



Coastwatch

UNC SEA GRANT ■ JUNE/JULY 1990



Photo by C.R. Edgerton

North Carolina's Coastal Lakes

Mattamuskeet, Phelps, Pungo, Alligator.

North Carolina's coastal lakes are shrouded in mystery.

Each is unique. Each has its own set of outstanding ecological features. Each makes its own tattoo on the face of the Pamlico peninsula.

They have been known since man's earliest wanderings on the continent as places of beauty and abundance.

Yet, no one knows how they were formed. Scientists have their theories—meteor showers, glaciation, sink holes, wind and waves, peat burns—but none dare to say "this is the way they were made."

The four shallow lakes lie peacefully on the large wetland area west of Pamlico Sound, once one of the largest swamp forests in the world.

Each year they attract more and more people. In spring, anglers come in schools to battle their favorite fish. In fall and winter, bird lovers flock to see migratory waterbirds by the thousands.

This issue of Coastwatch explores Lake Mattamuskeet and Lake Phelps—the largest of the state's natural coastal lakes.

Mattamuskeet's Struggle to Maintain Quality

By C.R. Edgerton

Lake Mattamuskeet shines like a silver bowl on a table of swampy land.

From the first discovery of North Carolina's magnificent inland sea, people have hunted and fished here. They have also attempted to mold Mattamuskeet into something it was never meant to be.

But man's involvement on Lake Mattamuskeet has been only a moment in the lake's biological time line. Long before humans decided they'd control the heartbeat of the lake, millions of migratory birds called Mattamuskeet home during the fall and winter months.

That's the primary attraction of this lake for hundreds of people every year, says biologist Kelly Davis. With

binoculars in hand, birders make annual treks to Mattamuskeet's peaty shores.

In earlier days, hunters swarmed the lake. Most would take home prizes that were all too easy to bag. Old photos show these men with ducks, geese, swans and other migratory birds strung around their shoulders.

Today, hunting on Mattamuskeet is strictly regulated by refuge officials. For two weeks in December, 360 people—chosen by lottery among thousands who apply—are allowed to hunt for two days each. And at Thanksgiving, the refuge sponsors a two-day hunt for youth.

"Other than that, hunting is prohibited on the lake," Davis says,

The birds have always been punctual. As the air cools and snow clouds

begin to form, they follow their instincts and leave their homes in the far northern territories of the United States and Canada.

Mother Nature drops her barometric pressure and bends her easterly winds southward. This tail wind is the final cue. Millions of migratory birds begin their flight south.

As the feathered creatures wing their way toward warmer climes, they are driven by one major influence: a need for food. This food is found in abundance at Lake Mattamuskeet and the other coastal lakes, all of which lie directly under the Atlantic Flyway.

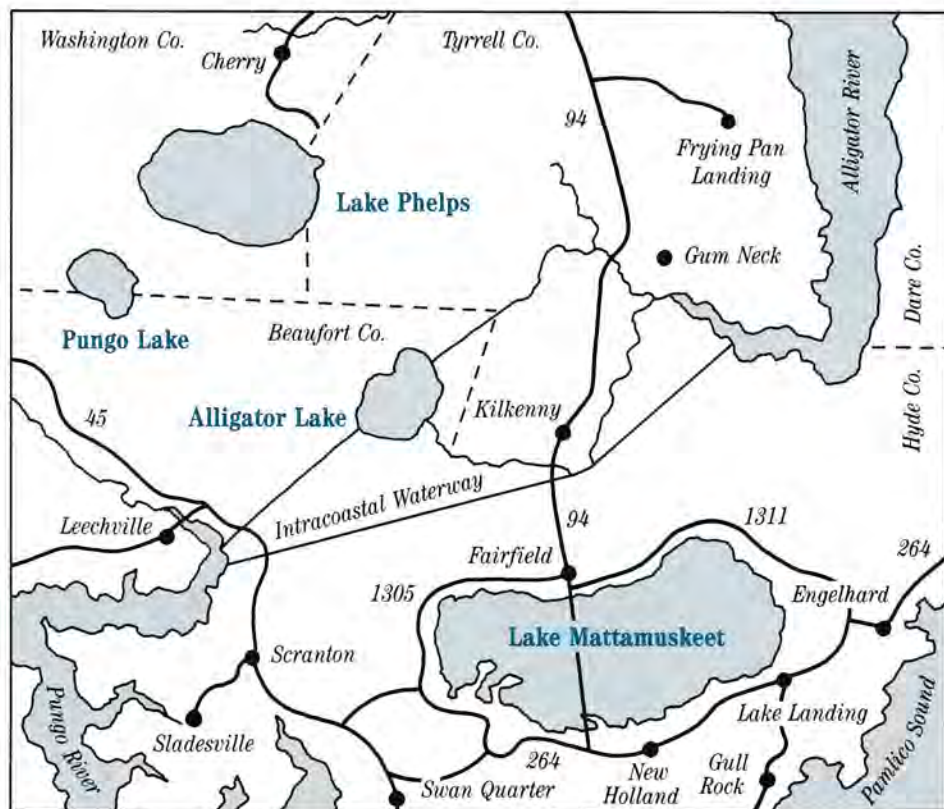
What kinds of birds seek the refuge of lakes Mattamuskeet, Pungo, Alligator and Phelps?

In the 1988-89 season, the skies

In the 1988-89 season, the skies over Mattamuskeet were clouded by 23,000 tundra swans, 17,000 Canada geese, 5,000 snow geese and 122,400 ducks (including canvasbacks, mallards, diving ducks, teals and widgeons).



Photo by C.R. Edgerton



over Mattamuskeet were clouded by 23,000 tundra swans, 17,000 Canada geese, 5,000 snow geese and 122,400 ducks (including canvasbacks, mallards, diving ducks, teals and widgeons).

They sought the lake's plentiful supply of redheadgrass, wild celery, southern naiad and muskgrasses. They also found refuge and food in the cattails and rushes that line the shores.

The bald eagle, a majestic bird whose Tar Heel populations dwindled to almost nothing during the decades of the 60s and 70s, is also a frequent winter guest.

In the 1940s and 50s, 40 to 75 eagles wintered at Mattamuskeet, but by the early 1980s only 3 to 5 were sighted. By 1984, the winter count had increased. Last year, 8 to 12 birds and at least four pairs were nesting in the eastern portions of the state.

Seeing that eagles might make a comeback on the lake, officials at the Mattamuskeet National Wildlife Refuge released 33 eaglets from 1983 to 1988. The survivors of this tiny brood are expected to make their presence known

in just a few years.

Other birds of prey wintering at Mattamuskeet include the osprey and a variety of hawks.

The lake is unique in other ways. "We have the largest aquatic vegetation resource in the state, and a very unique fishery," Davis says.

Anglers from many parts of the country make annual hook-and-line safaris to the lake to fish for largemouth bass, catfish, sunfish, perch and other freshwater species.

"But we also have some species—like striped bass, croaker, spot, flounder and crabs—that are more at home in salty or brackish waters," she says, attributing their presence in the lake to the series of canals that connects Mattamuskeet to the Pamlico Sound.

"The gates on those canals used to leak pretty much, allowing brackish water to filter through," Davis says. "That's when the saltwater fish came in."

The key to making sure Mattamuskeet's uniqueness is preserved for future generations lies in the quality of the

lake's waters, Davis says. The U.S. Fish and Wildlife Service's extensive and ongoing water monitoring program for the lake and its canals and impoundments is a key element in assuring good water quality.

"We're constantly measuring the water quality and how it's linked to the vegetation in the lake," she says. "We're concerned with the acidity of the lake because there's little buffering, little to make sure the acid level doesn't get too high to support the vegetation that the birds and fish feed on."

The past infusions of salt water into the lake from Pamlico Sound once served as a buffer, reducing the amount of acidity in the lake. New gates on outflow canals essentially keep brackish water out.

Also, some of the rain that falls into the lake has a pH level of about 3.8 to 4.8, Davis says. "That's on the acid side, and we think it's going to become more and more acid," she adds.

When the pH reaches a certain point, changes will occur in the lake's ecology. "This will definitely affect the food chains," she says.

Davis and her co-workers are worried about the acid levels. But they aren't alarmed about runoff from the 26,000 acres of farmland that drain into the lake. The lake's water "turns over" often enough to filter out most of the pollution and other contaminants. "It takes about seven months for the water to turn over," she says. "And that's pretty good. We're getting new water all the time."

Davis will continue to monitor the lake's water until 1993. By then she should be able to determine if the lake is going to reach a "steady state of alkalinity." "If not, then we'll have to devise a plan to re-alkaline the lake," she says.

She's optimistic. She thinks Lake Mattamuskeet will hold to its healthy trends. With good management, she says, the lake will continue to host desirable plants that provide food and cover for the unique fishery and the multitudes of wintering waterfowl. ●

Man's Impact on the Lake

By C.R. Edgerton

The Algonquin Indians called it Mattamuskeet—"Dry Dust"—but no one knows why.

There is nothing dry about Lake Mattamuskeet. At 40,000 acres, it's the largest natural lake in North Carolina.

Perhaps it was so named by the Indians during a summer of drought, when peat-laden soil around the lake drained and became dry as a puff ball.

In any case, no Hyde County resident denies the economic and ecological importance of Lake Mattamuskeet. The lake's waters average two or three feet deep and teem with an abundance of fish. Its boundaries lie within the 55-year-old Lake Mattamuskeet National Wildlife Refuge.

"The ecological and economic value of this lake go hand in hand," says Kelly Davis, a U.S. Fish and Wildlife Service biologist at the refuge. "Hyde County depends heavily on its natural resources, and here we have one of the richest resources around."

Davis says about 50,000 people visit the lake each year—two thirds of them fish and crab in the lake's unique fishery and the others come to watch the thousands of waterfowl that winter there.

For more years than man has counted, this expanse of fresh water has been one of the major winter stopovers for thousands of migratory



waterfowl traveling the Atlantic Flyway.

Swans, ducks, geese and other birds depend on the lake as a safe harbor from the rigors of winter and its accompanying lack of food. Though the numbers of these wintering birds have fluctuated over the years, Mattamuskeet is a regular pit stop.

Mattamuskeet hasn't always been a protected sanctuary. In the decade before the Civil War and the 20 years following 1914, the lake faced radical surgery from those who attempted to drain its waters and change its face for their own purposes.

Lake Mattamuskeet was originally a self-contained body of fresh water. No streams, creeks or rivers flowed in or out. Its pristine waters came from rain, runoff and ground water.

Then, in the mid-19th century, the men living near its shores had what they claimed was a brilliant idea: Let's drain the lake and use its fertile bottom for farming.

Slaves provided the labor to build the first of what would become a series of canals from Mattamuskeet to the Pamlico Sound. The canal stretched from Lake Landing on the south shore to Wysocking Bay on the Pamlico.

The work was difficult. Many problems arose and the farmers asked the state legislature for assistance. By 1911 the General Assembly had established a drainage district around the lake and authorized the sale of the lake bottom, which at that time was owned by the State Board of Education.

As many as four different companies purchased the lake bottom over the next decade, each one beginning with the same dream and each one encountering the same problems.

In 1925, The New Holland Company bought the lake bottom and, with the help of a pumping station that could handle 1.25 million gallons of water a day, managed to drain and farm 12,000 acres of the lake for three years. The company later fell prey to several problems—among them insects, low prices and excessive rainfall—and went belly up. The land was sold to the U.S. government in 1934 and the national wildlife refuge was formed.

The Civilian Conservation Corps turned the old pumping station into a lodge, which was used by the public until 1974. The lodge still stands on the lake's southern shore and is widely known as a landmark and a symbol of the era in which man attempted to harness natural forces beyond his control. ●

In 1925, The New Holland Company bought the lake bottom and, with the help of a pumping station that could handle 1.25 million gallons of water a day, managed to drain and farm 12,000 acres of the lake for three years.



Photo by C.R. Edgerton

Lake Phelps: Clear Waters Reflect Unique Environment

By C.R. Edgerton

A light rain filters through the thick canopy of cypress, sweetgum and poplar trees 135 feet above Sid Shearin's head.

His nylon coat is wet, his cap droops and a slight chill in the air makes for a little discomfort. But he doesn't seem to mind.

This is "his special place," a haven from the rest of the world where it's not unusual to see a cypress tree as thick as the height of an average man. Most of the trees in this virgin forest were here before the first white man ever set foot in the New World. For centuries they towered over Algonquin Indians as they built villages and carved dugout canoes.

"I'm a tree man myself," says Shearin, who for the last seven years has been superintendent of Pettigrew State Park in Washington County. "I love it out here. I never grow tired of walking down this path, looking at the trees."

This day, he treads carefully on the half-mile trek to Moccasin Overlook, a wooden boardwalk recently constructed to give park visitors access through a swampy area of the park they wouldn't otherwise visit.

He and his two companions dodge puddles of mud and peat and soak in not only the rain, but the beauty of one of the last remnants of the state's once-vast swamp forests.

But this Eden isn't the central feature of Pettigrew, North Carolina's largest state park. Lake Phelps dominates. Discovered in 1755, its 16,600 acres of crystal clear waters form what Shearin calls one of the best-kept secrets of the state's park system.

Like its sister lakes—Mattamuskeet, Pungo and Alligator (or New)—the origin of Lake Phelps is lost in the unknown.



Photo by C.R. Edgerton

Sid Shearin treads carefully on Moccasin Overlook, a wooden boardwalk recently constructed to give park visitors access through a swampy area of the park they wouldn't otherwise visit.

"Some folks say the lakes are the footprints of Paul Bunyan, but that can't be true," Shearin says, laughing. "Paul Bunyan never came this far south."

There is no consensus as to how these lakes were formed, but the latest scientific research points away from outlandish theories of the past—meteorites, sink holes—and toward a more logical hypothesis, such as glaciation or the wind and wave actions of ancient receding seas.

"The North Carolina bays could have had multiple origins," says James K. Holley, a geologist with Applied Environmental Services in Raleigh whose recent Master's thesis dealt with the lake's hydrogeology.

"They could have formed from old peat burns or they could have been the remnants of old river channels. In any case, there's no real consensus."

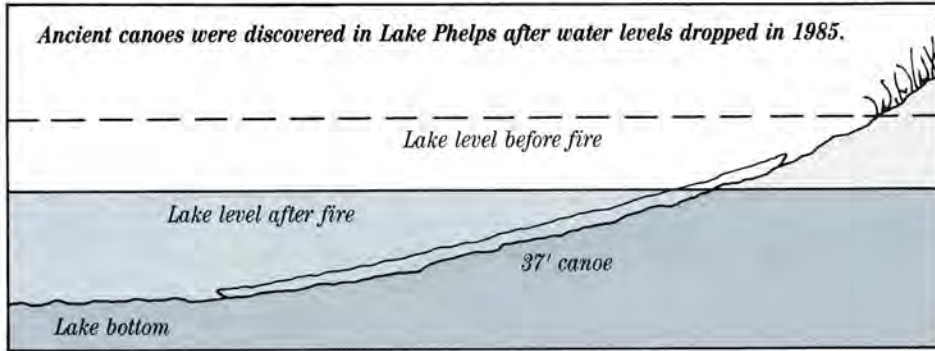
Holley's recent findings—based on radiocarbon dating—have placed the ages of lakes Phelps and Mattamuskeet at more than 38,000 years.

"That means the lakes have been around a lot longer than man has been living on them," he says. "And all that time, Lake Phelps has been shifting, migrating northward."

That migration can be proven by a series of ancient rims discovered on the south shore, Holley says. Core samples have indicated that over the centuries the lake moved, creating new shorelines.

Continued on next page...

...continued from previous page



"This means the lake is shifting or was once larger than it is now," he says.

But theories about the beginnings of Lake Phelps cannot explain other things that make this lake and its environs one of the most unique biological areas in the state.

"It's amazing," says Shearin. "Largemouth bass flourish in this lake, but they're not supposed to. They supposedly can't reproduce in water with a pH below 6.0. But here, the water is about 4.6 pH. We don't know why they live here."

Then there's the Waccamaw Killifish, a tiny fish that's found in Lake Phelps—and further inland in Lake Waccamaw—and nowhere else in the world.

"How do you explain something like that?" Shearin says. "Here are two disjunct populations of a particular fish and no one knows how this happened."

The most unusual thing about Lake Phelps, and the feature that has given the lake lots of publicity in recent years, is the lake's ability to preserve wood.

Since 1985, about 30 ancient dugout Indian canoes have been found in the lake's sandy bottom. These canoes range in age from 550 to more than 4,350 years old.

"We started finding the canoes around 1985, after a fire occurred in the summer of 1984 on the south side of the lake," Shearin says. The fire burned 95,000 acres of timber, and fire fighters pumped millions of gallons of water from Lake Phelps in efforts to control it.

"The water level in the lake went down about eight inches," Shearin says.

"That's when the canoes started showing up."

David Phelps, an archaeologist at East Carolina University, notes that the first canoes, as well as hundreds of other Indian artifacts, were discovered by fishermen. Most of the items were seen clearly through the lake's clear, shallow waters.

In a brochure published last year, Phelps estimated that artifacts spanning 11,000 years have been collected by fishermen and archaeologists. He says the 30 Lake Phelps canoes are "the largest number of canoes in the Southeastern United States still in association with the sites where they were manufactured or used."

Shearin says the longest canoe measures about 37 feet, making it the longest dugout canoe discovered in the South. Nineteen of the canoes have been radiocarbon dated and 16 of them are more than 1,500 years old, he says.

But why the large number of canoes and how could they have been preserved over centuries, some even longer than the Great Pyramid of Giza in Egypt?

"This is another area that has caused some speculation, but no real answers," Shearin says. "The canoes are made of cypress, which has a natural tendency to resist decay and they have been under sediments on the lake bottom, which prevents oxygen from reaching them."

Another reason for the canoes' longevity might be found in the makeup of the water in the lake, which is unpolluted and slightly acid.

"Everything drains away from the lake, nothing drains into it," Shearin

says. "This means the water is mostly rainfall, and therefore very clean. There's no pollution in it."

Shearin says the algae and other microscopic plants and animals that would literally "eat up" a wooden canoe in normal freshwater lakes and ponds are not present in Lake Phelps. "This is another thing we can't explain, but these organisms just aren't there," he says.

Though no one has surveyed the water quality of Lake Phelps, recent events may lead to more stringent controls of the lake's waters, Shearin says.

"We're real picky about our water here," he says. "We're getting more fishing here on the lake every year. The fishermen are discovering Lake Phelps because of polluted water elsewhere."

Hopefully, Shearin notes, the influx of more fishermen will not spell doom for the lake's excellent water. "We want to remain one of the best fishing lakes in the state," he says.

James Holley believes Shearin's wishes for Lake Phelps can be realized if management of the land in and around the park stays within the public's jurisdiction.

"One has to consider the possibilities of development around the lake, and some of that is already occurring," Holley says. "But the best bet for the lake is public management. We'd do a lot better that way. If it's done privately, the land and the lake would most likely be exploited." ●



Photo by C.R. Edgerton

The Back Page

"The Back Page" is an update on Sea Grant activities—on research, marine education and advisory services. It's also a good place to find out about meetings, workshops and new publications. For more information on any of the projects described, contact the Sea Grant offices in Raleigh (919/737-2454). For copies of publications, write UNC Sea Grant, Box 8605, NCSU, Raleigh, N.C. 27695-8605.



Blue crabs may not be just summer pickins' any more.

David Green, Sea Grant's seafood specialist, has received a grant from the

National Coastal Resources Research and Development Institute to test methods for extending the availability of blue crab meat.

Green says that during peak supply months when prices are low and pickers are overworked, crab houses could steam cook, flash freeze and store crab body cores. Then when prices rise and pickers are out of fresh product, the cores could be thawed and the meat picked.

Technology has already been developed for such a storage process, Green says. But it hasn't been used by the blue crab industry.

Green hopes to change that.

He plans to develop processing specifications that will yield thawed crab meat that is bacteriologically safe and tastes good.

Scientists already know that crab meat can be stored at minus 20 F for up to eight months with no change in texture or taste. Yet, Green wants to test the procedure on a commercial scale and use a taste panel and instrumental analysis to test the thawed product.

But all of Green's work won't involve steamers and freezers. He'll also be punching numbers into a calculator to reach an economic bottom line for storing the crab meat. To assist with the economic analysis, Green will call on Florida Sea Grant economist Chuck Adams of the University of

Florida Department of Food and Resource Economics.

Flash freezing could offer crab processors several benefits, Green says. It could stabilize supplies of crab meat to hand-picking houses. Processors could offer pickers a more secure work environment, which should attract better workers. And processors would have better inventory control.

For consumers, it would extend the availability of hand-picked crab meat beyond summer months and offer a more consistent supply of quality product.

When all the costs and benefits are calculated, Green hopes to convince processors that flash freezing crabs is a viable, profitable way to do business.



Sea Grant sleuth Bob Hines is heading south to investigate a new shrimp net that has caught on in Louisiana.

The net is called a skimmer trawl, and it's a cross between a butterfly net and a Vietnamese chopstick rig, says Hines, a Sea Grant Marine Advisory Service fisheries agent. The net is rigged so that the boat pushes the trawl instead of pulling it as with conventional shrimp rigs.

The net has several attributes that led the Gulf and South Atlantic Fisheries Development Foundation to fund Hines' investigation.

First and foremost, it may eliminate the need for turtle excluder devices, or TEDs, a contraption disliked by most shrimpers.

The way the net is rigged, the tailbag is fished near the stern of the boat. This allows fishermen to pull it in every 20 minutes without stopping the boat. Any ensnared sea turtle could easily survive a 20-minute tow before being released after the net is hauled back.

Likewise, the frequent haul backs should also increase the likelihood that bycatch could be returned to the water alive.

The skimmer has even more merits. It improves the quality of the catch, snares less debris, uses less fuel and increases maneuverability.

And to top it all off, Bayou shrimpers claim 16-foot skimmer nets can outfish 50-foot conventional trawls.

With such an impressive list of attributes, Hines wants to see for himself the skimmer net in action. And he's taking along Carteret County fisherman Marion Lewis and East Carteret County High School marine vocational instructor John Weeks to aid in the investigation.

If the skimmer net works like Louisiana fishermen say, Hines wants to bring one back for testing in Tar Heel waters.

Spencer Rogers figures that the Dutch know that it takes more than a finger in a dike to hold back the ocean. In fact, Holland's ability to stay afloat rests squarely on the erosion and water-control techniques developed by its coastal engineers.

Rogers, Sea Grant's coastal engineer, hopes to pick up a few Dutch pointers during an international coastal engineering conference being held in Holland in late June.

But the learning will not be one-sided. Rogers plans to tell his international audience how folks on this side of the Atlantic design coastal buildings to withstand storm surge and wave damage.

Dikes and windmills aren't the only items on Rogers' June agenda. Capitol Hill also occupies a space on his calendar.

Rogers is slated to present Congressional testimony on proposed amendments to the Federal Flood Insurance Program. He will speak before a subcommittee of the U.S. Congress June 20.



No beach trip is complete without a shell collection.

It seems we're all compelled to pick up a few of these beach beauties and take them home as reminders of our summer vacation.

But why not do more than just let your collection gather dust. Identify these beach baubles and learn more about them.

It's easy with the Sea Grant booklet, *Seashells Common to North Carolina*. Using the photographs and drawings pictured in the booklet, folks can determine a shell's common and scientific name and learn about its range and habitat.

For a copy of this 36-page illustrated guide to more than 100 of the state's shells, write UNC Sea Grant. Ask for UNC-SG-72-09. The cost is \$2.



Many people agree: North Carolina's coastal waters are in trouble.

Rivers, streams and sounds are choked and poisoned by the residues

of man's progress.

But there's hope. Through several media outlets, people are learning about the problems facing the state's coastal waters.

WRAL-TV's latest documentary, "Troubled Rivers," and Glenn Lawson's new book, *Troubled Waters*, are two of the most recent offerings.

"Troubled Rivers" examines the Neuse River, a major North Carolina waterway that receives many pollutants during its long journey to the Pamlico Sound.

A videotape version of "Troubled Rivers" is available for teachers. The tape can be borrowed from WRAL at no charge or purchased for \$10. Contact Phyllis Parrish at 919/821-8646.

Like the WRAL video, Glenn Lawson's book takes a look at North Carolina's coastal waters and reports the feelings and fears of the people who work and play there.

For copies of the book, send \$10.45 to Hadnot Creek Publishing Company, 3223-5 Highway 58, Swansboro, N.C. 28584.

Coastwatch is published monthly except July and December by the University of North Carolina Sea Grant College Program, 105 1911 Building, Box 8605, North Carolina State University, Raleigh, N.C. 27695-8605. Vol. 17, No. 6, June/July 1990. Dr. B.J. Copeland, director. Kathy Hart, editor. C.R. Edgerton and Carla B. Burgess, staff writers.

Coastwatch is a free newsletter. If you'd like to be added to the mailing list, fill out this form and send it to Sea Grant, Box 8605, NCSU, Raleigh, N.C. 27695-8605.

Name _____

Address _____

City/State/Zip _____

To help us specialize our services, please answer these questions.

I am in the following line of work:

- | | | |
|---|--|--|
| <input type="checkbox"/> Boatbuilding/repair | <input type="checkbox"/> Homemaker | <input type="checkbox"/> Seafood processing/marketing |
| <input type="checkbox"/> City/county government | <input type="checkbox"/> Lawyer | <input type="checkbox"/> State government |
| <input type="checkbox"/> Commercial fishing | <input type="checkbox"/> Marina operator | <input type="checkbox"/> University professor/researcher |
| <input type="checkbox"/> Educator | <input type="checkbox"/> Marine recreation | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Farming | <input type="checkbox"/> Mass media | _____ |

Coastal property owner: yes no Boat owner yes no

\$_____ contribution to defray printing costs for *Coastwatch*

Coastwatch

105 1911 Building
Box 8605
North Carolina State University
Raleigh, NC 27695-8605

ADDRESS CORRECTION REQUESTED

Nonprofit Organization
U.S. Postage
P A I D
Raleigh, NC
Permit No. 896