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NORTH CAROLINA SEA GRANT • AUTUMN • 2015 • ISSUE 4 • $3.75

MEASURING UP:
OYSTERS TAKE CENTER STAGE

IF YOU DEVELOP IT — AND IF YOU SEED IT — PERHAPS THEY WILL COME.

That's what some University of North Carolina Wilmington scientists hope their research will do: Build the oyster aquaculture industry in North Carolina.

Seed funding from North Carolina Sea Grant has jump-started two projects that could help the state achieve this goal. These UNCW researchers are developing building blocks that might make it easier and more efficient for those who want to grow oysters in the state.

An online siting tool to help identify potential new aquaculture lease sites and a research shellfish hatchery are parts of a larger effort that could make North Carolina among the nation's leaders in oyster aquaculture.

"The siting tool and hatchery are essential for the expansion of the oyster aquaculture industry in the state," says Chuck Weirich, Sea Grant marine aquaculture specialist. "The tool will greatly assist potential oyster growers in finding suitable locations for their farms. The hatchery research being conducted at UNCW is determining the best native oyster lines for aquaculture production in North Carolina's waters."

PLANTING THE SEEDS FOR A COMMON WEALTH

BY E-CHING LEE

With only one commercial shellfish hatchery currently operating in North Carolina, many growers in the state are using seed from Virginia to meet stocking requirements. Those looking to get into the business have to sort through complex rules and regulations that specify where they can get leases to start their operations.

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ABOVE: *North Carolina researchers want to replicate the success of Virginia's oyster aquaculture industry, including breeding lines of successful North Carolina broodstock.* *Jamie Moncrief/UNCW*


DEH Photography

"All we have to do is look at what the other successful states have done and emulate it. We don't have to reinvent the wheel with this," says Jay Styron, president of the N.C. Shellfish Growers Association. "We've got successful blueprints from many other states. It's not rocket science. It's not like it's a high-tech business either. It's truly very simple."

But first, where does one begin?

• NAVIGATING WATERS

Starting a shellfish aquaculture venture in North Carolina can be overwhelming. The state offers lots of promising locations but choosing one can be limited by personal, environmental and regulatory considerations.

How would you begin identifying a good lease site? Or even know where to start looking?

Troy Alphin, a biologist who studies oysters at UNCW, is familiar with this dilemma.

"The question we get 90 percent of the time when we run into people is, 'Where's a good place to grow oysters and clams?' " he says.

To help potential growers navigate the state's regulatory — and actual — waters, Alphin led the development of the North Carolina Shellfish Aquaculture Siting Tool, available at *www.uncw.edu/benthic/sitingtool*. The online tool can help users identify possible lease sites that meet their needs and that could be acceptable to state regulators.

It presents data from many sources that have to be considered during the lease application process, accomplishing a lot of the initial groundwork for aspiring growers. Available information includes water quality, depth, salinity, restricted areas and current operations. The tool is a good starting point, but users also have to consider actual, in-the-field conditions, Alphin notes.


E-Ching Lee

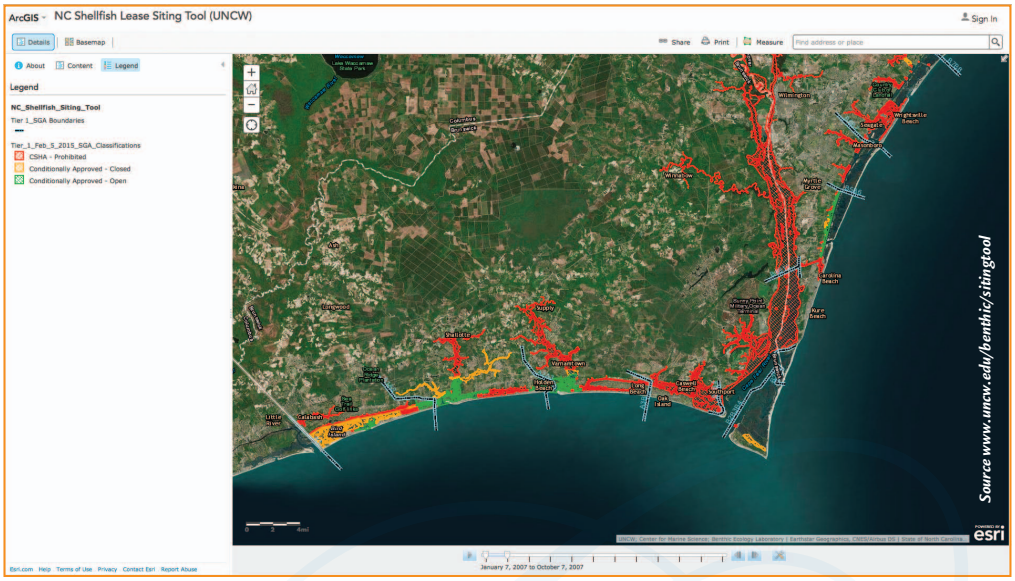

Courtesy Keith Hall

TOP: *For Jay Styron, oyster grower and president of the N.C. Shellfish Growers Association, more aquaculture leases would be a positive coastal development.* ABOVE: *Troy Alphin and Keith Hall are adding a module that will score sites based on suitability for leasing.* LEFT: *Hall conducted many field tests to confirm the accuracy of the data sets.*

The initial work was funded by the National Sea Grant Aquaculture Competition through North Carolina Sea Grant. The overall project was led by Marc Turano, a former North Carolina Sea Grant extension specialist.

In addition to providing seed money to begin work on the siting tool, this grant resulted in a survey of the state's aquaculture operations. The funding also enabled Turano to bring several individuals — including Chris Matteo who went on to establish Chadwick Creek Oysters — on a tour to learn how Maryland and Virginia oyster growers developed and grew their businesses.

"It's a really good example of where the



TOP: *Teams conducted field surveys at eight locations, using methods similar to those of the N.C. Division of Marine Fisheries.* BOTTOM: *Users praise the siting tool for providing a variety of useful information at their fingertips.*

North Carolina Sea Grant funding provided the nucleus," explains Martin Posey, a benthic ecologist at UNCW who worked with Alphin on the siting tool. Posey notes that the team continues on funding from other sources, particularly UNCW. "What we have now is several generations beyond the original project, and it's a much more advanced tool for understanding where appropriate habitats are."

• ONE-STOP SITING

North Carolina provides for the private use of its public waters — the water column or unproductive bottom — for shellfish culture through leases. This program is administered by the N.C. Division of Marine Fisheries, or DMF.

"The waters out there are public-trust waters. They belong to the people of North Carolina," says Steve Murphey, chief of the DMF Habitat and Enhancement Section. "The charge to us is to make sure that person or franchise or whoever gets that lease uses it for the purpose intended, which is the commercial production of shellfish."

He notes that the tool could help smooth the lease application process. "It's a great compilation of a lot of different data layers that have been developed by various government agencies and academic areas. It allows prospective leaseholders to go in and narrow down where might be a good place to put a lease — or better yet, a good place not to put a lease," Murphey says.

"What this does is to allow people to do some homework up front before they get started with the application process," he adds. It saves time for the person seeking the lease and for DMF, which has to review the application.

This includes conducting a site investigation for each proposed site to ensure that it does not contain a natural shellfish bed or submerged aquatic vegetation, which serves as important habitat.

"It puts it all together in one-stop shopping," says Styron, who also owns Carolina Mariculture Co. on Cedar Island. The oyster grower helped Alphin confirm the accuracy of the tool and helped make the system more user-friendly.

In addition, Styron has assisted several people who are using the tool to "put eyes on the water" to determine which locations could be potential shellfish leases.

Kure Beach resident Tim Holbrook used the tool to help him identify a lease site. "I had a tremendous amount of information at my fingertips to select the location," he notes. He had access to valuable data, such as salinity, mean water depth at low tide, water quality and presence of submerged aquatic vegetation.

"To be able to fly in from a 20,000-foot view to a view that is 20 feet by 20 feet and also see the orthoimagery and all the details is something you could never do in a boat," Holbrook adds.

He started his search in January this year. Using the tool — and aided by contacts he met at the 2015 N.C. Aquaculture Development Conference in New Bern — he identified and submitted a request for a lease site to DMF in the spring.

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"I found it unbelievably helpful. I would spend hours and hours on it before I would go out in the field because it just saved me so much time," he recalls.

Holbrook anticipates getting DMF approval to set seed in early September.

The coastal resident envisions this as a family venture. "I have two teenaged boys, and I look forward to having them out on the farm," he explains, "so they can learn about sustainable farming that enhances the environment."

Deb Bettini is a vegetable gardener who was looking to grow oysters on a small scale near her family home on Topsail Island. Alphin and his team, whom she met at the 2014 aquaculture conference, helped her use the siting tool to search for potential sites.

"I found the tool to be easy to use. And the graphics that they had were good for pointing out the space that was available," Bettini notes.

The results altered her plans. "It pointed me to the fact that there already were oyster leases in that area," she explains. Her solution? Find a neighbor with a lease who could sell oysters to her.

"It helped me to find what I was looking for, which was local seafood produced by a local waterman," says the local food enthusiast.

The tool officially launched in October 2014. However, Alphin and graduate student Keith Hall already are working on the next feature — a suitability index.

"It wasn't enough for me to tell them where everything is and whether or not it was supporting shellfish. They wanted us to score it," Alphin recalls.

The team tested this prediction system by comparing the tool's results to active leases. They've also used data from the UNCW Shellfish Research Hatchery to check the suitability ranking. The index is being refined and currently is not available on the public version of the tool.

The team also continues to update the online version of the tool as the data sets change.

"This is a living, developing tool. So, as we get more data, we'll push it out there as folks give us feedback," Alphin notes. "It's critical to know when these things change. The only way we can be sure of seeing no change is not to look."

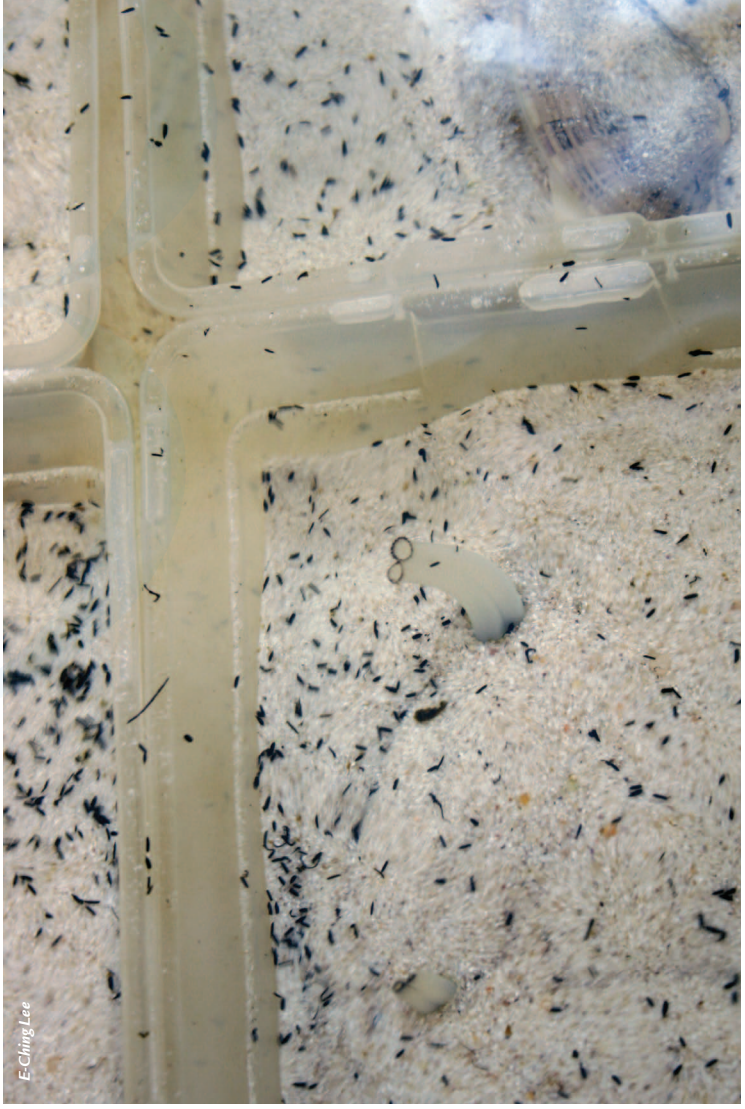
• BUILDING BROODSTOCK

Since 2012, Ami Wilbur, director of UNCW's hatchery, has been focusing on selectively breeding North Carolina oysters.

Her goal is to develop lines of local oysters for use in North Carolina by the state's growers. In addition, she wants to determine if oysters from local waters are better adapted to, and grow faster in, conditions in North Carolina.

The first support for this selective breeding work came through the N.C. Blue Crab and Shellfish Research Program, administered by Sea Grant.

"The Sea Grant



TOP: *Ami Wilbur is testing whether sunray venus clams can be cultured in North Carolina, which is at the northern end of the species' range.* BOTTOM: *On spawning days at the research hatchery, a team of students helps Wilbur harvest and fertilize eggs from the oysters.*

TOP: *Ami Wilbur, pictured on the right with technician Amy Finelli, directs the UNCW Shellfish Research Hatchery, studying oysters and other North Carolina shellfish species.* BOTTOM: *Wilbur is trying to grow sunray venus clams, a shellfish that is popular among consumers in Florida.*

funding that I received for the hatchery has been instrumental in initiating our program. When the hatchery was initially constructed, there were no operations funds. So our initial efforts to pursue the goals the planning committee had set for the hatchery were largely funded by Sea Grant," Wilbur says.

In 2016, she will produce the third generation of the Sea Grant lines. They were started using wild oysters from the Crab Hole oyster sanctuary in the Pamlico Sound, as well as reefs in Stump Sound, Hewletts Creek and Lockwood Folly River.

Funding from UNCW and the New Hanover County Farm Bureau has enabled the research hatchery to continue the breeding program.

Each generation takes about two years. Oysters are spawned in the hatchery, and their offspring are initially grown in indoor tanks and later, at the facility's outdoor farm. Once the young oysters reach about 9 mm, Wilbur sends some to industry partners who provide information on how the oysters do in different locations.

When the oysters are mature, they are returned to the hatchery. Those that exhibit specific desired characteristics are spawned to produce the next generation. The selection criteria include disease resistance, quick growth and the deep-cupped shape prized by the restaurant industry.

The hatchery staff also is evaluating the performance of triploid oysters, with three sets of chromosomes instead of two. These oysters grow faster and are marketable year round. The production process involves patented technology from Virginia. This means that the hatchery's triploids result from crossing a North Carolina female oyster with a male from Virginia. Initial results indicate that the triploids outgrow the diploids.

"I'm 100 percent in support of the hatchery because I think they're doing the work now that is going to pave the way for us down the road," says Joey Daniels, who heads Bodie Island Oysters. "The groundwork is being laid for an industry to take off here. And it's important that it continues."

His business is one of several helping the UNCW hatchery grow out the oysters as part of the research.

Wilbur points to Virginia's oyster industry that has grown by leaps and bounds in the past decade or so. "That's largely on the back of a program like this one, started at the Virginia Institute of Marine Science," she says. Her hope is to match — or even surpass — that achievement.

But she's not content to rest on these

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bivalves alone. Based on industry input, Wilbur also is branching out, raising local lines of bay scallops and sunray venus clams.

"Our research focus is the idea of providing farmers with some ability to diversify their crops so that they're not just growing oysters. And these are two candidate species that they've expressed interest in," she notes.

"This is not just an exercise in scientific curiosity. It really does have real-world impact," Wilbur stresses. "Basic science can happen in the hatchery, but the focus is on applied research that can do good things for North Carolina."

THIS PAGE, ABOVE: *Part of Ami Wilbur's research is trying to determine why some oysters grow faster than others.* FACING PAGE, TOP: *The hatchery grows different strains of algae as food for the shellfish.* FACING PAGE, BOTTOM: *Wilbur grows out shellfish along the boat dock behind the research hatchery, located on the Intracoastal Waterway in Wilmington.*

• PLANNING FOR GROWTH

Wilbur is not the only one who singles out Virginia as an example to follow. Many local shellfish experts and growers believe that North Carolina can — and should — build its oyster aquaculture industry to rival that of its northern neighbor.

In 2014, North Carolina's oyster aquaculturists brought in about $343,000, while Virginia's industry was worth $17.1 million. In 2005, both states' oyster aquaculture industries had similar outputs. Virginia's farm-gate value totaled about $240,000 while North Carolina's was approximately $260,000.

To achieve Virginia's level, experts believe North Carolina must expand aquaculture operations and support hatcheries that can provide local oyster seed for various ventures.

Weirich is seeking additional areas where Sea Grant can contribute to industry growth. He has received a 2015 National Sea Grant Aquaculture Competition grant that includes support to develop demonstration facilities to evaluate gear types for off-bottom oyster culture and production of other shellfish species for industry diversification. These facilities also could serve as sites for training sessions to transfer knowledge and technology to growers. *See the Tiding on page 3 for details of this new funding.*

But those are in the near future. For now, the siting tool and research hatchery are addressing different parts of this effort.

"There's increased interest in exploring the farms. There's increased interest in pursuing sites. That's clear by contacts we're getting, by what we hear from DMF," Posey says. "The conversation and the interest have ramped up dramatically. The actual existence of larger culture farms hasn't gotten there yet — but that's a progression of time."

He believes that the siting tool will help those interested in aquaculture, particularly those unfamiliar with the coast. "It's always been a matter of transforming that interest into people doing it," he notes. "We've lots of room for expansion and still keep our pristine and wonderful resource."

Weirich welcomes the new blood. "The growth of the industry will be largely dependent on getting new people involved. The current growers are doing a great job, but to realize the increase in oyster aquaculture that Virginia has, we need more growers in North Carolina. And the tool can help with that."

Alphin fields calls from many noncoastal residents who want a farm. If the hits on the siting tool website are any indication — about 500 to 1,000 page views per month since its launch — many people are interested.

"It's like penguins at the edge of the ice," Posey explains. "We've got to get a few going to get the others going."

• SUPPORTING DEMAND

But once the industry starts to grow, North Carolina needs to have sufficient resources — meaning oyster seed — to support its own entrepreneurs.

"It's very important to get our own research hatchery to get the bugs worked out from the specific lines and then get hatcheries in North Carolina to start producing seed for North Carolina growers," Styron says.


E-Ching Lee


Jeff Janowski/UNCW

The one commercial hatchery in North Carolina does not produce enough seed to meet the demand of local aquaculture operations. So the state's growers turn to Virginia or other states for their needs.

This dependence is neither advisable nor sustainable, as demand increases or during times of inevitable seed shortage. "More and more people are going to be competing to get that seed. And Virginia, they're going to take care of themselves first. That's understandable," oyster grower Daniels says.

And that's where the research hatchery can help. Its goal is to introduce tested lines of locally sourced oyster seed and make the North Carolina oyster growing industry self-sufficient.

"We're finding that a lot of North Carolina-specific lines are doing better than the actual Virginia lines," Styron says of the oysters he is growing out for the UNCW hatchery. "If that shows something local is going to perform better, that's going to help us in the long run."

Researchers and growers also note that regulatory changes could encourage the oyster aquaculture industry. This topic was discussed at the N.C. Oyster Summit in early 2015 and also in the N.C. General Assembly.

Murphey says DMF supports aquaculture but the agency has a duty to discharge. "We want to see people succeed in it but we're also very diligent about making sure that we are good custodians of the public trust."

Styron, for one, would like to see more legislative action — and soon. "It's a nonpartisan issue too. Both sides of the aisle like oysters. That's the great thing. And both sides of the aisle like the coast. It's all positive," he says.

Weirich advises patience, noting that the issue is starting to gain some traction. "Legislators realize the importance of oyster aquaculture to North Carolina," he notes.

The environmental benefits a booming oyster aquaculture industry can bring to the state is one topic experts and growers hope will influence the dialog on regulatory changes to support the oyster aquaculture industry.

"I see this as a win-win," Wilbur says. "There's a tremendous opportunity for economic development and there's also a tremendous positive environmental impact from oyster aquaculture."

Oysters in the water, whether wild or cultured, filter out impurities and clean the water. They also provide good hiding places and nurseries for economically important juvenile fish.

"I've been working here for 20 years. Everybody wants to know what they need to do to bring back the fish or bring back the oysters. It's clean up the water quality," Alphin says. "Growing shellfish is the ultimate green industry. It leaves the water cleaner than when the water arrived. You're not adding food. They pull their food right out of the water column. They promote water clarity. They promote stability of the bottom," he adds.

"At that point, I look at this and I have a hard time seeing a downside to promoting shellfish culture for saving our coastal resources. It just makes perfect sense to me."