# Interim Report: Pamlico Sound Shellfish Aquaculture Pilot Project Study

# And

# Follow Up Report: Identification of Areas Under a Moratorium for Shellfish Leasing that Could Potentially Be Established as Shellfish Aquaculture Enterprise Areas


**January 1, 2025**

**Division of Marine Fisheries**

**NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY**

**Pursuant to SL 2019-37 Sec. 2**

# I. INTRODUCTION

The N.C. General Assembly ("General Assembly") passed Session Law ("S.L.") 2019-37 effective July 1, 2019. The subtitle of the law is "to provide further support to the shellfish aquaculture industry in the State of North Carolina."[1] Section 1(d) of the law requires the N.C. Department of Environmental Quality ("NCDEQ"), Division of Marine Fisheries ("DMF") to identify areas in waters that are under a moratorium for shellfish leasing that could potentially be established as Shellfish Aquaculture Enterprise Areas ("SEA"). The DMF reported its preliminary findings to the General Assembly by the due date of April 1, 2020. The report included the recommendation that the DMF further study moratorium areas as possible sites for SEAs and provide a follow up report prior to the sunset date of July 1, 2026, for the moratorium areas created in New Hanover County and Bogue Sound by Sections 7 and 8 of the law, respectively. Section 2 of the law enables the DMF to grant up to three shellfish cultivation leases or water column leases in Pamlico Sound each up to 50 acres in size as a pilot project. Under the pilot project, DMF is required to study the advantages and disadvantages of leasing such areas in the Pamlico Sound and provide an interim report by January 1, 2025. In the process of addressing these legislative initiatives, the DMF also considered current moratorium areas from previous legislation, namely Core Sound and Brunswick County.

The DMF conducted these two studies simultaneously by addressing possible SEA siting and the leasing of large areas in the Pamlico Sound in the same meetings with shellfish growers. Combining these efforts enabled DMF staff to summarize and digitize factors that were expressed by shellfish growers that are important to both studies. This report focuses on evaluating the Pamlico Sound Pilot Project and the possibility of SEAs in the Bogue Sound moratorium area. Due to lack of applications for large shellfish cultivation or water column leases in the Pamlico Sound, the public response to these types of leases could not be studied. The DMF did, however, study the feasibility of large-scale SEA siting in the Pamlico Sound as a proxy to the Pamlico Sound Pilot Project.

In North Carolina, approval of individual shellfish leases under the current N.C. laws can be a time-consuming and resource intensive process. SEAs are intended to be an additional method for enabling prospective shellfish growers into the industry more efficiently. SEAs are areas of public trust water bodies that are identified by the Secretary of NCDEQ and pre-approved for shellfish leasing in accordance with the laws governing shellfish leases; these areas may then be subdivided into multiple smaller parcels and made available for shellfish aquaculture. Other states have, early in the growth of their shellfish aquaculture industry, chosen to designate areas of public trust water bodies exclusively for pre-permitted shellfish aquaculture activities. In these states, legislatures have statutorily designated large areas of public trust water bodies to be set aside for shellfish aquaculture. Once the larger SEA is approved, these SEAs are then subdivided into smaller lease parcels, thereby streamlining the shellfish leasing process. The primary benefit to shellfish growers (and state shellfish regulators) is that once approved an SEA allows for applications to proceed without going through the rigorous and lengthy application siting process.[2] Streamlined permitting encourages industry development by easing the state's shellfish lease application burden and potentially mitigating user conflict issues. This process also provides greater authority to the state to regulate the activities within the designated SEAs.[3]

---

[1] https://www.ncleg.gov/EnactedLegislation/SessionLaws/PDF/2019-2020/SL2019-37.pdf

[2] *Study On How to Reduce User Conflict Related to Shellfish Cultivation Leases* (N.C. Department of Environmental Quality, Division of Marine Fisheries and N.C. Marine Fisheries Commission), 2019

[3] Id.

The DMF staff compiled information for this report from its own ongoing work, municipalities around Bogue Sound, stakeholder groups, shellfish and aquaculture experts, shellfish growers, non-governmental organizations, and internal DMF staff with expertise in this area. DMF also drew upon the findings and recommendations from previous legislative studies related to shellfish leases and aquaculture.

## II. BACKGROUND

### A. North Carolina's Shellfish Lease and Aquaculture Program

The DMF grants shellfish leases in North Carolina in public trust waters. Public trust resources are land and water areas, whether publicly or privately owned, that are subject to Public Trust Rights as defined under N.C. law. Public Trust Rights are held in trust by the state for the use and benefit of all citizens of North Carolina in common. Public Trust Rights include, but are not limited to, the right to "navigate, swim, hunt, fish, and enjoy all recreational activities in" North Carolina waters.[4] Public Trust Rights cannot be conveyed in a manner that adversely affects public trust uses. The General Assembly charged NCDEQ with the stewardship of the public trust marine and estuarine resources of the state. The NCDEQ Secretary may delegate that authority to the DMF Director.[5]

Shellfish leases using public trust bottom areas for private shellfish cultivation (in brackish and higher salinity waters) have existed in North Carolina for over 150 years and are administered by the DMF. Private shellfish cultivation is commonly referred to as shellfish aquaculture or shellfish leases throughout this report. Shellfish leases are divided into two types: bottom and water column. The shellfish lease holder must have a shellfish bottom lease to have a shellfish water column lease. The shellfish water column lease can be granted over the entire footprint or a portion of a shellfish bottom lease but must be sited directly above a shellfish bottom lease or shellfish franchise.[6] A shellfish franchise is like a shellfish bottom lease except that shellfish franchises are registered submerged lands claims and, therefore, are perpetual, are not charged rent, and are not required to report annual production.[7] The Secretary may also grant bottom and water column leases for research or demonstration purposes that are limited in their commercial value, are granted for 5-year contract terms, and may only be renewed once.[i8]

Traditionally, shellfish growers employed the practice of planting cultch for oysters or bedding clams under netting on shellfish bottom leases, known as extensive aquaculture methods. The General Assembly expanded traditionally based growing methods in 1989 by authorizing the leasing of the water column for shellfish aquaculture for areas above a shellfish bottom lease. This new growing method facilitates the use of intensive gear. Intensive shellfish aquaculture means shellfish grown on the bottom or in the water column using cages, racks, bags, or floats. Conversely, extensive shellfish aquaculture means shellfish are grown without additional gear other than predator netting. The General Assembly amended its shellfish leasing requirements in 2015 to allow the use of gear resting on the bottom up to 18 inches off the bottom for shellfish bottom leases, which enables intensive gear on shellfish bottom leases and more clearly defines the line between bottom and water column leases.[9]

The DMF has observed a substantial growth in shellfish leases in the past 20 years (Table 1; Figure 1). The growth of the industry and availability of intensive commercial shellfish aquaculture gear has been accompanied by an increase in the number of shellfish lease applications. The average annual number of shellfish lease applications has been 38.7 for the past 10 years, the highest year being 2019 with 64 applications (Table 2; Figure 2). While shellfish water column leases have been authorized since 1989, the use of water column leases has only recently increased in popularity. The growth in shellfish water column leases has increased the use of intensive gear, leading to a rise in user conflicts.

---

[4] N.C.G.S. § 1-45.1
[5] N.C.G.S. § 113-131(b)
[6] N.C.G.S. § 113-202.1
[7] N.C.G.S. § 113-205
[8] N.C.G.S. § 113-202.1(i)
[9] N.C.G.S. § 113-202(r)

The number of shellfish lease applications in North Carolina has increased drastically from the period of 2005 to 2014 (56 total shellfish lease applications) compared to the period of 2015 to 2024 (387 shellfish lease applications). This is an increase in average annual applications from 5.6 between 2005-2014 to 38.7 between 2015-2024, nearly a 700 percent increase (Table 2; Figure 2). DMF's Shellfish Lease and Aquaculture Program has seven full time dedicated staff—one program supervisor, one biologist, two administrative positions, and three technicians—to manage the administrative and field-based workload from the shellfish lease applications. The sustained increase in shellfish lease applications and the continued increase in active shellfish leases and franchises compounds the administrative and field-based workload to evaluate and maintain proposed and existing shellfish leases.

Table 1. Shellfish lease and franchises growth over the past 20 years

| Year | Bottom and Water Column Leases | Franchises | Research Demonstration | Total Leases and Franchises |
|---|---|---|---|---|
| 2005 | 7 | 32 | 0 | **39** |
| 2006 | 9 | 34 | 0 | **43** |
| 2007 | 11 | 34 | 0 | **45** |
| 2008 | 15 | 35 | 0 | **50** |
| 2009 | 19 | 35 | 0 | **54** |
| 2010 | 20 | 35 | 0 | **55** |
| 2011 | 22 | 35 | 0 | **57** |
| 2012 | 26 | 36 | 0 | **62** |
| 2013 | 26 | 37 | 0 | **63** |
| 2014 | 36 | 39 | 0 | **75** |
| 2015 | 68 | 40 | 0 | **108** |
| 2016 | 102 | 43 | 0 | **145** |
| 2017 | 159 | 45 | 0 | **204** |
| 2018 | 226 | 48 | 3 | **277** |
| 2019 | 290 | 48 | 3 | **341** |
| 2020 | 322 | 48 | 3 | **373** |
| 2021 | 374 | 48 | 3 | **425** |
| 2022 | 402 | 48 | 3 | **453** |
| 2023 | 449 | 48 | 3 | **500** |
| 2024 | 472 | 48 | 3 | **523** |

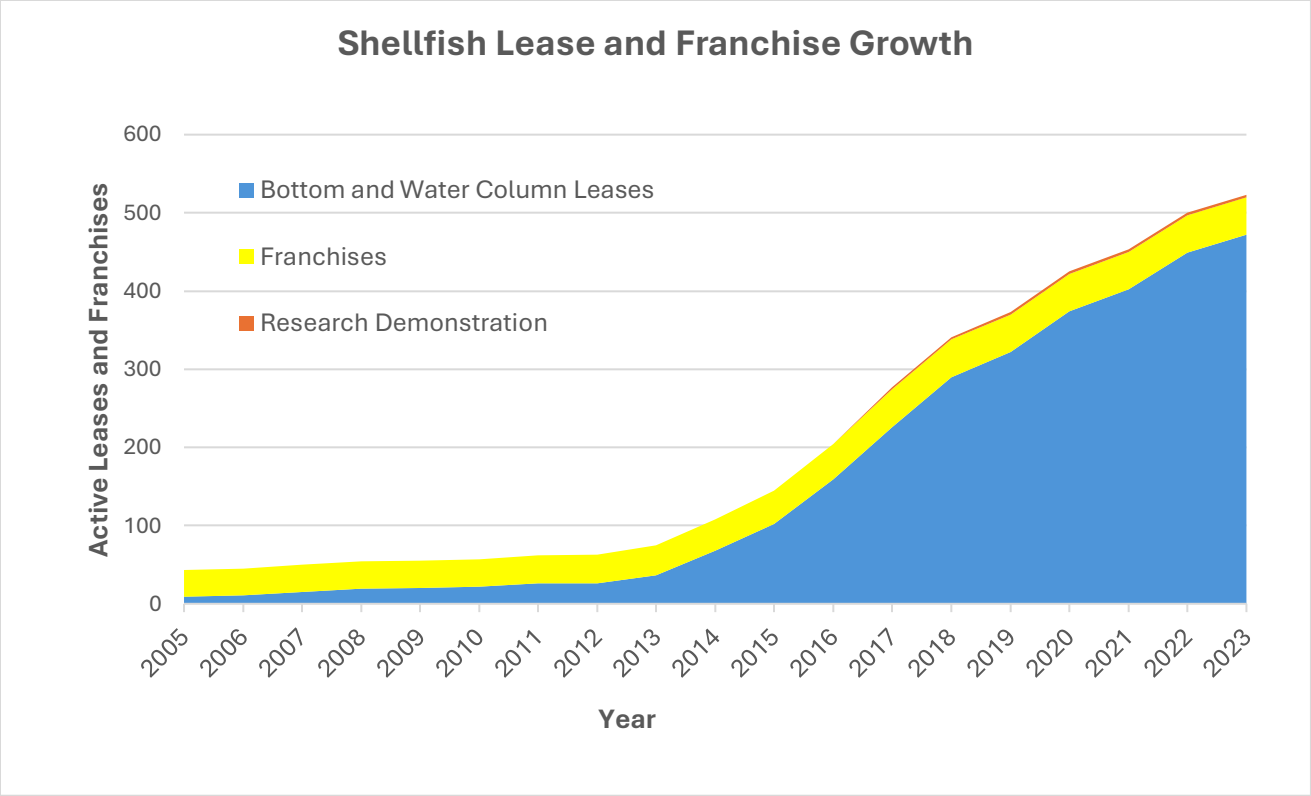


Figure 1. Shellfish lease and franchise growth over the past 20 years

Table 2. Annual shellfish lease applications by type and total application packages. Bottom and water column lease applications are not necessarily additive because a bottom lease or franchise is required to apply for and receive a water column amendment.

| Year | Bottom | Water Column | Total Applications |
|---|---|---|---|
| 2005 | 3 | 1 | 3 |
| 2006 | 5 | 1 | 6 |
| 2007 | 3 | 0 | 3 |
| 2008 | 5 | 0 | 5 |
| 2009 | 0 | 0 | 0 |
| 2010 | 1 | 1 | 2 |
| 2011 | 1 | 1 | 1 |
| 2012 | 8 | 6 | 11 |
| 2013 | 6 | 10 | 10 |
| 2014 | 8 | 7 | 15 |
| 2015 | 9 | 2 | 11 |
| 2016 | 10 | 11 | 28 |
| 2017 | 52 | 46 | 56 |
| 2018 | 36 | 33 | 45 |
| 2019 | 58 | 48 | 64 |
| 2020 | 26 | 23 | 37 |
| 2021 | 36 | 30 | 39 |
| 2022 | 35 | 36 | 51 |
| 2023 | 27 | 26 | 32 |
| 2024 | 23 | 22 | 24 |

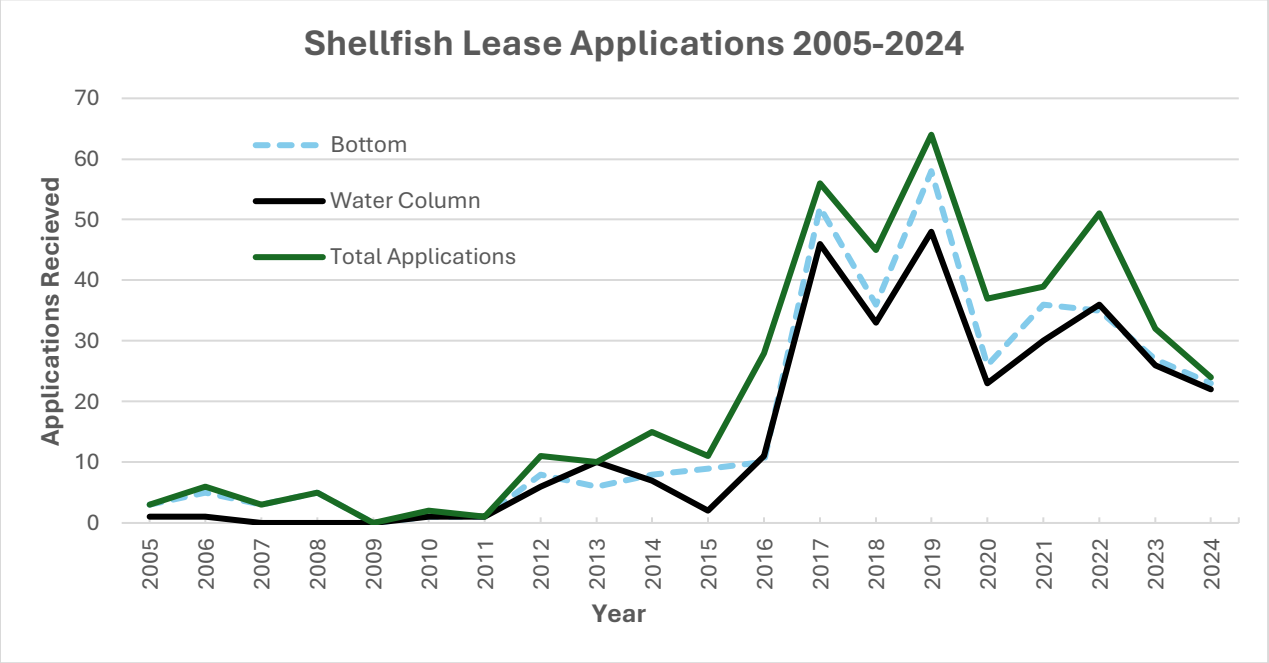


Figure 2. Annual shellfish lease applications by type and total application packages

There are eight coastal counties that have shellfish leases. As of November 1, 2024, there were 48 shellfish franchises, 351 shellfish bottom leases, 167 shellfish water column leases, and 3 research demonstration leases in North Carolina covering 2,517.67 acres (Table 3; Figures 3 and 4). Carteret County has 209 shellfish leases, totaling 741.19 acres, the most of any county (Table 2; Figures 3 and 4). The second and third largest number of leases are in Onslow and Pender counties, respectively; these high numbers and much smaller waterbody systems compared to most other counties show a greater potential for user conflicts.

Table 3. Shellfish leases and acreage by county and type in 2024

| | Bottom | | Water Column | | Franchise | | Research | | **Total** | |
|---|---|---|---|---|---|---|---|---|---|---|
| County | Number | Acres | Number | Acres | Number | Acres | Number | Acres | **Number** | **Acres** |
| Beaufort | 2 | 7.24 | 1 | 2.24 | 0 | 0 | 0 | 0 | **3** | **9.48** |
| Brunswick | 1 | 3.39 | 1 | 3.39 | 0 | 0 | 0 | 0 | **2** | **6.78** |
| Carteret | 133 | 492.76 | 73 | 243.95 | 2 | 1.91 | 1 | 2.57 | **209** | **741.19** |
| Dare | 15 | 57.13 | 15 | 57.13 | 0 | 0 | 1 | 0.5 | **31** | **114.76** |
| Hyde | 27 | 236.79 | 16 | 51.48 | 9 | 245.75 | 0 | 0 | **52** | **534.02** |
| New Hanover | 4 | 4.81 | 1 | 1.05 | 1 | 3.08 | 1 | 2.74 | **7** | **11.68** |
| Onslow | 55 | 361.93 | 28 | 93.66 | 28 | 191.59 | 0 | 0 | **111** | **647.18** |
| Pamlico | 13 | 75.13 | 11 | 68.84 | 8 | 48.64 | 0 | 0 | **32** | **192.61** |
| Pender | 52 | 222.13 | 20 | 37.84 | 0 | 0 | 0 | 0 | **72** | **259.97** |
| Total | 302 | 1461.31 | 166 | 559.58 | 48 | 490.97 | 3 | 5.81 | **519** | **2517.67** |

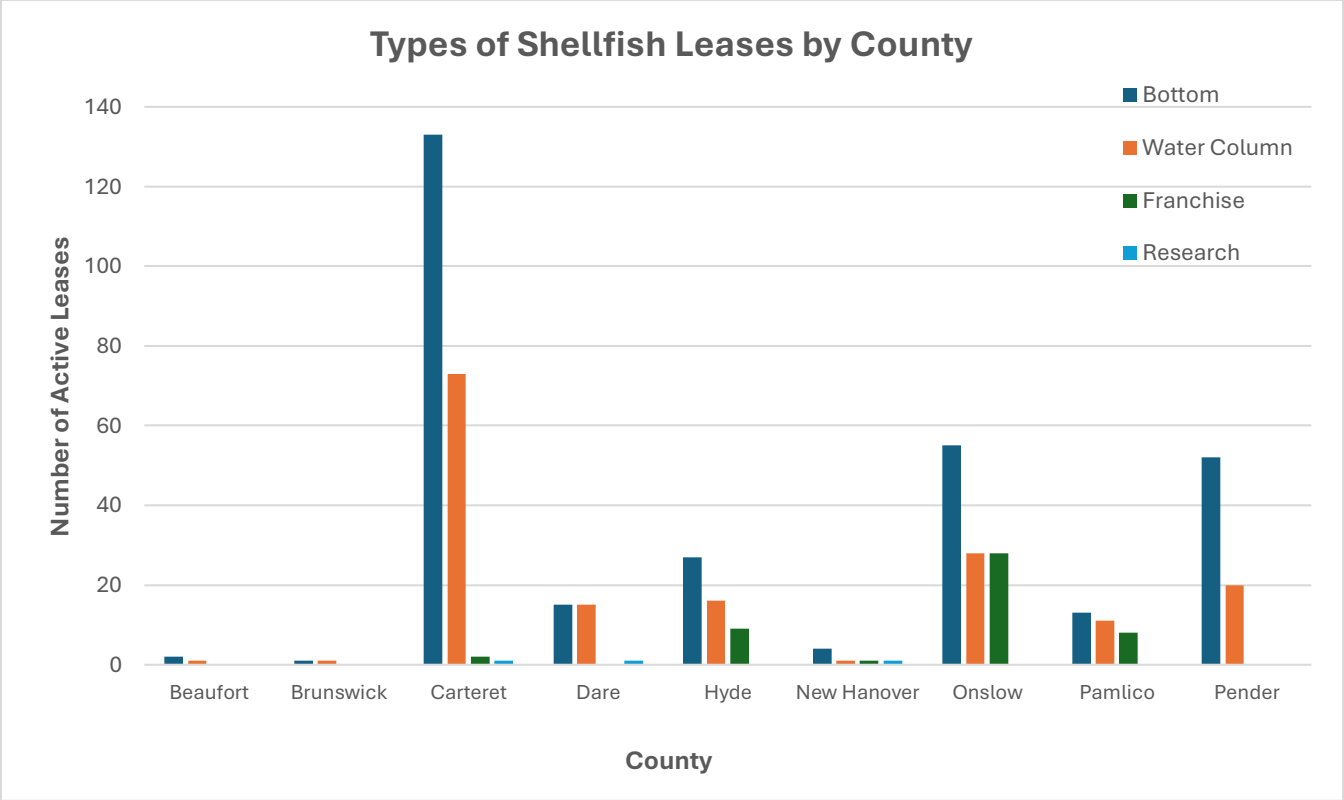


Figure 3. Number of shellfish leases and franchises by type and county in 2024

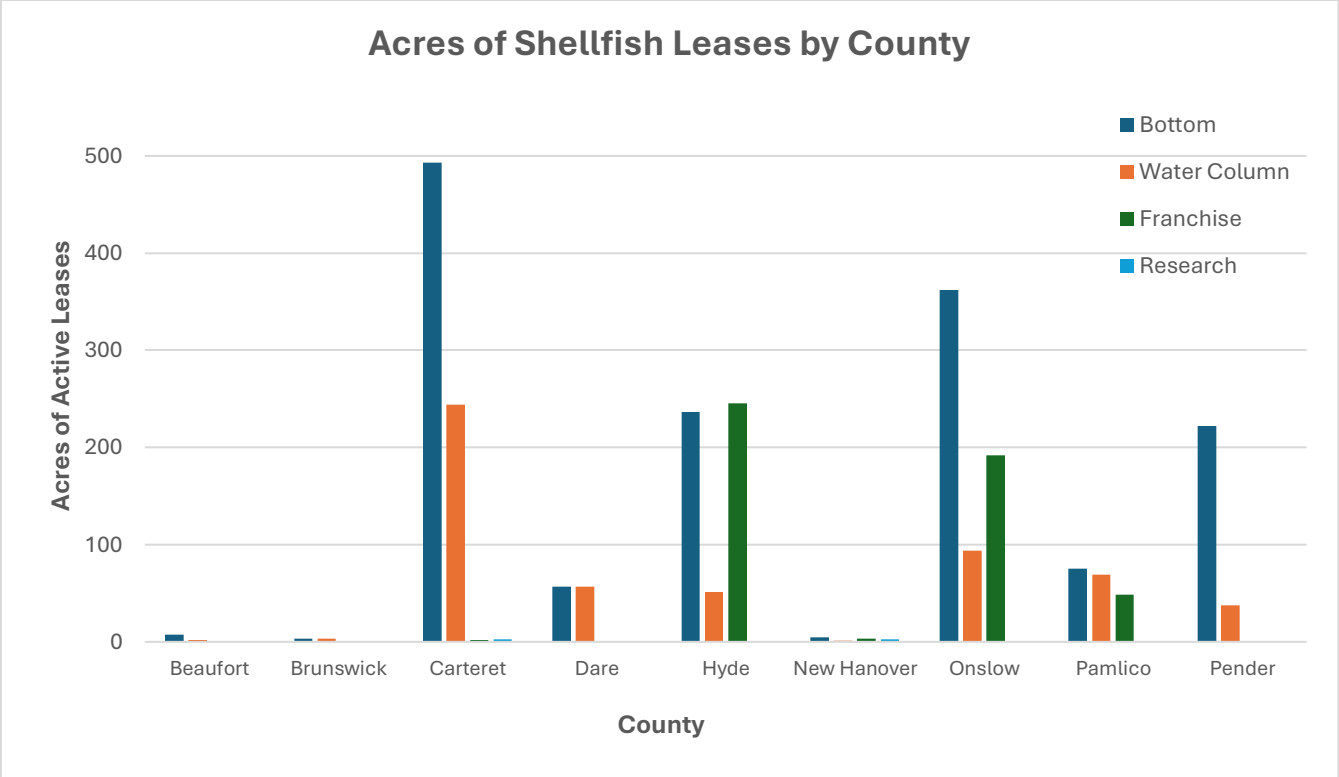


Figure 4. Acres of shellfish leases and franchises by type and county in 2024

**B. Federal Permitting - U.S. Army Corps of Engineers' Nationwide Permit 48**

Permitting for shellfish leasing is accomplished both by N.C. law, in part pursuant to N.C.G.S. §§ 113-202 and 113-202.1, and through the U.S. Army Corps of Engineers' ("USACE") Nationwide Permit 48 ("NWP 48") process - Commercial Shellfish Aquaculture Activities.[10] The USACE re-issued NWP 48 in March 2021, which will be subject to renewal in March 2026. The NWP 48 encompasses activities related to commercial shellfish aquaculture in waters of the United States. The NWP 48 for North Carolina includes regional conditions such as restricting shellfish leases from being greater than one third of a navigable waterbody and requiring Submerged Aquatic Vegetation (SAV) coverage to be below the limit developed in a joint protocol between the USACE and DMF.[11] This protocol was initially developed in 2015 to enable the threshold of acceptable SAV coverage in a proposed shellfish lease area to be higher than the previous regional condition of no SAV present. The protocol developed between USACE and the Coastal Habitat Protection Plan (CHPP) Program enabled a shellfish lease location to be verified under the NWP 48 if the area has less than 15% coverage of SAV at a sparse or less intensity.

**C. Recent Increase in Legal Challenges to DMF's Shellfish Lease Decisions**

User conflict issues in the last ten years, primarily in densely populated areas with high amounts of shellfish leasing, have resulted in an increase in contested cases filed by potentially aggrieved petitioners in the N.C. Office of Administrative Hearings, as well as other legal

[10] Nationwide Permit 48 - Commercial Shellfish Aquaculture Activities Effective Date: March 19, 2017; Expiration Date: March 18, 2022 (NWP Final Notice, 82 FR 1860)
[11] SAV Protocol for North Carolina Nationwide Permit #48: Effective Date May 19, 2015

challenges. The N.C. Department of Justice represents DMF in defending DMF's shellfish leasing decisions.

The only recent instance of a contested case filed by a third party against the approval of a shellfish lease was in 2023 and was brought to the recently established Shellfish Cultivation Lease Review Committee (SCLRC).[12][13] While the SCLRC ruled that the defense approved the shellfish lease following all necessary N.C. General Statutes and N.C. Marine Fisheries Commission ("MFC") rules and was not arbitrary or capricious, the resolution of the case is still awaiting appeal in the Carteret County Superior Court. This case, having been decided upon July 18, 2023, by the SCLRC, has yet to be assigned a hearing date in Superior Court and remains unresolved. As a result, the State has not executed the contract for the shellfish bottom and water column leases approved in this decision.

In February 2024, the State has also defended its decision to deny a shellfish bottom and water column lease combined application, in which the denial was affirmed. The State is also currently in the pre-hearing process for two additional applicant-filed contested cases for denied shellfish leases.

While these specific contested cases have continued, the occurrences of third-party contested cases have declined overall. The User Conflict Study and subsequent MFC rule changes outlined in S.L. 2019-37, have enabled the DMF to mitigate the discordance from potentially incompatible proposed shellfish leases and the general public's public trust usage expectations.[14] Due to the lengthy time to promulgate MFC rules, these regulation changes made to mitigate user conflicts have only recently come into full effect and will ideally continue to lessen the instance of third party contested cases for approved shellfish leases.

### D. 2020 Report – Identification of Areas Under a Moratorium for Shellfish Leasing that Could Potentially Be Established as Shellfish Aquaculture Enterprise Areas

The DMF submitted an initial report to the General Assembly about the potential of SEAs in moratorium areas in April of 2020. This report outlined SEAs in other states, active shellfish leasing moratoria in North Carolina, and set up the study that was conducted as examined in this report.

Many states, including Maryland, Florida, Delaware, Massachusetts, New Jersey, New York, and California, have implemented SEAs to streamline the shellfish lease permitting process, reduce costs, and mitigate user conflicts. These states assign various names to SEAs, such as Aquaculture Enterprise Zones (AEZs) in Maryland, covering 176 acres, Aquaculture Use Zones (AUZs) in Florida, with 21 SEA areas covering 2,456 acres, and Aquaculture Development Zones (ADZs) in New Jersey, covering 1,250 acres. SEAs allow states to simplify and expedite the permitting process by designating these pre-approved areas. This benefits both the state and shellfish growers by reducing the time and resources required to evaluate individual leases. SEAs also help manage user conflicts by ensuring that shellfish aquaculture operations are compatible with other uses, such as navigation, recreation, and commercial fishing, and by fostering coordination with local stakeholders. The protocols for siting and permitting within SEAs follow similar guidelines as those for individual shellfish leases, including setbacks, public hearings, and ensuring compatibility with oyster restoration activities. In these states, shellfish growers can operate more easily because the state conducts the environmental review and

[12] N.C.G.S. § 143B-289.57(f)
[13] N.C.G.S. § 113-202(g)
[14] *Study on How to Reduce User Conflict Related to Shellfish Cultivation Leases* (N.C. Department of Environmental Quality, Division of Marine Fisheries and N.C. Marine Fisheries Commission), 2019

obtains necessary federal permits on their behalf. Additionally, similar work is being done in federal waters to increase marine aquaculture production in the Northeast, with funding from the National Oceanic and Atmospheric Administration (NOAA). This NOAA initiative includes reviewing the current permitting process and assessing the feasibility of establishing a federal pre-permitting system for offshore aquaculture, similar to SEAs in state waters.

The April 2020 report also recommends the DMF further study SEAs in specific areas through public outreach including local governments, private citizens, and shellfish growers prior to recommending the siting of any SEAs.

## E. Bogue Sound Shellfish Leasing Moratorium Area

Effective July 1, 2019, the General Assembly established shellfish lease moratorium areas throughout New Hanover County and Bogue Sound through S.L. 2019-37, Sections 7 and 8, respectively. These moratoria were set to, and in fact did, sunset effective July 1, 2021. Effective November 18, 2021, S.L. 2021-180 Section 12.3 reinstated the New Hanover County and Bogue Sound moratorium areas and established a new sunset date of July 1, 2026. In the lapsed time between the sunsetting and reinstatement of these shellfish leasing moratoria, there were applications submitted for two shellfish leases in Bogue Sound—both included a bottom lease and water column amendment—both of which were approved and remain active shellfish leases.

## F. DMF's Management of Shellfish Leasing is Under Resourced

Due to the expansion of the shellfish aquaculture industry, primarily in terms of gear and shellfish seed availability, shellfish aquaculture experienced a significant increase in interest from prospective growers globally. This increase began in 2016 in North Carolina as gear efficiency and marketability of shellfish enabled businesses to be far more viable. In addition, the growth of in-water shellfish aquaculture nationwide has led to the need for additional public health measures to ensure consumer safety implemented through the Interstate Shellfish Sanitation Conference's (ISSC) National Shellfish Sanitation Program (NSSP). North Carolina's compliance with the NSSP Model Ordinance protects consumers of N.C. shellfish within and outside of the State and enables the export of N.C. shellfish, and therefore, is paramount to the success of the shellfish aquaculture industry.

### 1. Increased Workload of Managing Shellfish Leasing

The increase in average annual shellfish lease applications since 2016 (Table 2; Figure 2) not only causes more direct workload increases to evaluate these proposed leases, but also has a cascading effect on workload for shellfish lease renewals and transfers. The average total review process for shellfish lease applications since 2016 has remained at 12 months. In 2024, S.L. 2024-32 Section 5(b) required the NCDEQ Secretary to automatically approve all shellfish lease applications within 365 days of a complete and properly marked application. This timeline has provided additional prioritization of lease applications and workload on the Shellfish Leasing Program. Since the expansion of shellfish leasing in 2016, the Shellfish Leasing Program has not received any additional positions to manage the increased contract workload or to contribute to ensuring the completion of all application evaluations within the time limit.

Shellfish leases must be renewed on every tenth anniversary of the lease being granted, prior to its expiration on July 1 of that year.[15] The workload from shellfish lease renewals has steadily grown and will quickly and significantly increase in the upcoming years as a result of the increase in shellfish lease applications since 2017. The drastic increase in shellfish leases

[15] N.C.G.S. § 113-202(j)

beginning in 2017 has remained continually higher than previous years and results in an average of 78 potential new leases per year (Table 4).

Table 4. Average shellfish lease applications by type

| Year | Bottom Lease | Water Column Lease | Total Applications | Total Proposed Leases |
|---|---|---|---|---|
| 2017 | 52 | 46 | 56 | 98 |
| 2018 | 40 | 36 | 45 | 76 |
| 2019 | 58 | 48 | 64 | 106 |
| 2020 | 32 | 26 | 37 | 58 |
| 2021 | 36 | 31 | 39 | 67 |
| 2022 | 43 | 41 | 51 | 84 |
| 2023 | 30 | 28 | 32 | 58 |
| **Average** | **42** | **34** | **46** | **78** |

Additionally, the shellfish lease contracts are able to be transferred, which is also managed by Shellfish Leasing Program.[16] With the increase of shellfish leases in the State, transfers have also steadily increased.

The Shellfish Leasing Program has processed an average of 109 contracts annually over the last five years. With the forthcoming increase in contract renewals, the average new proposed leases, and the average shellfish lease transfers, the projected contracts for the next five years will greatly surpass the average contracts processed (Table 5). These projections, compounded by the established time limit from S.L. 2024-32, exceed the capability of the Shellfish Leasing Program in both administrative and field-based work.

Table 5. Projected shellfish lease contracts to process annually by type

| Renewal Year | Lease Contract Renewals | Average New Contracts | Average Transfers | **Total** |
|---|---|---|---|---|
| 2025 | 26 | 78 | 26 | **130** |
| 2026 | 24 | 78 | 26 | **128** |
| 2027 | 66 | 78 | 26 | **170** |
| 2028 | 72 | 78 | 26 | **176** |
| 2029 | 67 | 78 | 26 | **171** |
| 2030 | 48 | 78 | 26 | **152** |

### 2. Enforcement of Shellfish Leasing Regulations

This increased workload also drastically impacts DMF Marine Patrol, as they are responsible for handling the monitoring of day-to-day operations for shellfish leaseholders, harvesters, and dealers. In addition, the Marine Patrol is responsible for conducting a large portion of shellfish lease inspections for permit violations since the DMF has only one Shellfish Lease Inspector to conduct inspections. Without the completion of inspections or patrolling of polluted shellfish areas by the Marine Patrol, North Carolina would fall out of compliance with the NSSP. Non-compliance with the NSSP would halt exports of shellfish from North Carolina.

[16] N.C.G.S. § 113-202(k)

From this increase in responsibilities and the continuous growth of shellfish leases, the Marine Patrol needs 30 additional officers to meet demand.

## III. Combined Study Process

### A. Pamlico Sound Pilot Project

The creation of the Pamlico Sound Pilot Project in Section 2 of S.L. 2019-37 enabled the creation of up to 3 shellfish cultivation leases or water column leases in the Pamlico Sound with a maximum acreage of 50 acres each. The creation of these shellfish cultivation leases, as all shellfish cultivation leases in the State, required stakeholders to apply for a shellfish cultivation lease of this size in this area. Since S.L. 2019-37 was enacted, there have been no applications or interested parties contact the DMF to discuss this possibility. Because of this lack of interest, and therefore, an inability to study public and municipality feedback from large Pamlico Sound shellfish cultivation leases, DMF utilized the ongoing follow up study to the 2020 SEAs study to identify potential factors about the Pamlico Sound Pilot Project causing the lack of interest from shellfish growers.

### B. Combined Study Approach

The follow up study of SEAs in moratorium areas was originally focused on the Bogue Sound moratorium area because of proximity to DMF, existing leases in the waterbody, and the size of the waterbody. The primary goal of this study was to meet with local municipalities and shellfish growers separately, conduct geospatial analyses, and then to conduct a combined public meeting to determine if SEAs would be an acceptable route to pursue in the Bogue Sound area.

The necessity of SEAs to be large areas that can be permitted to several shellfish growers, as stated above, enabled them to be a perfect proxy to the Pamlico Sound Pilot Project to study in the absence of interest from shellfish growers. To conduct this along with the SEA follow up study, DMF staff included the consideration of Pamlico Sound SEAs in the geospatial analysis and discussed results of the analysis and other concerns with the shellfish growers.

### C. Meetings Conducted

The meetings strategy for this study was to begin by meeting with local municipalities, holding a public meeting, meeting with representative shellfish growers, and holding a final follow up meeting with the municipalities (Table 6). Because the impetus of the Bogue Sound shellfish leasing moratorium originated from the concerns of the municipalities in the Bogue Sound area, it was prudent for the study to begin with the education of and discussion with the town representatives.

Table 6. Meetings conducted to study SEAs in Bogue Sound

| SEA Meetings Conducted | |
|---|---|
| Representation | Date |
| Morehead City | 1/14/2022 |
| Pine Knoll Shores | 1/25/2022 |
| Emerald Isle | 2/15/2022 |
| Indian Beach | 3/14/2022 |
| Virtual Public Meeting | 6/22/2022 |
| Shellfish Growers | 12/6/2022 |
| Atlantic Beach, Emerald Isle, Morehead City, Newport, Pine Knoll Shores | 5/31/2023 |

#### 1. Bogue Sound Municipalities

Meetings with Bogue Sound Municipalities included mayors and/or employees of Atlantic Beach, Bogue, Emerald Isle, Indian Beach, Morehead City, Newport, and Pine Knoll Shores (Table 6). The first set of meetings with these municipalities focused on educating the attendees about the shellfish leasing process including the steps DMF takes to evaluate proposed shellfish leases. The meetings enabled town representatives to express the concerns of their constituents, ask how the Shellfish Lease Program handles discordant situations, and provide feedback on areas about which they have specific concerns that stem from the impact of shellfish leasing on their respective towns. Attendees were also educated about SEAs and were informed about the process of the study along with the study timeline. Lastly, attendees were asked to discuss shellfish leasing and SEAs with their towns and encourage public attendance at the virtual public meeting.

#### 2. Combined Public Meeting

The DMF held a virtual public meeting to educate the local public on shellfish leases and SEAs and to gather feedback on public response and further education needed. The meeting was held on Webex and included attendees from the Bogue Sound municipalities, shellfish growers, and the general public. The DMF only received completed feedback forms from shellfish growers with thoughts in preparation for the shellfish growers meeting. The DMF staff were able to utilize these comments to determine who would be proper representatives for the Shellfish Growers meeting.

### D. Geospatial Analysis

The geospatial analysis for each study area was conducted by DMF staff using Esri's Geographic Information Systems (GIS) software ArcGIS Pro. The studies originated by evaluating each area with mapped layers that could constrain shellfish leasing based on the siting standards found in N.C. General Statutes or the USACE NWP #48 Regional Conditions including data compiled and maintained by the N.C. Division of Coastal Management (DCM), the Albemarle-Pamlico National Estuarine Partnership (APNEP), the N.C. Wildlife Resources Commission (WRC), and NOAA National Ocean Service/National Centers for Coastal Ocean Science (NOAA NOS/NCCOS) (Table 7).

Table 7. Data layers used for geospatial analyses

| Data Layer | Description | Source |
|---|---|---|
| **All Analyses** | | |
| Planted Cultch Sites | All mapped areas where cultch planting has occurred historically by the DMF Shellfish Rehabilitation Program | DMF |
| Submerged Aquatic Vegetation Historical Mosaic | Areas that contain submerged aquatic vegetation, a constraint in the Regional Conditions in the USACE NWP #48 | DMF and APNEP |
| Mapped Benthic Habitats | Mapping data evaluating the presence of shellfish and vegetation, conducted by the DMF Estuarine Benthic Habitat Mapping Program | DMF |
| Boating Access Areas | Public and private open to public boat ramps | WRC and DMF |
| Shellfish Growing Areas | Waterbody classification for areas open, conditionally open/closed, restricted, and permanently closed to shellfish harvest, conducted and maintained by DMF Shellfish Sanitation and Recreational Water Quality Section | DMF |
| Submerged Land Claims | Recognized submerged land claims which grant private shellfishing rights to claimant | DMF |
| Shellfish Management Areas | Areas of existing or potential shellfish restricted to mechanical methods and can be opened or closed by DMF Director Proclamation | DMF |
| Active Shellfish Leases | All areas already granted for shellfish cultivation | DMF |
| **Bogue Sound** | | |
| Bogue Sound Shellfish Lease Moratorium | Area closed off for shellfish cultivation leasing, outlined in S.L. 2019-37 | DMF |
| NOAA Bogue Sound Pilot Study | Shellfish lease siting analysis conducted by NOAA NOS/NCCOS and NOAA NMFS Office of Aquaculture | NOAA NOS/NCCOS |
| **New Hanover County** | | |
| Coastal Reserves | Boundaries of protected sites established for long-term research, education and stewardship by DCM | DCM |
| New Hanover County Shellfish Lease Moratorium | Area closed off for shellfish cultivation leasing, outlined in S.L. 2019-37 | DMF |
| **Pamlico Sound** | | |
| Core Sound Shellfish Lease Moratorium | Area closed off for shellfish cultivation leasing, outlined originally in S.L. 1993-44 | DMF |
| Mapped Subtidal Oyster Rocks | Subtidal oyster rocks mapped with bathymetric surveys conducted by the DMF Artificial Reef and Oyster Sanctuary Programs | DMF |
| Oyster Sanctuaries | Areas closed to shellfish harvest built to enable oyster growth in Pamlico Sound by the DMF Oyster Sanctuary Program | DMF |
| Historical Mapped Oyster Beds | Locations of natural oyster rock mapped in 1887 and converted to GIS in 2005 | Eugene Balance |

### 1. Pamlico Sound

The geospatial analysis for Pamlico Sound was conducted prior to meeting with shellfish growers in order to receive their feedback on the potential for large, permitted areas in the Pamlico Sound. In addition to the layers applied to all analyses, DMF staff included layers specific to Pamlico Sound, including historically mapped shellfish beds and oyster Sanctuaries (Table 7), and created the evaluation locations as 5-mile radii from known public and private open to the public boating access areas (Figures 5-6). The evaluation locations were constrained to the 5-mile radii as access areas distant from one another in areas around the sound and from previous discussions with shellfish growers that highlighted the proximity of a shellfish lease is one of the largest concerns with siting a shellfish lease. The resulting evaluation areas show significantly less opportunity for large scale shellfish leases within 1-2 miles of the boat ramp, especially in higher population areas; the areas that remain available are surrounded by known incompatibilities, such as navigation channels and SAV, that may also be present in those areas (Figure 6). This analysis did not include the small-scale siting standard evaluations that occur on a case-by-case basis for shellfish leases currently, including non-marked navigation channels or potential public trust incompatibilities.

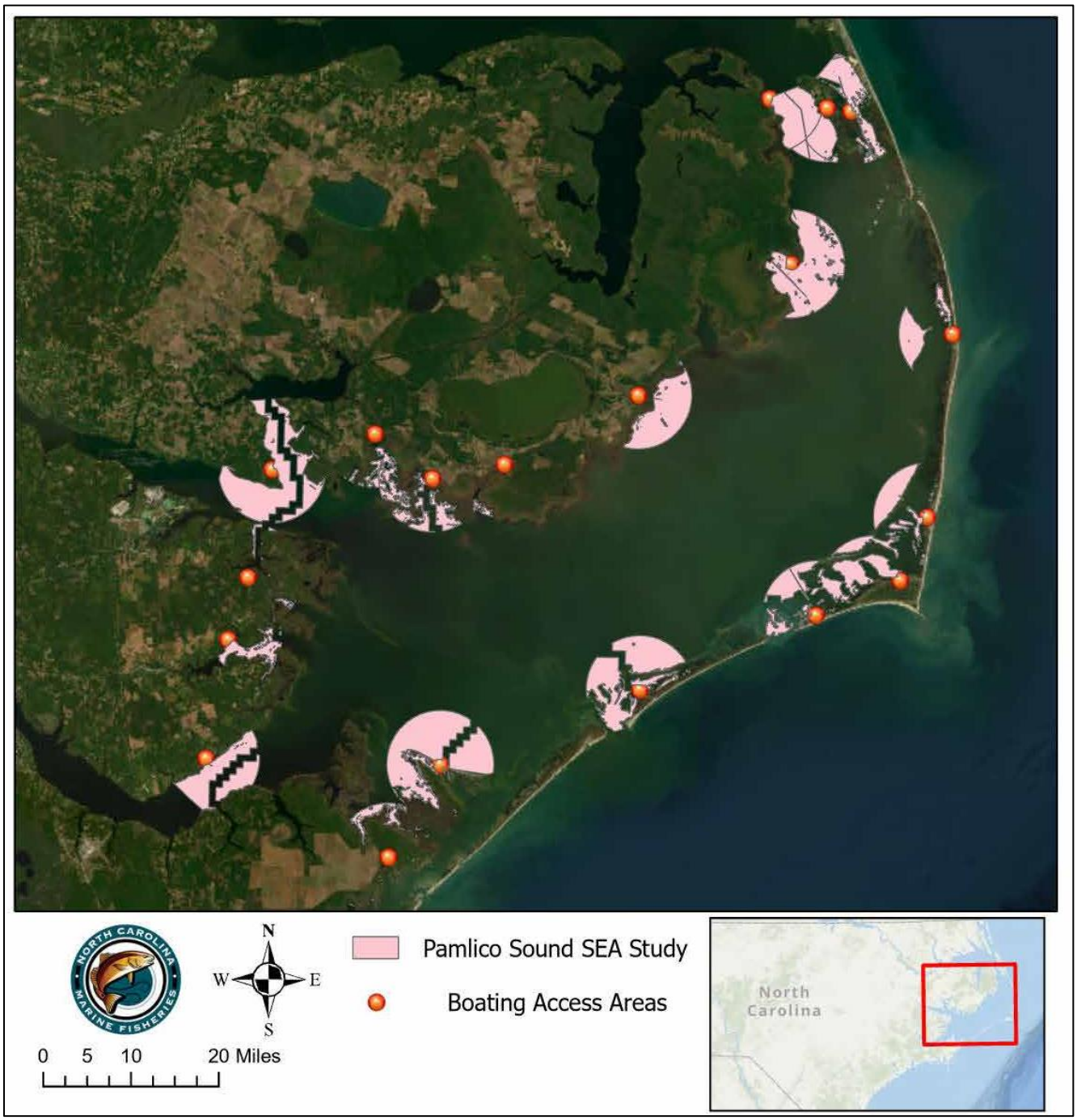


Figure 5. Pamlico Sound boating access areas with 5-mile buffers


Figure 6. Southern areas of Pamlico Sound boating access area buffers

**2. Bogue Sound**

The geospatial analysis for Bogue Sound was also conducted prior to meeting with shellfish growers and was continued during the meeting to enable meeting attendants to see and adapt possible locations based on the discussion. In addition to the layers applied to all analyses, DMF staff included the Bogue Sound moratorium area as described in S.L. 2019-37 and the GIS layer developed by NOAA NOS/NCCOS's Bogue Sound Pilot Study (Figure 7). The Bogue Sound Pilot Study compiled state, federal, public usage, and biological data known in Bogue Sound to determine the most suitable areas in Bogue Sound for shellfish aquaculture to occur.

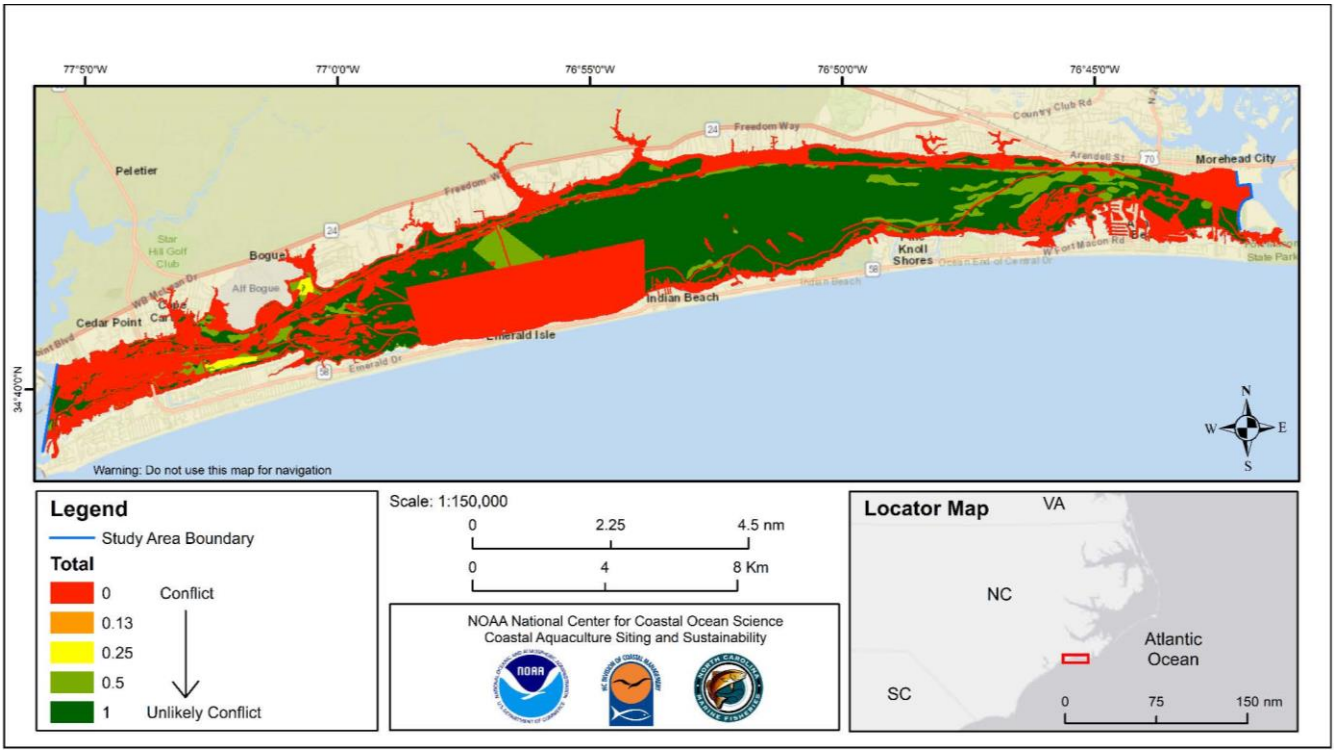


Figure 7. Total scored layer for Bogue Sound from NOAA Aquaculture Bogue Sound Pilot Study. Green areas are those that are the most biologically suited to shellfish aquaculture and least likely for user conflicts and red areas are the most likely for user conflicts from the general public and state and federal agencies.

### 3. New Hanover County

The geospatial analysis for New Hanover County was conducted following the meeting with the shellfish growers. In addition to the layers applied to all analyses, DMF staff included the boundary of the New Hanover County moratorium area as described in S.L. 2019-37 and the boundaries for Coastal Reserves maintained by DCM. Based on the feedback from the shellfish growers meeting, DMF staff also applied a 1,500-foot buffer from the shoreline to determine if the suggestion for Bogue Sound could also be applied as a starting point for future discussions with New Hanover County municipalities.

## E. Shellfish Growers

The meeting held with shellfish growers included representation from the North Carolina Shellfish Growers Association, the Carteret Community College Shellfish Farming Academy, and a local shellfish grower. The latter two both held at least one shellfish lease in Bogue Sound at the time of the meeting, already. The meeting consisted of a briefer overview of SEAs and the follow up SEA study being conducted and an overview of the evaluation of SEAs in the Pamlico Sound as a proxy for the Pamlico Pilot Project. The attendees were then presented with the geospatial analysis to gather their feedback and work together to site possible SEAs in both sounds.

The attendees and the DMF staff then worked through each location to get feedback on what factors would determine the effectiveness of shellfish leases and SEAs in Bogue and Pamlico Sounds. The primary factors denoted by the growers were the size of the SEA being

large enough to simultaneously enable activities by several permitees, proximity to boat ramp access, the depth of site, and the sites' protection from weather and waves.

Based on the discussion, it was recommended that an SEA be at least 50-100 acres to enable adequate usage from the immense siting effort. It was also noted that the siting of shellfish leases completed by applicants is heavily based on the shellfish species and growing styles the grower wants to employ. These concerns, along with the potential of sites at this scale could easily have areas within them that don't meet the standards of the lease statutes or USACE regional conditions—namely, natural shellfish and SAV, respectively—which would complicate or prevent the effectiveness of an SEA that must be broken up into multiple smaller sections. The different shellfish growing styles would also force permittees of an SEA into certain growth methods, which may limit their ability to avoid issues such as weather and mortality events, and, ultimately, could render an SEA unappealing and underutilized by growers.

The DMF staff and shellfish growers were able to site potential locations for SEAs in Bogue Sound, though the growers had concerns at each of these locations (Figures 8-9). The growers felt that the outlined SEAs would likely be utilized by beginner growers to start growing immediately while they apply for a shellfish lease from the DMF. As a result, the growers recommended pursuing an SEA directly across from Carteret Community College (Figure 9) for new farmers who have graduated from the CCC Shellfish Farming Academy to begin their operations.

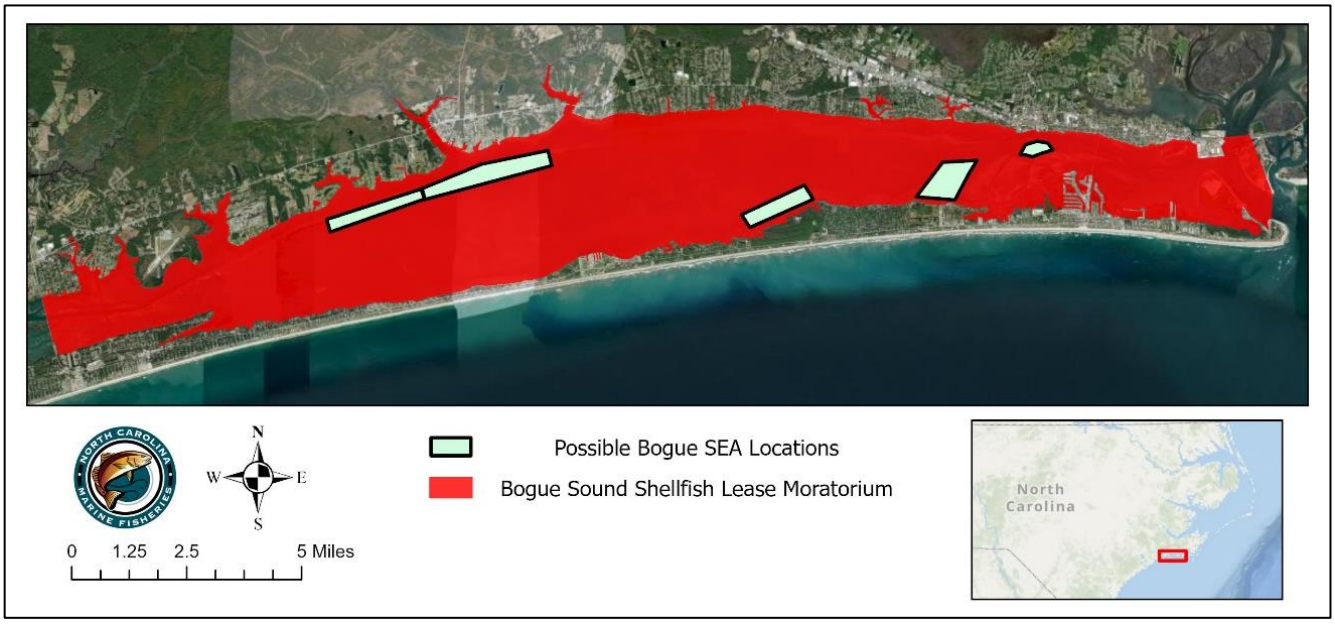


Figure 8. Possible sites for SEAs in Bogue Sound from shellfish growers meeting

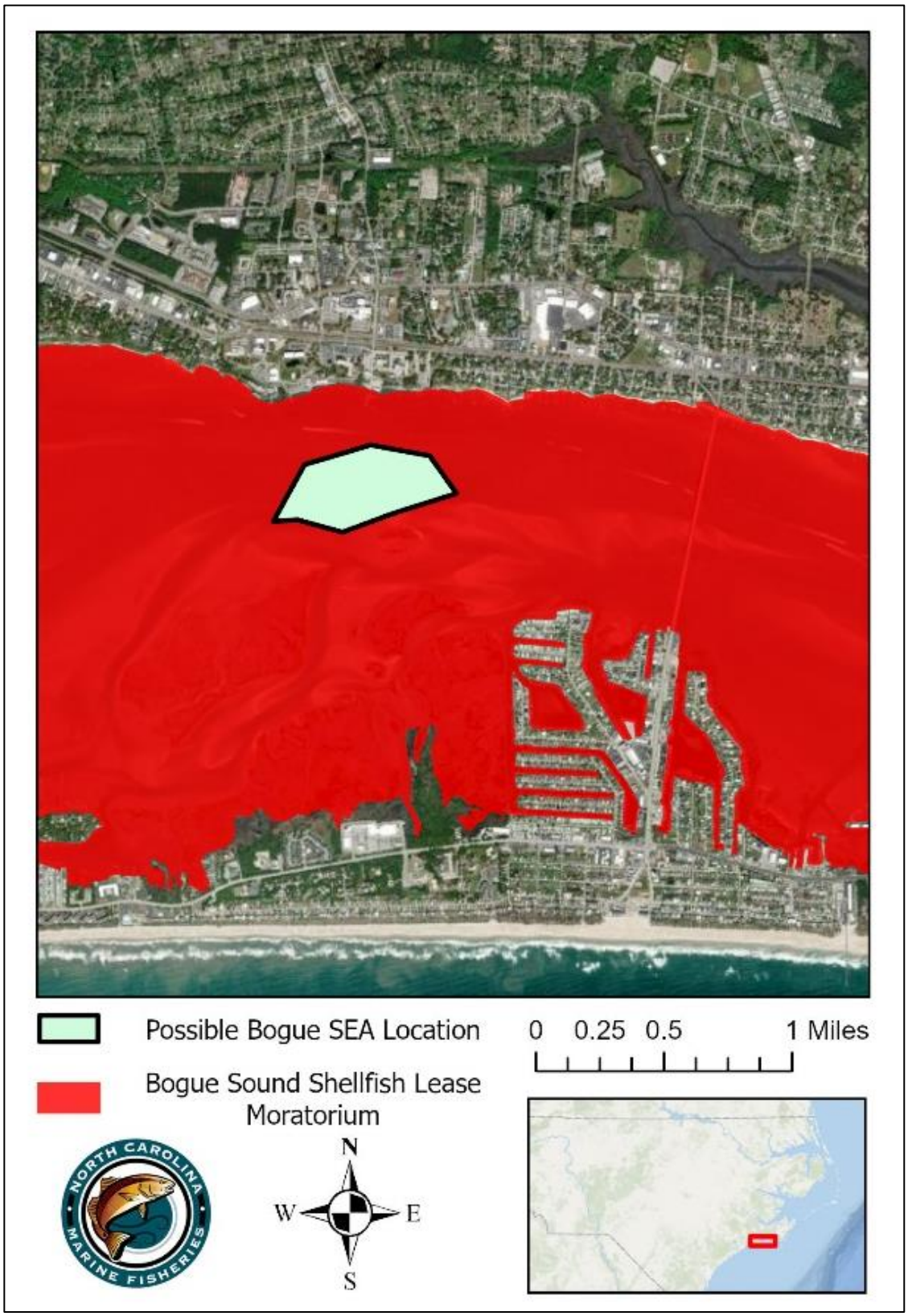


Figure 9. SEA in Bogue Sound identified for beginning shellfish growers

In identifying these areas in Bogue Sound, the growers and the DMF staff noted that all the feasible SEA areas were similarly offset from shore. This discussion led to the potential of leasing in Bogue Sound based on a set buffer of 1,500 feet from the shoreline (Figure 10). This buffer prevented potential leases from being in areas of likely increased user conflict, while enabling those leases to be on the inside of shoals in Bogue Sound where the water depth and protection from weather and waves were suitable for shellfish aquaculture.

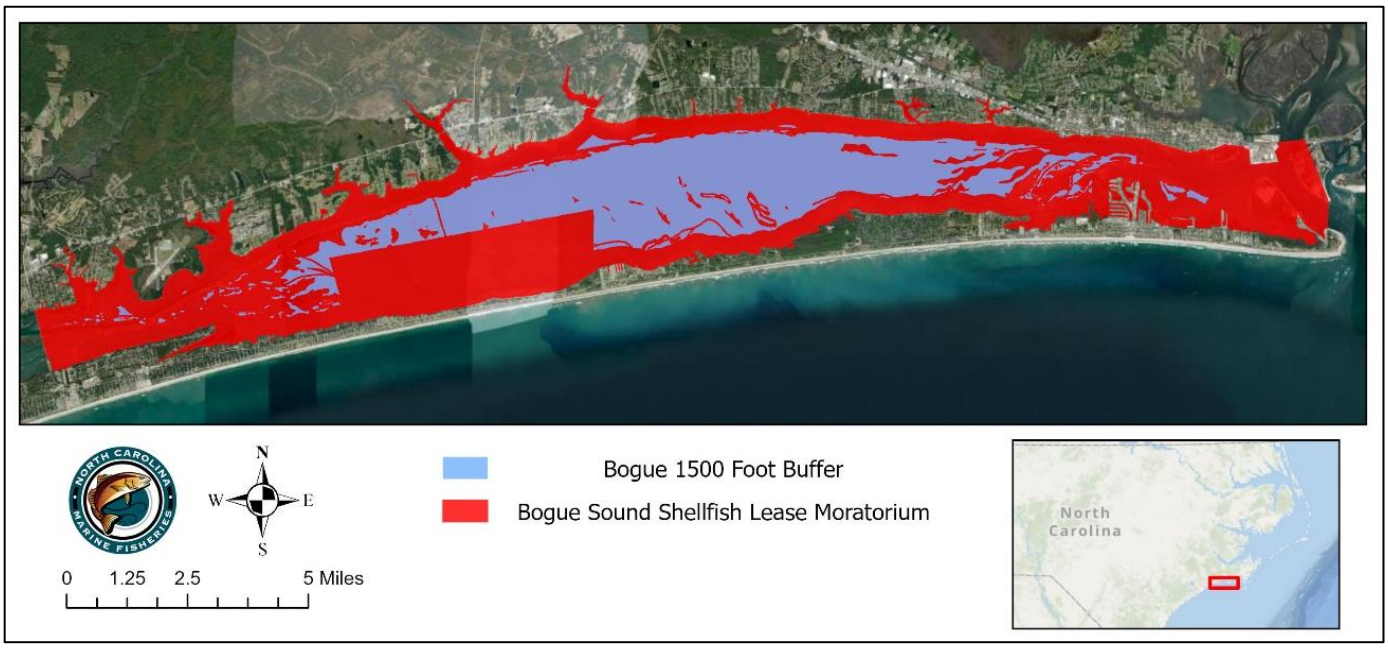


Figure 10. Bogue Sound moratorium area with 1,500-foot buffer

The review of the Pamlico Sound geospatial analysis was, however, less successful of an exercise. The greater distance between public boat ramps, significant increase in weather and wave concerns, and even higher likelihood of siting standard issues all contributed to a lack of possible SEA sites in the Pamlico Sound identified by the growers. As stated above, the geospatial analysis for the Pamlico Sound Pilot Project limited the areas of evaluation to 5-mile radii from public boat ramps (Figure 5). The DMF staff and shellfish growers noted that the only feasible locations within the geospatial analysis were nearer to the furthest extent of the radii, and would, therefore, be a distance that would greatly limit the economic viability of SEAs. As a result, it was concluded by the DMF staff and shellfish growers that siting an SEA in Pamlico Sound, and therefore a large-scale shellfish lease as described in S.L. § 2019-37 Section 2, would likely not result in utilization by shellfish growers.

## F. Follow Up Meeting with Bogue Sound Municipalities

A final meeting was held with all the Bogue Sound Municipalities in Atlantic Beach where the DMF staff presented the geospatial analysis results from the Shellfish Growers meeting. The DMF staff presented both the maps of potential SEA sites identified by the growers and the 1,500-foot buffer proposed by the growers. The municipalities were very responsive to the buffer option, with the consideration of not enabling shellfish leases on the eastern side of the Atlantic Beach bridge due to higher likelihood of continued user conflicts in that area (Figure 11). The DMF staff highlighted that the buffer option would still include the DMF to evaluate potential effects from each individual proposed shellfish lease in the area.

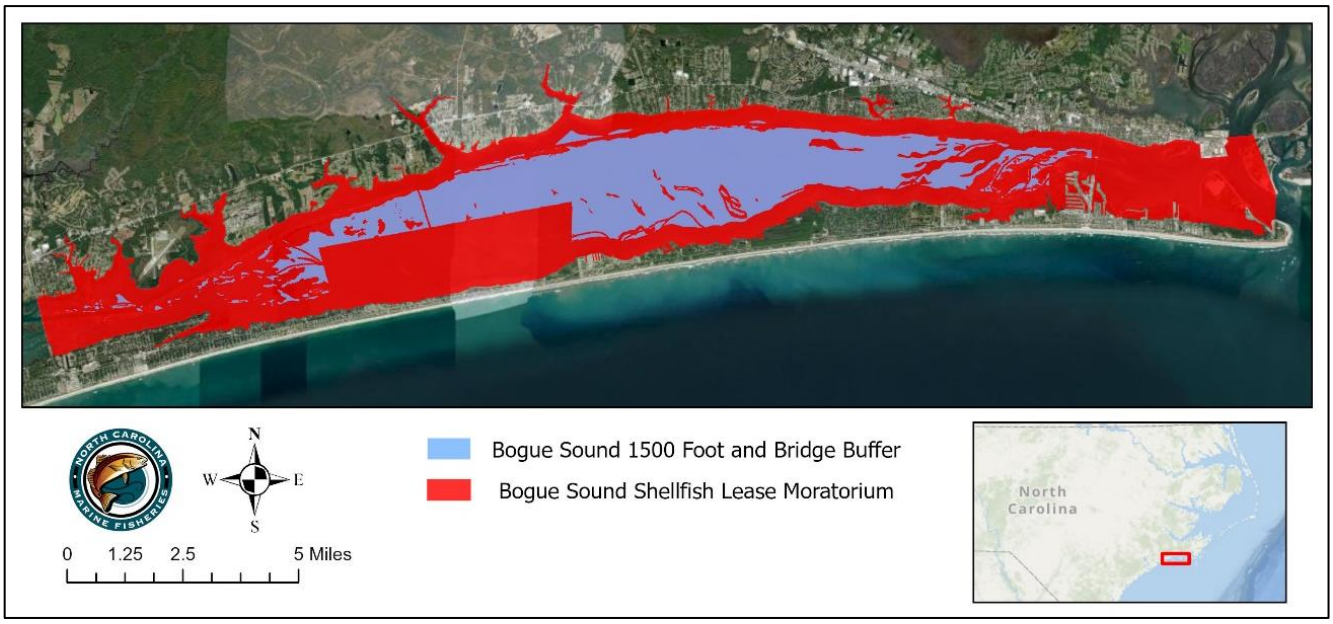


Figure 11. Bogue Sound moratorium area with 1,500-foot and east of Atlantic Breach Bridge buffer

## G. Resources Needed for Growth of Aquaculture Industry

Due to the size needed to make an SEA feasible, the workload of evaluating a single 100-acre SEA would be substantial enough to require the entirety of the Shellfish Leasing Program for at least 5 months—not including statute defined intervals such as the public comment period (Table 8). The SEA outlined by the shellfish growers meeting, for instance, is a proposed area of 97.13 acres and would be directly comparable to the cost analysis of evaluating a single 100-acre SEA shown in Table 8 (Figure 9).

Table 8. Cost analysis estimating cost to grant a single 100-acre SEA. Estimate does not include travel costs, such as per diem and hotels, or other fieldwork associated costs, such as repairs.

| Item | Hours | Salary | Gallons | Cost |
|---|---|---|---|---|
| *Investigation (125 samples/day, 25 samples/acre)* | | | | |
| Tech I | 160 | 20.60 | | 3,296.00 |
| Tech I | 160 | 20.60 | | 3,296.00 |
| Tech II | 160 | 23.18 | | 3,708.80 |
| Tech II | 160 | 23.18 | | 3,708.80 |
| Boat Fuel (Non-ethanol) | | | 800 | 2,800.00 |
| Truck Fuel (Diesel) | | | 600 | 2,100.00 |
| *Admin Tasks* | | | | |
| FIN Processing (Admin. Spec. I) | 2 | 19.50 | | 39.00 |
| Application Processing (Admin. Off. II) | 6 | 25.62 | | 153.72 |
| Application Processing (Bio I) | 12 | 24.70 | | 296.40 |
| Application Processing (Prog. Sup. I) | 12 | 30.66 | | 367.92 |
| Mailings (Admin. Spec. I) | 2 | 19.50 | | 39 |
| Investigation Report (Admin. Off. II) | 2 | 25.62 | | 51.24 |
| Investigation Report (Bio I) | 16 | 24.70 | | 395.20 |
| Investigation Report (Prog. Sup. I) | 5 | 30.66 | | 153.30 |
| Internal Review (Admin. Off. II) | 6 | 25.62 | | 153.72 |
| Internal Review (Prog. Sup. I) | 8 | 30.66 | | 245.28 |
| Public Hearing (Admin. Spec. I) | 12 | 19.50 | | 234 |
| Public Hearing (Bio I) | 10 | 24.70 | | 247 |
| Public Hearing (Admin. Off. II) | 10 | 25.62 | | 256.20 |
| **Totals** | **743** | | | **$ 21,541.56** |

As a result of the time and funding requirements needed to properly evaluate a proposed SEA, there are several concerns that process would cause. The primary concern would be the aforementioned 365-day time limit set forth in S.L. 2024-32 for evaluating proposed shellfish leases. Aside from the question of whether the SEA evaluation process would also incur the 365-day time limit, which has not currently been legally reviewed, the interaction between the immense time investment of an SEA and the time limit incurred on private shellfish lease applications would require one of two instances: the SEA evaluation would have to be done piecemeal in the time not working through application evaluations over the course of several years, or the Shellfish Lease Program would likely not meet the deadline for private shellfish lease application evaluations. The former instance would prevent the SEA from being a reasonably timed resolution to a shellfish leasing moratorium and the latter would cause shellfish leases that do not meet the siting standards of N.C.G.S. §§ 113-202 and 113-202.1. This could result in further user conflicts and frustration between the municipalities and their constituents and the shellfish growers.

Another concern with siting an SEA would be the potential failure of the entirety of the proposed SEA to meet the siting standards. In this instance, a proposed SEA of 100 acres could be quickly fragmented into a few or a single much smaller area, ultimately rendering it

ineffective as a resolution to a shellfish leasing moratorium or as a lease timeline reprieve for prospective shellfish growers.

These issues would increase the timeline and workload of evaluating and granting an SEA greatly and would require an entirely separate team of field technicians, a biologist, and administrative staff to evaluate.

Aside from SEAs, the Shellfish Leasing Program is already responsible for a continually increasing workload that impairs the program's ability to support active and prospective shellfish growers in a timely manner. The projected increase in annual lease contracts in the next 6 years rises to as high as 160% of the current annual processing limit of 109 (Table 5). With this increase, and the 365-day time limit established in S.L. 2024-32, the Shellfish Leasing Program will be unable to keep up with the contract demands of the industry. This will lead to effects to all three types of lease contract process: the shellfish lease transfer process will be greatly delayed or postponed as it is the only contract process without a statutory deadline or timeline; renewals will be unable to be fully reevaluated for newly developed incompatibilities with public trust usage; and new shellfish lease applications will lose the benefit of the Shellfish Leasing Program to mitigate public trust incompatibilities while finding a method to approve a proposed lease before the auto-approval from the time limit. This limitation to the processing of shellfish lease applications increases the risk of litigation from applicants and third parties, alike, furthering the discordance between shellfish aquaculture and other public trust users. Additionally, the Shellfish Leasing Program will lose the ability to aid or consult with USACE and National Marine Fisheries Service for proposed leases with concerns for impacts to endangered species or protected habitats.

To meet the increasing demand for shellfish leasing and prevent these issues, the Shellfish Leasing Program would need five additional full-time employees (FTEs) along with recurring and non-recurring funding for additional boats, trucks, and operations (Table 9). The Environmental Technician II and two Environmental Technician I's enable an additional full sampling team to conduct the required biological investigations and lease marking pole verifications outlined in the shellfish leasing laws. [17][18] The Administrative Specialist II would allow for greater coordination with counsel, applicants, and public hearing attendees to find routes of mitigating public trust interferences while keeping up with the deadlines and time limits in law. The Environmental Specialist II would be an additional Aquaculture Inspector to aid the Inspector created in the 2023 State Budget.[19] This additional Inspector would enable all shellfish leases to be inspected annually to remain in compliance with NSSP requirements and would help educate shellfish growers on safe shellfish handling practices to greatly lessen the risk of public health issues impacting the industry.

[17] N.C.G.S. § 113-202¶

[18] N.C.G.S. § 113-202.1

[19] https://www.ncleg.gov/Sessions/2023/Bills/House/PDF/H259v7.pdf

Table 9. Total estimated costs for expansion of Bogue Sound shellfish leasing. R denotes recurring funds, and NR denotes non-recurring funds.

| **Item** [1] | **Cost** | **R/NR** |
|---|---|---|
| Administrative Specialist II (1) | $67,760 | R |
| Environmental Specialist II (1) | $73,816 | R |
| Environmental Technician II (1) | $63,480 | R |
| Environmental Technician I (2) | $112,853 | R |
| Purchased Services | $60,000 | R |
| Supplies | $5,000 | R |
| Supplies | $70,000 | NR |
| Equipment | $175,000 | NR |
| **Total** | **$627,909** | |
| [1] Positions include all costs (i.e., fringe) | | |

The potential increase in applications if one or more shellfish leasing moratoria were lifted would cause the same issues as an SEA in preventing the complete evaluation of shellfish lease applications within the time limit, in addition to processing lease renewals and transfers. The granting of multiple leases that are not fully evaluated as meeting the siting standards would result in renewed user conflicts and tension surrounding shellfish leasing in a lifted moratorium. Without adequate staffing to meet the greatly increased demands of shellfish leasing, the State could return to a high level of user conflicts that hinder or even reverse the growth of the industry.

# IV. Study Results

## A. Pamlico Pilot Project

The geospatial analysis conducted for this area and the feedback from shellfish growers outlined several potential reasons for the lack of applications for large shellfish leases outlined in the Pilot Program and for the low feasibility of SEAs in this area as a proxy. As a result, DMF staff were not able to further refine the geospatial analysis based on their input.

The largest concern the shellfish growers provided in response to the geospatial analysis was the distance from the boat ramp that would be needed for any reasonable likelihood of having a large-scale shellfish lease granted. Because the compiled limiting factors in the geospatial analysis are primarily concentrated near the shore, any lease applied for (by an individual or the State in the case of an SEA) would either need to be beyond 1-2 miles from the shoreline or would be at greater risk of limitation from the biological or public usage factors nearby. The risk of these limitations could lead to a proposed lease being greatly reduced or completely ineffective from concerns in the center of the applied area, as the final lease would need to be a single contiguous lease. In addition to the nearshore limitations reducing the likelihood of a proposed lease, the increased distance from shore would greatly increase costs of working the lease and would create much greater risk on the aquaculture gear from regular and inclement weather affecting the Pamlico Sound. The equipment currently available to prepare aquaculture gear for inclement weather is both expensive and not well researched, making it increasingly difficult to anticipate measures needed for areas without substantial protection from weather and current.

Another concern with the large-scale shellfish leases in this area is the capital investment required. Shellfish growers are already investing tens of thousands of dollars on gear to fill out portions of shellfish leases at 10 acres or below and significantly more for processing and safely transporting harvested shellfish. The investment needed to fill out and run a large-scale shellfish lease would be cost prohibitive for most if not all active shellfish leaseholders. An operation of this size would also need a shore-based operations center to work, harvest, refrigerate, and ship harvested shellfish, which is another major investment needed for most of the potential areas in the geospatial analysis.

As a result of this study, the DMF expects that the Pamlico Pilot Project will continue to not be utilized by active or prospective shellfish growers.

## B. Bogue Sound Study

The Bogue Sound Study was able to provide possible locations for SEAs in Bogue Sound along with finding a compromise between shellfish growers and local municipalities (Figures 8-11). The shellfish growers expressed that the possible SEAs identified would likely be utilized by new shellfish growers, especially those having recently graduated from the Shellfish Farming Academy at Carteret Community College. For established shellfish growers, the constraints of the SEA would be less appealing considering their equipment and growing styles require certain waterbody aspects, such as depth and flow.

As stated in Section III G above, the increased workload of shellfish leases due to the growth of the industry requires additional positions in the Shellfish Leasing Program or will result in significant delays in processing annual applications, transfers, and renewals. These delays could put the Shellfish Leasing Program out of compliance with the N.C. General Statutes governing shellfish leasing. The addition of the large processing time of a single 100-acre SEA would further exacerbate the effects of inadequate staffing. To avoid non-compliance with these laws, the Shellfish Leasing Program would have to process an SEA over a greatly extended

timeline—likely several years—to properly evaluate a single SEA in Bogue Sound without adequate staff. This timeline would render the solution of an SEA in Bouge Sound as ineffective in efforts to meet industry growth while mitigating user conflict and impacts.

The prospect of a 1,500-foot buffer from shore was amenable to the municipalities and the growers and would enable shellfish leasing to occur in Bogue Sound and retain the mitigation of user conflicts in the area (Figure 10). The further request from the municipalities to retain the shellfish leasing moratorium on the eastern side of the Atlantic Beach Bridge was not evaluated by the shellfish growers, however (Figure 11).

While the resolution of the Bogue Sound shellfish leasing moratorium and adoption of a 1,500-foot buffer would certainly increase the workload of the Shellfish Leasing Program, the additional staff and funding needed, as stated in Section III G, would be significantly less than the needs for processing SEAs. The additional staff would also enable the Shellfish Leasing Program to meet the increased demand for new shellfish leases and maintenance of existing shellfish leases and franchises.

## C. New Hanover County Study

The New Hanover County Study was significantly impacted by the boundary of the Masonboro Island Coastal Reserve and the 1,500-foot buffer from shore due to the drastic difference in hydrography of these waterbodies (Figures 12-14). The combination of these factors resulted in a reduction in possible shellfish leasing sites to a very limited area. In addition, the remaining area has a high level of natural shellfish and could result in user conflicts.[20]

[20] DMF Anecdotal

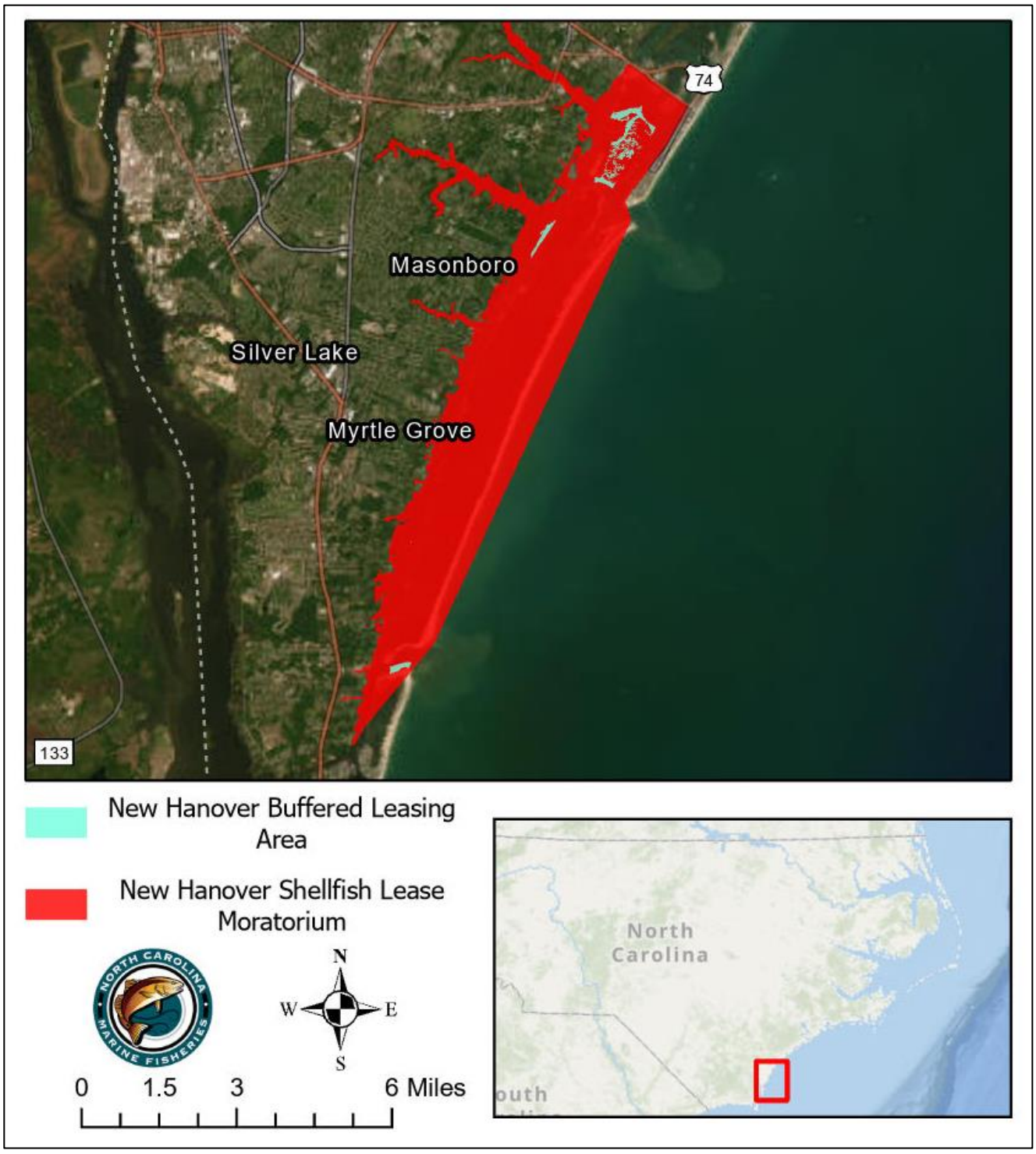


Figure 12. New Hanover County moratorium area with 1,500-foot buffer

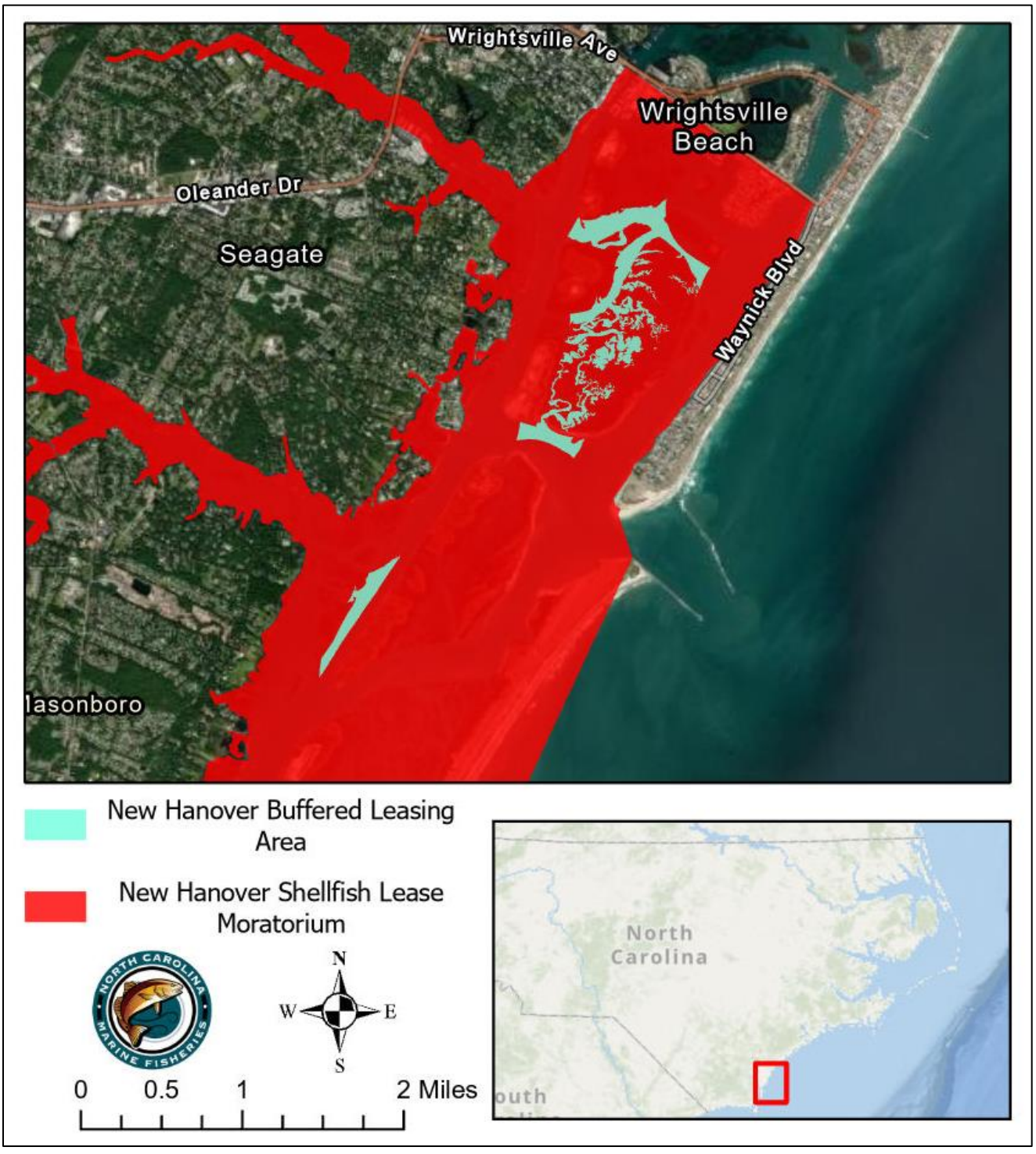


Figure 13. Northern New Hanover County moratorium area with 1,500-foot buffer

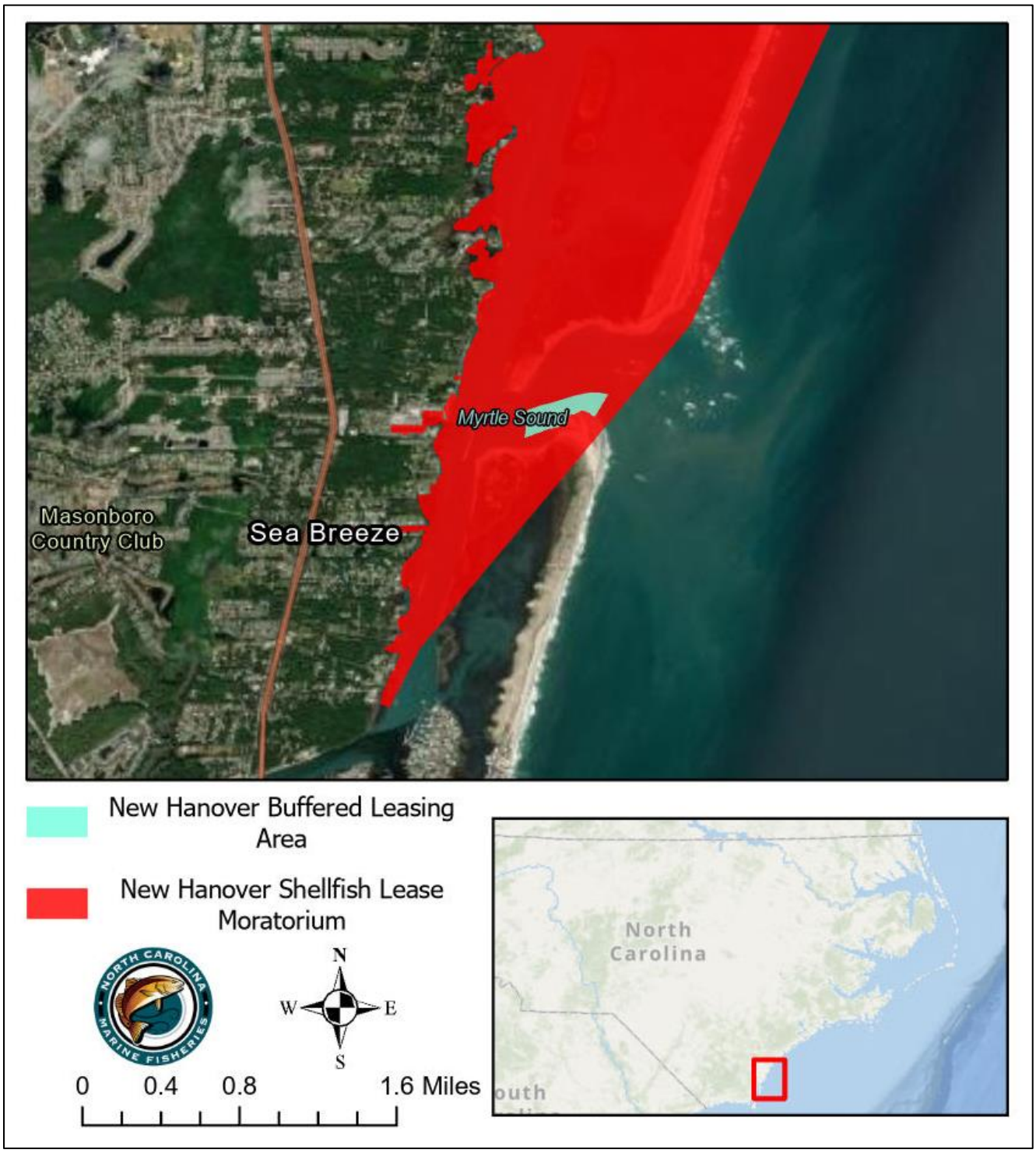


Figure 14. Southern New Hanover County moratorium area with 1,500-foot buffer

# V. Recommendations

## A. Recommendation #1: Regulatory Reform

### 1. Bogue Sound Shellfish Leasing Moratorium

If the Bogue Sound Shellfish Leasing Moratorium is lifted, the DMF recommends following the outlined compromise of a 1,500-foot buffer from the shoreline and no shellfish leasing to occur on the eastern side of the Atlantic Beach Bridge.

### 2. Pamlico Sound Pilot Project

The DMF recommends no regulatory action on the Pamlico Sound Pilot Project. DMF's Shellfish Leasing Program will further study the pilot project upon the application for a large Pamlico Sound shellfish lease application.

### 3. New Hanover County Shellfish Leasing Moratorium

The DMF recommends continuing the SEA study by meeting with New Hanover County municipalities and existing shellfish growers in the area to determine the potential for an SEA or shellfish leasing compromise in this area similar to the Bogue Sound SEA Study.

## B. Recommendation #2: Further Study and Evaluation of Success

The DMF recommends continuing the SEA in Shellfish Leasing Moratoria Study for Core Sound. The resolutions of existing shellfish leasing moratoria are likely to be waterbody specific and may include SEAs or a compromise between municipalities and shellfish growers. The DMF also recommends continuing routine meetings with Bogue Sound municipalities and shellfish growers, if the shellfish leasing moratorium is lifted, to evaluate the success of shellfish leasing in this area.

## C. Recommendation #3: Resource Allocation

The DMF recommends the creation of 5 FTE in the Shellfish Leasing Program and allocating the proposed recurring and non-recurring funding to alleviate the increasing shellfish lease workload and prevent further user conflict issues throughout the State (Table 9). The DMF also recommends the allocation of funding to increase the number of Marine Patrol officers to enable continued monitoring of shellfish leases and ensure compliance with the NSSP.

---

i