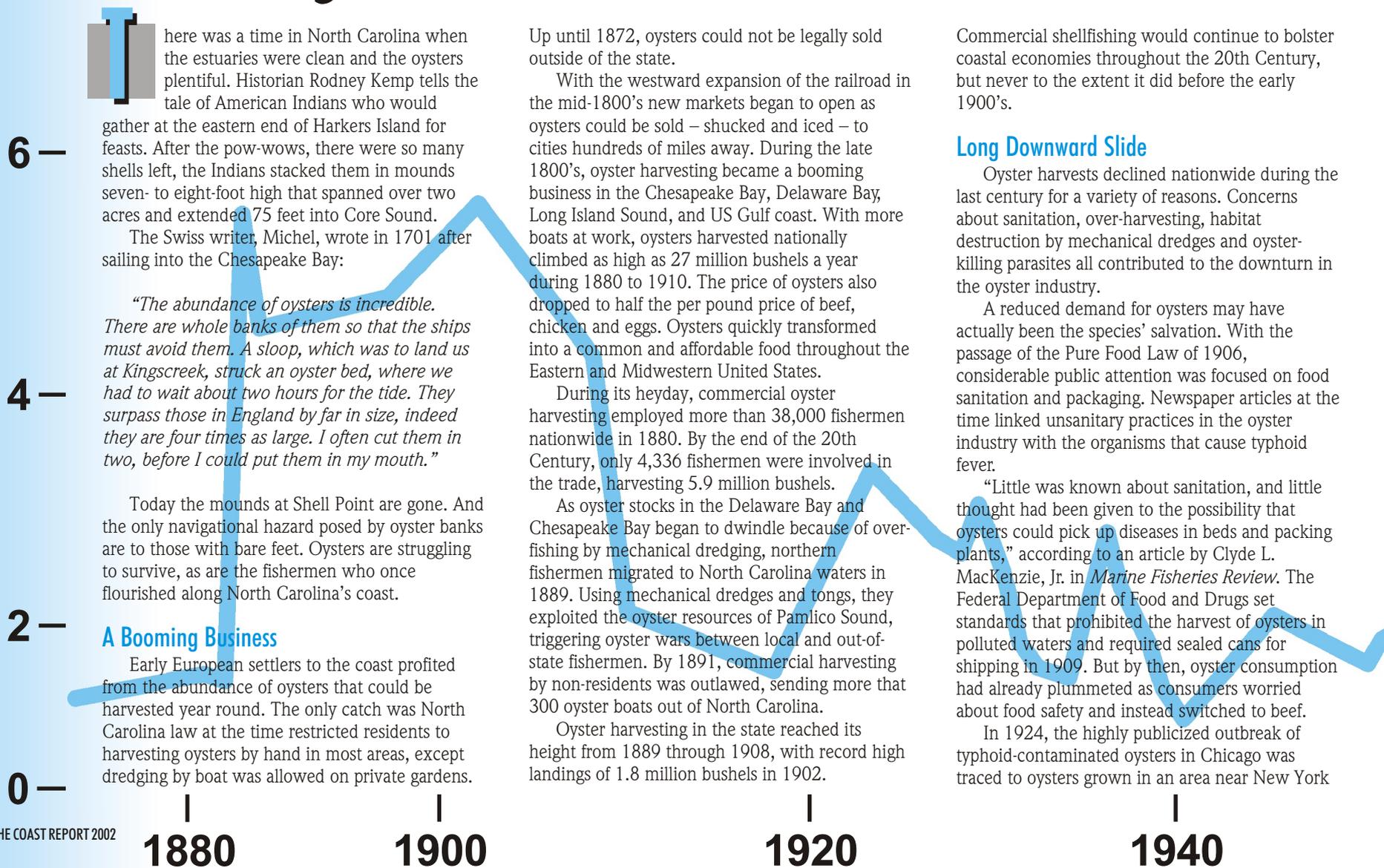
By acting now, we can restore the oyster to its original ecological luster and beauty. ■

The Rise & Fall of the Oyster



Oysters are piled high on the deck of a schooner in the Pamlico River in 1884. Source: NC Office of Archives and History

NC OYSTER HARVEST (in millions of lbs.)



City. A year later the US Surgeon General established sanitation principles that were the precursor of the National Shellfish Sanitation Program. The principles required all shipments of shellfish tagged to identify their origin, along with sanitary inspections of shellfish beds and processing plants.

The Shellfish Sanitation Section in the NC Department of Health and Human Services inspects oyster-growing areas to insure that water quality meets standards set by the National Shellfish Sanitation Program. If inspectors determine that water quality does not support shellfish harvesting, the NC Division of Marine Fisheries issues a proclamation closing the area.

All shellfish waters undergo a sanitary survey to determine whether the area should be open or closed. Shellfish beds near marinas and municipal wastewater outfalls are always closed.

About 1.43 million acres are open to shellfishing in North Carolina. Another 364,132 acres are permanently closed, of which 56,000 acres are in highly productive saltwater areas.

Another 50,000 acres of prime habitat are “conditionally open,” but shut down temporarily when it rains 1 ½ to 2 inches in a 24-hour period. Rainfall carries sediment, nutrients, fecal coliform bacteria and other contaminants into ditches and storm drains that funnel directly into creeks and sounds. For oyster beds, fecal coliform and sediment are the primary culprits. Excess sediment can bury oysters. Fecal coliform serves as an indicator that pathogens associated with typhoid, cholera, gastroenteritis, salmonella and hepatitis-A may be present.

On stormy days, Patti Fowler with the Shellfish Sanitation Unit checks rain gauges to determine which shellfish areas of the coast should be temporarily closed. “We can get several inches in one place, but only half an inch a couple miles away,” Fowler said. Once closed, “conditionally open” areas are reopened after water quality tests show fecal coliform counts are again safe.

The closure process is frustrating for fishermen because it makes it difficult to guarantee shipments to customers. If a downpour occurs before a delivery date, then the oysters in a “conditionally open” area cannot be harvested. But the Shellfish Sanitation Section plays a critical role by assuring consumers that the oysters they purchase are safe and wholesome to eat.

Water pollution is one of several factors that led to the decline in oyster populations during the last century. Overfishing caused oyster stocks to become depleted, while mechanical fishing gear dislodged or removed oyster-rock habitat. Mechanical dredges were very effective in harvesting oysters, but they caused long-term

damage to oyster reefs.

Since 1988, diseases that afflict oysters, but not people, have ravaged North Carolina oyster beds. A parasite known as *Dermo* attacks the stomach and intestine of oysters and causes death within three years. The impact of *Dermo* was particularly devastating in the salty waters of the Pamlico Sound, where 90 percent of the state’s oysters were traditionally landed. The impact of *Dermo* and another parasite called *MSX* resulted in a drop in landings from 138,000 bushels of oysters in 1988 compared to 48,707 bushels in 2001.

Bellwether Species

In response to the rapid decline in oyster landings, the NC Blue Ribbon Advisory Council on Oysters was formed in 1992. A report produced by the Council stated, “The health of North Carolina’s oyster population is a good indicator of the overall health of our estuaries, and all prudent measures should be taken to ensure a viable oyster resource.”

If the oysters are thriving, it is likely that other shellfish and finfish that spend some part of their lifecycle in the estuary are also doing well. Oysters stabilize habitat for other fisheries by filtering dirt, nutrients and algae from the water, thereby improving water quality in creeks and sounds. Oyster rocks also provide prime habitat for other aquatic life. Hundreds of small animals use oyster beds, including grass shrimp, mud crabs and barnacles. Many of these smaller animals serve as prey food for striped bass, weakfish, black drum, croakers, and blue crabs.

Over the last decade, oyster harvests have contributed an annual average of \$932,086 to the state’s fishing industry. Add in the annual catch of finfish and crabs that use oyster habitat and the indirect commercial value of healthy oyster beds rises to more than \$62 million per year.

What would it take to revive the oyster industry in North Carolina? According to Mike Marshall, a fisheries manager for the NC Division of Marine Fisheries, oyster resources have dwindled over time due to over-harvesting, loss of habitat from fishing practices and coastal land development, poor water quality, and oyster diseases. “It took us a long time to get us to where we are today,” said Marshall.

The road to recovery will require major public investment in oyster restoration projects, coupled with improvements in water quality, wetlands restoration, enforcement of environmental laws and education of the public to understand the importance of funding these actions.

“I would love to see harvests reach 300,000 bushels again,” Marshall said. “It could happen. But it’s not going to happen overnight.”

In their own words . . .

There have been some areas that showed improvement over the years and, of course, others have slowly deteriorated. The major changes where you can see some significant changes in numbers are where we’ve had some real improvements in waste-disposal systems. The Cape Fear River is a good example. When I first started in 1966, the Cape Fear River right almost to the mouth was a cesspool to me. I never envisioned, when I compared the Cape Fear to the other regions that I surveyed, that the Cape Fear would be an open system to shellfish harvesting. But lo and behold some years later they did some major improvements to the wastewater-treatment systems and we saw some amazing improvements in water quality in the lower Cape Fear. Most of it is open today.

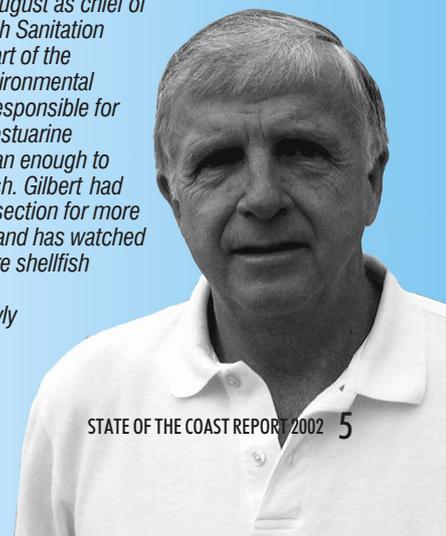
The flip side of that, the more unfortunate side of that, is through the years we have basically developed in some way, shape or form much of the our coastal shorelines. When we talk about development here, it doesn’t necessarily have to be the big shopping center, the big residential neighborhoods close to the water. It’s basically any kind of land-disturbing activity taking place close to that watershed that brings the stormwater, which brings the bacteria and the sedimentation.

Naturally as we have developed, we’ve seen a slow deterioration, a slow loss of areas where we can harvest oysters. That’s been the discouraging part. It’s encouraging to see large areas open, but it’s discouraging to see these small areas closed because most of the time these small areas that we close are around small estuaries, small tributaries that are prime shellfish habitat. This is where they produce best, simply because the things that oysters and clams feed on are the things the tributaries bring to them. The stormwater now though has become more laden with bacteria, chemicals and sediment than it was 50 years ago.

Septic tanks are a problem, no question about it. But if you point at them to blame for deterioration of estuarine water quality, no they’re not. They’re insignificant. You get every one of them out of the water, it won’t make any difference. You’re still going to have the same problems.

If we keep going the way we’re going and don’t do anything different and don’t make improvement, within five to 10 years, the oyster industry in North Carolina will be gone. You may be able to scrape up a mess to eat and that’ll be it. Commercial oystering will be a thing of the past. I don’t know how far clams will be behind that but somewhere along the line I think we’re going to overharvest them and be out of business. We’ve lost a lot of small estuaries that are beneficial to clams. I think we’re going to be in big trouble if we don’t do something.

George Gilbert announced his retirement in August as chief of the NC Shellfish Sanitation Section, the part of the Division of Environmental Health that’s responsible for ensuring that estuarine waters are clean enough to harvest shellfish. Gilbert had been with the section for more than 30 years and has watched the areas where shellfish can be safely harvested slowly decrease.



In their own words . . .

1960

1980

2000

In their own words . . .

The oyster plays a huge role in water quality, shoreline erosion, fish and crab and shrimp habitat and as a fishery species itself. You can hardly find a species more central to the functioning of an estuarine system than an oyster.

Historically, before 1900, oysters would filter a volume of water equal to the whole volume of Pamlico Sound and Chesapeake Bay within about a four or five day period. That filtering is very efficient for removing particles. It removes sediment. It removes algae. It's a natural backstop for any insults that we have to water quality because it helps to remove that material and restore the clarity of the water.

So the fact that oysters are down means that we lost that natural biological control of water quality. As we add nutrients through various activities, including stormwater and hog lagoons and human waste and industrial waste, we no longer have the natural bio-control in the system to accommodate those insults. The decline of the oyster is a problem that's felt throughout the ecosystem.

Oysters also serve as habitat. They serve as the habitat for blue crabs. We have a problem with blue crabs in this state. Fish like drum, croaker, sheephead and a whole variety depend on oyster reef habitat.

The loss of the oyster from our system cascades through these other various components of the ecosystem, in every case affecting some aspect of the quality of the water, the production of fisheries or the general ecosystem health in very important and critical ways.

We used to catch them. We used to eat them a lot. There used to be fisheries, fishermen, families and whole communities dependent on them. Oysters provide a service in the cold months of the year when finfishes aren't available. For the small-boat fisherman in North Carolina, the loss of that winter income can be really significant.

Oysters have played a role, too, in North Carolina and the Southeast that goes beyond their economic value as a fishery. Oyster roasts are a traditional part of many rural communities and occasions for people to come together and celebrate harvest, to talk about issues and generally appreciate their neighbors. We've come a long way towards losing that role that oysters play as the glue to communities.

Charles H. "Pete" Peterson studies our state's sounds and estuarine waters as a researcher at the University of North Carolina's Institute of Marine Sciences in Morehead City. Oysters are among his specialties. He served on the state's Blue Ribbon Oyster Panel and has been researching restoring oyster reefs since the early 1990s. Peterson is also on the NC Environmental Management Commission.

Profile of the Oyster

They aren't the prettiest things in the water, but oysters have long been one of the most important – ecologically and gastronomically – on both sides of the Atlantic. When they arrived on the shores of North America, the first white settlers were most impressed with the abundance, size, and succulence of oysters, whose thick rafts of reefs were hazards to unwary navigators in their small wooden boats. Friendly Indians reportedly brought oysters along with wild turkeys to the first Thanksgiving. They taught these strangers how to hunt for the fat shellfish with leather tongs and how to dry them for winter food.

On the other side of the Atlantic, oysters had been a prized food since the pre-Christian era. The ancient Romans served large quantities at their banquets, learned to cultivate them, and even made a monetary unit, the *denarius*, equal in value to one oyster.

Quite an illustrious history for a critter that doesn't even have a backbone. In fact, oysters are scientifically classed as *mollusks*, a word from the Latin meaning "soft." Protecting those soft bodies is a hard shell made up of two valves that are joined by a hinge and held together by a strong muscle. Except in the earliest stage of their development, oysters even lack the power of locomotion. They spend much of their lives lying motionless on the floor of brackish bays, coves and estuaries, usually attached to rocks or other hard, submerged objects, sometimes in great clusters.

A Hardy Species

Many different species of oysters live in the inshore waters of the world's temperate and tropical seas. The one native to North Carolina, *Crassostrea virginica*, is commonly known as the American oyster, the Atlantic oyster, and the Eastern oyster. It is a hardy species that can live in waters as varied in salinity and temperature as those found from Nova Scotia to the Gulf of Mexico.

The separate sexes of the American oyster ripen in early summer. When the water warms to about 68 degrees, they release eggs and sperm into the water. During the spawning season, a single female, by clapping her shells gently, will puff out many millions of buoyant eggs and a male will release an even greater number of sperm.

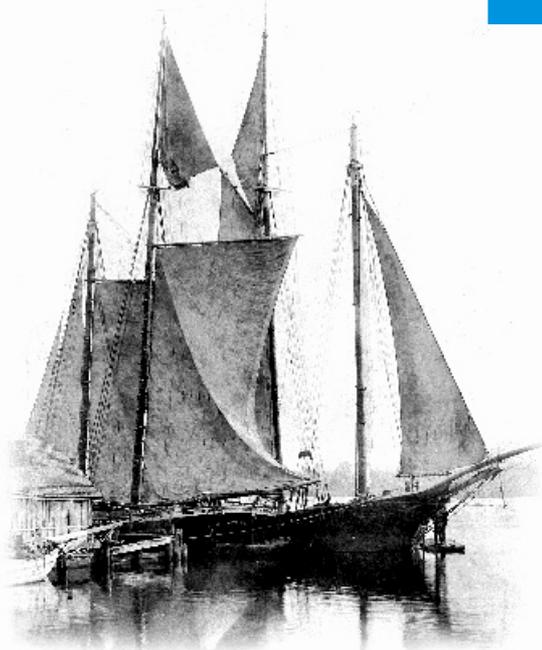
The fertilized egg develops into a microscopic larva, which swims and drifts in the tidal currents for about three weeks. The larva may travel far from the spawning area, feeding on microscopic plants and, in turn, being eaten by other animals. Less than 1 percent of the young larvae reach the next stage of development.

When it's about the size of a grain of pepper, each larva extends a probing foot and seeks a permanent place to live. Once it finds a suitable, clean, hard surface, the foot gland ejects a tiny pool of cement-like adhesive. The little oyster then turns on its left side, cements itself to the object, and remains immobile for the rest of its life. From then on, it can feed only on what food the water brings and is unable to escape overcrowding, pollution or its enemies.

Nature's Filters

The small oyster, or *spat*, now the size of a dime, grows by pumping water through its body and filtering out its food – mostly algae and decaying plant material. In this way it cleans the waters. A healthy market-size oyster can filter approximately 50 gallons of water a day. Oysters provide other ecological benefits as well. Oyster reefs, with their many folds and crevasses, can have fifty times the surface area of a similarly extensive flat bottom. Its convolutions provide habitat for an enormous range of other animals, such as worms, snails, sea squirts, sponges, small crabs, and fishes, including North Carolina's state fish, the red drum. ■

In their own words . . .



Way Back When ...

Left: A schooner ties up at an oyster cannery in Beaufort around the 1900s. Photo Credit: NC Office of Archives and History.

Below: Menhaden fishermen near Morehead City in 1947 haul in their catch. Photo Credit: NC Maritime Museum

People don't look at that sound and think about what a great natural resource it is. When you're out of money and need money, you can go out there. Bill always said he didn't think people down here appreciated it, unless you lived in a place like he lived in Alabama. He said in the wintertime there was no way to make an extra dime when you had a farm. He said down here people could fish, oyster and clam and crab. He said it was like a paradise. He always said it was like a mother to us.

We had seven kids, and we always made out, but you sure couldn't do it just on farming. We made more in the sound than we did from farming. It sure helped us raise our family.

It helped Papa raise his because he'd plow all day. I was the oldest so I was the one putting out the soda. Back then you didn't have tractors. I could keep ahead of him. He'd plow and I'd put out the soda and he'd turn it. Then he'd want to go fishing. Of course, we didn't have money to buy anything. I would be so tired but I was scared for him to go by himself so I made like I wanted to go too.

Now that weren't fun. In the wintertime, I'd freeze to death because we didn't have the gloves or clothes to wear back then. He would put his lantern down in the keg, you know, where he was running out his nets and I would warm my hands up over that lantern. And no motor. He had to push the boat to get around. Then we had to walk as far, I reckon, as from here to the church or further to get home. And carried the fish we caught. Whew! But we never went hungry.

We couldn't raise seven children from the sound now. Red tide got us one year, killing all our oysters. We had piles of oysters. We were doing good until we had to stop. For several years we didn't have anything in our gardens.

Bernice Rice

Sometimes they close it down for about a week after a good rain until they get it tested. It hurts, especially when you have a man sitting up there waiting to buy your oysters. We have a good market. So it hurts when they close us down. Yes, sir, it hurts. ■

Bernice Rice, a native of Pender County, has been shellfishing in Stump Sound since she was 12 years old. She and her husband Bill Rice lived on a farm in Tar Landing on the shores of the sound since World War II, back before the high rises of Topsail Island marred the view. They grew beans and peanuts and harvested fat oysters from their leased bottom lands – “gardens,” Bernice calls them. She's 77 now, and Bill has passed on, but Bernice still ventures out in the sound on winter days to oyster.

In the late '40s and into the '50s, '60s and '70s, Beaufort became a center for the menhaden industry. Can you imagine when we had 100 boats in here with 30-man crews? Three thousand people would descend on Beaufort in the fall, and they did all their Christmas shopping here. The merchants would come out and if they didn't smell any odor, they'd say, “Oh, we're going to have a bad year.” If all that smoke settled down in Beaufort, everybody was smiling. You had all your grocery stores on the south side of Front Street. You had all your appliance shops on the north side. I mean it was a-bustling.

Let me tell you how people used to make a living. First of all, they were very diversified. They had different boats for different things, for different seasons. In the fall of year, they'd do mullet for the roe. They did oystering. Then they worked at the menhaden plants. As soon as the season was over they'd go jump in some other part of the fishery because that's all they knew. To make a good living, that's what it took. But the bulk of the money came from the menhaden business. They'd subsidize that for the rest of the year.



As the menhaden plants disappeared, the oyster population disappeared, the mullets got fewer and fewer. When you shut down one part of the fishing industry, then the fishermen go jump into another part. And pretty soon you have overcrowding in that fishery. It's not that the stocks are depleted. The stocks are depleted in that area where they can get to because, like I said, they had little boats and they're limited as to where they can fish. ■

Jule Wheatly, president of Beaufort Fisheries, Inc., has been in the menhaden industry for almost 30 years. When he started in the business, there were four menhaden plants in Beaufort. His processing plant at the end of Front Street is now the last menhaden plant in town, a remnant of the days when menhaden was king.

Jule Wheatly

Sewers & Shellfish

You can't easily have both. Build a centralized sewer system and watch the land it serves become crowded with people and the coastal waters around it too polluted to safely fish for oysters and clams. It's almost a given unless those building the sewer go to great lengths to control the poisoned runoff that the sewer will inevitably bring. Up until now, though, state and local governments have shown little stomach for real protective measures. As a result, oysters and the estuaries they live in are threatened.

The tide, though, could be turning if the state seriously enforces a new program to control runoff and if local governments heed this lesson recently learned in Brunswick County where the NC Coastal Federation joined environmentalists there to appeal a state permit for a regional sewer system: Politically motivated environmental decisions lead only to chaos and costly delays. Healthy oysters and clean water require more.

One of the first things the Federation did after it formed in 1982 was to comment at a public hearing sponsored by the US Environmental Protection Agency on its draft Environmental Impact Statement, or EIS, that evaluated options for providing sewage treatment on North Carolina's barrier islands.

The study's main conclusion – so obvious today – was that the density of development on land that is marginally suitable for development increases dramatically when centralized sewer systems are built. Land that was unsuitable for septic tanks can be developed once the sewer is available. This increases polluted stormwater runoff contaminating coastal waterways. Dirty runoff from roads, driveways, yards, and roofs overshadows the water-quality benefits from the new sewage-treatment plants.

Because of the EPA study, federal grants to help barrier islands build big new central sewage-treatment systems stopped, but the push to build sewers hardly slowed.

Atlantic Beach, North Topsail, Wrightsville Beach, Oak Island, Ocean Isle, and Sunset Beach continued to see sewers as pots of gold that would glitter into their development rainbow. And, intense interest in building sewers wasn't confined to barrier islands. A number of counties and mainland towns saw sewers as key to growth.

Development boomed. Consultants optimistically advised local governments that sewer systems could be paid for locally with bonds and low interest loans. While federal grants were no longer available, federal funds still flowed for the construction of sewer systems through the state revolving loan fund. A point system used by the state to rank loan applications by local governments favored coastal communities because of their proximity to sensitive, high quality surface waters.

State regulators adopted policies in basinwide water-quality plans supporting rationalization of sewage systems. Bigger was better – or so the state said.

Sewers and Water Pollution

New Hanover County's board of commissioners convinced themselves and voters to support a \$46 million bond referendum in 1984 to build the first "countywide" sewer system on the coast. The campaign for the bond was based on the dubious contention that the sewer was needed to clean up polluted shellfish beds.

Once the county started to provide sewer service, it became obvious the system was more about easing new development than cleaning up polluted waters. It was also obvious that initial cost estimates were grossly low. System costs increased to \$270 million by 1993.

A retrospective analysis in 1997 by William B. Farris, a former Wilmington city manager and now a planning consultant, documented the effects of the sewer on Howe Creek. At the time the sewer was built about 34 percent of its watershed was freshwater wetlands. The state classified the creek as Outstanding Resource Waters in 1989 because of exceptional water quality.

Ten years later only 16 percent of the entire watershed was still undeveloped. The dense development triggered increased stormwater runoff, and the creek is now too polluted for shellfishing.

Other large sewer systems sprung up – some even privately financed – on Topsail Island, Ocean Isle, and Yaupon Beach. Existing sewer systems servicing mainland cities snaked out to new development.



Voices in the Wilderness

South River is about as remote as you can get in Carteret County and still have electricity and telephones. It's not the type of place you'd expect a revolt against the sewers to begin. But in 1983 when Atlantic Beach announced plans to pump its treated sewage 30 miles to Open Grounds Farm, fishermen in South River got angry.

Commercial fishermen throughout Downeast Carteret County had seen severe declines in water quality when this 44,000-acre farm was cleared and drained in the early 1970s. They didn't think much of the sewage plans. The South River Civic Association worked with the NCCF to petition the state to prepare an EIS.

The request was first ignored, but the South River fishermen simply became more determined. Their lobbying eventually persuaded the state to require Atlantic Beach to prepare the study. The EIS would have forced the town to look at the secondary and cumulative effects, such as density of development and stormwater runoff, of the proposed system.

More than 1,000 outraged residents of eastern Carteret County packed the public hearing on the draft study at East Carteret High School. Public opposition so overwhelmed Atlantic Beach that it never finished its study.

Stormwater: The Big Issue

Forced to address stormwater pollution due to pending legal appeals, the state went through a six-year process of developing, adopting, and refining rules to control stormwater runoff in coastal counties. Early proposals by scientists such as Dr. Richard T. Barber of the Duke University Marine Lab, then a member of the NC Environmental Management Commission, had developers up in arms.

Barber recognized from the outset that overland surface runoff generally does not exist on vegetated, undisturbed coastal landscapes. When runoff is created by ditching or paving, it transports bacteria, nutrients, sediments and other pollutants into downstream waters. Treatment measures, commonly called best management practices don't remove enough pollution to assure downstream waters will be clean enough to allow for shellfishing and swimming.

Thus, the only way to keep pollution from entering the water is to develop property in a way that does not create runoff. That means limiting the amount of concrete, asphalt, roofs and other so-called “impervious surfaces” and leaving as much of the natural landscape intact as possible that could absorb runoff before it enters the water. To protect shellfish waters, state officials first told developers they would have to keep the density of development near such waters to less than 10 percent impervious surface or devise ways to allow about eleven inches of rainfall from a 24-hour storm to infiltrate into the ground.

Political pressure mounted. By the time the proposal reached formal rule-making proceedings in 1986 the state’s professional water quality staff was recommending a 12 percent built-upon area or the infiltration of 5 inches of rainfall from a 24-hour rain event.

More than 400 comments from citizens supporting the state’s proposals did not outweigh opposition to the rules mounted by a handful of politically connected developers. The commission weakened the proposal so that no controls were required if development stayed below 25 percent impervious cover. Projects exceeding the built-upon limit had to control a mere 1½ inches of rainfall.

With these weak rules in place, developers hoped stormwater issues would go away. The push for sewers intensified, and scientists busied themselves documenting further declines in coastal water quality.

The Battle is Joined

Brunswick County and the towns of Sunset Beach and Calabash formed the South Brunswick County Water and Sewer Authority in the early 1990s to provide sewer service within a 55-square-mile area just north of Myrtle Beach. Much of the proposed service area is already polluted by stormwater runoff.

The engineer hired to coordinate building the sewer system said the authority would not only provide sewer service but would also regulate stormwater to protect water quality. Concrete plans for preventing and controlling stormwater runoff remained elusive and grossly underfunded, however, despite requests for more details from the Federation and the Sunset Beach Taxpayers Association.

Remarkably, the NC Division of Water Quality signed off on the sewer plans in 1994 without requiring an EIS. The Taxpayers Association and NCCF appealed the decision, and won after a four-day hearing in 1996 before an administrative law judge. It became clear during testimony that the authority had not developed a workable strategy to control stormwater pollution.

The state, in the EIS, outlined an innovative approach for controlling stormwater. It limited the density of development on the barrier island of Sunset Beach to only what could be built anyway with septic tanks. Sewer service was prohibited on any land classified as wetlands. No sewer system

could be built until a federal wastewater stormwater discharge permit was applied for and issued for the entire service area.

Requiring the sewer system to obtain a permit meant stormwater from ditches and culverts would be classified as a point source of pollution – the same as wastewater discharged from an industrial factory or municipal sewage plant. This federal permit is enforceable by citizens. The Taxpayers Association and NCCF decided that these commitments might actually work, and the EIS became final in late 1998.

Two more years passed before the authority received its stormwater permit. Once again, the Taxpayers Association and the Coastal Federation found the state failed to require sufficient and meaningful measures to prevent stormwater pollution. Represented by the Southern Environmental Law Center, the groups appealed the permit in 2001 claiming that it was a prescription for pollution.

This permit appeal did not take place in a policy vacuum. The EPA, in December 1999, issued final rules for the second phase of its stormwater permit program, which requires every community where stormwater poses a threat to water quality to apply for a permit by March 2007. Programs need to be effective in preventing further degradation of water quality.

Because pollution of shellfish waters by stormwater runoff is so common, the sewer authority’s permit is an important precedent for establishing what coastal communities will do to comply with the new program. The permit appeal also came at a terrible time for the authority. Its decade-long struggle had left the authority so in debt that the State Local Government Commission would not allow bonds to be sold to finance the sewer until the permit appeal was resolved.

The parties agreed to try to settle differences. Several months of mediation resulted in a settlement agreement (see sidebar) that is a workable model to prevent further pollution of shellfish waters not only in Brunswick County, but also throughout the coast.

Ironically, many elements of the settlement are almost identical to what the state originally proposed for controlling stormwater pollution on the coast back in 1986. It’s likely that the authority could have built its sewer years ago if the state had just gone ahead and adopted adequate stormwater controls.

The perils of ignoring good science and caving into political pressures are now obvious. Regulatory gridlock pits frustrated neighbors against one another as they struggle with growth-management problems. The absence of environmental protection measures that really work have threatened the health of the oyster and the estuaries in which it lives. Adopting an effective stormwater program modeled after the authority’s permit is essential if oyster populations and the shellfish industry are to be restored on our coast. ■

Highlights of the settlement between the South Brunswick County Water and Sewer Authority and the NC Coastal Federation and Sunset Beach Taxpayers Association:

- Storm events will be monitored for fecal coliform bacteria at outfalls.
- Stormwater will be sampled before it is discharged so that problem waters can quickly be identified.
- In the event that water quality standards are not met, additional management will be implemented with the help of water-quality experts.
- For low-density areas of development a 30-foot wide vegetative buffer is required next to water bodies. For high-density areas excess runoff must pass through a 50-foot wide vegetative buffer.
- Existing sources of stormwater discharge within a half-mile of shellfish harvest waters or draining into tributaries of shellfish harvest areas may not be expanded, and current outflow must meet water quality standards.
- New development may not exceed 12% impervious unless infiltration systems capable of handling absorbing 5 inches of rainfall from a 24-hour storm event are possible.
- A map of storm drains will be created and continued mapping is to be done. Results will be made public.
- Best Management Practices will be enforced to ensure that water quality is in compliance with the requirements of the Clean Water Act.
- There will be no new points of direct stormwater discharge into shellfish harvest waters.



Wetlands play an important role in the coastal ecosystem. They help to control flooding by absorbing excess rainfall and snowmelt and then releasing them slowly. One acre of wetland can store up to 1.5 million gallons of floodwater. Wetlands also filter out organic wastes and other pollutants, improving water quality. Coastal wetlands serve as nurseries for fish and shellfish, and act as natural buffers against damaging storm waves.

Agricultural runoff is the leading cause of non-point pollution. Nutrients and pesticides are channeled into sensitive waters by stormwater. State studies show that from 1995-1999 agricultural runoff contributed to the impairment of 58% of the state's polluted waters.

UNC-Wilmington researchers have concluded that 10% impervious surface coverage degrades the quality of a stream into which it drains. Impervious surface of 30% is usually devastating to the receiving water body. Most existing residential developments contain 20-50% impervious surface coverage, depending on design.

Between 1990 and 1996, NC Division of Coastal Management authorized the construction of more than 133 miles of bulkheads. These bulkheads eliminate the shallow water habitat that is critical to the ecosystem of the estuary.

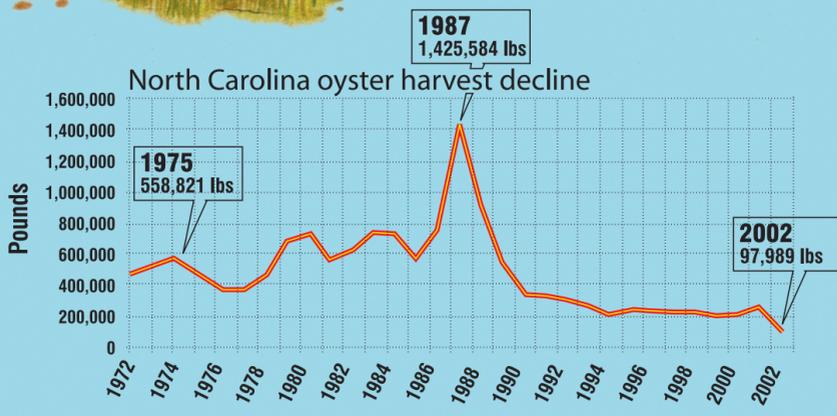
North Carolina's Wetlands are home to 173 rare species, including the red wolf and bald eagle. Unfortunately, 49% of North Carolina's wetlands have been lost due to forestry, agriculture, and other forms of development.

Runoff from streets, sidewalks, and parking lots accounted for 39 percent of the polluted waters in North Carolina in 2000, according to state studies. With that flood of pollution comes harmful bacteria, which accounted for 41 percent of polluted acres in the state estuaries.

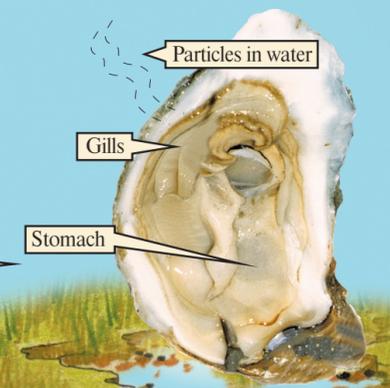
More than 364,000 acres of coastal waters are closed to shellfish harvesting in NC. An additional 50,000 acres of shellfish waters can be temporarily closed after 1.5 inches of rain in a 24-hour period. These temporary closures can last from several days to more than a month. It is estimated that stormwater accounts for more than 90% of shellfish closings.

Oysters and Our Estuaries

North Carolina is blessed with more than 2 million acres of estuaries, a vast expanse of shallow bays and rivers and creeks that once bred oysters in such numbers that their thick beds could sink the canoes of unwary Native Americans. Now flooded by stormwater that contains a witch's brew of chemicals and bacteria, oysters have been reduced to about 1 percent of their historic numbers.



An oyster filters water at a rate of about 1,500 times its body volume per hour. In the late 19th Century, oysters in the Chesapeake Bay filtered the entire bay in 3 to 6 days. It takes the smaller current oyster population over 365 days to filter the same volume.



Unfortunately, oysters cannot grow properly in areas affected by pollution. Heavy metals decrease an oyster's resistance to disease and parasites, resulting in poor shell growth. Pesticides reduce growth rate and lower disease resistance.

Oysters' waste products help to improve water quality through denitrification — converting nutrients into a gaseous form. This helps to prevent the overgrowth of algae that decompose and reduce oxygen content, leading to fish and shellfish kills.

Sources: Chesapeake Bay Foundation; Clean Water Network; Environmental Protection Agency; NC Division of Marine Fisheries; NC Division of Water Quality; Shellfish Sanitation Section of the NC Division of Environmental Health; Sierra Club; Stormwater Manager's Resource Center; University of North Carolina — Wilmington



A Blueprint for Change

This edition of the *State of the Coast Report* can at least claim a distinguished pedigree. Among the few things to rival the decline in North Carolina's oyster population during the last decade have been all the plans devised to do something about it.

We heard it as recently as last year when the state's Division of Marine Fisheries released its oyster management plan, which contained 47 recommendations to increase harvests and restore habitat. Few were actually implemented.

Then there was the higher-profile plan drawn up in 1995 by the grand-sounding Blue-Ribbon Advisory Council on Oysters that the NC General Assembly created. It, too, was chock-full of recommendations – 38 in all – and it, too, is collecting dust on a shelf in Raleigh.

Before that there was the NC Oyster Summit, a group made up of watermen, scientists, conservationists and regulators that held a public forum in 1994. From that came the general blueprint for resurrecting the state's decimated oyster population. After the meeting, everybody went home, and oysters continued their downward slide.

So Charles "Pete" Peterson has heard it all before. He's a researcher at the University of North Carolina's Institute of Marine Sciences in Morehead City and a member of the state Environmental Management Commission. Peterson has spent much of his adult life studying oysters and the shallow coastal waters where they live. He has written about them, championed them, even eaten a few of them. He served on the

blue-ribbon council and now has weighed in with his own restoration plan that has the support of one of the state's most powerful politicians. This time, he says, things are different.

"I think we're at the cusp of a major initiative that is going to positively change the estuaries of this state and bring us back to a brave new world of oysters and all the services they provide," Peterson said. "The whole fate of studies that are commissioned legislatively or by the executive branch depends upon the vision, the energies, the foresight and initiative of some leaders who move those reports forward and their recommendations. It appears that there's the will now in the legislative and executive branches in state government to actually take these recommendations and to do something effective and on a scale that will be meaningful."

Peterson's plan distills many of the recommendations endorsed by the other groups with an emphasis on restoring large expanses of oyster reefs and creating sanctuaries to protect them from over-fishing and destructive mechanical gear such as dredges and trawls. The goal, he said, would be similar to the one set in the Chesapeake Bay: Bring the oyster back to 10 percent of its historic numbers.

"I would say that the Chesapeake Bay target is a meaningful one," Peterson said. "That is to say that if we retrieve 10 percent of what historically oysters have covered, if we protect those as habitat sanctuary ... we enhance other fisheries."

And we may also over time produce oysters that are naturally resistant to the diseases that now

ravage them along certain parts of our coast. Peterson's research has shown that disease-resistant oysters will gradually inhabit reefs that are protected. "So we have the very real potential of natural selection spreading resistance if we maintain these reefs," he explained. "But we're talking decades for that to take hold in the broader system and to rid us of the monkey of oyster disease."

Until then, watermen need to make a living, Peterson said. To allow them to continue fishing while the oysters recover, fishermen should be allowed to raise disease-resistant foreign oysters, he said. Introducing non-native oysters into state waters is certainly the most controversial of Peterson's recommendations. They would be strictly controlled by the state, which would also establish a hatchery to provide sterile oysters at cost to the fishermen, he said.

"It provides a vehicle to replace some of the economic losses that the loss of our native oyster represents these days and at the same time you get the water-quality benefits of all those oysters clearing the water of various types of particulate pollution," he said.

Peterson's plan has the endorsement of Marc Basnight, a Dare County Democrat who is president pro-tem of the NC Senate. Diseases that like the high salinity of the northern coast have ravaged oysters in Basnight's home waters. Something must be done to help the fishermen there, Basnight said, including introducing exotic species.

"I'm torn between what's right and what's



CHERYL BURKE

wrong there,” he said. “I want to see our heritage continue, I will tell you that. I’m a strong advocate of these people’s heritage living on and not losing it. That’s important to me and, I think, it should be important to this state.”

The Pacific oyster, he noted, saved the French shellfish industry after a viral disease wiped out that country’s native stock in the early 1970s. Foreign oysters have also revived Connecticut and Louisiana’s shellfish industries.

Though the foreign oyster most suited for NC waters – the suminoe from Southeast Asia – tastes the same as natives and reaches market size in half the time, they come fraught with potential problems, Peterson noted. The kudzu-covered fields of the South are constant reminders of what can happen when an exotic species is let loose, and even sterile oysters can eventually re-attain their sexual capabilities in the wild.

“There is a lot of interest in truly introducing this oyster without restrictions,” Peterson said. “The question is how can it hurt. There are ways it can hurt, and science appropriately should address those before we engage in such an experiment with Mother Nature.”

This is a charged issue where it has cropped up. Along the Chesapeake Bay, for instance, environmental groups last summer turned on Jim Wesson, the head of Chesapeake Bay’s long effort to restore the bay’s oysters, after he endorsed introducing the suminoe because natives continue to die on the rebuilt reefs despite millions of dollars spent on the effort. The groups charged that Wesson was throwing in the towel. They may have missed the point, however.

Wesson’s experience on the Chesapeake should show that it will take more than rebuilding reefs and creating sanctuaries to save native oysters. A bolder program will ultimately be required, one that attempts to stanch the flow of polluted runoff that poisons oysters with bacteria and to fix a system of environmental protection that was supposed to keep us from reaching this point in the first place.

George Gilbert has been a part of that system for more than 30 years. He announced his retirement recently as the head of the state’s

Shellfish Sanitation Section, which ensures that our coastal waters are safe enough to harvest oysters. He offers a sobering assessment of the protections we have put into place to preserve that water for the oysters and ourselves.

“I’ve worked here an awfully long time,” Gilbert said “We’ve had a Division of Water Quality by some name ever since I’ve been here. When it comes to looking at what they were supposed to be responsible for and what they were supposed to accomplish, I never saw anything to let me know that they even existed.

“There’s no question that certain levels of government have let us down. The system somehow or another has let us down. It is hard to really find the true cause of what happened. The rules are good. The rules will work if the rules were applied. And we’ve had good people in the system to use those rules. You can take the best of people with the best of intentions but you can only hit your head against the wall so many times.”

Basnight feels the same frustration. The system can be made to work, he said, and controlling stormwater could be made an integral part of an oyster-restoration plan. “People want clean water,” he said. “That’s going to be a part of the attraction in the future for North Carolina.”

Bringing oysters back to even a fraction of their former range will take decades and as much as \$10 million a year, Peterson said. Oyster reefs, which cleanse water and are vital habitat for a variety of animals, could become as important as wetlands in the regulatory scheme, he explained. Cities that want to expand their sewage plants could be made to build and protect reefs as a way to lessen the effects of the additional pollution they generate, Peterson said.

“We make this a whole piece of the puzzle,” he said, “and the marketplace ends up paying for the restoration.”

The final price tag – whatever it is – will be worth it, Basnight said, even in these times of tight budgets. “It’s a small investment for the environment,” he said. “Some will argue that you shouldn’t spend any money today on the environment. This is when you would spend money. You should accelerate your efforts.” ■

In their own words . . .

Bringing Back Oysters

A couple of plans have been devised since 1995 to restore the state’s oyster populations. They contain many common elements:

- Rebuild native oyster reefs.
- Create sanctuaries to protect the reefs.
- Improve water quality by controlling agricultural and urban runoff.
- Create a new water classification – Use Restoration Water – for closed shellfish waters that allow special management to identify and clean up the sources of pollution and re-open the oyster beds.
- Promote aquaculture of disease-resistant non-native oysters to provide a commercial crop.
- Create a state hatchery to provide the sterile non-native oysters.
- Fund research into non-natives, reef building techniques and materials and fisheries and water-quality benefits of oyster reefs.

In their own words . . .

When I was a child, my dad bought me an oyster dredge, and I caught oysters. I remember I had so many one time that I thought the little 14-foot boat would sink. I loaded the boat with beautiful oysters. I remember old-timers bringing in oysters and giving them away. Oysters couldn’t bring much of a price then. These are fond memories.

The boats would come in from Chesapeake Bay to take our oysters and they took them for years and years. There were literally hundreds of shucking houses, and a lot of people were employed in those shucking operations. They put them in 5-gallon brass pails that were made for oysters. They iced them and put them on the rail and shipped them all over. Well, we lost all of that up here.

I blame all of us. People used to say, “It’s the hogs, the hogs, the hogs.” I used to say, “Look into the mirror. We are the hogs.” We contribute in our own fashion and in our own way.

Marc Basnight is the president pro tem of the NC Senate and a native of Dare County.



At the Water's Edge

Oysters need a helping hand these days. They require the same things the rest of us do – clean water, a safe place to live, and a reliable source of food. At one time, they found all they needed in our shallow coastal rivers and sounds where they once flourished, forming great reefs that attached to firm surfaces, such as shell bottoms.

Scientists, though, now speculate that the oyster population in North Carolina has declined by more than 80 percent from its historic levels. The survivors will need a boost from us, if they are ever to regain anything approaching their former glory.

Luckily, we know what it will take to bolster oyster populations. Native reefs need to be rebuilt and protected from over-fishing and the physical ravages of dredges and thongs. We must change the way we develop the surrounding land to reduce polluted runoff, and scientists must continue looking for ways to develop disease-resistant oysters.

Building reefs is one way people can help restore oyster habitat. Such efforts are ongoing throughout the state's estuaries and provide many ways property owners and concerned citizens can get involved.

Here are a few highlights of recent projects in which NCCF has been involved:



■ **Hope Pole Creek:** NC Coastal Federation's efforts to restore oyster habitat began at Hoop Pole Creek in Carteret County in 1998. The Federation's education staff, with the help of more than 400 volunteers, have built and monitored small oyster gardens and reefs in the creek.

Volunteers and staff members spread about 16,500 pounds, or 300 bushels, of oyster shells (or cultch) in two areas of Hoop Pole. The NC Division of Marine Fisheries designated both areas as research sanctuaries in 2001.

Staff and volunteers have also worked to recruit and grow new oysters along the established reefs. After seeking advice from the Division of Marine Fisheries, the NC Sea Grant program and oyster growers Jim and Bonnie Swartzenburg, NCCF installed floating cages filled with juvenile oysters. Mesh bags were filled with oyster cultch and anchored on raised racks, which provide a place for baby oysters (or spat) to attach above the muddy bottom where they would otherwise suffocate.

Through such efforts, more than 8,000 new oysters have been added to the Hoop Pole sanctuary since 1998.

For several years, NCCF has been involved with NC Division of Coastal Management, NOAA, Sea Grant, and various natural-resource agencies and private property owners to build natural alternatives to wooden bulkheads and stone walls to control erosion in our estuaries. The projects involve using combinations of stone and marsh grass to stabilize eroding shorelines, while restoring and preserving valuable marshes.

Many of the projects use stone structures, called sills, in the water below the normal high-tide line. The sills protect the shoreline and the marshes behind them from erosion. Because they are partially or fully covered by tides each day, the sills become valuable habitat for numerous fish and shellfishes such as oysters and crabs, as well as hiding, resting and feeding spots for shorebirds, mammals and other estuarine animals. The hard

surfaces of the granite or marl used to build the sills provide the necessary hard structure near the water's surface for oysters to attach and grow.



■ **Hammocks Beach State Park:** NCCF, NOAA and the NC Wetlands Restoration Program helped officials at Hammocks Beach State Park replace a failing bulkhead with a more natural shoreline. Now in its second full season, the nooks and crannies of the stone sill are home to a healthy oyster population, urchins, sea squirts, anemones, hydroids and numerous fish that hide and feed among the rocks and marsh grasses.



■ **Roanoke Island Festival Park:** NCCF worked with the US Army Corps of Engineers, the NC Division of Water Resources, FishAmerica and the staff at Roanoke Island Festival Park in Manteo to protect more than 1,300 feet of shoreline and provide a sustainable habitat for oysters and other creatures. Park officials wanted to stabilize the

shoreline while restoring parts of the heavily eroded natural marsh and forests that encircle the island. The recently completed project included stone sills and breakwaters to control erosion and areas for oyster cultch, replanted sea grasses, and a restored coastal marsh and native maritime forest. A second phase will include creating an acre of artificial oyster reef and building an oyster tank to grow oyster larvae that can then be released.



■ **Duke University Marine Lab:** Several hundred live oysters were protected through relocation prior to construction of a 300-foot stone sill and a 485-foot stone revetment. Volunteers planted more than 7,000 marsh grass seedlings behind the stone structures, greatly expanding and enhancing marsh and oyster habitat.

■ **NC Aquarium at Pine Knoll Shores:** A 430-foot stone sill was constructed along this Bogue Sound shoreline adjacent to the Aquarium and 2,000 spartina plants were planted to restore coastal marsh habitat. Volunteers spread about 200 bushels of oyster cultch along the alignment of the sill to provide a surface on which oysters will grow.

About 30 miles of the state's estuarine shoreline are legally walled or armored by stone each year. That fact should worry those of us concerned about the health of our sounds and coastal waters. Projects such as those completed by the Duke Lab, Hammocks Beach State Park and private property owners can provide a better alternative to control erosion, while at the same time helping to protect water quality, restore oyster reefs and highly productive coastal marshes. ■

A number of groups and university researchers are working on ways to restore oysters. Here are descriptions of a few projects:

North Carolina: The NC General Assembly created the Shellfish Rehabilitation Program in 1997 to replace a smaller restoration effort begun 50 years earlier. The program spends about \$268,650 a year on a variety of restoration methods and is capable of spreading more than 500,000 bushels of oyster cultch and moving 20,000 bushels of oysters a season. There are currently five large oyster-reef sanctuaries in North Carolina: in Bogue Sound, West Bay, Deep Cove, Croatan Sound, and behind Hatteras Island.

NC Sea Grant: Sea Grant works with waterfront property owners on backyard shellfish "gardens" to raise oysters for personal use and to better the environment. Property owners establish suitable substrate and buy small, or "seed," oysters from a North Carolina hatchery to plant in the prepared shellfish beds. Under suitable conditions, oysters can reach harvest size in two to three years. For more information, call Skip Kemp at 252-222-6314, or visit the Sea Grant website at www.ncsu.edu/seagrant.

The Nature Conservancy: With a federal grant, the Nature Conservancy is trying to restore oysters in the Pamlico Sound. During 2002-2003, the conservancy is working with the NC Division of Marine Fisheries to build six limestone mounds in the southeastern corner of Pamlico Sound near Clam Shoal, just north of Frisco. The group will encourage local teachers to get involved in the project. The conservancy also plans to build more reefs and begin an oyster recycling program and an oyster gardening program.

Wilson Bay Water-Quality Initiative: Jacksonville is using oysters to help clean Wilson Bay, long polluted by sewage discharges. Because oysters and wetlands are natural water cleansers, about 2.5 million oysters have been put back into the bay and 3.5 acres of wetlands have been restored adjacent to the bay. To help establish better growing areas, oyster cultch will also be spread in eight of the 15 bay sites in the near future.

UNC Institute of Marine Sciences: Professors Charles H. Peterson and Shawn Powers have restored shallow and deepwater reefs at Rachel Carson Reserve, Neuse River, and Bogue Sound, and have ongoing research projects to study the reefs' success. Institute researchers are also studying oyster diseases and non-native oyster species.

UNC-W Center for Marine Science: Researcher Troy Alphin and Professors Martin Posey and Amy Wilbur are studying the effects water quality has on oyster habitat and the differences in oyster populations within the state. The findings will be valuable in successfully building oyster reefs and in developing sustainable native oysters.

In their own words . . .

In their own words . . .

I think I started seeing the writing on the wall 10 years ago that things are going to have to be done differently to look ahead for the next 30 years. I sort of like being on the cutting edge of it. It wasn't a purely unselfish motive either. If things are going to change, you got to be able to roll with it. I did start to see a change in the attitude of our customers. Until about 10 years ago, the typical attitude of the man who walked in the door was, "I want to build a pier. My neighbor's got one that runs out 400 feet from shore. I want to go out 500 so I can get to deep water." He's got a 17-foot skiff and doesn't need to be there to start off with. But you could not talk him out of it. About 10 years ago, I started to see that attitude change. People come in and are willing to play by the rules now. The overall picture is that people are more concerned about the environment and that's increasing every year.

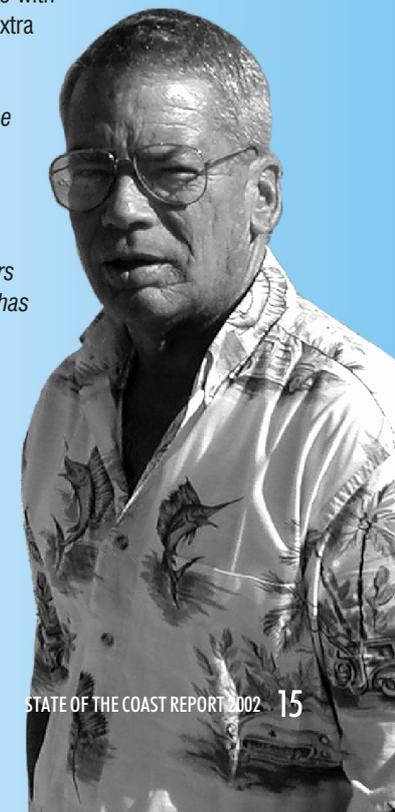
After all the hurricanes three or four years ago, I started looking at marsh grass as a protective measure, as a buffer. And I'm seeing individual property owners who want the grass. I can remember when they wanted to pull up the grass because they wanted a sandy beach.

I think we could have a lot more rock sills if the sites were more accessible. The problem in Carteret County is that everybody sort of squeezed all the lots together, and getting equipment to the site is a big problem.

I hope to see more interest in it. The project's got a certain appeal. If you got this behind your house rather than a standard bulkhead then you've made a statement that you're trying to do something to help the environment. It costs more money but they've got a pretty marsh.

Now if you ask me if I had a piece of waterfront property which would I prefer for my own house? If the contour of my lot was in harmony with the elevation of the sill and the fill material, there would be no question I'd go with the sill and I'd pay extra money for it.

Chuck Bisette is the vice president of T.D. Eure Construction Co. in Beaufort. The company builds piers and bulkheads and has worked on three shoreline projects with the Coastal Federation using marsh grasses and rock sills.



Up the Creek



Seen from the air, Open Grounds Farm and North River Farms look like a huge checkerboard – a patchwork quilt of fields covered in soybeans, wheat, cotton and corn bordered by ditches and canals. The farms are so large, sprawling over 50,000 acres of eastern Carteret County, that satellites passing hundreds of miles overhead can easily detect them with their cameras.

The shellfishermen of the North River and Jarrett Bay also know they're there. Runoff from the farms have polluted many of the creeks feeding the bay and river with bacteria, putting their oysters and clams off limits most of the time. Those were once productive shellfish areas, back before the ditches were dug to drain the protective wetlands and corn and cotton replaced cedars and wax myrtle.

Much of the ditching and draining occurred before Congress passed the Clean Water Act in 1972 and gave wetlands some protection. To repair the damage the NC Coastal Federation, with the state's help, bought land through which some of this pollution flows. Our plan is to rebuild the wetlands to absorb the poisons and bring the creeks and the oysters they nurture back to health. It could take years and millions of dollars.

There is, of course, an easier and ultimately cheaper way. By being smarter in how we develop land along sensitive water, we can use the land and avoid the kinds of pollution and shellfish closures we now see in the North River or in Jarrett Bay. Weyerhaeuser Corp. is finding that out along the Neuse River in Pamlico County, where the Federation, other environmental groups and state agencies are advising the company on how to build a 600-unit subdivision without trashing the surrounding waters in the process.

A land of plenty

Explorer John Lawson found a pristine environment when he surveyed the North Carolina coast for Queen Anne of England in the

late 1660s. He wrote about a new world where the water of the Cape Fear River was clear and clean enough to drink, the earth was fertile and large oaks were plentiful. The river, he noted, was abounding with fish such as mullet, shads and stripped bass.

Before colonization, North Carolina had a significant variety of forest types, and the forest cover was extensive. Wetlands were also plentiful, covering about 11 million acres. To survive in this wild land, though, early settlers cleared forests and drained wetlands to grow their food and raise their animals.

Farming and logging were also big business. George Washington and his partners drained and cleared about 40,000 acres of the Great Dismal Swamp for agriculture. Ditches and canals were dug to drain wetlands and lower the water table enough to log forests or plant crops.

Wetlands have historically been viewed as hostile places and tagged with such adjectives as "dismal." Federal and state governments gave incentives to landowners to destroy wetlands to promote economic growth and improve public health. By the 1860s, there were around 69,000 active farms in North Carolina, and timber and turpentine production had already toppled two-thirds of the state's original forests.

Today, we know that wetlands are important to protect water quality and habitat. They filter pollution, retain floodwaters and recharge groundwater. More than 75 percent of all fish and shellfish are dependent on wetlands and 43 percent of federally threatened or endangered species rely on them for survival.

With the passage of the federal Clean Water Act, wetlands gained significant legal protection, and their destruction began to slow. Although it is now more difficult for landowners to destroy or alter wetlands, the ecological effect of losing more than half of the wetlands in North Carolina is still evident.

Turning the tide

Time has yielded many changes in farming. The number of farms has dropped, but the size of farms has increased dramatically. When farms are abandoned, land is converted to housing, shopping centers or intensive timber or livestock farms. These changes in land uses can cause even greater damage to water quality and loss of habitat for fish and wildlife.

Core Sound is as pretty a body of water that exists in North Carolina. The sound and its tributaries produce more than 10 million pounds of seafood landings a year worth more than \$7.7 million. The North River, along with Ward, Middens, Wade and Williston creeks in Carteret County are tributaries to the Outstanding Resource Waters of Core Sound and Jarrett Bay. These tributaries are designated as High Quality Waters and Primary Nursery Areas by the state.

Yet, these same waters are also polluted by fecal coliform bacteria and are usually closed to shellfishing. The primary source of fecal coliform bacteria is agricultural runoff from nearby farms, especially Open Grounds. Its ditches drain either north to the Neuse River or south to the tributaries of Core Sound. Down them come millions of gallons of runoff after each heavy rain. Runoff that once meandered slowly through wetlands, being absorbed and purified, now rushes down canals and into the creeks, bringing with it bacteria, pesticides, fertilizer and other pollutants.

Two of those canals that drain some 8,000 acres go through the 5,800-acre North River Farms, which sits astride Open Grounds' southern flank and surrounds some of the North River's important creeks. The Federation in 1999 bought about a third of North River Farms with a grant from the NC Clean Water Management Trust Fund.

We plan the largest restoration project in state history, turning 808 acres of cropland back to wetlands and protecting the remaining 1,183 acres of salt marsh. We'll re-create the natural flood basin

by plugging more than seven miles of drainage ditches and planting up to 500,000 trees. We'll also divert water draining from those two Open Grounds' canals into the re-created floodplain, allowing pollutants to settle out and be treated in the restored wetlands.

The NC Wetlands Restoration Program has committed \$1 million to the effort and the US Environmental Protection Agency and the National Oceanic and Atmospheric Administration are contributing \$50,000 each. The NC Cooperative Extension Service has been selected to conduct the restoration.

Through a second proposal to the Clean Water Management Trust Fund, NCCF hopes to buy most of the rest of North River Farms and restore the wetlands. This project will re-create the historic headwaters and stream channels of Middens, Wade and Williston creeks that flow to Jarrett Bay.

The trust fund, though, comes under yearly attack by shortsighted legislators blinded by falling state revenues and driven by a need to cut state spending. If the trust fund doesn't have the money to buy the rest of North River Farms, NCCF is working with several people who are interested in buying the remaining 1,400 acres for a private hunting camp. They have agreed to restore the wetlands and enroll the land in the federal program that encourages landowners to protect wetlands by paying them to preserve them. The owners would also agree never to develop the property and to permanently protect it by giving the Federation conservation easements to the land.

Taken together, the North River Farms projects represent one of the most significant restoration efforts undertaken in the nation. According to Todd Miller, NCCF executive director, "Our objective is to restore natural hydrology to the land and reduce surface runoff of fecal coliform bacteria to the receiving streams so that shellfish beds may be reopened."

Doing no harm

Forests in the coastal region are vulnerable to development, particularly if they are anywhere near the water. Such development can pollute the water with runoff and close shellfish beds when forests are leveled, marinas built and too many houses thrown up along the water's edge.

One of the state's goals for the Neuse River is to "Protect those waters that are presently unimpaired while accommodating reasonable economic growth." A lofty goal to be sure, that had fallen far short in practice.

When Weyerhaeuser Real Estate Development Co. decided to build a 600-unit housing development in a forest along the Neuse River in Pamlico County, corporate executives braced for

the worst. A previous legal battle with environmental groups over another development had left the company bruised and wondering if there was a better way.

Ed Mitchell, the manager for the project, decided to test the waters. He contacted Todd to see if the company's objectives could be balanced with those of environmental groups. Miller explained that state environmental rules function as minimum standards and seldom protect the environment from degradation. Mitchell offered to go beyond state standards if the company's objective could be met and the needed permits secured through a collaborative effort with environmental groups and regulatory agencies.

Mitchell brought together environmental groups and state regulators and hired Land Ethics, Inc. to develop a development plan that balanced economic viability and environmental protection.

All of the creeks upstream from the planned development had been closed to shellfishing because of fecal coliform bacteria from developments and pollution from marinas. Yet, Broad Creek, Gum Thicket and other waters on the Weyerhaeuser property still met all water quality standards. The site also contained 394 acres of wetlands and 28 miles of waterfront property.

Land Ethics came up with an innovative design that effects less than an acre of wetland, limits impervious surfaces to 10 percent and prohibits individual boat slips in front of houses. The plan utilizes an upland marina that will be carved into the center of the property, thus keeping Broad Creek from being automatically closed to shellfishing.

The Neuse River Foundation and NCCF were impressed with Weyerhaeuser's commitment to proceed with the plan. The two environmental groups collaborated on a grant from the Clean Water Management Trust Fund to create a 301-acre conservation area on the site beside the Neuse River and Gum Thicket.

Marion Smith, the foundation's former executive director, said, "With this grant and the outstanding riparian land conservation it brings, along with the other conservation aspects of this project; it establishes a new benchmark for environmentally compatible development on the North Carolina coast."

Restoring wetlands, preserving natural areas and designing sustainable developments are important strategies for improving or protecting water quality and preventing habitat destruction in the coastal region. North River and Gum Thicket can serve as models for other places in the coastal region where water quality is still good or where restoration is the only option.

There's no mystery here. What happens on the land will affect what happens to the water. ■

In their own words . . .

If you're going to have development and you're going to manage the development, then it has to be a healthy business as well. To do this, we have to win on the economics side. There needs to be a fair return for those doing it.

Water quality impacts fisheries. It impacts a number of things. It impacts the quality of our lives. So on this piece of property we had to look at the fact that water quality was the issue. This piece of property is surrounded by water and anything we do on the site was going to have some sort of impact. I certainly don't have all the answers about water quality. The best thing to do was to get all the stakeholders in and let's see how we can put the pieces together.

I think one of the things that happens in business is that we react to the environment. We get to the point where we're forced to do something. We're forced to do something that becomes a line item in the business without looking at all the impacts. If you don't go through the efforts of listening to everybody, you'll never learn anything environmentally.

I never made a business decision on this project without looking at the environmental side. At the same time, I never made an environmental decision without looking at the business side. That really simplified things.

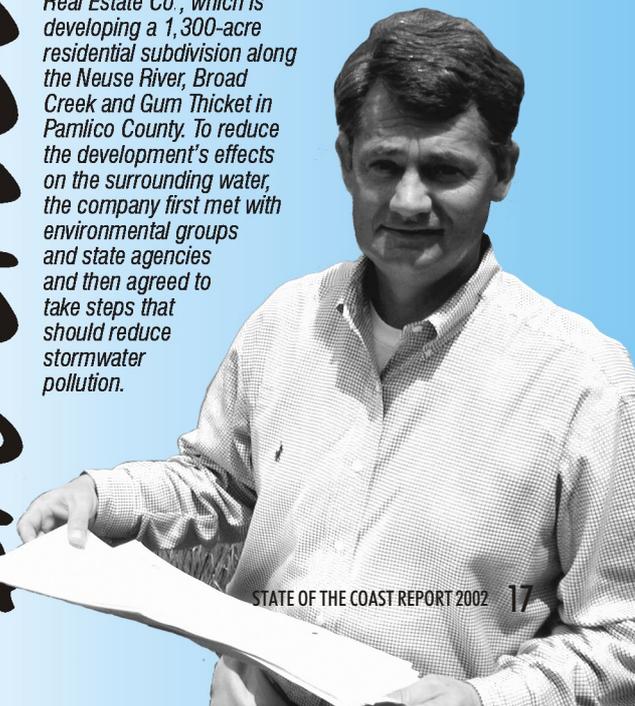
We started off with 1,300 acres. We take those sites and have consolidated in certain areas. We're reducing road areas. We're leaving a lot of open space. Not only are we reducing impervious surface by doing that, we are turning some of the stormwater inward. I'm not saying we won't affect water quality because it's very difficult not to affect water quality in some way, but we will reduce that.

There was potential, in the initial plan, for some 250 waterfront lots, which would have individual docks. That was going to have a tremendous impact on the water quality. It was certainly realized by us that we needed to look for a solution to that. Surprisingly to us, the solution was the upland basin. Then we had to look at how that restricted boat docks. Now that's a big compromise for us. Through our covenants and deed restrictions, you will not be allowed to put a boat dock behind your house here. You will keep the shoreline as natural as possible.

You cannot cut a tree in this community larger than six inches without our approval. If it's in your building envelope then we're not going to argue with you. If you step outside that building envelope, then we're going to question why you want to cut that down. There will be some good reasons.

Ed Mitchell is with Weyerhaeuser Real Estate Co., which is developing a 1,300-acre residential subdivision along the Neuse River, Broad Creek and Gum Thicket in Pamlico County. To reduce the development's effects on the surrounding water, the company first met with environmental groups and state agencies and then agreed to take steps that should reduce stormwater pollution.

In their own words . . .



Coastal Report Card



W = withdrawn failing

Gov. Hunt and His Administration										
1994	1995	1996	1997	1998	1999	2000	2001	2002		
C-	C+	I	B	D+						

Gov. Easley and His Administration										
1994	1995	1996	1997	1998	1999	2000	2001	2002		
N/A	N/A	N/A	N/A						W	

NC Senate										
1994	1995	1996	1997	1998	1999	2000	2001	2002		
D	B	I	C	C	C				W	

NC House										
1994	1995	1996	1997	1998	1999	2000	2001	2002		
D	C-	B	C	C	C	D			W	

Local Governments										
1994	1995	1996	1997	1998	1999	2000	2001	2002		
A+	D+	C	D+	D					W	

Other										
1994	1995	1996	1997	1998	1999	2000	2001	2002		
B	A	A	B+	B+	B+	C-			W	

Every year about this time, we've sat down and tried to judge how the General Assembly, the governor, local governments and even the public have protected our coastal environment in the year since the last report card. We've tried to be fair about it. Honest. But with a few notable exceptions, we've handed out mediocre or barely passing grades.

The truth is that our coastal environment has slowly and relentlessly deteriorated since the first report card eight years ago. This issue of the *State of the Coast Report* is an indication of how bad things have gotten. It's devoted to bringing back the oyster, a creature central to the health of our estuaries and the traditions of our coastal communities and once almost as abundant as the water itself. Colonial mariners told of sinking their boats on the huge oyster reefs in Pamlico Sound and of oysters so big that they had to be cut in half to be eaten. The oyster population has since collapsed under the weight of pollution and diseases – which leads to overfishing. Its demise signals a deepening doom for our coastal environment.

So why dole out more miserable grades? What's the point? And, in the end, is it really fair to the people who get those failing marks? Clearly, something is terribly amiss. But it's not people or programs or laws. Generally, we have good laws to protect our coastal environment and conscientious people in state and federal agencies to administer them. They haven't failed us. Something else has, though, something bigger than all that.

The System Has Failed Us

Call it **THE SYSTEM**. It's the process by which those laws are passed, rules are written, implemented and enforced. It's the labyrinth of agencies and commissions in which we entrust our natural heritage and how they interact with one another. It's the lobbyists who troll the halls of the legislature with their bulging briefcases and their keys to hospitality suites. It's mayors and county commissioners, administrative law judges and, yes, members of environmental groups.

We've spent decades and billions of dollars building **THE SYSTEM**, and it has failed us miserably.

The oyster offers ample evidence of that failure. Within **THE SYSTEM** can be found all the tools needed to save our oysters. There are rules to protect water quality, prevent the over-development of shorelines and encourage the restoration of oyster reefs. There are agencies and people empowered to enforce those rules. Yet, **THE SYSTEM** failed to protect oysters, even after being directed to do so by high-powered, blue-ribbon commissions appointed by the governor.

Often, **THE SYSTEM** runs aground somewhere between the passage of a rule or law and its implementation. Usually no extra money comes with the new mandate and we end up with situations like the one at the NC Division of Water Quality's regional office in Wilmington where one inspector is responsible for reviewing 265 of the 304 pending stormwater permits. One other person handles much of the remainder. These two state employees are also responsible for enforcing the 3,900 existing stormwater permits in their region. We submit that they can't do a credible job no matter how hard they try. One result: The oysters keep disappearing.

Other times, **THE SYSTEM** grinds potentially good laws beyond recognition. Take those stormwater rules again. Scientists knew by the 1980s the detrimental effects that runoff was having on our shellfish waters. To preserve our oysters and clams, they recommended that the NC Environmental Management Commission pass new rules that required engineered solutions to controlling stormwater if as little as 10 percent of land near shellfish waters was paved or otherwise hardened. Studies had shown that water quality suffers beyond that threshold.

Along came the homebuilders and real-estate developers and other moneyed interests that are part of **THE SYSTEM**. The Commission, pressured by the legislature and the Governor, listened, as it often does, and, ignoring the science, passed a rule in 1986 that more than doubled that threshold to 25 percent. This allows for intense development, and guarantees more polluted oysters.

Even the smallest of problems seems to be beyond the ability of **THE SYSTEM**. When a minor rule change survives the sausage grinder intact, **THE SYSTEM** allows the moneyed men to scurry behind the

scenes, beyond the glare of public scrutiny, to kill it. That's what recently happened to a sensible rule that the Coastal Resources Commission, which sets development policy along the coast, passed in 2001 to keep swimming pools and tennis courts from becoming battering rams during hurricanes. Hurricane Fran in 1996 and five other recent hurricanes caused billions of dollars in damage to houses, hotels, roads and utilities. In addition, more than a dozen pools were damaged or destroyed because they had been built too close to the ocean. Their pieces then became projectiles that damaged adjacent buildings. To prevent a repeat, the CRC, after 16 months of study and public deliberation, required that pools and tennis courts meet the same setback rules as any building along the oceanfront. No one publicly objected.

The moneyed men, as it turns out, didn't have to. **THE SYSTEM** gives them a convenient back door to kill rules they don't like. The state's Administrative Procedures Act, which was revised by the legislature in the early 1990s to stymie environmental regulations, prevents any new rule from taking effect until legislators have a chance to kill it. Fearing that the swimming-pool rule could limit profits on selling or renting oceanfront property, a group of developers, real estate agents and local-government officials found compliant legislators to sponsor a bill to kill the rule. They met with state and county officials and representatives of the NC Homebuilders Associations to discuss the bill. The public wasn't invited. The rule's opponents bypassed the normal committee hearings in the NC House and cut off public comment at the Senate hearing. The bill passed in the waning weeks of the legislative session.

If **THE SYSTEM** can't do the small things to protect our coastal environment we should no longer entrust it with the larger ones.

Neither are popular programs totally safe within **THE SYSTEM**. The Clean Water Management Trust Fund was created by the legislature in 1996 to find innovative solutions to our state's toughest water-pollution problems, and it has done measurable good. The fund has doled out 314 grants worth \$257.7 million. That money has protected 1,685 miles of riparian buffers and preserved 155,510 acres of land. It helped 67 local governments improve their sewage plants and funded 57 projects to restore stream shorelines and 21 to control stormwater. The trust fund doesn't have nearly enough money to fund all the requests it gets each year.

Yet, every year, the fund's meager appropriations become bargaining chips in the annual fiscal tug of war in the legislature, and conservation groups must fight for every dime. If not for a powerful ally – Sen. Marc Basnight, the senate's president pro-tem – the trust fund may not have survived this long.

Our beaches have also fallen victim to **THE SYSTEM**, which failed to act while the dredges despoiled seven miles of public beaches on Bogue Banks in Carteret County. **THE SYSTEM** determined that the black, shelly hash that private-property owners dumped on our beaches to protect their

buildings met the permit requirement of being "compatible" with native sand, though the average shell content was four times higher than what's normally found at Bogue Banks.

Some members of **THE SYSTEM** even conspired to muzzle a federal geologist who had the audacity to publicly question what was being done to the natural beach. The mayors of the towns protected by the shell hash conducted a spirited letter-writing campaign to congressmen, senators and highest-level political appointees. The geologist and the agency she works for were effectively silenced and the message was sent to any other member of **THE SYSTEM** contemplating a mutiny.



THE SYSTEM is broken and its component parts are well deserving of an **F**.

Where Do We Go From Here?

But THE SYSTEM can be, and must be, fixed. It took decades for the wheels to finally fall off the thing, and it will probably take almost that long to re-engineer a new system, one that's truly protective of our coastal environment. From now on, we will no longer grade **THE SYSTEM's** main players – the legislature, the governor, local governments and citizens – for nibbling around the edges. Passing laws without the money to ensure adequate enforcement will no longer count. Neither will sound-bites uttered by a governor. County commissioners will no longer get credit for approving land-use plans they have no intention of following.

*Only bold action aimed at reforming **THE SYSTEM** will count.* To get high marks in our new grading system, governors will have to appoint people to

environmental commissions and agencies who actually believe in environmental protection. Because change begins at the top, governors must endorse good programs, like the Clean Water Management Trust Fund, and fight for its funding.

Governors and legislators must embark on a new course that recognizes the simple truth of protecting our coastal environment: More people mean more pollution. Technology won't bring back our oysters or fix our other problems. Numerous scientific reports prove that there is a threshold under which land uses don't cause significant environmental harm to coastal resources. We need to push management programs to protect these thresholds, and to manage land uses so they don't overwhelm the assimilative capacity of coastal landscapes.

To stop the degradation we must intervene early and prevent the intense development on the land. We must protect what's undisturbed, conserve what's developing, and restore what's degraded. In other words, we must refocus our efforts to places where they can have the most dramatic impact.

Instead of passing even more laws, the legislature should give agencies the money and people they need to enforce the ones they already have. The burden of new laws merely makes it harder for the agencies to enforce what they already have. Passing laws also gives legislators and the public the false sense that the problem was solved.

County commissioners and town councils must take land-use plans seriously, and adopt ordinances that carry these plans out in a way that protects coastal resources.

Constant citizen participation at all levels of government is critical. The good news is that just about every time citizens get involved in a timely way in a coastal protection issue, the coast is better protected.

Next year be prepared for a new grading system. Instead of letter grades, we'll start handing out awards to individuals, agencies, journalists and groups for what they have accomplished that's really good, bad and ugly.

This new grading system will accentuate the positive, and also let everyone know about dirty little deals that "maul" our beautiful coast.

"Nature in America has always been suspect, on the defensive, cannibalized by progress," author Susan Sontag wrote in a melancholy essay in 1977. "In America, every specimen becomes a relic."

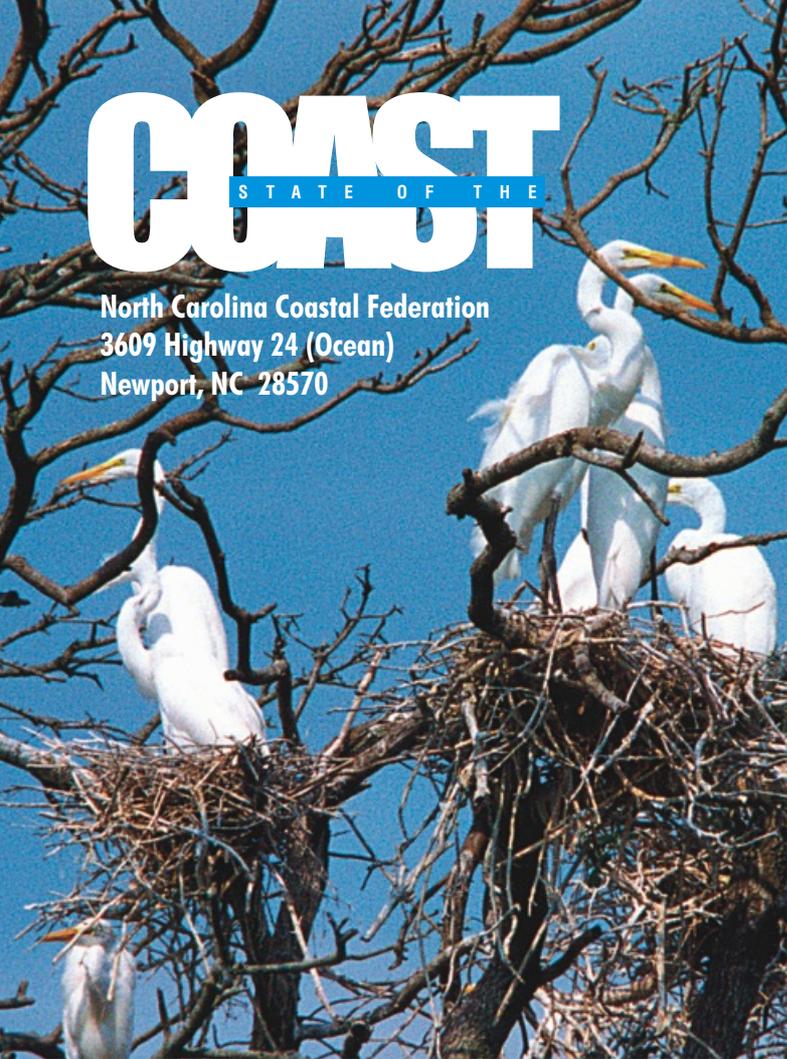
We're optimists around here. We think we have it in us to keep our native oysters from becoming one of those relics and to save this critical part of our coastal environment and heritage. It will take more than building oyster reefs and creating sanctuaries, however. Those are the easy things. Neither will new laws do it nor bold plans that once the TV lights are dimmed are relegated to a drawer in Raleigh to attract silverfish.

It will take public will and political grit to corral the monster. We must enforce our laws, redirect how we spend our money, rethink our entire strategy of protecting our coastal environment. We must, in the end, reform **THE SYSTEM**. We pledge to do our part, and we'll be watching. ■

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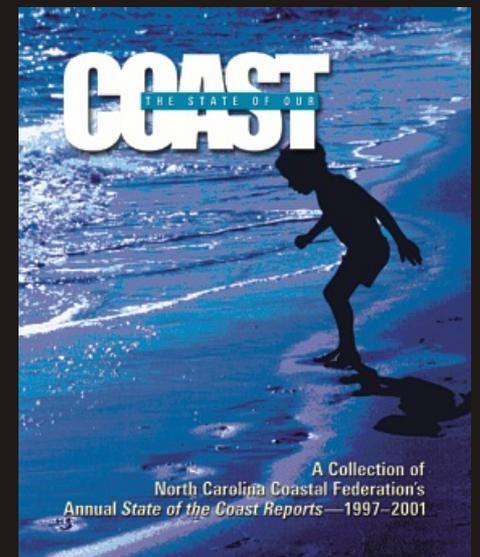
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