UNC Sea Grant

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COASTWATCH

Coastal transportation—a rose or a thorn?

*Editor's note: Water is a natural part of the coastal setting—the ocean, the rivers, the sounds, the inlets. And people who live along the coast have found the waters to be both an aid and a hindrance to travel. In a two-part series, **Coastwatch** will examine some of the problems inherent in coastal transportation. The October issue will discuss the means of spanning these bodies of water: ferries and bridges.*

From the pontoon drawbridge at Sunset Beach to the three-mile, concrete span bridge at Oregon Inlet, transportation officials have tried to link coastal North Carolina across a labyrinth of rivers, inlets and sounds.

Transportation has been a controversial topic among coastal residents and bridges have often been part of the controversy as residents have fought for and against their placement.

William F. Caddell, assistant secretary of planning at the N.C. Department of Transportation, says the N.C. Board of Transportation decides when and where bridges will be built.

The department's planning division recommends certain locations for bridges based on studies, Caddell says. But the public also plays a role in bridge planning, he added.

"Anyone can request a new bridge," Caddell says. "These requests are what the department considers candidate projects. We have hundreds of them."

Also, the board of transportation has public meetings throughout the state so citizens and local government officials can tell the board their trans-

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Photo by N. C. Dept. of Transportation

Cape Fear Memorial Bridge near Wilmington

portation priorities, he says.

Enough clamor from the public can go a long way toward getting a transportation project placed on the board's seven-year schedule for completion, he indicated.

"Usually when there is a lot of outcry from an area for a bridge or a road that is an indication there is a certain amount of need," Caddell says. But, he adds, careful studies are made of all projects to determine their social, economic and environmental benefits before funds are earmarked.

No bridge, however, can be built over navigable waters without the consent of the U.S. Coast Guard.

Once a bridge is completed, transportation officials say the lifespan of that bridge is 40 to 50 years in the coastal environment. "After that amount of time, bridge supports begin to deteriorate and usually the bridge is posted for less than legal loads until it can be replaced, says Jimmy Lee, head of the transportation department's bridge maintenance unit.

How fast a bridge is replaced depends on such factors as its general location, the alternate routes available and the number of school buses that use the bridge, Caddell says.

"All bridges in the state are inspected every two years and none of them are unsafe," Caddell says. "We do have some that are posted, but these are not unsafe as long as people observe the posted limits."

Few bridges are posted for weight limits along major routes and none of these restrict commercial traffic, Caddell adds.

While officials must decide when and where to build a bridge, they also must decide what type of bridge is most suitable for the waterway being spanned.

Lee says the drawbridge is one type of bridge that allows road traffic and water traffic to alternately cross the same waterway.

Four types of drawbridges are currently being used by the department of transportation in coastal North Carolina.

One of these is the outdated pontoon bridge that connects Sunset Beach with Brunswick County. The opening section of this one-lane bridge floats on pontoons. It is opened by a cable which pulls the bridge to the bank.

Lee says this bridge, slated for replacement, is opened more than any other state-operated drawbridge because it does not allow any water traffic to pass beneath it. Other types of drawbridges—swing, bascula and vertical lift—allow smaller craft to pass beneath their movable spans.

Swing bridges, such as the one that crosses Bogue Sound from Morehead City to Atlantic Beach, open by rotating 90° on a center support. Bascula bridges divide in the middle with each side rising to a vertical position.

The fourth type of bridge, the vertical lift, can be seen in Wilmington where U.S. 17 crosses the Cape Fear River. Lee says this bridge, built to accommodate the passage of large ocean-going vessels, rises between two towers.

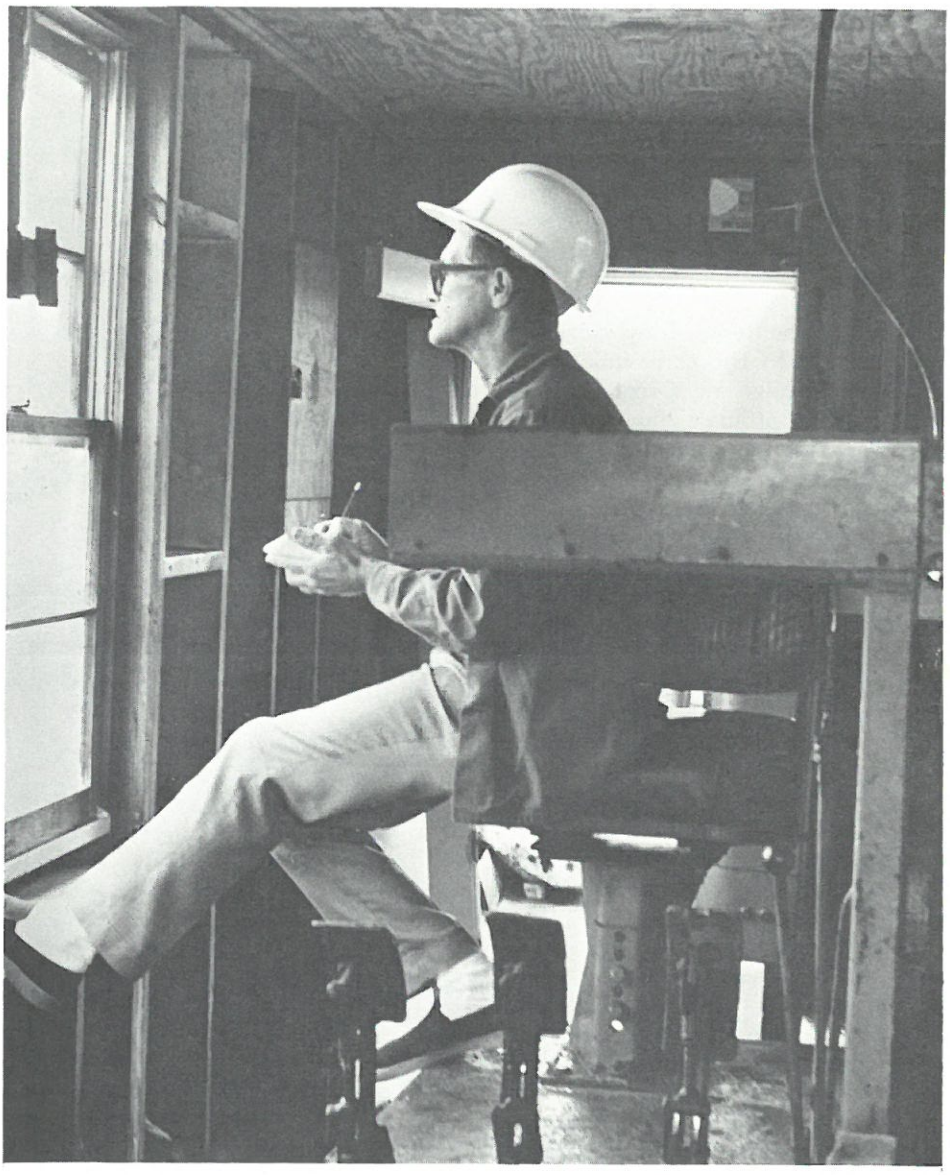
There are 22 drawbridges in full-time operation by the state, Lee says. Four drawbridges are on call and water traffic must give the state 24 hours notice for a tender to be present to open these bridges.

The U.S. Army Corps of Engineers also operates several of its own drawbridges in the state.

It is usually more expensive to build, maintain and operate a drawbridge than a span bridge, but span bridges cannot be built everywhere, Lee says. There is not always enough undeveloped land available on each side of the river or waterway to allow engineers the proper slope necessary to build such high-level bridges.

The coast is known to be unstable and the clash between shifting sands and permanent structures can result in

Photo by Mary Day Mordecai



Howard Holden opens pontoon bridge at Sunset Beach

a costly expenditure in terms of bridge maintenance, transportation officials have found.

A thorn in the transportation department's side since its completion, the multi-million-dollar Herbert C. Bonner Bridge has cost the state additional millions to keep the bridge standing over the shifting Oregon Inlet.

The inlet's channel, once at the northern end of the bridge, has now drifted to the southern end, sweeping about 30 feet of sand from around pilings.

Lee says old pilings had to be stabilized and new ones driven to keep the bridge from collapsing.

Though Lee says the situation is under control now, the Corps of Engineers is considering building jetties to stop the inlet's southerly migration.

This project, however, raises environmental questions that will be considered in the November issue of *Coastwatch*.

Photo by Jim Page

The swing-span bridge that connects Atlantic Beach and Morehead City

Taylors lived high and dry

Andy and Carolyn Taylor are making their home on dry ground these days. But time was when the Pamlico River ran 12 feet beneath the floorboards of their house and U.S. 17 passed within yards of their front door.

The Taylors lived for 12 years on a drawbridge near Washington, N.C.

They and their son, Drew, moved into the house in 1943 so Andy could assume duties as the bridge's tender.

Taylor remained on call 24 hours a day to open the bridge for water traffic that moved up and down the Pamlico River. "For a while Andy worked 29 days a month," says Carolyn Taylor, "and I would have to bring Charlie the barber out from town to cut his hair."

Taylor says the job was dull because traffic on the river was light. But, occasionally there was a little excitement.

Andy recalls that once Carolyn was on the back porch hanging out clothes as a tugboat was hauling a large barge through the opened bridge.

"The tug captain had approached the opening from the wrong angle," Taylor says, "and the barge was headed straight for the corner of the house. I began hollering at my wife to move and at the captain to control the barge."

Carolyn Taylor says she dropped her laundry, headed around the side of the house and ran into the street.

The captain spotted his mistake and corrected the barge's course. But in doing so he caused his own vessel to rock so violently that the operator's house was partially submerged in the water as the tug rolled from side to side, Taylor recalls.

The Taylors also remember Hurricane Hazel's blow through North Carolina in 1954. Taylor remembers that as the storm approached winds became strong and the house began to sway and groan. "When I saw the water in the kitchen sink being sloshed across the floor I told Carolyn it was time for her and the children to leave," he says.

Taylor said he waited the storm out at a nearby filling station where he could keep an eye on the bridge.

While runaway barges and hurricanes weren't usual experiences, the Taylors found that even their everyday life was altered by living on a bridge.

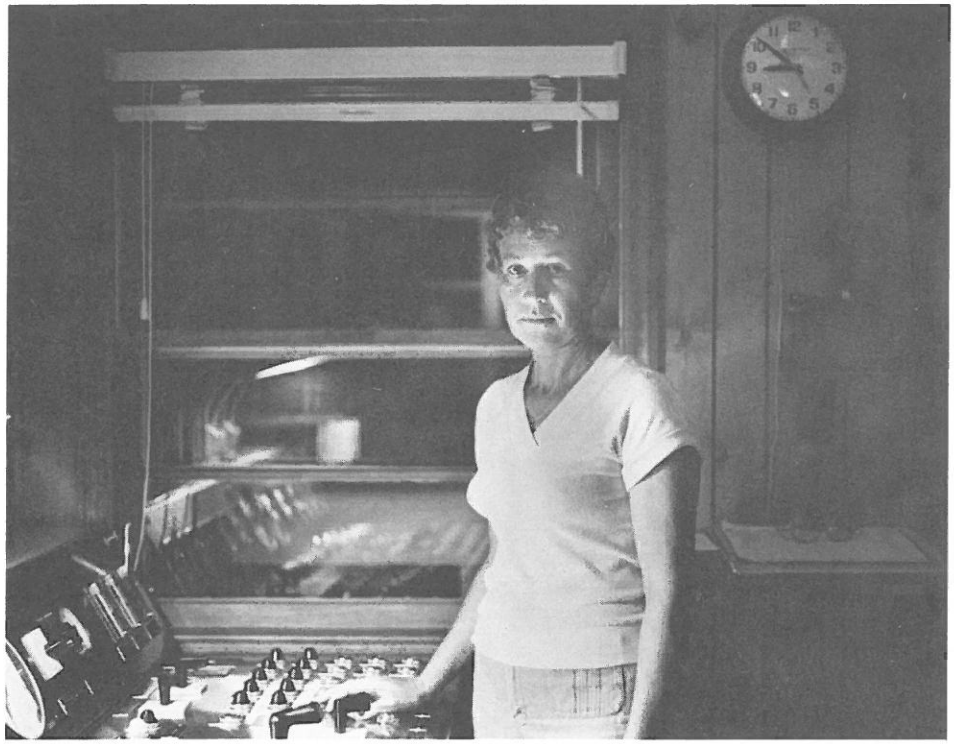
"I used to grieve that Drew didn't have a yard or a neighborhood," says Carolyn Taylor, "but he had his own little boat that he rowed along the river."

Carolyn Taylor said her husband wasn't the only one who knew how to open the bridge. "One night Andy was ill and I had to climb up to the bridge house and open the bridge myself," she said. "Andy had shown me how to open it, but I was scared to death."

The Taylors tried to make their house as much like other homes as possible by planting shrubs, vines and vegetables in barrels around the house and building flower boxes by the windows.

Living on a bridge with small children posed an added worry for the Taylors. They tacked up chicken wire anywhere they thought the children might fall through and watched them closely when they were outdoors.

The Taylors moved away in 1955 and the bridge house was torn down several years later. But Carolyn Taylor keeps a book of snapshots stashed away in a drawer to remind her family of the bridge home.



Lottie Glover at control panel *Photo by Kathy Hart*

Bridge gets tender care

Bridge tender Lottie Glover spots the light of a vessel just as it comes into view, south of the Surf City bridge. She hops from her perch on the elevated chair and moves to the window to watch the boat approach.

At night, it's hard to determine whether or not a boat can slide beneath the bridge's span. But, three short blasts of a horn minutes later remove any doubt and Glover moves to her control panel.

She blasts the bridge horn three times and begins turning the knobs and levers that light the panel in Christmassy reds and greens.

First, Glover turns on the red lights at each end of the bridge and simultaneously a bell begins clanging to warn motorists to stop. She then checks up and down the bridge to make sure no cars are on the bridge before lowering the gates.

"You have to be real careful," Glover says, "because when the lights go on and the bells start ringing some people go crazy trying to see how fast they can get across the bridge."

A clanking thud announces that the wedges balancing the bridge in place have been removed. A whining hum begins as the bridge starts its 90° turn.

Once the bridge stops, a trawler moves through the opening. Lottie takes note of its name and waits for the trawler to clear the bridge before reversing the process that ends with traffic streaming across the bridge.

The whole process takes eight minutes. Lottie logs the amount of time the bridge was opened, the weather conditions, the name and kind of boat, and the number of cars stopped for the opening.

"There is a lot more to bridge tending that most people think," Glover says. "You have a lot of lives in your hands when you control both water and road traffic."

Glover, a resident of Surf City, has been tending the bridge for two years. She is the only woman employed by the state as a full-time bridge tender.

The boat captains Glover talks to over the bridge's two-way radio are usually surprised to find a woman operating the bridge, she says.

Glover says she took the job because "it was something different to do." "And," she adds, "I've enjoyed every minute of it."

But Glover has found that there are some drawbacks to the job. "I've been cursed at, honked at and hassled over the telephone by drivers who thought I held the bridge open too long, but I pay it no mind," she says with a grin.

Glover isn't the only bridge tender who has to listen to motorists' complaints, says Jimmy Lee, head of the N.C. Department of Transportation's bridge maintenance unit.

What most motorists don't realize is that in all but emergency cases, water traffic has the right-of-way over road traffic, according to the Coast Guard's regulations for navigable waters.

"It is much easier to stop a car than it is to stop a tug pulling a string of barges," Lee says.

The only exception to the water right-of-way is the heavily-traveled drawbridge at Atlantic Beach. Tenders there open the bridge on demand for commercial vessels and boats in distress. They also open the bridge on demand for recreational vessels, except on summer days between 8 a.m. and 8 p.m., when the bridge opens hourly.

Motorists aren't the only ones who cause problems. Lee says some openings of drawbridges are unnecessary.

Occasionally boat captains blow for the bridge to be opened without first lowering apparatus not essential to navigation, such as fishing outrigging and radio antennas, that would have allowed the boat to pass beneath the unopened bridge, he says.

If this happens, the bridge tender reports the boat's name and number to the nearest Coast Guard commander.

October is the busiest month for the bridge tenders along the intercoastal waterway. "It seems like I'm opening the bridge every five or ten minutes when the yachts and sailboats start to move south to Florida," Glover says.

But things quiet down in winter, when water traffic is minimal. It's just as well, though, because when the winter storms blow in, with gusts over 30 mph, there are times when the bridge can't be opened, Glover says.

Glover does more than just open the bridge. Once a month she counts all the cars that cross the bridge and she is also responsible on her eight-hour shift for keeping the bridge house clean and for greasing the gears that turn the bridge. "I'm a grease monkey sometimes, too," she says.

Glover, who claims to be just "a plain ol' Tar Heel," says she plans to be a bridge tender as long as she can. "They're going to have a hard time getting rid of me," she says.

North Carolina operates "little navy"

Chances are, few inland North Carolinians realize that the state has its own fleet—a fleet of ferries, that is. Folks at places such as Hatteras and Ocracoke, however, know that the ferries are a vital link in North Carolina's coastal transportation.

Currently, there are 15 ferry boats in North Carolina's "little navy," says Ben L. O'Neal, director of the N. C. Department of Transportation's ferry division.

O'Neal says the number of ferries has grown steadily since the division was established in the early 1940s with ferry service across the Alligator River. Now the ferries travel seven routes across sounds, inlets and rivers along the coast.

Many of the early ferry crossings at places like Oregon Inlet and Croatan Sound were stopped after bridges were erected, O'Neal explains. "But when we do away with service in one area we just start it up somewhere else," he says.

Most bridges are, in the long run, less costly than ferries, which require a constant expenditure of funds for upkeep and personnel, state transportation officials say. But the North Carolina coast, with its system of barrier islands, large sounds, shifting inlets and many rivers, often makes ferry service more feasible than bridges, officials say.

Officials also say, traffic to some coastal areas does not warrant the expenditure necessary to build a bridge.

Tolls are charged for the three longest ferry crossings—Ocracoke-Swan Quarter, Cedar Island-Ocracoke and Southport-Ft. Fisher. By charging a fare, the division tries to recoup at least part of its operating cost, O'Neal says. In 1978, $5 million were spent on maintenance and operation of the ferry division, he says.

Fare information and ferry schedules are listed on the official North Carolina highway map distributed by the transportation department and the travel and tourism section of the N.C. Department of Commerce. Ferry information can also be obtained by writing the Ferry Division, N.C. Dept. of Transportation, P.O. Drawer P, Morehead City, N.C. 28557, or by calling (919) 726-6446.

O'Neal emphasizes that people taking the Ocracoke-Swan Quarter ferry or the Cedar Island-Ocracoke ferry should make reservations several days in advance. These ferries are often crowded because they are the main access routes to and from Ocracoke Island and the Outer Banks and reservations are needed to assure people of space on the ferry, O'Neal says.

These reservations may be made in person at the ferry terminal or by telephone between the hours of 6 a.m. and 6 p.m. For departures from Ocracoke, call (919) 928-3841; from Cedar Island, call (919) 225-3551; from Swan Quarter call (919) 926-1111.

Most of the ferry schedules change in the summer months to accommodate the increased traffic from tourists, so travelers should check to see when winter and summer schedules are in effect for each ferry.

The ferries are captained for the most part, O'Neal says, by retired Navy and Coast Guard personnel who have been licensed by the Coast Guard as captains. The Coast Guard also inspects the ferries regularly.

O'Neal says the ferry division is a part of the state's civil preparedness plan to evacuate people in case of a hurricane. He adds that, in the case of a hurricane, ferries would run until conditions became too severe to safely carry passengers. Then they would be moored at various points up and down the coast.

O'Neal says he thinks the ferry system will be around for years to come "because of the traveling needs of the public and the nature of our outer islands."

Photo by N. C. Dept. of Transportation

Bearing passengers from Hatteras, the Ocracoke slides into the dock at Ocracoke Island

Gallop is master Aboard ferry

Captain Derwood E. Gallop stands on the wooden bridge, smiling and speaking to his prospective passengers as they board the ferry for Swan Quarter. But Capt. Gallop is doing more than just getting acquainted; he's checking for leaky gas tanks in the cars and boats being hauled aboard.

"As captain I always want to know what I have on my vessel before we leave the dock," said Gallop. "If I can smell gas leaking I don't allow them aboard because leaking gas could mean a dangerous fire at sea," he said.

Gallop is the captain of the Edmund Hyde, the newest and most plush ship in the state's navy.

Once the boat is loaded, Gallop heads for the bridge to launch the ferry toward Swan Quarter. As soon as the Hyde is safely out of the dock at Ocracoke Island, Gallop picks up the microphone to broadcast the rules for the trip.

"These rules are for the safety of the passengers and so a few don't infringe upon the rights of others," Gallop says.

After the rules are out of the way, Gallop settles back to tell passengers a little history of Ocracoke Island. Gallop started giving these informative lessons a short time ago after combing books for some of the area's more colorful history.

He has since recorded several tape cassettes for other captains to use on the Cedar Island-Ocracoke and Swan Quarter-Ocracoke ferry routes.

After the history lesson is finished, Gallop usually leaves the navigation of the ferry to his quartermaster and heads for the lower deck to chat and mingle with the passengers. He is an obvious hit with them.

"I always enjoy the complimentary letters I receive from the people who ride the ferries," he says. "My basic philosophy is I try to treat people like I would like them to treat me."

But being a ferry captain isn't always easy, says George Godley, Jr., captain of the Silver Lake, one of Cedar Island-Ocracoke ferries. "Once in a while, people get upset and mad at you because of loading procedures," he says. "They see you put somebody on the boat that arrived after they did and they think they're getting cheated. They don't understand that the ferry has to be loaded in a certain way for safety reasons."

Captain Derwood Gallop

Photo by Dennis Rogers

Godley says large vehicles, such as buses and cars pulling campers, are loaded next to the operator's house, while smaller vehicles are loaded next to the railing. This method of loading prevents the ferry from rocking and the larger vehicles from turning over in rough waters, he says.

"It's a balancing act," Godley says, "and each load is different."

Captains also receive complaints when they decide to cancel a crossing because of bad weather, Godley says. "Anytime you are responsible for that many people, no captain is going to jeopardize his license or his passengers' safety by making a crossing in hazardous weather," he says.

Gallop agrees, but adds that cancellations for weather conditions are rare. "Usually only high winds of 40 to 50 knots will stop us from crossing," he says.

Both captains say summer months when lots of tourists are traveling are the busiest months for the ferry service.

"During the summer, you squeeze every car you can on board and still you leave some cars behind to wait for the next ferry," says one crew member.

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 and workshops and new publications. For more information on any of the projects described, contact the Sea Grant office in Raleigh (919/737-2454).

Paul Hosier, a Sea Grant researcher, has been studying the effects of off-road vehicles (ORVs) on beaches, dunes and grasslands. This fall, the National Park Service contracted with Hosier to map ORV damage to the Cape Lookout National Seashore. Hosier has been conducting a similar study at Cape Hatteras.

At Cape Lookout, Hosier will mark off and protect small sections of shoreline, leaving others open to driving, so that he can measure changes in the plant cover. In some of the tests, Hosier will use three-wheeled "all-terrain" vehicles to test whether they cause more or less damage than conventional vehicles. Hosier has also agreed to compose an atlas of the park, showing areas expecially vulnerable to ORVs, and areas more able to tolerate traffic.

Hosier is working with Tom Wolcott, a North Carolina State University zoologist, who is studying the impact of ORVs on the ghost crab population at the shoreline.

As miles and miles of the nation's oceanfront property are parceled out and developed, legions of "no trespassing" signs are springing up to block the public from the shorelines.

The problem of beach access has suddenly become a sore subject among tourists, fishermen and coastal landowners, and a hot potato for government officials.

Back in 1974, David Brower saw the problem coming. With a grant from Sea Grant, Brower investigated the range of laws and policies that applied, and became one of a handful of authorities on beach access.

So when a U.S. House subcommittee on oceanography met in October to conduct hearings on the coming reauthorization of the Coastal Zone Management program, the representatives asked Brower to testify. Brower told the subcommittee that the program should be strengthened to ensure that all citizens can reach the nation's shorelines, especially those areas valued for recreation.

The response, Brower reports, was "surprisingly favorable." In fact, the representatives have asked him to help them draw up specific proposals that would put teeth in the law and keep paths to the beaches open.

The cost of such legislation? As Brower told the subcommittee: "This need not be an expensive program . . . A ten-foot walkway, linked to a remote parking area or bicycle path, could cost very little, but open miles of public beach for use by the public.

For most of us, the Lock Ness monster is little more than an unfocused image from magazines. But to Tim Dinsdale, Nessie is a career. Dinsdale, a native of Wales, gave up engineering to spend 15 years studying the Scottish lock, which he claims does indeed harbor much more than murky water.

During the Sea Grant-sponsored visit Nov. 12 to the North Carolina State University campus in Raleigh, Dinsdale told his audience that the famous lock was once a part of the Atlantic Ocean. During the last ice age, he said, rising land severed the waters from the sea and locked in Nessie's dinosaur-like ancestors.

Showing his well-publicized film of what he claims is Nessie's hump submerging, Dinsdale reviewed the legends and research that have captivated Nessie's fans. The record of monster sitings, photographs and sonic "pictures," he says, proves that Nessie exists.

The "evidence" is still sketchy. But Dinsdale believes. And he has proven at least one thing: There are still occasions when the worlds of science and fancy rub elbows.

People and dogs aren't the only ones that get lazy during hot weather. Sea Grant researcher Mark Sobsey says oysters do, too. Sobsey has been relaying oysters from polluted waters to clean waters to see how fast they can flush viral contaminants from their bodies. He has found that during winter and spring months the oysters cleanse themselves at faster rates as the water becomes warmer.

Sobsey predicted the cleaning rate would reach its peak during summer, but things turned out differently. When water temperatures were 77°F to 80°F, the oysters eliminated only 78 percent of the viruses from their bodies during a thirty-day period. In March and April experiments, the oysters eliminated 99.9 percent of the contaminants in three days.

Sobsey says there could be several possible explanations for the lack of elimination of viruses during hot weather. The warmer water could cause the oysters to become extremely sluggish and therefore reduce the rate at which they flush water through their bodies. Or the viruses could become sequestered in the shellfish tissue because of changes in the shellfish physiology during spawning. Whatever the reason, Sobsey says more experiments are needed to decide why the self-cleaning oyster doesn't tidy up as fast during hot weather.

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Another North Carolina lighthouse is being imperiled by a shifting shoreline. The Cape Hatteras lighthouse, the tallest in the nation, has signaled navigators away from treacherous waters since 1870, when it replaced an older structure built in 1803.

But, because of erosion, authorities believe the lighthouse will collapse—some say within 30 years, others much sooner.

The National Park Service is trying to decide whether to preserve the landmark, either by moving it or arming its foundations against encroaching waters. The park service has enlisted the help of the MTMA Design Group of Raleigh, which is investigating ways to save the building. The design group has asked Jerry Machemehl, an engineer and Sea Grant researcher, to produce plans for protecting the lighthouse.

Machemehl has studied the waves, currents and storm surges of the shoreline, which he terms a "high-energy" area. The problem, he says, is to formulate a design flexible enough to allow the natural shoreline processes to continue, but solid enough to keep the lighthouse erect. One of Machemehl's designs calls for the construction of a revetment that would encircle the lighthouse and, as the shoreline recedes, create a man-made island under the landmark.

Two alternative plans call for groins, beach nourishment and a smaller revetment—all designed to build a buffer of sand between the ocean and the lighthouse.

Machemehl will submit his plans to the park service in January.

The North Carolina Sea Grant program has received funding for its 1980 budget allocations. Sea Grant will receive $1,045,000 in federal funds and $522,500 in state funds. Director B.J. Copeland says this is a 10 percent increase over the 1979 funding. Nine new research projects will be initiated, while 21 others will be continued.

It was an unfamiliar habitat, but 300 coho salmon and 150 rainbow trout weathered eastern North Carolina's hot summer this year. The fish lived in cages in the canals of Texasgulf Inc. on the shores of the Pamlico River near Aurora.

Sea Grant researchers imported the fish last April for one of a series of aquaculture experiments being conducted at the site of NCSU's eel farm, which is headed by Sea Grant associate director Bill Rickards. The eel farm is located on property leased by Texasgulf to East Carolina University.

The water running in the Texasgulf canals comes from underground wells in the plant's open pit mines. Naturally, it is colder than nearby surface waters. In the summertime, the canal water reaches the high 60s, the upper limit of the temperature range tolerated by coho salmon and rainbow trout.

Researchers found that the fish not only survived the summer, they thrived. Both species grew at a faster rate than they would have in the wild. The trout gained weight at a surprising rate, reaching an average size of one-third pound after six months. Growth of the salmon was less impressive, but still enough to encourage researchers about the possibility of raising more salmon in eastern North Carolina.

The experiment ended this fall, when most of the fish died from embolisms caused by gas bubbles. The disease was due to mechanical problems with water dispersion in the canals. Rickards thinks that this problem can be corrected when further experiments are conducted with another group of fish next year.

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