STATE OF THE OYSTER: 2016 Progress Report

on the OYSTER RESTORATION AND PROTECTION PLAN FOR NORTH CAROLINA

Prepared by the North Carolina Coastal Federation

"NOTHING TELLS THE COMPLICATED STORY OF OUR COAST LIKE THE OYSTER... WRAPPED UP IN IT, IS A STORY ABOUT OUR COAST'S PAST, PRESENT AND FUTURE."

— Bit and Grain

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EXECUTIVE SUMMARY

The Oyster Restoration and Protection Plan for North Carolina: A Blueprint for Action 2015-2020 (Blueprint) includes seven major goals and dozens of corresponding actions to reverse the decline of oyster populations in North Carolina through oyster restoration and mariculture. This annual *State of the Oyster Report* tracks progress made in 2016 to carry out the *Blueprint*.

Significant progress was made in 2016 to accomplish the seven goals and dozens of actions called for in the *Blueprint*. The level of support from the General Assembly has been solid with meaningful financial appropriations and policy guidance that has enabled many tangible accomplishments. The support and hard work from state agencies, particularly the North Carolina Division of Marine Fisheries, has translated legislative support into effective administrative actions and work in our coastal waterways. Numerous private sector partners have also come to the table to work on this initiative, including fishermen, shellfish growers, community organizations, private foundations and businesses. In addition, the academic community continues to provide innovative research and development capacity that helps advance technology, policy and regulatory decisions through adaptive environmental and fisheries management. The involvement by state agencies in this effort expanded in 2016 to include the North Carolina Department of Commerce. In addition, two federal agencies, the National Oceanic and Atmospheric Administration and the Environmental Protection Agency, assisted with federal funds and professional expertise.

The results of 2016's bipartisan and productive collaboration by many diverse stakeholders are summarized in this report. Please visit ncoysters.org for more information or contact the North Carolina Coastal Federation if you have questions or require more details on this work.

Background and Purpose

The 2016 State of the Oyster Progress Report tracks progress made in carrying out the *Oyster Restoration and Protection Plan: A Blueprint for Action 2015-2020*. This progress builds on the accomplishments of many stakeholders since the 1995 Blue Ribbon Advisory Council on Oysters, 1997 Fisheries Reform Act and the first edition of the *Blueprint*, originally drafted in 2003 and now in its third edition.

The *Blueprint* aims to achieve the following goals by 2020:

1. Link restoration of oysters and water quality with an economic development strategy for North Carolina;
2. Establish at least 500 acres of new oyster sanctuaries;
3. Plant cultch to provide for ample sustainable wild oyster harvest;
4. Build the oyster mariculture industry to meet or exceed wild harvest;
5. Sustainably manage oyster harvest on public bottom;
6. Protect and improve water quality in priority shellfish growing areas; and
7. Document oyster population status and trends resulting from the successful implementation of the *Blueprint*.

HARVEST TRENDS

Oysters are vital to North Carolina's coastal economic and ecological future. Numerous factors such as disease, habitat loss, overharvesting and poor water quality have caused a severe decline in their numbers since peak harvest over a century ago.

Despite some recovery in recent years, the current amount of oysters harvested within the state represents only 15-20 percent of historic harvest levels. Oyster harvest is currently considered the best measure of the oyster population.

Harvest Over the Years (in bushels and USD ex-vessel value)

- 1889 ..... 800,000 bu.
- 1960 ..... 200,000 bu.
- 1994 ..... 35,000 bu.
- 2004 ..... 70,000 bu..... $1,551,870
- 2014 ..... 137,000 bu..... $4,544,236
- 2015 ..... 119,000 bu..... $3,897,184
- 2016 ..... 123,000 bu..... ~$4,045,375[1]

CAUSE OF THE DECLINE

Due to their reduced populations, oysters remain listed as a "species of concern" by the Division of Marine Fisheries. The *Blueprint* identifies the primary reasons for the decline in oyster populations and harvest levels:

- Overharvest without returning enough substrate to the water
- Habitat loss
- Natural disasters
- Low recruitment
- Shellfish diseases and predators
- Water quality degradation

1 North Carolina Department of Environmental Quality. Division of Marine Fisheries. 2016. North Carolina License and Statistics Section 2016 Annual Report., Preliminary 2016 data was received through email from Alan Bianchi, Marine Biologist Supervisor. North Carolina Division of Marine Fisheries. April 2017

GOAL 1: Link restoration of oysters and water quality to an economic development strategy for North Carolina.

Every $1 invested in the state's habitat enhancment activities provides $4.05 in benefits.[2]

The *Blueprint* includes a five-year strategy for incorporating coastal restoration as part of a formal state economic development plan.

2016 LEGISLATIVE ACTION

The General Assembly recognized the potential economic value of oyster and shellfish mariculture. It also provided significant funding to enable large-scale development of oyster sanctuaries that will be constructed by private enterprise in partnership with the Division of Marine Fisheries.

OTHER ACTIONS

Recent research has proven that investing in coastal restoration activities yields profitable returns. Research conducted in 2016 on the value of habitat restoration includes:

- Research Triangle Institute (RTI) International conducted a cost-benefit analysis of the Division of Marine Fisheries' resource enhancement activities. This study concluded that $1 invested in restoration provided $4 worth of fishing and water quality benefits.[2]
- The North Carolina Coastal Federation released a draft *Strategic Plan for Creating a Robust Coastal Economy with Coastal Restoration*, a coastal restoration-based economic development strategy.[3]
- North Carolina Sea Grant conducted a study examining the impact of the state's "Ocean Economy". Results from the study concluded that the Ocean Economy contributes to 66 percent of the state's GDP and provides 12.9 percent of the total employment.[4]
- RTI International conducted a study to evaluate important societal contributions made by natural resources in the Albemarle-Pamlico estuary system. Results indicate that for North Carolina residents, the annual value of preserving the Albemarle-Pamlico's natural resources is in the range of $113-202 million per year. This study also found the area's natural resources provide over 36,000 direct jobs, equaling $672 million in wages each year.[5]

IN PROGRESS

The North Carolina Coastal Federation took the lead in organizing the North Carolina Sound Economic Development Summit held March 22 and 23, 2017 in Raleigh. Planning in 2016 involved the coordination of hundreds of decision-makers, policy experts, private industry representatives and members of the general public.

2 Callihan R, *et al.* 2016. Economic Analysis of the Costs and Benefits of Restoration and Enhancement of Shellfish Habitat and Oyster Propagation in North Carolina. RTI International. Prepared for the Albemarle-Pamlico National Estuary Partnership.

3 2017. Strategic Plan for Creating a Robust Coastal Economy with Coastal Restoration. North Carolina Coastal Federation.

4 2017. North Carolina's Ocean Economy, A First Assessment and Transitioning to a Blue Economy. North Carolina Sea Grant.

5 Van Houtven, G., *et al.* 2016. Economic Valuation of the Albemarle-Pamlico Watershed's Natural Resources. RTI International. Prepared for the Albemarle-Pamlico National Estuary Partnership.

HOW IS RESTORATION LINKED TO THE ECONOMY?

TOURISM accounts for a huge chunk of the state's entire economy, bringing over **$20 BILLION PER YEAR**.

Almost a **QUARTER OF ALL TOURISM OCCURS ON THE COAST.**[6]

North Carolina fisheries are **DEPENDENT** on **GOOD WATER QUALITY** and **HABITAT**.

Recent estimates concluded that commercial fishing supported approximately **35,000 JOBS** and produced **$51 MILLION IN INCOME STATEWIDE.**[9]

Every **$1 INVESTED** in the state's habitat enhancment activities provides **$4.05 IN BENEFITS.**[7]

$8M = **166** & **$13.8M**[8]

INVESTED IN HABITAT RESTORATION | **TEMPORARY FULL-TIME JOBS** | **RESULTING COASTAL REVENUE**

6 North Carolina Department of Commerce. 2015. 2015 North Carolina Regional Travel Summary

7 Callihan R, *et al.* 2016. Economic Analysis of the Costs and Benefits of Restoration and Enhancement of Shellfish Habitat and Oyster Propagation in North Carolina.

8 Lawrence S. *et al.* 2015. Coastal Restoration and Community Economic Development in North Carolina Final Report. RTI International. Prepared for RTI International. Prepared for the Albemarle-Pamlico National Estuary Partnership.

9 North Carolina Division of Marine Fisheries Bulletin. 2014. portal.ncdenr.org/c/document_library/get_file?uuid=7c7dde2b-47c5-4169-a480-c220e29b775d&groupId=38337

GOAL 2: Establish at least 500 acres of new oyster sanctuaries.

The Division of Marine Fisheries strategically locates oyster sanctuaries in estuarine waters to ensure there are sufficient natural juvenile oysters (spat) to populate nearby harvested oyster reefs. Oyster sanctuaries have been found to support 27 times more broodstock oysters (>3") that produce spat to help sustain oyster populations, than harvestable natural oyster reefs.[10]

2016 LEGISLATIVE ACTION

- The General Assembly appropriated $1.5 million non-recurring funds to build the Senator Jean Preston Oyster Sanctuary in Pamlico Sound.[11]

189.46 ACRES **Restored** | **500** ACRES **Goal** | PROGRESS **37.9%** **complete**

OTHER ACTIONS

CUMULATIVE ACREAGE OF SANCTUARIES IN NORTH CAROLINA (500 ACRE GOAL)	ACREAGE ADDED IN 2016
189.46 Built	11.8 Acres Built
329.2 Acres Permitted	20.7 Acres Permitted[12]

A Public-Private Partnership DOUBLED State Appropriations for Building Sanctuaries

The North Carolina Coastal Federation received a grant from the National Oceanic and Atmospheric Administration for nearly $1.3 million. This funding, combined with the Division of Marine Fisheries' $1.5 million appropriation, doubles the impact of state funds.

With this funding, a private North Carolina contractor will be hired to build a new oyster sanctuary — the Swan Island Oyster Sanctuary — located in the mouth of the Neuse River. This project will:

Build **15** ACRES of oyster reefs

Employ **43-65** workers[13]

Provide **173** T additional seafood/yr[14]

Sanctuary Site Selection Tools

The Nature Conservancy has expanded web-based mapping tools available for long-term, large-scale management and restoration of oyster habitat. The Restoration Explorer (coastalresilience.org/project/restoration-explorer/) helps planners and resource managers prioritize oyster sanctuary locations in Pamlico Sound. The tool also assists in determining where oyster reefs could make the most difference in preventing shoreline erosion. The tool also assists in prioritizing oyster sanctuary locations in the Pamlico Sound. The Oyster Calculator (oceanwealth.org/tools/oyster-calculator/) calculates the area of oyster habitat needed to quantify and forecast improvements to water quality and fisheries production.

IN PROGRESS

North Carolina Sea Grant is currently sponsoring research aimed at exploring: opportunities to restore seagrass beds simultaneously with oyster reefs; the use of living shorelines that incorporate oysters; the development of a GIS-based decision support tool for oyster restoration; and the creation of a population dynamics guide for oyster restoration and habitat protection.

The Division of Marine Fisheries continues to solicit input through public meetings on the placement and construction of future oyster sanctuaries.

Figure 1: *North Carolina's oyster sanctuary network.* *Map courtesy North Carolina Division of Marine Fisheries.*

10 Peters J.W., Eggleston D.B., Puckett B.P., Theuerkauf S.J. In prep. Oyster Demographics in Harvested Reefs versus No-Take Reserves: Implications for Larval Spillover. 41 pp.

11 Data received from Joint Conference Committee Reports found www.ncleg.net/fiscalresearch/budget_legislation/budget_legislation.html

12 Data received through email from NCDMF data request performed by Jason Peters, North Carolina Division of Marine Fisheries, Artificial Reef Coordinator. April 2017.

13 Based off calculations stated in: RTI International. 2015. Coastal Restoration and Community Economic Development in North Carolina Final Report. Prepared for the North Carolina Coastal Federation.

14 Based off calculations stated in: Peterson C.H., Grabowski J.H., Powers S.P. 2003. Estimated enhancement of fish production resulting from restoring oyster reef habitat: quantitative valuation. Marine Ecology Progress Series. 264: 249-264.

THE 50 MILLION OYSTER INITIATIVE

Recent monitoring of oyster sanctuaries showed that for every acre of oyster sanctuary created, over 1 million oysters are restored to our coastal waters. The North Carolina Coastal Federation has recently launched an initiative to help the Division of Marine Fisheries restore at least 50 acres of oyster reefs coastwide in three years, thereby restoring 50 million oysters to our sounds by 2020. Those 50 million oysters will filter an estimated 2.5 trillion gallons of water daily — providing cleaner water, better habitat and a stronger coastal economy.

OYSTER PATCH AND FRINGING REEFS

Additional oyster habitat restoration in the form of patch and fringing reefs and living shorelines are smaller scale restoration efforts carried out by nonprofits, universities, municipalities and waterfront property owners. They typically range in size from a tenth of an acre to two acres. In 2016, 1.3 acres of these reefs were built.

IN 2016, THE DIVISION OF MARINE FISHERIES PLANTED MORE THAN DOUBLE THE AMOUNT OF CULTCH COMPARED TO 2015.

GOAL 3: Plant cultch to provide for ample sustainable wild oyster harvest.

The Division of Marine Fisheries has worked since 1915 to regulate oyster harvest and enhance reef habitat. Cultch planting throughout the state's shellfish waters create public shellfish management areas that are open for public harvest once oysters reach legal size (>3"). The *Blueprint* calls for renewing the cultch planting efforts through adaptive management and implementing a strategy of building the reefs with both state personnel and private contractors when conditions warrant (as recommended by the 2015-16 RTI International report).[15]

2016 LEGISLATIVE ACTION

Increased recurring funds for the cultch planting program to $900,000 in FY 16/17 with $300,000 non-recurring funds. This totals $1.2 million for cultch planting from July 1, 2016 to June 30, 2017. [16]

OTHER ACTIONS

In 2016 and with FY 15/16 funding, the Division of Marine Fisheries planted 432,214 bushels of cultch material, more than twice the amount planted in 2015.[17]

IN PROGRESS

The Division of Marine Fisheries is exploring a new rotational management cultch planting strategy designed to maximize the effectiveness of the cultch planting program and is also exploring a potential "spat on shell" planting in areas where larval settlement is limited. The Division of Marine Fisheries continues to solicit public input on the placement of future cultch planted reefs.

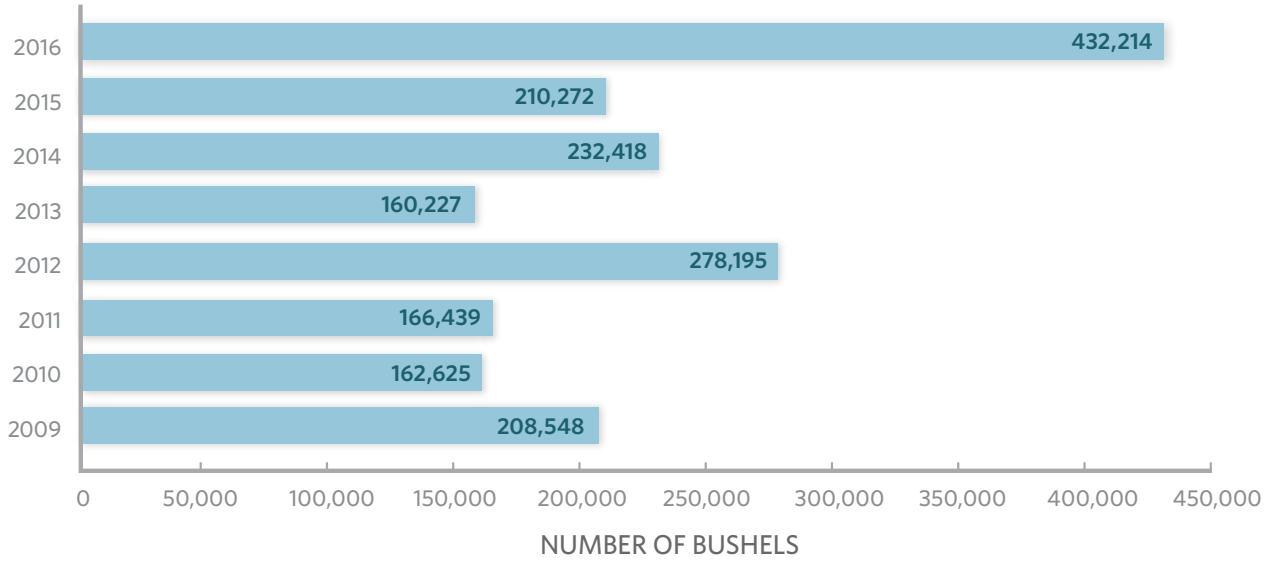

Figure 2: *The Division of Marine Fisheries deploys cultch material annually in designated cultch planting sites. In 2016 and with FY 15/16 funding, the Division planted more than twice the amount of cultch planted in 2015.*

CULTCH PLANTING PROGRAM

The Division of Marine Fisheries annually plants an average of 230,000 bushels of shell and marl — collectively called cultch — in shellfish waters from the Shallotte River to Pamlico Sound. Cultch is then colonized by oyster larvae. This "spat" attaches and grows to harvest size (three inches) in 18-36 months. These cultch sites are open to public harvest once oysters reach legal harvest size.

The Division of Marine Fisheries is permitted to plant up to 100 acres of cultch annually. It is the Division of Marine Fisheries' goal to plant as much acreage as possible each year, but it is dependent on reliable material and adequate funding to carry out the program.

15 Callihan R, *et al.* 2016. Economic Analysis of the Costs and Benefits of Restoration and Enhancement of Shellfish Habitat and Oyster Propagation in North Carolina. RTI International. Prepared for the Albemarle-Pamlico National Estuary Partnership; Lawrence S. et al. 2015. Coastal Restoration and Community Economic Development in North Carolina Final Report. RTI International. Prepared for North Carolina Coastal Federation.

16 Data received from Joint Conference Committee Reports found www.ncleg.net/fiscalresearch/budget_legislation/budget_legislation.html

17 Preliminary data received through email from Garry Wright, North Carolina Division of Marine Fisheries, Biologist Supervisor. Spring 2017.

GOAL 4: Build the oyster mariculture industry to meet or exceed wild harvest levels.

Cultivating or farming oysters on leases granted by the Division of Marine Fisheries has enormous potential to provide significant economic benefits for coastal residents, while improving water quality and potentially reducing harvest pressures on wild oysters.

2016 LEGISLATIVE ACTION

Improve the Shellfish Leasing Process

In 2016, the General Assembly streamlined rules and provided additional funds for the Division of Marine Fisheries' Shellfish Leasing Program. These changes include:

- Changing the original lease payment and the renewal payment to have the same due date;
- Allowing water column leases to be transferrable, like that allowed for bottom leases, so long as approved by the Secretary of the Department of Environmental Quality;
- Changing the renewal period for shellfish mariculture demonstration leases from a two-year to five-year period and changing the allowable profit from the demonstration leases to be no more than $5,000 per acre per year (changed from $1,000 per acre per year);
- Adding two additional staff to increase efficiency in processing lease applications;
- Increasing the penalties for theft of oysters and culture gears from leases.[18]

Study on Mariculture

The General Assembly directed the University of North Carolina Policy Collaboratory to conduct a study on how best to encourage North Carolina shellfish mariculture. The UNC Policy Collaboratory has been working with the Oyster Steering Committee to move forward with the study and will submit a report to lawmakers by Dec. 31, 2018.

State Funds for University of North Carolina Wilmington Shellfish Research Hatchery

The research hatchery located at UNCW provides a critical service in developing the best strains of oysters that can be used successfully by North Carolina mariculture operations. The goal is to develop disease resistant oysters that are adapted to North Carolina's estuarine conditions. Funding from the General Assembly has enabled significant progress in producing and testing the viability of strains of native oyster larvae. In 2016, 300,000 seed and 1.5 million eyed larvae were sold to growers with an additional 127,000 seed deployed on six North Carolina farms as part of a North Carolina Sea Grant funded project. [19]

OTHER ACTIONS

With funding from the National Oceanic and Atmospheric Administration Aquaculture Extension and Technology Transfer Program, North Carolina Sea Grant has partnered with Carteret Community College and UNCW to establish three sites along the North Carolina coast to serve as shellfish mariculture demonstration centers. These sites will be used for hands-on training, improving production practices and species diversification. Sites include the UNCW Center for Marine Sciences located on Masonboro Sound, the North Carolina State University Center for Marine Sciences and Technology and Carteret Community College located on Bogue Sound in Morehead City and the North Carolina Coastal Federation's office on Broad Creek in Wanchese.

The Division of Marine Fisheries has worked in collaboration with interested parties to update and streamline its shellfish lease application. The new application combines the once separate water column and bottom lease applications and includes opportunities for input from additional state and federal agencies.

UNCW has completed its North Carolina Shellfish Siting Tool that aims to ease the site selection process for new or expanding shellfish mariculture operations, available at uncw.edu/benthic/sitingtool/.

IN PROGRESS

North Carolina Sea Grant is working with Carteret Community College to establish a shellfish mariculture training program geared toward providing practical, hands-on training for individuals wishing to enter the industry. North Carolina Sea Grant is also leading or partnering on several research projects relevant to oyster mariculture (see ncseagrant.ncsu.edu/oysters/NCSG_oysterprojects.docx for details).

FISCAL YEAR	AWARD	AWARD CHARGE	PROGRESS
2014-2015	**$450,000** state appropriation recurring revenue	To contract with UNCW to develop a specific North Carolina oyster broodstock.	Successful spawns showed >1500 percent increase in seed production in the past two years. Hatchery selected lines show a 200-400 percent increase in the yield of market sized oysters in 18 months. [20]
2015-2016	Increased to **$500,000** state appropriation recurring revenue		

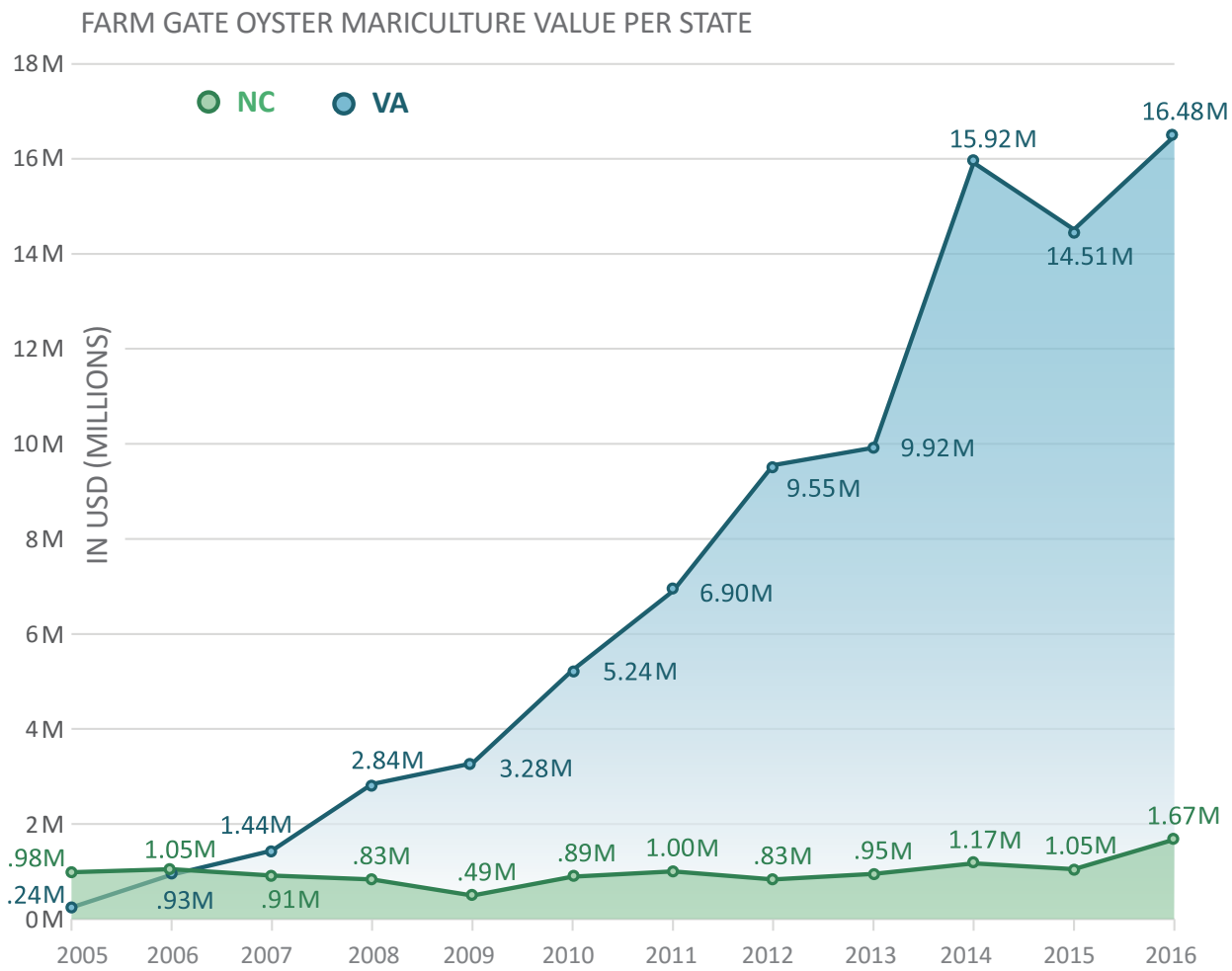

Figure 3: Comparative growth of oyster mariculture in Virginia and North Carolina since 2005. In 2016, the Division of Marine Fisheries used a new quantification method to insure data accuracy. All North Carolina data were updated according to the new method.[21]

18 2016 Appropriations Act. H1030vCCR. Sections 13.4-14.11 (2016).

19 Data received through email from Ami Wilbur, University of North Carolina Wilmington, Associate Professor. March 2017.

20 Data received through email from Ami Wilbur, University of North Carolina Wilmington, Associate Professor. March 2017

21 North Carolina data provided by Garry Wright, North Carolina Division of Marine Fisheries, Habitat and Enhancement Section, Biologist Supervisor, June 2017. Virginia values were calculated by multiplying average yearly price per oyster by the total number estimated to be sold, extrapolated from Murray and Hudson, Virginia Shellfish Aquaculture Situation and Outlook Report(s), 2011-2017.

22 Data received through email from Michael Graven, North Carolina Division of Marine Fisheries, Lease Program Coordinator. April 2017.

In 2016, 46 lease applications were submitted, with 33 leases granted. This shows more than a fourfold increase of interest compared to the past five years when an average of 11 lease applications were submitted per year.[22] The increased interest in leases is also translating to an increase in oyster offerings at local oyster bars. For example, Coastal Provisions Oyster Bar and Wine Bar Café boasts that its oyster selection offers 10 out of 17 oysters coming from North Carolina sources. In 2013, the restaurant had a hard time finding even one locally sourced oyster to offer.

GOAL 5: Sustainably manage oyster harvest on public bottom.

Wild harvest of oysters is vital to our coastal economy and heritage. Efforts to refine strategies through the state's Fisheries Management Plan (FMP) process and secure adequate resources will help to ensure that wild harvest can continue in a safe and sustainable manner.

2016 LEGISLATIVE ACTION

Continued recurring funding to the Division of Marine Fisheries to staff and operate its fisheries management program.

OTHER ACTIONS

The Division of Marine Fisheries has prepared FMPs since 1997 for all commercially and recreationally significant species. The Oyster FMP was reviewed and amended in 2016 by the N.C. Department of Environmental Quality Secretary and the Joint Legislative Commission on Governmental Operations. Final approval of these amendments and implementing rules occurred in February 2017, with rules becoming effective no earlier than May 1, 2017. Recommended changes to carry out the Oyster FMPs Amendment 4 include:

- Lowering the daily harvest limit of oysters for those fishing under a commercial shellfish license off public bottom, limited to 2 bushels (bu)/person, not to exceed 4 bu/operation;
- Reducing the culling tolerance for oysters statewide from 10 to five percent;
- Continuing the monitoring system to determine when to close mechanical oyster harvest off public bottom in an area;
- Aligning the maximum daily harvest limit for oysters off public bottom in rule with current management;
- Changing the time frame for opening deep bays off public bottom to mechanical harvest, for increased flexibility;
- Revoking fishing licenses for certain violations on shellfish leases and franchises;
- Providing a lease term extension when "Acts of God" prevent a leaseholder from meeting production requirements;
- Increasing the maximum proposed area for hand-harvest shellfish leases from five to 10 acres; and
- Increasing efforts to plant and monitor cultch material.
- Amendment 4 also recommends long-term management strategies as well as a list of research recommendations.[23]

IN PROGRESS

The Division of Marine Fisheries is exploring a fishery dependent metric of effort to better inform management decisions and is also exploring new ways of quantifying the wild oyster population.

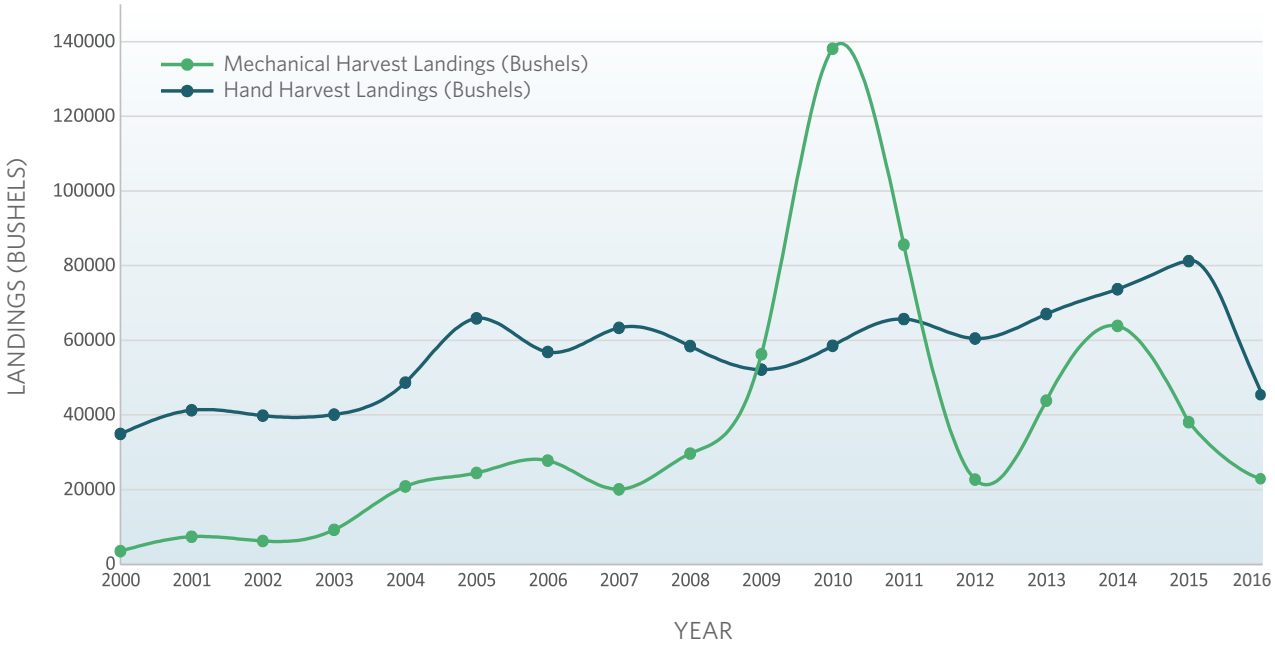

Figure 4: *Comparison of oyster landings off of public bottom areas by harvest method since 2000. Bushels calculated using the standard conversion rate of lbs. meat/ 5.29 = bushels.*[24]

23 Data received by email from Tina Moore, North Carolina Division of Marine Fisheries, Biologist Supervisor. April 2017.

24 Data obtained from 2016 North Carolina Division of Marine Fisheries License and Statistics Annual Report pg 11-62., 2016 Data received by email from Garry Wright. North Carolina Division of Marine Fisheries. Habitat Enhancement Section. Biologist Supervisor. June 2017.


SEAFOOD
RETAIL ENTRANCE

GOAL 6: Protect and improve water quality in priority shellfish growing areas.

Coastal waters must be clean enough to allow oysters to be harvested and eaten. Land drainage carries increased volumes of runoff and transports high levels of bacteria and other pollutants into coastal waters, threatening public health. Shellfish beds are closed to fishing after moderate to severe rains. For example, the rich oyster beds in the middle of Stump Sound in Onslow County were closed to shellfish harvest for a third of 2016 due to stormwater runoff, and many of its tributary tidal creeks are now permanently closed to harvest.

In 2016, Shellfish Sanitation reported a total of 757,605.78 acres, or 34.1 percent of all shellfish growing areas, were closed to harvest due to poor water quality or lack of funding for monitoring.[25] However, in early 2017, an additional >2,000 acres were closed as a result of analysis of water quality samples taken in the past five years.[26]

SELECTED COUNTIES	ACRES CLOSED IN 2016	ADDITIONAL ACRES CLOSED IN 2017*
Brunswick	28,315.41	175
Carteret	17,979.51	877
Dare	94,362.35	0
Hyde	12,154.23	244
New Hanover	12,154.23	7
Onslow	17,206.72	134
Pamlico	20,953.08	626
Pender	2,848.50	17

** Closures occurred as a result of water quality sampling done from a period of 2011 to 2016.*

Preparing watershed restoration plans to identify the most cost-effective measures to protect and improve water quality, restoring wetlands located in the headwaters of growing areas, retrofitting existing land uses with stormwater reduction measures and using low-impact development practices in new developments are tools that help restore and protect water quality management efforts.

2016 LEGISLATIVE ACTION

New Stormwater Rules

In 2016, the General Assembly approved revisions to the Coastal Stormwater Rules. The rules were developed in cooperation with a diverse group of stakeholders made up of professional engineers, local governments, university professors, environmental groups and the state Department of Transportation, as well as a soil scientist and a landscape architect.

Any questions related to the state's stormwater program or new stormwater rules can be directed to Annette Lucas at annette.lucas@ncdenr.gov or 919-807-6381.

Increased Appropriations to Protect Water Quality

The General Assembly also appropriated an $8.6 million increase to the North Carolina Clean Water Management Trust Fund for water quality protection and restoration projects in the 2016 final budget.

OTHER ACTIONS

The Division of Marine Fisheries and the Division of Energy, Mineral and Land Resources revisited the state Stormwater Design Manual to ensure consistency with the new stormwater rules. The design manual was finalized in April 2017.

The North Carolina Coastal Federation reduced the volume of polluted runoff reaching coastal waters by an estimated 227,154 gallons based on the number and size of stormwater retrofits it installed in Dare, Carteret, New Hanover and Brunswick counties in 2016.

IN PROGRESS

The Division of Marine Fisheries and the Division of Energy, Mineral and Land Resources is currently working with engineering firm WithersRavenel to update the supplemental forms required to submit stormwater plans for state permit review. The new forms, called "Supplement-EZ," will make permit submittals simpler for both the state stormwater reviewers and project designers/engineers.

The Division of Marine Fisheries is looking into reopening a laboratory on the northeastern coast for water quality monitoring. Due to lack of funding in 2015, this lab was shut down, effectively closing viable shellfishing acres. Reopening this lab would enable 54,503 acres to open for shellfish activities, and the state would be better equipped to respond to water testing needs after rainfall events.

Two coastal communities, the Town of Swansboro and the Town of Beaufort, began to develop new watershed restoration plans in 2016 for adoption in 2017. The North Carolina Coastal Federation also secured funding from a private foundation to prepare a watershed restoration plan for the Lower Cape Fear River below Wilmington that will be completed in 2017.

Tracking water quality trends in the state

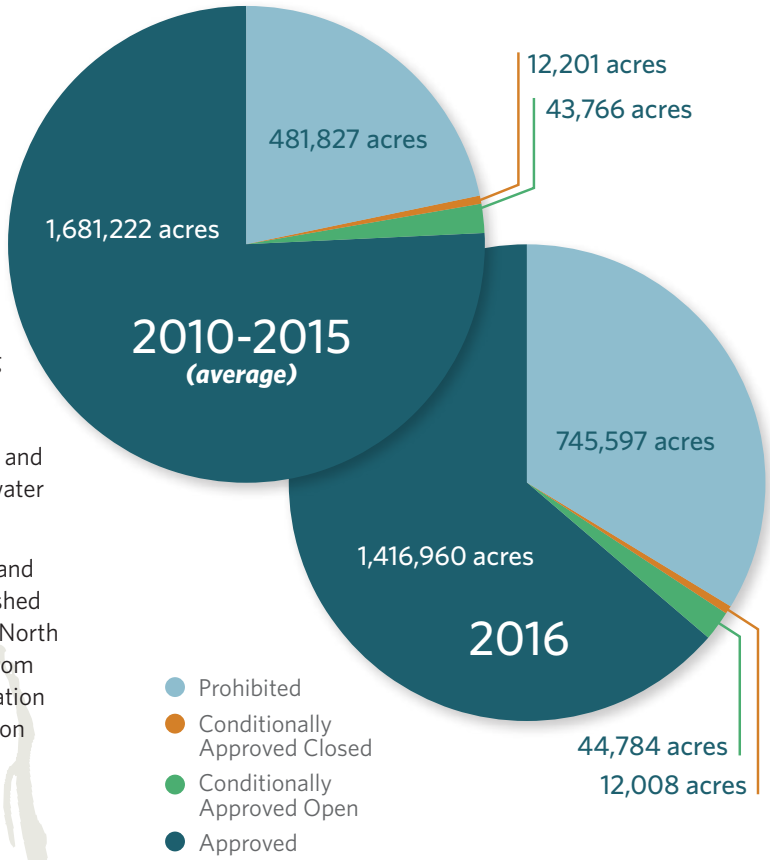

Figure 5: *The Shellfish Sanitation and Recreational Water Quality Section of the Division of Marine Fisheries monitors the health of the state's waters for public safety. Closures are issued based on harmful bacterial levels or stormwater inputs in sensitive areas.* [27]

25 Data received through email from Shannon Jenkins, Shellfish Sanitation and Water Quality Section Chief, N.C. Division of Marine Fisheries, April 2017.

26 2017. Coastal Review Online. Staff Report. www.coastalreview.org/2017/03/2000-shellfish-water-closed/. Retrieved April 2017.

27 Data received through email from Shannon Jenkins, Shellfish Sanitation and Water Quality Section Chief, N.C. Division of Marine Fisheries, April 2017.

GOAL 7: Document oyster population status and trends resulting from successful implementation of the *Blueprint*.

The *Blueprint* lays out seven overarching goals for successful oyster restoration and protection in the state. *The State of the Oyster: 2016 Progress Report* is aimed at providing a way to track progress in carrying out the *Blueprint*. For more immediate news and updates go to ncoysters.org and sign up to receive the "On the Half Shell" quarterly e-newsletter.

2016 LEGISLATIVE ACTION

No legislative action was sought in 2016

OTHER ACTIONS

North Carolina researchers at UNCW, NCSU's Center for Marine Sciences and Technology, UNC Institute of Marine Sciences, Carteret Community College, RTI International and North Carolina Sea Grant were very productive in 2016 studying the topics of:

- The effects of wave exposure on reefs;
- Improving oyster sanctuary network design;
- Measuring ecosystem based effects of restoration;
- The cost-benefit of the state's habitat enhancement programs;
- Evaluating societal contributions made by natural resources;
- Using oyster shell chemistry to infer larval dispersal;
- Living shorelines' effect on habitat use;
- North Carolina oyster disease;
- Genetic variability in the eastern oyster;
- Evaluating the performance of habitat restoration;
- Comparing oyster culture gear types and performance of native oyster strains;
- Evaluating methods to prevent biofouling of farmed oysters;
- Using oyster reef soundscapes to enhance oyster larval settlement;
- Assessing production practices, economics and market demand of the developing North Carolina oyster industry;
- Developing a mariculture curriculum for North Carolina high schools;
- Exploring establishment of a state or regional shellfish mariculture initiative; and
- Comparing policy and financial tools available to the state's oyster farming industry.

In addition, North Carolina Sea Grant is sponsoring research to determine the effects of oyster mariculture on submerged aquatic vegetation; understand the public health risk associated with under dock oyster culture and commercial mariculture; and evaluate oyster culture gear suited for intertidal coastal areas.

IN PROGRESS

The Oyster Steering Committee continues to track the progress toward implementing the *Blueprint* and refining recommendations and guidance for its successful implementation.

KEY NEXT STEPS

A solid investment in oyster mariculture and restoration of natural oyster reefs safeguarded by enhanced restoration measures to protect water quality and habitat provides the potential for tremendous economic, social and environmental returns for coastal communities in North Carolina. The North Carolina coast is poised with all the assets and public interest to become the "Napa Valley" of oysters.

IN THE YEARS AHEAD, THE FOLLOWING ARE KEY PRIORITIES:

Prepare a strategic plan for the North Carolina shellfish mariculture industry.

Develop North Carolina specific broodstock through university research and foster the development of private hatcheries to provide a suitable amount of seed for a growing mariculture industry.

Invest in water quality and habitat restoration.

Develop public-private partnerships whenever possible to build out oyster reefs and expand the state's capacity to restore oysters.

Keep our waters clean and productive for the growing oyster industry by promoting effective stormwater management and low-impact development.

Provide adequate funding to implement watershed restoration plans and the monitoring of shellfish waters.

Develop enforceable measures to safeguard both public and private reefs from illegal poaching.

Continue to produce sound science from the state's universities and community colleges in collaboration with stakeholders from all aspects of the industry to refine and expand restoration and oyster mariculture.

Educate and develop a highly skilled workforce, through practical education and training, that will support competitive and sustainable commercial shellfish production.

It's an exciting time for oysters in North Carolina. Over the next three years, a solid investment in this industry and measures to safeguard water quality will yield tremendous returns.

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