Environmental Quality

PAT McCRORY
Governor

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Secretary

TO: The Coastal Resources Commission

FROM: Christine A. Goebel, Assistant General Counsel CAG

DATE: November 16, 2016 (for the November 30- December 1, 2016 CRC Meeting)

RE: **Variance Request by Water's Edge Homeowners' Association, Inc. (CRC-VR-16-10)**

Petitioner Water's Edge Homeowners' Association, Inc. ("HOA" or "Petitioner") owns common-area piers which extend from the subdivision property on the Atlantic Intracoastal Waterway ("AIWW") in Pender County. The subdivision developer built 9 slips on the AIWW in 2004 which extended into the waterbody out to the AIWW channel setback and which had depths in 2004 which ranged from -1.91' to -3.92' NGVD '29. In 2008, Petitioner started the CAMA permit process seeking to dredge the slips but halted the process once objections were raised concerning impacts to SAV and SAV habitat by DCM, DWQ, DMF and WRC. In May of 2005, Petitioner again sought a CAMA permit in order to dredge SAV and SAV habitat. Water depths at the site now range from -0.82' to -3.0' nlw. After the same resource agencies raised concerns similar to those noted in 2008, DCM denied Petitioner's permit application on December 4, 2015. Petitioner now seeks a variance from the Commission's rules which requires dredging avoid significant adverse impacts upon SAV and which requires navigation channels and boat basins to avoid beds of SAV, which are noted in the denial letter.

The following additional information is attached to this memorandum:

Attachment A:	Relevant Rules
Attachment B:	Stipulated Facts
Attachment C:	Petitioner's Positions and Staff's Responses to Variance Criteria
Attachment D:	Petitioner's Variance Request Materials
Attachment E:	Stipulated Exhibits including powerpoint

cc(w/enc.): Stephen D. Coggins, Petitioner's Attorney, electronically
Mary Lucasse, Special Deputy AG and CRC Counsel, electronically

RELEVANT STATUTES OR RULES APPENDIX A

SECTION .0200 – THE ESTUARINE AND OCEAN SYSTEMS

15A NCAC 07H .0201 ESTUARINE AND OCEAN SYSTEM CATEGORIES

Included within the estuarine and ocean system are the following AEC categories: estuarine waters, coastal wetlands, public trust areas, and estuarine and public trust shorelines. Each of the AECs is either geographically within the estuary or, because of its location and nature, may significantly affect the estuarine and ocean system.

15A NCAC 07H .0202 SIGNIFICANCE OF THE SYSTEMS APPROACH IN ESTUARIES

The management program must embrace all characteristics, processes, and features of the whole system and not characterize individually any one component of an estuary. The AECs are interdependent and ultimately require management as a unit. Any alteration, however slight, in a given component of the estuarine and ocean system may result in unforeseen consequences in what may appear as totally unrelated areas of the estuary. For example, destruction of wetlands may have harmful effects on estuarine waters which are also areas within the public trust. As a unified system, changes in one AEC category may affect the function and use within another category.

15A NCAC 07H .0203 MANAGEMENT OBJECTIVE OF THE ESTUARINE AND OCEAN SYSTEM

It is the objective of the Coastal Resources Commission to conserve and manage estuarine waters, coastal wetlands, public trust areas, and estuarine and public trust shorelines, as an interrelated group of AECs, so as to safeguard and perpetuate their biological, social, economic, and aesthetic values and to ensure that development occurring within these AECs is compatible with natural characteristics so as to minimize the likelihood of significant loss of private property and public resources. Furthermore, it is the objective of the Coastal Resources Commission to protect present common law and statutory public rights of access to the lands and waters of the coastal area.

15A NCAC 07H .0204 AECS WITHIN THE ESTUARINE AND OCEAN SYSTEM

The following regulations in this Section define each AEC within the estuarine and ocean system, describe its significance, articulate the policies regarding development, and state the standards for development within each AEC.

15A NCAC 07H .0206 ESTUARINE WATERS

(a) Description. Estuarine waters are defined in G.S. 113A-113(b)(2) to include all the waters of the Atlantic Ocean within the boundary of North Carolina and all the waters of the bays, sounds, rivers and tributaries thereto seaward of the dividing line between coastal fishing waters and inland fishing waters…

(b) Significance. Estuarine waters are the dominant component and bonding element of the entire estuarine and ocean system, integrating aquatic influences from both the land and the sea. Estuaries are among the most productive natural environments of North Carolina. They support the valuable commercial and sports fisheries of the coastal area which are comprised of estuarine dependent species such as menhaden, flounder, shrimp, crabs, and oysters. These species must spend all or some part of their life cycle within the estuarine waters to mature and reproduce. Of the 10 leading species in the commercial catch, all but one are dependent on the estuary.

This high productivity associated with the estuary results from its unique circulation patterns caused by tidal energy, fresh water flow, and shallow depth; nutrient trapping mechanisms; and protection to the many organisms. The circulation of estuarine waters transports nutrients, propels plankton, spreads seed stages of fish and shellfish, flushes wastes from animal and plant life, cleanses the system of pollutants, controls salinity, shifts sediments, and mixes the water to create a multitude of habitats. Some important features of the estuary include mud and sand flats, eel grass beds, salt marshes, submerged vegetation flats, clam and oyster beds, and important nursery areas.

Secondary benefits include the stimulation of the coastal economy from the spin off operations required to service commercial and sports fisheries, waterfowl hunting, marinas, boatyards, repairs and supplies, processing operations, and tourist related industries. In addition, there is considerable nonmonetary value associated with aesthetics, recreation, and education.

(c) Management Objective. To conserve and manage the important features of estuarine waters so as to safeguard and perpetuate their biological, social, aesthetic, and economic values; to coordinate and establish a management system capable of conserving and utilizing estuarine waters so as to maximize their benefits to man and the estuarine and ocean system.

(d) Use Standards. Suitable land/water uses shall be those consistent with the management objectives in this Rule. Highest priority of use shall be allocated to the conservation of estuarine waters and their vital components. Second priority of estuarine waters use shall be given to those types of development activities that require water access and use which cannot function elsewhere such as simple access channels; structures to prevent erosion; navigation channels; boat docks, marinas, piers, wharfs, and mooring pilings.

In every instance, the particular location, use, and design characteristics shall be in accord with the general use standards for coastal wetlands, estuarine waters, and public trust areas described in Rule .0208 of this Section.

15A NCAC 07H .0207 PUBLIC TRUST AREAS

(a) Description. Public trust areas are all waters of the Atlantic Ocean and the lands thereunder from the mean high water mark to the seaward limit of state jurisdiction; all natural bodies of water subject to measurable lunar tides and lands thereunder to the normal high water or normal water level; all navigable natural bodies of water and lands thereunder to the normal high water or normal water level as the case may be, except privately-owned lakes to which the public has no right of access; all water in artificially created bodies of water containing public fishing resources or other public resources which are accessible to the public by navigation from bodies of water in which the public has rights of navigation; and all waters in artificially created bodies of water in which the public has acquired rights by prescription, custom, usage, dedication, or any other means. In determining whether the public has acquired rights in artificially created bodies of water, the following factors shall be considered:

(1) the use of the body of water by the public;

(2) the length of time the public has used the area;

(3) the value of public resources in the body of water;

(4) whether the public resources in the body of water are mobile to the extent that they can move into natural bodies of water;

(5) whether the creation of the artificial body of water required permission from the state; and

(6) the value of the body of water to the public for navigation from one public area to another public area.

(b) Significance. The public has rights in these areas, including navigation and recreation. In addition, these areas support commercial and sports fisheries, have aesthetic value, and are important resources for economic development.

(c) Management Objective. To protect public rights for navigation and recreation and to conserve and manage the public trust areas so as to safeguard and perpetuate their biological, economic and aesthetic value.

(d) Use Standards. Acceptable uses shall be those consistent with the management objectives in Paragraph (c) of this Rule. In the absence of overriding public benefit, any use which jeopardizes the capability of the waters to be used by the public for navigation or other public trust rights which the public may be found to have in these areas shall not be allowed. The development of navigational channels or drainage ditches, the use of bulkheads to prevent erosion, and the building of piers, wharfs, or marinas are examples of uses that may be acceptable within public trust areas, provided that such uses shall not be detrimental to the public trust rights and the biological and physical functions of the estuary. Projects which would directly or indirectly block or impair existing navigation channels, increase shoreline erosion, deposit spoils below normal high water, cause adverse water circulation patterns, violate water quality standards, or cause degradation of shellfish waters are considered incompatible with the management policies of public trust areas. In every instance, the particular location, use, and design characteristics shall be in accord with the general use standards for coastal wetlands, estuarine waters, and public trust areas.

15A NCAC 07H .0208 USE STANDARDS

(a) General Use Standards

(1) Uses which are not water dependent shall not be permitted in coastal wetlands, estuarine waters, and public trust areas. Restaurants, residences, apartments, motels, hotels, trailer parks, private roads, factories, and parking lots are examples of uses that are not water dependent. Uses that are water dependent include: utility crossings, wind energy facilities, docks, wharves, boat ramps, dredging, bridges and bridge approaches, revetments, bulkheads, culverts, groins, navigational aids, mooring pilings, navigational channels, access channels and drainage ditches;

(2) Before being granted a permit, the CRC or local permitting authority shall find that the applicant has complied with the following standards:

(A) The location, design, and need for development, as well as the construction activities involved shall be consistent with the management objective of the Estuarine and Ocean System AEC (Rule .0203 of this subchapter) and shall be sited and designed to avoid significant adverse impacts upon the productivity and biologic integrity of coastal wetlands, shellfish beds, submerged aquatic vegetation as defined by the Marine Fisheries Commission, and spawning and nursery areas;

(B) Development shall comply with state and federal water and air quality

(C) Development shall not cause irreversible damage to documented archaeological or historic resources as identified by the N.C. Department of Cultural resources;

(D) Development shall not increase siltation;

(E) Development shall not create stagnant water bodies;

(F) Development shall be timed to avoid significant adverse impacts on life cycles of estuarine and ocean resources; and

(G) Development shall not jeopardize the use of the waters for navigation or for other public trust rights in public trust areas including estuarine waters.

(3) When the proposed development is in conflict with the general or specific use standards set forth in this Rule, the CRC may approve the development if the applicant can demonstrate that the activity associated with the proposed project will have public benefits as identified in the findings and goals of the Coastal Area Management Act, that the public benefits outweigh the long range adverse effects of the project, that there is no reasonable alternate site available for the project, and that all reasonable means and measures to mitigate adverse impacts

of the project have been incorporated into the project design and shall be implemented at the applicant's expense. Measures taken to mitigate or minimize adverse impacts shall include actions that:

(A) minimize or avoid adverse impacts by limiting the magnitude or degree of the action;

(B) restore the affected environment; or

(C) compensate for the adverse impacts by replacing or providing substitute resources.

(4) Primary nursery areas are those areas in the estuarine and ocean system where initial post larval development of finfish and crustaceans takes place. They are usually located in the uppermost sections of a system where populations are uniformly early juvenile stages. They are designated and described by the N.C. Marine Fisheries Commission (MFC) and by the N.C. Wildlife Resources Commission (WRC);

(5) Outstanding Resource Waters are those estuarine waters and public trust areas classified by the N.C. Environmental Management Commission (EMC). In those estuarine waters and public trust areas classified as ORW by the EMC no permit required by the Coastal Area Management Act shall be approved for any project which would be inconsistent with applicable use standards adopted by the CRC, EMC, or MFC for estuarine waters, public trust areas, or coastal wetlands. For development activities not covered by specific use standards, no permit shall be issued if the activity would, based on site specific information, degrade the water quality or outstanding resource values; and

(6) Beds of submerged aquatic vegetation (SAV) are those habitats in public trust and estuarine waters vegetated with one or more species of submergent vegetation. These vegetation beds occur in both subtidal and intertidal zones and may occur in isolated patches or cover extensive areas. In either case, the bed is defined by the Marine Fisheries Commission. Any rules relating to SAVs shall not apply to non-development control activities authorized by the Aquatic Weed Control Act of 1991 (G.S. 113A-220 et seq.).

(b) Specific Use Standards

(1) Navigation channels, canals, and boat basins shall be aligned or located so as to avoid primary nursery areas, shellfish beds, beds of submerged aquatic vegetation as defined by the MFC, or areas of coastal wetlands except as otherwise allowed within this Subchapter. Navigation channels, canals and boat basins shall also comply with the following standards:

(A) Navigation channels and canals may be allowed through fringes of regularly and irregularly flooded coastal wetlands if the loss of wetlands will have no significant adverse impacts on fishery resources, water quality or adjacent wetlands, and if there is no reasonable alternative that would avoid the wetland losses;

(B) All dredged material shall be confined landward of regularly and irregularly flooded coastal wetlands and stabilized to prevent entry of sediments into the adjacent water bodies or coastal wetlands;

(C) Dredged material from maintenance of channels and canals through irregularly flooded wetlands shall be placed on non wetland areas, remnant spoil piles, or disposed of by a method having no significant, long-term wetland impacts. Under no circumstances shall dredged material be placed on regularly flooded wetlands. New dredged material disposal areas shall not be located in the buffer area as outlined in 15A NCAC 07H .0209(d)(10);

(D) Widths of excavated canals and channels shall be the minimum required to meet the applicant's needs but not impair water circulation;

(E) Boat basin design shall maximize water exchange by having the widest possible opening and the shortest practical entrance canal. Depths of boat basins shall decrease from the waterward end inland;

(F) Any canal or boat basin shall be excavated no deeper than the depth of the connecting waters;

(G) Construction of finger canal systems are not allowed. Canals shall be either straight or meandering with no right angle corners;

(H) Canals shall be designed so as not to create an erosion hazard to adjoining property. Design may include shoreline stabilization, vegetative stabilization, or setbacks based on soil characteristics; and

(I) Maintenance excavation in canals, channels and boat basins within primary nursery areas and areas of submerged aquatic vegetation as defined by the MFC shall be avoided. However, when essential to maintain a traditional and established use, maintenance excavation may be approved if the applicant meets all of the following criteria:

(i) The applicant demonstrates and documents that a water dependent need exists for the excavation;

(ii) There exists a previously permitted channel that was constructed or maintained under permits issued by the State or Federal government. If a natural channel was in use, or if a human made channel was constructed before permitting was necessary, there shall be evidence that the channel was continuously used for a specific purpose;

(iii) Excavated material can be removed and placed in a disposal area in accordance with Part (b)(1)(B) of this Rule without impacting adjacent nursery areas and submerged aquatic vegetation as defined by the MFC; and

(iv) The original depth and width of a human made or natural channel shall not be increased to allow a new or expanded use of the channel.

This Part does not affect restrictions placed on permits issued after March 1, 1991.

STIPULATED FACTS **ATTACHMENT B**

1. The Petitioner, Water's Edge HOA, ("Petitioner" or "HOA") is a North Carolina non-profit corporation. Based on records filed with the Secretary of State, Water's Edge HOA, Inc. was incorporated in 2004. Petitioner's Registered Agent is Chris Blake. Petitioner is represented in this variance petition by Stephen D. Coggins.

2. HOA is a residential planned community subdivision formed pursuant to the North Carolina Planned Community Act (N.C.G.S. § 47F et seq.).

3. The Petitioner owns common-area property, being a 6' wide access to the pier, located within the Water's Edge subdivision located in Pender County, North Carolina, as well as the two piers containing nine boat slips located on the AIWW (the "Site"). The right to use each of these nine slips has been assigned to nine specific lots who are Class A Boating Members within the subdivision though the subdivision restrictive covenants, a copy of which are attached and are recorded at Book 2425, Page 250 of the Pender County Registry with four amendments recorded at Book 2442, Page 157, Book 2523, Page 164, Book 3079, Page 45 and Book 4190, Page 232, copies of which are attached. The developer, through the restrictive covenants, chose to develop community piers instead of having individual lots have individual piers, which are prohibited by the covenants (See pp. 20-21 of the covenants).

4. The Site is bounded on the east by the Atlantic Intracoastal Waterway ("AIWW"), on the north and south by residential lots 2 and 3, and on the west by the intersection of Great Oak Drive and Water's Edge Drive. The Site is located approximately 665 feet to the north of the entrance to Mill Creek from the AIWW. There is an AIWW channel marker located between the two piers at issue. The Site is located approximately 7000 feet southwest of the entrance to Topsail Creek and an additional 6500 feet to the throat of New Topsail Inlet.

5. The Site is located adjacent to Topsail Sound, which at this location is part of the Atlantic Intracoastal Waterway ("AIWW"). At this location, the waters of Topsail Sound are classified as SA-ORW [Outstanding Resource Waters] by the Environmental Management Commission and are open to the harvest of shellfish. While the waters of the AIWW at the site of the proposed dredging are not designated as nursery area, the waters of Mill Creek are designated as a Permanent Secondary Nursery Area by the Marine Fisheries Commission.

6. Existing development on the Site includes a bulkhead along the shoreline, upland subdivision infrastructure and residences, and 18 boat slips on three piers—one pier with 9-slips on Mill Creek, a 5-slip pier on the AIWW and a 4-slip pier on the AIWW.

<u>Original CAMA Major Permit and Modification</u>

7. On May 27, 2003, DCM issued the 2003 CAMA Permit to Jimmy's Island, LLC, which was the owner of the subdivision development at the time. The 2003 CAMA Permit authorized the development of upland subdivision infrastructure and a bulkhead along the Site's shoreline for "Waters Edge at Deerfield" subdivision.

8. On May 25, 2004, DCM issued a major modification to the 2003 CAMA Permit ("2004 Major Mod") to Jimmy's Island, LLC authorizing the development of 18 slips located on three different piers. Nine slips (Nos. 10-18) were located on Mill Creek and Nine slips (Nos. 1-9) were located on the AIWW, split between two piers (a 5-slip pier with slips 5-9 at the north dock and a

4-slip pier with slips 1-4 at the south dock). As more than 10 slips were permitted, the project was considered a “marina” and required the preparation of an Environmental Assessment (“EA”) document pursuant to the State Environmental Protection Act (“SEPA”).

9. The reasoning for splitting the 18 slips into 9 slips on Mill Creek and 5 slips and 4 slips on separate piers in Topsail Sound/AIWW was to “ensure that a closure of open shellfishing does not occur as a result of the project” as stated on the 2004 CAMA Major Mod. See 15A NCAC 7H .0208(b)(5)(E).

10. At the time of the 2004 Major Mod, all of the subdivision was owned by the developer, Jimmy’s Island, LLC. In permitting the 18 total slips, the developer used the linear feet of shoreline for the whole parcel in order to meet the standards of 15A NCAC 7H .0208(b)(6)(B) which limits dock/platform area based on a site’s linear shoreline length. While one of the permit conditions of the 2004 Major Mod was to record notice of the use of and exhaustion of the linear feet of all of the larger parcel, there is no such notice found in the chain of title for this subdivision, though the restrictive covenants prohibit private docks. A copy of the 2004 Major Mod is attached as a stipulated exhibit.

11. When the developer subdivided the parcel into individual lots, it created a series of riparian lots with a lot line following the mean high water of Topsail Sound/AIWW and Mill Creek. However, these riparian owners cannot build new piers due to the linear feet of shoreline having been used up for the permitting of the HOA’s 18 existing slips and also because individual piers are prohibited by the restrictive covenants. DCM Staff acknowledges that these riparian owners have riparian rights other than the ability to pier out from their own lots, but does not make property ownership determinations.

12. At the time of the 2003 CAMA Permit and the 2004 Major Mod, the Commission’s rules included the provisions found in 15A NCAC 7H .0208(a)(6) and .0208(b)(1) which concern avoiding significant adverse impacts to SAV, and from which Petitioner now seeks this variance.

13. The nine slips were built on the two piers located in Topsail Sound/AIWW sometime between May of 2004 and October 2005.

2008 CAMA Major Permit Application

14. On or about September 8, 2008, Petitioner applied for a CAMA Major permit for the proposed new dredging in slips 5-9, located on the north pier.

15. At the time of the 2008 major permit application, the water depths surrounding the docking facility ranged from -0.5 to -1.5 ‘ NLW.

16. In connection with the 2008 major permit application, DCM Field Representative Heather Coats drafted a Field Investigation Report (“Field Report”) dated September 11, 2008, a copy of which is attached. In that Field Report, Ms. Coats stated that “submerged aquatic vegetation (SAV) is present within the boat slips and therefore dredging would impact SAV and SAV habitat.”

17. As part of the 2008 major permit application review process, the application materials and Field Report were circulated for comment to approximately 15 resource agencies. On October 9, 2008, the NC Division of Water Quality sent a letter to the Petitioner stating that it was determined that the dredging would result in significant adverse impacts to SAV and the Division would

recommend denial of the 401 Water Quality Certification unless the project was modified to address dredging only in areas outside of SAV habitat. The Division of Marine Fisheries and the Wildlife Resources Commission also recommended denial of the permit due to adverse impacts to SAV. Copies of these comments are attached as a stipulated exhibit.

18. As a result of the unfavorable comments, on October 21, 2008, Petitioner requested that its permit application be placed on voluntary hold. After a period of inactivity, DCM closed the file through a letter to Petitioner on August 27, 2013.

2015 CAMA Major Permit Application

19. On or about May 14, 2015, Petitioner submitted a CAMA Major Permit Application ("2015 Application") proposing to dredge around Slips 1-9 (all the slips at the two piers on the AIWW). A copy of the permit application is attached as a stipulated exhibit.

20. Specifically, Petitioner states in its project narrative in the 2015 Application that a 50' by 75' by -4' cut would be made along the southern dock (Slips 1-4) and a 50' by 100' by -4' cut would be made along the northern dock (Slips 5-9). In the application, Petitioner states that the existing water depths average -1' NLW around each of the slips. Approximately 971 cubic yards of spoil is proposed to be dredged and placed on designated spoil island DA-203 and permission was granted by the owner of this spoil area by Northeast New Hanover County Conservancy, the owner of the spoil area, to place any spoil there.

21. Petitioner indicates that the dredging is proposed primarily within the footprint of Slips 1-9, with an overcut proposed which extends beyond the footprint of the existing Slips on the AIWW side of the docking facilities. Petitioner proposes to deepen this area from -1.0' NLW to -4.0' NLW, sloping towards the AIWW. Petitioner would not dredge landward of the slips, beyond the side boundaries of the slips, or underneath the floating docks.

22. The proposed dredging would disturb approximately 8,750 square feet of shallow bottom habitat including the removal of SAV and would impact SAV habitat.

23. As part of the CAMA Major Permit review process, notice of the proposed project application was posted on site, was published in the Wilmington Star News, and was sent to the adjacent riparian owners. DCM received no objections related to this permit application.

24. As part of the CAMA Major Permit review process, DCM Field Representative Jason Dail drafted a Field Investigation Report ("Field Report") dated July 15, 2015, a copy of which is attached. In that Field Report, Mr. Dail stated that "It should be noted SAV is still present and flourishing in/around the existing docking facilities located along the AIWW. . . SAV encompasses the vast majority of the docking facility comprising slips 5-9 and spotty vegetation exists around the docking facility comprising slips 1-4."

25. On April 28, 2015, Mr. Dail and DCM Fisheries Specialist Shane Staples visited the Site and to observe depth and SAV presence. On June 18, 2015, DCM Fisheries Specialist Gregg Bodnar visited the site with other DCM Staff, and made notations of depth measurements and the presence of SAV based on a copy of a 2003 survey by Arnold Carson which had been submitted in connection with the 2004 Major Mod. This survey had been updated with hand-labeled depths when it was submitted to DCM in 2015. The 2015 permit application finally noted that the depths were: at Slip #4 was -2.44' NLW; at Slip #5 was -1.82' NLW and at Slip #9 was -1.31' NLW. Mr.

Bodnar's own measurements were similar to those final depths in the 2015 CAMA Major Permit application. A copy of these observations is attached as a stipulated exhibit, and it is labeled "For internal rev. only. Drawing not provided by applicant" along the bottom.

26. Based on the June 18, 2016 site visit made by Mr. Bodnar and other DCM Staff, Mr. Bodnar sketched the SAV present onto the Petitioner's site plan submitted with its 2015 CAMA permit application. In October of 2015, after DWR placed the application on hold pending more information about SAV on site, Anne Deaton of DMF emailed Mr. Bodnar and asked for his notes from the June 2015 site visit. In order to make the SAV show up better on the sketch copy, Mr. Bodnar enlarged his field diagram and then used a green highlighter to approximate the SAV presence he observed on June 18, 2015. Mr. Bodnar also noted his observation with more detail in his comments to DCM regarding the permit, a copy of which is attached.

27. A memo from Anne Deaton of DMF to Karen Higgins of DWR dated October 23, 2015 ("Deaton Memo") notes that she visited the Site and measured water depths at approximate low tide. At Slips 5-9, depths ranged from -0.25 meters (-0.82') to -0.54 meters (-1.77'), and that a portion of the floating dock was sitting on the bottom. Depths at Slips 1-4 ranged from -0.74 meters (-2.4') to -0.92 meters (-3.0'). The Deaton Memo noted that the tidal range at the Site was approximately one meter. A copy of the Deaton Memo is attached.

28. The Deaton Memo also noted that the major SAV species present was shoal grass during her visit, while during DCM's April and June visit, the predominant species was eelgrass. She noted that eelgrass and shoal grass tend to occur in mixed beds, with eelgrass more abundant in the spring and early summer and shoal grass more abundant in the late summer and fall, so this difference in species was expected.

29. According to the project narrative submitted by Petitioner in 2015, it states, "The goal is to restore the original depth of water at the docks when the marina area was original [sic] built (see figure 1.), under permit 68-03." And it further stated "Approximately 3 ft. of material needs to be removed to restore the original depth of -3 to -4 feet." The narrative concluded that "Since the area has received depositional sediments creating shallower water depths, submerged aquatic vegetation has colonized the northernmost end of the dock structure. Some of this SAV would be destroyed in the dredging process. These depositional sediments could be shoaling due to the lack of dredging by the Corps of Engineers nin [sic] the ICWW."

30. According to a March 3, 2003 survey submitted with the 2003 CAMA Permit application, a copy of which is attached as a stipulated exhibit, the water depths in Slips 1-9 ranged from -1.91' to -3.92' relative to NGVD '29. No calculations were provided to convert these depths relative to normal low water or normal high water. On Form DCM-MP-4 in the 2004 Major Mod application, the applicant indicated that the water depth at the waterward end of piers was -4' MLW. A copy of the 2004 Major Mod Application is attached as a stipulated exhibit.

31. The developer submitted an Environmental Assessment ("EA"), as revised on December 29, 2003 pursuant to the SEPA was required for marina permitting (more than 10 slips) at that time. In this December 29, 2003 revision, written by the developer's consultant at the time Charles Hollis and submitted in connection with the 2004 Major Mod, it described the site as follows:

> Topsail Sound (AIWW) Piers. A 6'-wide walkway will begin along the edge of the boundary of lots 1 and 2 and extend (elevated) across the marsh where the two Topsail

> Sound piers will begin. The northernmost pier will extend approximately 300' waterward from the mean high water contour to the -4' (mlw) contour in Topsail Sound (AIWW). This is at a point about 65' waterward of the marsh edge and 80' away from the bottom edge of the AIWW. This pier will accommodate 5 boats up to 24' in length. The southernmost pier, located about 100' south of the first, will extend to a point about 140' waterward of the marsh edge where the water depth is 14' [sic] mlw and the bottom edge of the AIWW is 80' away. This pier will accommodate 4 boats up to 24' in length. The distance between the marsh edges in this area is approximately 500'.. Each of these piers will have a 12' x 12' covered deck. This construction work will involve jetting and/or driving timbers into the ground and constructing the pier using conventional fasteners (nails, etc.)

The EA (page 3) stated that no SAVs were observed. A copy of the EA is attached as a stipulated exhibit.

32. An affidavit of Raymond Ballard, an original resident in 2004, is attached as a stipulated exhibit, and indicates that the slips were deep enough for 24/7 access when they were built and have since shoaled in.

33. As part of the CAMA Major Permit review process, the permit application and Field Investigation Report were sent to other state and federal agencies for review and comment. The following agencies replied with substantive comment: The Wildlife Resources Commission, which raised concerns about impacts to SAV and its role as essential fish habitat, DCM's Fisheries Resources Specialist who, following a site visit and review of SAV presence and water depths, raised concerns about impacts to SAV and its role as fish habitat, DWR's 401 Section which noted a likely denial of the 401 application based on the requirement of 15A NCAC 02B .0225(c)(2) which prohibits dredging when it results in a reduction of beds of SAV, and the Corps of Engineers who indicated that SAV needed to be avoided. Copies of these comments are attached as stipulated exhibits.

34. On December 4, 2015, DCM Staff denied Petitioner's 2015 Application as it was contrary to 15A NCAC 7H .0208(a)(2)(A) which requires dredging to avoid significant adverse impacts upon SAV and 7H .0208(b)(1) which requires navigation channels and boat basins to avoid beds of SAV. A copy of the denial letter is attached. Petitioners did not timely file a Petition for a Contested Case to challenge this decision. Petitioner has stipulated that the proposed development is inconsistent with those rules cited in the denial letter.

35. On December 14, 2015, DWR denied Petitioner's application for a 401 Water Quality Certification as the proposed plan was contrary to 15A NCAC 2B .0225(c)(2), which states in party "No dredge or fill activities shall be allowed if those activities would result in a reduction of the beds of [SAV]..." and contrary to 2B .0506(b) which states, "The Director shall issue a certification upon determining that existing uses are not removed or degraded by a discharge to classified surface waters for an activity which (3) does not result in the degradation of groundwaters or surface waters." A copy of the DWR denial letter is attached. Petitioners did not timely file a Petition for a Contested Case to challenge this decision. At this time, no variance petition has been filed by Petitioner with the Environmental Management Commission seeking to vary these rules.

36. On December 14, 2015, the Army Corps of Engineers ("Corps") denied without prejudice Petitioner's application for authorization to dredge. A copy of the denial letter is attached. Petitioners have not filed an appeal of this denial. The parties understand that a "denial without prejudice" allows an applicant to re-submit an application for the denied work in the future.

37. Petitioner now seeks a variance from the Commission from 15A NCAC 7H .0208(a)(2)(A) and 7H .0208(b)(1) in order to undertake new dredging in SAV as proposed in their permit application.

38. Petitioner has obtained an affidavit of Dawn Beard, a licensed real estate broker and who is on the Petitioner's Board of Directors. In the affidavit, Ms. Beard describes her opinion about financial impacts on the owners of Slips 1-9, a copy of which is attached along with the comparative sales data upon which she bases her opinion.

39. Petitioner have obtained an affidavit of Todd Skeen, a copy of which is attached as a stipulated exhibit, who is a resident of the HOA and discusses his opinion on the dangers resulting from shoaling at the Site.

40. Petitioner has obtained an affidavit of Whitney Skeen, a copy of which is attached as a stipulated exhibit, who is a resident and who describes a boating accident nearby the Site.

41. Petitioner has obtained an affidavit of Michael Mac, a copy of which is attached as a stipulated exhibit, who is a resident, President of the HOA and a retired scientist with the USF&W and USGS. He describes the boating accident nearby the Site, the issues from the shoaling at the slips, the financial benefits of the slips to the owners, and his opinions about the SAV at the site.

42. Petitioner has drawn on the green highlighted SAV drawing made by DCM Staff in order to illustrate where the proposed dredging is to take place (drawn in red) and what SAV is, and is not to be dredged (shown in blue pen hand-written notations) on copies of the SAV drawing, attached as proposed exhibits.

43. As part of the Fisheries Reform Act of 1997, the CRC, the MFC and the EMC collaborated on the Coastal Habitat Protection Plan ("CHPP"), a guidance document that addresses habitat and water quality efforts needed to protect, enhance and restore fish habitat in North Carolina. The CHPP is subdivided into six habitat types where coastal species forage, seek refuge, grow or spawn, one of which is SAV habitat. A copy of the SAV section of the CHPP is attached as a stipulated exhibit.

44. The Final 2016 CHPP Source Document notes the following about SAV:

- Because the [SAV] plants are rooted in anaerobic sediments, they need to produce a large amount of oxygen to aerate the roots, and therefore have the highest light requirements of all aquatic plants. P. 84

- High salinity estuarine species that occur in North Carolina include eelgrass (Z. marina) and shoalgrass (H. wrightii). Eelgrass is a temperate species at the southern limit of its Atlantic range in North Carolina. In contrast, shoalgrass is a tropical species that reaches its northern-most extent in the state. P. 84

- Despite the difficulty of defining the boundaries of SAV beds, un-vegetated bottom between nearby patches is included as a component of patchy SAV habitat because rhizomes and/or seedlings may be present and the beds migrate with patterns of sediment erosion and deposition (Fonseca et al. 1998). P. 85

- Beds of SAV occur in North Carolina in subtidal, and occasionally intertidal, areas of sheltered estuarine and riverine waters where there is sediment, adequate light reaching the bottom, and moderate to negligible current velocities or turbulence. P. 85

45. Some of the mapping efforts of SAV within the State are summarized on Page 88 of the Final 2015 CHPP Source Document, a copy of which is attached.

46. Some scientific papers have found the following information about SAV:

- On the Atlantic coast, North Carolina ranks second behind Florida in SAV presence. (Funderburk, S. L., J. A. Mihursky, S. J. Jordan, and D. Riley. 1991. Habitat requirements for Chesapeake Bay living resources. Habitat Objectives Workgroup, Living Resources Subcommittee and Chesapeake Research Consortium with assistance from Maryland Department of Natural Resources, Solomons, MD. And Sargent, F. J., T. J. Leary, D. W. Crewz, and C. R. Kruer. 1995. Scarring of Florida's seagrasses: Assessment and management options. Florida Department of Environmental Protection, St. Petersburg, FL.)

- Observations and anecdotal information since 2000 have indicated that SAV coverage in North Carolina is expanding into previously unobserved areas, notably the southern coastal area. In the late 2000's DMF biologists observed SAV expansion throughout the estuaries, which continued through 2014. (NCDEQ (North Carolina Department of Environmental Quality). 2016. North Carolina Coastal Habitat Protection Plan Source Document. Morehead City, NC. Division of Marine Fisheries. 477 p.)

- The North Carolina Coastal Habitat Protection Plan has summarized the primary environmental factors controlling SAV distribution which are; water depth, sediment composition, energy, and light penetration. (NCDEQ (North Carolina Department of Environmental Quality). 2016. North Carolina Coastal Habitat Protection Plan Source Document. Morehead City, NC. Division of Marine Fisheries. 477 p.)

- Thayer et al. (1984) notes that eelgrass (Zostera marina) is tolerant of high energy waters, and SAV is evident along much of the extent of the AIWW (NCDEQ 2016a). Provided these factors are within limits of the particular species, growth is possible. (Thayer, G. W., W. J. Kenworthy, and M. S. Fonseca. 1984. The ecology of eelgrass meadows of the Atlantic coast: a community profile. U.S. Fish and Wildlife Service. And NCDEQ (NC Department of Environmental Quality). 2016a. http://portal.ncdenr.org/web/mf/habitat/SAV)

- "Shoal grass is known as a pioneer species, colonizing areas that are too shallow for other species to thrive in or on banks that have been damaged." Chesapeake Bay Program, "Shoal Grass" http://www.chesapeakebay.net/fieldguide/critter/shoal_grass

47. While different divisions within DEQ have contributed resources to SAV mapping projects, none of these mapping efforts are intended to replace field observation in connection with a CAMA permit application. At the time of the 2004 Major Mod, there was not much SAV mapping which had been undertaken. Following a search for such information, the parties were not able to find any SAV mapping available in 2004 which indicated the presence of SAV at the Site at that time.

48. Since the time of the CAMA permit denial, Petitioner has requested and participated in scoping-like meetings with DCM staff and other division staff to discuss possible alternatives to dredging including dock reconfiguration. On February 11, 2016 in a response to an inquiry from Representative Millis, DCM Director Davis summarized the issue and DCM's response to the issue, a copy of which is attached as a stipulated exhibit.

49. On May 20, 2016, DCM received an incomplete CAMA Major Permit application from Petitioner which proposed relocating Slips 5-9 onto the southern end of the dock with Slips 1-4. These materials did not propose dredging. The add-info letter from DCM indicating what information was needed to make it a complete application is still pending as Petitioner has not responded by providing the needed information. Petitioner's President has indicated that because of the cost to relocate the docks, and because of the need for the riparian owner to be a co-applicant or otherwise sign-off on development on non-HOA owned property, the HOA is not pursuing the relocation option at this time.

50. On May 9, 2016, DCM was copied on a letter from counsel for Mr. Blanton who owns Lot 2 and 3 next to the pier, requesting notice of any future CAMA Major Permit Applications filed by Petitioner.

51. A powerpoint presentation is attached as a stipulated exhibit which shows the Site and surrounding areas.

52. Stephen D. Coggins, Esq. represents Petitioner in this variance request and Christine Goebel, Assistant General Counsel represents DCM in this variance request.

Stipulated Exhibits:

1. Restrictive Covenants filed in the Pender County Registry at the following Books and Pages: 2425/250, 2442/157, 2523/164, 3079/45, and 41/90/232.
2. 2005 Major Mod application
3. 2004 Major Mod issued to Jimmy's Island, LLC on May 24, 2004.
4. OMITTED
5. 2008 CAMA Major Permit DCM Field Investigation Report by Heather Coats
6. 2008 comments from DWQ
7. 2008 comments from DMF
8. OMITTED

9. 2015 CAMA Major Permit Application by Water's Edge HOA
10. 2015 CAMA Major Permit DCM Field Investigation Report by Jason Dail
11. 2015 DCM SAV notations (Internal Use note at bottom)
12. 2015 DCM SAV field notes enlarged and with green highlighting added
13. 2015 Deaton Memo
14. 2003 Depth Survey (NGVD'29 benchmark used)
15. December 29, 2003 revised EA
16. Affidavits of Petitioner-members Raymond Ballard, Todd Skeen, Whitney Skeen, and Michael Mac
17. 2015 comments from WRC
18. 2015 comments from DCM's Fisheries Specialist with Site visit notes
19. 2015 comments from DWR
20. 2015 comments from Corps
21. 2015 DCM Denial Letter
22. 2015 DWR 401 Denial Letter
23. 2015 Corps Denial Letter
24. Affidavit of Dawn Beard
25. CHPP 2016 Source Document- Selected Chapters Attached include: SAV Section (Chapter 4), Physical Disturbances (Chapter 8), and Management Section (Chapters 13-15)
26. February 11, 2016 response from DCM to Representative Millis
27. May 9, 2016 letter to DCM from Blanton's Counsel
28. Three exhibits by Petitioner, adding notations onto the green-highlighted SAV drawing made by DCM.
29. Powerpoint presentation

PETITIONER'S and STAFFS' POSITIONS **ATTACHMENT C**

To qualify for a variance, Petitioner must show all of the following:

I. Will Unnecessary Hardships would result from strict application of the rules, standards, or orders? If so, Petitioner must identify the unnecessary hardships.

<u>Petitioner's Position</u>: Yes.

CAMA Major Permit # 68-03 issued May 24, 2004 authorized a 9-slip community boat dock facility located directly on the Atlantic Intracoastal Waterway (AICW). The boat slips constructed under the permit provided direct AICW access for the 18-lot Waters Edge subdivision. At the time the permit was issued, the natural draft within the slips was more than sufficient to support direct AICW boat access.

Over time, however, the boats slips have "shoaled in". They are now virtually unusable. Navigating in the vicinity of the boat slips has become hazardous. At least one boat and associated boat slip equipment has been damaged as a result of the infilling. Consequently, Petitioner applied for a Dredge and Fill Permit so that the boat slips could be dredged in order to restore the original depth to -4 ft. NLW.

However, the same dynamics that led to the infilling of the boat slips caused the same to become vegetated over time with SAVs. Consequently, the application was denied under CAMA Rule 15A NCAC 07H .0208(a)(2)(A) and (b)(l).

The application of Rule 15A NCAC 07H .0208(a)(2)(A) and (b)(l) as applied by the Division of Coastal Management [as well as 15A NCAC 02B .0225(c)(2) as applied by the Division of Water Resources] constitutes an unnecessary hardship because it:

1. prohibits the use of the community boat dock as approved in CAMA permit #68-03;
2. impedes and renders hazardous navigation along the AICW in the vicinity of the boat slips and within the boat slips themselves;
3. subjects boats and associated equipment stored and used at the boat slips to damage;
4. substantially reduces the fair market value of Waters Edge subdivision homesites.

<u>Staffs' Position</u>: No.

As an initial matter, it needs to be clear that the Coastal Resources Commission's Variance process does not grant a variance to any of the Environmental Management Commission's rules including those administered by the Division of Water Resources. Staff understands that the EMC may have its own variance process.

Strict application of the Commission's requirements found in 15A NCAC 7H .0208(a)(2)(A) and .0208(b)(1), which state that the location, design, and need for development (including new dredging) "shall be sited and designed to avoid significant adverse impacts upon the productivity and biologic integrity of. . .submerged aquatic vegetation…", do not create an unnecessary hardship for Petitioner. The purpose of the Commission's rules is to protect SAV and SAV habitat as it is an important fish habitat, specifically used by coastal species where they "forage, seek refuge, grow or spawn."

It is important to note that the rules from which Petitioner seeks a variance have been in place since before the time of the initial 2004 permitting and construction. Staff note that this subdivision had limited access to deep water when it was developed and the piers were constructed in 2004. The Site for the piers on the AIWW was marginal for use as a docking facility at the time of the initial permit, where the depths were reported in the 2004 DCM field report to be as shallow as 1.5' and was less than 4' at the deepest point. Additionally, Staff note that strict application of the rules prohibiting new dredging in SAV do not prohibit use of the existing dock, but may just limit the size and draft of boats favored by Petitioner. Further, Petitioner is unable to extend the piers waterward as the piers as constructed in 2004 were built up to the AIWW channel setback. Petitioner also may have difficulties moving the piers to other portions of the subdivision shoreline, as that shoreline is now in private ownership and is not part of the HOA common area.

As the site was always marginal based on shallow initial depths, the potential for shoaling, it's limitations for extending the piers based on the location of the AIWW setback, and was further limited by the rules in place in 2004 which prohibited new dredging projects in areas with SAV and SAV habitat, Petitioner should have no expectations to undertake new dredging at this Site, to the 2004 depths or otherwise. Finally, Petitioner can continue to make use of the docking facility for riparian uses, such as boating.

II. Do the hardships result from conditions that are peculiar to the property, such as the location, size, or topography of the property? Explain.

Petitioner's Position: Yes.

No SAVs were located within the boat slips when they were constructed and initially used. The boat slips are not located in areas that were previously mapped as having SAVs at the time of their construction and initial use. The AICW at the location of the boat slips supports significant recreational and commercial boat traffic. However, Petitioners know of no dredging of the AICW since the time of the boat slips were constructed. SAVs typically do not colonize or become established immediately adjacent to a major navigational, heavily-traversed and consistently maintained and dredged channel. Such circumstances can be considered peculiar conditions.

Staffs' Position: No.

Staff do not believe that hardships result from conditions peculiar to the property. Shallow depths along and outside the bounds of the AIWW are not a peculiar condition, and is common along the AIWW-designated waterbodies. Further, shallow waters such as those in the area of the Site are typical SAV habitat, as it needs shallow depths to have enough sunlight to support its growth.

Shoaling around docking facilities is also not a condition peculiar to Petitioner's facility and is often caused by the docking facility slowing the water and resulting in the deposition of suspended sediment from the water. Finally, pier length being restricted by the AIWW setback is not uncommon as the AIWW winds its way through coastal North Carolina, and has been a known limitation on pier length since its development.

III. Do the hardships result from actions taken by the petitioner? Explain.

<u>Petitioner's Position</u>: No.

The hardship was not a result of actions taken by Petitioner. Since the original granting of Major Permit #68-03, the SAV beds have spread to the boat slips due to several possible environmental factors unrelated to actions by the Petitioner. The proposed project is to restore the depth of an existing and recently-permitted boat dock. Changes in conditions from shoaling and the concomitant spread of SAV have resulted in the need to dredge the boat slips and were not caused by Petitioner.

<u>Staffs' Position</u>: No.

Petitioner's predecessor in interest, the developer, chose to develop slips on the AIWW shoreline of the subdivision, despite the shoreline being a marginal location for piers and access by the size of boats Petitioner's members were able to navigate initially, both because of water depths and the location of the AIWW channel setback. Additionally, shoaling is a predictable result of pier construction. The location choice and marginal AIWW shoreline seems to be the primary cause of the hardships in this case, as shallow water is the preferred habitat for SAV. While the hardship is also caused by the size/draft of boats Petitioners wish to use at the Site where the Site depths do not now facilitate those drafts, Staff acknowledges that Petitioner did not encourage the growth of SAV in its slips. While there is room to move the piers at issue along the AIWW shoreline where no SAV is currently present, the private ownership of the upland lot in the alternative location is likely to prevent the resolution of this issue by moving the piers.

IV. Is the requested variance (1) consistent with the spirit, purpose, and intent of the rules, standards, or orders, (2) will secure public safety and welfare; and (3) will preserve substantial justice? Explain.

<u>Petitioner's Position</u>: Yes.

(1) is consistent with the spirit, purpose, and intent of the rules, standards or orders issued by the Commission;

A granting of the sought variance would be consistent with the spirit, purpose, and intent of the CRC's rules, standards and orders. A CRC management objective for Public Trust Areas is to protect public rights for navigation and recreation and to perpetuate their economic and aesthetic value. [Rule 15A NCAC 07H .0207(c)]. Related to this objective is Rule 15A NCAC 02B

.0225(c)(2), which allows for maintenance dredging (such as that required to maintain access to existing channels), even if such results in reduction of SAV.

(2) will secure the public safety and welfare; and

The public safety will be enhanced by restoration of the depth of the permitted and already constructed 9 boat slips. Safe boating access will be improved. The boat dockage can serve as a staging area for rescue operations at an important location, which took place on September 18, 2015. Public welfare will be further secured by Pender County realizing a fair return on its property taxation of home sites in Waters Edge due to the maintenance of the fair market value of those properties.

(3) will preserve substantial justice.

Restoring the original depth of the boat slips will enhance the public purposes served by CAMA Major Permit 68-03, that is, allowing the boaters to use the boat slips in a manner that grants reasonable and safe access to the AICW without damage to their boat, or the docks or to associated lifts and other dockage equipment. The owners in Waters Edge subdivision will realize their reasonable, investment-backed expectations, in that they would be able to use and benefit from Slips 1 through 9. The boat slips were financed, constructed and maintained based upon the original permitting of the boat slips in 2004. SAV was not present when the boat docks and slips were constructed and initially used. For the State not to allow continued use of the boat docks due to spread of SAV into the boat slips would be unjust.

Staffs' Position: No.

Petitioner's variance request seeking to undertake new dredging in SAV and SAV habitat is not consistent with the Commission's rules from which Petitioner seeks its variance. The purpose of these rules requiring docking facilities to avoid significant adverse impacts to SAV and SAV habitat is to protect this critically important habitat. Above, Petitioner supports a finding in its favor on this variance criterion by citing to 15A NCAC 7H .0207(c), which is the Commission's management objective for Public Trust Area AECs, but only highlights the language of that rule which note the importance of protecting the economic and aesthetic value of Public Trust Areas. However, the rule reads in full:

> Management Objective. To protect public rights for navigation and recreation and to conserve and manage the public trust areas so as to safeguard and perpetuate their *biological*, economic and aesthetic value. (emphasis added)

This rule acknowledges that a balance must be struck between all of these important values of the public trust areas, and economic and aesthetic values do not trump a waterbody's biological importance or safeguarding public navigation. In this case, the balance was struck when the Petitioner's predecessor in interest constructed the piers at issue at this marginal Site with existing shallow depths, knowing that future pier extension and new dredging were not allowed. It allowed for riparian use of the subdivision property subject to those constraints. Granting this variance would subjugate the biological value of this Site to Petitioner's economic concerns, and would not keep with the spirit, purpose, and intent of the Commission's rules from which Petitioner seeks the variance.

While the value of SAV has been understood and acknowledged in the CRC's rules for decades, the importance of SAV habitat is further highlighted by the Coastal Habitat Protection Plan as being essential for coastal species where they can "forage, seek refuge, grow or spawn." Species which spend significant portions of their lifecycle in SAV include spotted sea trout, red drum, bay scallop, shrimp, hard clam, flounder, juvenile gag grouper and black sea bass. Petitioner cites a rule of the Environmental Management Commission, 15A NCAC 2B .0225, which allows for *maintenance* dredging, even if such results in reduction of SAV, as it relates to water quality. The new dredging proposed here is not for the maintenance of an existing channel that has become shallow due to shoaling. It is to increase access for the Petitioner and its users to the AIWW from the docking facilities constructed at a marginal site with shallow water depths present at the time of permitting.

Petitioner argues that safe boating will result from their proposed new dredging, but this argument assumes that boating will be with water depths that exceed the depths at the time of permitting. Instead, Staff note that public safety and welfare will be preserved if the existing SAV and SAV habitat are left un-dredged and can continue to function as habitat for fish species, an important public trust resource whose importance was noted in the CHPP and the Fisheries Reform Act. If all owners of now-shallow depth slips were allowed to dredge in SAV habitat and other highly-productive habitat, large-scale damage to some of the State's most critical fisheries habitats could occur.

Finally, it would not preserve substantial justice to allow Petitioner to dredge in an area not dredged before in order to "realize their reasonable, investment-backed expectations" where it is not reasonable for Petitioner to rely on having unfettered access to the AIWW from such a marginal site. The rules limiting SAV dredging were in place at the time of permitting and construction, and continue today, and while SAV may not have been present at the Site in 2004, the site was shallow enough at that time to constitute SAV habitat. It is also unreasonable for Petitioner to propose dredging to a depth which exceeds the depths documented in 2004. The reasonable expectations would be that the use of these marginal slips can continue without new dredging, by using smaller craft with shallower drafts and/or timing use around the tidal cycle.

ATTACHMENT D:
PETITIONERS' VARIANCE REQUEST MATERIALS

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SEPTEMBER 29, 2016

Via Regular U.S. Mail

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Re: Variance Request by Waters Edge HOA, Inc.

Dear Director Davis, Ms. Lucasse, and Ms. Goebel:

I am pleased as counsel for the Petitioner, Waters Edge HOA, Inc., to submit a variance request to permit dredging of community boat docks located on the Atlantic Intracoastal Waterway in Pender County to be heard by the Coastal Resources Commission during its regularly-scheduled meeting to be held November 30, 2016 in Atlantic Beach, NC. In support of the request, I enclose the following:

1. CAMA Variance Request Form [DCM Form 11 downloaded 9/28/16 at https://deq.nc.gov/about/divisions/coastal-management/coastal-management-permits/variances-appeals] signed and dated by me as Petitioner's attorney;
2. Permit Application, which includes the name and location of the proposed development
3. Denial of Permit by Division of Coastal Management dated December 4, 2015;
4. Denial of Permit by Division of Water Resources dated December 14, 2015;
5. Copy of instruments recorded in the Pender County Registry indicating Petitioner's ownership of the property where the proposed development is to take place, as follows:
    a. Restrictive Covenants at Deed Book 2426, Page 248 vesting rights in Petitioner and deed to Declarants recorded at Deed Book 2303, Page 182:
    b. Deed Book 2442, Book 156;
    c. Deed Book 2523, Page 164;
    d. Deed Book 3079, Page 45;
    e. Deed Book 4190, page 232; and
    f. Map Book 42, Page 80 (Sheets 1-3);
    g. Map Book 37, Page 133;
6. Complete description of proposed development, including site plan, which consists of:
    a. Application noted in # 2 above, already as being enclosed;

* also licensed in AZ
** licensed in VA-NC license pending

   b. Site Sketch indicating location of dredging (marked in red) in relation to SAV presence noted in green;
   c. Map Book 42, Page 80 (Sheet 2 of 3);
   d. Contractor's email confirmation of outer limits of dredging;
7. Stipulation that proposed development is inconsistent with rules at issue;
8. Proof of notice sent to adjacent owners, per 15A NCAC 07J .0701(c)(7);
9. Petitioner's written reasons and arguments about why the Petitioner meets the four variance criteria set forth in 15 NCAC 07J .0701(c)(8)(A)-(D); and
10. Petitioner's draft set of proposed stipulated facts;
11. Petitioner's proposed stipulated exhibits:
    a. Permission to use spoil island to deposit dredging spoil;
    b. Site Sketch indicating presence of SAV in green;
    c. Site Sketch indicating location of dredging (marked in red) in relation to SAV presence noted in green;
    d. Site Sketch indicating location of dredging in relation to SAV presence, with affected SAV outlined in dark blue;
    e. Contractor's confirmation of outer limits of dredging;
    f. Waters Edge Valuation Report;
    g. October 23, 2015 memo from Anne Deaton (Division of Marine Fisheries) to Karen Higgins (Division of Water Resources);
    h. DCM staff notations on Sheet 2 of 4 of unsigned March 3, 2003 Arnold Carson survey of Proposed Dock Facility "A" at Waters Edge at Deerfield;

I look forward to working with Ms. Goebel with the wording of the Staff Report on the Variance Criteria (#9 above) and the Stipulated Facts (#10 above) and the Stipulated Exhibits. We have a number of photographs that would aid understanding, which I am sure Ms. Goebel and I can reach agreement about inclusion in the CRC packet and use during the hearing.

Thank you for your attention and we look forward to working with you.

Very Truly Yours,

Stephen D. Coggins

Stephen D. Coggins

Enclosures

cc: Michael J. Mac, President – Waters Edge HOA, Inc. (w/ encl)
Jason Dail, Division of Coastal Management-Wilmington Regional Office (w/ encl)

CAMA VARIANCE REQUEST FORM

DCM FORM 11
DCM FILE No.:________

PETITIONER'S NAME **WATERS EDGE HOA, INC.**
COUNTY WHERE THE DEVELOPMENT IS PROPOSED **PENDER**

Pursuant to N.C.G.S. § 113A-120.1 and 15A N.C.A.C. 07J .0700 *et seq.,* the above named Petitioner hereby applies to the Coastal Resources Commission (CRC) for a variance.

VARIANCE HEARING PROCEDURES

A variance petition will be considered by the CRC at a regularly scheduled meeting, heard in chronological order based upon the date of receipt of a complete petition. 15A N.C.A.C. 07J .0701(e). A complete variance petition, as described below, must be *received* by the Division of Coastal Management (DCM) a minimum of six (6) weeks in advance of the first day of a regularly scheduled CRC meeting to be eligible for consideration by the CRC at that meeting. 15A N.C.A.C. 07J .0701(e). The final set of stipulated facts must be agreed to at least four (4) weeks prior to the first day of a regularly scheduled meeting. 15A N.C.A.C. 07J .0701(e). The dates of CRC meetings can be found at DCM's website: **www.nccoastalmanagement.net**

If there are controverted facts that are significant in determining the propriety of a variance, or if the Commission determines that more facts are necessary, the facts will be determined in an administrative hearing. 15A N.C.A.C. 07J .0701(b).

VARIANCE CRITERIA

The petitioner has the burden of convincing the CRC that it meets the following criteria:

(a) Will strict application of the applicable development rules, standards, or orders issued by the Commission cause the petitioner unnecessary hardships? Explain the hardships.

(b) Do such hardships result from conditions peculiar to the petitioner's property such as the location, size, or topography of the property? Explain.

(c) Do the hardships result from actions taken by the petitioner? Explain.

(d) Will the variance requested by the petitioner (1) be consistent with the spirit, purpose, and intent of the rules, standards or orders issued by the Commission; (2) secure the public safety and welfare; and (3) preserve substantial justice? Explain.

Please make your written arguments that Petitioner meets these criteria on a separate piece of paper.
The Commission notes that there are some opinions of the State Bar which indicate that non-attorneys may not represent others at quasi-judicial proceedings such as a variance hearing before the Commission.

These opinions note that the practice of professionals, such as engineers, surveyors or contractors, representing others in quasi-judicial proceedings through written or oral argument, may be considered the practice of law. Before you proceed with this variance request, you may wish to seek the advice of counsel before having a non-lawyer represent your interests through preparation of this Petition.

For this variance request to be complete, the petitioner must provide the information listed below. The undersigned petitioner verifies that this variance request is complete and includes:

__X__ The name and location of the development as identified on the permit application;

__X__ A copy of the permit decision for the development in question;

__X__ A copy of the deed to the property on which the proposed development would be located;

__X__ A complete description of the proposed development including a site plan;

__X__ A stipulation that the proposed development is inconsistent with the rule at issue;

__X__ Proof that notice was sent to adjacent owners and objectors*, as required by 15A N.C.A.C. 07J .0701(c)(7);

_N/A_ Proof that a variance was sought from the local government per 15A N.C.A.C. 07J .0701(a), if applicable;

__X__ Petitioner's written reasons and arguments about why the Petitioner meets the four variance criteria, listed above;

__X__ A draft set of proposed stipulated facts and stipulated exhibits. Please make these verifiable facts free from argument. Arguments or characterizations about the facts should be included in the written responses to the four variance criteria instead of being included in the facts.

__X__ This form completed, dated, and signed by the Petitioner or Petitioner's Attorney.

**Please contact DCM or the local permit officer for a full list of comments received on your permit application. Please note, for CAMA Major Permits, the complete permit file is kept in the DCM Morehead City Office.*

Due to the above information and pursuant to statute, the undersigned hereby requests a variance.

Stephen D. Coggins

Signature of Petitioner or Attorney

September 29, 2016

Date

Stephen D. Coggins

Printed Name of Petitioner or Attorney

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Fax Number of Petitioner or Attorney

DELIVERY OF THIS HEARING REQUEST

This variance petition must be **received by** the Division of Coastal Management at least six (6) weeks before the first day of the regularly scheduled Commission meeting at which it is heard. A copy of this request must also be sent to the Attorney General's Office, Environmental Division. 15A N.C.A.C. 07J .0701(e).

Contact Information for DCM:

By mail, express mail or hand delivery:
Director
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

By Fax:
(252) 247-3330

By Email:
Check DCM website for the email address of the current DCM Director
www.nccoastalmanagement.net

Contact Information for Attorney General's Office:

By mail:
Environmental Division
9001 Mail Service Center
Raleigh, NC 27699-9001

By express mail:
Environmental Division
114 W. Edenton Street
Raleigh, NC 27603

By Fax:
(919) 716-6767

Revised: July 2014

CAMA VARIANCE REQUEST **DCM FILE No.:________**
PENDER

STIPULATION BY PETITIONER WATER'S EDGE HOA, INC. THAT PROPOSED DEVELOPMENT IS INCONSISTENT WITH RULE

The Petitioner Waters Edge HOA, Inc., by and through its counsel and pursuant to N.C.G.S. § 113A-120.1 and 15A N.C.A.C. 07J .0700 *et seq.,* stipulates that the proposed development that is the subject of its proposed variance request is inconsistent with the following rules:

15A NCAC 07H.0208(a)(2)A): The location, design, and need for development, as well as the construction activities involved shall be consistent with the management objective of the Estuarine and Ocean System AEC (Rule .0203 of this subchapter) and shall be sited and designed to avoid significant adverse impacts upon the productivity and biologic integrity of coastal wetlands, shellfish beds, submerged aquatic vegetation as defined by the Marine Fisheries Commission, and spawning and nursery areas.

15A NCAC 07H.0208(b)(l): Navigation channels, canals, and boat basins shall be aligned or located so as to avoid primary nursery areas, shellfish beds, beds of submerged aquatic vegetation as defined by the MFC, or areas of coastal wetlands except as otherwise allowed within this Subchapter.

This 29th day of September, 2016.

Stephen D. Coggins

Stephen D. Coggins
NC State Bar No. 8223
scoggins@rountreelosee.com
Rountree Losee LLP
Post Office Box 1409
Wilmington, NC 28402-1409
O: (910) 763-3404
F: (910) 763-0080

Attorney for Petitioner

George Rountree, Jr.
(1904-1979)
Ryan F. Tennant
(1973-2016)
George Rountree, III*
Special Counsel
Geoffrey A. Losee
Stephen D. Coggins
Andrew R. Jones

Anna Richardson Smith**
Of Counsel

ROUNTREE LOSEE LLP

Est. 1896

Street Address
2419 Market Street
Wilmington, NC 28403

Mailing Address
P.O. Box 1409
Wilmington, NC 28402

Phone
910.763.3404

Fax
910.763.0080
910.763.0320

SEPTEMBER 29, 2016

Via U.S. Certified Mail-Return Receipt Requested

Mr. Michael Norris
3701 Reston Court
Wilmington NC 28403

Re: Variance Request by Waters Edge HOA, Inc. to Dredge Community Boat Docks

Dear Mr. Norris:

I serve as counsel to Waters Edge HOA, Inc., who is petitioning the NC Coastal Resources Commission (CRC) for a variance to allow it to dredge boat slips 1 through 9 of the Waters Edge community boat docks located on the Atlantic Intracoastal Waterway near the intersection of Great Oaks Drive and Waters Edge Drive in Waters Edge at Deerfield subdivision. The next meeting of the CRC is scheduled for November 30, 2016 at the Doubletree Inn in Atlantic Beach NC.

This notice is sent to you pursuant to 15A NCAC 07J .0701(c)(7), as you own property adjacent to the Waters Edge subdivision. Please feel free to contact me should you have any questions regarding this matter. You may also contact the following:

Mr. Braxton Davis, Director
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

Mary Lucasse, Esq, CRC Counsel
Department of Environmental Quality
9001 Mail Service Center
Raleigh NC 27699-9001

Christine Goebel, Esquire
Asst. Attorney General
1601 Mail Service Center
Raleigh NC 27699-1601

Mr. Jason Dail
Division of Coastal Management
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845

Sincerely Yours,

Stephen D Coggins

Stephen D. Coggins

cc: Michael J. Mac, President – Waters Edge HOA, Inc. (w/ encl)

* also licensed in AZ
** licensed in VA-NC license pending

George Rountree, Jr.
(1904-1979)
Ryan F. Tennant
(1973-2016)
George Rountree, III*
Special Counsel
Geoffrey A. Losee
Stephen D. Coggins
Andrew R. Jones

Anna Richardson Smith**
Of Counsel

ROUNTREE LOSEE LLP

Est. 1896

SEPTEMBER 29, 2016

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Wilmington, NC 28402

Phone
910.763.3404

Fax
910.763.0080
910.763.0320

Via U.S. Certified Mail-Return Receipt Requested

Ms. Hollie Batson
110 Captains Cove
Hampstead NC 28443

Re: Variance Request by Waters Edge HOA, Inc. to Dredge Community Boat Docks

Dear Ms. Batson:

I serve as counsel to Waters Edge HOA, Inc., who is petitioning the NC Coastal Resources Commission (CRC) for a variance to allow it to dredge boat slips 1 through 9 of the Waters Edge community boat docks located on the Atlantic Intracoastal Waterway near the intersection of Great Oaks Drive and Waters Edge Drive in Waters Edge at Deerfield subdivision. The next meeting of the CRC is scheduled for November 30, 2016 at the Doubletree Inn in Atlantic Beach NC.

This notice is sent to you pursuant to 15A NCAC 07J .0701(c)(7), as you own property adjacent to the Waters Edge subdivision. Please feel free to contact me should you have any questions regarding this matter. You may also contact the following:

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Christine Goebel, Esquire
Asst. Attorney General
1601 Mail Service Center
Raleigh NC 27699-1601

Mr. Jason Dail
Division of Coastal Management
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845

Sincerely Yours,

Stephen D. Coggins

Stephen D. Coggins

cc: Michael J. Mac, President – Waters Edge HOA, Inc.

* also licensed in AZ
** licensed in VA-NC license pending

BEFORE THE NORTH CAROLINA COASTAL RESOURCES COMMISSION
Waters Edge HOA, Inc. Variance Request

AFFIDAVIT OF SERVICE ON HOLLIE BATSON
BY CERTIFIED U.S. MAIL, RETURN RECEIPT REQUESTED

The undersigned, after being first duly sworn, deposes and says:

1. That he is the attorney of record for Waters Edge HOA, Inc. in the above-entitled action.

2. That Hollie Batson owns property adjacent to the Waters Edge subdivision.

3. On September 29, 2016, a letter (a copy of which is attached as Exhibit "A") was deposited in the United States Mail for mailing by certified mail, return receipt requested, to the following address:

Ms. Hollie Batson
110 Captains Cove
Hampstead, NC 28443

4. That such letter was received by the said Hollie Batson on October 3, 2016, as evidenced by the return receipt attached hereto as Exhibit "B".

ROUNTREE LOSEE LLP
Post Office Box 1409
Wilmington, NC 28402-1409
Telephone: (910) 763-3404
Fax: (910) 763-0080
Email: scoggins@rountreelosee.com

Stephen D. Coggins

Stephen D. Coggins
NC State Bar No. 8223

Sworn to and subscribed before me this 15th day of November, 2016.

Kathryn B. Ansley

Notary Public

KATHRYN B ANSLEY
Notary Public, North Carolina
Brunswick County
My Commission Expires
May 22, 2020

My Commission expires: 5-22-20

EXHIBIT "A"

George Rountree, Jr.
(1904-1979)
Ryan F. Tennant
(1973-2016)
George Rountree, III*
Special Counsel
Geoffrey A. Losee
Stephen D. Coggins
Andrew R. Jones

Anna Richardson Smith**
Of Counsel

ROUNTREE LOSEE LLP

Est. 1896

Street Address
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Wilmington, NC 28403

Mailing Address
P.O. Box 1409
Wilmington, NC 28402

Phone
910.763.3404

Fax
910.763.0080
910.763.0320

SEPTEMBER 29, 2016

Via U.S. Certified Mail-Return Receipt Requested

Ms. Hollie Batson
110 Captains Cove
Hampstead NC 28443

Re: Variance Request by Waters Edge HOA, Inc. to Dredge Community Boat Docks

Dear Ms. Batson:

I serve as counsel to Waters Edge HOA, Inc., who is petitioning the NC Coastal Resources Commission (CRC) for a variance to allow it to dredge boat slips 1 through 9 of the Waters Edge community boat docks located on the Atlantic Intracoastal Waterway near the intersection of Great Oaks Drive and Waters Edge Drive in Waters Edge at Deerfield subdivision. The next meeting of the CRC is scheduled for November 30, 2016 at the Doubletree Inn in Atlantic Beach NC.

This notice is sent to you pursuant to 15A NCAC 07J .0701(c)(7), as you own property adjacent to the Waters Edge subdivision. Please feel free to contact me should you have any questions regarding this matter. You may also contact the following:

Mr. Braxton Davis, Director
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

Mary Lucasse, Esq, CRC Counsel
Department of Environmental Quality
9001 Mail Service Center
Raleigh NC 27699-9001

Christine Goebel, Esquire
Asst. Attorney General
1601 Mail Service Center
Raleigh NC 27699-1601

Mr. Jason Dail
Division of Coastal Management
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845

Sincerely Yours,

Stephen D. Coggins

Stephen D. Coggins

cc: Michael J. Mac, President – Waters Edge HOA, Inc.

* also licensed in AZ
** licensed in VA-NC license pending

Exhibit "B"

7014 1200 0001 3987 0359

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

For delivery information visit our website at www.usps.com®

OFFICIAL USE

Postage	$ .465
Certified Fee	3.30
Return Receipt Fee (Endorsement Required)	2.70
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$ 6.465

Postmark Here

USPS POSTAL SERVICE WILMINGTON NC 28401 SEP 29 2016

Sent To Ms. Hollie Batson

Street, Apt. No.; or PO Box No. 110 Captains Cove

City, State, ZIP+4 Hampstead, NC 28443

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:
Ms. Hollie Batson
110 Captains Cove
Hampstead, NC 28443

9590 9402 1772 6074 8501 40

2. Article Number *(Transfer from service label)*
7014 1200 0001 3987 0359

COMPLETE THIS SECTION ON DELIVERY

A. Signature
x Hollie Batson ☐ Agent ☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

HAMPSTEAD NC 28443 OCT 3 2016

HAMPSTEAD NC 28443 2016

3. Service Type
☒ Adult Signature
☐ Adult Signature Restricted Delivery
☒ Certified Mail®
☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
☐ Collect on Delivery Restricted Delivery
☐ Insured Mail
☐ Insured Mail Restricted Delivery (over $500)
☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Return Receipt for Merchandise
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2015 PSN 7530-02-000-9053 Domestic Return Receipt

BEFORE THE NORTH CAROLINA COASTAL RESOURCES COMMISSION
Waters Edge HOA, Inc. Variance Request

AFFIDAVIT OF SERVICE ON MICHAEL NORRIS
BY CERTIFIED U.S. MAIL, RETURN RECEIPT REQUESTED

The undersigned, after being first duly sworn, deposes and says:

1. That he is the attorney of record for Waters Edge HOA, Inc. in the above-entitled action.

2. That Michael Norris owns property adjacent to the Waters Edge subdivision.

3. That on September 29, 2016, a letter (a copy of which is attached as Exhibit "A") was deposited in the United States Mail for mailing by certified mail, return receipt requested, to the following address:

Mr. Michael Norris
3701 Reston Court
Wilmington, NC 28403

4. That such letter was returned to the undersigned on October 25, 2016, with the following notation from the U.S. Postal Service: "Return to Sender – Insufficient Address – Unable to Forward" (see attached Exhibit "B").

5. That on October 25, 2016, a letter (a copy of which is attached as Exhibit "C") was deposited in the United States Mail for mailing by certified mail, return receipt requested, to the following address:

Mr. Michael Norris
3701 Apt. A Reston Court
Wilmington, NC 28403

6. That the U.S. Postal Service attempted to deliver the second letter on October 27, 2016. A notice was left at the residence because an authorized recipient was not available (see attached Exhibit "D").

7. That on November 2, 2016, a letter (a copy of which is attached as Exhibit "E") was deposited in the United States Mail for mailing by first class mail, to the following address:

Mr. Michael Norris
3701 Apt. A Reston Court
Wilmington, NC 28403.

8. That as of the date of the execution of this Affidavit, Exhibits "C" and "E" have not yet been returned by the U.S. Postal Service, and that the Norris address is the only one known to the undersigned after a reasonable investigation.

ROUNTREE LOSEE LLP
Post Office Box 1409
Wilmington, NC 28402-1409
Telephone: (910) 763-3404
Fax: (910) 763-0080
Email: scoggins@rountreelosee.com

Stephen D Coggins

Stephen D. Coggins
NC State Bar No. 8223

Sworn to and subscribed before me this 15th day of November, 2016.

Kathryn B. Ansley

Notary Public

KATHRYN B ANSLEY
Notary Public, North Carolina
Brunswick County
My Commission Expires
May 22, 2020

My Commission expires: 5-22-20

EXHIBIT "A"

George Rountree, Jr.
(1904-1979)
Ryan F. Tennant
(1973-2016)
George Rountree, III*
Special Counsel
Geoffrey A. Losee
Stephen D. Coggins
Andrew R. Jones

Anna Richardson Smith**
Of Counsel

ROUNTREE LOSEE LLP

Est. 1896

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Wilmington, NC 28403

Mailing Address
P.O. Box 1409
Wilmington, NC 28402

Phone
910.763.3404

Fax
910.763.0080
910.763.0320

SEPTEMBER 29, 2016

Via U.S. Certified Mail-Return Receipt Requested

Mr. Michael Norris
3701 Reston Court
Wilmington NC 28403

Re: Variance Request by Waters Edge HOA, Inc. to Dredge Community Boat Docks

Dear Mr. Norris:

I serve as counsel to Waters Edge HOA, Inc., who is petitioning the NC Coastal Resources Commission (CRC) for a variance to allow it to dredge boat slips 1 through 9 of the Waters Edge community boat docks located on the Atlantic Intracoastal Waterway near the intersection of Great Oaks Drive and Waters Edge Drive in Waters Edge at Deerfield subdivision. The next meeting of the CRC is scheduled for November 30, 2016 at the Doubletree Inn in Atlantic Beach NC.

This notice is sent to you pursuant to 15A NCAC 07J .0701(c)(7), as you own property adjacent to the Waters Edge subdivision. Please feel free to contact me should you have any questions regarding this matter. You may also contact the following:

Mr. Braxton Davis, Director
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

Mary Lucasse, Esq, CRC Counsel
Department of Environmental Quality
9001 Mail Service Center
Raleigh NC 27699-9001

Christine Goebel, Esquire
Asst. Attorney General
1601 Mail Service Center
Raleigh NC 27699-1601

Mr. Jason Dail
Division of Coastal Management
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845

Sincerely Yours,

Stephen D Coggins

Stephen D. Coggins

cc: Michael J. Mac, President – Waters Edge HOA, Inc. (w/ encl)

* also licensed in AZ
** licensed in VA-NC license pending

EXHIBIT "B"

CERTIFIED MAIL™

ROUNTREE LOSEE LLP
Est. 1896
Post Office Box 1409 | Wilmington, NC 28402

7014 1200 0001 3987 0373

UNITED STATES POSTAGE
PITNEY BOWES
02 1P $ 006.46⁵
0001944069 SEP 29 2016
MAILED FROM ZIP CODE 28403

RECEIVED
OCT 25 2016
BY: LT

IA

10 24 16

Mr. Michael Norris
3701 Reston Court
Wilmington, NC 28403

NIXIE 276 DE 1 0010/20/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD
BC: 28402140909 *0248-12587-30-01

IA
~~28402$1409~~

EXHIBIT "C"

George Rountree, Jr.
(1904-1979)
Ryan F. Tennant
(1973-2016)
George Rountree, III*
Special Counsel
Geoffrey A. Losee
Stephen D. Coggins
Andrew R. Jones
Jason R. Harris**

Diane K. Pappayliou

Anna Richardson Smith***
Of Counsel

ROUNTREE LOSEE LLP

Est. 1896

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Wilmington, NC 28403

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P.O. Box 1409
Wilmington, NC 28402

Phone
910.763.3404

Fax
910.763.0080
910.763.0320

October 25, 2016

Via U.S. Certified Mail - Return Receipt Requested – 2nd Attempt

Mr. Michael Norris
3701 Apt. A Reston Court
Wilmington NC 28403

Re: Variance Request by Waters Edge HOA, Inc. to Dredge Community Boat Docks

Dear Mr. Norris:

I serve as counsel to Waters Edge HOA, Inc., who is petitioning the NC Coastal Resources Commission (CRC) for a variance to allow it to dredge boat slips 1 through 9 of the Waters Edge community boat docks located on the Atlantic Intracoastal Waterway near the intersection of Great Oaks Drive and Waters Edge Drive in Waters Edge at Deerfield subdivision. The next meeting of the CRC is scheduled for November 30, 2016 at the Doubletree Inn in Atlantic Beach NC.

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1601 Mail Service Center
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Mr. Jason Dail
Division of Coastal Management
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845

Sincerely Yours,

Stephen D. Coggins

cc: Michael J. Mac, President – Waters Edge HOA, Inc. (w/ encl)

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Get Easy Tracking Updates ›
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Tracking Number: 70162070000064920361

Updated Delivery Day: Thursday, October 27, 2016

Product & Tracking Information

Postal Product:

Features:
Certified Mail™

DATE & TIME	STATUS OF ITEM	LOCATION
October 27, 2016 , 1:21 pm	Notice Left (No Authorized Recipient Available)	WILMINGTON, NC 28403

We attempted to deliver your item at 1:21 pm on October 27, 2016 in WILMINGTON, NC 28403 and a notice was left because an authorized recipient was not available. You may arrange redelivery by using the Schedule a Redelivery feature on this page or calling 800-ASK-USPS, or may pick up the item at the Post Office indicated on the notice beginning October 28, 2016. If this item is unclaimed by November 11, 2016 then it will be returned to sender.

October 27, 2016 , 5:56 am	Arrived at Unit	WILMINGTON, NC 28403
October 26, 2016 , 7:14 pm	Departed USPS Facility	FAYETTEVILLE, NC 28302
October 26, 2016 , 9:40 am	Arrived at USPS Facility	FAYETTEVILLE, NC 28302
October 26, 2016 , 1:41 am	Departed USPS Facility	CHARLOTTE, NC 28228
October 26, 2016 , 12:17 am	Arrived at USPS Facility	CHARLOTTE, NC 28228

Available Actions

Schedule Redelivery

Text Updates

Email Updates

Track Another Package

Tracking (or receipt) number

Track It

Manage Incoming Packages

Track all your packages from a dashboard.
No tracking numbers necessary.

Sign up for My USPS ›

EXHIBIT "E"

George Rountree, Jr.
(1904-1979)
Ryan F. Tennant
(1973-2016)
George Rountree, III*
Special Counsel
Geoffrey A. Losee
Stephen D. Coggins
Andrew R. Jones
Jason R. Harris**

Diane K. Pappayliou

Anna Richardson Smith***
Of Counsel

ROUNTREE LOSEE LLP

Est. 1896

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Wilmington, NC 28403

Mailing Address
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Wilmington, NC 28402

Phone
910.763.3404

Fax
910.763.0080
910.763.0320

November 2, 2016

Via U.S.P.S. First Class Mail
Mr. Michael Norris
3701 Apt. A Reston Court
Wilmington NC 28403

Re: Variance Request by Waters Edge HOA, Inc. to Dredge Community Boat Docks

Dear Mr. Norris:

I serve as counsel to Waters Edge HOA, Inc., who is petitioning the NC Coastal Resources Commission (CRC) for a variance to allow it to dredge boat slips 1 through 9 of the Waters Edge community boat docks located on the Atlantic Intracoastal Waterway near the intersection of Great Oaks Drive and Waters Edge Drive in Waters Edge at Deerfield subdivision. The next meeting of the CRC is scheduled for November 30, 2016 at the Doubletree Inn in Atlantic Beach NC.

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Raleigh NC 27699-9001

Christine Goebel, Esquire
Asst. Attorney General
1601 Mail Service Center
Raleigh NC 27699-1601

Mr. Jason Dail
Division of Coastal Management
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845

Sincerely Yours,

Stephen D Coggins

Stephen D. Coggins

cc: Michael J. Mac, President – Waters Edge HOA, Inc. (w/encl)

ATTACHMENT E:

STIPULATED EXHIBITS INCLUDING POWERPOINT

Hogue, Hill, Jones, Nash + Lynch

FILED

BK2426PG248

04 JUL -8 PM 1:10

JOYCE M. SWICEGOOD
REGISTER OF DEEDS
PENDER COUNTY, NC

STATE OF NORTH CAROLINA

COUNTY OF PENDER

DECLARATION OF COVENANTS CONDITIONS AND RESTRICTIONS FOR WATERS EDGE AT DEERFIELD

This Declaration, Made the 8th day of July, 2004, by **UNIVERSITY GROUP, INC.**, a North Carolina corporation, hereinafter referred to as "Declarant" or "Developer" for the purposes hereinafter stated;

WITNESSETH:

Whereas, Declarant is the owner of certain real property in Pender County, North Carolina, known as **WATERS EDGE AT DEERFIELD**, which is shown on a plat recorded in the Office of the Register of Deeds of Pender County, North Carolina, in Map Book 37 Page 133, to which reference is made for a more particular description (the "Property").

NOW, THEREFORE, Declarant declares that the Property described above shall be held, sold and conveyed subject to the North Carolina Planned Community Act set forth in Chapter 47F of the North Carolina General Statutes (the "Act"), as well as the following easements, restrictions, covenants, and conditions.

ARTICLE I.
DEFINITIONS

In addition to other terms defined herein, the following capitalized terms shall have the following meanings as used herein:

SECTION 1. Additional Property shall mean and refer to any lands, in addition to the above described Property, annexed to and made a part of the Planned Community.

SECTION 2. Allocated Interest shall mean the Common Expense Liability and votes in the Association allocated to each Lot.

Recorded and Verified
Joyce M. Swicegood
Register of Deeds
Pender County, NC

31

SECTION 3. Association shall mean and refer to Waters Edge HOA, Inc., a North Carolina non-profit corporation, its successors and assigns, the owners association organized pursuant to the Act for the purposes set forth herein.

SECTION 4. Boat Slips shall mean the 18 boat slips shown on the above referenced plat of the Community Boating Facility.

SECTION 5. Boat Slip Certificate shall mean the Boat Slip Certificate in the form attached hereto as Exhibit B.

SECTION 6. Common Elements or Open Space shall mean and refer to all lands and easements within or appurtenant to the Planned Community owned or enjoyed by the Association, other than a Lot, and intended for the common use and enjoyment of the Owners, including, without limitation, any private roads and storm water facilities within the Planned Community. Any streets and roads shown on the above referenced plat as public shall constitute Common Elements until such streets and roads are accepted for maintenance by the NC Department of Transportation. All Access Easements and Public and Private Utility Easements, including but not limited to those over Lots 2, 3, 17 and 18 as shown on the above referenced plat, constitute Common Elements (but the Owners of said Lots may use their land for any purpose that does not interfere with such easements, including access to their Lots). The easements granted by Lanwillo Development Company by Deed of Easement recorded in Book 1946, Page 183 of the Pender County Registry (the "Deed of Easement"), as amended, constitute Common Elements and shall be maintained by the Association as provided in the Deed of Easement.

SECTION 7. Common Expenses means expenditures made by or financial liabilities of the Association, together with any allocations to reserves, including but not limited to (i) the cost of irrigation for the Common Elements and (ii) the cost of electricity, water and irrigation for the Community Boating Facility (defined below).

SECTION 8. Common Expense Liability means the liability for Common Expenses allocated to each Lot as permitted by the Act, this Declaration or otherwise.

SECTION 9. Community Boating Facility means the riparian easement, the pier, the floating dock, and 18 boat slips as to be shown on the plat referenced in the preamble to these covenants and labeled "Community Boating Facility". The Community Boating Facility shall be for the exclusive use and enjoyment of the subclass of Class A Members designated and defined hereinafter as "Class A Members-Boating". The Association is obligated pursuant to this Declaration to operate and maintain the Community Boating Facility with the cost thereof being assessed only against the Class A Members-Boating as is hereinafter provided.

SECTION 10. Declarant shall be used interchangeably with Developer (which designations shall include singular, plural, masculine and neuter as required by the context) and shall mean and refer to University Group, Inc., its successors and assigns, if such successors or assigns should acquire undeveloped property from the Declarant or a Lot not previously disposed of for the purpose of development and reserves or succeeds to any Special Declarant Right.

SECTION 11. Declarant Control Period shall have the meaning set forth in Article III hereof.

SECTION 12. Declaration shall mean this instrument as it may be from time to time amended or supplemented.

SECTION 13. Executive Board or Board shall be used interchangeably with the Board of Directors and means the body, regardless of name, designated in this Declaration or otherwise to act on behalf of the Association.

SECTION 14. Limited Common Elements shall mean areas and facilities within any Lot which are for the use of the Lot Owner as septic nitrification fields but which the Association is obligated to maintain pursuant to the terms of this Declaration. The Limited Common Elements shall consist of SF (septic fields) 3A, 6A, 9A, 10A, 18A and Reserve No. 1 as shown on the above referenced plat (if none, so state). The Declarant shall have the right to grant an easement for septic fields Reserve No. 1 to any Lots of Declarant's choice (subject to approval of applicable regulatory agencies). The Declarant may at any time release its right to grant septic field easements over Reserve No. 1 and upon such release, said Lots shall cease to be Limited Common Elements and shall become Common Elements.

SECTION 15. Lot(s) shall mean and refer to any portion of the Planned Community designated for separate ownership by a Lot Owner.

SECTION 16. Lot Owner or Owner shall mean the Declarant or other Person who owns a fee simple title to any Lot, including contract sellers, but excluding those having such interest merely as security for the performance of an obligation.

SECTION 17. Master Association means a master association as defined in the Act.

SECTION 18. Person means a natural person, corporation, business trust, estate, trust, partnership, association, joint venture, government, governmental subdivision, or agency or other legal or commercial entity.

SECTION 19. Planned Community shall mean and refer to the Property plus any Additional Property made a part of the Planned Community by the exercise of any Special Declarant Right.

SECTION 20. Purchaser means any Person, other than the Declarant or a Person in the business of selling real estate for the purchaser's own account, who by means of a voluntary transfer acquires a legal or equitable interest in a Lot, other than (i) a leasehold interest (including renewal options) of less than 20 years, or (ii) as security for an obligation.

SECTION 21. Reasonable Attorneys' Fees means attorneys' fees reasonably incurred without regard to any limitations on attorneys' fees which otherwise may be allowed by law.

SECTION 22. Special Declarant Rights means rights reserved for the benefit of the Declarant including without limitation the right (i) to complete improvements intended or planned by Developer for the Property or Additional Property; (ii) to exercise any development or other right reserved to the Declarant by this Declaration or otherwise; (iii) to maintain within the Planned Community sales offices, management offices, construction offices/trailers, signs advertising the Planned Community, and models; (iv) to use the Common Elements for the purpose of making improvements within the Planned Community; (v) to make the Planned Community part of a larger planned community or group of planned communities; (vi) to make the Planned Community subject to a Master Association; (vii) to appoint or remove any officer or Executive Board member of the Association or any Master Association during the Declarant Control Period or (viii) to permit other land to be annexed to and made part of the Planned Community in accordance with the terms of this Declaration.

SECTION 23. Stormwater Permit shall mean State Stormwater Permit # SW8 030110 issued by the North Carolina Division of Water Quality (DWQ), Department of Environment and Natural Resources (DENR).

ARTICLE II.
PROPERTY RIGHTS AND EASEMENTS

SECTION 1. Owners' Property Rights and Easement of Enjoyment. Every Owner shall have and is hereby granted a right and easement of enjoyment in and to the Common Elements, if any, which shall be appurtenant to and shall pass with the title to every Lot, subject to the following provisions:

A. The Association may make and amend reasonable rules and regulations governing use of the Common Elements by the Owners;

B. The Association may grant a security interest in or convey the Common Elements, or dedicate or transfer all or part of the Common Elements, to any public agency, authority or utility for such purposes and subject to such conditions as may be agreed to by at least eighty percent (80%) of the Members, excluding the Developer; provided, however, that the Association may without the consent of the Owners grant easements, leases, licenses and concessions through or over the Common Elements. No conveyance or encumbrance of Common Elements shall deprive any Lot of its rights of access or support.

C. An easement of enjoyment in and over SF (septic fields) 3A, 6A, 9A, 10A,18A (in favor of the Owners of Lots 3, 6, 9, 10 and 18, respectively) and in and over Reserve No. 1 (with Declarant being entitled to grant, subject to the approval of applicable regulatory agencies, septic field easements over Reserve No. 1 to such Lots as Declarant deems appropriate) as shown on the above referenced plat, for the purpose installing, operating and maintaining upon them septic nitrification fields with such piping and other facilities as appropriate. Any damage to any septic nitrification fields located upon any such Lot caused by the negligence of the Association or any Owner other than the Owner of the Lot in question shall be paid for by the Association (but the Association may recover from the Lot Owner causing such damage in accordance with the provisions of Article X, Section 2. A. hereof). Lot 3 only has an easement over SF3A, Lot 6 over SF6A, Lot 9 over SF9A, Lot 10 over SF10A and Lot 18 over SF18A.

SECTION 2. Easements in Favor of Declarant and the Association. The following easements are reserved to Declarant and the Association, their agents, contractors, employees, successors and assigns:

A. Easements as necessary in the lands constituting the Common Elements and the rear, front and side ten feet of each Lot for the installation and maintenance of utilities and drainage facilities (including the right to go upon the ground with men and equipment to erect, maintain, inspect, repair and use electric and telephone lines, wires, cables, conduits, sewers, water mains and other suitable equipment for the conveyance and use of electricity, telephone equipment, gas, sewer, water or other public conveniences or utilities on, in or over each Lot and such other areas as are shown on the plat of the Property or any Additional Property recorded or to be recorded in the office of the Register of Deeds of the county where the Planned Community is located; the right to cut drain ways, swales and ditches for surface water whenever such action may appear to the Developer or the Association to be necessary in order to maintain reasonable standards of health, safety and appearance; the right to cut any trees, bushes or shrubbery; the right to make any grading of the soil, or to take any other similar action reasonably necessary to provide economical and safe utility installation and to maintain reasonable standards of health, safety and appearance; and the right to locate wells, pumping stations, and tanks within residential areas, or upon any Lot with the permission of the Owner of such Lot). No structures or plantings or other material shall be placed or permitted to remain upon such easement areas or other activities undertaken thereon which may damage or interfere with the installation or maintenance of utilities or other services, or which may retard, obstruct or reverse the flow of water or which may damage or interfere with established slope ratios or create erosion. These easement areas (whether or not shown on the recorded plats for the Planned Community) but not the improvements within such areas shall be maintained by the respective Owner except those for which a public authority or utility company is responsible.

B. Easements over all private streets, if any, access easements, and Common Elements within the Planned Community as necessary to provide access, ingress and egress, to and the installation of utilities for any Additional Property.

C. An easement of unobstructed access over, on, upon, through and across each Lot and the Limited Common Elements located thereon, if any, at all reasonable times to perform any maintenance and repair to the Limited Common Elements required by this Declaration.

SECTION 3. Other Easements. The following additional easements are granted by Declarant:

A. An easement to all police, fire protection, ambulance and all similar persons, companies or agencies performing emergency services, to enter upon all Lots and Common Elements in the performance of their duties.

B. In case of any emergency originating in or threatening any Lot or Common Elements, regardless of whether any Lot Owner is present at the time of such emergency, the Association or any other person authorized by it, shall have the immediate right to enter any Lot for the purpose of remedying or abating the causes of such emergency and making any other necessary repairs not performed by the Lot Owners.

C. The Association is granted an easement over each Lot for the purposes of providing Lot maintenance when an Owner fails to provide maintenance and upkeep in accordance with this Declaration.

D. The Owners of Lots having an easement of enjoyment in and over SF 3A, 6A, 9A, 10A, 18A, and Reserve No. 1 shall be entitled to install, operate and maintain upon the "10' Utility Easement[s] for Public and Private Use" and "15' Utility Easement[s] for Public and Private Use" shown on the above referenced plat, and over Waters Edge and Great Oak Drives, pipelines to transport sewage from their septic tanks to their septic fields. Each Lot Owner installing and maintaining such pipelines shall restore the surface of the easements to the condition existing immediately before such installation or maintenance commenced and shall be responsible for any damage to any road surface, landscaping, other property, or to persons, occurring on account of such activities. The location of any such pipelines within Waters Edge Drive must be approved by the Declarant or the

Architectural Control Committee. All easements granted or described herein are subject to being replaced by North Carolina Department of Transportation ("NCDOT") encroachment agreements at any time that NCDOT accepts Waters Edge Drive and/or Great Oaks Drive for maintenance. All septic fields (onsite and offsite), force mains, collection sewers and other sewer facilities shall be located (setbacks, etc) as required by North Carolina Administrative Code Section 15A NCAC 18A.1950, entitled "Location of Sanitary Systems".

E. The Owner of Lot 4 as shown on the above referenced plat is granted a non-exclusive easement over the land described on **Exhibit A** attached hereto and incorporated herein by reference, the same being portion of the "30' Access and Utility Easement" located on Lot 3 as shown on said plat for the purpose of to constructing/installing, operating and maintaining a driveway and landscaping over said easement.

SECTION 4. Nature of Easements. All easements and rights described herein are perpetual easements appurtenant, running with the land, and shall inure to the benefit of and be binding on the Declarant and the Association, their successors and assigns, and any Owner, purchaser, mortgagee and other person having an interest in the Planned Community, or any part or portion thereof, regardless of whether or not reference is made in the respective deeds of conveyance, or in any mortgage or trust deed or other evidence of obligation, to the easements and rights described in this Declaration.

ARTICLE III.
HOMEOWNERS' ASSOCIATION

SECTION 1. Formation of Association. The Association shall be incorporated no later than the date the first Lot in the Planned Community is conveyed. The Association is a nonprofit corporation organized pursuant to the Nonprofit Corporation Act of the State of North Carolina for the purpose of establishing an association for the Owners of Lots to operate and maintain the Common Elements and any Limited Common Elements in accordance with this Declaration, its Charter and Bylaws The Association shall be empowered to perform and/or exercise those powers set forth in the Act as it may be amended from time to time, in addition to any powers and authority otherwise granted to it.

SECTION 2. Membership. Every Lot Owner shall be a Member of the Association. Membership shall be appurtenant to and may not be separated from Lot ownership.

SECTION 3. Voting Rights. The Association shall have two classes of voting Membership.

> *Class A.* Class A Members shall be all Owners, with the exception of the Declarant, and shall be entitled to one vote for each Lot owned. When more than one person holds an interest in any Lot, all such persons shall be Members. The

vote for such Lot shall be exercised as they determine, but in no event shall more than one vote be case with respect to any Lot. Fractional voting with respect to any Lot is prohibited. There shall be a subclass of membership within Class A Membership known and "Class A Membership-Boating". The subclass shall consist of those Class A Members who hold a Boat Slip Certificate.

Class B. The Declarant shall be a Class B Member and shall be entitled to three (3) votes for each Lot owned. The Class B Membership shall cease and be converted to Class A Membership on the happening of any of the following events, whichever occurs earlier:

(a) when the total vote outstanding in the Class A Membership equals the total vote outstanding in the Class B Membership; or

(b) on December 31, 2007; or

(c) upon the voluntary surrender of all Class B Membership by the holder thereof.

The period during which there is Class B Membership is sometimes referred to herein as the "Declarant Control Period".

SECTION 4. Government Permits. After completion of construction of any facilities required to be constructed by Declarant pursuant to permits, agreements and easements for the Planned Community, all duties, obligations, rights and privileges of the Declarant under any water, sewer, stormwater and utility agreements, easements and permits for the Planned Community with municipal or governmental agencies or public or private utility companies, shall be the duties, rights, obligations, privileges and the responsibility of the Association, notwithstanding that such agreements, easements or permits have not been assigned or the responsibilities thereunder specifically assumed by the Association. There are additional provisions made in this Declaration concerning stormwater facilities and the Stormwater Permit.

SECTION 5. Common Elements. The Association shall at its sole cost and expense be responsible for the operation and maintenance of each Common Element within the Planned Community form the date of completion of its construction or improvement by the Developer, whether or not (i) such Common Element has actually been deeded to the Association, or (ii) any permit issued by a governmental agency to Declarant for the construction and operation of the Common Element has been transferred from the

Declarant to the Association or assumed by the Association. If the Declarant is required by any government agency to provide any operation or maintenance activities to a Common Element for which the Association is liable to perform such operation and maintenance pursuant to this section, then the Association agrees to reimburse the Declarant the cost of such operation and maintenance within 30 days after Declarant renders a bill to the Association therefor. The Association agrees to levy a Special Assessment to cover the amount of such bill if it does not have other sufficient funds available. Declarant shall be entitled to specific performance to require the Association to levy and collect such Special Assessment.

SECTION 6. Architectural Control Committee. The Executive Board shall perform all duties of the Architectural Control Committee if no such committee is appointed by it, subject, however, to the Special Declarant Rights. Any Architectural Control Committee appointed by the Executive Board shall consist of at least 3 members.

ARTICLE IV.
INSURANCE AND BONDS

SECTION 1. Community Boating Facility Insurance. Commencing not later than the time of the first issuance of a Boat Slip Certivicate to a Person that is not a Declarant, it shall be the duty of the Association to maintain in effect casualty and liability insurance covering the Community Boating Facility as follows, to the extent it is reasonably available:

A. Amount and Scope of Insurance. All insurance policies necessary or desisrable (except personal property of an Owner) shall be secured by the Board of Directors, or its designee, on behalf of the Association. Such insurance shall at a minimum cover against (1) loss or damage by fire or other hazards normally insured against in an amount after application of any deductibles of not less than 80 percent of the replacement cost of the insured property at the time the insurance is purchased and at each renewal date exclusive of land escalation, foundations and other items normally excluded from property policies, and (2) general liability insurance for each Lot, with limits of at least $1,000,000.00 for bodily injury, including deaths of persons and property damage arising out of a single occurrence.

B. Insurance Provisions. The Board of Directors shall make diligent efforts to insure that the insurance policies required by this section provide for the following:

> (1) a waiver of subrogation by the insurer as to any claims against the Association, any officer, director, agent or employee of the Association, the Lot Owners and their employees, agents, tenants and invitees;

(2) a waiver by the insurer of its right to repair and reconstruct instead of paying cash;

(3) coverage may not be canceled or substantially modified (including cancellation for nonpayment of premium) without at least thirty days prior written notice to the named insured and all mortgagees;

(4) coverage will not be prejudiced by act or neglect of the Lot Owners when said act or neglect is not within the control of the Association or by any failure of the Association to comply with any warranty or condition regarding any portion of the Planned Community over which the Association has no control.

(5) the master policy cannot be cancelled, invalidated or suspended on account of the conduct of any one or more individual Lot Owners;

(6) the master policy cannot be cancelled, invalidated or suspended on account of the conduct of any officer or employee of the Board of Directors without prior demand in writing that the Board of Directors cure the defect and the allowance of a reasonable time thereafter within which the defect may be cured;

(7) each Class A Member-Boating is an insured person under the policy to the extent of the Member's insurable interest;

(8) if at the time of a loss under the policy, there is other insurance in the name of a Class A Member-Boating covering the same risk covered by the policy, the Association's policy provides primary insurance.

C. Premiums. All premiums on the insurance policies required by this section and any deductibles payable by the Association upon loss shall be a Common Expense paid by the Class A Members-Boating.

D. Proceeds. All insurance policies purchased pursuant to these provisions shall provide that all proceeds thereof shall be payable to the Board as insurance trustee or to such attorney-at-law or institution with trust powers as may be approved by the Board of

Directors who shall hold any such insurance proceeds in trust for Class A Members-Boating and lien holders as their interest may appear;

E. Policies. All insurance policies purchased by the Board of Directors shall be with a company or companies permitted to do business in the State of North Carolina and holding a rating of "A" or better by the current issue of Best's Insurance Reports. All insurance policies shall be written for the benefit of the Board of Directors and the Class A Members-Boating and their mortgagees as their respective interests may appear, and shall provide that all proceeds thereof shall be payable to the Board of Directors.

F. Distribution of Insurance Proceeds. Subject to the provisions of Section 47F-3-113(g) of the Act, the proceeds of insurance policies maintained by the Association pursuant to this section shall be distributed to or for the benefit of the beneficial owners in the following manner:

> (1) all reasonable expenses of the insurance trustee shall be first paid or provision may therefor;
>
> (2) the remaining proceeds shall be used to defray the cost of repairs for the damage or reconstruction for which the proceeds are paid. Any proceeds remaining after defraying such cost shall be distributed to the beneficial owners, including lienholders of record, or retained by the Association for such common expenses or purposes as the Board shall determine.

SECTION 2. Individual Home Insurance. All Owners shall purchase at their individual expense individual policies covering each Lot and Lot Owner individually.

SECTION 3. Common Element Insurance. The Board of Directors on behalf of the Association, as a Common Expense of all Lot Owners, may at all times keep the Common Elements and other assets of the Association insured against loss or damage by fire or other hazards and such other risks, including public liability insurance, upon such terms and for such amounts as may be reasonably necessary from time to time to protect such property, which insurance shall be payable in case of loss to the Association for all Members. The Association shall have the sole authority to deal with the insurer in the settlement of claims. In no event shall the insurance coverage obtained by the Association be brought into contribution with insurance purchased by Members or their mortgagees. The Association at minimum shall maintain with regard to the Common Elements the insurance coverage(s) required by the Act.

SECTION 4. Fidelity Bond. The Association may maintain, as a Common Expense paid by all Owners, blanket fidelity bonds for all officers, directors, employees and all other persons handling or responsible for funds of the Association, as follows (provided, however, that if the Association shall delegate some or all of the responsibility for the handling of its funds to a management agent, such fidelity bonds shall be maintained by such management agent for its officers, employees and agents handling or responsible for funds of or administered on behalf of the Association):

A. The total amount of fidelity bond coverage required shall be based upon best business judgment and shall not be less than the estimated maximum of funds, including reserve funds, in the custody of the Association or the management agent, as the case may be, at any given time during the term of each bond. However, in no event may the aggregate amount of such bonds be less than a sum equal to three months aggregate assessments on all units plus reserve funds;

B. Fidelity bonds required herein must meet the following requirements:

(1) fidelity bonds shall name the Association as an obligee;

(2) the bonds shall contain waivers by the issuers of the bonds of all defenses upon the exclusion of persons serving without compensation from the definition of "employees", or similar terms or expressions;

(3) the premiums on all bonds required herein for the Association (except for premiums on fidelity bonds maintained by a management agent for its officers, employees and agents) shall be paid by the Association as a common expense;

(4) the bonds shall provide that they may not be canceled or substantially modified (including cancellation for nonpayment of premium) without at least ten (10) days prior written notice to the Association, to any insurance trustee and each institutional holder of a first lien on any Lot.

ARTICLE V.
COVENANTS FOR ASSESSMENTS

SECTION 1. Creation of the Lien and Personal Obligation of Assessments. Each Lot Owner covenants and agrees to pay to the Association the following assessments (collectively the "Assessments"):

A. Annual Assessments;

B. Special Assessments;

C. Insurance Assessments;

D. Ad Valorem Tax Assessments; and

E. Working Capital Assessments.

The Assessments, together with interest, costs and reasonable attorney's fees, shall be a charge on the land and shall be a continuing lien upon the respective Lot against which the Assessments are made. Each such Assessment, together with interest, costs and reasonable attorney's fees, shall also be the personal obligation of the Person who was the Owner of such Lot at the time when the Assessment fell due. The personal obligation for delinquent Assessments shall not pass to the Owner's successors in title unless expressly assumed by them.

SECTION 2. Purpose of Annual Assessments. The Annual Assessments levied by the Association shall be used exclusively to promote the recreation, health, safety and welfare of the Owners and residents of the Planned Community and for the maintenance, repair and replacement of the Common Elements, the Community Boating Facility, and any Limited Common Elements. The maintenance of the Community Boating Facility shall include such dredging as is necessary to keep the boat channels and docking areas passable at all normal tides. The Association is authorized to enter into contracts with other property owners who utilize the boat channels for the sharing of the cost of maintenance/dredging thereof. The funds arising from said assessments or charges, may be used for any or all of the following purposes: Operations, maintenance and improvement of the Common Elements, and any Limited Common Elements, including payment of utilities; enforcing this Declaration; paying taxes, insurance premiums, legal and accounting fees and governmental charges; establishing working capital; paying dues and assessments to any organization or Master Association of which the Association is a member; and in addition, doing any other things necessary or desirable in the opinion of the Association to keep the Common Elements, the Community Boating Facility and Limited Common Elements in good operating order and repair.

SECTION 3. Annual Assessments. The Executive Board shall adopt a proposed annual budget at least 90 days before the beginning of each fiscal year of the Association. Within 30 days after adoption of the proposed budget for the Planned Community, the Executive Board shall provide to all of the Lot Owners a summary of the budget, by components as established hereinafter in this Section, and notice of a meeting to consider its ratification, including a statement that the budget may be ratified without a quorum. Each component of the budget is ratified unless at the meeting a majority of all of the Lot Owners in the Association entitled to vote on the component rejects the budget component. All members shall be entitled to vote on the Common Element Component (defined below).

Only the Class A Members-Boating, shall be entitled to vote on the Community Boating Component (defined below). In the event the proposed budget (or component) is rejected, the periodic budget (or component) last ratified by the Lot Owners shall be continued until such time as the Lot Owners ratify a subsequent budget (or component) proposed by the Executive Board. The Annual Assessment for each Lot shall be established based on the annual budget thus adopted; provided, however, that the first Annual Assessment shall be set by the Declarant prior to the conveyance of the first Lot to an Owner. The due date for payment shall be established by the Executive Board. The Executive Board shall have the authority to require the Assessments to be paid in periodic installments. The Association shall, upon demand, and for a reasonable charge furnish a certificate signed by an officer of the Association setting forth whether the Assessments on a specified Lot have been paid.

A. Budget and Assessment Components: The Board shall include as a separate component of the annual budget and of the Annual Assessments, the following:

(i) Common Element Component consisting of the annual cost of operating and maintaining the Common Elements.

(ii) Community Boating Component consisting of the annual cost of operating and maintaining the Commmunity Boating Facility, including the annual premium for the insurance coverage required by Article IV, Section 1 hereof.

B. Calculation of Annual Assessments: The Common Element Component shall be paid equally by all Lots. The Community Boating Component shall be paid equally by the Class A Members-Boating.

SECTION 4. Special Assessments. In addition to the Annual Assessments authorized above, the Association may levy, in any assessment year, a Special Assessment applicable to the year only for the following purposes:

A. To defray, in whole or in part, the cost of any construction, reconstruction, repair or replacement of a capital improvement upon the Common Elements and any Limited Common Elements, including fixtures and personal property related thereto, provided that any such Special Assessment shall have the assent of two-thirds (2/3) of the Members of each class who are voting in person or by proxy at a meeting duly called for this purpose. Written notice of any meeting of Owners called for the purpose of approving such Special Assessment shall be sent to all Members not less than ten (10) days nor more than sixty (60) days in advance of the meeting.

B. Without a vote of the Members, to provide funds to reimburse the Declarant as provided for in Article III, Section 5, hereof.

SECTION 5. Insurance Assessments. All premiums on insurance policies purchased by the Board of Directors or its designee and any deductibles payable by the Association upon loss shall be a Common Expense, and the Association may at any time levy against the Owners equally an "Insurance Assessment", in addition to the Annual Assessments, which shall be in an amount sufficient to pay the cost of all such deductibles and insurance premiums not included as a component of the Annual Assessment.

SECTION 6. Ad Valorem Tax Assessments. All ad valorem taxes levied against the Common Elements, if any, shall be a common expense, and the Association may at any time year levy against the Owners equally an "Ad Valorem Tax Assessment", in addition to the Annual Assessments, which shall be in an amount sufficient to pay ad valorem taxes not included as a component of the Annual Assessment.

SECTION 7. Working Capital Assessments. At the time title to a Lot is conveyed to an Owner by Declarant, the Owner shall pay the sum of $100.00 to the Association as working capital to be used for operating and capital expenses of the Association. Class A Members-Boating shall pay an additional working capital assessment at closing of $100.00. Such amounts paid for working capital are not to be considered as advance payment of the Annual or any other Assessments.

SECTION 8. Rate of Assessment. The Association may differentiate in the amount of Assessments charged when a reasonable basis for distinction exists, such as between vacant Lots of record and Lots of record with completed dwellings for which certificates of occupancy have been issued by the appropriate governmental authority, or when any other substantial difference as a ground of distinction exists between Lots. However, Assessments must be fixed at a uniform rate for all Lots similarly situated.

SECTION 9. Commencement of Assessments. Assessments for each Lot shall commence upon the date of acceptance by an Owner of a deed from Declarant.

SECTION 10. Effect Of Nonpayment of Assessments And Remedies Of The Association. Any Assessment or installment thereof not paid within thirty (30) days after the due date shall bear interest from the due date at the highest rate allowable by law. The Association may bring an action at law against the Owner personally obligated to pay the same, or foreclose the lien against the Owner's Lot. No Owner may waive or otherwise escape liability for the Assessments provided for herein by non-use of the Common Elements or abandonment of his Lot. All unpaid installment payments of Assessments shall become immediately due and payable if an Owner fails to pay any installment within the time permitted. The Association may also establish and collect late fees for delinquent installments.

SECTION 11. Lien for Assessments. The Association may file a lien against a Lot when any Assessment levied against said Lot remains unpaid for a period of 30 days or longer.

A. The lien shall constitute a lien against the Lot when and after the claim of lien is filed of record in the office of the Clerk of Superior Court of the county in which the Lot is located. The Association may foreclose the claim of lien in like manner as a mortgage on real estate under power of sale under Article 2A of Chapter 45 of the General Statutes. Fees, charges, late charges, fines, interest, and other charges imposed pursuant to Sections 47F-3-102, 47F-3-107, 47F-3-107.1 and 47F-3-115 of the Act are enforceable as Assessments.

B. The lien under this section shall be prior to all liens and encumbrances on a Lot except (i) liens and encumbrances (specifically including, but not limited to, a mortgage or deed of trust on the Lot) recorded before the docketing of the claim of lien in the office of the Clerk of Superior Court, and (ii) liens for real estate taxes and other governmental assessments and charges against the Lot.

C. The lien for unpaid assessments is extinguished unless proceedings to enforce the tax lien are instituted within three years after the docketing of the claim of lien in the office of the Clerk of Superior Court.

D. Any judgment, decree, or order in any action brought under this section shall include costs and reasonable attorneys' fees for the prevailing party.

E. Where the holder of a first mortgage or deed of trust of record, or other purchaser of a Lot obtains title to the Lot as a result of foreclosure of a first mortgage or first deed of trust, such purchaser and its heirs, successors and assigns shall not be liable for the Assessments against the Lot which became due prior to the acquisition of title to the Lot by such purchaser. The unpaid Assessments shall be deemed to be Common Expenses collectible from all of the Lot Owners including such purchaser, its heirs, successors and assigns.

F. A claim of lien shall set forth the name and address of the Association, the name of the record Owner of the Lot at the time the claim of lien is filed, a description of the Lot, and the amount of the lien claimed.

ARTICLE VI
RIGHTS OF DEVELOPER

The Declarant shall have, and there is hereby reserved to the Declarant, the Special Declarant Rights as herein defined and the following rights, powers and privileges which shall be in addition to the Special Declarant Rights and any other rights, powers and privileges reserved to the Declarant herein:

SECTION 1. The Architectural Control Committee/Executive Board. All duties and responsibilities conferred upon the Architectural Control Committee by this Declaration or the Bylaws of the Association shall be exercised and performed by the Declarant or its designee, so long as Declarant shall own any Lot within the Property or any Additional Property. The Declarant shall be entitled during the Declarant Control Period to appoint and remove the officers and members of the Executive Board.

SECTION 2. Plan of Planned Community. The right to change, alter, add to or re-designate the allocated planned, platted, or recorded use or designation of any of the lands constituting the Planned Community including, but not limited to, the right to change, alter, add to, or re-designate road, utility and drainage facilities and easements and to change, alter, add to, or re-designate such other present and proposed amenities, Common Elements, or facilities as may in the sole judgment and discretion of Declarant be necessary or desirable. The Declarant hereby expressly reserves unto itself, its successors and assigns, the right to re-plat any one (1) or more Lots shown on the plat of any subdivision of the Property or Additional Property in order to create one or more modified Lots; to further subdivide tracts or Lots shown on any such subdivision plat into two or more Lots; to recombine one or more tracts or Lots or a tract and Lots to create a larger tract or Lot (any Lot resulting from such recombination shall be treated as one Lot for purposes of Assessments); to eliminate from this Declaration or any plats of the Planned Community Lots that are not otherwise buildable or are needed or desired by Declarant for access or are needed or desired by Declarant for use as public or private roads or access areas, whether serving the Planned Community or other property owned by the Declarant or others, or which are needed for the installation of utilities, Common Elements or amenities, and to take such steps as are reasonably necessary to make such re-platted Lots or tracts suitable and fit as a building site, access area, roadway or Common Elements.

SECTION 3. Amendment of Declaration by the Declarant. This Declaration may be amended without Member approval by the Declarant, or the Board of the Association, as the case may be, as follows:

A. In any respect, prior to the sale of the first Lot.

B. To the extent this Declaration applies to Additional Property.

C. To correct any obvious error or inconsistency in drafting, typing or reproduction.

D. To qualify the Association or the Property and Additional Property, or any portion thereof, for tax-exempt status.

E. To incorporate or reflect any platting change as permitted by this

Article or otherwise permitted herein.

F. To conform this Declaration to the requirements of any law or governmental agency having legal jurisdiction over the Property or any Additional Property or to qualify the Property or any Additional Property or any Lots and improvements thereon for mortgage or improvement loans made, insured or guaranteed by a governmental agency or to comply with the requirements of law or regulations of any corporation or agency belonging to, sponsored by, or under the substantial control of the United States Government or the State of North Carolina, regarding purchase or sale of such Lots and improvements, or mortgage interests therein, as well as any other law or regulation relating to the control of property, including, without limitation, ecological controls, construction standards, aesthetics, and matters affecting the public health, safety and general welfare. A letter from an official of any such corporation or agency, including, without limitation, the Department of Veterans Affairs, U. S. Department of Housing and Urban Development, the Federal Home Loan Mortgage Corporation, Government National Mortgage Corporation, or the Federal National Mortgage Association, requesting or suggesting an amendment necessary to comply with the requirements of such corporation or agency shall be sufficient evidence of the approval of such corporation or agency, provided that the changes made substantially conforrn to such request or suggestion. Notwithstanding anything else herein to the contrary, only the Declarant, during the Declarant Control Period, shall be entitled to amend this Declaration pursuant to this Section.

SECTION 4. Annexation of Additional Property. Declarant may annex to and make a part of the Planned Community any other real property, whether now owned or hereafter acquired by Declarant or others, and whether developed by the Declarant or others (the "Additional Property"). Annexation of Additional Property to the Planned Community shall require the assent of 67 percent of the Class A Members who are voting in person or by proxy at a meeting called for this purpose; provided, however, Additional Property may be annexed to the Planned Community without the assent of the Members so long as the Additional Property is used for residential purposes and amenities related thereto.

ARTICLE VII.
USE RESTRICTIONS, ARCHITECTURAL CONTROL AND MAINTENANCE

SECTION 1. Approval of Plans for Building and Site Improvements. No dwelling, wall or other structure (including driveway culvert pipes and headwalls) shall be commenced, erected, or maintained upon any Lot, nor shall any exterior addition to or change in or alteration therein (including painting or repainting of exterior surfaces) be made until the plans and specifications showing the nature, kind, shape, heights, materials, colors and location of the same shall have been submitted to and approved in writing as to harmony of external design and location in relation to surrounding structures and topography by the Architectural Control Committee. If the Architectural Control Committee fails to approve or disapprove such design and location within thirty (30) days after said plans and specifications have been submitted to it, approval will not be required and this Article will be deemed to have been fully complied with. Refusal or approval of any such plans, location or specification may be based upon any ground, including purely aesthetic and environmental considerations, that in the sole and uncontrolled discretion of the Architectural Control Committee shall be deemed sufficient. One copy of all plans and related data shall be furnished to the Architectural Control Committee for its records. The Architectural Control Committee shall not be responsible for any structural or other defects in plans and specifications submitted to it or in any structure erected according to such plans and specifications.

SECTION 2. Minimum Standards for Site Improvements.

A. Each dwelling shall have a minimum of 2,400 square feet of enclosed, heated dwelling area; provided, however, the Architectural Control Committee may permit a dwelling to have a minimum of 2,000 square feet if the Committee in its sole discretion finds that the variance will not adversely impact property values within the Planned Community. The term "enclosed, heated dwelling area" shall mean the total enclosed area within a dwelling which is heated by a common heating system; provided, however, that such term does not include garages, terraces, decks, open porches, and like areas.

B. Since the establishment of inflexible building setback lines for location of houses on Lots tends to force construction of houses directly to the side of other homes with detrimental effects on privacy, view, preservation of important trees and other vegetation, ecological and related considerations, no specific setback lines shall be established by this Declaration, except for a minimum side set-back from all side property lines of 20 feet. In order to assure, however, that the foregoing considerations are given maximum effect, the site and location of any house or dwelling or other structure upon any Lot shall be controlled by and must be approved absolutely by the Architectural Control Committee; provided, however, that no structure shall be constructed closer to a Lot line than is permitted by applicable governmental regulations.

C. The exterior of all dwellings and other structures must be completed within twelve (12) months after the construction of same shall have commenced, except where such completion is impossible or would result in great hardship to the Owner or builder, due to strikes, fires, national emergency, natural calamities, or the complexity of design and construction.

D. All service utilities, fuel tanks, and wood piles are to be enclosed within a wall or plant screen of a type and size approved by the Architectural Control Committee, so as to preclude the same from causing an unsightly view from any highway, street or way within the subdivision, or from any other residence within the subdivision. All mail and newspaper boxes shall be uniform in design. Design for mail and newspaper boxes shall be furnished by the Architectural Control Committee. Fences shall be permitted on any Lot; provided, however, that the design, placement, and materials of any fence are approved by the

Architectural Control Committee. Clothes lines are not permitted on any Lot. All driveway culvert pipes must be installed below grade and must have headwalls.

E. Off street parking for not less than two (2) passenger automobiles must be provided on each Lot prior to the occupancy of any dwelling constructed on said Lot which parking areas and the driveways thereto shall be constructed of concrete, brick, asphalt, or turf stone, or any other material approved by the Architectural Control Committee.

F. All light bulbs or other lights installed in any fixture located on the exterior of any building or any Lot for the purpose of illumination shall be clear, white or non-frost lights or bulbs.

G. The design of all driveway culverts shall be approved by the Declarant or the Architectural Control Committee. Driveway culverts shall have headwalls on both ends.

SECTION 3. Use Restrictions.

A. Land Use And Building Type. No Lot shall be used for any purpose except for residential purposes, subject, however, to the rights of the Declarant contained herein. All numbered Lots are restricted for construction of one single-family dwelling (plus, a detached garage, if there is not one attached to the residence, and such other accessory buildings as may be approved by the Architectural Control Committee).

B. Nuisances. No noxious or offensive activity shall be carried on upon any Lot, nor shall anything be done thereon which may be or may become an annoyance or nuisance to the neighborhood. There shall not be maintained any plants or animals, nor device or thing of any sort whose normal activities or existence are in any way noxious, dangerous, unsightly, unpleasant or other nature as may diminish or destroy the enjoyment of other Lots by the Owners thereof. It shall be the responsibility of each Owner to prevent the development of any unclean, unsightly or unkept condition of buildings or grounds on the Owner's Lot which would tend to decrease the beauty of the neighborhood as a whole or the specific area.

C. Temporary Structures. No structure of a temporary character, trailer, basement, tent, shack, garage, barn or other outbuilding shall be used on any Lot any time as a residence either temporarily or permanently without the written consent of the Architectural Control Committee.

D. Vehicles/Boats/Piers. No boat, motor boat, camper, trailer, motor or mobile homes, tractor/trailer, or similar type vehicle, shall be permitted to remain on any Lot or on any street at any time, without the written consent of the Association. No inoperable vehicle or vehicle without current registration and insurance will be permitted on any Lot, street or Common Element. The Association shall have the right to have all such vehicles towed away at the owner's expense. No repairs to any vehicle may be made on streets or in driveways but only in garages or other areas and not visible from the street. A Class A

Member-Boating shall not be entitled to build any pier or dock over the waters adjacent to the Member's Lot.

E. Animals. No animals, livestock or poultry of any kind shall be kept or maintained on any Lot or in any dwelling except that dogs, cats or other household pets may be kept or maintained provided that they are not kept or maintained for commercial purposes and provided further that they are not allowed to run free, are at all times kept properly leashed or under the control of their owner and do not become a nuisance.

F. Statuary, TV Satellite Dishes and Outside Antennas. No yard statuary or TV satellite signal receiving dishes are permitted on any Lot and no outside radio or television antennas shall be erected on any Lot or dwelling unit unless and until permission for the same has been granted by the Architectural Control Committee; provided, however, satellite dishes not over 18" in diameter which cannot be seen from the street are permitted.

G. Construction in Common Elements. No Person shall undertake, cause, or allow any alteration or construction in or upon any portion of the Common Elements except at the direction or with the express written consent of the Association.

H. Signs. No signs (including "for sale" or "for rent" signs) shall be permitted on any Lot or in the Common Elements without permission of the Executive Board; provided, however, the Declarant may, so long as Declarant owns any Lot, maintain for sale signs on Declarant's Lots and maintain signs on the Common Elements advertising the Plannned Community.

I. Subdividing. Subject to any rights reserved to the Declarant herein, no Lot shall be subdivided, or its boundary lines changed except with the prior written consent of the Declarant during the Declarant Control Period and thereafter by the Board of Directors.

J. Wells and Septic Tanks. The location of all wells, septic tanks or other sewerage disposal systems must be approved by the Architectural Control Committee.

SECTION 4. Maintenance. Each Lot Owner shall keep his Lot free from weeds, underbrush or refuse/dirt piles, or unsightly growth or objects. All structures shall be kept neat and in good condition and repair. All shrubs, trees, grass and plantings shall be kept neatly trimmed and properly cultivated. All septic tank drain fields shall be properly maintained in good working order and in accordance with the rules and regulations of applicable governmental agencies.

ARTICLE VIII
STORMWATER PERMIT/FACILITES

SECTION 1. Stormwater Permit. The Association and each of its Members agree that at anytime after (i) all work required under the Stormwater Permit has been completed (other than operation and maintenance activities), and (ii) the Developer is not prohibited under DENR regulations from transferring the Stormwater Permit for the Planned Community to the Association, the Association's officers wihtout any vote or approval of Lot Owners, and within 10 days after being requested to do so, will sign all documents required by DENR for the Stormwater Permit to be transferred to the Association; provided, however, that at the time the Developer requests that the Association accept transfer of the Stormwater Permit, the Developer has delivered to the Association a certificate from an engineer licensed in the State of North Carolina, dated no more than 45 days before the date of the request, that all stormwater retention ponds, swales and related facilities are constructed in accordance with the plans and specifications therefore. If the Association fails to sign the documents required by this paragraph, the Developer shall be entitled to specific performance in the courts of North Carolina requiring that the appropriate Association officers sign all documents necessary for the Stormwater Permit to be transferred to the Association. Failure of the officers to sign as provided herein shall not relieve the Association of its obligations to operate and maintain the stormwater facilities covered by the Stormwater Permit.

SECTION 2. Stormwater Facilities O & M. Any stormwater retention ponds and related facilities for the Planned Community which have or are to be constructed by or on behalf of Declarant constitute Common Elements and, subject only to the provisions of Section 3 of this Article VII, the Association, at its sole cost and expense, is responsible for the operation and maintenance of such facilities. Such O & M shall include, but not be limited to, compliance with all of the terms and obtaining any renewals of the Stormwater Permit. Except as provided in Section 3 of this Article VII, the Association shall indemnify and hold harmless the Developer form any obligations and costs under the Stormwater Permit for operation and maintenance of the stormwater retention ponds and related facilities.

SECTION 3. Damage to Storm Water Facilities. The Declarant shall at its sole cost and expense be responsible for repairing any damage to storm water facilities caused by the Developer's development activities. The Developer shall not be responsible for damages to stormwater retention ponds and related facilities caused by any other cause whatsoever, including but not limited to construction of residences or other activities by Owners, their agents and contractors, upon their Lots, acts of God, and the negligence of others. Lot Owners shall be responsible for damages to such stormwater facilities caused by construction of buildings or other activities upon the Owner's Lot. Each Owner, shall within 30 days after receipt of notice of damage to stormwater facilities, repair the damage at the Owner's sole cost and expense to return them to the state required by the storm water plans and specifications for the Planned Community. If the Lot Owner fails to do so within said 30-day period, the Association shall perform the work and the cost of the work shall be added to the Annual Assessment due from the Lot Owner.

SECTION 4. Enforcement Of Storm Water Runoff Regulations.

A. The following covenants are intended to ensure ongoing compliance with State Stormwater Management Permit Number SW8 030110, as issued by the Division of Water Quality under NCAC 2H.1000.

B. The State of North Carolina is made a beneficiary of these covenants to the extent necessary to maintain compliance with the stormwater management permit.

C. These covenants are to run with the land and be binding on all persons and parties claiming under them.

D. The covenants pertaining to stormwater may not be altered or rescinded without the express written consent of the State of North Carolina, Division of Water Quality.

E. Alteration of the drainage as shown on the approved plan may not take place without the concurrence of the Division of Water Quality.

F. The maximum allowable built-upon area per lot is 9,743 square feet. This allotted amount includes any built-upon area constructed within the lot property boundaries, and that portion of the right-of-way between the front lot line and the edge of the pavement. Built upon area includes, but is not limited to, structures, asphalt, concrete, gravel, brick, stone, slate, and coquina, but does not include raised, open wood decking, or the water surface of swimming pools.

G. Filling in or piping of any vegetative conveyances (ditches, swales, etc.) associated with the development except for average driveway crossings, is strictly prohibited by any persons.

H. Each lot will maintain a 30' wide vegetated buffer between all impervious areas and surface waters.

I. All roof drains shall terminate at least 30' from the mean high water mark of surface waters.

J. Lots within CAMA's Area of Environmental Concern may have the permitted maximum built-upon area reduced due to CAMA jurisdiction within the AEC.

ARTICLE IX.
COMMUNITY BOATING FACILITY

SECTION 1. Establishment of Facility. There is hereby established a Community Boating Facility as defined herein. The Community Boating Facility shall constitute a part of the Common Elements of the Development.

SECTION 2. Use of Limited Common Elements. Each Boat Slip will be assigned by the Declarant to a Lot pursuant to a Boat Slip Certificate in the form attached hereto as **Exhibit B**. Only Lot Owners or persons renting the Lot Owner's residence shall be entitled to use the boat slips. Title to a Boat Slip Certificate may not be separated from Lot ownership but Boat Slips may be transferred among Lot Owners.

SECTION 3. Use Restriction. The Community Boating Facility may not be used for more than 18 Boat Slips. Boats of 21 feet or less with no cabins or head are permitted. No gasoline sales or other commercial activity shall be permitted. No motor vehicles or boat trailers shall be permitted on site and access shall be limited to the Access Easements over Lots 2, 3, 17 and 18 as shown on the above referenced plat. Notwithstanding the foregoing, motor vehicles may use the temporary parking spaces/drop-off area constituting a part of the Community Boating Facility. In addition to the other use restrictions contained in this Declaration, the following use restrictions shall also apply to the Community Boating Facility:

A. Nuisances. No noxious or offensive activity shall be carried on upon any boat, Boat Slip or Common Area, nor shall anything be done thereon which may be or may become an annoyance or nuisance to the neighborhood. There shall not be maintained any plants or animals, nor device or thing of any sort whose normal activities or existence are in any way noxious, dangerous, unsightly, unpleasant or other nature as may diminish or destroy the enjoyment of other Boat Slips. It shall be the responsibility of each holder of a Boat Slip Certificate to prevent the development of any unclean, unsightly or unkept condition of the Boat Slip or any boat using it.

B. Devices and Structures. No device, structure or other thing shall be located or maintained on any dock or other Common Area except one dock box per Boat Slip, the design and location of which must be approved by the Association. All fishing gear and other marine devices and equipment when not in use shall be stored on board or in a dock box.

C. Boats. No "tramp vessels", "derelict vessels", barges, or commercial vessels may be moored in any Boat Slip. All boats shall be maintained in a neat, clean, ship shape, and seaworthy condition. No inoperable boat without current registration and insurance, will be permitted in any Boat Slip. The Association shall have the right to have all prohibited boats towed away and stored at the expense of the holder of the Boat Slip Certificate. No major repairs or complete overhauls to any boat may be made at a Boat Slip. Boats may not be used as permanent residences.

D. Signs. No signs (including "for sale" or "for rent" signs) shall be permitted on any Boat Slip or in the Common Areas.

E. Trash Disposal. Newspapers, magazines and other similar items must be placed in a solid waste container. Garbage and other perishable items shall be placed in a plastic bag secured at the top and placed in the solid waste container. Loose garbage shall not be deposited anywhere. No trash or empty boxes of any kind shall be left on the dockways. No one shall throw, discharge, pump or deposit from any boat or float any refuse, oil, spirits, flammable liquid or polluting matter in the harbor. All such matter shall be deposited at approved oil disposal facilities. Waste material such as paper, beer or drink cans, cigarette stubs, trash, etc., must not be thrown from the boats or dock areas.

F. Dockways. Children under twelve (12) years of age are not permitted on docks without the immediate presence of a parent or other responsible adult. Parents shall not allow children to run and play on the dockways. Dockways shall be kept clear and uncluttered.

G. Mooring/Storm Precautions. To prevent damage from weather or storms, adequate mooring lines must be properly secured and maintained, and all outside property shall be battened down, secured, or placed inside the boat. The Association may order boats immediately removed from their slips in the event of impending hurricanes or other storms in order to protect the docks and other Common Areas. Upon the issuance of any such order, each holder of a Boat Slip Certificate shall immediately remove his boat from the Boat Slip or cause any tenant using the Boat Slip to do so. Any damage caused to the common area on account of failure to remove a boat in accordance with such order shall be repaired by the Association at the sole cost and expense of the Boat Slip Certificate holder failing to remove or cause the removal of the boat.

H. Guests. Every holder of a Boat Slip Certificate shall insure that his guests and tenants abide by this Declaration and all rules and regulations and shall be responsible to the Association for any violation. The number of guests permitted at any one time may be limited by the Association.

I. Fish Cleaning. Fish cleaning of any kind will not be permitted at the Development except at a place or places designated by the Board of Directors.

J. Operation of Engines. Unnecessary operation of engines in slips is not permitted. Engines may not be operated in gear while boats are moored.

K. Water/Power Lines and Connections. Water or power lines shall not be left unattended across main walks. All connections to electrical receptacles shall be with marine grade cords only. All accessory cords shall be maintained in a good, safe operating condition. Frayed cords shall promptly be replaced at the Boat Slip Certificate holder's expense.

L. Speed Limit. The speed limit within the Community Boating Facility shall be dead slow, or wakeless speed, whichever is slower.

M. Animals. Animals shall be leashed at all times when on the premises. No animals shall be tied to any part of the dock, including fingers or dock boxes. Animals shall be physically kept on board at all times. The owner of an animal is responsible for cleaning up pet feces and urine.

N. Alterations. No part of the docks, utility posts or any other Common Area may be altered in any way.

O. Safety and Compliance with Law. All persons using the facilities shall do so lawfully and in such fashion as to maintain and preserve those facilities and the Common Area. Each person shall be responsible for his/her own conduct and safety. All persons shall comply with all applicable governmental ordinances.

SECTION 4. Profits. Notwithstanding that the Boat Slip Certificates are issued by the Association, the proceeds, if any, from the initial sale or transfer of Boat Slip Certificates shall belong to and be the sole property of the Developer. When requested to do so by the Developer, the Association will issue Boat Slip Certificates without charge. The Association shall not issue any initial Boat Slip Certificate except at the direction of the Developer.

SECTION 5. Transfer of Certificate. Upon the transfer of a Boat Slip Certificate, the transferring holder shall surrender the applicable Certificate to the Association and a new Certificate shall be issued by the Association to the new holder. The Association shall be entitled to charge a reasonable administrative fee for handling the transfer.

ARTICLE X
LOTS SUBJECT TO DECLARATION/ENFORCEMENT

SECTION 1. Lots Subject to Declaration. The covenants and restrictions contained in this Declaration are for the purpose of protecting the value and desirability of the Planned Community and the Lots. All present and future Owners, tenants and occupants of Lots and their guests or invitees, shall be subject to, and shall comply with the provisions of the Declaration, and as the Declaration may be amended from time to time. The acceptance of a deed of conveyance or the entering into of a lease or the entering into occupancy of any Lot shall constitute an agreement that the provisions of the Declaration are accepted and ratified by such Owner, tenant or occupant. The covenants and restrictions of this Declaration shall run with and bind the land and shall bind any person having at any time any interest or estate in any Lot, their heirs, successors and assigns, as though such provisions were made a part of each and every deed of conveyance or lease, for a term of twenty (20) years from the date this Declaration is recorded, after which time they shall be automatically extended for successive periods of ten (10) years, unless terminated by the Lot Owners.

SECTION 2. Enforcement and Remedies. The covenants and restrictions of this Declaration shall inure to the benefit of and be enforceable (by proceedings at law or in equity) by the Association, or the Owner of any Lot, their respective legal representatives, heirs, successors and assigns. The Executive Board shall be entitled to enforce its Articles of Incorporation, Bylaws and Rules and Regulations. In addition to the remedies otherwise provided for herein concerning the collection of Assessments, the following remedies shall be available:

A. Association to Remedy Violation. In the event an Owner (or other occupant of a Lot) is in violation of or fails to perform any maintenance or other activities required by this Declaration, the Association's Bylaws, Charter or Rules and Regulations, the Executive Board, after 30-days notice, may enter upon the Lot and remedy the violation or perform the required maintenance or other activities, all at the expense of the Owner. The full amount of the cost of remedying the violation or performing such maintenance or other activities shall be chargeable to the Lot, including collection costs and reasonable attorneys' fees. Such amounts shall be due and payable within 30 days after Owner is billed. If not paid within said 30 day period, the amount thereof may immediately be added to and become a part of the Annual Assessment levied against said Owner's Lot. In the event that any maintenance activities are necessitated to any Common or Limited Common Elements by the willful act or active or passive negligence of any Owner, his family, guests, invitees or tenants, and the cost of such maintenance, repair or other activity is not fully covered by insurance, then, at the sole discretion of the Board of Directors, the cost of the same shall be the personal obligation of the Owner and if not paid to the Association upon demand, may immediately be added to and become a part of the Annual Assessment levied against said Owner's Lot.

B. Fines. The Association may in accordance with the procedures set forth in the Act establish a schedule of and collect fines for the violation of this Declaration or of the Association's Articles of Incorporation, Bylaws or Rules and Regulations. If an Owner does not pay the fine when due, the fine shall immediately become a part of and be added to the Annual Assessment against the Owner's Lot and may be enforced by the Association as all other Assessments provided for herein.

C. Suspension of Services and Privileges. The Association may in accordance with the procedures set forth in the Act suspend all services and privileges provided by the Association to an Owner (other than rights of access to Lots) for any period during which any Assessments against the Owner's lot remain unpaid for at least 30 days or for any period that the Owner or the Owner's Lot is otherwise in violation of this Declaration or the Association's Charter, Bylaws, or Rules and Regulations.

SECTION 3. Miscellaneous. Failure by the Association or by an Owner to enforce any covenant or restriction herein contained shall in no event be deemed a waiver of the right to do so thereafter. The remedies provided herein are cumulative and are in addition to any other remedies provided by law.

ARTICLE XI
GENERAL PROVISIONS

SECTION 2. Rights of Institutional Note Holders. Any institutional holder of a first lien on a Lot will, upon request, be entitled to (a) inspect the books and records of the Association during normal business hours, (b) receive an annual audited financial statement of the Association within ninety (90) days following the end of its fiscal year, (c) receive written notice of all meetings of the Association and right to designate a representative to attend all such meetings, (d) receive written notice of any condemnation or casualty loss that affects either a material portion of the Planned Community or the property securing its loan, (e) receive written notice of any sixty-day (60) delinquency in the payment of Assessments or charges owed by any Owner of any property which is security for the loan, (f) receive written notice of a lapse, cancellation, or material modification of any insurance policy or fidelity bond maintained by the Association, (g) receive written notice of any proposed action that requires the content of a specified percentage of mortgage holders, and (h) be furnished with a copy of any master insurance policy.

SECTION 3. Utility Service. Water and Sewer for the Planned Community shall be by private well and septic system. The Declarant reserves the right to subject the Planned Community to a contract with Progress Energy Carolinas for the installation of street lighting requiring a continuing monthly payment to Progress Energy Carolinas by each Lot Owner.

SECTION 4. Severability. Invalidation of any one of these covenants or restrictions by judgment or court order shall in no way affect any other provisions which shall remain in full force and effect.

SECTION 5. Amendment of Declaration. Except in cases of amendments that may be executed by the Declarant under this Declaration or by certain Lot Owners under Section 47F-2-118(b) of the Act, this Declaration may be amended by affirmative vote or written agreement signed by Owners of Lots to which at least sixty-seven percent (67%) of the votes in the Association are allocated, or by the Declarant if necessary for the exercise of any Special Declarant Right or development or other right reserved to the Declarant herein.

SECTION 6. FHA/VA Approval. So long as there is Class B membership, annexation of Additional Properties, dedication of Common Elements and amendments to this Declaration must be approved by the Federal Housing Administration and/or the

Department of Veterans Affairs, as the case may be, if either of those agencies has approved the making, insuring or guaranteeing of mortgage loans within the Planned Community.

SECTION 7. North Carolina Planned Community Act. It is the intent of the Declarant to comply with the requirements imposed on the Planned Community by the Act and to the extent any of the terms of this Declaration violate the Act, the terms of the Act shall control.

IN TESTIMONY WHEREOF, Declarant has caused this Declaration to be signed in its corporate name by its president pursuant to authority of Declarant's Board of Directors as of the day and year first above written.

UNIVERSITY GROUP, INC

By: Terry F Turner President

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, V. M. Strachan, a Notary Public of the county and state aforesaid, certify that TERRY F. TURNER personally appeared before me this day and acknowledged that he is President of UNIVERSITY GROUP, INC., and further acknowledged the due execution of the foregoing instrument on behalf of the corporation. Witness my hand and official stamp or seal, this 8th day of July, 2004.

V. M. Strachan
Notary Public

My commission expires: 2-20-2006
(SEAL)

OFFICIAL SEAL
NORTH CAROLINA • NEW HANOVER COUNTY
V.M. STRACHAN
NOTARY PUBLIC
My Commission Expires ______

Legal Description for the Easement to Lot No. 4, Waters Edge at Deerfield

Located in Topsail Township, Pender County, North Carolina and beginning at an iron rod set in the western right of way line of Waters Edge Drive where it is intersected by the western line of Lot No. 3 and the eastern line of Lot No. 4, Waters Edge at Deer Field. Running thence, from the said point of beginning and with the western right of way line of Waters Edge Drive as it curves to the left, South 46 degrees 12 minutes 09 seconds East – 12.42' chord distance (Delta = 14°16'16", Tangent = 6.26', Radius = 50.00') to a point on the edge of the asphalt pavement; thence, with the edge of the asphalt pavement, the following courses: South 19 degrees 30 minutes 26 seconds West – 13.29 feet, South 09 degrees 12 minutes 17 seconds East – 10.61 feet, South 27 degrees 22 minutes 37 seconds East – 9.39 feet, South 37 degrees 38 minutes 53 seconds East – 41.44 feet, South 36 degrees 14 minutes 58 seconds East – 29.92 feet, and South 37 degrees 23 minutes 32 seconds East – 33.33 feet to a point on the edge of the asphalt; thence, South 55 degrees 27 minutes 35 seconds West – 15.27 feet to an iron rod at the southeast corner of Lot No. 4; thence, with the dividing line of Lot No. 3 and Lot No 4, North 36 degrees 39 minutes 00 seconds West – 100.26 feet to an iron rod; thence, with the said dividing line of Lot No. 3 and Lot No. 4 as it curves to the right, North 12 degrees 35 minutes 52 seconds West – 24.54 feet chord distance (Delta = 48°14'48", Tangent = 13.43', Radius = 30.00') to an iron rod; thence, North 08 degrees 12 minutes 47 seconds East – 27.92 feet to the point of beginning, containing 1970 square feet and being that area of Lot No. 3 lying west of the existing asphalt pavement and adjacent to and east of the eastern lot line of Lot No. 4, Waters Edge at Deerfield.

NORTH CAROLINA PROFESSIONAL SEAL L-2580 LAND SURVEYOR MANLEY D. CARR

Manley D Carr 5/03/04

NORTH CAROLINA - PENDER COUNTY: The foregoing (or annexed) certificate of V. M. Strachan, is certified to be correct. This 8 day of July, A.D. 20 04
JOYCE M. SWICEGOOD - Pender County Register of Deeds
By: Jahi P Green Deputy/~~Assistant~~ Register of Deeds

BOAT SLIP CERTIFICATE
of
WATERS EDGE COMMUNITY BOATING FACILITY
Issued by
Waters Edge HOA, Inc.
A NON-PROFIT CORPORATION
INCORPORATED UNDER THE LAWS OF THE STATE OF NORTH CAROLINA

THIS CERTIFIES THAT ______________________________ (the "Holder") is the holder of one (1) Boat Slip Certificate (the "Certificate") for the Community Boating Facility at Waters Edge at Deerfield (the "Facility"). The Certificate shall be held and transferred in accordance with the Declaration of Covenants, Conditions and Restrictions for Waters Edge at Deerfield recorded in Book ______, at Page ______, of the Pender County Registry (the "Declaration"), and the Association's Articles of Incorporation, Bylaws and Rules and Regulations, as they may be amended from time to time.

This Certificate shall entitle the Holder to exclusive use and enjoyment of Boat Slip ____ (___) of the Community Boating Facility, as identified upon the records of the undersigned.

This Certificate may be transferred only to the owners of a Lot within Waters Edge at Deerfield.

The Holder acknowledges by acceptance of this Certificate that the Community Boating Facility has not been constructed. University Group, Inc., the Developer as described in the Declaration, covenants and agrees with the Holder to construct the Community Boating Facility with reasonable dispatch generally in accordance with the plans therefore by Arnold W. Carson, PLSPC, dated March 3, 2003 and entitled "Proposed Dock Facility for Water's Edge At Deerfield", consisting of 5 sheets. A letter of credit in the amount of $300,000.00 has been posted with Pender County to cover the cost of the project.

IN WITNESS WHEREOF, the Association has caused this Certificate to be signed by its duly authorized officer.

DATED: ______________

WATERS EDGE HOA, INC.

By:______________________
_____ President

UNIVERSITY GROUP, INC

By:______________________
_____ President

FILED

04 JAN 16 PM 3:19

JOYCE M. SWICEGOOD
REGISTER OF DEEDS
PENDER COUNTY, NC

PENDER COUNTY NC 01/16/2004
$5800.00
STATE OF NORTH CAROLINA Real Estate Excise Tax

JK

Warranty Deed

Excise Tax $5,800.00 Recording time, book and page

Parcel Identifier No. 03A00086
No certification or opinion on title is expressed by the preparer of this deed except as may appear from the preparer's signed certificate or opinion.
Prepared by: William O.J. Lynch
Hogue, Hill, Jones, Nash & Lynch, L.L.P.
P. O. Drawer 2178
Wilmington, NC 28402
Grantee mailing address: 1904 Eastwood Road, Suite 212, Wilmington, NC 28403
Returned to:

STATE OF NORTH CAROLINA

COUNTY OF PENDER

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS that **JIMMY'S ISLAND, LLC**, a North Carolina limited liability company, "GRANTOR", in consideration of TEN AND NO/100 ($10.00) DOLLARS and other good and valuable consideration, paid to GRANTOR by **UNIVERSITY GROUP, INC.**, a North Carolina corporation, "GRANTEE", the receipt of which is hereby acknowledged, by these presents, does give, grant, bargain, sell and convey unto the said GRANTEE, and GRANTEE'S successors, and assigns, forever, in fee simple, all that certain parcel of land situated, lying and being in Topsail Township, County of Pender, State of North Carolina, and more particularly described as follows:

All of that land shown on that certain map entitled "Map of Survey Showing the Boundary of Water's Edge at Deerfield", said map being recorded in Map Book 35, Page 66, of the Pender County Registry, reference to which map is hereby made for a more complete description.

Together with all rights, easements, privileges and benefits appurtenant thereto.

There is excepted, however, from this conveyance the property described on Exhibit A attached hereto and incorporated herein as if set out in full.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging, to the said GRANTEE and said GRANTEE's heirs, successors, and assigns, forever, in fee simple; and the GRANTOR, for itself, its successors and assigns, does covenant with the said GRANTEE and said GRANTEE's heirs, successors and assigns, that GRANTOR is seised of the premises in fee simple, and has the right to convey the same in the estate aforesaid, that title is marketable and free and clear of all encumbrances, except as herein stated, and that GRANTOR hereby will warrant and defend the title against the lawful claims of all persons whomsoever, except for the exceptions herein stated.

Title to the property is subject to the following exceptions:

The provisions of all applicable zoning and land use ordinances, statutes and regulations;
current year ad valorem taxes; and
all applicable restrictive covenants and utility easements of record.

The designation GRANTOR and GRANTEE as used herein shall include said parties, their successors and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

IN WITNESS WHEREOF, the GRANTOR has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officer, this the 10 day of January, 2004.

JIMMY'S ISLAND, LLC

By: Terry F Turner (SEAL)
Terry F. Turner, Member-Manager

By: A V Saffo (SEAL)
A. V. Saffo, Member-Manager

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, Kelly Repko, a notary public of the County and State aforesaid, do hereby certify that TERRY F. TURNER, a member-manager of JIMMY'S ISLAND, LLC, a North Carolina limited liability company, personally appeared before me this day and acknowledged the execution of the foregoing instrument. WITNESS my hand and official seal this the 10 day of January, 2004.

My commission expires: 5-5-2007 Kelly Repko
Notary Public
(SEAL)

KELLY REPKO NOTARY PUBLIC NEW HANOVER COUNTY, N.C.

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, Kelly Repko, a notary public of the County and State aforesaid, do hereby certify that A. V. SAFFO, a member-manager of JIMMY'S ISLAND, LLC, a North Carolina limited liability company, personally appeared before me this day and acknowledged the execution of the foregoing instrument. WITNESS my hand and official seal this the 10 day of January, 2004.

My commission expires: 5-5-2007 Kelly Repko
Notary Public
(SEAL)

KELLY REPKO NOTARY PUBLIC NEW HANOVER COUNTY, N.C.

EXHIBIT A

THERE IS EXCEPTED FROM THIS CONVEYANCE THE FOLLOWING DESCRIBED PROPERTY:

Located in Topsail Township, Pender County, North Carolina and beginning at a point in the western right of way line of a proposed 50 foot wide access road. Said point is located North 66 degrees 29 minutes 11 seconds West – 358.35 feet from an existing "RBH" stone marking the southwest corner of Lot No. 1, Section 1, Deerfield Subdivision as shown on a map of said subdivision recorded in Map Book 13 at Page 60, Pender County Registry. Running thence, from the said point of beginning, South 46 degrees 37 minutes 59 seconds West – 316.02 feet to a point at the approximate high water line of Mill Creek; thence, with the high water line of Mill Creek, North 67 degrees 33 minutes 11 seconds West – 26.75 feet to a point; thence, continuing with the high water line of Mill Creek, North 89 degrees 01 minutes 13 seconds West – 20.97 feet to a point; thence, continuing with the high water line of Mill Creek, North 30 degrees 11 minutes 15 seconds West – 30.00 feet to a point; thence, continuing with the high water line of Mill Creek, North 08 degrees 05 minutes 54 seconds West – 62.65 feet to a point; thence, North 49 degrees 32 minutes 43 seconds East – 325.78 feet to a point in the western line of a proposed 50 foot wide access road; thence, with the western line of the said proposed road as it curves to the left to a point that is South 35 degrees 56 minutes 11 seconds East – 12.40 feet chord distance (Curve Data: Delta = 0°21'10", Tangent = 6.20', Radius 2014.00'); thence, continuing with the western right of way line of said proposed road as it curves to the right to a point that is South 28 degrees 03 minutes 20 seconds East – 93.91 feet chord distance (Curve Data: Delta = 16°06'52", Tangent = 47.42', Radius = 335.00') to the point of beginning, containing 0.878 acres more or less as computed by the coordinate method and being a part of that property conveyed to Jimmy's Island Inc, in Deed Book 1946 at Page 179, Pender County Registry. All bearings are in angular relation to NC Grid North (NAD 83) and all distances are horizontal field measurements.

Subject to a 10 foot wide utility easement which lies adjacent to and west of the western right of way line of the above reference road. And being a strip of property 10 foot wide and parallel with the western line of said proposed road and beginning at the south property line and extending in a northern direction to the north property line of the above described property.

Together with an easement for ingress and egress to the above described property. Said easement begins at the northwestern corner of Lot 1, Section 1, Deerfield Subdivision as shown on a map recorded in Map Book 13 at Page 60, Pender County Registry and in the southern right of way line of Great Oaks Drive if it were extended to the west. Running thence, from the said beginning point, and with the southern line of said of said proposed road, South 42 degrees 02 minutes 14 seconds West – 109.73 feet to an point; thence, with the right of way of said road as it curves to the left to a point that is South 29 degrees 36 minutes 59 seconds West – 15.06 feet chord distance to a point (Curve Data: Delta = 24°50'31", Tangent = 7.71', Radius = 35.00'); thence, continuing with the southern right of way line of said proposed road as it curves to the right to a point that is North 85 degrees 23 minutes 53 seconds West – 96.84 feet chord distance to a point in the western right of way line of said proposed road (Curve Data: Delta = 151°06'06", Tangent = 194.05', Radius = 50.00'); thence, continuing with the western right of way line of said proposed road as it curves to the left to a point that is North 22 degrees 58 minutes 48 seconds West – 152.23 feet chord distance (Curve Data: Delta = 26°15'56", Tangent = 78.16', Radius = 335.00'); thence crossing the said proposed road, North 53 degrees 53 minutes 14 seconds East – 50.00 feet to a point in the eastern right of way line of said proposed road; thence, with the eastern right of way line of said roadway, South 28 degrees 56 minutes 16 seconds East – 96.17 feet chord distance (Curve data: Delta = 14°52'55", Tangent = 48.47', Radius = 385.00') to a point; thence, continuing with the eastern right of way line of the said proposed road as it curves to the left to a point in the northern right of way line of the said proposed road that is, South 79 degrees 51 minutes 46 seconds East – 59.43 feet chord distance (Curve Data: Delta = 116°11'59", Tangent = 56.23', Radius = 35.00'); thence, with the northern right of way line of the said proposed road, North 42 degrees 02 minutes 14 seconds East – 80.27 feet to a point in the eastern line of that property conveyed to Jimmy's Island Inc.; thence, with the eastern line of the Jimmy's Island Inc., South 38 degrees 15 minutes 37 seconds East – 60.87 feet to the point of beginning, containing .0478 acres more of less as computed by the coordinate method and being a part of that property conveyed to Jimmy's Island Inc. in Deed Book 1946 at Page 179, Pender County Registry.

All bearings in the above-described property are in angular relation to NC Grid North (NAD 83) and all distances are horizontal field measurements. This property was surveyed, mapped and described by Robert H. Goslee & Associates, PA during January, 2003.

NORTH CAROLINA - PENDER COUNTY: The foregoing (or annexed) certificate of Kelly Kepko, is certified to be correct. This 16 day of Jan, A.D. 2004
JOYCE M. SWICEGOOD - Pender County Register of Deeds
By: Sharon B. Willoughby Deputy/~~Assistant~~
Register of Deeds

vBHN

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JOYCE M. SWICEGOOD
REGISTER OF DEEDS
PENDER COUNTY, NC

**COVER SHEET FOR
AMENDMENT TO DECLARATION OF
COVENANTS, CONDITIONS AND
RESTRICTIONS FOR WATERS EDGE
AT DEERFIELD
DATED JULY 29, 2004**

Recorded and Verified
Joyce M. Swicegood
Register of Deeds
Pender County, NC

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STATE OF NORTH CAROLINA

COUNTY OF PENDER

AMENDMENT TO DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS FOR WATERS EDGE AT DEERFIELD

This Amendment to Declaration of Covenants, Conditions and Restrictions, made the 29 day of July, 2004, by UNIVERSITY GROUP, INC., a North Carolina corporation, hereinafter referred to as "Declarant" or Developer";

W I T N E S S E T H:

Whereas, a Declaration of Covenants, Conditions and Restrictions for Waters Edge at Deerfield (the "Declaration") has been recorded in Book 2426 at Page 248, Pender County Registry; and

Whereas, the Declarant desires to amend the Declaration for the purpose of correcting an obvious error or inconsistency in drafting, typing or reproduction as permitted by Article VI, Section 3.C. of the Declaration.

Now, therefore, Declarant amends the preamble of the Declaration to read as follows:

> Whereas, Declarant is the owner of certain real property in Pender County, North Carolina, known as **WATERS EDGE AT DEERFIELD**, which is shown on plats recorded in the Office of the Register of Deeds of Pender County, North Carolina, in Map Book 37 Pages 133 and 134, to which reference is made for a more particular description (the "Property").

Developer confirms that the Declaration, as hereby amended, shall remain in full force and effect. All capitalized terms used herein shall have the meaning defined in the Declaration.

IN TESTIMONY WHEREOF, Declarant has caused this Amendment to Declaration to be signed in its corporate name by its president pursuant to authority of Declarant's Board of Directors as of the day and year first above written.

UNIVERSITY GROUP, INC

By: Tony F Turner

President

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, V. M. Strachan, a Notary Public of the county and state aforesaid, certify that TERRY F. TURNER personally appeared before me this day and acknowledged that he is President of UNIVERSITY GROUP, INC., and further acknowledged the due execution of the foregoing instrument on behalf of the corporation. Witness my hand and official stamp or seal, this 29 day of July, 2004.

V. M. Strachan
Notary Public

My commission expires: 2-20-2006
(SEAL)

OFFICIAL SEAL
NORTH CAROLINA • NEW HANOVER COUNTY
V.M. STRACHAN
NOTARY PUBLIC
My Commission Expires ________

NORTH CAROLINA - PENDER COUNTY: The foregoing (or annexed) certificate of V. M. Strachan, is certified to be correct. This 30 day of July, A.D. 2004
JOYCE M. SWICEGOOD - Pender County Register of Deeds
By: Cathy D. Green Deputy/Assistant
Register of Deeds

Hogue+hill

FILED

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JOYCE M. SWICEGOOD
REGISTER OF DEEDS
PENDER COUNTY, NC

STATE OF NORTH CAROLINA

COUNTY OF PENDER

AMENDMENT TO DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS FOR WATERS EDGE AT DEERFIELD

This Amendment to Declaration of Covenants, Conditions and Restrictions, made the 10 day of November, 2004, by UNIVERSITY GROUP, INC., a North Carolina corporation, hereinafter referred to as "Declarant" or Developer";

WITNESSETH:

WHEREAS, a Declaration of Covenants, Conditions and Restrictions for Waters Edge at Deerfield (the "Declaration") has been recorded in Book 2426 at Page 248, Pender County Registry; and

WHEREAS, Article IX, Section 3, of the Declaration provides in part that "Boats of 21' or less with no cabins or head are permitted"; and

WHEREAS, the applicable regulatory agencies now permit Boats up to 24' in length to be moored at the boating facility at Waters Edge; and

WHEREAS, Article VI, Section 3, of the Declaration permits the Declarant to amend the Declaration to comply with governmental regulations applicable to the Planned Community.

NOW, THEREFORE, Declarant amends Article IX, Section 3, of the Declaration to read as follows:

SECTION 3. Use Restriction. The Community Boating Facility may not be used for more than 18 Boat Slips. Boats of 24 feet or less with no cabins or head are permitted. No gasoline sales or other commercial activity shall be permitted. No motor vehicles or boat trailers shall be permitted on

Recorded and Verified
Joyce M. Swicegood
Register of Deeds
Pender County, NC

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site and access shall be limited to the Access Easements over Lots 2, 3, 17 and 18 as shown on the above referenced plat. Notwithstanding the foregoing, motor vehicles may use the temporary parking spaces/drop-off area constituting a part of the Community Boating Facility. In addition to the other use restrictions contained in this Declaration, the following use restrictions shall also apply to the Community Boating Facility:

A. Nuisances. No noxious or offensive activity shall be carried on upon any boat, Boat Slip or Common Area, nor shall anything be done thereon which may be or may become an annoyance or nuisance to the neighborhood. There shall not be maintained any plants or animals, nor device or thing of any sort whose normal activities or existence are in any way noxious, dangerous, unsightly, unpleasant or other nature as may diminish or destroy the enjoyment of other Boat Slips. It shall be the responsibility of each holder of a Boat Slip Certificate to prevent the development of any unclean, unsightly or unkept condition of the Boat Slip or any boat using it.

B. Devices and Structures. No device, structure or other thing shall be located or maintained on any dock or other Common Area except one dock box per Boat Slip, the design and location of which must be approved by the Association. All fishing gear and other marine devices and equipment when not in use shall be stored on board or in a dock box.

C. Boats. No "tramp vessels", "derelict vessels", barges, or commercial vessels may be moored in any Boat Slip. All boats shall be maintained in a neat, clean, ship shape, and seaworthy condition. No inoperable boat without current registration and insurance, will be permitted in any Boat Slip. The Association shall have the right to have all prohibited boats towed away and stored at the expense of the holder of the Boat Slip Certificate. No major repairs or complete overhauls to any boat may be made at a Boat Slip. Boats may not be used as permanent residences.

D. Signs. No signs (including "for sale" or "for rent" signs) shall be permitted on any Boat Slip or in the Common Areas.

E. Trash Disposal. Newspapers, magazines and other similar items must be placed in a solid waste container. Garbage and other perishable items shall be placed in a plastic bag secured at the top and placed in the solid waste container. Loose garbage shall not be deposited anywhere. No trash or empty boxes of any kind shall be left on the dockways. No one shall throw, discharge, pump or deposit from any boat or float any refuse, oil, spirits, flammable liquid or polluting matter in the harbor. All such matter shall be deposited at approved oil disposal facilities. Waste material such as paper, beer or drink cans, cigarette stubs, trash, etc., must not be thrown from the boats or dock areas.

F. Dockways. Children under twelve (12) years of age are not permitted on docks without the immediate presence of a parent or other responsible adult. Parents shall not allow children to run and play on the dockways. Dockways shall be kept clear and uncluttered.

G. Mooring/Storm Precautions. To prevent damage from weather or storms, adequate mooring lines must be properly secured and maintained, and all outside property shall be battened down, secured, or placed inside the boat. The Association may order boats immediately removed from their slips in the event of impending hurricanes or other storms in order to protect the docks and other Common Areas. Upon the issuance of any such order, each holder of a Boat Slip Certificate shall immediately remove his boat from the Boat Slip or cause any tenant using the Boat Slip to do so. Any damage caused to the common area on account of failure to remove a boat in accordance with such order shall be repaired by the Association at the sole cost and expense of the Boat Slip Certificate holder failing to remove or cause the removal of the boat.

H. Guests. Every holder of a Boat Slip Certificate shall insure that his guests and tenants abide by this Declaration and all rules and regulations and shall be responsible to the Association for any violation. The number of guests permitted at any one time may be limited by the Association.

I. Fish Cleaning. Fish cleaning of any kind will not be permitted at the Development except at a place or places designated by the Board of Directors.

J. Operation of Engines. Unnecessary operation of engines in slips is not permitted. Engines may not be operated in gear while boats are moored.

K. Water/Power Lines and Connections. Water or power lines shall not be left unattended across main walks. All connections to electrical receptacles shall be with marine grade cords only. All accessory cords shall be maintained in a good, safe operating condition. Frayed cords shall promptly be replaced at the Boat Slip Certificate holder's expense.

L. Speed Limit. The speed limit within the Community Boating Facility shall be dead slow, or wakeless speed, whichever is slower.

M. Animals. Animals shall be leashed at all times when on the premises. No animals shall be tied to any part of the dock, including fingers or dock boxes. Animals shall be physically kept on board at all times. The owner of an animal is responsible for cleaning up pet feces and urine.

N. Alterations. No part of the docks, utility posts or any other Common Area may be altered in any way.

O. Safety and Compliance with Law. All persons using the facilities shall do so lawfully and in such fashion as to maintain and preserve those facilities and the Common Area. Each person shall be responsible for his/her own conduct and safety. All persons shall comply with all applicable governmental ordinances.

Developer confirms that the Declaration, as hereby amended, shall remain in full force and effect. All capitalized terms used herein shall have the meaning defined in the Declaration.

IN TESTIMONY WHEREOF, Declarant has caused this Amendment to Declaration to be signed in its corporate name by its president pursuant to authority of Declarant's Board of Directors as of the day and year first above written.

UNIVERSITY GROUP, INC

By: Terry F. Turner
President

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, V. M. Strachan, a Notary Public of the county and state aforesaid, certify that TERRY F. TURNER personally appeared before me this day and acknowledged that he is President of UNIVERSITY GROUP, INC., and further acknowledged the due execution of the foregoing instrument on behalf of the corporation. Witness my hand and official stamp or seal, this 10 day of November, 2004.

V. M. Strachan
Notary Public

My commission expires: 2-20-2006
(SEAL)

OFFICIAL SEAL
NORTH CAROLINA • NEW HANOVER COUNTY
V.M. STRACHAN
NOTARY PUBLIC
My Commission Expires

NORTH CAROLINA - PENDER COUNTY: The foregoing
(or annexed) certificate of V.M. Strachan, is
certified to be correct. This 17 day of Nov., A.D. 2004
JOYCE M. SWICEGOOD - Pender County Register of Deeds
By: Joyce M. Swicegood ~~Deputy/Assistant~~
Register of Deeds

FILED

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JOYCE M. SWICEGOOD
REGISTER OF DEEDS
PENDER COUNTY, NC

Recorded and Verified
Joyce M. Swicegood
Register of Deeds
Pender County, NC

STATE OF NORTH CAROLINA

COUNTY OF PENDER

AMENDMENT TO DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS FOR WATERS EDGE AT DEERFIELD

This Amendment to Declaration of Covenants, Conditions and Restrictions, made the 24 day of October, 2006, by UNIVERSITY GROUP, INC., a North Carolina corporation, hereinafter referred to as "Declarant" or Developer";

WITNESSETH:

WHEREAS, a Declaration of Covenants, Conditions and Restrictions for Waters Edge at Deerfield (the "Declaration") has been recorded in Book 2426 at Page 248, Pender County Registry; and

WHEREAS, in Article I, Section 9 of the Declaration, "Community Boating Facility" is defined as being shown on plat recorded in Map book 37, Page 133, Pender County Registry; and

WHEREAS, the Community Boating Facility is in fact shown on plat recorded in Map book 42, Page 80, Pender County Registry; and

WHEREAS, the Declaration permits the Declarant to amend the Declaration to reflect platting changes.

NOW, THEREFORE, be it resolved that Article I, Section 9 of the Declaration is amended to read as follows:

> SECTION 9. Community Boating Facility means the riparian easement, the pier, the floating dock, and 18 boat slips shown on plat recorded in Map Book 42, Page 80 of the Pender County Registry and labeled "Community Boating Facility". The Community Boating Facility shall be for the exclusive use and enjoyment of the subclass of Class A Members designated and defined hereinafter as "Class A Members-Boating". The Association is obligated pursuant to this Declaration to operate and

Hogue Hill Jones Nash Lynch

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maintain the Community Boating Facility with the cost thereof being assessed only against the Class A Members-Boating as is hereinafter provided.

Developer confirms that the Declaration, as hereby amended, shall remain in full force and effect. All capitalized terms used herein shall have the meaning defined in the Declaration.

IN TESTIMONY WHEREOF, Declarant has caused this Amendment to Declaration to be signed in its corporate name by its president pursuant to authority of Declarant's Board of Directors as of the day and year first above written.

UNIVERSITY GROUP, INC

By: A. V. Saffo
Vice President

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, VICTORIA M. STRACHAN V.M. Strachan, a Notary Public of the county and state aforesaid, certify that A. V. SAFFO personally appeared before me this day and acknowledged that he is Vice President of UNIVERSITY GROUP, INC., and further acknowledged the due execution of the foregoing instrument on behalf of the corporation. Witness my hand and official stamp or seal, this 24 day of October, 2006.

Victoria M. Strachan
Notary Public

My commission expires: 2-28-2011
(SEAL)

VICTORIA M. STRACHAN
Notary Public
New Hanover County, NC

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Pender County, NC Register of Deeds page 1 of 2

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STATE OF NORTH CAROLINA

COUNTY OF PENDER

AMENDMENT TO DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS FOR WATERS EDGE AT DEERFIELD

This Amendment to Declaration of Covenants, Conditions and Restrictions, made the 07 day of December, 2012, by WATERS EDGE HOA, Inc., a North Carolina corporation;

WITNESSETH:

WHEREAS, a Declaration of Covenants, Conditions and Restrictions for Waters Edge at Deerfield has been recorded in Book 2426 at Page 248, Pender County Registry, and has previously been amended by instrument recorded in Book 3079 at Page 45, Pender County Registry (As amended, the Declaration of Covenants, Conditions and Restrictions for Waters Edge at Deerfield is referred to herein as the "Declaration"); and

WHEREAS, the Declaration permits the Amendment of Declaration, ARTICLE XI, Section 5, except in cases of amendments that may be executed by the Declarant under this Declaration or by certain Lot Owners under Section 47F-2-118(b) of the Act, this Declaration to be amended by affirmative vote or written agreement signed by Owners of Lots to which at least sixty-seven percent (67%) of the votes in the Association are allocated; and

WHEREAS, votes are currently allocated to a total of eighteen (18) Lots; and

WHEREAS, at a meeting of the members held on December 07, 2012, the Owners of thirteen (13) Lots (or 67%) voted in favor of a resolution

NOW, THEREFORE, be it resolved that Article IX, Section 3 of the Declaration is amended to replace the first paragraph with the following:

SECTION 3. Use Restrictions. The Community Boating Facility may not be used for more than 18 Boat Slips. Boats of 24 feet or less with no cabins or head are permitted. No gasoline sales or other commercial activity shall be permitted. No motor vehicles or boat trailers shall be permitted on site and access shall be limited to the Access Easements over Lots 2, 3, 17 and 18 as shown on the above referenced map. Notwithstanding the foregoing, motor vehicles may use the temporary parking spaces/drop-off area constituting a part of the Community Boating Facility. In addition to the other use

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restrictions contained in this Declaration, the following use restrictions shall also apply to the Community Boating Facility:

IN TESTIMONY WHEREOF, Waters Edge HOA, Inc. has caused this Amendment to Declaration to be signed in its corporate name by its President pursuant to the Authority of the Board of Directors as of the day ad year first above written.

WATERS EDGE HOA, Inc.

A.T. ~~Alan~~ Afshin Tamadon – President

Michael Mac – Secretary

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, Joyce M. Bonessi, a Notary Public of the county and state aforesaid, certify that A.T. ~~Alan~~ Afshin Tamadon personally appeared before me this day and acknowledged the he is President of WATERS EDGE HOA, Inc., and further acknowledged the due execution of the foregoing instrument on behalf of the corporation. Witness my hand and official stamp or seal, this 10 day of January, 2013.

Notary Public

My commission expires: 3/31/2017
(SEAL)

JOYCE M. BONESSI
NOTARY
PUBLIC
NEW HANOVER COUNTY, NC

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, Joyce M. Bonessi, a Notary Public of the county and state aforesaid, certify that Michael Mac personally appeared before me this day and acknowledged the he is Sectary of WATERS EDGE AT DEERFIELD HOA, Inc., and further acknowledged the due execution of the foregoing instrument on behalf of the corporation. Witness my hand and official stamp or seal, this 10 day of January, 2013.

Notary Public

My commission expires: 3/31/2017
(SEAL)

JOYCE M. BONESSI
NOTARY
PUBLIC
NEW HANOVER COUNTY, NC

Form DCM-MP-1

APPLICATION

(To be completed by all applicants)

RECEIVED
DIVISION OF COASTAL MANAGEMENT

1. APPLICANT

a. Landowner:

Name JIMMY'S ISLAND, LLC

Address 1904 EASTWOOD RD., SUITE 212

City WILMINGTON State N.C.

Zip 28403 Day Phone 910-256-1045

Fax 910-256-0112

b. Authorized Agent:

Name TERRY TURNER

Address 1904 EASWOOD RD, SUITE 212

City WILMINGTON State N.C.

Zip 28403 Day Phone 910-256-1045

Fax 910-256-0112

(MAJOR MODIFICATION OF PERMIT NO. 68.03)

c. Project name (if any) COMMUNITY DOCKING FACILITY FOR WATER'S EDGE AT DEERFIELD

NOTE: Permit will be issued in name of landowner(s), and/or project name.

2. LOCATION OF PROPOSED PROJECT

a. County PENDER

b. City, town, community or landmark HAMPSTEAD

c. Street address or secondary road number — END OF GREAT OAKS DR.

d. Is proposed work within city limits or planning jurisdiction? ____ Yes X No

e. Name of body of water nearest project (e.g. river, creek, sound, bay) MILL CREEK AND TOPSAIL SOUND (AIWW)

3. DESCRIPTION AND PLANNED USE OF PROPOSED PROJECT

a. List all development activities you propose (e.g. building a home, motel, marina, bulkhead, pier, and excavation and/or filling activities.

CONSTRUCT 2 "Y" SHAPED PIER SYSTEMS

b. Is the proposed activity maintenance of an existing project, new work, or both? NEW WORK

c. Will the project be for public, private or commercial use? PRIVATE

d. Give a brief description of purpose, use, methods of construction and daily operations of proposed project. If more space is needed, please attach additional pages. PROVIDE BOAT ACCESS TO MILL CREEK AND TOPSAIL SOUND FOR LOT OWNERS OF WATER'S EDGE AT DEERFIELD SUBDIVISION BY CONSTRUCTING 4 PIERS WITH BOAT SLIPS ALONG THE SHORELINE OF THE SUBDIVISION. CONSTRUCTION WILL INVOLVE JETTING PILINGS AND ASSEMBLING PIER TIMBERS.

Form DCM-MP-1

(THE BELOW LISTED INFORMATION PROVIDED ON ORIGINAL APPLICATION FOR PERMIT 68-03)

4. LAND AND WATER CHARACTERISTICS

a. Size of entire tract ______

b. Size of individual lot(s) ______

c. Approximate elevation of tract above MHW or NWL ______

d. Soil type(s) and texture(s) of tract ______

e. Vegetation on tract ______

f. Man-made features now on tract ______

g. What is the CAMA Land Use Plan land classification of the site? *(Consult the local land use plan.)*

____ Conservation ____ Transitional
____ Developed ____ Community
____ Rural ____ Other

h. How is the tract zoned by local government? ______

i. Is the proposed project consistent with the applicable zoning? ____ Yes ____ No
(Attach zoning compliance certificate, if applicable)

j. Has a professional archaeological assessment been done for the tract? ____ Yes ____ No
If yes, by whom? ______

k. Is the project located in a National Registered Historic District or does it involve a National Register listed or eligible property?
____ Yes ____ No

l. Are there wetlands on the site? ____ Yes ____ No
Coastal (marsh) ____ Other ____
If yes, has a delineation been conducted? ____
(Attach documentation, if available)

m. Describe existing wastewater treatment facilities. ______

n. Describe location and type of discharges to waters of the state. (For example, surface runoff, sanitary wastewater, industrial/commercial effluent, "wash down" and residential discharges.) ______

o. Describe existing drinking water supply source. ______

5. ADDITIONAL INFORMATION

In addition to the completed application form, the following items must be submitted:

- A copy of the deed (with state application only) or other instrument under which the applicant claims title to the affected properties. If the applicant is not claiming to be the owner of said property, then forward a copy of the deed or other instrument under which the owner claims title, plus written permission from the owner to carry out the project.

- An accurate, dated work plat (including plan view and cross-sectional drawings) drawn to scale in black ink on an 8 1/2" by 11" white paper. (Refer to Coastal Resources Commission Rule 7J.0203 for a detailed description.)

Please note that original drawings are preferred and only high quality copies will be accepted. Blue-line prints or other larger plats are acceptable only if an adequate number of quality copies are provided by applicant. (Contact the U.S. Army Corps of Engineers regarding that agency's use of larger drawings.) A site or location map is a part of plat requirements and it must be sufficiently detailed to guide agency personnel unfamiliar with the area to the site. Include highway or secondary road (SR) numbers, landmarks, and the like.

- A Stormwater Certification, if one is necessary.

- A list of the names and complete addresses of the adjacent waterfront (riparian) landowners and signed return receipts as proof that such owners have received a copy of the application and plats by certified mail. Such landowners must be advised that they have 30 days in which to submit comments on the proposed project to the Division of Coastal Management. Upon signing this form, the applicant further certifies that such notice has been provided.

Name SEE ATTACHED LIST
Address
Phone

Name
Address
Phone

Name
Address
Phone

- A list of previous state or federal permits issued for work on the project tract. Include permit numbers, permittee, and issuing dates.

CAMA PERMIT 68-03
CORPS OF ENGS ACTION ID 200300506

- A check for $250 made payable to the Department of Environment, Health, and Natural Resources (DEHNR) to cover the costs of processing the application.

- A signed AEC hazard notice for projects in oceanfront and inlet areas.

- A statement of compliance with the N.C. Environmental Policy Act (N.C.G.S. 113A - 1 to 10) If the project involves the expenditure of public funds or use of public lands, attach a statement documenting compliance with the North Carolina Environmental Policy Act.

6. CERTIFICATION AND PERMISSION TO ENTER ON LAND

I understand that any permit issued in response to this application will allow only the development described in the application. The project will be subject to conditions and restrictions contained in the permit.

I certify that to the best of my knowledge, the proposed activity complies with the State of North Carolina's approved Coastal Management Program and will be conducted in a manner consistent with such program.

I certify that I am authorized to grant, and do in fact, grant permission to representatives of state and federal review agencies to enter on the aforementioned lands in connection with evaluating information related to this permit application and follow-up monitoring of the project.

I further certify that the information provided in this application is truthful to the best of my knowledge.

(REVISED DEC 29, 2003)

This is the 1st day of JULY, 2003

Print Name Terry F. Turner

Signature Terry F Turner
Landowner or Authorized Agent

Please indicate attachments pertaining to your proposed project.

- [ ] DCM MP-2 Excavation and Fill Information
- [ ] DCM MP-3 Upland Development
- [x] DCM MP-4 Structures Information
- [ ] DCM MP-5 Bridges and Culverts
- [x] DCM MP-6 Marina Development

NOTE: Please sign and date each attachment in the space provided at the bottom of each form.

RECEIVED
JAN 0 2 2004
DIVISION OF
COASTAL MANAGEMENT

REVISED 12/29/03

Form DCM-MP-4

STRUCTURES

(Construction within Public Trust Areas)

Attach this form to Joint Application for CAMA Major Permit, Form DCM-MP-1. Be sure to complete all other sections of the Joint Application which relate to this proposed project.

a. Docks and/or Piers
  (1) __Commercial X Community X Private
  (2) Number 4

	Mill Creek Pier 1	Mill Creek Pier 2	Topsail Sound Pier 1	Topsail Sound Pier 2
(3) Length (From MHW)	265'	265'	300'	300'
(4) Width	6'	6'	6'	6'
(5) Finger Piers	0	0	3	2 (All 24'x4')
(6) Platforms	1	1	1	1
Length	150'	120'	90'	40'
Width	6	6	6	6 TFT
* (7) Number of Slips	5	4	5	4
(8) Proximity to Adjacent Riparian Property lines	75'	225'	100'	250'
(9) Width of Waterbody (Marsh to Marsh)	85'	100'	500'	560'
(10) Water Depth at Waterward end of pier at MLW	-3'	-3'	-4'	-4'

* SLIPS ARE 14'W X 21'L BOAT-LIFTS

b. Boathouse (including covered lifts) (NONE)
  (1) ________ Commercial ________ Private
  (2) Length ________
  (3) Width ________

c. Groin (e.g. wood, sheetpile, etc.) (NONE)
  (1) Number ________
  (2) Length(s) ________

d. Breakwater (e.g. wood, sheetpile, etc.) (NONE)
  (1) Length ________
  (2) Average distance from MHW, NWL or wetlands ________
  (3) Maximum distance beyond MHW, NWL or wetlands ________

e. Mooring buoys (NONE)
  (1) ___ Commercial ___ Community ___ Private
  (2) Number ________
  (3) Description of buoy (Color, inscription, size, anchor, etc.) ________
  (4) Width of water body ________
  (5) Distance buoy(s) to be placed beyond shoreline ________

f. Mooring structure (boatlift, mooring pilings, etc.)
No mooring structures are proposed for these piers; boats will be tied alongside floating platforms. The two piers to be extended into Topsail Sound will be constructed so as to allow the individual lot-owner the ~~option~~ permit to install a boat lift at a later date. 9 @ 14'x14' lifts TFT TFT

g. Other *(Give complete description)*

A ~~12~~ 16' x ~~12~~ 16' covered deck is proposed for each of the four proposed piers.

COMMUNITY DOCKING FACILITY FOR WATER'S EDGE AT DEERFIELD
Applicant or Project Name

[signature]
Signature

JULY 1, 2003
Date

Revised 12/29/0

Form DCM-MP-6

MARINA DEVELOPMENT

(Required for the mooring of more than 10 vessels)

Attach this form to Joint Application for CAMA Major Permit, Form DCM-MP-1. Be sure to complete all other sections of the Joint Application that relate to this proposed project.

1. MARINA CHARACTERISTICS

a. Check below the type of marina proposed.
____ Commercial ____ Public ✓ Residential

b. Will the marina be open to the general public?
____ Yes ✓ No

c. If there is residential development associated with the marina, how many units or lots are planned and how many are currently developed?
N/A

d. Check all of the types of services to be provided.
____ Full service, including travel lift and/or rail
____ Dockage, fuel, and marine supplies
____ Dockage ("wet slips") only
Number of slips 2 SYSTEMS OF 9 SLIPS
____ Dry storage
Number of boats 2 SYSTEMS OF 9 BOATS
____ Boat ramp(s)
____ Other (describe) ____

e. Check below the proposed type of siting.
____ Land cut and access channel
____ Open water with dredging for basin and/or channel
✓ Open water, no dredging required
____ Other (describe) ____

f. Describe the typical boats to be served (for example, open runabout, charter boats, sail boats, mixed types). OPEN RUNABOUT

g. Typical boat length 21'

h. Maximum boat length 21'

i. Are any floating structures planned? ____
If so, describe FLOATING DOCKS

2. MARINA OPERATIONS

NONE

a. Check each of the following sanitary facilities that will be included in the proposed project.
____ Office toilets
____ Toilets for patrons
Number ____
Location ____
____ Showers
____ Boat holding tank pumpout
Type and location ____

b. Describe treatment type and disposal location for all sanitary wastewater. ____

c. Describe the disposal of solid waste, fish offal and trash disposal. ____

d. How will overboard discharge of sewage from boats be controlled? ____

e. Give the location and number of "No Sewage Discharge" signs proposed. ____

Form DCM-MP-6

f. Describe the special design, if applicable, for containing industrial type pollutants, such as paint, sandblasting waste and petroleum products.

g. Where will residue from vessel maintenance be disposed of ?

h. Give the number of channel markers and "No Wake" signs proposed.

i. Give the location of fuel-handling facilities, and describe the safety measures planned to protect area water quality.

j. Describe design measures that promote boat basin flushing or circulation and that reduce water quality impacts.

k. What will be the marina policy on overnight and live-board dockage?

l. Is the proposed marina located near any shellfish leases? ______ Yes ______ No
If yes, give the name and address of the leaseholder.

m. If this project is an expansion of an existing marina, what types of services are currently provided?

n. How many slips are now available? NONE

o. Is the marina proposed within a primary or secondary nursery area? ✓ Yes ______ No

p. Is the marina proposed within an area open to shellfish harvesting? ______ Yes ✓ No

q. Give the location and number of "Pumpout Available" signs proposed. NONE

COMMUNITY DOCKING FACILITY FOR WATER'S EDGE AT DEERFIELD

Tony F. Thoma[illegible]
Signature

DEC 29, 2003
Date

400 copies of this public document were printed at a total cost of $11.00 or $ .03 per copy.

Permit Class
MODIFICATION/MAJOR

Permit Number
68-03

STATE OF NORTH CAROLINA
Department of Environment and Natural Resources
and
Coastal Resources Commission

RECEIVED
JUN 18 2004
DIVISION OF COASTAL MANAGEMENT

Permit

for

X Major Development in an Area of Environmental Concern pursuant to NCGS 113A-118

___ Excavation and/or filling pursuant to NCGS 113-229

Issued to **Jimmy's Island, LLC, 1904 Eastwood Rd., Suite 212, Wilmington, NC 28403**

Authorizing development in Pender County at Mill Creek and Topsail Sound

, as requested in the permittee's application dated revised 12/29/03, including the attached workplan drawings (5), dated received 1/2/04

This permit, issued on May 25, 2004, is subject to compliance with the application (where consistent with the permit), all applicable regulations, special conditions and notes set forth below. Any violation of these terms may be subject to fines, imprisonment or civil action; or may cause the permit to be null and void.

Marina Facility

1) To ensure that a closure of open shellfishing waters does not occur as a result of this project, the 4-slip and 5-slip sections of the docking facilities located on the Topsail Sound/AIWW section of the project must be separated by a minimum of 100'.

2) The marina facility will display a sign showing the location of the nearest pumpout facilities, including other appropriate waste disposal information, at the entrance and exit from the main piers.

3) No sewage, whether treated or untreated, shall be discharged at any time from any boats using the marina. Any sewage discharge at the marina facility shall be considered a violation of this permit for which the permittee is responsible. This prohibition shall be applied and enforced throughout the entire existence of the permitted structure.

(See attached sheets for Additional Conditions)

This permit action may be appealed by the permittee or other qualified persons within twenty (20) days of the issuing date. An appeal requires resolution prior to work initiation or continuance as the case may be.

This permit must be accessible on-site to Department personnel when the project is inspected for compliance.

Any maintenance work or project modification not covered hereunder requires further Division approval.

All work must cease when the permit expires on

December 31, 2006

In issuing this permit, the State of North Carolina agrees that your project is consistent with the North Carolina Coastal Management Program.

Signed by the authority of the Secretary of DENR and the Chairman of the Coastal Resources Commission.

Charles S. Jones, Director
Division of Coastal Management

This permit and its conditions are hereby accepted.

Signature of Permittee

ADDITIONAL CONDITIONS

4) This permit authorizes only the docks, piers, and other structures and uses located in or over the water that are expressly and specifically set forth in the permit application. No other structure, whether floating or stationary, may become a permanent part of this marina facility without permit modification. No non-water dependent uses of structures may be conducted on, in or over public trust waters without permit modification.

5) This permit authorizes a maximum of 18 boat slips. At no time shall more than 18 vessels be moored or docked at the facility. Furthermore, boats may only be moored in the 18 slips defined and numbered on the attached workplan drawing 2 of 5 and 4 of 5, both dated received 1/2/04. The restriction on the number of vessels and docking locations shall apply to all marine vessel types, including but not limited to motorboats, sailing vessels and personal watercraft.

6) No portion of the covered decks associated with pier shall be constructed over vegetated wetlands.

7) In accordance with commitments made by the permittee in the Environmental Assessment prepared for this project, restrictive covenants shall be placed on each lot within the subdivision prohibiting additional piers off of any lot within the subdivision. The restrictive covenants must be in place, and copies provided to the Division of Coastal Management, prior to the construction of any structures authorized by this permit.

8) In accordance with commitments made by the permittee in the Environmental Assessment prepared for this project, restrictive covenants shall be placed on each lot within the subdivision prohibiting dockage by any boats greater than 24' in length, and prohibiting dockage by any boats with cabins or heads. The restrictive covenants must be in place, and copies provided to the Division of Coastal Management, prior to the construction of any structures authorized by this permit.

9) The construction and/or operation of the authorized facilities shall not directly result in any closure of any waters outside of the marina basin that are open to the taking of shellfish. Any such closure directly attributable to the marina facility will require that the permittee undertake remedial actions to remedy the situation.

10) The Mill Creek portion of the authorized project is located within a primary nursery area (PNA). Therefore, in accordance with T15A:07H.0208 of the Rules of the Coastal Resources Commission, no new dredging or excavation within the PNA shall be permitted. Dredging in any manner, including "kicking" with boat propellers, is not authorized. This prohibition shall be applied and enforced throughout the entire existence of the permitted structure.

11) No attempt will be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the authorized work.

12) The authorized structure and associated activity must not cause an unacceptable interference with navigation.

13) Any portion of the permitted access piers and docking facilities built over coastal wetlands must not exceed six feet in width and must be elevated a minimum of three feet over the wetland substrate as measured from the bottom of the decking.

ADDITIONAL CONDITIONS

14) The permittee will maintain the authorized work in good condition and in conformance with the terms and conditions of this permit. The permittee is not relieved of this requirement if he abandons the permitted activity without having it transferred to a third party.

15) This permit does not authorize the interference with any existing or proposed Federal project, and the permittee will not be entitled to compensation for damage to the authorized structure or work, or injury which may be caused from existing or future operations undertaken by the United States in the public interest.

16) It is possible that the authorized structure may be damaged by wave wash from passing vessels. The issuance of this permit does not relieve the permittee from taking all proper steps to ensure the integrity of the permitted structure and the safety of moored boats. The permittee shall not hold the United States liable for any such damage.

17) The permittee must install and maintain at his expense any signal lights or signals prescribed by the U.S. Coast Guard, through regulation or otherwise, on the authorized facilities. At a minimum, permanent reflectors should be attached to the structure in order to make it more visible during hours of darkness or inclement weather.

18) No portion of any structure will be located within 80 feet of the near bottom edge of the federally maintained AIWW channel. As as-built survey must be performed on the authorized structures and sent to the U.S. Army Corps of Engineers Wilmington Regulatory Office.

19) The State of North Carolina and/or the Federal Government does not assume any liability for:

A. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or natural causes.
B. Damages to the permitted project or uses thereof as a result of current or future Federal activities initiated on the publics behalf.
C. Damages to other permitted or unpermitted activities or structures caused by the authorized activity.
D. Design and construction deficiencies associated with the permitted work.
E. Damage claims associated with any future modification, suspension, or revocation of this permit.

Endangered Species Protection

20) The West Indian Manatee, which is a federally endangered species, may be present in the waters surrounding the authorized project. In order to protect this species, all in-water work should be done during the period from November 1 to May 31. If work must be done during the period from June through October, the enclosed guidelines, entitled "precautions for General Construction in Areas Which Maybe Used by the West Indian Manatee in North Carolina" must be followed.

ADDITIONAL CONDITIONS

General

21) The permittee understands and agrees that, if future operations by the United States requires the removal, relocation, or other alteration of the structure or work authorized by this permit, or if in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate or alter the structural work or obstructions caused thereby, without expense to the United States or the state of North Carolina. No claim shall be made against the United States or the state of North Carolina on account of any such removal or alteration.

22) No vegetated wetlands or open water areas may be excavated or filled.

23) The permitted activity will be conducted in such a manner as to prevent a significant increase in turbidity outside of the area of construction or construction-related discharge. Increases such that the turbidity in the waterbody is 25 NTU's or less in all saltwater classes are not considered significant.

24) Any mitigative measures or environmental commitments specifically made by the applicant in the Environmental Assessment for this project should be implemented, regardless of whether or not such commitments are addressed by individual conditions of this permit.

25) This Major Modification must be attached to the original of Permit No. 68-03, which was issued on 5/27/03, and both documents must be readily available on site when a Division of Coastal Management representative inspects the project for compliance. Call conditions and stipulations of the active permit remain in force under this major modification unless altered herein.

NOTE: This permit does not eliminate the need to obtain any additional state, federal or local permits, approvals or authorizations that may be required.

NOTE: Future development of the permittee's property may require a modification of this permit. Contact a representative of the Division at (910) 395-3900 prior to the commencement of any such activity for this determination. The permittee is further advised that many non-water dependent activities are not authorized within 30 feet of the normal high water level.

NOTE: The N.C. Division of Water Quality has assigned the proposed project DWQ Project No. 030327.

NOTE: The U.S. Army Corps of Engineers has assigned the proposed project COE Action Id. No. 200400494.

DIVISION OF COASTAL MANAGEMENT
FIELD INVESTIGATION REPORT

1. **APPLICANT'S NAME**: Water's Edge HOA- c/o John Cockrum

2. **LOCATION OF PROJECT SITE**: The project site is located at the Water's Edge community dock on Great Oak Drive, adjacent to the AIWW, in Hampstead, Pender County.

Photo Index – **2006:** 26-6638 S-T, 16 **2000**: 26-336 D-F, 8 **1995:** 22-267: O-P, 19

State Plane Coordinates - X: 2392290 **Y**: 218888
Lat: 34°20'39.69210" N Long: 77°42'01.60142" W

3. **INVESTIGATION TYPE**: CAMA / Dredge & Fill **ROVER FILE #:** Q090309A

4. **INVESTIGATIVE PROCEDURE: Dates of Site Visit** – 9/3/08, 9/12/08
Was Applicant Present – No

5. **PROCESSING PROCEDURE**: **Application Received** – Complete on 9/8/08
Office – Wilmington

6. **SITE DESCRIPTION**:
   - **(A)** **Local Land Use Plan** – Pender County
     Classification From LUP – Conservation
   - **(B)** **AEC(s) Involved**: PT, EW
   - **(C)** **Water Dependent**: Yes
   - **(D)** **Intended Use**: Commercial
   - **(E)** **Wastewater Treatment: Existing** – N/A
     Planned - N/A
   - **(F)** **Type of Structures**: **Existing** – Bulkhead, community dock.
     Planned – Perform new dredging.
   - **(G)** **Estimated Annual Rate of Erosion**: N/A **Source** – N/A

7. **HABITAT DESCRIPTION**: [AREA]

	DREDGED	FILLED	OTHER
(A) Vegetated Wetlands			
(B) Non-Vegetated Wetlands – (open water)	**<4,999 ft.²**		
(C) Other- High ground (Spoil Disposal)	**20,000 ft.²**		

   - **(D)** **Total Area Disturbed**: ~24,999 ft.² (0.57 acres)
   - **(E)** **Primary Nursery Area**: No
   - **(F)** **Water Classification**: SA-ORW **Open:** Yes

8. **PROJECT SUMMARY**: The applicant is proposing to perform new dredging in the location of Slips 5-9 at the existing Water's Edge community docking facility.

9. PROJECT DESCRIPTION:

The project site is located between Lots 2 and 3 of the Water's Edge subdivision, on Great Oak Drive, adjacent to the AIWW, in Hampstead, Pender County. To access the site from Wilmington, take US Hwy 17 N to Headwaters Drive at the Deerfield subdivision. Turn right onto Headwaters Drive and travel approximately 0.8 miles to Overlook Drive. Make a left onto Overlook Drive and then turn right onto East Creekview Drive. At the end of E. Creekview Drive, make a right. Travel to the end of the road and the docking facility will be located adjacent to the AIWW on the left.

State permit #68-03 was issued to Jimmy's Island, LLC on May 27, 2003 for the construction of the Water's Edge 18-lot subdivision. It was modified on May 25, 2004 to allow for the construction of a 4-dock 18-slip marina located in the project area on the AIWW and on Mill Creek. It was modified again on December 21, 2004 to allow for the filling of §404 wetlands on Lot 6. The permit expired on December 31, 2006.

The project site consists of an upland common access to an existing 9-slip docking facility split into two sections. Slips 1-4 are located to the south and slips 5-9 are located north of the access pier. Both docking structures also have a covered platform located landward of the slips. The docks each consist of a T-head with finger piers. See Sheet 4 of 6 for a depiction of the northern docking facility (and the proposed project site). Current water depths at this dock currently range from approximately -0.5' to –1.5' at Normal Low Water (NLW). Wetland vegetation located landward of the docks consists primarily of Salt Marsh Cordgrass (Spartina alterniflora).

The waters of the AIWW adjacent to the project site are classified as SA-ORW by the North Carolina Division of Water Quality. They are **NOT** designated as a **Primary Nursery Area (PNA)** by the North Carolina Division of Marine Fisheries, and they are **OPEN** to the harvest of shellfish.

PROPOSED PROJECT:

The applicant is proposing to perform new dredging at the northern section of the existing docking facility. The area to be excavated is primarily located within the footprint of Slips 5-9, measuring approximately 30' in length by 90' in width. The applicant is also proposing to dredge a "channel" immediately east of the dock, extending an additional 28' in length towards the AIWW. This area would be irregularly shaped, and would only measure an average of 69' in width (see Sheet 4 of 6). Final projects depth would taper from –3' to –4' at NLW, sloped towards the AIWW. Approximately 500 cubic yards of material would be excavated using a barge mounted excavator. Excavated material would then be transported by barge to a high-ground area located off Spring Garden Road. Spring Garden Road is located in Hampstead off Country Club Road (see Sheet 6 of 6). The spoil disposal site is owned by Mr. Rupert Piver and a letter of authorization has been submitted from the property owner.

10. ANTICIPATED IMPACTS

The excavation of the channel would disturb approximately 4,999 $ft.^2$ of shallow bottom. The dredging operation would likely result in a temporary increase in turbidity. Submerged aquatic vegetation (SAV) is present within the boatslips and therefore dredging would impact SAV and SAV habitat. The high ground disposal would result in approximately 20,000 square feet of land disturbance.

Submitted by: Heather Coats **Date:** September 11, 2008 **Office:** Wilmington

---

127 Cardinal Drive Ext., Wilmington, North Carolina 28405-3845
Phone: 910-796-7215 \ FAX: 910-395-3964 \ Internet: www.nccoastalmanagement.net

Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources
Coleen H. Sullins, Director
Division of Water Quality

DS

October 9, 2008

OCT 15 2008
Morehead City DCM

CERTIFIED MAIL: 7007 0220 0000 8222 7542
RETURN RECEIPT REQUESTED

Water's Edge Homeowners Association
Attn: John Cockrum
115 Waters Edge Drive
Hampstead, NC 28443

SUBJECT: Waters Edge at Deerfield
DWQ Project # 08 1437
Pender County

Dear Mr. Cockrum:

This Office has reviewed your CAMA application for the new dredging of slips 5 – 9 at the existing docking facility for the proposed project. The Division of Marine Fisheries (DMF) has determined that Submerged Aquatic Vegetation (SAVs) exists in the footprint of the proposed dredging. Because dredging would result in significant adverse impacts to SAVs and their habitat, this Office has determined that significant uses could be removed or degraded by this project. Therefore, unless modifications of the proposal are made, we will recommend moving towards denial of the 401 Water Quality Certification as required in 15A NCAC 2H .0507. Specifically, we strongly encourage you to remove the portion of the new dredging that impacts this habitat.

If the project is modified to address dredging only in the areas outside the SAV habitat, DWQ will have no objection to the project.

Please respond within three weeks of the date of this letter by sending a copy of the information to Joanne Steenhuis and to Cyndi Karoly, 401 Wetlands Unit, 2321 Crabtree Blvd., Raleigh, NC 27604-226, her phone number is 919.733.9721. If we do not hear from you within three weeks, we will assume that you no longer want to pursue this project and we will consider the project as withdrawn. If you have any questions, please feel free to call me at 910 796.7215.

Sincerely,

Joanne Steenhuis
Joanne Steenhuis
Senior Environmental Specialist

cc: Cyndi Karoly -Wetlands Unit/Raleigh
William Warren, Jr.- Consultant
Heather Coats – DCM Wilmington
Doug Huggett – DCM Morehead
Fritz Rohde – Division of Marine Fisheries
WiRO

Dg

NCDENR

North Carolina Department of Environment and Natural Resources
Division of Marine Fisheries

Michael F. Easley, Governor
William G. Ross Jr., Secretary

Dr. Louis B. Daniel III, Director

MEMORANDUM

TO: Doug Huggett
Major Permits Processing Coordinator

FROM: Dr. Louis B. Daniel, III, Director
Division of Marine Fisheries

RECEIVED
OCT 10 2008
Morehead City DCM

DATE: October 8, 2008

SUBJECT: CAMA / DREDGE AND FILL PERMIT
Water's Edge HOA c/o John Cockrum
Water's Edge S/D on Great Oak Drive, adjacent to the AIWW
Pender County

I have reviewed the comments provided by the District Manager and/or Bio-Supervisor and concur with their recommendation(s).

10/8/08

Director, Date
Dr. Louis B. Daniel, III

Deputy Director, Date
Barbara Y. Lupton

Anne Deaton 10/8/08

Habitat Protection Section Chief, Date
Anne Deaton

3441 Arendell Street, P.O. Box 769, Morehead City, North Carolina 28557
Phone: 252 726-7021 \ FAX: 252 727-5127 \ Internet: www.ncdmf.net

NCDENR

North Carolina Department of Environment and Natural Resources

Division of Coastal Management

Michael F. Easley, Governor | **James H. Gregson, Director** | William G. Ross Jr., Secretary

September 17, 2008

MEMORANDUM:

TO: Fritz Rohde
Division of Marine Fisheries

FROM: Doug Huggett, NC DENR-DCM Major Permits Coordinator
400 Commerce Ave., Morehead City, NC 28557 ***(Courier 11-12-09)***

SUBJECT: CAMA / Dredge & Fill Major Permit Application Review

Applicant: **Water's Edge HOA c/o John Cockrum**

Project Location: Water's Edge S/D on Great Oak Dr., adjacent to the AIWW, in Hampstead, Pender Co.

Proposed Project: to perform new dredging of slips 5-9 at existing docking facility

Please indicate below your agency's position or viewpoint on the proposed project and return this form by **October 11, 2008**. If you have any questions regarding the proposed project, contact Heather Coats at (910) 796-7424, when appropriate, in-depth comments with supporting data is requested.

REPLY:

_____ This agency has no objection to the project as proposed.

_____ This agency has no comment on the proposed project.

_____ This agency approves of the project only if the recommended changes are incorporated. See attached.

✓ This agency objects to the project for reasons described in the attached comments.

SIGNED ______________ **DATE** 10/6/08

Anne Deaton 10/8/08

127 Cardinal Drive Ext., Wilmington, North Carolina 28405-3845
Phone: 910-796-7215 \ FAX: 910-395-3964 \ Internet: www.nccoastalmanagement.net

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Marine Fisheries
Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dr. Louis B. Daniel III, Director

September 24, 2008

TO: Doug Huggett

FROM: Fritz Rohde FR A.S.D.

SUBJECT: Water's Edge HOA c/o John Cockrum

The following comments by the North Carolina Division of Marine Fisheries (DMF) on the above project are offered pursuant to G.S. 113-131. The applicant is proposing to perform new dredging in one of their docking facilities located in the AIWW near Hampstead in Pender County. **The Division of Marine Fisheries objects to this project due to the presence of substantial amounts of submerged aquatic vegetation (SAV) within the slips and the significant adverse impact that the dredging would have upon this valuable resource.** SAVs are classified as Critical Habitat by the Marine Fisheries Commission.

A site visit was conducted on the afternoon of September 12, 2008 by Chip Collier (DMF), Heather Coats (DCM), and the author. Visibility was extremely limited that day. Chip and I used clam rakes to randomly check the substrate for the presence or absence of SAV. There was evidence of SAV (either eelgrass or shoalgrass) in all of the samples we took. In addition, although not quantified, a shellfish resource (hard clams) was present within the proposed dredging footprint.

The following is taken from the Coastal Habitat Protection Plan, which emphasizes the importance of SAV and thus DMFs objection.

Fish use of SAV habitat

- Over 150 fish and invertebrate species are known to use SAV as adults or juveniles, of which about 30 are important commercial fishery species.
- SAV beds provide an excellent nursery area for many species, including blue crabs, red drum, pink shrimp, spotted seatrout, and gag.
- SAV blades provide a surface for post-larval shellfish attachment, especially bay scallops, and refuge for small fish like mummichogs, pipefish, and grass shrimp.
- Large predators, like flounders, rays, and red drum, forage around SAV.

DCM MP-1

APPLICATION for Major Development Permit

(last revised 12/27/06)

North Carolina DIVISION OF COASTAL MANAGEMENT

1. Primary Applicant/ Landowner Information

Business Name Waters Edge Homeowners Association		Project Name (if applicable) Boat dock dredging		
Applicant 1: First Name Michael	MI J	Last Name Mac		
Applicant 2: First Name John	MI	Last Name Corkrum		
If additional applicants, please attach an additional page(s) with names listed.				
Mailing Address 2108 Capital Drive, Suite 102		PO Box	City Wilmington	State NC
ZIP 28405	Country USA	Phone No. (573) 808-0288 910 - 799 - 9779 ext.		FAX No. 910 - 799 - 9981
Street Address (if different from above)		City	State	ZIP
Email cblake@communitysolutionse.com mikejmac11@gmail.com				

2. Agent/Contractor Information

Business Name Maritech Llc				
Agent/ Contractor 1: First Name Adam	MI C.	Last Name Knierim		
Agent/ Contractor 2: First Name	MI	Last Name		
Mailing Address 108 Circle Dr.		PO Box	City Hampstead	State NC
ZIP 28443		Phone No. 1 910 - 270 - 4058 ext.	Phone No. 2 910 - 297 - 7710 ext.	
FAX No. 910 270 4058		Contractor # N/A		
Street Address (if different from above)		City	State	ZIP
Email adamknierim@gmail.com				

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<Form continues on back>

3. Project Location				
County (can be multiple) Pender	Street Address			State Rd. #
Subdivision Name Waters Edge at Deefield		City Hampstead	State NC	Zip 28443 -
Phone No. 573- - 808 - 0288 ext.		Lot No.(s) *(if many, attach additional page with list)* Between lot 2 and lot 3, , , ,		
a. In which NC river basin is the project located? Cape Fear		b. Name of body of water nearest to proposed project AIWW		
c. Is the water body identified in (b) above, natural or manmade? ☒Natural ☐Manmade ☐Unknown		d. Name the closest major water body to the proposed project site. AIWW		
e. Is proposed work within city limits or planning jurisdiction? ☒Yes ☐No		f. If applicable, list the planning jurisdiction or city limit the proposed work falls within. Pender Co.		

4. Site Description	
a. Total length of shoreline on the tract (ft.) 10'	b. Size of entire tract (sq.ft.) Easement 10' 871200
c. Size of individual lot(s) NA, , , *(If many lot sizes, please attach additional page with a list)*	d. Approximate elevation of tract above NHW *(normal high water)* or NWL *(normal water level)* NA ☐NHW or ☐NWL
e. Vegetation on tract Native grass, oak, marsh grass	
f. Man-made features and uses now on tract Existing Access Pier, Gazebo and floating docks for 9 boat slips, retainign wall, concrete drive	
g. Identify and describe the existing land uses adjacent to the proposed project site. Existing floating facility is between lot 2 and 3 of Waters Edge Subvidivsion, Facility is on a designated area for Community docks and recreation	
h. How does local government zone the tract? single residents and recreation	i. Is the proposed project consistent with the applicable zoning? (Attach zoning compliance certificate, if applicable) ☒Yes ☐No ☐NA
j. Is the proposed activity part of an urban waterfront redevelopment proposal? ☐Yes ☒No	
k. Has a professional archaeological assessment been done for the tract? If yes, attach a copy. ☐Yes ☐No ☒NA If yes, by whom?	
l. Is the proposed project located in a National Registered Historic District or does it involve a National Register listed or eligible property? ☐Yes ☐No ☒NA	

<Form continues on next page>

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m. (i) Are there wetlands on the site?	☑Yes ☒No
(ii) Are there coastal wetlands on the site?	☑Yes ☒No
(iii) If yes to either (i) or (ii) above, has a delineation been conducted? *(Attach documentation, if available)*	☐Yes ☒No
n. Describe existing wastewater treatment facilities. Community sewage (septic tanks/fields) for homes, no wastewater treatment for small boats	
o. Describe existing drinking water supply source. community Water	
p. Describe existing storm water management or treatment systems. NA	

5. Activities and Impacts

a. Will the project be for commercial, public, or private use?	☐Commercial ☐Public/Government ☒Private/Community
b. Give a brief description of purpose, use, and daily operations of the project when complete. New work in existing basin area to restore depth to provide boat access, to provide water access and relieve stress on existing dock facility. Floating docks rest on bottom during low tides.	
c. Describe the proposed construction methodology, types of construction equipment to be used during construction, the number of each type of equipment and where it is to be stored. Dredging operations will be performed utilizing bucket and barge methodology. A barge and pushboat will be used for transporting dredged material. Material will be disposed of in state approved site.	
d. List all development activities you propose. New excavation to enable boat usage of docks by subdivision residents.	
e. Are the proposed activities maintenance of an existing project, new work, or both?	New
f. What is the approximate total disturbed land area resulting from the proposed project?	8750 submerged, and 90,000 disposal site ☒Sq.Ft or ☐Acres
g. Will the proposed project encroach on any public easement, public accessway or other area that the public has established use of?	☐Yes ☒No ☐NA
h. Describe location and type of existing and proposed discharges to waters of the state. NA	
i. Will wastewater or stormwater be discharged into a wetland?	☐Yes ☒No ☐NA
If yes, will this discharged water be of the same salinity as the receiving water?	☐Yes ☐No ☒NA
j. Is there any mitigation proposed? If yes, attach a mitigation proposal.	☐Yes ☒No ☐NA

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6. Additional Information

In addition to this completed application form, (MP-1) the following items below, if applicable, must be submitted in order for the application package to be complete. Items (a) – (f) are always applicable to any major development application. Please consult the application instruction booklet on how to properly prepare the required items below.

a. A project narrative.

b. An accurate, dated work plat (including plan view and cross-sectional drawings) drawn to scale. Please give the present status of the proposed project. Is any portion already complete? If previously authorized work, clearly indicate on maps, plats, drawings to distinguish between work completed and proposed.

c. A site or location map that is sufficiently detailed to guide agency personnel unfamiliar with the area to the site.

d. A copy of the deed (with state application only) or other instrument under which the applicant claims title to the affected properties.

e. The appropriate application fee. Check or money order made payable to DENR.

f. A list of the names and complete addresses of the adjacent waterfront (riparian) landowners and signed return receipts as proof that such owners have received a copy of the application and plats by certified mail. Such landowners must be advised that they have 30 days in which to submit comments on the proposed project to the Division of Coastal Management.

Name Hollis Batson — Phone No. 910-270-0866
Address 110 Captains Cove

Name Michael Norris — Phone No. unlisted
Address 3701 Reston ct, apt A, Wilmington NC 28403

Name — Phone No.
Address

g. A list of previous state or federal permits issued for work on the project tract. Include permit numbers, permittee, and issuing dates.

68-03, Jimmy's Island LLC, May 2004

h. Signed consultant or agent authorization form, if applicable.

i. Wetland delineation, if necessary.

j. A signed AEC hazard notice for projects in oceanfront and inlet areas. *(Must be signed by property owner)*

k. A statement of compliance with the N.C. Environmental Policy Act (N.C.G.S. 113A 1-10), if necessary. If the project involves expenditure of public funds or use of public lands, attach a statement documenting compliance with the North Carolina Environmental Policy Act.

7. Certification and Permission to Enter on Land

I understand that any permit issued in response to this application will allow only the development described in the application. The project will be subject to the conditions and restrictions contained in the permit.

I certify that I am authorized to grant, and do in fact grant permission to representatives of state and federal review agencies to enter on the aforementioned lands in connection with evaluating information related to this permit application and follow-up monitoring of the project.

I further certify that the information provided in this application is truthful to the best of my knowledge.

Date 5/14/15 Print Name MICHAEL MAC, for WATERS EDGE HOA

Signature Michael Mac

Please indicate application attachments pertaining to your proposed project.

☒DCM MP-2 Excavation and Fill Information
☐DCM MP-3 Upland Development
☐DCM MP-4 Structures Information
☐DCM MP-5 Bridges and Culverts

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Form DCM MP-2

EXCAVATION and FILL

(Except for bridges and culverts)

Attach this form to Joint Application for CAMA Major Permit, Form DCM MP-1. Be sure to complete all other sections of the Joint Application that relate to this proposed project. Please include all supplemental information.

Describe below the purpose of proposed excavation and/or fill activities. **All values should be given in feet.**

	Access Channel (NLW or NWL)	Canal	Boat Basin	Boat Ramp	Rock Groin	Rock Breakwater	Other (excluding shoreline stabilization)
Length			N-50', S-50'				
Width			N-100', S75'				
Avg. Existing Depth				-1.0 NLW	NA	NA	
Final Project Depth				-4.0 NLW	NA	NA	

1. EXCAVATION

☐ This section not applicable

a. Amount of material to be excavated from below NHW or NWL in cubic yards.
971

b. Type of material to be excavated.
sand, muddy sand

c. (i) Does the area to be excavated include coastal wetlands/marsh (CW), submerged aquatic vegetation (SAV), shell bottom (SB), or other wetlands (WL)? If any boxes are checked, provide the number of square feet affected.
☐CW ____ ☒SAV ____ ☐SB ____
☐WL ____ ☐None
(ii) Describe the purpose of the excavation in these areas:
Restore depth and boat docks

d. High-ground excavation in cubic yards.
N/A

2. DISPOSAL OF EXCAVATED MATERIAL

☐ This section not applicable

a. Location of disposal area.
USACE DA 203

b. Dimensions of disposal area.
300' x 300'

c. (i) Do you claim title to disposal area?
☐Yes ☒No ☐NA
(ii) If no, attach a letter granting permission from the owner.

d. (i) Will a disposal area be available for future maintenance?
☒Yes ☐No ☐NA
(ii) If yes, where?

e. (i) Does the disposal area include any coastal wetlands/marsh (CW), submerged aquatic vegetation (SAV), shell bottom (SB), or other wetlands (WL)? If any boxes are checked, provide the number of square feet affected.
☐CW ____ ☐SAV ____ ☐SB ____
☐WL ____ ☒None
(ii) Describe the purpose of disposal in these areas:

f. (i) Does the disposal include any area in the water?
☐Yes ☒No ☐NA
(ii) If yes, how much water area is affected?

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3. SHORELINE STABILIZATION
(If development is a wood groin, use MP-4 – Structures)

☒ *This section not applicable*

a. Type of shoreline stabilization:
☐ Bulkhead ☐ Riprap ☐ Breakwater/Sill ☐ Other: _____

b. Length: _____
Width: _____

c. Average distance waterward of NHW or NWL: ______

d. Maximum distance waterward of NHW or NWL: ______

e. Type of stabilization material: ______

f. (i) Has there been shoreline erosion during preceding 12 months?
☐ Yes ☐ No ☐ NA
(ii) If yes, state amount of erosion and source of erosion amount information.
______

g. Number of square feet of fill to be placed below water level.
Bulkhead backfill _____ Riprap _____
Breakwater/Sill _____ Other _____

h. Type of fill material.
______

i. Source of fill material.
______

4. OTHER FILL ACTIVITIES
(Excluding Shoreline Stabilization)

☒ *This section not applicable*

a. (i) Will fill material be brought to the site? ☐ Yes ☐ No ☐ NA
If yes,
(ii) Amount of material to be placed in the water _____
(iii) Dimensions of fill area _____
(iv) Purpose of fill
______

b. (i) Will fill material be placed in coastal wetlands/marsh (CW), submerged aquatic vegetation (SAV), shell bottom (SB), or other wetlands (WL)? If any boxes are checked, provide the number of square feet affected.
☐ CW _____ ☐ SAV _____ ☐ SB _____
☐ WL _____ ☐ None
(ii) Describe the purpose of the fill in these areas:
______

5. GENERAL

a. How will excavated or fill material be kept on site and erosion controlled?
standard disposal sit practices

b. What type of construction equipment will be used (e.g., dragline, backhoe, or hydraulic dredge)?
Bucket and barge

c. (i) Will navigational aids be required as a result of the project?
☐ Yes ☒ No ☐ NA
(ii) If yes, explain what type and how they will be implemented.
______

d. (i) Will wetlands be crossed in transporting equipment to project site? ☐ Yes ☒ No ☐ NA
(ii) If yes, explain steps that will be taken to avoid or minimize environmental impacts.
______

Date
5/14/15

Project Name
WATERS EDGE DOCKS

Applicant Name
MICHAEL J MAC for WATERS EDGE HOA

Applicant Signature
Michael J Mac

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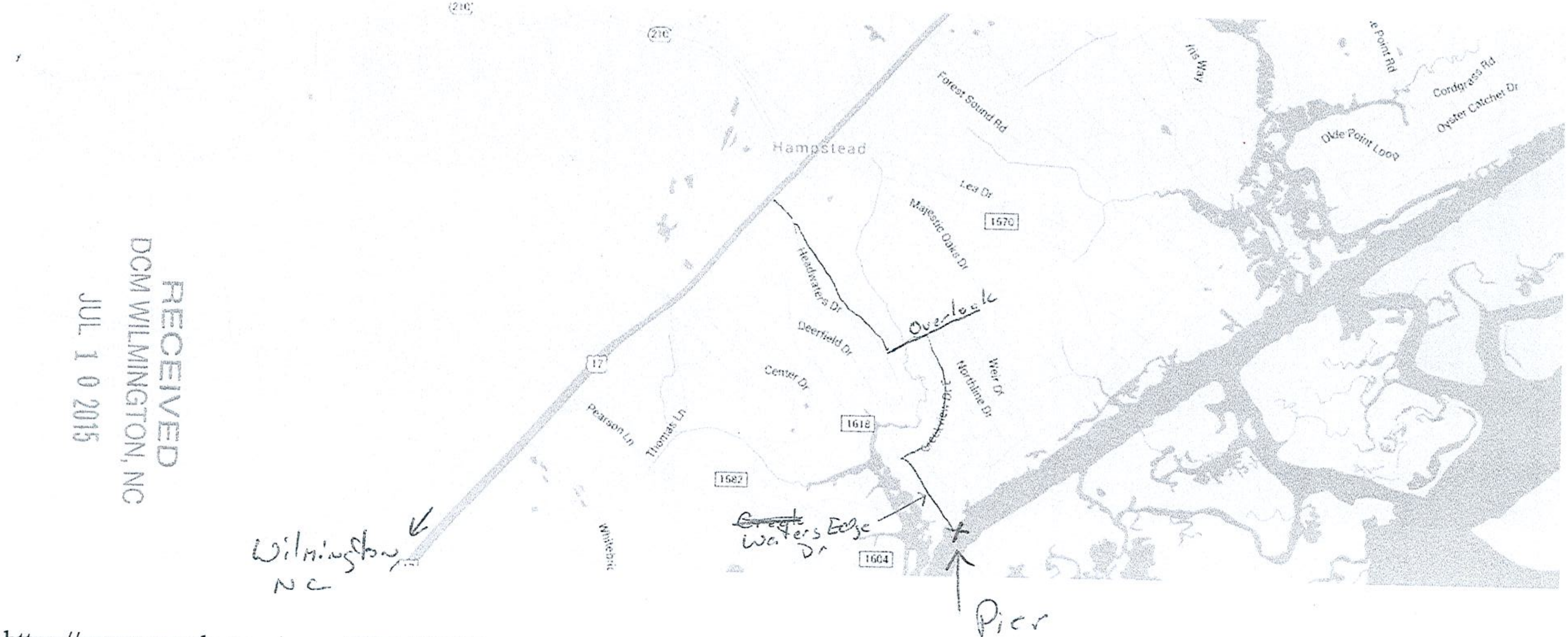
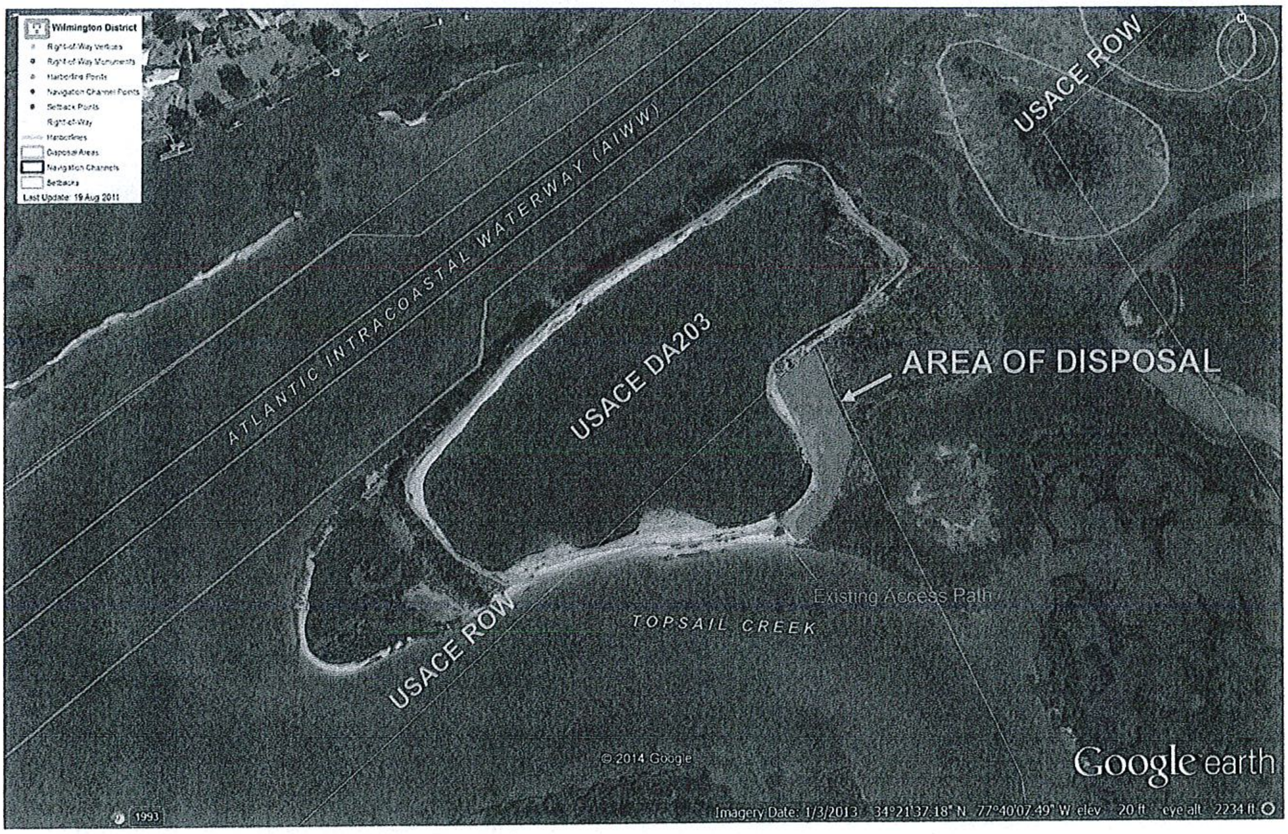
Location Map





Disposal
Area
Map

Waters Edge
HOA
6/23/15

4 of 4

Project Narrative

The permit is being requested to dredge out two areas used for boat docks by the Waters Edge Homeowners Association. The goal is to restore the original depth of water at the docks when the marina area was original built (see figure 1.), under permit 68-03. Two separate boat dock areas are to be dredged (see figure 2.,), one with 4 boat slips (southernmost dock, photo 1) and one with 5 boat slips (northernmost photo 2). The docks are attached to land through a pier structure Approximately 3 ft. of material needs to be removed to restore the original depth of -3 to -4 feet. Approximately 971 cu. yds. of material will need to be removed, 555 from the northern dock, 416 from the southern dock, and placed in the state disposal site at Topsail Creek.

Since the area has received depositional sediments creating shallower water depths, submerged aquatic vegetation has colonized the northernmost end of the dock structure. Some of this SAV would be destroyed in the dredging process. These depositional sediments could be shoaling due to the lack of dredging by the Corps of Engineers non the ICWW.

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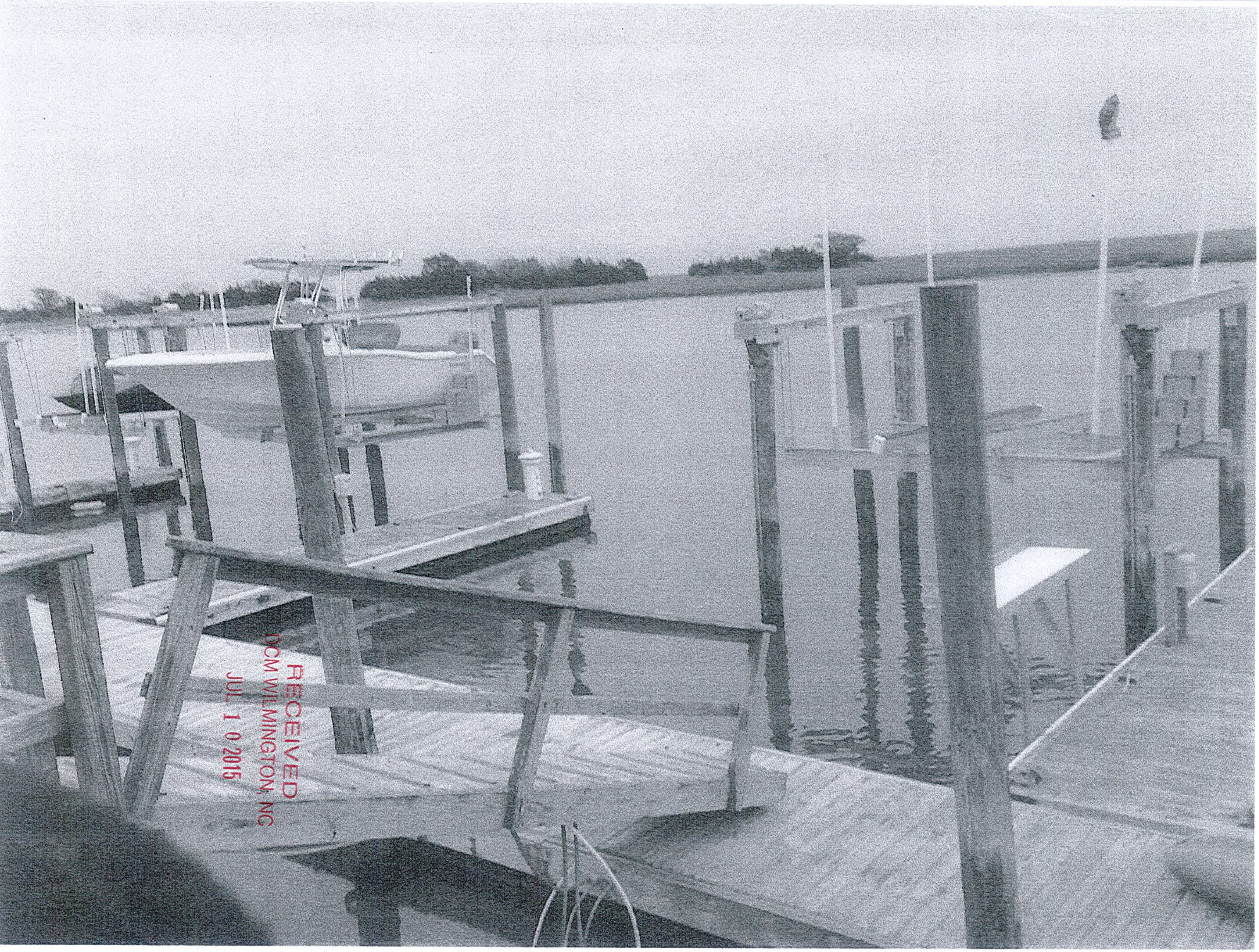


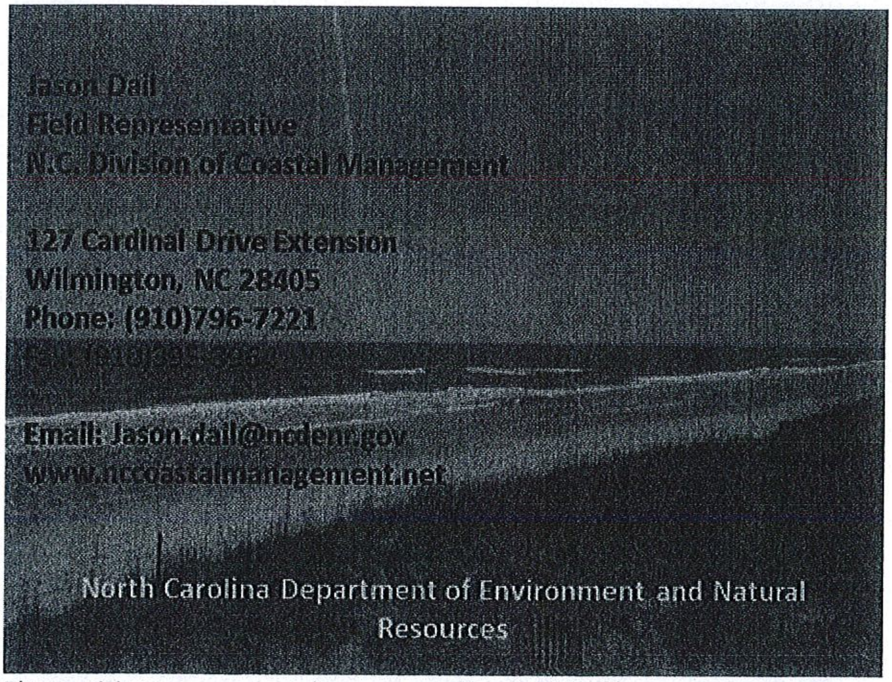
Dail, Jason

From: Dail, Jason
Sent: Wednesday, June 03, 2015 10:19 AM
To: 'cblake@communitysolutionse.com'
Subject: Waters Edge CAMA MAjor Permit Application - Additional Information Requested.
Attachments: WatersEdge.Jun.15.doc

Mr Mac and/or Mr. Corkrum:

Please find attached a request for additional information related to the recent submission of a CAMA Major Development Permit for dredging activities around the Waters Edge community docking facility. If you have any questions about the information being requested, please feel free to give me a call at the number below.

Thank you,
Jason Dail



Please visit www.nccoastalmanagement.net <http://www.nccoastalmanagement.net/> to subscribe to Coastal Management's quarterly newsletter, the CAMAgram.

Also, please note that e-mail correspondence to and from this address may be subject to the North Carolina Public records Law and may be disclosed to third parties.

ADDITIONAL INFORMATION REQUESTED

1) Please provide amended and/or updated WORKPLAN DRAWINGS pursuant to ***15A NCAC 07J .0203 PREPARATION OF WORK PLATS.*** All drawings shall include a top view of the project area, cross sectional view, as well as a location map (vicinity map). Each drawing shall have a standard North arrow, must depict the applicant's name, date and shall be numbered. Plans shall be accurately drawn to scale at 1"=200' or less. The work plans provided shall be current and show all existing development as well as all proposed development. In this case, the dredge footprint shall be defined on the plans. In addition, the location of all submerged aquatic vegetation (SAV) within the project area shall be shown on the plans. You may show a general footprint depicting the location of SAVs.

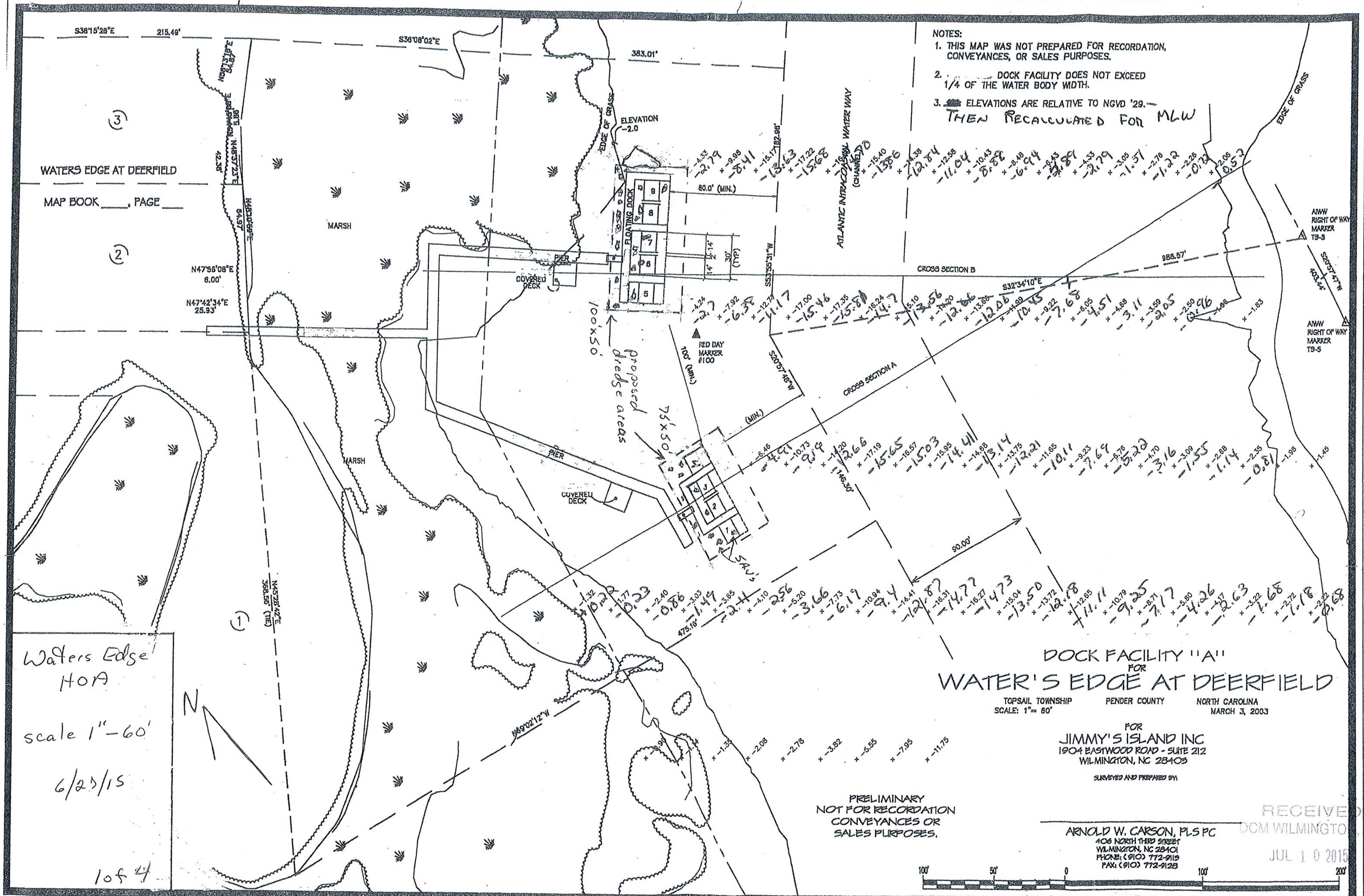
2) Please provide the signed certified mail receipts ("green cards") that were sent to the adjacent riparian property owners.

3) Please provide a letter from the U.S. Army Corp of Engineers allowing the deposition of spoil material on and/or at the proposed disposal area (COE disposal site DA-203).

4) Please provide a site plan of the disposal area showing the limits of disturbance resulting from the project, as well as the location of the normal high water boundary and any wetlands. All information provided on the drawing shall be consistent with the information outlined in Number 1) of this additional information document.

5) Based on information provided by the US Army Corp of Engineers, a portion of the existing docking facility is located within the Corps 100' channel setback. Any plans provided should reference this encroachment and the setback line (measured 100' from the edge of the channel) shall be depicted on the site plan(s).

6) The site plans that were provided show "proposed" development including piers, decks, ramps, docks and lifts. These features should be shown as "existing".



NOTES:
1. THIS MAP WAS NOT PREPARED FOR RECORDATION, CONVEYANCES, OR SALES PURPOSES.
2. DOCK FACILITY DOES NOT EXCEED 1/4 OF THE WATER BODY WIDTH.
3. ELEVATIONS ARE RELATIVE TO NGVD '29.
THEN RECALCULATED FOR MLW
WATERS EDGE AT DEERFIELD
MAP BOOK ____, PAGE ____
MARSH
ELEVATION −2.0
EDGE OF GRASS
FLOATING DOCK
PIER
COVERED DECK
80.0' (MIN.)
ATLANTIC INTRACOASTAL WATER WAY (CHANNEL)
CROSS SECTION B
CROSS SECTION A
RED DAY MARKER #100
100' (MIN.)
(MIN.)
90.00'
AIWW RIGHT OF WAY MARKER T9-3
AIWW RIGHT OF WAY MARKER T9-5
100x50'
proposed dredge areas
75'x50'
SAVs
S38°15'28"E 215.49'
S36°08'02"E
383.01'
N47°56'08"E 6.00'
N47°42'34"E 25.93'
S32°34'10"E
988.57'
N69°02'12"W
475.16'
N45°28'42"E 358.56' (TIE)
Waters Edge HOA
scale 1"–60'
6/23/15
1 of 4
N
DOCK FACILITY "A" FOR
WATER'S EDGE AT DEERFIELD
TOPSAIL TOWNSHIP PENDER COUNTY NORTH CAROLINA
SCALE: 1" = 60' MARCH 3, 2003
FOR
JIMMY'S ISLAND INC
1904 EASTWOOD ROAD - SUITE 212
WILMINGTON, NC 28403
SURVEYED AND PREPARED BY:
ARNOLD W. CARSON, PLS PC
406 NORTH THIRD STREET
WILMINGTON, NC 28401
PHONE: (910) 772-9119
FAX: (910) 772-9123
PRELIMINARY
NOT FOR RECORDATION
CONVEYANCES OR
SALES PURPOSES.
100' 50' 0 100' 200'
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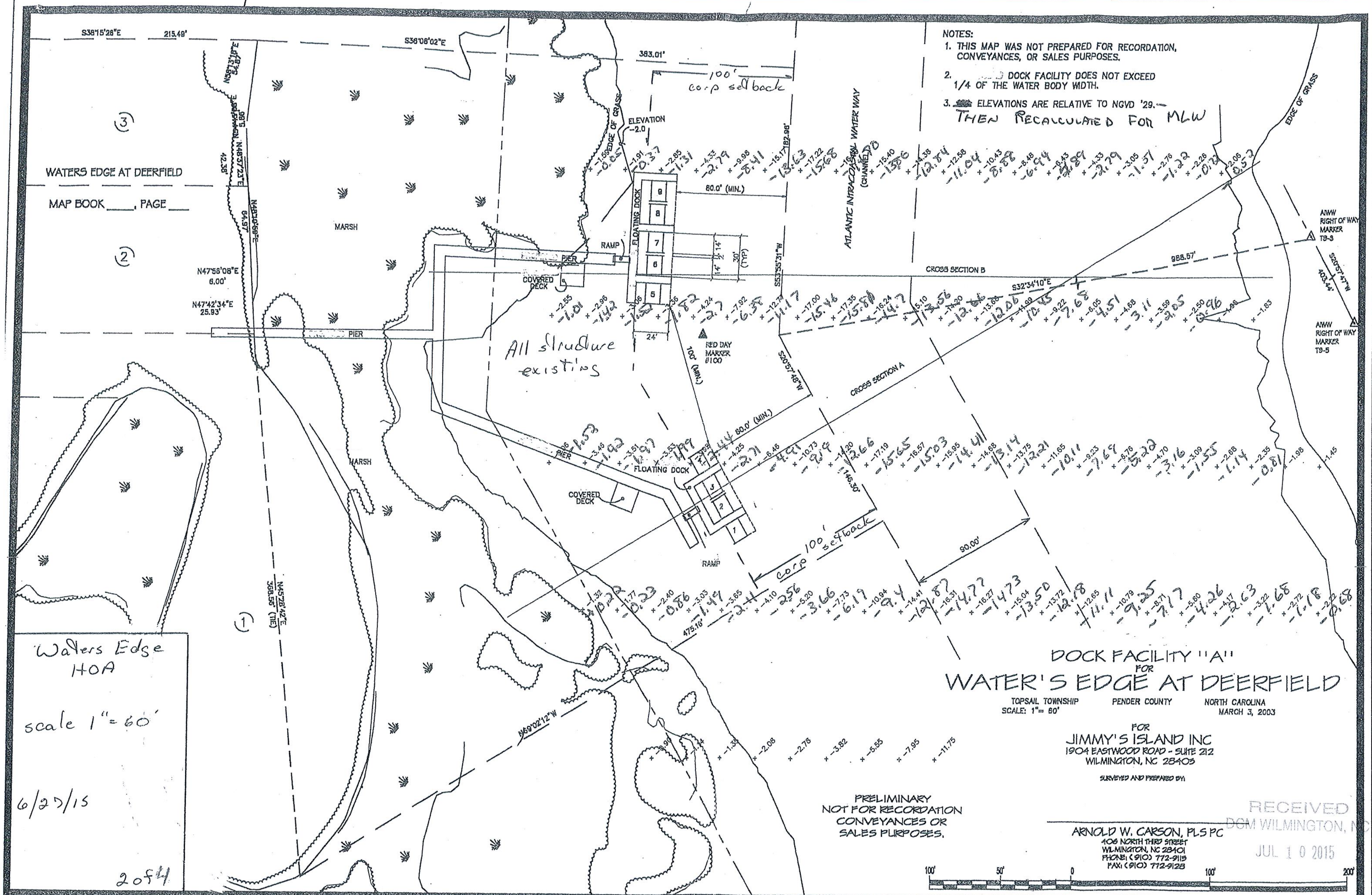

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3. ELEVATIONS ARE RELATIVE TO NGVD '29.
THEN RECALCULATED FOR MLW
S38°15'28"E
215.49'
S36°08'02"E
383.01'
100' corp setback
WATERS EDGE AT DEERFIELD
MAP BOOK ____, PAGE ____
MARSH
EDGE OF GRASS
ELEVATION -2.0
FLOATING DOCK
RAMP
PIER
COVERED DECK
80.0' (MIN.)
ATLANTIC INTRACOASTAL WATER WAY (CHANNEL)
CROSS SECTION B
CROSS SECTION A
988.57'
S32°34'10"E
AIWW RIGHT OF WAY MARKER T9-3
AIWW RIGHT OF WAY MARKER T9-5
RED DAY MARKER #100
All structure existing
N47°56'08"E 6.00'
N47°42'34"E 25.93'
N45°28'42"E 368.56' (TIE)
N69°02'12"W
475.76'
90.00'
100' corp setback
Waters Edge HOA
scale 1" = 60'
6/23/15
2 of 4
DOCK FACILITY "A"
FOR
WATER'S EDGE AT DEERFIELD
TOPSAIL TOWNSHIP
PENDER COUNTY
NORTH CAROLINA
SCALE: 1" = 60'
MARCH 3, 2003
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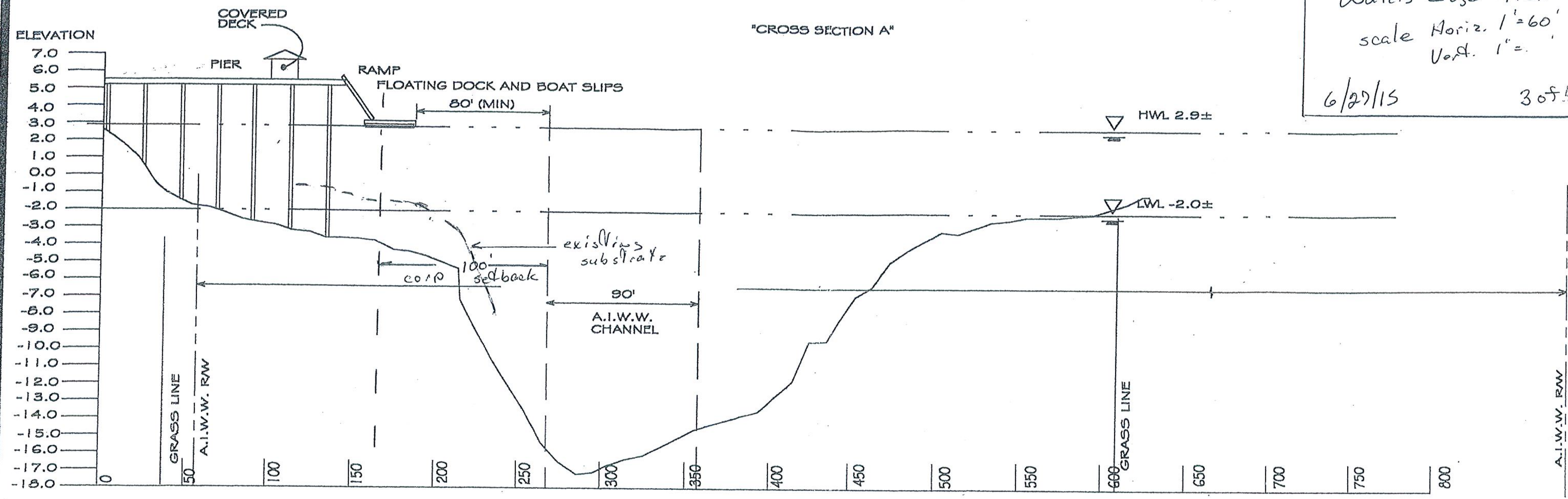
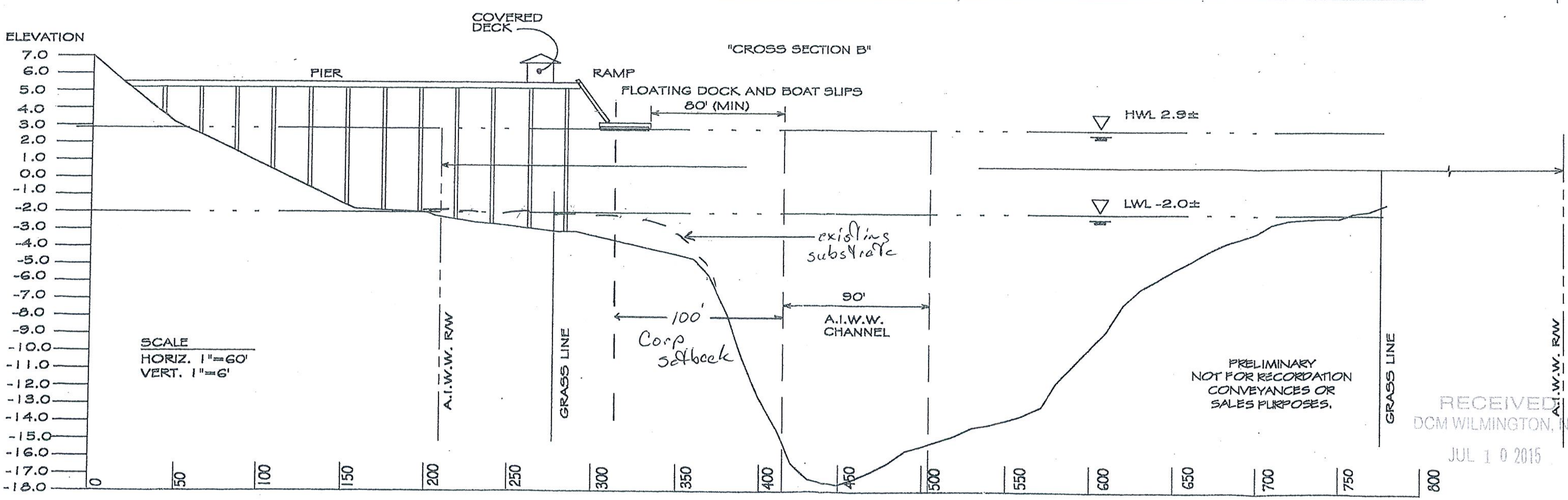
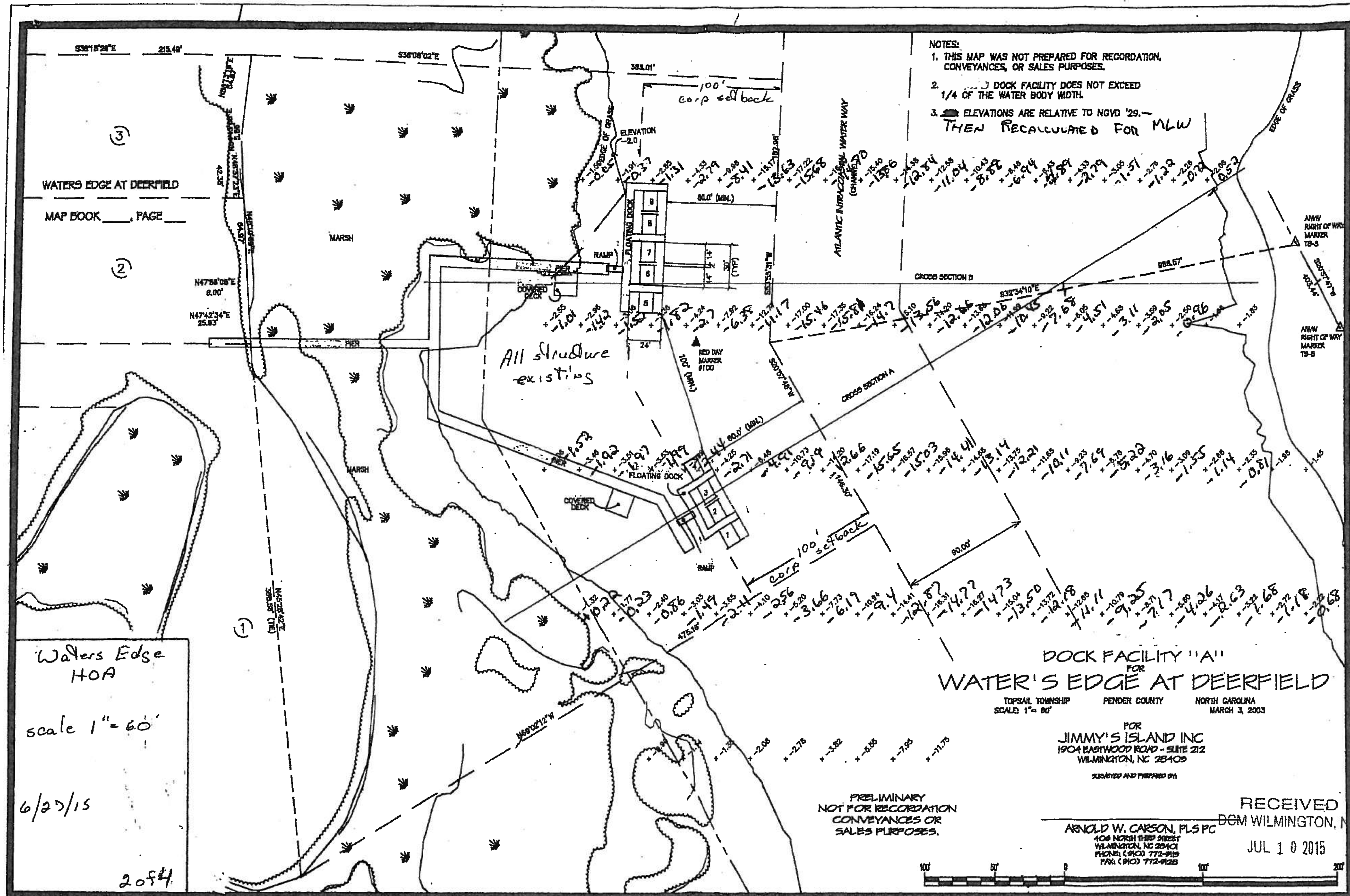
Waters Edge HOA
scale Horiz. 1"=60'
Vert. 1"=
6/27/15
3 of 4







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WATERS EDGE AT DEERFIELD
MAP BOOK ____, PAGE ____
MARSH
100' corp setback
ELEVATION -2.0
EDGE OF GRASS
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CROSS SECTION B
CROSS SECTION A
ATLANTIC INTRACOASTAL WATER WAY
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AIWW RIGHT OF WAY MARKER
All structure existing
DOCK FACILITY "A" FOR WATER'S EDGE AT DEERFIELD
TOPSAIL TOWNSHIP
PENDER COUNTY
NORTH CAROLINA
SCALE: 1"= 60'
MARCH 3, 2003
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WILMINGTON, NC 28403
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406 NORTH THIRD STREET
WILMINGTON, NC 28401
PHONE: (910) 772-9115
FAX: (910) 772-9128
PRELIMINARY NOT FOR RECORDATION CONVEYANCES OR SALES PURPOSES.
Waters Edge HOA
scale 1" = 60'
6/23/15
2 of 4
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KK

Waters Edge Homeowners Association, Inc.

2108 Capital Drive Suite 102
Wilmington, NC 28405

COPY

Saturday, October 10, 2015

Karen Higgins
North Carolina Dept. of Environmental Quality
Division of Water Resources – 401 &Buffer Permitting Unit
1647 Mail Service Center
Raleigh, NC 27699-1617

Dear Ms. Higgins,

The Waters Edge HOA is aware of the presence of submerged aquatic vegetation (SAV) in the area of our docking facility and thus in the proposed dredging project. We have been working with Jason Dail, DCM-Wilmington, to have Fisheries Division personnel do a survey and they have also ascertained the presence of SAV in the proposed permit area. We do not refute this, and are aware that this project would not be in compliance with Title 15A NCAC 02H .0502 (e). We hope this can spare us the expense of a formal SAV survey.

Our understanding is that this permit will have to be denied by the permitting Agencies due to the SAV presence and we will have to appeal to the North Carolina Coastal Resources Commission for a variance. Please let me know if you need additional information.

Thank You,

Michael Mac and John Corkrum for the Waters Edge HOA

cc.

Heather Coats, DCM Wilmington
Jason Dail, DCM Wilmington
Liz Hair, USACE

1+2

DIVISION OF COASTAL MANAGEMENT
FIELD INVESTIGATION REPORT

I. **APPLICANT'S NAME**: Waters Edge Homeowners Association C/o Mike Mac

2. **LOCATION OF PROJECT SITE**: Site is located at the southern terminus of Great Oaks Drive, in Hampstead, Pender County.

Photo Index – 2006: 26-6638, S-T 16 2000: 26-336/A-D 8-9, E 9-11 1995: 26-319/H-N 17-18, O18 -19
State Plane Coordinates - X: 2392028 **Y:** 219169 **GPS File:** Q-021720A
Lat: 34°20'39.35"N **Long:** 77°42'02.30"W

3. **INVESTIGATION TYPE**: CAMA/Dredge and Fill

4. **INVESTIGATIVE PROCEDURE**: **Dates of Site Visit** – 4/20/15, 4/28/15 and 6/18/15
Was Applicant Present – Yes, No and No

5. **PROCESSING PROCEDURE**: **Application Received** – 7/10/15
Office - Wilmington

6. **SITE DESCRIPTION**:
   - (A) **Local Land Use Plan**– Pender County
     Land Classification From LUP – Residential, Resource Protection and Conservation
   - (B) **AEC(s) Involved**: PT, EW
   - (C) **Water Dependent**: Yes
   - (D) **Intended Use**: Private
   - (E) **Wastewater Treatment: Existing**- Septic
     Planned- N/A
   - (F) **Type of Structures**: **Existing**- Single family residences, bulkheads and 18-slip docking facility.
     Planned- Dredge around both waterway docking facilities.
   - (G) **Estimated Annual Rate of Erosion**: N/A

7. **HABITAT DESCRIPTION**: **[AREA]**

	DREDGED	FILLED	OTHER
(A) Vegetated Wetlands (§404)			
(B) Non-Vegetated Wetlands (Open Water) ***Subject area contains Submerged Aqautic Vegetation (SAV) habitat**	8,750 sq. ft.		
(C) Other - Highground disturbance		90,000 sq. ft.	

   - (D) **Total Area Disturbed**: 98,750 sq. ft. (2.26 acres)
   - (E) **Primary Nursery Area**: **No**
   - (F) **Water Classification**: **SA-ORW** Open: **Yes (adjacent AIWW – Mill Creek Closed)**

8. **PROJECT SUMMARY**: The applicant proposes to dredge around the existing docking facilities located along the AIWW.

HR

9. **PROJECT DESCRIPTION**

The project site is located at the southern end of Great Oak Drive in the Deerfield Subdivision in Hampstead, Pender County. The new development, which is the subject of this permit application, surrounds the docking facilities located within/adjacent to the AIWW (slips 1-9).

To locate the project site from Wilmington, take US Hwy 17 north to Hampstead. Approximately 0.5 miles south of the Hwy 210 and US Hwy 17 intersection turn right onto Headwaters Drive. Continue along Headwaters Drive and take a left onto Overlook Drive. From there, take your next right onto Creekview Drive E and continue until the road ends. At the terminus, turn right onto Great Oaks Drive and the property will be located along the left hand side of the road at the very end.

Existing development on the property includes: single-family residences, bulkheads, subdivision infrastructure and an eighteen slip community docking facility (consisting of four access pier and docks).

The property is fairly flat with average elevations of approximately 5 feet. The property consists of approximately 19.95 acres with most of the tract having been cleared and developed. The periphery of the site adjacent to the water is well vegetated. The wetland delineation shows that the majority of the wetlands on the site are adjacent to Mill Creek and the Intracoastal waterway. Vegetation at the project site includes: a small silviculture stand of Pine trees (*Pinus sp.*) in addition to this American Holly (*Ilex opaca*), Live Oak (*Quercus virginiana*), Sweet bay (*Magnolia virginiana*), Hickory (*Carya sp.*), Yaupon (*Ilex vomitoria*), Japanese Honeysuckle (*Lonicera japonica*) and Cat briars (*Smilax sp.*). Along the coastal wetland border of the property the vegetation includes more salt tolerant species such as: Saltmarsh Cordgrass (*Spartina alterniflora*), Black-needle rush (*Juncus roemeranus*), Spike grass (*Disticlus spicata)* and Cat tails (*Typha sp.*). A Coastal Wetland and a 404/401 Wetland delineation has been conducted for the property. The 404 Wetland line has been approved by the US Army Corps of Engineers.

The waters adjacent to the project are classified "SA-ORW" by the Division of Water Quality. The area within Mill Creek is designated as a Permanent Secondary Nursery Area by the Division of Marine Fisheries; however, the waters bordering the AIWW are not (surrounding the existing AIWW docking facilities). The waters of the AIWW are OPEN to the harvesting of shellfish.

Pender County's Land Use Plan (LUP) classifies the upland areas as limited transition and all other areas as Conservation, however, the Land Use Plan includes all Areas of Environmental Concern (AEC) as well as the 404 wetlands in the Conservation class.

The subdivision has a history of CAMA/COE permitting that spans back to 2003 (CAMA permits). Specifically, on May 27, 2003, a CAMA major development permit (#68-03) was issued to Jimmy's Island, LLC for the development of a subdivision known as "Waters Edge at Deerfield". The permit authorized development of a subdivision to include only those land disturbing activities associated with establishment of the subdivision. In addition, the permit authorized the installation of a bulkhead along the property's shoreline.

On May 25, 2004, the permit was modified (major permit modification) to allow for the construction of an eighteen (18) slip docking facility, part of which was to be constructed along the headwaters of Mill Creek (slips 10-18) and the remaining portion to be located within the AIWW (slips 1-9). Based on information presented in the major modification request, water depths surrounding the AIWW dock ranged from -1.91' to -3.92' relative to NGVD '29. No calculations were provided to depict the water depths at either area based on "normal low water".

CAMA major permit No 68-03 was again modified (minor permit modification) on December 21, 2004, to allow for the filling of additional "404" type wetlands on one of the lots within the subdivision. This permit expired on December 31, 2006.

Hc

On September 8, 2008, Waters Edge Homeowners Association applied for a CAMA Major permit to perform new dredging in the location of slips 5-9. Slips 5-9 are the northern most slips located along the AIWW, and consist of an access pier, a "T-head" shaped platform and three (3) finger piers. At the time of submission, water depths surrounding the docking facility ranged from approximately -0.5' to –1.5' at Normal Low Water (NLW). According to the field investigation report prepared by Heather Coats (field representative for the Division of Coastal Management) on September 11, 2008, Ms. Coats states: *"Submerged aquatic vegetation (SAV) is present within the boatslips and therefore dredging would impact SAV and SAV habitat".* The application was circulated and reviewed by numerous resource agencies and comments supporting the planned development were unfavorable due to the project's impacts on SAV and SAV habitat. As a result, the applicant withdrew the permit package and no further action was taken.

It should be noted SAV is still present and flourishing in/around the existing docking facilities located along the AIWW. Existing conditions, as observed on April 28, 2015, by fisheries resource specialist Shane Staples and DCM field staff, revealed that SAV encompasses the vast majority of the docking facility comprising slips 5-9 and spotty vegetation exists around the docking facility comprising slips 1-4. Although an actual SAV survey has not been performed, a rudimentary sketch of where SAV is present is included in the application package. This depiction was made possible by DCM/DMF staff, and was based on conditions as they existed on April 28, 2015 and June 18, 2015 (second visit by DCM staff).

The following describes the applicant's intent to further pursue new dredging in the area not only surrounding slips 5-9, but also from the area surrounding slips 1-4.

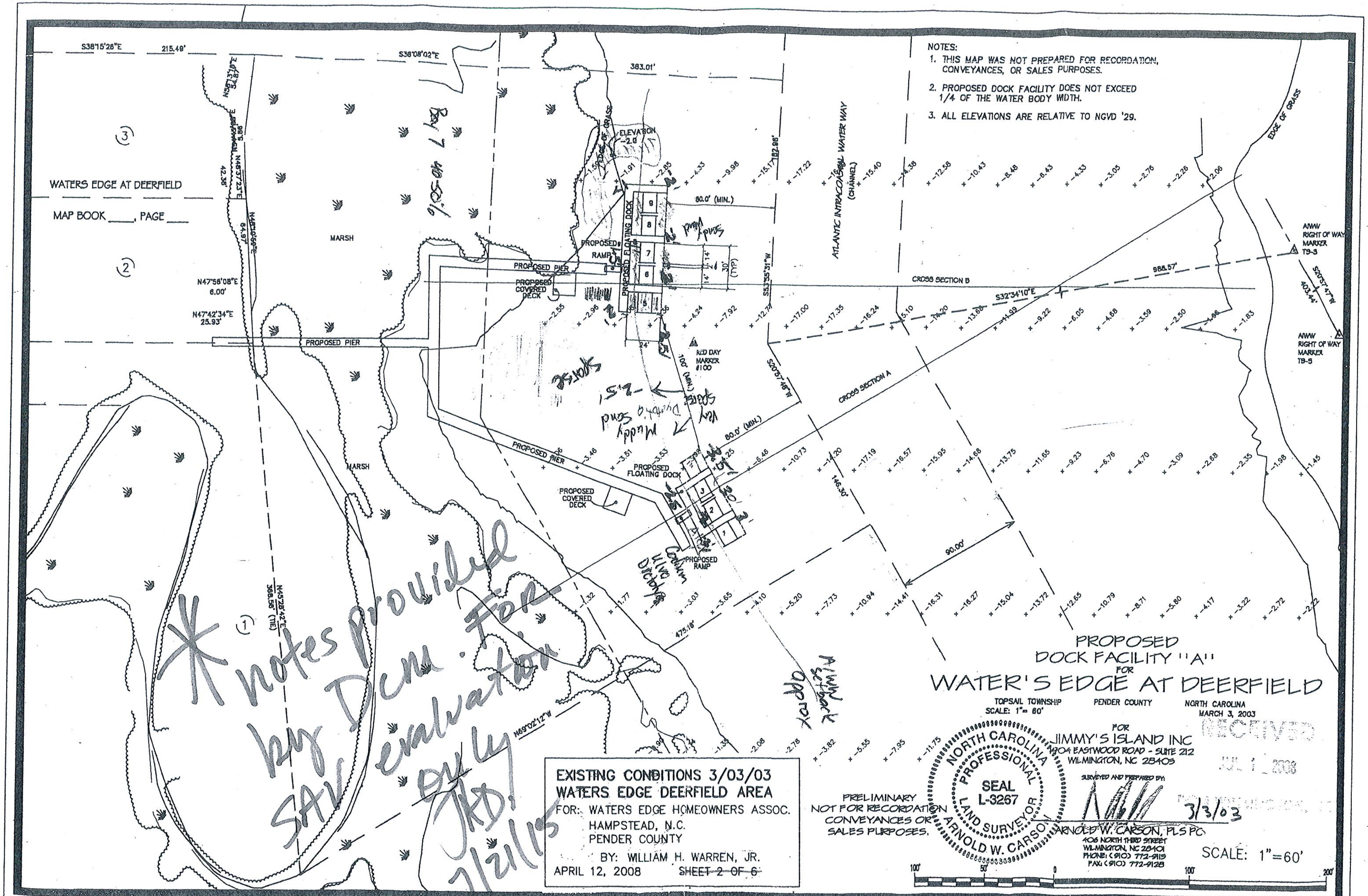
PROPOSED PROJECT

According to the project narrative and application package, the applicant is proposing to perform new dredging around the existing docking facilities located along the AIWW. As designed, a 50'(w) x 75'(l) x -4.0'(d) cut would be made along the southern dock comprising slips 1-4 and a 50' (w) x 100' (l) x -4.0' (d) cut would be made around the northern most dock comprising slips 5-9. As stated in the application package, existing water depths average -1.0' around each of the docking facilities, relative to normal low water (NLW). As proposed, spoil material generated from the proposed project would be disposed of on the USACE's disposal island DA 203; however, as of today, no consent agreement has been provided to DCM (from neither the USACE nor the applicant) allowing deposition of spoil material at this site, as it relates to this particular project. The area to be excavated is primarily located within the footprint of Slips 1-9; however, there is an overcut proposed that extends beyond the footprint of the existing docks, primarily along the waterway side of the facilities. As previously mentioned, final projects depth would increase the vertical water column in these areas from roughly -1.0' to –4' at NLW, sloping towards the AIWW. As designed, approximately 971 cubic yards of material would be excavated using a barge mounted excavator.

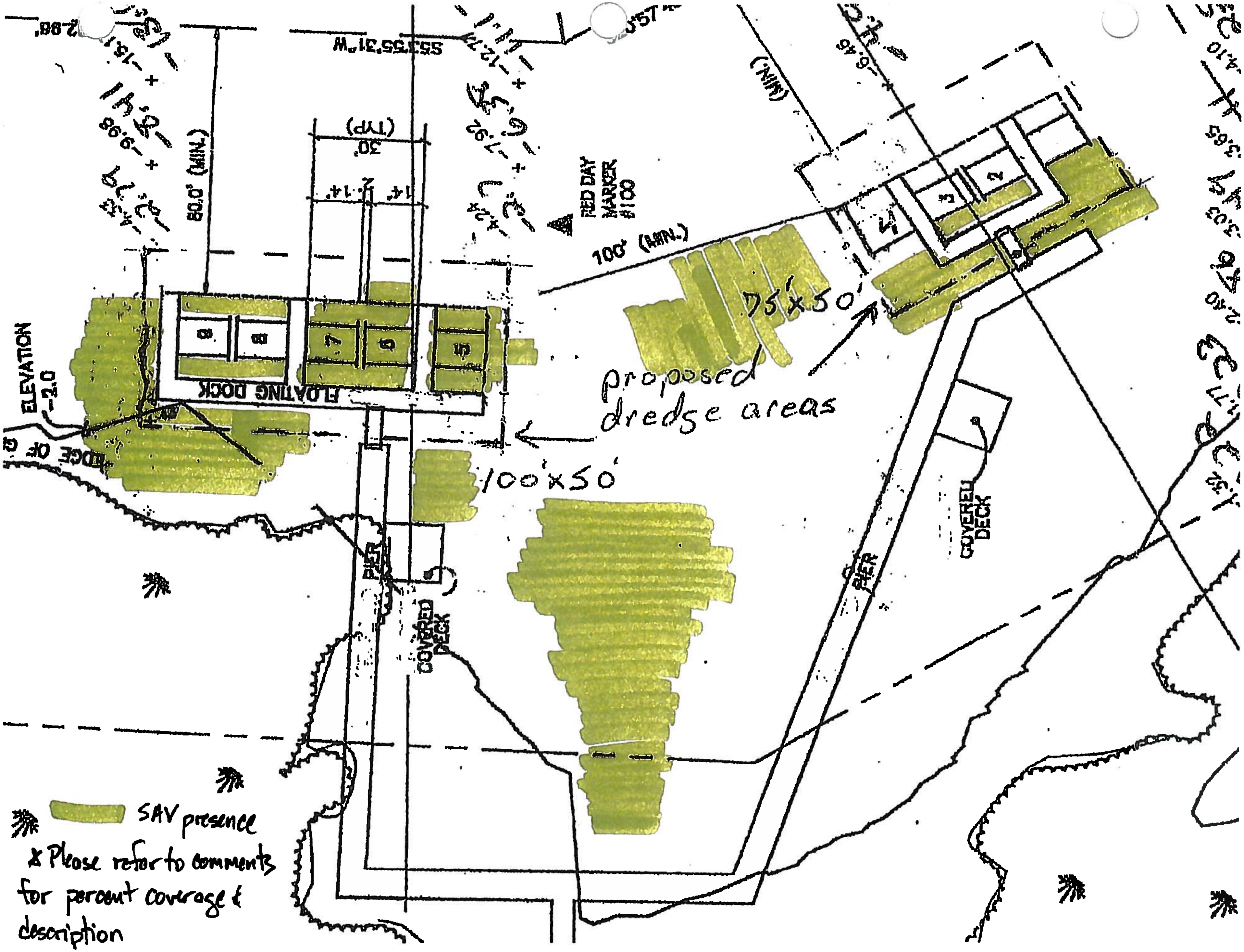
10. ANTICIPATED IMPACTS

The proposed excavation would disturb approximately 8,750 ft.² of shallow bottom area. In addition, dredging activities would result in the removal of submerged aquatic vegetation (SAV) and impact SAV habitat. The high ground disposal would result in approximately 90,000 square feet of land disturbance. The amount of actual SAV and SAV habitat eliminated as a result of the project is unknown at this time.

Submitted by: Jason Dail Date: July 15, 2015 Office: Wilmington



FOR INTERNAL REV. ONLY. DRAWING NOT PROVIDED BY APPLICANT



FLOATING DOCK
PIER
COVERED DECK
PIER
COVERED DECK
RED DAY MARKER #100
100' (MIN.)
80.0' (MIN.)
30' (TYP.)
ELEVATION -2.0
EDGE OF
proposed dredge areas
100'x50'
75'x50'
SAV presence
* Please refer to comments for percent coverage & description

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

October 23, 2015

To: Karen Higgins, Division of Water Resources

From: Anne Deaton, Division of Marine Fisheries

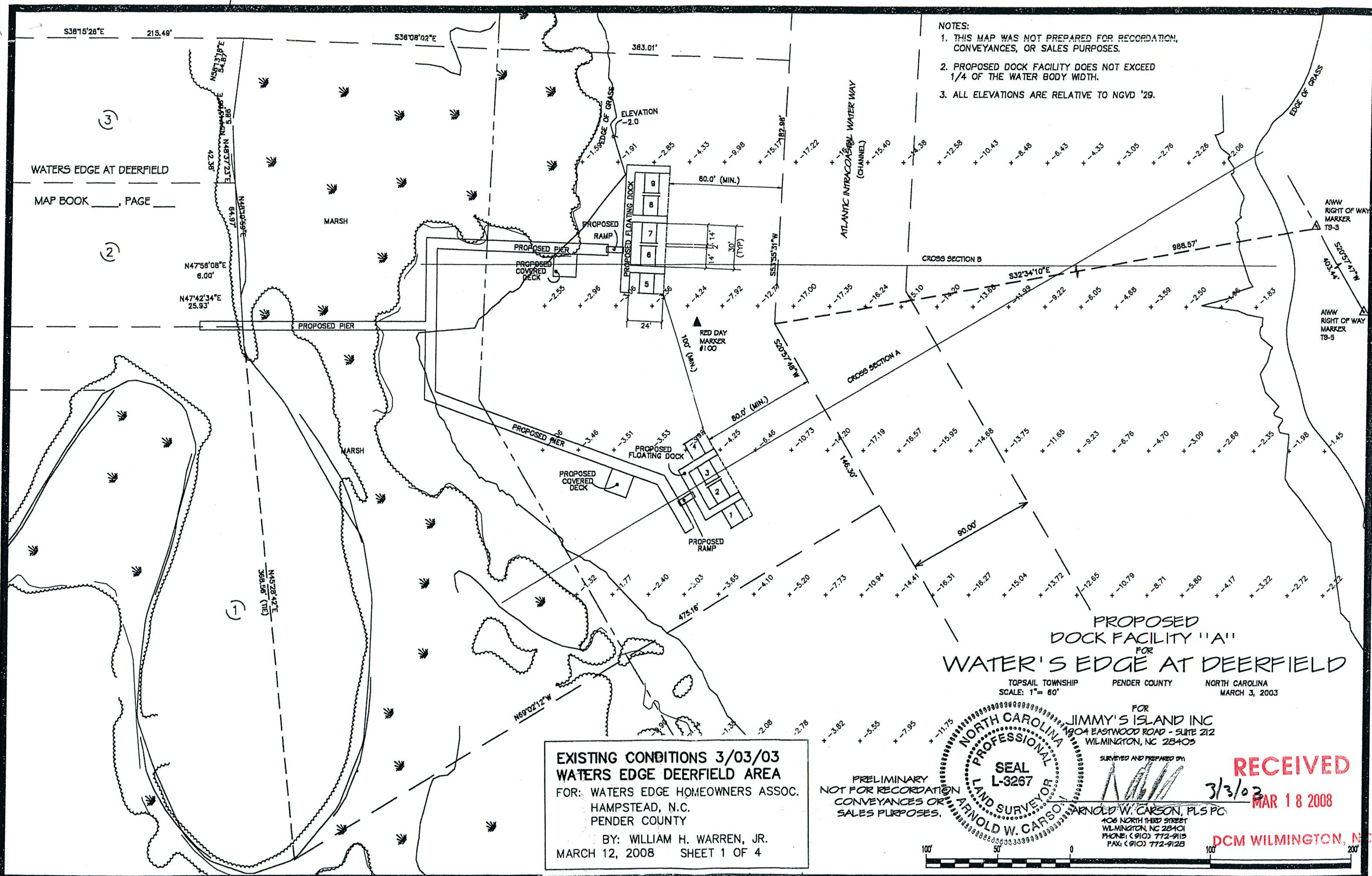
Subject: Water's Edge Homeowner's Association (Great Oaks Dr.)
Hampstead, NC

I was asked by the applicant's contractor, Jimmy North, to conduct an SAV survey for the above referenced property to satisfy the Division of Water Resource's (DWR) request for additional information. I was told by Division of Coastal Management (DCM) staff that although DCM fisheries resource specialists conducted a field visit and submerged aquatic vegetation (SAV) survey in June, a survey was needed from the Division of Marine Fisheries (DMF) or a consultant.

Under G.S. 113-131, the Division of Marine Fisheries (DMF) has authority to review and comment on development projects. In 2013, DMF transferred fisheries resource specialist positions to the Division of Coastal Management (DCM). These two positions were responsible for reviewing permit applications for DMF, and were to continue doing that function at DCM. I have attached a memo explaining that agreement. Currently the two positions that serve as the fisheries resource specialists are Gregg Bodnar and Shane Staples. I have worked with both and have complete confidence in their abilities.

Mr. Bodnar and other DCM staff surveyed the site in April and June and submitted comments in a letter dated August 20, 2015 (attached letter and survey sketch). At that time, they found SAV within the footprint of both the northern (slip # 5-9) and southern (slip #1-4) docks. The dominant species present at that time was eelgrass (Z. marina), with density ranging from 10-70%. SAV coverage was more prevalent and denser on the northern dock.

On October 23, 2015, I visited the site at low tide. Water depth at the northern dock was 0.25 - 0.54 m and a portion of the floating dock was sitting on the bottom. Water depth at the southern dock was 0.74 – 0.92 m deep. There appears to be about a 1 m tide range at the site. I observed SAV to be present in similar locations and densities as identified by DCM staff, although the major species present was shoal grass (H. wrightii). Eelgrass and shoal grass tend to occur in mixed beds, with eelgrass more abundant in the spring and early summer and shoal grass more abundant in the late summer and fall, so this difference in species was expected. Based on my visual inspection of the proposed dredge site, I concur with the previous survey results found by DCM in June.



NOTES:
1. THIS MAP WAS NOT PREPARED FOR RECORDATION, CONVEYANCES, OR SALES PURPOSES.
2. PROPOSED DOCK FACILITY DOES NOT EXCEED 1/4 OF THE WATER BODY WIDTH.
3. ALL ELEVATIONS ARE RELATIVE TO NGVD '29.
WATERS EDGE AT DEERFIELD
MAP BOOK ____, PAGE ____
MARSH
ATLANTIC INTRACOASTAL WATER WAY (CHANNEL)
EDGE OF GRASS
ELEVATION -2.0
PROPOSED FLOATING DOCK
PROPOSED RAMP
PROPOSED PIER
PROPOSED COVERED DECK
80.0' (MIN.)
100' (MIN.)
90.00'
RED DAY MARKER #100
CROSS SECTION A
CROSS SECTION B
AIWW RIGHT OF WAY MARKER T9-3
AIWW RIGHT OF WAY MARKER T9-5
S38°15'28"E 215.49'
S36°08'02"E 383.01'
S32°34'10"E 988.57'
N69°02'12"W 475.16'
N45°28'42"E 368.56' (TIE)
PROPOSED DOCK FACILITY "A" FOR WATER'S EDGE AT DEERFIELD
TOPSAIL TOWNSHIP PENDER COUNTY NORTH CAROLINA
SCALE: 1" = 60' MARCH 3, 2003
FOR JIMMY'S ISLAND INC
1904 EASTWOOD ROAD - SUITE 212
WILMINGTON, NC 28403
NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-3267 ARNOLD W. CARSON
PRELIMINARY NOT FOR RECORDATION CONVEYANCES OR SALES PURPOSES.
SURVEYED AND PREPARED BY:
3/3/03
ARNOLD W. CARSON, PLS PC
406 NORTH THIRD STREET
WILMINGTON, NC 28401
PHONE: (910) 772-9115
FAX: (910) 772-9128
RECEIVED
MAR 18 2008
DCM WILMINGTON, NC
EXISTING CONDITIONS 3/03/03
WATERS EDGE DEERFIELD AREA
FOR: WATERS EDGE HOMEOWNERS ASSOC.
HAMPSTEAD, N.C.
PENDER COUNTY
BY: WILLIAM H. WARREN, JR.
MARCH 12, 2008 SHEET 1 OF 4

ENVIRONMENTAL ASSESSMENT

FOR THE

COMMUNITY DOCKING FACILITY
FOR WATER'S EDGE AT DEERFIELD

TOPSAIL SOUND (AIWW) AND MILL CREEK
PENDER COUNTY, NORTH CAROLINA

PROPOSED BY

JIMMY'S ISLAND LLC
1904 EASTWOOD ROAD, SUITE 212
WILMINGTON, NC 28403

FOR THE RESPONSIBLE AGENCY:

THE NORTH CAROLINA DIVISION OF COASTAL MANAGEMENT
1638 MAIL SERVICE CENTER
RALEIGH, NC 27699-1638
CONTACT PERSON: DOUG HUGGETT
919-733-2293; EXT. 247

PREPARED BY

CHARLIE HOLLIS
REGULATORY CONSULTANT
138 GREEN FOREST DRIVE
WILMINTON, NC 28409
910-392-6833

REVISED
DECEMBER 29, 2003

IN ACCORDANCE WITH
THE NORTH CAROLINA ENVIRONMENTAL POLICY ACT

ENVIRONMENTAL ASSESSMENT

COMMUNITY DOCKING FACILITY
FOR WATER'S EDGE AT DEERFIELD
TOPSAIL SOUND (AIWW) AND MILL CREEK
PENDER COUNTY, NORTH CAROLINA

REVISED
DECEMBER 29, 2003

TABLE OF CONTENTS

ENVIRONMENTAL ASSESSMENT

COMMUNITY DOCKING FACILITY
FOR WATER'S EDGE AT DEERFIELD
TOPSAIL SOUND (AIWW) AND MILL CREEK
PENDER COUNTY, NORTH CAROLINA

REVISED
DECEMBER 29, 2003

SCOPE: Authorization for the Community Docking Facility for Water's Edge at Deerfield addressed in this Environmental Assessment has been requested in the form of a Major Modification to the recently issued Major CAMA Permit No.68-03 which provided approval of the overall Water's Edge Subdivision. Since that issued permit addressed all of the landward features of the overall subdivision project, this Environmental Assessment is limited to addressing only the impacts of the proposed Community Docking Facility. This document will provide the N.C. Division of Coastal Management (NCDCM) and associated agencies with a decision-making tool to determine if the proposed docking facility for the Water's Edge at Deerfield Subdivision will cause sufficient environmental impact as to require the preparation of an Environmental Impact Statement (EIS). If an EIS is not warranted, a Finding of No Significant Impact (FONSI) may be issued prior to the final action on a CAMA Major Development Permit. A FONSI does not assure issuance of a CAMA permit.

A. PROPOSED PROJECT DESCRIPTION

General. The Water's Edge at Deerfield Subdivision is an 18-lot subdivision on a 20-acre tract approximately 15' above sea level located along the eastern shore of Mill Creek and the northern edge of Topsail Sound and is an extension of the existing Deerfield Subdivision near Hampstead, in Pender County, N.C. The property is located at the end of Great Oaks Drive. The Water's Edge subdivision has been previously platted and was the subject of review for a Major Coastal Area Management Act (CAMA) Permit No. 68-03 issued on May 27, 2003. That permit authorized construction of a bulkhead with backfill after review of the total project and after the N.C. Division of Water Quality issued Stormwater Permit No. SW8030110. Other approvals of the subdivision are under review by the Pender County Planning Department. The scope of this Environmental Assessment, therefore, is limited to assessing the impact of the construction and operation of the four proposed piers that constitute the docking facility for the subdivision residents. The Developer is Jimmy's Island, LLC; 1904 Eastwood Road, Wilmington, NC 28403. The area is zoned R-20 by Pender County whose Land Use Plan designates the area as "Rural". Along the shorelines of Mill Creek, aerial photography (10-21-00) provided by NCDCM shows nine small residential piers across the creek from the Water's Edge project and none on the same side. Along the AIWW to the north, the photography shows seven residential piers within a mile of Water's Edge and one within a mile to the south. Adjacent and nearby land use is residential. The proposed Community Docking Facility for Water's Edge at Deerfield will provide recreational water access for the residents of each of the 18 lots within the approved Water's Edge Subdivision. Deed restrictions will be recorded for each lot that prohibits the construction of individual piers or docks and that designate specific dock space at the community facility. Language for these restrictions will in accordance with advice from the NCDCM. The proposed facility consists of four piers: two each in the waters of Topsail Sound (AIWW) (Dock Facility "A") and two each in Mill Creek (Dock Facility "B"). The Topsail Sound(AIWW) facility is 7500' from the Mill Creek facility. Plans showing the proposed piers are enclosed. As requested by the NC Wildlife Resources Commission: (1) the pier decking will be constructed a minimum of 4' off of the marsh floor, (2) will take place during periods of minimum biological activity, and (3) will conform to NCDCM ¼ rule. The docks are located adjacent to existing dredge-maintained channels in Mill Creek and the AIWW, respectively.

__**Dock Facility "A": Topsail Sound (AIWW) Piers.**__ In __Topsail Sound (AIWW)__, one T-head pier with 5 boat slips at a 90'-long by 4'-wide floating dock with three 24'-long by 4'-wide finger piers will be located approximately 65' waterward of the marsh edge and 80' from the bottom edge of the Atlantic Intracoastal Waterway (AIWW). Topsail Sound at this point is approximately 500' wide. The second pier in __Topsail Sound (AIWW)__, an L-head pier is located 100' from the first, and proposes 4 boat slips at a 38'-long by 4'-wide floating dock with two 24'-long by 4'-wide finger piers. It will be located approximately 140' waterward from the edge of the marsh and also 80' from the bottom edge of the AIWW. The width of Topsail Sound at this point is approximately 560'. Both of the __Topsail Sound (AIWW)__ piers are designed to accommodate either boat-lifts or wet slips, at the option of the lot owner. Only boats 21' or less in length and without cabins or heads will be accommodated in either option. Each of these piers will have a 15' x 15' covered deck.

__**Dock Facility "B": Mill Creek Piers.**__ In __Mill Creek__, one L-head pier with 5 boat slips spaced along a 150'-long by 4'-wide floating platform, is located approximately 20' waterward of the marsh edge in a reach of the creek where the width between the marsh edges is 85'. The second pier in __Mill Creek__, a T-head pier, is located 115' from the first, has 4 boat slips spaced along a 120'-long by 4'-wide floating platform and is located approximately 25' waterward of the marsh edge in a reach of the creek where the width between the marsh edges is 100'. Both of the __Mill Creek__ piers have wet slips for boats 21' or less in length and without cabins or heads. Each of these piers will have a 15' x 15' covered deck.

B. PURPOSE AND NEED FOR PROJECT.

The purpose of this project is to provide recreational water access for the residents of each of the 18 lots within the Water" Edge Subdivision. The need for the project is embraced by the goal of the Jimmy" Island LLC Group of providing quality housing in a quality neighborhood where residents can enjoy the adjacent waters of Mill Creek and Topsail Sound for recreational boating, fishing, crabbing, and quiet contemplation. The location of the Water's Edge project affords the unique opportunity for the realization of these goals. Additionally, the provision of water access allows the developer to expect a realistic price for the residential lots, not necessarily for greater profit, but to offset the greater cost of this tract of waterfront property.

C. ALTERNATIVES ANALYSIS.

1. **BOAT RAMP.** No area along the Water's Edge Shoreline would accommodate a boat ramp without some dredging and filling, activities which are not allowed in this Primary Nursery Area.
2. **INLAND BASIN.** This alternative would require dredging a channel, not allowed in a PNA.
3. **18 INDIVIDUAL PIERS.** All of the lots at the Water's Edge Subdivision are located on the water front of either Mill Creek or Topsail Sound. Most, if not all, of the lot owners could likely obtain a permit to construct a private residential pier with up to 4 boat slips. At the worst case, dock space for 72 boats might result. This clutter of docks and boats is not acceptable to the developer and would detract from the intended quality of the Water's Edge project
4. **DO NOTHING.** This alternative would not meet the goals and needs of the project.
5. **CONSTRUCT FOUR PIERS (PREFERRED ALTERNATIVE)** This is the least environmentally damaging alternative that would satisfy the needs of the Water's Edge project that have been identified. The alternative not only provided the desired and needed water access for the lot owners, but it limits the number of boat slips to 18 along a shoreline of over 3000'.

D. EXISTING ENVIRONMENTAL CHARACTERISTICS OF THE PROJECT AREA.

1. **MILL CREEK.** The Water's Edge Subdivision is an extension of the larger Deerfield Subdivision. During the development of Deerfield in the 1970's and 1980's, Mill Creek was dredged extensively to create waterfront lots. The lower 2500' of the Mill Creek dredged channel extends along the south shore of the Water's Edge Subdivision. Approximately 3000' of existing Mill Creek dredged channels are located upstream of Water's Edge. This channel system continues to be subject to periodic maintenance dredging. The Water's Edge shoreline on Mill Creek has a bordering complex of tidal marsh and mud-flat extending about 200' or more out to the mean low water line. The project area consists of the pier corridors over which the structures will extend. Within this area are scattered oyster clusters and various benthic species (fiddler crabs, etc.). No submerged aquatics have been observed or noted on aerial photography within the project area. Existing water depths at the end of the Mill Creek piers is –3.5' MLW. The area is designated a Primary Nursery Area and Mill Creek serves as a small estuary where upstream fresh water flows into the salt waters of Topsail Sound. This mixing zone attracts a wide variety of juvenile and small finfish, crabs, and other local species.

2. **TOPSAIL SOUND (AIWW).** The eastern shoreline of Water's Edge extends about 600' along Atlantic Intracoastal Waterway. Here too, there is a 200'+ border of tidal marsh and mud flat separating the high ground of Water's Edge from the mean low water line. The project area here also consists of the pier corridors over which the structures will extend. The intertidal area in this location is more stressed by the regular wave wash from passing vessels and its unprotected exposure to northeasterly and southeasterly wind quadrants. Scattered oyster clusters and benthic species are observed in this area. No submerged aquatics have been observed. Existing water depths at the end of the piers is –3.5' MLW. The area is designated a Primary Nursery Area and serves as habitat for a variety of fish and crabs. The AIWW hosts regular commercial and non-commercial vessels moving north and south in front of this site. The AIWW is subject to periodic Maintenance dredging

E. PREDICTED ENVIRONMENTAL EFFECTS OF THE PIERS

1. **TOPOGRAPHY.** No impact

2. **SOILS.** Insignificant impact caused by jetting piling during construction.

3. **LAND USE.** No changes in land use will occur because of these piers.

4. **WETLANDS.** The pier structures will be elevated well above all coastal and/or fresh marsh.

5. **PRIME or UNIQUE AGRICULTURAL LANDS.** No impact

6. **PUBLIC LANDS and SCENIC, RECREATIONAL, and STATE NATURAL AREAS.** Mill Creek and Topsail Sound are Public Trust Waters, within which water-dependent structures, such as these piers are allowed.

7. **AREAS of ARCHAEOLOGICAL or HISTORICAL VALUE.** No impact

8. **AIR QUALITY.** Exhausts from the motors of the small boats using these facilities will have short-term minor impacts on air quality. The locations of all of the piers are in wide open areas where wind movement is unrestricted and will quickly dissipate exhaust gases.

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COASTAL MANAGEMENT

9. **NOISE LEVELS.** Noise during construction will occur for a few days. Noise from the motors of the boats will be minor and not unlike the existing boat noise in the area.

10. **WATER RESOURCES (SURFACE WATER AND GROUND WATER).** . The tidal surface waters of Topsail Sound are designated as a "Primary Nursery Area" by the North Carolina Division of Marine Fisheries and are classified "SA" by the North Carolina Division of Water Quality. The waters are open to the taking of shellfish. Restrictive covenants will be imposed by the developer to limit boats using the dock to 21' or less in length and preventing the presence of cabins or heads. Accidental spills will be quickly dissipated by the full range of twice-daily tides present in the area.

11. **FOREST RESOURCES.** No impact.

12. **SHELLFISH or FISH and THEIR HABITATS.** The construction of the piers will affect some scattered shellfish. The day to day usage of the facility will result in some spillage of fuel and oils, but no overboard discharge from onboard sanitary facilities will occur since the developer has imposed restrictive covenants that prohibit the length of boats to 21' or less, and without cabins or heads. The boat docks are to be located 265' and 300', respectively offshore of the land where existing boat traffic and usage prevails and where extensive tidal currents will effectively diffuse spills. No fuel facilities will be located on the dock systems. No shellfish closure will be imposed for this facility since only 18 boat slips are proposed and the boats are limited in size to 21' with no cabins or heads. There are significant finfish, crab, and shrimp resources in these waters, none of which are anticipated to be significantly adversely affected by this project.

13. **WILDLIFE and NATURAL VEGETATION.** Waterfowl use this area for feeding and resting as well as do occasional otter and other mammals. These pier facilities and their use will not add significant disturbance to these species beyond that they experience from the existing similar facilities on other properties.

14. **INTRODUCTION OF TOXIC SUBSTANCES.** Only lumber and timbers subjected to acceptable treatment methods will be use in the construction of these piers. No other substances other than rare accidental minor petroleum spills will be introduced. This area is subject to the maximum tidal amplitude expected in the region because of the close proximity to Masons Inlet and the Atlantic Ocean.

15. **CONSTRUCTION.**

a. **<u>Dock Facility "A": Topsail Sound (AIWW) Piers</u>.** A 6'-wide walkway will begin along the edge of the boundary of lots 1 and 2 and extend (elevated) across the marsh where the two Topsail Sound piers will begin. The northernmost T-head pier will extend approximately 250' waterward from the mean high water contour to which is attached a 90' x 4' floating platform with three 21' x 4' finger piers extending to the –3.5' (mlw) contour in Topsail Sound (AIWW). This is at a point about 65' waterward of the marsh edge and 80' away from the bottom edge of the AIWW. The floating platform will be designed to provide the option of a boat-lift or wet slip for 5 boats up to 21' in length. The southernmost pier, located 100' south of the first, will extend 230' from the mean high water contour to a point about 100' waterward of the marsh edge. A floating platform measuring 40' x 4' with two 24' x 4' finger piers will be attached to this second pier and will reach a point where the water depth is –3.5' mlw and the bottom edge of the AIWW is 80' away. This pier will accommodate 4 boats up to 21' in length at a floating platform designed to provide the option of a boat-lift or wet slip. The distance between the marsh edges (across the AIWW) in this area is approximately 500'. Each of these piers will have a 15' x 15' covered deck. This construction work will involve jetting and/or driving timbers into the ground and constructing the pier using conventional fasteners (nails, etc.). Noise will be generated during construction.

b. **<u>Dock Facility "B": Mill Creek Piers</u>.** A single 6'-wide walkway will begin at the edge of a cul-d-sac and extend along the boundary of lots 17 and 18 to the approximate mean high water contour where the two Mill Creek piers will begin. The upstream L-head pier will extend (elevated) across the wetlands and marsh to a point about 20' waterward of the marsh edge or a distance of about 265' waterward of the mean high water contour and terminate at the (approx.) –3.5' (mlw) contour. Five boat slips are proposed to be aligned alongside a 150'-long by 4'-wide floating platform. Each slip will accommodate one boat up to 21' in length. The second pier, located 115' downstream of the first, will extend across the marsh to a point about 25' waterward of the marsh edge which is also about 265' waterward of the mean high water contour. Water depth at this point is about –3.5' (mlw). The pier will have 4 boat slips aligned alongside a 120'-long by 4'-wide floating platform. Each of these slips will accommodate one 21' boat. Each of these piers will have a 15' x 15' covered deck. The construction work for these piers will involve jetting and/or driving timbers into the ground and constructing each pier using conventional fasteners (nails, bolts, etc.). No excavation or fill will occur and no wetlands will be impacted. Noise will be generated during construction.

F. MITIGATIVE MEASURES

None required.

G. REFERENCES

None

H. EXHIBITS

Application for Major Coastal Management Act (CAMA) Permit

I. STATE and FEDERAL PERMITS REQUIRED

A Department of The Army (Corps of Engineers) Permit will be considered under the joint processing agreement with the N. C. Office of Coastal Management.

H. EXHIBITS

COPY OF APPLICATION AND DRAWINGS
FOR MAJOR MODIFICATION OF CAMA PERMIT NO. 68-03

APPENDIX

RESPONSE TO AGENCY COMMENTS

1. North Carolina Wildlife Resources Commission:

Comment: Permit should include conditions: (1) requiring the pier decking to be a minimum of 4' off the marsh floor, (2) perform no future dredging, (3) avoid work during sensitive biological activity, and (4) the piers and docks should conform to the NCDCM ¼ rule.

Response: Conditions 1, 3, and 4 are acceptable and changes have been made in this document to Reflect the applicant's concurrence. The proposed piers are located adjacent to existing dredge-maintained channels (Mill Creek and the AIWW) which will continue to be maintained as needed.

2. North Carolina Division of Water Quality:

Comment: The area "Myrtle Grove Sound" was erroneously used instead of Topsail Sound on Page 4, Section E, #10.

Response: This correction has been made.

Comment: Boats should be limited to 21' in length and with no heads. In compliance with North Carolina Administrative Code 15A NCAC 2B .0225(e)(7)(F).

Response: That change has been made throughout the document

BEFORE THE NORTH CAROLINA COASTAL RESOURCES COMMISSION
Waters Edge HOA, Inc. Variance Request

AFFIDAVIT OF RAYMOND L. BALLARD

Affiant, being first duly sworn, depose and say that:

1. My name is Raymond L. Ballard.

2. I am married to Beverly A. Ballard. We are the owners of a home in the Waters Edge at Deerfield subdivision, with the address of 107 Waters Edge Drive, Hampstead, NC 28443 and have resided there since 2004. The property is described as Lot 7, Waters Edge at Deerfield, as shown on a plat recorded in Plat Book 37 at Pages 133-134. We have been members of the Waters Edge HOA, Inc. (HOA) since July 14, 2004, when we acquired the subject property (see attached copy of Deed Book 2430, Page 185, Pender County Registry).

3. I am familiar with the nine (9) boat slips owned by the HOA that are located on the Atlantic Intracoastal Waterway. Our lot is assigned one of the boat slips, boat slip # 2.

4. The boat slips were constructed around 2004. At the time they were constructed, the water depth at each of the boat slips was sufficiently deep so that recreational boats up 24 feet could readily dock without difficultly at any time, regardless of low or high tide.

5. However, significant shoaling has taken place since the boat slips were constructed. The boat slips are now so shallow that they cannot be safely used at normal low to medium tides.

6. I am not aware of the presence of Submerged Aquatic Vegetation within the boat slips at the time they were constructed. The boat slips were constructed as permitted.

Raymond L. Ballard

STATE OF NORTH CAROLINA
COUNTY OF New Hanover

SWORN TO and subscribed before me this 10th day of November, 2016.

Virginia L. Simmons
Notary Public
New Hanover County
North Carolina
My Commission Expires 8.27.2018

Notary Public
My Commission expires: 8.27.2018

BEFORE THE NORTH CAROLINA COASTAL RESOURCES COMMISSION
Waters Edge HOA, Inc. Variance Request

AFFIDAVIT OF TODD SKEEN

Affiant, being first duly sworn, deposes and says that:

1. My name is Todd Skeen.

2. My wife Whitney Skeen and I are the owners of the property located at 108 Great Oak Drive, Hampstead, NC 28443 and described as Lot 1, Waters Edge at Deerfield subdivision, as shown on a plat recorded in Plat Book 37 at Pages 133-134.

3. We reside at 108 Great Oak Drive, Hampstead, NC 28443.

4. I have been a member of the Waters Edge HOA, Inc. since September 13, 2012, when I acquired the subject property (see attached copy of Deed Book 4131, Page 101, Pender County Registry). I serve on the HOA board of directors.

5. I am familiar with the nine (9) community boat slips owned by the HOA that are located on the Atlantic Intra-Coastal Waterway ("AICW"). The AICW boat slips are in two groups. Four slips (1 through 4) are at the southern prong of the AICW docks. Five slips (6 through 9) are at the northern prong. I am assigned rights to use Slip # 6 on the northern prong, towards its southern end.

6. The HOA's boat slips on the AICW were ideally located. Marker 100 of the AICW is located directly across from the boat slips. The boat slips are near Topsail Creek, from which direct access to the Atlantic Ocean via New Topsail Inlet can be obtained. The boat slips can be easily accessed by land vehicles, as they are located at the intersection of Waters Edge Drive and Great Oak Drive, which is about 1.5 miles from US Highway 17 in Hampstead NC.

7. I am a boating and fishing enthusiast, along with other residents of Water Edge. The Waters Edge subdivision is an ideal location for homeowners who desire beautiful coastal waterfront views and direct access to the adjacent ocean and estuarine waters.

8. I understand that the boat slips were constructed around 2004, and, at that time, the water depth at each of the boat slips was sufficiently deep so mooring could be achieved within them at any time without difficultly, even at low tide.

9. However, significant shoaling has taken place since their construction. I have witnessed the shoaling worsening significantly since my wife Whitney and I

moved to Waters Edge in 2014.

10. When I moved to Waters Edge, it was possible to use the boat slips at low tide. However, the shoaling is now so extreme that the boat slips are now so shallow that they cannot be safely used, even at the normal low to mid tides.

11. Attached as **Exhibits 1 through 22** are recent photographs that I either took or participated in taking during a normal low tide at the Waters Edge boat slips. The photographs illustrate the shoaling and damage caused by shoaling. Each photograph is incorporated by reference.

12. **Exhibit 1** is the view looking north from boat slips ## 8 and 9, which are the northernmost of the Waters Edge boat slips on the AICW. This photograph shows the slips are so shallow that sprigs of Submerged Aquatic Vegetation (SAV) are above the water surface.

13. **Exhibits 2 and 3** show the shallow depth of boat slips ## 8 and 9 and SAV interspersed within. **Exhibit 4** shows me standing in the middle of slip # 9, with the water coming up only to my ankles.

14. **Exhibit 5** is view looking landward from slip # 9 toward my home on Great Oaks Drive. The bottom of slips 8 and 9 is in the foreground, and muck located landward of the docks is in the background.

15. **Exhibit 6** shows an abandoned john boat stuck in the muck at low tide in slip # 7.

16. **Exhibits 7 and 8** show me measuring the shallow depth at the outside southern edge of slip # 5. I am using a white PVC pipe with orange tape marking 3 feet and dipping it into the shallow water.

17. **Exhibit 9** is a view looking out onto the AICW from the northern outside edge of slip # 9. A boat is shown traversing the AICW in southerly direction, leaving behind a wake. **Exhibit 10** shows waves from the wake washing into slips 8 and 9.

18. **Exhibit 11** shows me standing on the walkway of the southern prong of the Waters Edge community boat docks. I am standing in front of boat slip # 2, just to the left of the southern-most boat slip, which is boat slip # 1. **Exhibits 12 and 13** show me measuring the shallow depth of boat slip # 2.

19. **Exhibits 14 through 20** are submitted to show damage to my boat and boat lift equipment caused by the shoaling in my boat slip # 6.

20. **Exhibit 14** shows paint missing off of the engine skeg (picture of skeg is upside down). The paint was scrapped off the skeg from backing in and out of the slip

with insufficient water. The engine skeg drags through the bottom during the backing in and out, which scrapes off the paint.

21. **Exhibit 15** shows dents in propeller edges caused by the propeller while it is moving through shells in the sediment at slips. The slip is so shallow that there is not enough draw to prevent the propeller from going down into the submerged bottom.

22. **Exhibit 16** shows scrapes on the bottom of my boat hull caused by shells mixed in with the shallow sediment bottom within my slip. This comes from backing in/out and the hull scraping along the bottom.

23. **Exhibit 17** shows gashes in my boat's starboard gunnel. This happened when I returned from fishing one night. I was unable to use my own boat slip 6 because the extremely low tide. My boat lift in slip # 6 was so low towards the bottom that I could not maneuver my boat in the slip. Thus, I maneuvered into adjacent boat lift 5, which was not occupied and does not have a boat lift. I deployed spring lines and bumpers to minimize any damage from boat wakes while my boat was moored in boat slip 5. Notwithstanding this precaution, the boat still suffered these gashes from the boat slamming against the finger pier adjacent to slip 5 due to large boat wakes from the AICW.

24. **Exhibit 18** is a close-up of the steel lines wrapped in grooves within the turning cylinder of my boat slip. The cables appear as they should, wrapped around the cylinder within the grooves. **Exhibit 19** shows the same lift cables having come out of the grooves and are cross-wrapped over each. Note the evidence of the cables cutting into the metal bars on metal bars on each side of the cylinder. This happens when lifting and lowering the boat into the too-shallow water within the boat slip. This will lead to the cables deteriorating and cutting through each other when under the load of lifting up a 10,000 pound boat. This is an extremely dangerous condition that can cause serious personal injury or death and substantial property damage. **Exhibit 20** shows the progressive worsening after the lift bunks have been lowered. There is more damage to side metal bars. More of the cables have come unraveled from the cylinder grooves.

Todd Skeen

STATE OF NORTH CAROLINA
COUNTY OF Pender

SWORN TO and subscribed before me this 10 day of November, 2016.

DENISE C. BATSON
NOTARY
PUBLIC
PENDER COUNTY, N.C.

Denise C Batson
Notary Public
My Commission expires: 5/26/2017


EXHIBIT
1
tabbies

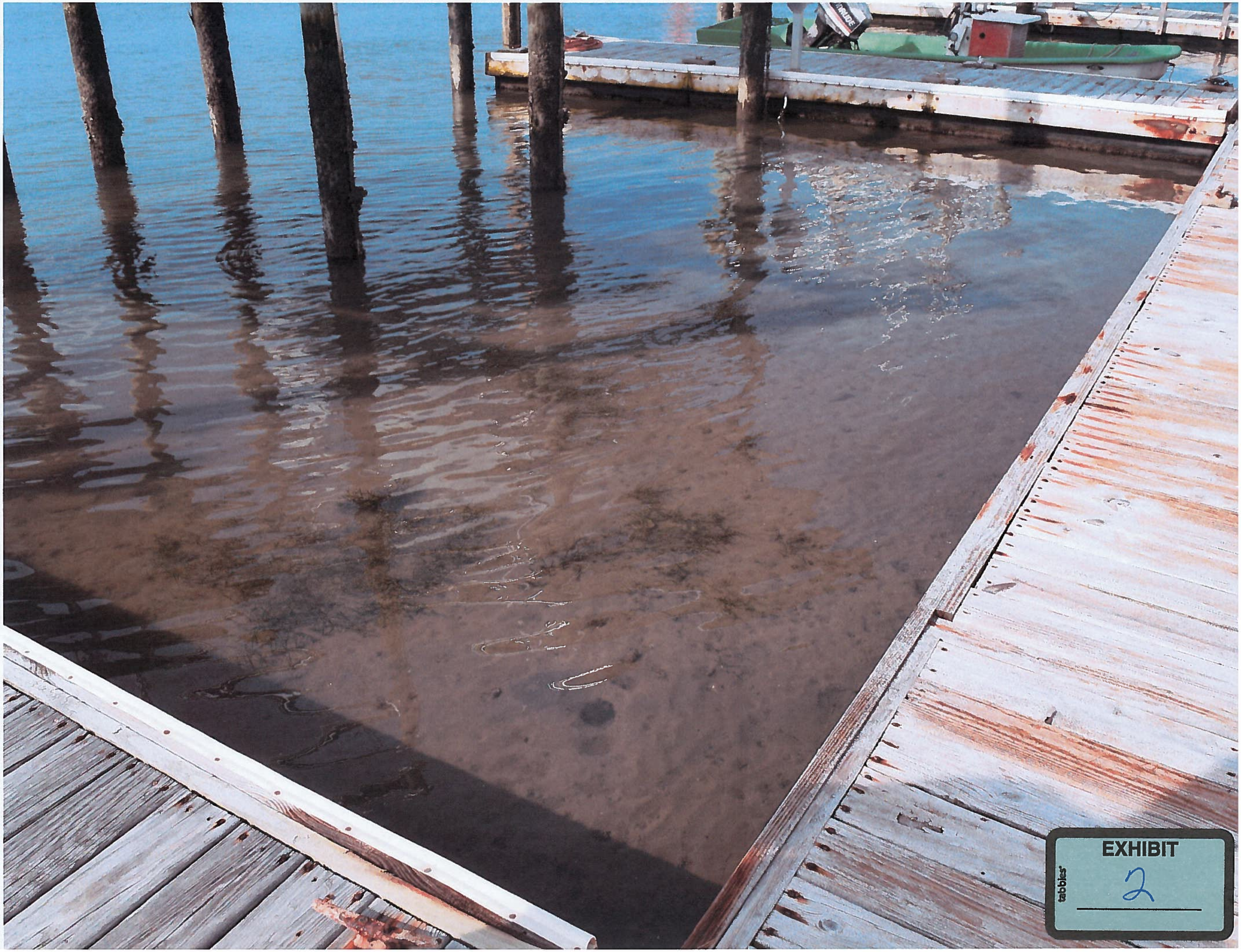

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EXHIBIT
2

EXHIBIT
3

EXHIBIT
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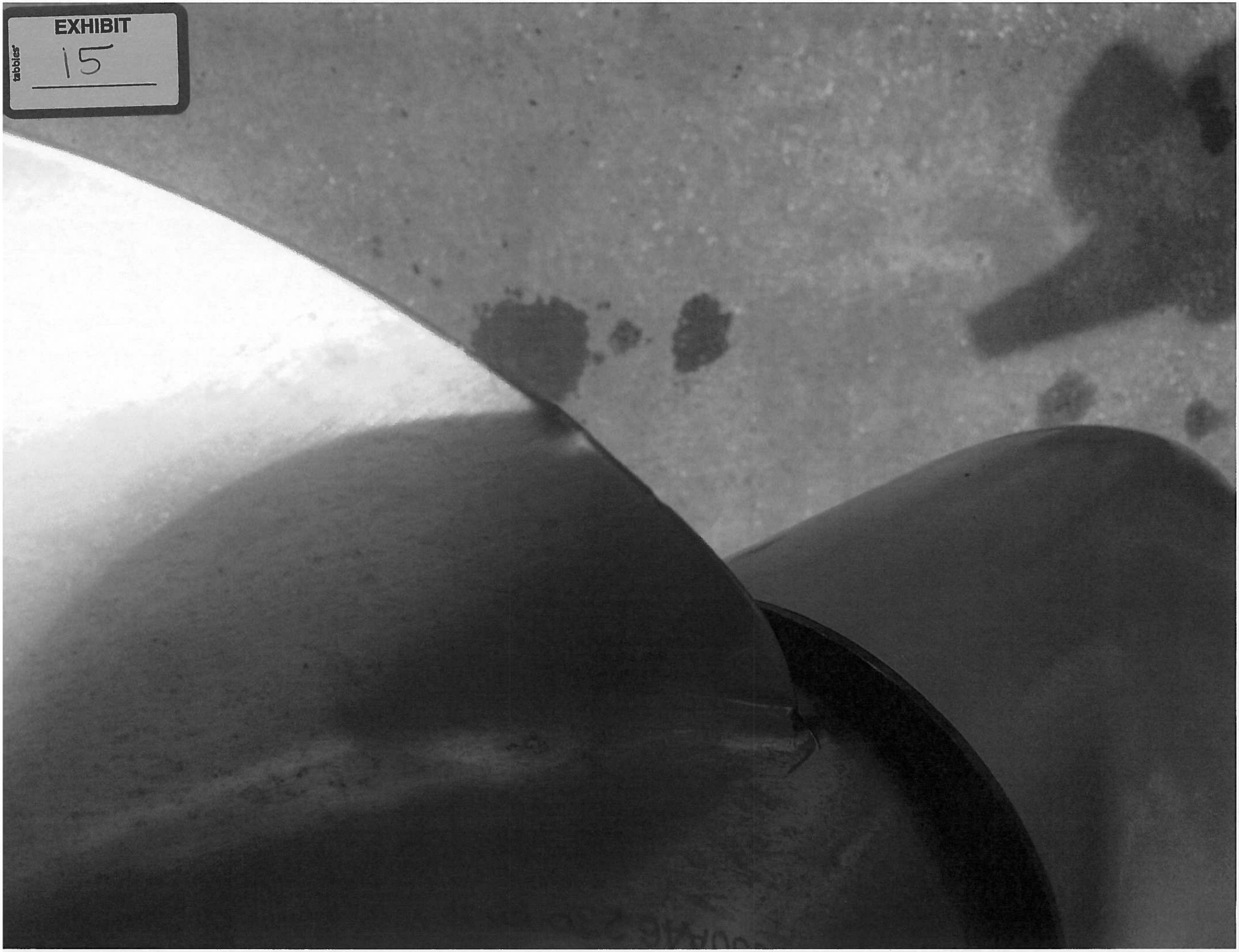
EXHIBIT 12


EXHIBIT
13

EXHIBIT 14

EXHIBIT
15



EXHIBIT

16

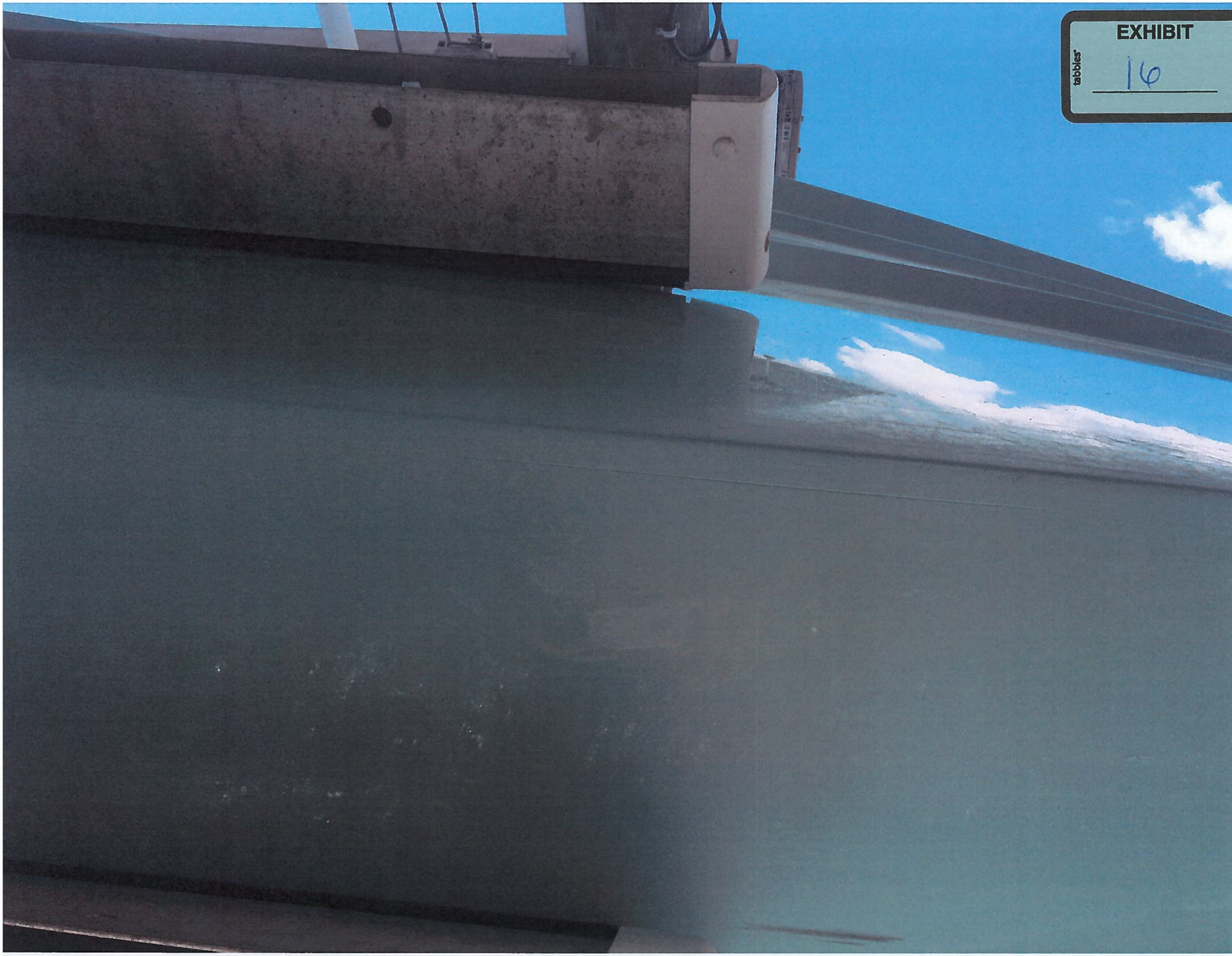


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EXHIBIT

17

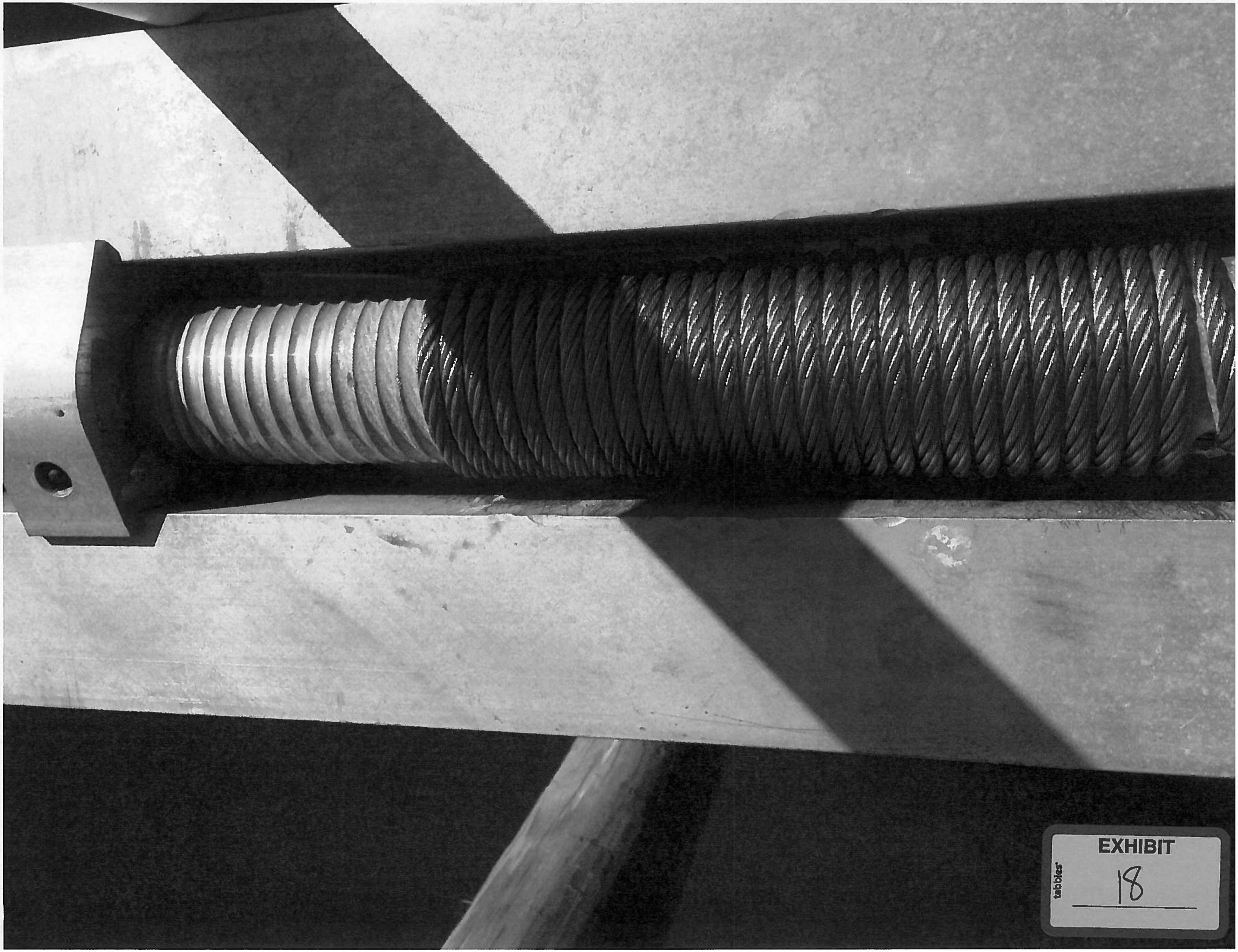

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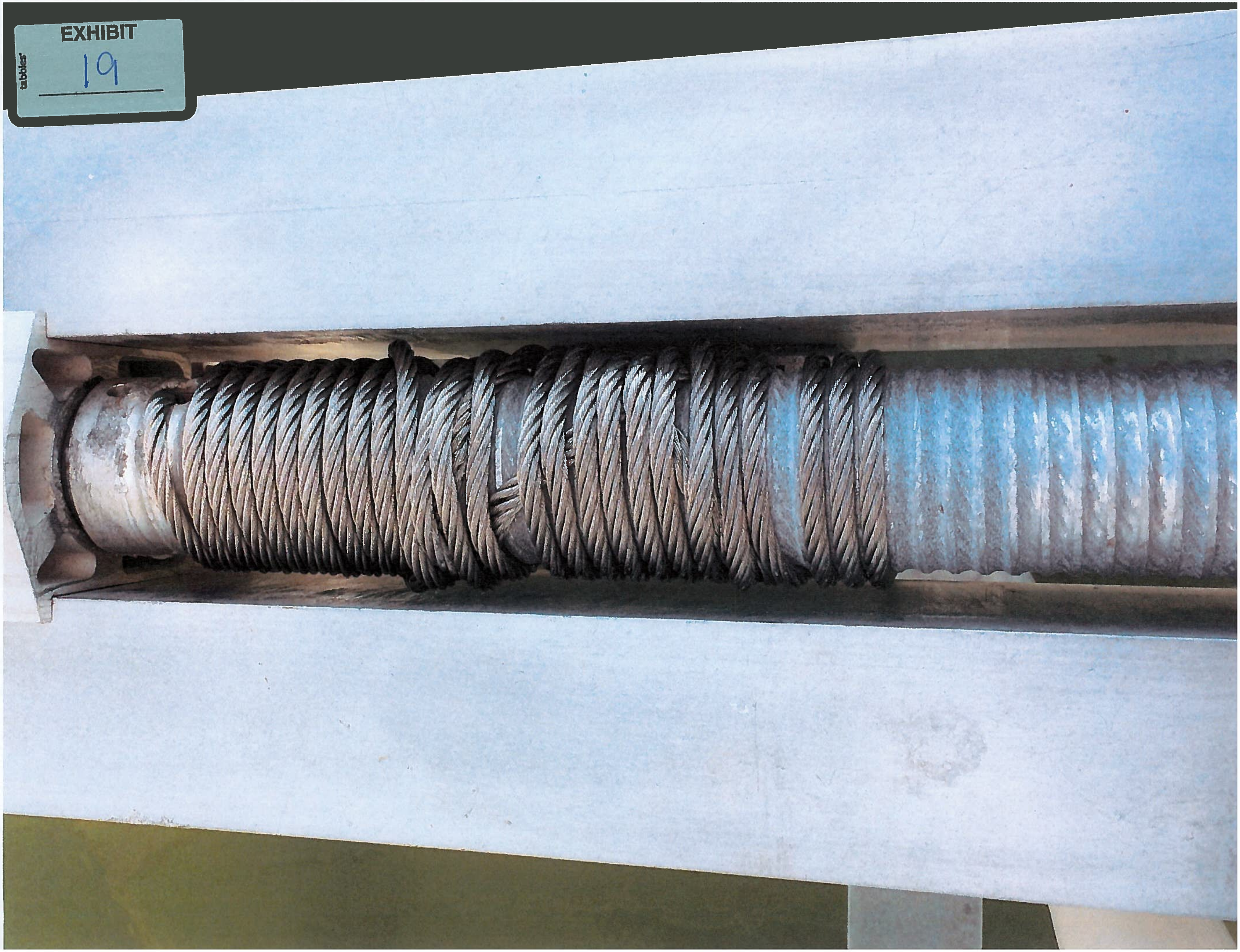
EXHIBIT
18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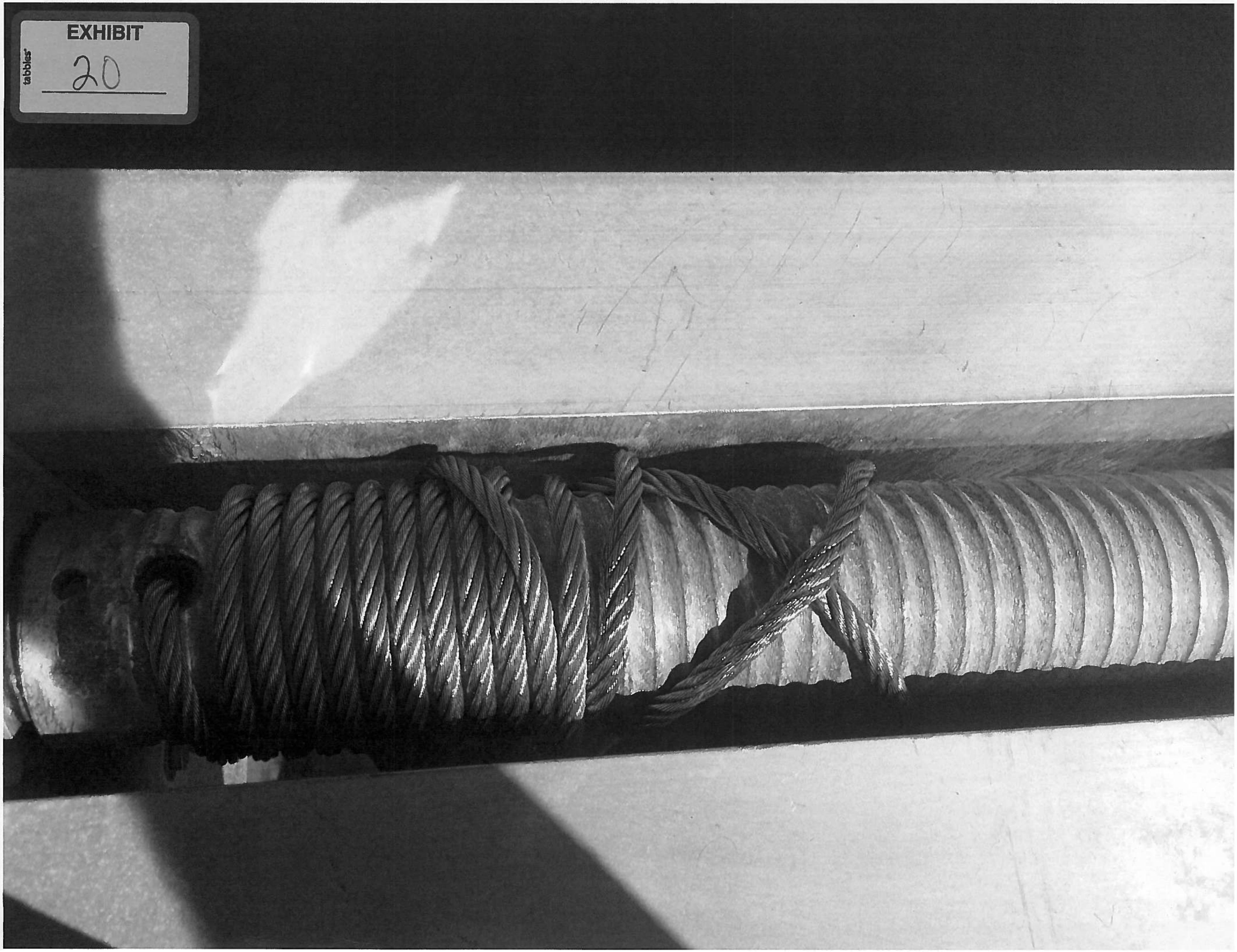
19



EXHIBIT
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20

BEFORE THE NORTH CAROLINA COASTAL RESOURCES COMMISSION
Waters Edge HOA, Inc. Variance Request

AFFIDAVIT OF WHITNEY SKEEN

Affiant, being first duly sworn, deposes and says that:

1. My name is Whitney Skeen.

2. My husband Todd Skeen and I are the owners of the property located at 108 Great Oak Drive, Hampstead, NC 28443 and described as Lot 1, Waters Edge at Deerfield, as shown on a plat recorded in Plat Book 37 at Pages 133-134.

3. We reside at 108 Great Oak Drive, Hampstead, NC 28443.

4. I have been a member of the Waters Edge HOA, Inc. since September 13, 2012, when I acquired the subject property (see attached copy of Deed Book 4131, Page 101, Pender County Registry).

5. I am familiar with the nine (9) boat slips owned by the HOA that are located on the Atlantic Intracoastal Waterway.

6. Marker 100 of the Atlantic Intracoastal Waterway is located directly across from the boat slips. The boat slips are near Topsail Creek, from which direct boat access to the Atlantic Ocean via New Topsail Inlet can be obtained. The boat slips can be easily accessed by land vehicles, as they are located at the intersection of Waters Edge Drive and Great Oak Drive, which is about 1.5 miles from US Highway 17 in Hampstead NC.

7. On September 18, 2015, I witnessed a boat traversing the Atlantic Intracoastal Waterway that caught fire directly across from the boat slips. It partially sank near the grasses on the other side of the waterway. A photograph of the capsized, partially submerged boat is attached as **Exhibit A**. Fire control and salvage operations coming from land were staged at the boat slips.

Whitney Skeen
Whitney Skeen

STATE OF NORTH CAROLINA
COUNTY OF Pender

SWORN TO and subscribed before me this 10 day of November, 2016.

DENISE C. BATSON NOTARY PUBLIC PENDER COUNTY, N.C.

Denise C Batson
Notary Public
My Commission expires: 5/26/2017


EXHIBIT
A
tabbies

BEFORE THE NORTH CAROLINA COASTAL RESOURCES COMMISSION
Waters Edge HOA, Inc. Variance Request

AFFIDAVIT OF MICHAEL J. MAC

Affiant, being first duly sworn, deposes and says that:

1. My name is Michael J. Mac. My wife Diane Mac and I are the owners of the property with the address of 125 Waters Edge Drive, Hampstead, NC 28443, which is in the 18-lot Waters Edge in Deerfield subdivision ("Waters Edge"). The property is described as Lot 16, Waters Edge at Deerfield, as shown on a plat recorded in Plat Book 37 at Pages 133-134. We have resided there since 2011.

2. I have been a member of the Waters Edge HOA, Inc. (HOA) since July 12, 2011, when I acquired the subject property (see attached copy of Deed Book 3945, Page 56, Pender County Registry). I am on the HOA Board of Directors and serve as its President.

3. I am boating and fishing enthusiast. My wife and I moved to Waters Edge shortly after my retirement in order to take advantage of the high end finishes on the homes in the subdivision, the beautiful waterfront views, the close proximity to conveniences in nearby Hampstead and Wilmington, and especially the two HOA community boat dock slips located on Mill Creek and on the Atlantic Intracoastal Waterway (AICW). Each community boat dock has 9 boat slips. Each one of the 18 boat slips are assigned to a particular lot in Waters Edge.

4. Both boat community boat dock slips are ideally situated for ease of access from land and water. The entrance to the boat slips on the AICW are at the intersection of Great Oaks Drive and Waters Edge Drive. The entrance to the Mill Creek boat slips is on Waters Edge Drive. Both community boat docks are a short drive from US Highway 17. The "24/7" deep water access provided by the HOA boat slips are a major selling point in Waters Edge.

5. The boat slips on the AICW are at Marker 100, near the entrance into Mill Creek. The location is near Howards Creek, which provides direct access to the Atlantic Ocean through New Topsail Inlet. Thus, considerable boat traffic goes by this location.

6. My home is assigned a boat slip in the community boat dock on Mill Creek. Those boat slips provide direct deep navigable water boat access at all times, whether at high or low tide.

7. The HOA boat slips on the AICW were also designed and constructed to provide direct deep navigable water boat access at all times, whether at high or low tide. I am informed that the AICW boat slips in fact provided such access when originally constructed around 2004. However, substantial shoaling of the HOA's boat slips on the AICW has taken place since that time. I have witnessed the shoaling becoming worse over time since I moved to Waters Edge in 2011. Dredging is vitally needed to maintain the boat slips and to allow their use.

8. I have reviewed the photographs marked as **Exhibits 1 through 13** of the Todd Skeen affidavit and they accurately depict the conditions at the AICW boat slips. The shoaling is so extreme that the virtually non-existent depths at low tides render them unusable. At mid tides, use may be possible, but it is dangerous, especially at night.

9. I am an environmental scientist. I spent my career with the U.S. Fish and Wildlife Service, and the U.S. Geological Survey of the U.S. Department of Interior. A copy of my *curricula vitae* is attached as **Exhibit A**, the contents of which is incorporated herein by evidence. My experience includes an accumulated understanding of (a) submerged aquatic vegetation (SAV), and (b) hydrogeological dynamics of sediment migration within major waterways and rivers that cause shoaling on the adjacent shorelines and the effects on aquatic life. Over the course of my career, I have observed the effects of wakes from vessels passing over waterways accelerating and enhancing the shoaling of adjacent shorelines.

10. The photographs marked as **Exhibits 9 and 10** to the Todd Skeen affidavit show wakes washing into the HOA's boat slips on the AICW caused by boat traffic. These wakes likely cause or accelerate the shoaling. The shallower depths in the boat slips caused by the shoaling have rendered the conditions there to be more conducive to the spread of SAV. Unfortunately, Waters Edge residents know of no dredging of the AICW in the vicinity of the HOA's boat slips on the AICW.

11. On September 18, 2015, while out jogging, I came across Pender County Fire and EMS equipment and personnel staged at the Waters Edge HOA's AICW boat dock. I identified myself as the HOA president and asked if they needed anything. They told me a boat had caught fire in the area and they were using our facility for shoreline support in case anyone required medical attention. They were able to confirm that no personnel were on the capsized vessel. I came to learn that the HOA's boat slips on the AICW were ideally located for land and water based rescue, fire and salvage operations to be conducted in order to deal with incidents that arise in this general area, which is often used by recreational boaters and commercial navigation.

12. In the course of preparing the HOA's permit application to dredge, we were prepared to suggest mitigation of SAV displaced by the dredging. We were told by DEQ Staff such mitigation efforts do not work. Accordingly, Waters Edge HOA has not proposed mitigation, but are prepared to do so if desired.

Michael J. Mac
Michael J. Mac

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK

SWORN TO and subscribed before me this 11th day of November, 2016.

KATHRYN B ANSLEY
Notary Public, North Carolina
Brunswick County
My Commission Expires
May 22, 2020

Kathryn B. Ansley
Notary Public
My Commission expires: 5/22/20

Curriculum Vitae

Michael John Mac
125 Waters Edge Dr
Hampstead, NC 28443
US citizen

Phone: 573-808-0288

mikejmac11@gmail.com

Summary

Federal science administrator with experience in all aspects of environmental research

- Current Chair of State/stakeholder/tribal advisory Committee on Missouri River restoration
- Past Director of a federal laboratory with a $13 million program in environmental research.
- Knowledgeable of environmental issues from the national perspective through Washington DC positions.
- Experienced in the federal budget process, Congressional interactions, and served on White House, and federal interagency committees focused on natural resource issues.
- Demonstrated excellence in written communication as published author and editor of two national environmental reports and nearly 50 research publications.
- Developed an independent research program of Great Lakes science.

Education and Management Training

Structured Decision Making, June 2013, National Conservation Training Center
Environmental Collaboration and Conflict Resolution, May 2012, USIECR
Leadership for a Democratic Society, Federal Executive Institute, 1999
Upper Level Management Development Program, US Fish and Wildlife Service, 1990-91
Ph.D., University of Wyoming, Laramie, WY 1986. Major: Physiology
M.S., University of Michigan, Ann Arbor, MI 1980. Major: Fisheries
B.S., Wayne State University, Detroit, MI 1973. Major: Biology,
St. Francis Cabrini, High School, Allen Park, MI 1969

Positions:

Chair, Missouri River Recovery Implementation Committee, Missouri River Recovery Implementation Committee Info@MRRIC.org, May 2011-present

- Chaired a Committee made up of 8 states, 29 stakeholders, 29 Native American tribes, and 15 Federal Agencies, advising the US Army corps of Engineers on operations of the Missouri River, and recovery of three listed species.

Director, Columbia Environmental Research Center, U.S Geological Survey, Columbia, MO 65201, November 2001-July 2010

- Direct a federal laboratory with research programs in ecotoxicology, large river systems, environmental chemistry, restoration ecology, and plant science with a $13 million budget, and workforce of 125.
- Oversee financial and scientific integrity of the Center and responsible for the administration and physical operation including supervision of top level scientific and administrative staff.
- Manage a facility of 120,000 square ft, including laboratories devoted to analytical chemistry, fish holding and exposure, histology, genomics, and microbiology as well as 7 field stations in 5 states.
- Represent the Center at scientific and management meetings, making presentations to resource managers, political leaders, and stakeholders on technical issues

Supervisor, Research Program Staff, U.S. Geological Survey, Reston, VA. October 1996 – November 2001

- Served in Washington D.C. headquarters of the Biology Division of the USGS, providing budget and programmatic leadership for national environmental research.
- Developed federal budget documents, responded to Congressional inquiries, briefed Administration and Congressional officials.
- Represented USGS and Department of Interior on a variety of Interagency and White House workgroups and task forces, for national and regional natural resource issues.
- Supervised Division program coordinators overseeing $125 million research budget.

Status and Trends Project Manager, National Biological Survey (Service), Washington, D.C. February 1994-September 1996

- Led effort to produce a national scale report entitled *Status and Trends of the Nation's Biological Resources.* Duties included: managing the project budget, report design, selection of contributors, supervision of editing and graphics production staff, organization of peer review, and writing of summary.
- Served as science editor and assumed responsibility as project director for the completion of *Our Living Resources* after the original director passed away. This Report is a compendium of biological monitoring programs.
- Co-chaired Endocrine Disruptor Research Workgroup for White House Office of Science and Technology policy.

Fishery Research Staff Specialist: U.S. Fish and Wildlife Service, Washington, D.C. January 1992 – February 1994

- Oversaw fishery research program of $20 million conducted at five regional research laboratories. Duties included: reviewing laboratory research plans, providing federal budget materials, interaction with Congressional and Administration staff,
- Served as the Drug and Chemical Registration Officer assigned to develop a program with the Food and Drug Administration and EPA on regulatory approval of drugs and chemicals used in aquaculture for the National Fish Hatchery System

Research Fishery Biologist, U.S. Fish and Wildlife Service, Great Lakes Science Center, Ann Arbor, MI November 1973-January 1992

- Initiated career in environmental science conducting research in the Great Lakes ecosystem.
- Developed research program devoted to fish health, physiology and behavior, bioaccumulation of toxins, toxic effects on fish reproduction, and cancer in fish.
- Participated in and led basinwide efforts for Great Lakes management agencies and international commissions on resource issues.
- Served on Board of Directors for International Association of Great Lakes Research.

Professional Activities and Recognition

<u>Honors and Awards</u>

- U. S. Dept. of Interior, Meritorious Service Award, 2000
- Most Notable Government Publication Award, for *Status and Trends of the Nation's Biological Resources,* American Association of Librarians, 2000
- Most Notable Government Publication Award, *for Our Living Resources,* American Association of Librarians, 1995
- Special Achievement Award, US Fish and Wildlife Service Fisheries Program, 1993
- U.S.FWS Great Lakes Fishery Laboratory Moffett Award for outstanding publication, 1991
- Certificate of Appreciation, U. of Mich. School of Natural Resources Mentoring Program, 1990
- Volunteer Award, Ann Arbor Board of Education, 1987, Adopt- a-school Program
- Wyoming Graduate Scholarship, 1983, for academic achievement
- Bachelor of Science, with distinction, 1973, for academic achievement.
- Michigan Competitive Scholarship, 1969, for academic achievement.

<u>University Appointments</u>

- 2001-present. Courtesy appointment, University of Missouri, Columbia
- 1989-1991. Adjunct Professor, Michigan State University, Dept. of Fisheries and Wildlife

Professional Society and Committee Participation

<u>Memberships</u>

American Fisheries Society, 1978-2008
Society of Environmental Toxicology and Chemistry, 1984- 1998, 2001
International Association for Great Lakes Research, 1987- 1997

<u>Committee Assignments</u>

Missouri River Recovery Implementation Committee – 2008-2010
Missouri River Interagency Roundtable, Federal Working Group, 2006-2010
USEPA, Environmental Monitoring and Assessment Program-Great Rivers Ecosystems, Senior Advisory Committee, 2005-2007
USGS National Field Managers Team, 2005-present, Chair 2009
Board of Directors, Mississippi Interstate Cooperative Resources Association, 2002-2010

Interagency Salmon Science Team, Vice-chair, 2000-2002
Coastal/ Marine Workgroup, Vice President's Environmental Report Card, 1998-2000
Interagency Working Group to Develop *Pfiesteri*a and National HAB Plan, 1997-2001
Committee on Natural Resources and Environment -Endocrine Disruptor Research Workgroup (vice chair) 1995-2001
Salton Sea Science Subcommittee, USGS, 1999
Federal Coordinating Committee on Breast Cancer - HHS, 1997
Committee on Natural Resources and Environment-Department of Interior representative to Integrated Monitoring Subcommittee, 1996
USEPA Endocrine Disruptor Screening and Testing Advisory Committee, 1996-present
USFWS Technical Development Center Review Team, 1993-1994
U.S. EPA Assessment and Remediation of Contaminated Sediments, Toxicity/Chemistry Workgroup, 1988-1992
International Joint Commission, Dredging Subcommittee, 1980-1986
International Joint Commission, Sediment Subcommittee, 1986-1990
USEPA Green Bay Mass Balance Biota Workgroup, 1987-1991
International Joint Commission, Biological Effects Subcommittee, 1989-1992
International Association for Great Lakes Research, Chandler/Misener Award Committee, 1989
International Joint Commission Remedial Action Plan Research Needs Committee, 1988
USFWS, Region 5, Tumor Task Force, 1985

Review Panels
USGS Office of Communications National Review, 2004-2005
Leetown Science Center, Laboratory Review, USGS, Leetown, WV, 2000
Whooping Crane Restoration Program Review, USGS, Patuxent, MD 1999
Western Fishery Research Center, Laboratory Review, USGS, Seattle, WA, 1998
Forest and Rangeland Ecosystem Science Center, Laboratory Review, USGS, Corvallis, OR, 1997
Northwest Biological Science Center, Laboratory Review, USFWS, Seattle, WA, 1993
U. Of Wisconsin Sea Grant Program Review, Madison, WI, 1990

Invited Presentations
Civil Works Coordination and Priorities Conference, Higgins Lake, MI. 1984. Bioassessment of contaminant availability in dredged materials.

U.S. Senate Field Hearing, Senator Robert Kasten, Milwaukee, WI, 1984.

Ecological Society of America Annual Meeting, Minneapolis, MN 1985. Toxic substances and survival of Lake Michigan Salmonids: Field and Laboratory approaches.

American Chemical Society National Meeting, Chicago, IL. 1985. Chronology of environmental contaminants and survival of young lake trout from southern Lake Michigan.

University of Wisconsin Sea Grant, Green Bay, WI. 1986. Tumors and chemical body burdens in fish from Green Bay.

Canada Centre for Inland Waters Seminar Series, Burlington, Ontario, Canada. 1988. Swim-up mortality of lake trout from southeastern Lake Michigan.

International Association of Great Lakes Research, Hamilton, Ontario, Canada. 1988. Expected tumor incidence rates in fish from clean sites.

University of Michigan Natural Science Colloquium, Dearborn, MI. 1989. Changing concepts in the environmental assessment of polychlorinated biphenyls.

International Joint Commission, Council of Great Lakes Research Managers, Chicago, IL, 1989. Environmental contaminants and the reproductive success of lake trout in the Great Lakes: An epidemiological approach.

U.S. EPA Planning Meeting for Sediment Criteria and Bioassay Development, Newport, OR, 1989. Overview of freshwater bioaccumulation bioassays.

House of Representatives, Water Resources Subcommittee Hearing on Contaminated Sediments, Washington D.C., 1989, Hon. Henry J. Nowak.

USEPA Colloquium of Ecological Exposure Assessment, Washington D.C. 1990. Exposure to Contaminated Sediments

DIOXIN 91. Investigations into the effects of PCB congeners on reproduction in lake trout from the Great Lakes. Chapel Hill, NC, 1991.

Cause-Effects Linkages II, Michigan Audubon Society, Lake trout bioeffects research. Traverse City, MI, 1991.

Critical Methodologies for the Study of Ecosystem Health. Biological Monitoring as a Guide for Health Effects Assessment and Research. University of California-Davis, September 10-11, 1996.

U.S. Geological Survey Seminar Series, BRD Programs in Organisms and Populations, Reston VA. October 11, 1996.

Federal Strategy for Endocrine Disruptor Research, Research needs in Ecology, Committee on Environment and Natural Resources, Washington D.C. November 22, 1996.

USGS role in Public Land Research, Briefing to Bureau of Land Management Science Board, Washington D.C.1998.

Fisheries and Aquatic Resources Program Review, USGS, Madison, WI, August 1998.

Activities of the Interagency Workgroup on Endocrine Disruptors, International Symposium on Endocrine Disruptors in the Environment, Kobe, Japan, December, 1999.

National Water Quality Conference, Keynote address, USGS-WRD, New Orleans, December 2000.

Synthesis and Geologic Framework of U.S. Coastal and Marine Regions-Designing a Template, USGS-GD, Reston, December 2000.

Huge fish in altered rivers, University of Wyoming Seminar Series, Jackson WY 2002

USGS monitoring activities in the Missouri River, Missouri River Basin Association Stakeholder Forum, December 2003, Kansas City, MO

Financially Sustaining Science Centers, USGS Expanded Management Team Meeting, March, 2005 Sacramento, CA

Pallid Sturgeon Research, Missouri River Biological Opinion 2204 Implementation Workshop, April, 2005, Omaha, NE

Comprehensive Sturgeon Research Program Overview: Missouri River Recovery Implementation Committee Meeting, December 2008, Omaha, NE

Independent Science Review:What, Why and How. Misouri River Recovery Implementation Committee, July 2009, Pierre, SD

Offered Presentations

Midwest Fish and Wildlife Conference, Dearborn, MI. 1976. Mac, M.J., W.H. Berlin, and D.V. Rottiers. Effects of temperature and chlorinated hydrocarbons on the hatch and survival of lake trout.

American Fisheries Society, Michigan Chapter, Ann Arbor, MI. 1981. Mac, M.J. Survival of lake trout eggs and fry in waters of the upper Great Lakes.

International Joint Commission Bioassessment Workshop, Ann Arbor, MI. 1984. Mac M.J. And W.A. Willford, Accumulation of PCBs and Hg from Toronto and Toledo harbor sediments.

International Joint Commission Workshop on Ecological Effects of In Situ Sediment Contaminants. Aberystwyth, Wales, 1984. Willford, W.A., M.J. Mac, and R.J. Hesselberg. Assessing the bioaccumulation of contaminants from sediments by fish and aquatic organisms.

World Conference on Large Lakes, Mackinac Island, MI. 1986. Willford, W.A. and M.J. Mac. Reproductive Impairment of lake trout.

Society of Environmental Toxicology and Chemistry Annual Meeting, Alexandria, VA. 1986. Mac, M.J. Structural analysis of livers of Lake Michigan lake trout fry suffering high mortality.

Toxic chemicals and aquatic life: Research and management, Seattle, WA. 1986. Fabacher, D.L., C.J. Schmitt, J.M.Besser, P.C.Baumann, and M.J. Mac. Great Lakes fish-neoplasia investigations.

Fourteenth Annual Aquatic Toxicity Workshop. Toronto, Ontario, Canada. 1987. Baumann, P.C. and M.J. Mac. Polynuclear aromatic hydrocarbons and tumors in brown bullheads from the Black and Cuyahoga Rivers- Cause and effect?

International Association for Great Lakes Research, Ann Arbor, MI. 1987. Mac, M.J. and C.C. Edsall. Pathology of lake trout fry from southeastern Lake Michigan suffering post swim-up mortality.

International Association for Great Lakes Research, Ann Arbor, MI. 1987. Mac, M.J. and C.C. Edsall. Mortality of lake trout swim-up fry from southeastern Lake Michigan.

Society of Environmental Toxicology and Chemistry Annual Meeting, Pensacola, FL. 1987. Mac, M.J., G.E. Noguchi, J.D. Bowker, and J.D. Shoesmith. Field validation of a sediment bioaccumulation bioassay for freshwater sediments.

International Association for Great Lakes Research, Hamilton, Ontario, Canada, 1988. Smith, S.B., M.J. Mac, A.E. Maccubbin, and J.C. Harshbarger. External abnormalities and incidence of tumors in fish collected from three Great Lakes Areas of Concern.

Society of Environmental Toxicology and Chemistry Annual Meeting, Arlington, VA. 1988. Mac, M.J., T.R. Schwartz, and C.C. Edsall. Correlating PCB effects on fish reproduction using dioxin equivalents.

International Association for Great Lakes Research, Madison, WI, 1989. Mac, M.J., Salmonid reproduction as an indicator of fish health.

International Association for Great Lakes Research, Madison, WI, 1989. Noguchi, G.E. and M.J. Mac. Yolk lipids as indicators of lake trout egg quality.

International Association for Great Lakes Research, Madison, WI, 1989. Rathbun, J., R. Kreis. E. Lancaster, M. J. Mac and M. Zabik. Pilot biomonitoring study at the Saginaw Confined Disposal Facility.

International Joint Commission/U.S. EPA Workshop on in vitro assessment of contaminated sediments for potential carcinogenicity. Duluth, MN. 1989. Mac, M.J. Introduction.

International Joint Commission/Great Lakes Fishery Commission. Roundtable on contaminant-caused reproductive problems in salmonids. Windsor, Ontario, 1990. Lake trout egg quality in Lakes Michigan and Ontario.

International Association for Great Lakes Research, Windsor, Ontario, 1990. Mortality periods and terata in developing lake trout from the Great Lakes. Mac, M.J. and C.C. Edsall.

International Association for Great Lakes Research, Windsor, Ontario, 1990. Lipid-contaminant relationships in Lake Michigan lake trout. Noguchi, G.E., L.J. Schmidt, and M.J. Mac.

International Assoc.for Great Lakes Research, Buffalo, NY, 1991. Use of clinical blood chemistry to assess health of laboratory-reared and field sampled lake trout. Edsall, C.C., and M.J. Mac.

International Association for Great Lakes Research, Buffalo, NY, 1991. Tissue distribution of PCB congeners in Lake Michigan lake trout. Noguchi, G.E., L.J. Schmidt, and M.J.Mac.

Proposal: A Salmon Science Inventory. Decision Support Network for Salmonid and other Species, Portland, March 2000.

Missouri river research progress, Missouri River Basin Association Directors Meeting, September 2005, Bismarck, ND

An Experiment with Stakeholder Influence on Natural Resource Management: The Missouri River Recovery Implementation Committee, University of Missouri Natural Resources Seminar. October 2009

Invited Participation in Technical Conferences and Workshops.

Bioassessment methodologies for the regulatory testing of freshwater dredged material. U.S. Army Corps of Engineers (COE) and Wisconsin DNR, Milwaukee WI. 1985.

Regulatory interpretation of PAHs in dredged material, U.S.Army COE, Vicksburg, MS. 1988.

Workshop on in vitro assessment of contaminated sediments for potential carcinogenicity. U.S. EPA, Duluth, MN. 1989, Workshop co-chair.

Cheasapeake Bay Ambient Toxicity Workshop, Chesapeake Research Consortium, Annapolis, MD. 1989.

International Joint Commission/Great Lakes Fishery Commission. Roundtable on contaminant-caused reproductive problems in salmonids. Windsor, Ontario, 1990. Lake trout egg quality in Lakes Michigan and Ontario. Workshop Organizer.

Investigational New Animal Drugs, USFWS, New Orleans, LA, 1993.

Research needs for the risk assessment of health and environmental effects of endocrine disruptors USEPA, Raleigh NC, 1995. Exposure Session Chair.

Ecological effects of Endocrine Disruptors, USEPA Duluth, MN, 1995.

Amphibian Deformities: Strategic planning workshop. USGS-BRD, Madison WI, 1997

Evaluating the increase of amphibian malformations: data objectives, field methods and information networks. USEPA, Shenandoah National Park, VA, 1997

Fisheries Database Summit and Aquatic Gap Workshop. USGS and states of Illinois, Wisconsin, Wyoming, San Diego, CA 1998

Assessing Aquatic Resources: A National Workshop to Determine Information Needs. September, San Diego, CA 1998

EU/US Transatlantic Co-operation on Endocrine Disrupting Chemicals, Ispra, Italy, April, 1999

Restoring Pacific Rivers, Sacramento CA. April 2000.

Missouri River Science panel discussion, Missouri River Natural Resources Conference, South Sioux City, NE June 2002

Research and Assessment Needs for Pallid Sturgeon Recovery in the Missouri river, May, 2004 Bloomington, MN.

Media Interactions

National Audubon Society Television Program, "Great Lakes, Great Legacy", film clip highlighting research and personal interview.

Talk of the Nation- Science Friday - National Public Radio, live- in studio interview. 1999

Earthwatch Radio Program, University of Wisconsin Sea Grant, taped interview

Magazine Interviews: Science News (1997, 1999), Smithsonian Magazine, 1999.

Newspaper Interviews: Detroit Free Press, (1988), Seattle Post Intelligencer 1999, Fresno Bee 1999, Caspar Star Tribune 1999,

Regular Guest on the Amy Miller Show, KSSZ 93.9 FM, Columbia, MO

Publications

1. Mac, M.J., L.W. Nicholson and C.A. McCauley.1979.PCBs and DDE in commercial fish feeds. Prog. Fish-Cult. 41:210-211.

2. Mac, M.J., 1980. The relationship between preferred temperature and ration size in lake trout, Salvelinus namaycush. MS Thesis, University of Michigan, Ann Arbor.

3. Mac, M.J., 1981. Vulnerability of young lake trout to predation after chronic exposure to PCBs and DDE. U.S. Fish Wildl. Serv. Tech. Paper 105. pp. 29-32.

4. Mac, M.J., and R.A. Bergstedt. 1981. Temperature selection by young lake trout after chronic exposure to PCBs and DDE. U.S. Fish Wildl. Serv. Tech Paper 105. pp. 33-35.

5. Mac, M.J., W.H. Berlin, and D.V. Rottiers. 1981.Comparative hatchability of lake trout eggs differing in contaminant burden and incubation conditions. U.S. Fish Wildl. Serv. Tech. Paper 105. pp. 8-10.

6. Mac, M.J., and J.G. Seelye. 1981. Patterns of PCB accumulation by fry of lake trout. Bull. Environm. Contam. Toxicol. 27:368-375.

7. Mac, M.J., and J.G. Seelye. 1981. Potential influence of acetone in aquatic bioassays testing the dynamics and effects of PCBs. Bull. Environm. Contam. Toxicol. 27:359-367.

8. Berlin, W.H., R.J. Hesselberg and M.J. Mac. 1981. Growth and mortality of fry of Lake Michigan lake trout during chronic exposure to PCBs and DDE. U.S. Fish Wildl. Serv. Tech. Paper 105. pp. 11-22.

9. Seelye, J.G. and M. J. Mac. 1981. Size specific mortality in fry of lake trout (Salvelinus namaycush) from Lake Michigan. Bull. Environm. Contam. Toxicol. 27:376-379.

10. Edsall, C.C. and M.J. Mac. 1982. Comparative hatching success of trout eggs in Lake Michigan water and well water. Prog. Fish-Cult. 44:47-48.

11. Seelye, J.G., R.J. Hesselberg, and M.J. Mac. 1982. Accumulation by fish of contaminants released from dredged sediments. Envirnm. Sci. Technol. 16:459-464.

12. Mac, M.J., C.C. Edsall, R.J.Hesselberg, and R.E. Sayers, Jr. 1984. Flow-through bioassay for measuring bioaccumulation of toxic substances from sediment. U.S. Environmental Protection Agency. EPA-905/3-84-007. 17 pp.

13. Seelye, J.G. and M.J. Mac. 1984. Bioaccumulation of toxic substances associated with dredging and dredged material disposal: A literature review. U.S. Environmental Protection Agency. EPA/3-84-005. 45 pp.

14. Mac, M.J. 1985. Effects of ration size on preferred temperature of lake charr (Salvelinus namaycush). Environ. Biol. Fishes 14:227-231.

15. Mac, M.J., C.C. Edsall, and J.G. Seelye. 1985. Survival of lake trout eggs and fry reared in waters of the upper Great Lakes. J. Great Lakes Res. 11:520-529.

16. Mac, M.J., C.C.Edsall, and R.J. Hesselberg. 1985. Accumulation of PCBs and Hg by fish and earthworms during field and laboratory exposures to Green Bay sediments. Great Lakes Fishery Laboratory Admin. Rept. 85-4. 25 pp.

17. Mac, M.J. 1986. Mortality of swim-up fry from Southeastern Lake Michigan: Documentation and hepatic structural analysis. Ph.D. Thesis. University of Wyoming, Laramie. 71 pp.

18. Mac, M.J., and W.A. Willford. 1986. Bioaccumulation of PCBs and Hg from Toronto and Toledo harbor sediments. In, Evaluation of sediment bioassessment techniques. Report of the dredging subcommittee to the Great Lakes water quality board. International Joint Commission, Windsor, Ontario.

19. Willford, W.A., M.J. Mac, and R.J.Hesselberg. 1987. Assessing the bioaccumulation of contaminants from sediments by fish and other aquatic organisms. Hydrobiologia. 149:107-111.

20. Mac, M.J. 1988. Toxic substances and survival of Lake Michigan salmonids: Field and laboratory approaches. pp. 389-401 in, Toxic Contaminants and Ecosystem Health; A Great Lakes Focus. M.S. Evans, ed., John Wiley and Sons, New York.

21. Fabacher, D.L., C.J. Schmitt, J.M. Besser and M.J. Mac. 1988. Chemical characterization and mutagenic properties of polycyclic aromatic compounds in sediment from tributaries of the Great Lakes. Environ. Toxicol. Chem. 7:529-543.

22. Mac, M.J., G.E. Noguchi, R.J.Hesselberg, C.C.Edsall, J.A.Shoesmith, and J.D. Bowker. 1990. A bioaccumulation bioassay for freshwater sediments. Environm. Toxicol. Chem. 9:1405-1414.

23. Baumann, P.C., M.J. Mac, S.B. Smith, and J.C. Harshbarger. 1991. Tumor frequencies in walleye and brown bullhead and sediment contaminants in tributaries of the Laurentian Great Lakes. Can. J. Fish. Aquat.Sci. 48:1804-1810.

24. Mac, M.J., and C.C. Edsall. 1991. Environmental contaminants and reproductive success of lake trout in the Great Lakes: An epidemiological approach. J. Toxicol. Environm. Health. 33:375-394.

25. Mac., M.J., and C.J. Schmitt. 1992. Sediment bioaccumulation testing with fish. Pages 295-308, In. Sediment Toxicity Assessment. G.A. Burton Jr. (ed). Lewis Publ. Ann Arbor. 457 pp.

26. Velleux, M.L., J.E. Rathbun, R.G. Kreis, J.L. Martin, M.J. Mac, and M.L. Tuchman. 1993 Investigation of contaminant transport from the Saginaw Confined Disposal Facility. J. Great Lakes Res. 19:158-174.

27. Mac, M.J., T.R. Schwartz, C.C. Edsall, and A.M. Frank.1993. Polychlorinated biphenyls in Great Lakes trout and their eggs: relations to survival and congener composition 1979-1988. J. Great Lakes Res. 19:752-765.

28. Mueller, M.E., M.J. Mac. 1994. Fish tumors and abnormalities. Pages 176-188 In: Assessment and Remediation of Contaminated Sediments Program: Assessment Guidance Document. U.S. EPA Great Lakes National Program Office, Chicago IL. EPA 905-B94-002.

29. Smith, S.B., M.A. Blouin, and M.J. Mac. 1994. Ecological comparisons of Lake Erie tributaries with elevated incidence of fish tumors. J. Great Lakes Res. 20:701-716.

30. LaRoe, E.T., G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac.eds. 1995. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals and ecosystems. U.S. Dept. Of Interior, National Biological Service, Washington D.C. 530 pp.

31. Kavlock, R.J. and 16 authors including, M.J. Mac. 1996. Research needs for the risk assessment of health and environmental effects of endocrine disruptors: a report of the U.S. EPA-sponsored workshop. Environ. Health Perspect. 104(Suppl.4):715-740.

32. Monosson, E., M.J. Mac, W.R. Kelce, and L.E. Gray. 1998. Environmental antiandrogens: potential effects on fish reproduction and development. *In Press*. Proc. Wingspread IV.

33. Reiter, L.W., C. DeRosa, R.J. Kavlock, G. Lucier, M.J. Mac, J. Melillo, R.L. Melnick, T. Sinks and B.T. Walton. 1998 The U.S. federal framework for research on endocrine disruptors and an analysis of the supported research programs during fiscal year 1996. Environ. Health Perspect., 106:105-113

34. Mac, M.J., P.A. Opler, C.E. Puckett Haecker, and P.D. Doran, eds. 1998. Status and trends of the nation's biological resources, U.S. Department of the Interior, U.S. Geological Survey, Washington D.C. 964 pp.

35. Beard, D., 10 coauthors including M.J. Mac. 1998. The Multistate Aquatic Resource Information System, Fisheries, 23:5, p 14-18

36. Mac, M.J. The Status and Trends of our Nation's Biological Resources. Renewable Resources Jour. 17(4), p 9-17. 1999

37. Wildhaber, M.L., 8 coauthors including M.J. Mac. 2007, A Conceptual Life-History Model for Pallid and Shovelnose Sturgeon: U.S. Geological Survey Circular 1315, 18.p.

Technical Reports

37. Mac, M.J. 1984. Bioaccumulation of toxic substancesfrom dredged sediments. U.S. Fish and Wildlife Service Research Information Bulletin No. 84-43.

38. Mac, M.J., C.C. Edsall, T.R. Schwartz, and P. Peterman. 1989. Determining effects of PCB congeners on lake trout reproduction. U.S. Fish and Wildlife Service Research Information Bulletin No. 89-13.

39. Sediment Subcommittee. 1989. Mac, M.J. and R. D. Johnson. Proceedings of the workshop on *in vitro* assessment of contaminated sediments for potential carcinogenicity. Report to the Great Lakes Water Quality Board. International Joint Commission, Windsor, Ontario. 40 pp.

40. Mac, M.J., G.E. Noguchi, J.G. Bowker, and J.A. Shoesmith. 1987. 10-day bioaccumulation bioassays in Detroit River sediments: Field verification of laboratory exposures. U.S. EPA Final Report. Great Lakes National Program Office. Chicago, IL

41. Rathbun, J.E., R.G. Kreis, E.L. Lancaster, M.J. Mac, and M.J. Zabik. 1988. Pilot confined disposal facility biomonitoring study: Channel/Shelter Island CDF, Saginaw Bay, Bay City, MI, 1987.

42. Sediment Subcommittee. 1988. Procedures for the assessment of contaminated sediment problems in the Great Lakes. Report to the Great Lakes water quality board. International Joint Commission, Windsor, Ontario. 140 pp.

43. Mac. M.J. and M Gilbertson, eds. International Joint Commission/Great Lakes Fishery Commission. Roundtable on contaminant-caused reproductive problems in salmonids. Windsor, Ontario, 1990.

44. The health and ecological effects of endocrine disrupting chemcials. Committee on Environment and Natural Resources, National Science and Technology Council. 1996.

45. Interagency Research Plan for Harmful Algal Blooms, 1997

46. Harmful Algal Blooms in the United States, NOAA/EPA, 1998

47. Designing a Report on the State of the Nation's Ecosystems, H. John Heinz Center, Washington, D.C. 1999. 119pp

WIRO

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

MEMORANDUM

TO: Heather Coats
Division of Coastal Management
North Carolina Department of Environmental Quality

FROM: Maria T. Dunn, Coastal Coordinator
Habitat Conservation

Maria T. D.

DATE: November 23, 2015

SUBJECT: CAMA Dredge/Fill Permit Application for Waters Edge HOA, Pender County, North Carolina.

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) reviewed the permit application with regard to impacts on fish and wildlife resources. The project site is located at the southern terminus of Great Oaks Drive, adjacent to the AIWW in Hampstead, NC. Our comments are provided in accordance with provisions of the Coastal Area Management Act (G.S. 113A-100 through 113A-128), as amended, Sections 401 and 404 of the Clean Water Act, as amended, and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The applicant proposes to dredge around two existing docking facilities to a final water depth of -4' NLW. Currently, water depths in the area of the facilities are approximately -1' NLW characterized with prominent submerged aquatic vegetation (SAV) as observed by the NC Division of Coastal Management's Fisheries Resource Specialist. No official SAV survey has been conducted. The area of impact would be approximately 8,750 ft^2, so since no survey has been conducted it is assumed SAV coverage is 100%. Material removed from the dredge project is stated to be placed in the US Army Corps of Engineer's spoil island DA 203, though no agreement was provided in the application. This are of the AIWW is classified SA-ORW by the Environmental Management Commission and is open to shellfish harvesting.

The NCWRC has reviewed the permit application and has significant concerns with the impact to SAV. SAV functions as essential fish habitat by providing for primary production, structural complexity, sediment and shoreline stabilization and nutrient cycling. SAV also enhances water quality that provides spawning, nursery and foraging areas for aquatic organisms. The NCWRC supports the concerns of the NCDCM Fisheries Resource Specialist. Furthermore, comments dated November 20, 2003 from the

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

NCDENR

North Carolina Department of Environment and Natural Resource

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

July 23, 2015

MEMORANDUM:

TO: Gregg Bodner
Fisheries Resource Specialist
DCM, Morehead City

FROM: Doug Huggett, NC DENR-DCM Major Permits Coordinator
400 Commerce Avenue, Morehead City, NC 28557 Fax: 252-247-3330
(Courier 11-12-09)

SUBJECT: CAMA / Dredge & Fill Permit Application Review

Applicant: ***Waters Edge HOA***

Project Location: *at the southern terminus of Great Oaks Dr., adjacent to the AIWW, in Hampstead, Pender County*

Proposed Project: *to dredge around two (2) existing docking facilites*

Please indicate below your agency's position or viewpoint on the proposed project and ***return this form to Doug Huggett*** at the address above by ***August 15, 2015.*** If you have any questions regarding the proposed project, contact Jason Dail at (910)796-7221 when appropriate, in-depth comments with supporting data is requested.

REPLY: _____ This agency has no objection to the project as proposed.

_____ This agency has no comment on the proposed project.

_____ This agency approves of the project only if the recommended changes are incorporated. See attached.

__X__ This agency objects to the project for reasons described in the attached comments.

SIGNED ____________ **DATE** 8/20/15

RECEIVED
JUL 27 2015

RECEIVED
JUL 29 2015

RECEIVED
JUL 27 2015
DCM-MHD CITY

N.C. Division of Coastal Management
127 Cardinal Drive Ext., Wilmington, NC 28405
Phone: 910-796-7215 \ FAX: 910-395-3964 Internet: www.nccoastalmanagement.net

An Equal Opportunity \ Affirmative Action Employer

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

MEMORANDUM:

TO: Doug Huggett, DCM Major Permit Coordinator

FROM: Gregg Bodnar, DCM Fisheries Resource Specialist

SUBJECT: Water's Edge HOA (Hampstead)

DATE: 8/20/2015

A North Carolina Division of Coastal Management (DCM) Fisheries Resource Specialist has reviewed the subject permit application for proposed actions that impact fish and fish habitats. The applicant proposes to conduct new dredging around an existing boating facility. Waters are classified as supporting shellfish (SA), Outstanding Resource Waters (ORW), Mill Creek (adjacent to site) is classified as Secondary Nursery Area (SNA), and waters are open to the harvest of shellfish by the NC Division of Marine Fisheries Shellfish Sanitation Section.

In 2004 a Major Modification was submitted to an existing Major Permit (#68-03) to construct an 18 slip community dock, nine slips within Mill Creek and nine slips within the Atlantic Intracoastal Waterway (AIWW). The permit was authorized. In 2008 a CAMA Major Permit application was submitted to perform new dredging within the AIWW portion of the docking facility (slips 5-9). DCM field staff noted submerged aquatic vegetation (SAV) within the dredge footprint. The application was circulated and numerous agencies replied unfavorably due to the impacts to SAV and SAV habitat. Furthermore NC Wildlife Resources Commission comments relating to the 2003 Environmental Assessment recommended that no dredging be allowed based on SAV impacts. The application was withdrawn and no further action was taken. In April and June 2015, DCM field staff and fisheries resource specialists surveyed the area and documented SAV within the current dredge footprint. As designed, slips 1-4 have a 50ft. wide x 75ft. long x -4ft. depth footprint. Slips 5-9 have a 50ft. wide x 100ft. long x -4ft. depth footprint. SAV, identified as mostly *Z. marina* (eel grass), has colonized the area and has shown to be prevalent behind and within the dredge footprint. In June 2015, SAV coverage within slips 5, 6, 8, and 9 was 10-40%. In slip 7, SAV coverage was 40-70%. Landward of slips 5-9 to the marsh also had 10-40% SAV coverage. The shallow embayment between the two piers has 10-40% coverage and transitions to algae and patchy SAV coverage at slips 1-4. Dominate species of algae were identified in the field as ulva, dictyota, and codium. Finfish utilize algal dominated areas in much the same way as SAV habitat, with many finfish species utilizing both habitats.

North Carolina ranks second behind Florida in SAV presence. Observations since 2000 have indicated that SAV coverage in North Carolina is expanding into previously unobserved areas. SAV is a vital component to the estuarine system and is excellent nursery area for many fisheries species, supporting high diversity of fish and invertebrates, and provides valuable ecosystem services as a primary producer and enhancer of water quality (Deaton et al. 2010). SAV filters water, stabilizes sediment (Fonseca 1996; Stephan and Bigford 1997), and provides refuge for juvenile finfish, crabs and shrimp (Savino and Stein 1989; Rooker et al. 1998). SAV supports a vast array of epiphytes and other sessile invertebrates that serve as a food source for many fisheries species. Waters containing SAV have higher species richness and abundance than those without SAV (Thayer et al. 1975, Ross and Stevens 1992), and can improve water quality and clarity through the filtration of water by the associated epiphytic community. SAV is recognized as essential fish habitat due to its primary production, structural complexity, modification of energy regimes, sediment and shoreline stabilization, and nutrient cycling (Deaton et al. 2010).

The proposed application intends to perform new dredging in and around the existing slips within the AIWW docking facility (slips 1-9). DCM field staff and fisheries resource specialists have observed SAV resource within the dredge footprint as far back as the 2008 CAMA Major Permit application, which was withdrawn due to the presence of SAV and unfavorable comments from multiple resource agencies. The authorization of new dredging at the project site would directly and negatively impact the SAV through direct removal of the resource and alteration of the habitat to discourage recolonization. **Therefore, I object to the project as proposed due to the significant and adverse impacts to the marine and estuarine resource, principally SAV, at the project site.**

Contact Gregg Bodnar at (252) 808-2808 ext. 213 or gregg.bodnar@ncdenr.gov with further questions or concerns.

Deaton, A.S., W.S. Chappell, K. Hart, J. O'Neal, B. Boutin. 2010. North Carolina Coastal Habitat Protection Plan. North Carolina Department of Environment and Natural Resources. Division of Marine Fisheries, NC. 639 pp.

Fonseca, M. S. 1996. The role of seagrasses in nearshore sedimentary processes: a review. p. 261-286 in C. Roman and K. Nordstrom (eds). Estuarine Shores: Hydrological, Geomorphological and Ecological Interactions. Blackwell, Boston, MA.

Rooker, J. R., G.J. Holt, and S.A. Holt. 1998. Vulnerability of newly settled red drum (Sciaenops ocellatus) to predatory fish: is early-life survival enhanced by seagrass meadows? Marine Biology 131(1): 145-151.

Ross, J. L. and T.M. Stevens. 1992. Life history and population dynamics of red drum (Sciaenops ocellatus) in North Carolina waters. NC Division of Marine Fisheries, Morehead City, NC, Marine Fisheries Research Completion Report Project F-29 , 130p.

Savino, J. F. and R.A. Stein. 1989. Behavior of fish predators and their prey: habitat choice between open water and dense vegetation. Environmental Biology of Fishes 24(4): 287-293.

Stephan, C. D. and T.E. Bigford. 1997. Atlantic coastal submerged aquatic vegetation: a review of its ecological role, anthropogenic impacts, state regulations, and value to Atlantic coastal fish stocks. Atlantic States Marine Fisheries Commission, 77p.

Thayer, G. W., S.M. Adams, and M.W. La Croix. 1975. Structural and functional aspects of a recently established Zostera marina community. p. 518-540 in L.E. Cronin (ed.). Estuarine Research. Academic Press, New York, NY.

WiRO

North Carolina Department of Environmental Quality

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

September 25, 2015

DWR # 04-0337 V2
Pender County

CERTIFIED MAIL: 7008 1300 0000 1124 1749
RETURN RECEIPT REQUESTED

Waters Edge Homeowners Association
Attn: Michael Mac and John Corkrum
2108 Capital Drive Suite 102
Wilmington, NC 28405

Subject: **REQUEST FOR ADDITIONAL INFORMATION**
Waters Edge HOA Boat Dock Dredging project, Hampstead

Dear Messrs. Mac and Corkrum:

On July 29, 2015, the Division of Water Resources (Division) received your CAMA application dated July 23, 2015, requesting a 401 certification for new dredging at your docking facility. The Division has determined that your application is incomplete and cannot be processed. **The application is on-hold until the following information is received:**

1. A Submerged Aquatic Vegetation Survey (SAV) survey of the proposed area to be dredged and the area adjacent to the docks.

2. The project is proposed in waters classified as "SA-ORW". Title 15A NCAC 02B .0225(c)(2), for Outstanding Resource Waters, which states
"Saltwater: Water quality conditions shall be maintained to protect the outstanding resource values of waters classified ORW. Management strategies to protect resource values shall be developed on a site-specific basis during the proceedings to classify waters as ORW. New development shall comply with the stormwater provisions as specified in 15A NCAC 02H .1000. Specific stormwater management requirements for saltwater ORWs are described in 15A NCAC 02H .1007. New non-discharge permits shall meet reduced loading rates and increased buffer zones, to be determined on a case-by-case basis. <u>No dredge or fill activities shall be allowed if those activities would result in a reduction of the beds of submerged aquatic vegetation</u> [emphasis added] or a reduction of shellfish producing habitat as defined in 15A NCAC 03I .0101(b)(20)(A) and (B), except for maintenance dredging, such as that required to maintain access to existing channels and facilities located within the designated areas or maintenance dredging for activities such as agriculture. A public hearing is mandatory for any proposed permits to discharge to waters classified as ORW."
Please explain how this proposed project complies with Title 15A NCAC 02B .0225(c)(2).

RECEIVED
DCM WILMINGTON, NC
SEP 2 5 2015

Pursuant to Title 15A NCAC 02H .0502(e), the applicant shall furnish all of the above requested information for the proper consideration of the application. Please respond in writing within 30 calendar days of receipt of this letter by sending three (3) copies of all of the above requested information to the 401 & Buffer Permitting Unit, 1650 Mail Service Center, Raleigh, NC 27699-1650. If all of the requested information is not received in writing within 30 calendar days of receipt of this letter, the Division will be unable to approve the application and it will be returned. The return of this project will necessitate reapplication to the Division for approval, including a complete application package and the appropriate fee.

Please be aware that you have no authorization under Section 401 of the Clean Water Act for this activity and any work done within waters of the state may be a violation of North Carolina General Statutes and Administrative Code.

Please contact Joanne Steenhuis at 910.796.7306 or Joanne.Steenhuis@ncdenr.gov or me at 919.807.6360 or Karen.Higgins@ncdenr.gov if you have any questions or concerns.

Sincerely,

Karen Higgins

Karen Higgins, Supervisor
401 & Buffer Permitting Unit

cc: Adam Knierim – Maritech LLC, adamknierim@gmail.com – electronic copy
Liz Hair – USACE – Sarah.E.Hair@usace.army.mil -electronic copy
Heather Coats – DCM Wilmington – electronic copy
Jason Dail – DCM Wilmington – electronic copy
Joanne Steenhuis – DWR WiRO
DWR 401 and Buffer Permitting Unit File Copy

File name: 040337v2WatersEdgeMarina(Pender)_HOLD.docx

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NCDENR

North Carolina Department of Environment and Natural Resource

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

July 23, 2015

RECEIVED/NCDENR/DWR
JUL 23 2015
Water Quality Regional Operations Section Wilmington Regional Office

MEMORANDUM:

TO: Joanne Steenhuis
401 Wetlands
DWR - WiRO

FROM: Doug Huggett, NC DENR-DCM Major Permits Coordinator
400 Commerce Avenue, Morehead City, NC 28557 Fax: 252-247-3330
(Courier 11-12-09)

SUBJECT: CAMA / Dredge & Fill Permit Application Review

Applicant: ***Waters Edge HOA***

Project Location: *at the southern terminus of Great Oaks Dr., adjacent to the AIWW, in Hampstead, Pender County*

Proposed Project: *to dredge around two (2) existing docking facilites*

Please indicate below your agency's position or viewpoint on the proposed project and ***return this form to Doug Huggett*** at the address above by ***August 15, 2015.*** If you have any questions regarding the proposed project, contact Jason Dail at (910)796-7221 when appropriate, in-depth comments with supporting data is requested.

REPLY: ______ This agency has no objection to the project as proposed.

______ This agency has no comment on the proposed project.

______ This agency approves of the project only if the recommended changes are incorporated. See attached.

__X__ This agency objects to the project for reasons described in the attached comments.

SENT DENIAL LETTER TO RALEIGH FOR SIGNATURE 9/25/15

SIGNED ________ **DATE** 09-25/15

violates
15A NCAC 2OB 0225(c)(2)
JHS 9/25/15

WiRO

September 30, 2015

Regulatory Division

Action ID. No. SAW-2003-00506/2004-00494

Mr. John Corkrum
Mr. Michael Mac
2108 Capital Drive, Suite 102
Wilmington, North Carolina 28405

Dear Messrs. Corkrum and Mac:

On July 27, 2015, we received your application for Department of the Army authorization to perform new dredging at a private docking facility, in navigable waters of the U.S. within Topsail Sound, at the southern terminus of Great Oak Drive, in Hampstead, Pender County, North Carolina.

After review of your proposal, the National Marine Fisheries Service have recommended revision of your application and plans by letter dated September 22, 2015 (copy enclosed). The Corps also has similar concerns. These recommendations are due to anticipated adverse environmental impacts to submerged aquatic vegetation (SAV). The recommendations are as follows:

1.) No dredging should be authorized in SAV and SAV habitat.

Additionally, this office has learned by letter dated September 25, 2015 (copy enclosed), the North Carolina Department of Environmental Quality, Division of Water Resources has placed your application on hold pending receipt of an SAV survey of the proposed dredge area, the area adjacent to the docks, and demonstration of compliance with state law for activities proposed in Outstanding Resource Waters (ORW). The Corps agrees that an SAV survey of the aforementioned areas should be completed and submitted to this office for review.

Please provide the completed SAV survey and a revised project plan which avoids and minimizes impacts to SAV and SAV habitat within 30 days of receipt of this letter.

If you have any questions, please contact Ms. Liz Hair at (910) 251-4049.

FILENAME: CL50_2003-00506.CORKUM &MAC.doc09a.doc

Sincerely, CESAW-RG-L/HAIR/tms/s
CESAW-RG-L/BETER
MAIL
CESAW-RG/FILE

Liz Hair, Project Manager
Wilmington Regulatory Field Office

Enclosures:
NMFS Letter
NCDEQ-DWR letter

Copies Furnished (without enclosures):

Mr. Fritz Rhode
National Marine Fisheries Service
Habitat Conservation Service
Pivers Island
Beaufort, North Carolina 28516

Mr. Pace Wilber
National Marine Fisheries Service
Habitat Conservation Division
219 Fort Johnson Road
Charleston, South Carolina 29412-9110

Mr. Doug Huggett
Morehead City Regional Office
Division of Coastal Management
North Carolina Department of Environmental Quality
400 Commerce Avenue
Morehead City, North Carolina 28557-3421

Coastal Management
ENVIRONMENTAL QUALITY

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

BRAXTON DAVIS
Director

December 4, 2015

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Waters Edge Homeowners Association
c/o Michael Mac & John Corkrum
2108 Capital Drive, Suite 102
Wilmington, NC 28405

Dear Sirs:

This letter is in response to your application for a Major Permit under the Coastal Area Management Act (CAMA) and State Dredge and Fill Law, in which authorization was requested to dredge around existing docking facilities adjacent to the Atlantic Intracoastal Waterway, at the southern terminus of Great Oak Drive, in Pender County. Processing of the application, which was received as complete by the Division of Coastal Management's Wilmington Office on July 10, 2015, is now complete. Based on the state's review, the Division of Coastal Management has made the following findings:

1) The proposed project involves excavation around two existing docking facilities located adjacent to the Atlantic Intracoastal Waterway. The first area of proposed excavation would involve an area 50 feet wide by 75 feet long, and the second area of excavation would involve an area 50 feet wide by 100 feet long.

2) The waters in the project area are classified as Outstanding Resource Waters by the N.C. Environmental Management Commission.

3) The field investigation report prepared by the Division for this permit application states that in 2008, submerged aquatic vegetation (SAV) was observed within the proposed dredge footprints. Division staff confirmed the continued presence of SAV within the proposed dredge footprints during site visits conducted on April 28, 2015 and June 18, 2015.

4) The proposed project would result in the excavation of approximately 8,750 square feet of SAV habitat.

5) The Division's fisheries resource specialist found that the project would result in a significant and adverse impact to marine and estuarine resources, principally SAV habitat, at the project site.

6) Based upon the above referenced findings, the Division has determined that the proposed project is inconsistent with the following Rules of the Coastal Resources Commission:

a) 15A NCAC 07H.0208(a)(2)A): "The location, design, and need for development, as well as the construction activities involved shall be consistent with the management objective of the Estuarine and Ocean System AEC (Rule .0203 of this subchapter) and shall be sited and designed to avoid significant adverse impacts upon the productivity and biologic integrity of coastal wetlands, shellfish beds, submerged aquatic vegetation as defined by the Marine Fisheries Commission, and spawning and nursery areas";

b) 15A NCAC 07H.0208(b)(1): "Navigation channels, canals, and boat basins shall be aligned or located so as to avoid primary nursery areas, shellfish beds, beds of submerged aquatic vegetation as defined by the MFC, or areas of coastal wetlands except as otherwise allowed within this Subchapter."

Given the preceding findings, it is necessary that your request for issuance of a CAMA Major Permit under the Coastal Area Management Act be denied. This denial is made pursuant to N.C.G.S. 113A-120(a)(8), which requires denial for projects inconsistent with the state guidelines for Areas of Environmental Concern or local land use plans, and N.C.G.S. 113-229(c)(5), which requires denial for projects that will cause a significant adverse effect on wildlife or freshwater, estuarine or marine fisheries.

If you wish to appeal this denial, you are entitled to a contested case hearing. The hearing will involve appearing before an Administrative Law Judge who listens to evidence and arguments of both parties before making a final decision on the appeal. Your request for a hearing must be in the form of a written petition, complying with the requirements of §150B of the General Statutes of North Carolina, and must be filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714, within twenty (20) days from the date of this denial letter. A copy of this petition should be filed with this office.

Another response to a permit denial available to you is to petition the Coastal Resources Commission for a variance to undertake a project that is prohibited by the Rules of the Coastal Resources Commission. Applying for a variance requires that you first acknowledge and recognize that the Division of Coastal Management applied the Rules of the Coastal Resources Commission properly in processing and issuing this denial. You may then request an exception to the Commission's Rules based on hardships to you resulting from unusual conditions associated with your property. To apply for a variance, you must file a petition for a variance with the Director of the Division of Coastal Management and the State Attorney General's

Office on a standard form, which must be accompanied by additional information on the nature of the project and the reasons for requesting a variance. The variance request may be filed at any time, but must be filed a minimum of six weeks before a scheduled Commission meeting for the variance request to be eligible to be heard at that meeting. The standard variance forms may be obtained by contacting a member of my staff, or by visiting the Division's web page at: http://www.nccoastalmanagement.net/web/cm/90.

Members of my staff are available to assist you should you desire to modify your proposal in the future. If you have any questions concerning this matter, please contact Ms. Heather Coats at (910) 796-7302.

Sincerely,

Braxton C. Davis
Director, NC Division of Coastal Management

cc: Col. Kevin P. Landers – U.S. Army Corps of Engineers, Wilmington, NC
OCRM/NOAA, Silver Spring, MD

NC

Water Resources
ENVIRONMENTAL QUALITY

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

S. JAY ZIMMERMAN
Director

December 14, 2015

DWR # 04-0337 v2
Pender County

CERTIFIED MAIL: 7008 1300 0000 1124 1848
RETURN RECEIPT REQUESTED

Waters Edge Homeowners Association
Attn: Michael Mac and John Corkrum
2108 Capital Drive Suite 102
Wilmington, NC 28405

Subject: **DENIAL of 401 Water Quality Certification**
Waters Edge HOA Boat Dock Dredging Project, Hampstead

Dear Messrs. Mac and Corkrum:

On July 29, 2015, the Division of Water Resources (Division) received your CAMA application dated July 23, 2015, requesting a 401 certification for new dredging at your docking facility. Your project is located within an area classified as Outstanding Resource Water (ORW) and is proposing to dredge submerged aquatic vegetation (SAV).

Pursuant to 15A NCAC 02H .0506, a certification shall be issued when the Director determines that water quality standards are met. The project has not met the following requirements:

1. Title 15A NCAC 02B .0225(c)(2)
"Saltwater: Water quality conditions shall be maintained to protect the outstanding resource values of waters classified ORW. Management strategies to protect resource values shall be developed on a site-specific basis during the proceedings to classify waters as ORW. New development shall comply with the stormwater provisions as specified in 15A NCAC 02H .1000. Specific stormwater management requirements for saltwater ORWs are described in 15A NCAC 02H .1007. New non-discharge permits shall meet reduced loading rates and increased buffer zones, to be determined on a case-by-case basis. No dredge or fill activities shall be allowed if those activities would result in a reduction of the beds of submerged aquatic vegetation or a reduction of shellfish producing habitat as defined in 15A NCAC 03I .0101(b)(20)(A) and (B), except for maintenance dredging, such as that required to maintain access to existing channels and facilities located within the designated areas or maintenance dredging for activities such as agriculture. A public hearing is mandatory for any proposed permits to discharge to waters classified as ORW."

2. Title 15A NCAC 02H .0506(b)
   "The Director shall issue a certification upon determining that existing uses are not removed or degraded by a discharge to classified surface waters for an activity which (3) does not result in the degradation of groundwaters or surface waters;"

In your letter to the Division dated October 10, 2015, you state that you are aware of the presence of SAV in the project area and that the project will not be in compliance with state rules.

In accordance with 15A NCAC 02H .0507(e), your application for a 401 Water Quality Certification is hereby denied.

This decision can be contested as provided in Articles 3 and 4 of General Statute 150B by filing a written petition for an administrative hearing to the Office of Administrative Hearings (hereby known as OAH) **within sixty (60) calendar days.**

A petition form may be obtained from the OAH at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000 for information. A petition is considered filed when the original and one (1) copy along with any applicable OAH filing fee is received in the OAH during normal office hours (Monday through Friday between 8:00am and 5:00pm, excluding official state holidays).

The petition may be faxed to the OAH at (919) 431-3100, provided the original and one copy of the petition along with any applicable OAH filing fee is received by the OAH within five (5) business days following the faxed transmission.

Mailing address for the OAH:

If sending via US Postal Service:	*If sending via delivery service (UPS, FedEx, etc):*
Office of Administrative Hearings	Office of Administrative Hearings
6714 Mail Service Center	1711 New Hope Church Road
Raleigh, NC 27699-6714	Raleigh, NC 27609-6285

One (1) copy of the petition must also be served to the Department of Environmental Quality:

Sam M. Hayes, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

This completes the review of the Division under section 401 of the Clean Water Act and 15A NCAC 02H .0500. Please be aware that you have no authorization under Section 401 of the Clean Water Act for this activity and any work done within waters of the state would be a violation of North Carolina General Statutes and Administrative Code.

Contact Joanne Steenhuis at 910.796.7306 or Joanne.Steenhuis@ncdenr.gov or Karen Higgins at 919.807.6360 or Karen.Higgins@ncdenr.gov if you have any questions or concerns.

Sincerely,

S. Jay Zimmerman
Director, Division of Water Resources

cc: Adam Knierim – Maritech LLC, adamknierim@gmail.com – electronic copy
Liz Hair – USACE – Sarah.E.Hair@usace.army.mil – electronic copy
Heather Coats – DCM Wilmington – electronic copy
Jason Dail – DCM Wilmington – electronic copy
Todd Bowers – EPA, Sam Nunn Federal Center, 61 Forsyth Street SW, Atlanta, GA 30303
Joanne Steenhuis – DWR WiRO
File Copy

File name: 040337v2WatersEdgeMarina(Pender)_Denial.docx

December 14, 2015

Wilmington District Regulatory Division

SAW-2003-00506/2004-00494

Mr. John Corckrum
Mr. Michael Mac
2108 Capital Drive
Wilmington, North Carolina 28405

Dear Messrs. Corkrum and Mac:

This refers to the Department of the Army (DA) permit application for a Department of Army permit to perform new dredging at a private docking facility, within navigable waters of the U.S., in Topsail Sound, at the southern terminus of Great Oak Drive, in Hampstead, Pender County, North Carolina. The application proposed new dredging impacts to submerged aquatic vegetation (SAV) and the removal of 971 cubic yards of material from a shallow bottom habitat area of approximately 8,750 square feet. A previous request dated September 2008 to perform new dredging within the project area was withdrawn due to the comments received on the proposal as a result of the potential impacts to the SAVs.

This office has received information that the State of North Carolina Division of Coastal Management (DCM) denied authorization for you to complete the above described work.

In accordance with 33 CFR Part 320.4(j), the District Engineer may deny permits when required State or local authorization and/or certification has been denied. Accordingly, your application for a DA permit is hereby denied without prejudice.

This denial without prejudice does not prohibit submittal of future applications. You must notify us in writing if your proposed work is approved by the DCM in the future. Further consideration will be given to your application at that time.

If you have any other questions concerning your application for a DA permit, please contact Ms. Liz Hair, at the above letterhead address, or by phone at 910-251-4049.

BY AUTHORITY OF THE SECRETARY OF THE ARMY:
FILENAME: SAW-2003-00506.CORKRUM.WatersEdgeDWOP.doc 12a.doc
Sincerely, CESAW-RG-L/HAIR/tms
CESAW-RG-L/BETER/s
MAIL
CESAW-RG/FILE

Kevin P. Landers, Sr.
Colonel, U.S. Army
District Commander

Copies Furnished:

National Marine Fisheries Service
Attn: Mr. Fritz Rohde
Pivers Island
Beaufort, North Carolina 28516

National Marine Fisheries Service
Attn: Mr. Pace Wilber
Habitat Conservation Division
219 Ft. Johnson Road
Charleston, South Carolina 29412-9110

North Carolina Department of
Environmental Quality
Division of Water Resources
Attn: Ms. Joanne Steenhuis
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

North Carolina Department of
Environmental Quality
Webscape Unit
Attn: Ms. Karen Higgins
1650 MSC
Raleigh, North Carolina 27699

North Carolina Department of
Environmental Quality
Division of Coastal Management
Attn: Mr. Braxton Davis
400 Commerce Avenue
Morehead City, North Carolina 28557

North Carolina Department of
Environmental Quality
Division of Coastal Management
Attn: Ms. Heather Coats
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

BEFORE THE NORTH CAROLINA COASTAL RESOURCES COMMISSION
Waters Edge HOA, Inc. Variance Request

AFFIDAVIT OF DAWN J. BERARD

Affiant, being first duly sworn, deposes and says that:

BACKGROUND

1. My name is Dawn J. Berard.

2. I have resided at 111 Waters Edge Drive, Hampstead, NC 28443 (Lot 9, Plat Book 37, Page 133 of Waters Edge at Deerfield subdivision) since 2012. I acquired the lot and residence by way of deed recorded December 28, 2012 at Deed Book 4184 at Page 302, Pender County Registry.

3. I subsequently conveyed the property referenced above to Dawn J. Berard, Trustee of the Dawn J. Berard Revocable Trust dated February 7, 2014 on February 13, 2014 (see attached copy of Deed Book 4377 at Page 64, Pender County Registry.)

4. I serve as the representative of the Dawn J. Berard Revocable Trust in its capacity as a Member of Waters Edge HOA, Inc., which is the corporate homeowners association for the Waters Edge at Deerfield Subdivision.

5. I am on the Board of Directors of the Waters Edge HOA, Inc.

6. I am a real estate broker licensed by the North Carolina Real Estate Commission (Individual License # 236951), am the Broker In Charge/Owner of Sold Buy the Sea Realty LLC (Firm License # C22936) and am qualified to render Broker Price Opinions under the Rules of the Commission.

7. Waters Edge HOA, Inc. is the owner of 9 boat slips located on the Intracoastal Waterway (ICWW). The boat slips are virtually unusable the majority of time because they have shoaled in.

8. I have prepared this affidavit without compensation on behalf of myself as an owner of property in Waters Edge at Deerfield subdivision and in response to a request by Waters Edge HOA, Inc. The purpose of the affidavit is to provide a comparison / Broker Price Opinion of sale prices of waterfront homes in Hampstead, NC (a) located on the ICWW or deep water creeks that have expansive views, but with*out* 24/7 access to those waters, versus (b) *with* boat slips and docks providing 24/7 access to those waters.

9. I am familiar with waterfront property sale prices in Hampstead, NC, the Water's Edge neighborhood and the local market and factors that determine those prices. I am the Owner

of Sold Buy the Sea Realty, Broker in Charge of 16 agents and two offices, a Realtor/Broker with credentials to teach as an approved Instructor for the North Carolina Real Estate Commission and a Board Member of several Realtor Association task forces. I have provided Broker Price Opinions (BPOs) for many properties. This year, I have had over $10,799,000 in personal listings that are waterfront, water access and/or with boat slips both community and private.

10. Waters Edge at Deerfield subdivision (Waters Edge) is in Hampstead NC. All homes have wonderful views of either the ICWW or Mill Creek (a deep water creek that flows into the ICWW. Waters Edge homes have high end finishes.

11. Equipped with my experience and knowledge referenced above and my access to the regional MLS, I have researched and compared sale prices of Hampstead, NC waterfront homes, with and without 24/7 deep-water access.

12. All the homes I examined share three key factors: (1) wonderful waterfront views, (2) high end finishes, and (3) close proximity to each other in Hampstead, NC. I refer to these as the "Subject Homes". The Subject Homes included (a) those *with* boat slip or dock direct access to the ICWW or deep water creeks with deep water allowing egress and ingress at all times throughout the day, i.e. not relying on high tide to get watercraft into and out of the water (called herein "direct 24/7 deep water access"), and (b) those with*out* such access. I examined the prices of the Subject Homes sold during the previous 12 months from November 8, 2015 to November 8, 2016 (the "Period").

13. While the location and amenities of the Subject Homes are very similar, they vary in size, age and condition. Consequently, I believe that for BPO purposes the best approach to determine the differences in sale prices of the Subject Homes attributable to "direct 24/7 deep-water access" would be to use the average price per square foot for all the Subject Homes sold during the Period. This is an approach used by appraisers.

WATERFRONT HOMES WITH*OUT* "DIRECT 24/7 DEEP-WATER ACCESS"

14. Twelve (12) Subject Homes with*out* "direct 24/7 deep water access" were sold during the Period. Using the method outlined above, the average price per square foot of Subject Homes sold during the Period is **$166.48** per square foot.

WATERFRONT HOMES *WITH* BOAT SLIPS & "DIRECT 24/7 DEEP-WATER ACCESS"

15. Four (4) Subject Homes *with* boat slip or dock "direct 24/7 deep water access" were sold during the Period. Using the method outlined above, the average price per square foot of Subject Homes *with* that access which were sold during the Period is **$221.71** per square foot.

FINDINGS

16. Based on all the evidence referenced above and the applicable MLS charts (attached as **Exhibit A**, the contents of which are incorporated herein by reference), it is apparent that Subject Homes sold during the Period with*out* "direct 24/7 deep water access" obtained a significantly lower price per square foot than Subject Homes *with* such access that sold during the Period. In particular, the average per square foot sales price of the Subject Homes with*out* the access sold during the Period is approximately **33% less** than the average per square foot sales price of Subject Homes *with* the access that sold during the Period.

17. Accordingly, an average 3500 square foot home in the Hampstead, NC area with wonderful waterfront views, with high end finishes, and with boat slip or dock "direct 24/7 deep water access" would sell in the $775,985 range. In contrast, an average 3500 square foot home in the Hampstead, NC area with wonderful waterfront views, with high end finishes, but with*out* the boat slip or dock "direct 24/7 deep water access", would sell in the $582,680 range.

18. As this pertains to the Waters Edge at Deerfield and the possibility of not regaining lost "direct 24/7 deep water access" from the boat slips located on the ICWW, the home owners served by those boat slips would face a significant hardship and potentially lose hundreds of thousands of dollars in home value.

19. In addition to my review of sales of Subject Homes during the period, I also reviewed current listings to sell Subject Homes. There are 14 active listings of Subject Homes *with* boat slip or dock "direct 24/7 deep water access". There are 13 active listings of Subject Homes with*out* "direct 24/7 deep water access". The list prices of Subject Homes *with* that access as compared to those with*out* that access is consistent with my findings as to actual sales prices. That is, the list price per square foot of Subject Homes with*out* the access is substantially less than that of Subject Homes *with* the access. However, my opinions herein are based on actual sale prices per square foot.

20. Nothing herein is an appraisal of the market value of property, and may not be used in lieu of an appraisal. If an appraisal is desired, the services of a licensed or certified appraiser shall be obtained. This opinion may not be used by any party as the primary basis to determine the value of a parcel of or interest in real property for a mortgage loan origination, including first and second mortgages, refinances, or equity lines of credit.

Dawn Berard

Dawn Berard

STATE OF NORTH CAROLINA
COUNTY OF New Hanover
SWORN TO and subscribed before me this 10th day of November, 2016.

Rebecca J. Tillson

Notary Public

My Commission Expires:

REBECCA J. TILLSON
NOTARY
PUBLIC
NEW HANOVER CO., NC

DEEP WATER

EXHIBIT

4

tabbies

Residential CMA

Listings as of 11/08/16 at 12:58 PM

Status of 'Active', 'Closed', 'Pending','Active Contingent'; Sub-Type of 'Single Family Residence'; City or Township of 'Hampstead'; Under Contract Date between '11/07/2015' and '11/07/2026'; Sold Date between '03/03/2016' and '11/07/2026'; or undefined of Canal Front, Creek Front, ICW Front, Marina Front, Marina View, Marsh Front or Sound Front. **(Selected Listings Only)**

ACTIVE Properties

Address	City	Subdivision	MLS #	Year Built	Beds	Baths	SqFt - Heated	Lot SqFt	DOM	List Price	LP/SqFt
135 Dogwood Lane	Hampstead	Not In Subdivision	100001371	1987	4	5	7,313	69,260	280	$1,800,000	$246.14
100 Drake Road	Hampstead	Mallard Bay	30518539	1999	4	5	3,932	27,225	554	$759,000	$193.03
380 S Kingfisher Lane	Hampstead	Not In Subdivision	30520054	2008	4	5	4,412	22,216	585	$995,000	$225.52
99 Soundview Drive	Hampstead	Belvedere Plantation	30527433	1999	5	5	5,556	52,272	437	$1,349,500	$242.89
101 Soundview Drive N	Hampstead	Belvedere Plantation	30531757	1994	3	4	3,227	47,916	311	$785,000	$243.26
1629 Kings Landing Road	Hampstead	Sidbury Acres	100009189	2006	3	4	2,386	10,498	156	$699,900	$293.34
605 Hughes Road	Hampstead	Washington Acres	100010261	1988	3	4	3,595	65,235	196	$640,000	$178.03
142 Great Oak Drive	Hampstead	Deerfield	100018073	1991	5	5	4,350	41,552	138	$1,290,000	$296.55
114 Inlet Court	Hampstead	Hideaway Shores	100018252	1987	4	3	3,169	26,136	140	$795,000	$250.87
1659 Kings Landing Road	Hampstead	Best View	100019131	2005	4	3	2,850	7,841	131	$989,000	$347.02
103 Soundview Drive	Hampstead	Belvedere Plantation	100021866	2005	4	7	5,834	36,699	113	$1,900,000	$325.68
109 Soundview Drive	Hampstead	Belvedere Plantation	100022816	1996	4	4	5,408	33,001	105	$1,245,000	$230.21
2176 Washington Acres Road	Hampstead	Long Point Estates	100023730	1981	4	4	3,912	29,185	98	$1,037,200	$265.13
117 White Heron Cove Road	Hampstead	Olde Point	100032758	1978	3	3	3,491	42,253	34	$849,000	$243.2
Total # of Listings: 14				Average	3.86	4.36	4,245.36	36,520.64	234.14	1,080,971.43	255.78
				Min	3	3	2,386	7,841	34	640,000	178.03
				Max	5	7	7,313	69,260	585	1,900,000	347.02
				Median	4	4	3,922	34,850	148	992,000	244.7

CLOSED Properties

Address	City	Subdivision	MLS #	Year Built	Beds	Baths	SqFt - Heated	Lot SqFt	DOM	List Price	Sold Price	SP/SqFt	Sale/List Ratio	Sold Date
655 Hickory Point Road	Hampstead	Hickory Point	30525095	1970	2	2	1,250	7,405	379	$360,000	$313,950	$251.16	87.21	09/14/2016
740 Red Fox Trail	Hampstead	Not In Subdivision	30527303	1984	3	2	2,325	47,916	184	$629,900	$610,000	$262.37	96.84	06/14/2016
205 Topsail Watch Drive	Hampstead	Topsail Watch	100004119	1998	3	3	3,425	39,185	139	$650,000	$640,000	$186.86	98.46	08/23/2016
485 Andrews Road	Hampstead	Not In Subdivision	100029198	1969	3	2	2,306	16,988	4	$429,900	$429,900	$186.43	100.00	10/21/2016
Total # of Listings: 4				Average	2.75	2.25	2,326.5	27,873.5	176.5	517,450	498,462.5	221.71		
				Min	2	2	1,250	7,405	4	360,000	313,950	186.43		
				Max	3	3	3,425	47,916	379	650,000	640,000	262.37		
				Median	3	2	2,315.5	28,086.5	161.5	529,900	519,950	219.01		

Property Type Count	18	Averages	Sqft: 3,819	$/Sqft: 248.21	DOM/CDOM: 221/221	O-Price: 1,003,228	L-Price: 955,744	S-Price: 498,463

* Price statistics for closed listings based on sold price. All other statuses and Totals based on current list price.

Residential CMA

NO DEEP WATER

Listings as of 11/08/16 at 1:01 PM
(Selected Listings Only)

ACTIVE Properties

Address	City	Subdivision	MLS #	Year Built	Beds	Baths	SqFt - Heated	Lot SqFt	DOM	List Price	LP/SqFt
207 Hickory Point Road Ext	Hampstead	Hickory Point	100006926	1962	2	2	1,550	22,651	229	$335,000	$216.13
100 N Gadwall Court	Hampstead	Pelican Reef	100032320	2013	4	3	2,367	27,830	36	$349,500	$147.66
102 Mill Dam Road	Hampstead	Olde Point	100009422	2001	4	4	3,536	24,633	203	$349,900	$98.95
321 Dogwood Lane	Hampstead	Washington Acres	30528064	1995	3	2	1,724	49,223	402	$375,000	$217.52
1538 Kings Landing Road	Hampstead	Sidbury Acres	100011748	2016	4	4	2,301	7,405	183	$399,900	$173.79
606 Ravenswood Road	Hampstead	Olde Point	100025586	1995	3	3	3,288	25,265	88	$565,000	$171.84
Lot 12 E High Bluff Drive	Hampstead	Pelican Reef	100036105	2017	4	3	2,594	23,374	4	$590,000	$227.45
22 Tidewater Court	Hampstead	Virginia Bay	100016723	2013	4	5	3,952	95,832	147	$599,000	$151.57
613 Hughes Road	Hampstead	Washington Acres	30514643	1996	5	4	3,201	117,612	686	$649,000	$202.75
863 Royal Tern Drive	Hampstead	Pelican Reef	100011240	2003	4	4	4,445	79,279	189	$675,000	$151.86
409 W Windward Landing Place	Hampstead	Middle Pointe Village	100034557	2007	4	5	4,334	39,217	15	$709,500	$163.71
608 Ballast Point Road	Hampstead	Sloop Point Plantation	100023717	1999	4	4	3,104	87,120	102	$749,000	$241.3
121 E High Bluff Drive	Hampstead	Pelican Reef	100033055	2005	4	4	3,605	28,902	29	$775,000	$214.98
Total # of Listings: 13				**Average**	3.77	3.62	3,077	48,334.08	177.92	547,753.85	183.04
				Min	2	2	1,550	7,405	4	335,000	98.95
				Max	5	5	4,445	117,612	686	775,000	241.3
				Median	4	4	3,201	28,902	147	590,000	173.79

CLOSED Properties

Address	City	Subdivision	MLS #	Year Built	Beds	Baths	SqFt - Heated	Lot SqFt	DOM	List Price	Sold Price	SP/SqFt	Sale/List Ratio	Sold Date
103 Marshview Road	Hampstead	Olde Point	100007971	1979	3	3	2,994	24,799	3	$369,900	$369,900	$123.55	100.00	05/19/2016
927 Grandview Drive	Hampstead	Eagle's Watch	100021371	2012	4	3	3,018	37,756	16	$398,000	$390,000	$129.22	97.99	09/21/2016
101 Dogwood Circle	Hampstead	Belvedere Plantation	30503928	1996	3	3	3,100	23,522	719	$399,000	$390,500	$125.97	97.87	04/25/2016
1012 Cordgrass Road	Hampstead	Olde Point	100011468	1993	4	3	3,292	66,647	10	$437,000	$420,000	$127.58	96.11	06/24/2016
485 Andrews Road	Hampstead	Not In Subdivision	100029198	1969	3	2	2,306	16,988	4	$429,900	$429,900	$186.43	100.00	10/21/2016
110 Topsail Watch Lane	Hampstead	Pirates Cove	100006702	1987	3	3	2,078	0.78	111	$475,500	$442,000	$212.7	92.95	08/26/2016
124 Canvasback Point	Hampstead	Pelican Reef	100001033	1999	3	3	3,118	40,075	144	$450,000	$442,500	$141.92	98.33	08/11/2016
1459 Royal Tern Drive	Hampstead	Pelican Reef	100001406	2006	3	3	3,078	25,679	12	$500,000	$480,000	$155.95	96.00	03/31/2016
77 Intracoastal Overlook	Hampstead	Harbour Village	30531840	2008	4	4	3,136	21,344	183	$515,000	$490,000	$156.25	95.15	08/30/2016
109 E High Bluff Drive	Hampstead	Pelican Reef	30532149	2010	3	4	2,192	38,498	8	$519,000	$495,000	$225.82	95.38	04/07/2016
100 Deer Cove Road	Hampstead	Olde Point	100008266	1996	4	4	3,083	29,961	120	$700,000	$680,000	$220.56	97.14	09/08/2016
123 Soundview Drive	Hampstead	Belvedere Plantation	30505212	1998	4	4	3,780	18,295	650	$825,000	$725,000	$191.8	87.88	06/02/2016
Total # of Listings: 12				**Average**	3.42	3.25	2,931.25	28,630.4	165	501,525	479,566.67	166.48		
				Min	3	2	2,078	0.78	3	369,900	369,900	123.55		
				Max	4	4	3,780	66,647	719	825,000	725,000	225.82		
				Median	3	3	3,080.5	25,239	63.5	462,750	442,250	156.1		

Property Type Count 25 **Averages** **Sqft:** 3,007 **$/Sqft:** 175.09 **DOM/CDOM:** 171/195 **O-Price:** 545,412 **L-Price:** 525,564 **S-Price:** 479,567

* Price statistics for closed listings based on sold price. All other statuses and Totals based on current list price.

North Carolina Coastal Habitat Protection Plan

Source Document

2016

NC Department of Environmental Quality

Enhancing coastal fisheries through habitat protection and restoration

NC Environmental Quality

North Carolina Marine Fisheries

Albemarle - Pamlico National Estuary Partnership

NC Division of Coastal Management

DWR Division of Water Resources

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CHAPTER 4. SUBMERGED AQUATIC VEGETATION

4.1. Description and distribution

4.1.1. Definition

Submerged aquatic vegetation (SAV) is fish habitat dominated by one or more species of underwater vascular plants. The North Carolina Marine Fisheries Commission (MFC) defines SAV habitat as submerged lands that: [MFC rule T15A NCAC 03I .0101 (4)(i)]

(i) are vegetated with one or more species of submerged aquatic vegetation including bushy pondweed or southern naiad (*Najas guadalupensis*), coontail (*Ceratophyllum demersum*), eelgrass (*Zostera marina*), horned pondweed (*Zannichellia palustris*), naiads (*Najas* spp.), redhead grass (*Potamogeton perfoliatus*), sago pondweed (*Stuckenia pectinata*, formerly *Potamogeton pectinatus*), shoalgrass (*Halodule wrightii*), slender pondweed (*Potamogeton pusillus*), water stargrass (*Heteranthera dubia*), water starwort (*Callitriche heterophylla*), waterweeds (*Elodea* spp.), widgeongrass (*Ruppia maritima*) and wild celery (*Vallisneria americana*). These areas may be identified by the presence of above-ground leaves, below-ground rhizomes, or reproductive structures associated with one or more SAV species and include the sediment within these areas; or

(ii) have been vegetated by one or more of the species identified in Sub-item (4)(i)(i) of this Rule within the past 10 annual growing seasons and that meet the average physical requirements of water depth (six feet or less), average light availability (Secchi depth of one foot or more), and limited wave exposure that characterize the environment suitable for growth of SAV. The past presence of SAV may be demonstrated by aerial photography, SAV survey, map, or other documentation. An extension of the past 10 annual growing season's criteria may be considered when average environmental conditions are altered by drought, rainfall, or storm force winds.

SAV is an underwater forest for juvenile fish and small invertebrates, and is a barometer of water quality.

Submerged aquatic vegetation is included as fish habitat under MFC rules defined above, modified to include low salinity species and to address difficulties in identification of SAV habitat in 2009. The previous definition required the presence of leaves, shoots, or rhizomes. However, because the presence of SAV varies seasonally and inter-annually, a single inspection could result in improper habitat determination. The modified rule defines habitat to include areas where SAV is present, or areas where there is documentation or professional knowledge of its presence within the past ten growing seasons. Regular mapping and monitoring of SAV habitat is, consequently, imperative for proper identification. To ensure consistency among agencies, CRC rules were modified to reference the MFC definition.

4.1.2. Description

Submerged aquatic vegetation habitat includes marine, estuarine and riverine vascular plants that are rooted. Although SAV occurs within the intertidal zone in high salinity regions, the plants are generally submerged and cannot survive if removed from the water for an extended length of time (Hurley 1990). Leaves and stems have specialized thin-walled cells (aerenchyma) with large intercellular air spaces to provide buoyancy and support in an aquatic environment. Leaves and stems are generally thin and lack the waxy cuticle found in terrestrial plants. The lack of a waxy cuticle increases the exchange of water, nutrients, and gases between the plant and the water (Hurley 1990). The extensive root and rhizome system anchors the plants and absorbs nutrients (Thayer et al. 1984). Because the plants are rooted in anaerobic sediments, they need to produce a large amount of oxygen to aerate the roots, and therefore have the highest light requirements of all aquatic plants (including phytoplankton, floating leaf plants, macroalgae, etc.). Reproduction occurs both sexually and asexually.

There are three basic types of SAV communities in North Carolina, all of which are important to coastal fisheries: (1) high salinity or saltwater (18-30 ppt); (2) moderate salinity or brackish (5-18 ppt); and (3) freshwater - low salinity (0-5 ppt). High salinity estuarine species that occur in North Carolina include eelgrass (*Z. marina*) and shoalgrass (*H. wrightii*). Eelgrass is a temperate species at the southern limit of its Atlantic range in North Carolina. In contrast, shoalgrass is a tropical species that reaches its northernmost extent in the state. Widgeon grass (*R. maritima)* grows best in moderate salinity but has a wide salinity range. The co-occurrence of these three SAV species is unique to North Carolina, resulting in high coverage of shallow bottom area in North Carolina's estuaries, both spatially and temporally (Ferguson and Wood 1994). Freshwater - low salinity SAV species in North Carolina are diverse and include native wild celery (*V. americana*), non-native Eurasian milfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata)*, bushy pondweed (*Najas guadalupensis*), redhead grass (*P. perfoliatus*), and sago pondweed (*P. pectinatus*) (Ferguson and Wood 1994). Submerged aquatic vegetation covers areas from small isolated patches less than a meter in diameter, to continuous meadows covering many acres.

Habitat for SAV supports aquatic plants other than solely submerged grasses. Macroalgae (benthic, drift, and floating) often co-occur with SAV and provide similar ecological services, but the plant taxa have distinctly different growth forms and contrasting life requirements (SAFMC 1998b). Macroalgae grow faster than SAV and do not require loose sediment for anchoring of root systems. Therefore, they do not provide as much sediment stabilization as rooted vascular plants. Their leaves are less rigid than those of submerged rooted vascular plants, reducing their use for attachment and friction for sediment deposition. Macroalgal genera include salt/brackish (*Ulva, Codium, Gracilaria, Enteromorpha*) and freshwater (*Chara, Nitella*) species. Macroalgae common to the rivers of the Albemarle Sound system include the charophytes (*Chara* spp.). In addition, the macroalgae *Ectocarpus* and *Cladomorpha* grow on salt marsh flats (Mallin et al. 2000a) and in association with SAV beds (Thayer et al. 1984).

Epibiota are important components of SAV habitat, being organisms that attach or grow on the surface of living plants, and may or may not derive nutrition from the plants themselves. Micro- and macroalgae (e.g., seaweed) can grow on the leaves of SAV. Invertebrates that attach to the SAV leaves include crabs, protozoans, nematodes, polychaetes, hydroids, bryozoans, sponges, mollusks, barnacles, and shrimps.

The three-dimensional shape of SAV habitat can be quite variable, ranging from highly mounded, patchy beds several meters wide, to more contiguous, low-relief beds (Fonseca et al. 1998). Leaf canopies, formed by the grass beds range in size from a few inches to more than three feet (0.91 m) in height. The structural complexity of an SAV bed also varies because of the growth form of the species present (SAFMC 1998b). While leaf density tends to be higher in contiguous beds than in patchy habitat, below-ground root mass is often denser in patchy beds (Fonseca et al. 1998). Despite the difficulty of defining the boundaries of SAV beds, unvegetated bottom between nearby patches is included as a component of patchy SAV habitat because rhizomes and/or seedlings may be present and the beds migrate with patterns of sediment erosion and deposition (Fonseca et al. 1998).

4.1.3. Habitat requirements

Beds of SAV occur in North Carolina in subtidal, and occasionally intertidal, areas of sheltered estuarine and riverine waters where there is sediment, adequate light reaching the bottom, and moderate to negligible current velocities or turbulence (Ferguson and Wood 1994; Thayer et al. 1984). While this is generally true for all SAV species, individual species vary in their occurrence along gradients of salinity, depth, and water clarity (Table 4.1). Field sampling of SAV beds in the Albemarle-Pamlico estuarine system between 1988 and 1991 found that occurrence of SAV was related to water depth, water clarity, and salinity. In the area sampled, average depth of SAV occurrence ranged from 2.63–3.94 ft (0.8–1.2 m), depending on the species. The maximum depth of observed presence, regardless of species, was 7.87 ft (2.4 m) (Ferguson and Wood 1994). Data indicated that freshwater SAV had a somewhat greater tolerance for turbidity than salt and brackish SAV (Ferguson and Wood 1994). This supports other research (Funderburk et al. 1991) in concluding that salt/brackish SAV requires slightly greater water clarity (Secchi depth >1.0 m, or 3.28 ft) than freshwater (Secchi depth >0.8 m or 2.63 ft).

The primary factors controlling distribution of SAV are water depth, sediment composition, energy, and the penetration of photosynthetically active radiation (PAR) through the water column (Biber et al. 2008; Cho and Poirrier 2005; Dennison et al. 1993; Duarte et al. 2007; French and Moore 2003; Gallegos 1994; Goldsborough and Kemp 1988; Havens 2003; Kemp et al. 2004; Kenworthy and Haunert 1991; Koch 2001; Moore et al. 1996; Moore et al. 1997). At a minimum, high salinity leaves require 15-25% of incident light (Bulthius 1994; Dennison and Alberte 1986; Fonseca et al. 1998; Kenworthy and Haunert 1991). Low salinity species have lower light requirements (9-13%) (EPA 2000a; Fonseca et al. 1998; 1991; Kemp et al. 2004). For comparison, phytoplankton in the water column requires only 1% of light available at the surface (Fonseca et al. 1998). The light requirements of SAV species can be expressed as percent of surface light, light attenuation coefficient ($K_d m^{-1}$), or Secchi depth (m). Table 4.2 summarizes what is known about the growing season and light requirements of North Carolina SAV species. The amount of light penetrating the water column is partitioned into two categories: light required through the water column, and light required at leaf. The light required at leaf refers to the amount of water column light that can penetrate epibiota to the leaf surface. If less light is available, photosynthesis is limited, reproduction may be inhibited, and growth and survival of the vegetation cannot be sustained.

Light penetration is affected by epibiotic growth and natural substances in the water column, such as dissolved organic matter (e.g., humics), suspended particulate matter (e.g., sediment and minerals), detritus, and algae (Biber et al. 2008; Kemp et al. 2004). Dissolved organic matter affects light penetration by coloring the water. For example, dissolved organic matter such as tannic acid (produced naturally in swamp waters via breakdown of detritus) and lignins (produced naturally and artificially, such as through wood pulp mill processing) strongly absorb blue light.

Suitable or potential SAV habitat can be determined by modeling habitat requirements. This could be done by simply selecting shallow bottom with appropriate substrate or could further be refined through modeling of additional bio-optical parameters and wave exposure. Turbidity, total suspended solids (TSS), Chlorophyll *a*, and dissolved organic matter are the optically active constituents (OACs) typically measured to determine light available in the water column above the substrate (Biber et al. 2008). In the mid-Atlantic, one study showed environmental conditions allowing adequate light penetration for SAV survival to be TSS <15 mg/l and chlorophyll *a* <15 µg/l (Kemp et al. 2004). Another study indicated that high salinity SAV requires chlorophyll *a* <10 µg/l and turbidity <1 ntu (Gallegos 1994). Bio-optical models predicting light attenuation under various environmental conditions have been calibrated for the Chesapeake Bay (Gallegos 2001), Indian River Lagoon in Florida (Gallegos and Kenworthy 1996), and North River in North Carolina (Biber et al. 2008). The North River in the northeast Albemarle Sound area was chosen because it exhibits a broad range of depths and salinities representative of the Albemarle-Pamlico estuarine system. The bio-optical model predicted a deeper depth distribution (1.7 m MSL) for SAV than was observed (0.87 m MSL). While SAV was not found as deep as predicted, the cause may have been confining hydrographic features, currents, epiphytic growth, substrate composition, or overestimation of colonization depth (Biber et al. 2008; Bradley and Stolt 2006; Kemp et al. 2004).

Table 4.1. Average environmental conditions at locations where submerged aquatic vegetation occurred in coastal North Carolina, 1988-1991 (Ferguson and Wood 1994).

	Environmental parameter					
	Salinity (ppt)		Secchi depth m (ft)		Water depth m (ft)	
SAV species	Range	Average	Range	Average	Range	Average
HIGH SALINITY (18-30 ppt)						
Eel Grass	10 - >36	26	0.3 - 2.0 (1.0 - 6.6)	1.0 (3.3)	0.4 - 1.7 (1.3 - 5.6)	1.2 (3.9)
Shoal Grass	8 - >36	25	0.4 - 2.0 (1.3 - 6.6)	1.0 (3.3)	0.1 - 2.1 (0.3 - 6.9)	0.8 (2.6)
MODERATE SALINITY (5-18 ppt)						
Widgeon Grass	0-36	15	0.2 - 1.8 (0.7 - 5.9)	0.7 (2.3)	0.1 - 2.5 (0.3 - 8.2)	0.8 (2.6)
FRESHWATER -LOW SALINITY (0-5 ppt)						
Redhead Grass	0-20	1	0.4 - 1.4 (1.3 - 4.6)	0.9 (3.0)	0.4 - 2.4 (1.3 - 7.9)	0.9 (3.0)
Wild Celery	0-10	2	0.2 - 2.0 (0.7 - 6.6)	0.6 (2.0)	0.2 - 2.3 (0.7 - 7.6)	1.0 (3.3)
Eurasian Watermilfoil	0-10	2	0.2 - 1.4 (0.7 - 4.6)	0.6 (2.0)	0.5 - 2.4 (1.6 - 7.9)	1.1 (3.6)
Bushy Pondweed	0-10	1	0.2 - 2.0 (0.7 - 6.6)	0.7 (2.3)	0.5 - 1.7 (1.6 - 5.6)	1.0 (3.3)
Sago Pondweed	0-9	2	0.2 - 0.4 (0.7 - 1.3)	0.3 (1.0)	0.6 - 0.9 (2.0 - 3.0)	0.8 (2.6)

Table 4.2. Light requirements for SAV species found in coastal North Carolina (EPA 2000a; Funderburk et al. 1991; Kemp et al. 2004).

SAV salinity categories	Light required at leaf (%)	Light required through water (%)
Moderate - high salinity (5-30 ppt)	>15	>22
Freshwater-low salinity (0-5ppt)	>9	>13

Kemp et al. (2004) developed a relationship to estimate epiphytic material and its associated light attenuation. In the Chesapeake Bay, epiphytic growth reduced the intensity of light by 20-60% in low salinity areas and 10-50% in moderate to high salinity areas (Kemp et al. 2004). From that, the amount of needed dissolved inorganic nitrogen (DIN) and dissolved inorganic phosphorus (DIP) was determined (~ 0.15 mg/l DIN; 0.01-0.02 mg/l DIP)(Funderburk et al. 1991; Kemp et al. 2004; Sand-Jensen 1977). The majority of nitrate used by SAV is derived from the sediment, rather than the water column (Thayer et al. 1984), suggesting the importance of substrate fertility in SAV distribution. Once light attenuation at both leaf and water column is determined, a maximum depth of SAV can be estimated. The actual distribution of potential habitat for SAV also depends on the distribution of substrate compositions, current velocities, and wave exposure during the growing season.

Below is a brief description of the habitat and plant characteristics of eight submerged grasses common to North Carolina's waters (Bergstrom et al. 2006; Hurley 1990):

4.1.3.1. High salinity SAV (18-30ppt)

- Eelgrass (*Zostera marina*): Grows in fine mud, silt, and loose sand in high salinity waters, tolerant of high energy waters (Thayer et al. 1984). Reproduces vegetatively throughout the growing season and sexually from December to April. Present primarily as a seed bank from July to November (P. Biber, NMFS, pers. com.). Rhizomes rarely deeper than 5 cm (1.97 inches). Spatially coexists with *Halodule* and *Ruppia* in North Carolina, but dominates from winter to summer, with lower densities during summer relative to *Halodule* (Thayer et al. 1984).
- Shoalgrass (*Halodule wrightii*): Forms dense beds and can occur in very shallow water. Known for its relative tolerance to desiccation (drying out) once rooted. Rhizomes situated fairly shallow in sediment and may extend into the water column with attached shoots. Almost exclusively vegetative reproduction from April through October and sexual (although rare) in spring and summer (J. Kenworthy and P. Biber, NMFS, pers. com.). May co-occur with *Zostera* and *Ruppia* and dominates mid-summer through fall in North Carolina, after which *Zostera* becomes relatively more predominant (Thayer et al. 1984).

4.1.3.2. Moderate salinity/brackish SAV (5-18ppt)

- Widgeon grass (*Ruppia maritima*): Tolerates a wide range of salinity regimes, from slightly brackish to high salinity, but grows best in moderate salinity. Found growing with eelgrass and shoalgrass, as well as low salinity species like redhead grass. Spreads vegetatively from creeping rhizome during April - October. Rare occurrence reported in fresh water. While more common on sandy substrates, is also found on soft, muddy sediments. High wave action damaging to slender stems and leaves. It reproduces sexually in summer and disperses by seed.

4.1.3.3. Freshwater-low salinity SAV (0-5ppt, occasionally to 15ppt)

- Redhead grass (*Potamogeton perfoliatus*): Found in fresh to moderately brackish and alkaline waters. Grows best on firm muddy soils in quiet waters with slow-moving currents. Because of its wide leaves it is more susceptible to being covered with epibiotic growth than more narrow leaved species. Securely anchored in the substrate by its extensive root and rhizome system.
- Wild celery (*Vallisneria americana*): Primarily a freshwater species occasionally found in moderately brackish waters. Coarse silt to slightly sandy soil. Tolerant of murky waters and high nutrient loading. Can tolerate some wave action and currents compared to more delicate species. Similar in appearance to eelgrass.
- Eurasian watermilfoil (*Myriophyllum spicatum*): Inhabits fresh to moderately brackish waters. Affinity for high alkalinity and moderate nutrient loading. Grows on soft mud to sandy mud in slow moving or protected waters. Not tolerant of strong currents and wave action. Over-wintering lower stems provide early spring cover for fish fry before other SAV species become established. *Myriophyllum spicatum* is a non-native, invasive species, estimated to cover over 4000 acres in Currituck and Albermarle sounds during the 1990s (DWR 1996) and is classified by the NC Board of Agriculture as a Class B noxious weed [T02 NCAC 48A .1702].
- Bushy Pondweed or Southern Niad (*Najas quadalupensis*): Present in small freshwater streams. Tolerates slightly brackish waters. Sand substrates are preferred, but the species can grow in muddy soils. *Najas* spp. requires less light than other SAV species.
- Sago pondweed (*Potamogeton pectinatus*): Fresh to moderately brackish, tolerant of high alkalinity.

Associated with silt-mud sediments. Long rhizomes and runners provide strong anchorage to substrate. Capable of enduring stronger currents and wave action than most SAV.

4.1.4. Distribution

The dynamic nature of SAV beds makes mapping and monitoring difficult. The distribution, abundance, and density of SAV varies seasonally and annually (Dawes et al. 1995; Fonseca et al. 1998; SAFMC 1998c; Thayer et al. 1984). Therefore, one needs consider historical as well as current occurrence to determine locations of viable seagrass habitat (SAFMC 1998c). In North Carolina, annual meadows of eelgrass are common in shallow, protected estuarine waters in the winter and spring when water temperatures are cooler. However, in the summer when water temperatures are above 25 – 30°C (77 – 86°F), shoalgrass is more abundant, and eelgrass thrives where water temperatures are lower (e.g., deeper areas and tidal flats with continuous water flow (SAFMC 1998c)).

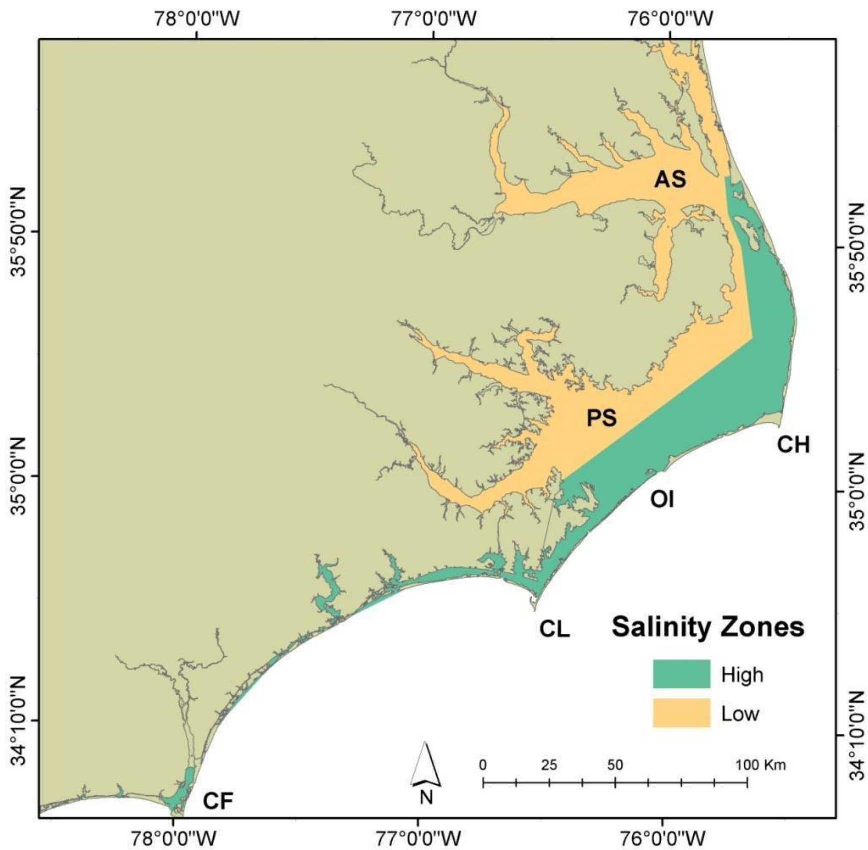
Along the Atlantic coast, North Carolina supports more SAV than any other state but Florida (Funderburk et al. 1991; Sargent et al. 1995). Mapping efforts suggest SAV habitat covers over 150,000 acres in coastal North Carolina (Map 4.1). Some recent mapping efforts include:

- DMF (North Carolina Division of Marine Fisheries) Bottom Mapping Program – http://portal.ncdenr.org/web/mf/shellfish-habitat-mapping.
- ECSU (Elizabeth City State University) Mapping Program – http://www.ecsu.edu/academics/department/natural-sciences/chemistry/sav/ecsu.cfm.
- NCSU (North Carolina State University) – Dr. Eggleston (http://marinesci.ncsu.edu/research/.
- DWR Rapid Response Teams - http://portal.ncdenr.org/web/wq/ess/savmapping.
- APNEP http://portal.ncdenr.org/web/apnep/sav-monitoring, Fall 2007 north of Oregon Inlet to Back Bay Virginia, Spring 2008 south of Oregon inlet. Map based on aerial photography.
- APNEP http://www.apnep.org/web/apnep/sav-monitoring, Fall 2013 north of Oregon Inlet, Spring 2013 south of Oregon Inlet. Imagery not completed at the time of CHPP completion.

A partial inventory of SAV mapping is located at http://portal.ncdenr.org/web/mf/58. When considering only mapping data, the area of SAV habitat in North Carolina covers ~29% of the shallow (<6 foot) littoral zone[6], and approximately ~8% of the total water area. The spatial distribution of coverage varies within and among regions, relative to the area of shallow estuarine waters (Table 4.3). A general distribution of high and low salinity submerged grass beds in North Carolina is shown in Map 4.2 below.

Most habitat for SAV in coastal North Carolina occurs along the Outer Banks estuarine shoreline (Pamlico and Core/Bogue sounds), with sparse cover along the mainland shores (Ferguson et al. 1989). As the systems become riverine, freshwater SAV is abundant in larger blackwater systems, but rare in small blackwater streams (Smock and Gilinsky 1992), due to irregular flows and shading from forested wetlands. Freshwater SAV can be extensive in low-salinity back bays and lagoons (Moore 1992), such as Currituck Sound, and in coastal lakes like Lake Mattamuskeet (not included in SAV coverage estimates). Estuarine SAV occurs sporadically south of Bogue Inlet to the South Carolina border, but these areas were not well photographed in the early 1990's (Ferguson and Wood 1994). Small areas of habitat have been observed in New River by DMF biologists, and in Alligator and Chadwick bays, Topsail Sound, and inside Rich Inlet (Staff, DMF, pers. com. 2010). More recent imagery and site visits have verified the presence of patchy SAV beds south of Bogue Sound (S. Chappell and A. Deaton, DMF, pers. obs. 2010).

[6] Based on digitizing contours from the depth points drawn on NOAA nautical charts.



Map 4.2. Submerged Aquatic Vegetation salinity zones in North Carolina.
Abbreviations: AS, Albemarle Sound; PS, Pamlico Sound; CH, Cape Hatteras; OI, Ocracoke Inlet; CL, Cape Lookout; CF, Cape Fear. Source: Development of a Performance-Based Submerged Aquatic Vegetation Monitoring and Outreach Program for North Carolina, Dean E. Carpenter, Joseph J. Luczkovich, W. Judson Kenworthy, David B. Eggleston and Gayle R. Plaia, 2012.

Table 4.3. Estimated acreage of mapped SAV habitat within CHPP regions. The area estimates are from a mosaic of mapping efforts spanning a time period from 1981-2011.

CHPP regions	Major water bodies	SAV area (acre)	<6 foot area (% SAV)	Total water area (% SAV)
1	Albemarle/Currituck sounds, Chowan River	36,880	212,099 (17%)	670,258 (6%)
1/2	Oregon Inlet	3,490	10,043 (35%)	11,924 (29%)
2	Pamlico Sound, Neuse/Tar-Pamlico rivers	102,791	251,478 (41%)	1,329,415 (8%)
2/3	Ocracoke Inlet	3,993	14,459 (28%)	24,247 (16%)
3	Core/Bogue sounds, New/White Oak rivers	48,108	154,493 (31%)	228,241 (21%)
4	Cape Fear River/southern estuaries	579	37,800 (2%)	89,304 (1%)
Totals	CHPP Management Unit	195,841	680,372 (29%)	2,353,388 (8%)

4.2. Ecological role and functions

Submerged aquatic vegetation is recognized as essential fish habitat because of five interrelated features – primary production, structural complexity, modification of energy regimes, sediment and shoreline stabilization, and nutrient cycling. Water quality enhancement and fish utilization are especially important ecosystem functions of SAV relevant to the enhancement of coastal fisheries.

The economic value of ecosystem services provided by SAV habitat is reportedly very large. Costanza et al. (1997), using published international literature, estimated the total value of ecosystem services of seagrass and algal beds to be $19,000/ha/yr ($7,700/ac/yr). Their estimate took into account services such as climate regulation, erosion control, waste treatment, food production, recreation, among others. The monetary estimate of SAV services did not account for the lesser value of alternative habitats, such as subtidal soft bottom. In Bogue Sound, North Carolina, SAV denitrification had an estimated value of $3,000/acre/year compared to approximately $400/acre/year for subtidal soft bottom (Piehler and Smyth 2011). Sediments in the vicinity of submerged grassbeds also provide more annual denitrification than marsh sediments (Smyth et al. 2013). Ecosystem services of subtidal soft bottom are less than SAV (Eyre and Ferguson 2002; Piehler and Smyth 2011), although there is much more of it; proportionately, SAV habitat provides more ecosystem services than subtidal soft bottom.

4.2.1. Productivity

Seagrass habitat is dominated by dense stands of vascular plants associated with epiphyte communities and benthic micro- and macroalgae. These grasses produce large quantities of organic matter under optimum conditions. Estimates of daily production for eelgrass beds rank among the most productive of marine plant habitats (Hemminga and Duarte 2000; Larkum et al. 2006; Peterson et al. 2007; Thayer et al. 1984). The typical biomass of growing eelgrass beds (leaves, roots, and rhizomes) in North Carolina was reported as 57–391 g (dry weight)/m^2 (Thayer et al. 1984; Twilley et al. 1985), with the majority contained in the roots (45-285 g m^{-2}). Based on published research (Peterson et al. 2007), the annual primary production estimates for eelgrass surpassed intertidal marsh grass (*Spartina alterniflora)*, intertidal and subtidal soft bottom, and shell bottom. The relative productivity of SAV suggests its importance as a source of secondary production. The components of SAV habitat production include epiphytes, above and below-ground biomass, epibenthic algae, and water column phytoplankton.

Contributions of the various components of SAV productivity varies by species, salinity type, and location throughout the growing season (Stevenson 1988). In general, high salinity grasses have more annual production than freshwater SAV, developing greater standing crops and storing biomass in extensive root and rhizome systems. Stevenson (1988) reported high salinity SAV production at >10 g carbon m^{-2} d^{-1} and low salinity SAV production at <5 g carbon m^{-2} d^{-1}. Attached epiphytes contribute substantially to the total productivity of SAV beds (Koch 2001) and are an important food source for fish and invertebrates. While early stages of epiphytic growth increase primary productivity, later stages can impede SAV growth and density by competing for light, nutrients, and carbon (Koch 2001; Thayer et al. 1984). Dillon (1971) and Penhale (1977) estimated that epiphytes (macroalgae) constitute 10-25% of the total SAV biomass in a North Carolina estuary, with seasonal variability in macroalgal abundance corresponding to fluctuations in eelgrass biomass (Penhale 1977; Thayer et al. 1975).

Because of their high rates of primary production and particle deposition, SAV beds are important sources and sinks for nutrients (SAFMC 1998b). Thayer et al. (1984) concluded that SAV beds in high velocity areas are sources (exporters) of organic matter, while SAV in low current areas are sinks (importers) of organic matter. Exported matter represents a large portion of total production in high salinity SAV beds in North Carolina (Thayer et al. 1984). When grasses die and decompose, the detrital material is broken down by invertebrates, zooplankton, and bacteria, and energy is transferred through the estuarine detrital food web. Decomposed SAV matter and its associated bacteria are of greater importance as food for fish than are living SAV leaves (Kenworthy and Thayer 1984; Thayer et al. 1984).

4.2.2. Ecosystem enhancement

Because SAV is rooted and provides semi-permanent structures, system enhancement is one of its more important ecological functions. Some of these include (SAFMC 1998b; Thayer et al. 1984):

- Accelerated deposition of sediment and organic matter,
- Physical binding of sediments beneath the canopy,
- Nutrient cycling between the water column and sediments, and
- Modification of water flow and reduction in wave turbulence.

These functions improve water quality in estuaries by removing TSS from the water column, improving water clarity, and adding DO. The presence of SAV is both a maintainer and indicator of good water quality (Biber et al. 2008; Dennison et al. 1993; Virnstein and Morris 1996). Moore (2004) studied the effect of SAV beds on water quality inside compared to outside of the bed in Chesapeake Bay. During spring (April – June), the rapidly growing beds were a sink for nutrients, TSS, and phytoplankton. As summer progressed, death of the vegetation caused a release of the sediment and nutrients to the surrounding water. The improvements in water quality were not measureable until SAV biomass exceeded 50-100 g (dry weight) m^{-2} or 25-50% vegetative cover. The rapid uptake of nutrients by growing SAV was reflected in a 73% decline in nitrate levels inside the bed compared to outside. A threshold coverage and density of SAV is needed to ensure bed survival through high levels of spring turbidity (Moore 2004; Moore et al. 1997). Beds of SAV can also enhance grazing on phytoplankton by providing daytime refuge for planktonic filter feeders (Scheffer 1999). By absorbing wave energy, aquatic grasses buffer turbulence, reduce erosion, improve clarity, and help stabilize marsh edge habitat (Fonseca 1996; Stephan and Bigford 1997).

4.2.3. Fish utilization

Many fish species occupy SAV at some point in their life cycles (Thayer et al. 1984), the value of the grassbed depending on its contribution to species' refuge, spawning, nursery, foraging, and corridor needs. Because of the seasonal abundance patterns of SAV, refuge and foraging habitat are provided almost year round for estuarine-dependent species (Steel 1991). Fish and invertebrates’ use of SAV differs spatially and temporally due to distribution ranges, time of recruitment, and life histories (Heck et al. 2008; Hovel et al. 2002; Nelson et al. 1991). The SAFMC considers SAV as EFH for brown, white, and pink shrimp, and species in the snapper-grouper complex. Table 4.4 is a partial list of species utilizing SAV habitat in North Carolina.

4.2.3.1. Moderate to high salinity SAV

In brackish and high salinity estuaries, fish and invertebrates use seagrass for nursery, refuge, foraging, and spawning. Studies in eelgrass beds in the Newport River estuary reported between 39 and 56 fish species found during monitoring in the 1970s (Adams 1976; Thayer et al. 1975; Thayer et al. 1984). The DMF juvenile fish sampling in SAV beds in eastern Pamlico and Core Sounds found >150 species of fish and invertebrates from 1984 to 1989, of which 34 fish and six invertebrates were important commercial species (DMF 1990). Long haul seine catches reported 49 adult fish species collected over SAV beds in eastern Pamlico Sound (DMF 1990). Over 70 benthic invertebrates have been reported in eelgrass beds along the east coast (Thayer et al. 1984). Spotted seatrout (*Cynoscion nebulosus*) are highly dependent on grass beds (Vetter 1977), and bay scallops occur almost exclusively in the beds (Thayer et al. 1984).

Table 4.4. Partial list of species documented to use submerged aquatic vegetation habitat.

Species*	SAV Functions [1] Refuge	Spawning	Nursery	Foraging	Corridor	2014 Stock status [2]
ANADROMOUS & CATADROMOUS FISH						
River herring - blueback/alewife	X		X	X	X	D-Albemarle Sound, U-Central/Southern
Striped bass				X		C- Alb/Roa; V-Atl Migratory
Yellow perch		**X**				**C**
American eel	X		X	X	X	D
ESTUARINE AND INLET SPAWNING AND NURSERY						
Bay scallop	**X**	**X**	**X**	**X**		**C**
Blue crab	**X**		**X**	**X**	**X**	**C**
Grass shrimp	**X**		**X**	**X**		
Hard clam	**X**		**X**	**X**		**U**
Red drum	**X**		**X**	**X**	**X**	**R**
Spotted seatrout	**X**		**X**	**X**	**X**	**D**
Weakfish	X		X	X	X	D
MARINE SPAWNING, LOW-HIGH SALINITY NURSERY AREA						
Atlantic croaker	X		X	X	X	C
Atlantic menhaden	X		X	X	X	C
Brown shrimp	**X**		**X**	**X**	**X**	**V**
Southern flounder			X	X		D
Spot	X		X	X	X	C
Striped mullet	X		X	X	X	V
White shrimp	X		X	X	X	V
MARINE SPAWNING, HIGH SALINITY NURSERY						
Black sea bass	X		X	X	X	V- S of Hat., R- N of Hat.
Bluefish			X	X		V
Gag	X		X	X	X	C
Kingfish spp.	X		X	X	X	U
Pinfish	**X**		**X**	**X**	**X**	
Pink shrimp	**X**		**X**	**X**	**X**	**V**
Smooth dogfish				**X**		
Spanish mackerel			X	X		V
Summer flounder			X	X		V

Names in bold are species with relative abundances reported in literature as higher in SAV than other habitats. Note: lack of bolding does not imply non-selective use of the habitat, but lack of information.

[1] Sources: (ASMFC 1997), (Thayer et al. 1984), (Peterson and Peterson 1979), (NMFS 2002), (SAFMC 1998b)

[2] V=viable, R=recovering, C=Concern, D=Depleted, U=unknown

Studies along the Atlantic and Gulf coasts have demonstrated significantly greater species richness and abundance in SAV beds compared to unvegetated bottom (ASMFC 1997; Heck et al. 1989; Hirst and Attrill 2008; Irlandi 1994; Ross and Stevens 1992; Summerson and Peterson 1984; Wyda et al. 2002). Blue crabs and pink shrimp were significantly more abundant in SAV beds than in shallow unvegetated estuarine bottoms in North Carolina, Alabama, and Florida (Murphey and Fonseca 1995; Williams et al. 1990). Wyda et al. (2002) found significantly higher abundance, biomass, and species richness of fish at sites with higher levels of seagrass habitat (biomass >100 wet g m^{-2}; density > 100 shoots m^{-2}) than sites with low-absent SAV (biomass <100 wet g m^{-2}; density <100 shoots m^{-2}), although the sites with low-absent

SAV biomass and density had higher proportions of pelagic species. In the Newport River estuary, rough silverside (*Membras martinica*) and smooth dogfish (*Mustelus canis*) were classified as abundant in SAV beds, but were rare or absent in marsh channel and intertidal flats (Thayer et al. 1984). In Back Sound, Elis et al. (1996) found that large macrofauna (e.g., fish, crabs, shrimp) were generally more abundant on artificial SAV beds (green plastic ribbon tied to black plastic mesh) than on shell bottom.

In Florida Bay, animal abundances were compared between the 1980s and 1990s when significant changes in SAV coverage occurred (Matheson et al. 1999). The major change was a decrease in abundance of small fish and invertebrates (e.g., crustaceans, pipefish) with decreases in SAV coverage, while larger demersal predatory fish (e.g., toadfish, sharks) increased. Increases in SAV density revealed significant increases in crustaceans. Another Florida Bay study saw reductions in pink shrimp abundance in SAV die-off areas relative to undamaged/recovering areas (Roblee and DiDomenico 1992).

In the Long Island estuaries of New York's Shinnecock Bay, Carroll et al. (2008) focused on the ability of hard clams to increase nutrient availability for eelgrass. Compared to control plots, eelgrass production in both ambient light and artificially shaded treatments was significantly higher with hard clams. Eelgrass on plots with hard clams also had higher N concentrations in their tissues. These results were nearly identical to those obtained with fertilizer stakes. The results demonstrate the positive interactions between hard clams and eelgrass, and show clams being capable of broadening the range of physical conditions within which eelgrass can survive by improving its habitat. Restoration efforts targeting SAV will benefit hard clams and vice versa.

Hovel et al. (2002) examined the effect of SAV bed structure (% cover and total linear edge), local-scale ecological attributes (shoot density, shoot biomass, percent organic matter), and elements of physical setting (water depth and wave energy regime) on fish and shellfish densities in Core and Back Sound, North Carolina. The surveys were conducted in two consecutive years in spring and fall. Wave energy regime and SAV shoot biomass had the most influence on species densities; other factors explained little of the variation. Processes operating at larger than local spatial scales (e.g., larval delivery by currents) were evident between sites with high and low faunal abundance (western vs. eastern Core Sound). The results support treating all moderate-high salinity SAV equally regarding fish and shellfish use.

4.2.3.2. Freshwater to low salinity SAV

Less information is available on fish use in low-salinity SAV habitat. Fish abundance and size has been shown to be greater in freshwater and low-salinity systems with SAV than in similar systems void of SAV (Petr 2000; Randall et al. 1996). In Currituck Sound, Borawa et al. (1979) observed an increase in fish abundance from approximately 1,000 to more than 15,000 fish hectare^{-1} after *Myriophylum spicatum* became established; however, the size of fish declined significantly. Another study in the Potomac River, VA, found densities of fish in SAV habitat 2-7 times higher than in areas without (Killgore et al. 1989). Species that inhabit freshwater SAV also include certain estuarine and anadromous fish (NOAA 2001; Rozas and Odum 1987; SAFMC 1998b). The most commonly occurring include:

Freshwater
- Minnows
- Juvenile American
- Pirate perch
- Inland silversides
- Yellow perch
- Largemouth bass
- Bluegill (bream)
- White perch

Estuarine
- Juvenile menhaden
- Spot
- Blue crab
- Grass shrimp
- Bay anchovy
- Striped mullet
- Tidewater

Anadromous
- Striped bass
- Shad (American and
- River herring

4.2.4. Specific biological functions

4.2.4.1. Refuge

The structure of SAV conceals prey from visual detection, restricts capture by predators, and protects organisms from adverse weather (Rooker et al. 1998; SAFMC 1998b; Savino and Stein 1989). Light levels are reduced within the canopy, further concealing prey (SAFMC 1998b). Since SAV can be as tall as one meter (3.28 ft), their canopies are three-dimensional, and contain large volumes of sheltered water. Additionally, cryptic species use camouflage to decrease visibility within SAV habitat. Rhizomes and roots of SAV provide a substrate matrix for meiofauna and macrofauna (Kenworthy and Thayer 1984). Hard clams are significantly more abundant in SAV beds than in unvegetated bottom due to differences in food supply, predation, and sediment stability (Irlandi 1994; Irlandi and Crawford 1997; Peterson and Peterson 1979). Estuarine-dependent spring-summer spawners (e.g., red drum, seatrout) utilize SAV habitat in the spring and summer for forage and refuge, residing prior to emigrating to the mouths of bays, rivers, inlets, or coastal ocean shelf waters to spawn (SAFMC Luczkovich et al. 1999; 1998b).

Benthic macroinvertebrates can be more vulnerable to crab predation in SAV because crabs use SAV for refuge from avian predators (Beal 2000; Micheli and Peterson 1999; Skilleter 1994). Summerson and Peterson (1984) hypothesized that nocturnal bottom predators living on sand flats use SAV diurnally to avoid predators. Matilla et al. (2008) found that SAV beds of various densities equally increased survival of shrimp from predators. In freshwater systems, excess vegetation can hamper movement and foraging efficiency of large predatory fish, resulting in stunted populations (Colle and Shireman 1980).

Seagrass, particularly eelgrass, may provide overwintering habitat for some estuarine species. Pink shrimp have been collected in SAV during winter months in North Carolina (Purvis and McCoy 1972; Williams 1964). The presence of SAV in the winter may contribute to pink shrimp’s ability to survive, supporting the spring fishery (Murphey and Fonseca 1995), which comprises a large portion of North Carolina’s annual shrimp landings. In contrast, in South Carolina and Georgia where there is very minimal SAV, pink shrimp comprise a very small portion of shrimp landings. Similarly, survival of blue crabs in a New Jersey estuary was attributed to the ability to overwinter in SAV (Wilson et al. 1990).

4.2.4.2. Spawning

It is difficult to know species whose reproduction success rate is higher in SAV than in other habitats. Preference for spawning in SAV could be assumed for species found almost exclusively in SAV habitat, such as the bay scallop (Thayer et al. 1984). Many other year-round estuarine residents benefit from proximity to SAV spawning and nursery areas. In the Chesapeake Bay, where bay scallops have been disappearing, researchers believe the population can be restored if spawning scallops can be protected from predators in SAV (Cordero et al. 2012). Seasonal patterns of reproduction and development of many temperate species coincide with seasonal abundance of seagrass (Stephan and Bigford 1997).

Freshwater fish spawning preferentially on or near SAV include carp, crappie, yellow perch and chain pickerel (Balon 1975; Graff and Middleton 2000). The roots and stems of the SAV provide substrate for attachment of eggs. Many species benefit from proximity to spawning and SAV nursery areas.

4.2.4.3. Nursery

Many species of fish and invertebrates along the Atlantic coast use SAV for nursery habitat (Thayer et al. 1984). The roots and stems provide protection and foraging habitat for developing fish and invertebrate larvae (Ambrose and Irlandi 1992; SAFMC 1998b). Commercial and recreational species present in SAV as juveniles in spring and early summer include gag, black sea bass, snappers, weakfish, spotted seatrout, bluefish, mullet, spot, Atlantic croaker, red drum, flounders, southern kingfish, hard clam, and herrings

(SAFMC Rooker et al. 1998; 1998b). Estuarine-dependent reef fish (e.g., gag, black sea bass) use seagrass as juveniles prior to moving offshore (Ross and Moser 1995). Juvenile sheepshead and gray snapper also utilize SAV beds (Pattilo et al. 1997). In North Carolina, where SAV is present year-round, some larval and early juvenile finfish, molluscan, and crustacean species are present in SAV habitat much of the year (SAFMC 1998b). Offshore, winter-spawning species such as spot, croaker, shrimp, and pinfish, inhabit SAV habitat as early juveniles in winter and early spring (Rooker et al. 1998).

In North Carolina, SAV has been recognized as critical nursery habitat for pink shrimp (Murphey and Fonseca 1995). The degree of preference by red drum is uncertain since they also utilize unvegetated estuaries. Still, red drum eggs, larvae, postlarvae, and juveniles, have been documented in SAV in North Carolina, which is particularly important for foraging young (1-2 year old) (Mercer 1984; Reagan 1985; Ross and Stevens 1992). Abundance of juvenile red drum in SAV varies seasonally and spatially, being more common during summer, in beds close to spawning areas (Zieman 1982; DMF, unpublished data). Juveniles are more abundant in edge habitat with patchy grass coverage than in homogeneously vegetated sites (Mercer 1984; Reagan 1985; Ross and Stevens 1992). Data from DMF seine surveys and tagging studies indicate high abundance of late YOY red drum in shallow high salinity SAV behind the Outer Banks (DMF 2001b). Analysis of DMF data, including juvenile abundance and concurrent habitat measurements, indicate a higher affinity to seagrass for ages 1 and 2 (Bachelor et al. 2009).

Other species showing some preference for SAV habitat include brown shrimp, bay scallop, hard clams, and blue crabs. Clark et al. (2004) compared the density of juvenile brown shrimp in various habitats (marsh edge, SAV, and soft bottom) using 16 years of data in Galveston Bay. The results indicated a preference for marsh and SAV over soft bottom, with SAV selected over marsh where habitats co-occur. Bay scallops and hard clams attach to grass blades temporarily before settling on the bottom (SAFMC 1998b; Thayer et al. 1984). Hard clams will also utilize other substrates, such as oysters and shell hash.

Juvenile blue crabs prefer shallow water with structures, such as SAV, marsh, shell bottom and detritus (Etherington and Eggleston 2000). In the Albemarle-Pamlico system, most initial recruitment of juvenile crabs occurs in SAV beds around inlets behind the Outer Banks, excepting major storm events. In years with large storm events, crabs disperse into lower salinity habitats (Etherington and Eggleston 2000). Near Ocracoke and Hatteras inlets, juvenile blue crab density rose significantly with increasing seagrass blade length, not with biomass or shoot abundance (Etherington and Eggleston 2000). In the Chesapeake Bay area, juvenile crabs grow faster, occur more densely, and survive at higher rates in SAV beds (Chesapeake Bay Commission 1997; Heck and Orth 1980). Hovel (2003) correlated the survival of juvenile crabs to SAV landscape characteristics such as patch size, isolation, and edge proximity in Back Sound. Survival was positively correlated with patch area and negatively correlated with shoot biomass.

In coastal riverine systems, finfish, shellfish, and crustaceans, particularly minnows, killifish, striped bass, largemouth bass, and molting blue crabs, utilize SAV as nursery areas (Hurley 1990). Paller (1987) found standing stock of larval fish in freshwater SAV beds to be 160 times higher than in adjacent open waters, and larvae concentrating in the interior of aquatic beds rather than in transition zones between habitats. This suggests that large SAV beds provide better refuge for larvae than equivalent areas of patchy SAV. Several studies in estuarine SAV beds found juvenile hard clams, pink shrimp, and blue crabs to be more abundant in large or continuous SAV beds than in small or patchy beds, whereas the opposite was found for adult pink and grass shrimp (Eggleston et al. 1998; Irlandi 1997; Murphey and Fonseca 1995). Hirst and Attrill (2008) found that a decrease in patch size did not affect invertebrate biodiversity, suggesting habitat fragmentation could have a varying effect on recruitment, depending on the species.

4.2.4.4. Foraging

The majority of macrofauna in SAV habitat forage on secondary production from epibiotic communities, benthic algae, organic detritus, and bacteria (Adams and Angelovic 1970; Carr and Adams 1973; Day 1967; Meyer 1982; SAFMC 1998b). Only a few fish species are known to consume SAV directly, including pinfish (*Lagodon rhomboides*), spot (*Leiostomus zanthurus*), filefish (*Monocanthus hispidus*), and toadfish (*Opsanus tau*). However, SAV comprised only 1 – 12% of their diet (Thayer et al. 1984). In contrast, there are numerous air-breathing species grazing directly on SAV that include migratory birds (e.g., black brant, *Branta bernicla;* Canada goose, *Branta canadensis;* and widgeon, *Anas penelope*), green sea turtle, and West Indian manatee (SAFMC 1998b). Green sea turtles appear to be more abundant in seagrass than in unvegetated areas in North Carolina, based on data from incidental occurrence in pound nets (SAFMC 1998b). Green turtles closely crop seagrass, greatly reducing the input of organic matter and nutrients to sediments near the SAV (Ogden 1980). Dramatic declines in eelgrass abundance have been documented following over-winter foraging activity of Canada Geese (Rivers and Short 2007). Geese' consumption of plant meristems caused sexual reproduction of the remaining eelgrass to be minimal the following summer. An absence of grazers can result in excessive growth and accumulation of slime mold, which is largely responsible for SAV wasting disease (Jackson et al. 2001). The balancing of SAV abundance and grazer populations is an example of ecosystem management.

Large predatory fish, (e.g., stingrays, flounders, bluefish, sharks, weakfish, red drum, spotted seatrout, blue crabs), are attracted to SAV beds for their concentrations of juvenile fish and shellfish (Thayer et al. 1984). Though large shellfish predators (e.g., cownose ray) represent a small proportion of the fish biomass in SAV habitat, they can be important in structuring seagrass communities, and can uproot grasses or alter the substrate (Orth 1975). Overharvesting predators of shellfish consumers (e.g., coastal sharks, skates) could therefore lead to increasing damage on their foraging habitat (Myers et al. 2007).

4.2.4.5. Corridor and connectivity

For some species, SAV can function as a safe corridor between habitats, thereby reducing predation (Micheli and Peterson 1999). In marshes where adjacent SAV was removed, the abundance of grass shrimp declined 27% compared to areas where SAV was not removed (Rozas and Odum 1987). Organisms associated with marsh edge habitat at high tide are provided refuge at low tide by SAV adjacent to marshes (Rozas and Odum 1987). Consequently, fish catch was higher at sites with both marsh and SAV. In a North Carolina estuary where SAV occurred adjacent to intertidal marsh, pinfish showed more movement, abundance, and weight than those in areas lacking SAV. These findings indicate that SAV provided safe passage and additional food resources (Irlandi and Crawford 1997). Another North Carolina study found adult fish abundances were greater where marsh, seagrass, and oyster reefs co-occurred, than in reefs or reefs with marsh (Grabowski et al. 2000). The corridor function of SAV may also apply to small predators susceptible to predation in open water.

4.2.4.6. Bird Utilization

Submerged aquatic vegetation is critical habitat for birds. Wading birds utilize SAV for foraging (Lantz et al. 2010). Lantz et al. (2010) experimentally showed that wading birds prefer shallow areas with dense SAV over the less dense areas, possibly as an expectation of higher density of prey.

4.3. Status and trends

4.3.1. Status of submerged aquatic vegetation habitat

When SAV beds are subjected to human-induced impacts in addition to natural stressors, large-scale losses may occur (Fonseca et al. 1998). Globally, SAV abundance is declining with approximately 14 % (10 species) of all seagrass species at an elevated risk for extinction and three at an endangered level (Short et al. 2011). Scientific studies indicate a global and national trend of declining SAV habitat (Orth et al. 2006; Waycott et al. 2009). Orth et al. (2006) summarized status and trends information on SAV at a global scale and found reports of large-scale SAV losses in the European Mediterranean, Japan, and Australia. Reports of SAV recovery were very low by comparison. Waycott et al. (2009) showed seagrasses disappearing at rates similar to coral reefs and tropical rainforests based in > 215 studies and 1,800 observations dating to 1879. The compilation of studies shows a 29% decline in known SAV extent since 1879. The study also indicated an acceleration of loss since 1940 (7%/yr, up from <0.9%/yr prior). In North America, losses of seagrass beds have been as high as 50% in Tampa Bay, 43% in northern Biscayne Bay, 30% in the northern portion of Indian River Lagoon, and as much as 90% in Galveston Bay, Texas, and Chesapeake Bay (Kemp et al. 1983; Pulich and White 1991; Smith 1998; Taylor and Saloman 1968). In North Carolina, SAV loss has not been quantified, but anecdotal reports indicate that the extent of SAV may have been reduced by as much as 50%, primarily on the mainland side of the sounds (North Carolina Sea Grant 1997), (J. Hawkins, pers. com., B. J. Copeland, pers. com.).

Trend data on SAV distribution in North Carolina are either limited to qualitative information for broad areas or quantitative information for selected areas of the coast. The qualitative information includes:

- Fishermen with journal accounts from the late 1800s describe extensive beds of SAV in coves along mainland Pamlico Sound where it was absent in the late 1990's (Mallin et al. 2000a).
- Seagrass wasting disease devastated eelgrass populations throughout the North Atlantic, including North Carolina, between 1930 and 1933, generally re-established by the 1960s.
- In upstream half of the Pamlico River estuary, tidal freshwater SAV was common until the mid-1970s (Davis and Brinson 1976; Davis and Brinson 1990). During the mid-1980's, SAV in western Albemarle Sound and Neuse River declined significantly (Davis and Brinson 1990).
- During the 1990's, Mallin et al. (2000a) reported extensive loss of eelgrass beds along the AIWW (Morehead City area) and near Harkers Island. There was a die-off of SAV in the Perquimans River after Hurricane Floyd in 1999 (S. Chappell, DMF, pers. obs.). A resurgence of SAV during the 1990's in some locations was implied by complaints about abundant grass around docks in the Neuse River and fishermen's anecdotal accounts in the Pamlico River (Mallin et al. 2000a).
- In 2002, DMF biologists noted high abundance of SAV in many shallow areas of Albemarle Sound and its tributaries, especially in Perquimans River (S. Winslow, DMF, pers. com.).
- In 2007 and 2008, DMF biologists reported extensive SAV growth throughout the estuaries (attributed to drought and lack of storms). The trend continued in most areas through 2014.

Quantitative information on SAV status and trends comes in three forms: 1) station monitoring, 2) transect monitoring, and 3) areal coverage monitoring. The earliest data comes from a 70+ year history of station and transect monitoring in Currituck Sound (Davis and Brinson 1983). Studies have documented the status of SAV in Currituck Sound since 1909, with a major decline in 1918 attributed mainly to turbidity (Bourn 1932; Davis and Brinson 1983). The locks of the Albemarle and Chesapeake Canal were opened during this time. This canal connects the Norfolk Harbor at the mouth of the Chesapeake Bay with Currituck Sound, via the North Landing River. From 1914 to 1918 the canal was deepened and widened, and the river was extensively dredged. In 1932, operation of the canal locks was modified and SAV began recovery. Fully recovered by 1951, SAV had the highest production in the Currituck-Back Bay system since 1918 (Davis and Brinson 1983). During 1954 and 1955, four hurricanes along North Carolina increased turbidities and resulted in widespread destruction of SAV beds (Dickson 1958). The community recovered rapidly, as growth was considered good by 1957 (Davis and Brinson 1983). After a severe nor'easter in 1962, saltwater intrusion in Currituck Sound raised the average salinity by 4.4 ppt, causing major reductions in freshwater SAV biomass (Davis and Brinson 1983).

As SAV beds recovered after 1962, Eurasian watermilfoil (non-native) began to spread across Currituck Sound from its northern extremities (Davis and Brinson 1983), possibly encouraged by improved water clarity due to dry conditions, and higher post-1962 salinities. Before this time native sago pondweed and wild celery were dominant and subdominant. By 1973, Eurasian watermilfoil had become the dominant aquatic plant species, followed by bushy pondweed. After a severe storm in 1978, bushy pondweed was virtually eliminated, and macrophyte biomass was 42% less than in 1973, again associated with extreme turbidity from severe weather during the early growing season. The monitoring transects referenced in Davis and Brinson (1983) were revisited in recent years by the Marine Environmental Science Program at Elizabeth City State University (Liz Noble, ECSU, unpublished data) and USACE (Piatkowski 2011).

Coast-wide aerial photography of SAV combined with on-site sampling is the standard method for mapping. The history of mapping in North Carolina estuaries began in 1981 with digitizing aerial photographs of Core and Bogue sounds (Carraway and Priddy 1983). The largest mapping coverage (Albemarle-Pamlico) over the shortest time period (1983–1992) was completed by NOAA and published in Ferguson and Wood (1994). Since then, comparable repeat mapping is available for the Neuse River, Currituck Sound, and Back Bay (Virginia). The Neuse River was remapped in 1998 by DWQ, and Currituck Sound and Back Bay were remapped by ECSU in 2003. Basic change analysis was only completed for the Neuse River (DWQ 1998). The DWQ assessment was conducted using aerial photography and field verification methods similar to those of Ferguson and Wood (1994). Results showed that SAV was present at four of five areas that had supported it in 1991, indicating there was not a major decline in SAV abundance over the seven-year period. More SAV was identified in 1998 than in 1991, possibly due to differences in methodology. In 2006, NOAA acquired SAV imagery of Core and Bogue sounds and completed digitizing in 2009 (D. Field, NOAA, pers. com.). The Multiple years of data for Bogue and Core sounds (Carraway and Priddy 1983; Ferguson and Wood 1994) suggest the possibility of change analysis. Non-digitized imagery is available for the purpose of SAV mapping and change analysis, the earliest funded by DOT in 2004 for Pea Island in northern Pamlico Sound, without field verification.

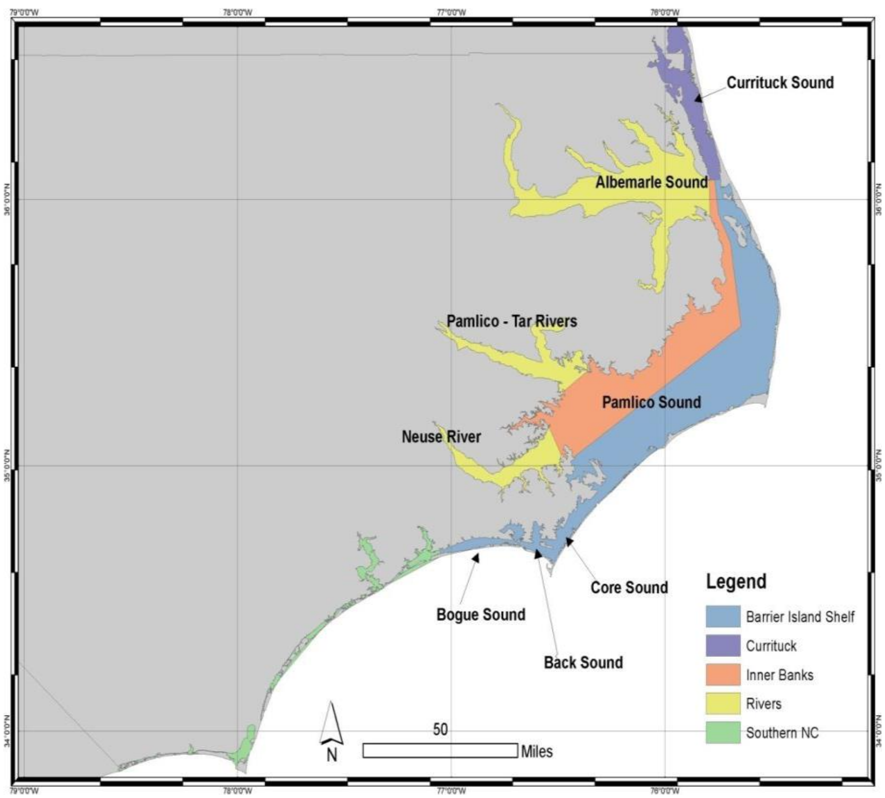
Comprehensive mapping of SAV habitat in coastal North Carolina was initiated in 2007 by a joint effort of federal and state agency and academic institutions. This interagency workgroup began in summer 2001, with the formation of the SAV Partnership, to pool resources with a common interest in assessing SAV habitat along the North Carolina and southeast Virginia coastal region. The Albemarle-Pamlico National Estuarine Partnership (APNEP) was the lead agency initially, but it now rotates among participating agencies. A Memorandum of Understanding formalized agency participation in a combined effort to map and monitor SAV habitat. The stated goal of the Partners is to “manage and conserve SAV habitats in the coastal areas of North Carolina and southeastern Virginia in a comprehensive manner through cooperative research, monitoring, restoration and educational activities.”

The first aerial surveys in support of this goal were flown during fall of 2003 in the northern coastal area. In 2007 and 2008, all areas known to potentially support SAV were mapped with aerial photography and field ground-truthing. This was accomplished with a collaborative effort pooling resources. The APNEP allocated $160,000 toward funding the imagery and an additional $130,000 was contributed by USFWS, DMF, DENR, and NOAA. The NOAA determined imagery specifications and secured the contract. The DMF monitored pre-flight conditions for suitability, organized field sampling, and conducted most of the ground-truthing. Staff from ECU, ECSU, DWR, DOT, WRC, NERR, FWS, and DCM also assisted. Over 90% of the flight lines were covered in 2007, with remaining areas flown in 2008.

In 2013, a subset of the SAV partnership completed a Coastal Recreational Fishing License Grant. The purpose of the grant was to investigate and recommend the best method for long-term mapping and monitoring of SAV. Partnering organizations for this grant included APNEP, NOAA, NCSU, and ECU. The study recommended that mapping be done regionally on five year cycles, breaking the coast into five regions (Map 4.3). Aerial photography was recommended by the grant partners for mapping high salinity grass beds due to the greater visibility. For low salinity areas, they recommended using acoustic SONAR to conduct surveys, and periodic underwater video to ground-truth acoustic results. Use of this protocol can discern changes in SAV coverage from 10% to 40% at a site (Kenworthy 2012). The areas mapped since the coastwide mapping event in 2007-2008 are shown in Table 4.5.

Table 4.5. Areas mapped or proposed for mapping since the 2007-2008 coastwide SAV mapping effort.

Date	Area	Method
Fall 2012	Currituck Sound	Aerial
Spring 2013	East Pamlico Sound to White Oak River	Aerial
Summer-Fall 2014	Albemarle Sound	SONAR
Planned for Fall 2015	Tar/Pamlico River	SONAR
Planned for Spring 2015	South of White Oak River	Aerial



Map 4.3. Recommended geographical stratification of North Carolina estuaries and river systems for SAV monitoring in a rotational sampling scheme.

The SAV mapping and monitoring protocol calls for annual sampling of sentinel sites. Trend analysis will require annual visits to various sites across coastal North Carolina. Random site selection will need to be employed for early detection of changes in areas outside of the sentinel sites (Kenworthy et al. 2012).

4.3.2. Status of associated fishery stocks

It is difficult to attribute changes in fish abundance to changes in habitat for lack of data. Assessments have been attempted for penaeid shrimp and red drum. Habitat relationships of certain life stages of fishery species were used to estimate population densities of brown shrimp by Clark et al. (2004), and priorities for habitat protection by Levin and Stunz (2005) in Galveston Bay. Clark et al. (2004) used the density of juvenile brown shrimp to estimate an overall population size of 1.3 billion in Galveston Bay. Levin and Stunz (2005) estimated that habitat for red drum larvae and juveniles should be given the highest priority for protection. Analyses have not been conducted in North Carolina.

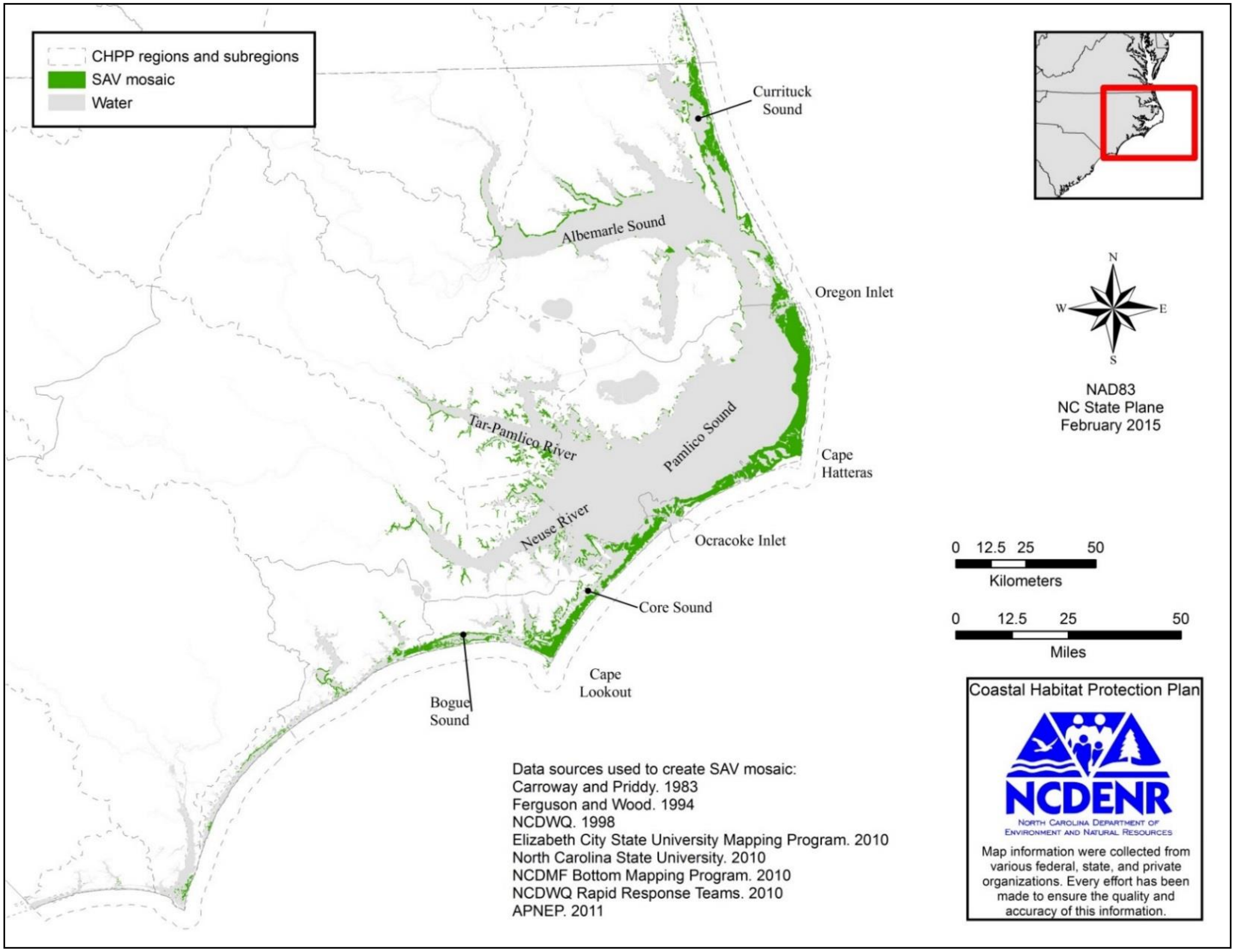
Estimated fishing mortality and juvenile abundance indices are used by DMF to determine the status of fishery stocks. Stock status evaluations may suggest habitat issues for *Concern* or *Depleted* species. Of the species identified in Table 4.4 with a preference for SAV habitat, 8 stocks were evaluated for fishery status. The hard clam was assigned an *Unknown* status. Of the remaining 7 stocks with a designated status, one was designated *Depleted* (spotted seatrout), two were *Concern* (yellow perch, blue crab), two were *Recovering* (red drum, bay scallop), and two were *Viable* (brown shrimp, pink shrimp) (DMF 2014). Whereas much of the cause of declining stock status is attributed to overfishing, habitat loss and degradation can make a stock more susceptible. Protected or enhanced SAV habitat can be particularly beneficial to SAV-enhanced species classified as *Depleted* or *Concern*, by maximizing recruitment and productivity (Minello 1999; Minello et al. 2003; SAFMC 1998b; Thayer et al. 1984).

4.4. Submerged aquatic vegetation summary

The ecological importance of SAV habitat is well documented in literature; research monitoring fish use of SAV of various patchiness or density is finding that SAV presence, regardless of bed shape or density, supports a greater diversity and abundance of organisms than unvegetated bottom. Valuation studies indicate the monetary value of ecosystem services provided by SAV is significant. With North Carolina having the second largest expanse of SAV on the east coast, protection and enhancement of this resource should be a high priority for the state.

Natural events, human activities, and an ever-changing climate influence the distribution and quality of SAV habitat. Natural events include shifts in salinity due to drought and excessive rainfall, animal foraging, storm events, temperature, and disease. Submerged vegetation is vulnerable to water quality degradation, in particular, suspended sediment and pollutant runoff.

Digitizing SAV polygons on aerial imagery was completed after the 2010 CHPP, and rotational updating of this process is currently underway. Additional mapping in western Pamlico Sound, Neuse River, and Tar/Pamlico River by DMF and DWR have increased the total area of mapped SAV to over 196,000 acres (NCDMF 2015a). Mapping SAV using aerial imagery to assess status and trends is a large and difficult task that must be augmented with monitoring.



Map 4. 1 Submerged aquatic vegetation mapped from 1981 to 2011. Absence of SAV does not suggest actual absence, as surveys have not been conducted in all areas. Presence of SAV does not reflect current state, as data dates to 1981.

CHAPTER 5. WETLANDS

The global community recognizes the inherent value of our wetlands (168 Ramsar contracting parties). The following mission statements substantiate and validate the need for research, education, and action to protect the remaining wetlands in North Carolina.

The Ramsar International Conventions on Wetlands 1971

The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world."

National Ocean Policy Implementation Plan 2013

The health and integrity of coastal habitats—such as coral reefs, wetlands, mangroves, salt marshes, and sea grass beds—are key to sustaining our nation's valuable coastal and ocean ecosystems and the wealth of benefits they provide to us.

NC Coastal Area Management Act 1978

It is the objective of the Coastal Resources Commission to conserve and manage coastal wetlands so as to safeguard and perpetuate their biological, social, economic and aesthetic values, and to coordinate and establish a management system capable of conserving and utilizing coastal wetlands as a natural resource essential to the functioning of the entire estuarine system.

Wetlands are essential breeding, rearing, and feeding grounds for many species of fish and wildlife. They provide critical ecosystem services that contribute to healthy ecosystems and fisheries habitat. Coastal wetlands cover 40 million acres, or 38 percent of the wetlands in the continental United States, with 81% in the southeast. From 2004 to 2009, wetlands in the U.S. coastal watersheds declined by ±360,720 acres, 31% being on the Atlantic Coast (Dahl and Stedman 2013).

5.1. Description and Distribution

5.1.1. Definition

Wetlands require the presence of water at or near the surface, and vegetation adapted to wet soils (Mitsch and Gosselink 1993). Defined by EPA [40 CFR 230.3(t)], used for regulatory purposes, wetlands are: "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." This definition and that of the NC Environmental Management Commission (EMC), include freshwater wetlands. The coastal wetlands definition under the Coastal Area Management Act does not: "any salt marsh or other marsh subject to regular or occasional flooding by tides, including wind tides … provided this shall not include hurricane or tropical storm tides." Division of Coastal Management regulated wetlands must contain one or more of the following: *Spartina alterniflora*, *Juncus roemerianus*, *Salicornia* spp., *Distichlis spicata*, *Limonium* spp., *Scirpus* spp., *Cladium jamaicense*, *Typha* spp., *Spartina patens, and S. cynosuroides*.

This chapter will focus on wetlands contiguous with coastal water bodies directly affecting fishery habitats while addressing fringe and non-riparian wetlands supportive of riverine and estuarine systems.

5.1.2. Description

Riparian wetlands abut water bodies, and provide numerous functions that protect water resources. They trap sediment, nutrients, and pollutants from overland runoff, and reduce the magnitude and velocity of flood waters, slowly releasing them into the waterbody. In general, wetlands protect and enhance the quality of the contiguous ecosystem.

For purposes of this chapter, riparian wetlands will be grouped into those categories most frequently utilized by fish: estuarine, and riverine, with the focus on saltwater and brackish marsh, freshwater marsh, and to a lesser degree, bottomland hardwood forest. Non-riparian headwater and pocosin wetlands will be discussed in lesser detail.

Estuarine wetlands are found along the margins of estuaries, and include salt/brackish marsh, estuarine shrub/scrub, and estuarine forests. While the salt and brackish marshes interact most directly with coastal waters, the adjacent wetlands perform myriad of ecosystem services as they transition inland for what can sometimes be miles across low-lying coastal habitat.

- Salt/brackish marshes - herbaceous plant communities subject to tides, containing species such as cordgrass, black needlerush, glasswort, salt grass, sea lavender, and salt meadow hay.
- Estuarine shrub/scrub - vegetation <20’ tall, subject to occasional tides. Usually found at the high end of coastal marshes, inclusive of species such as wax myrtle, marsh elder, and yaupon holly.
- Estuarine forested wetlands - forested communities ≥20’ tall, subject to occasional tides. Typical species include pine, cypress, black and sweet gums, and oaks.

Salt marsh occurs in salinities >15 ppt and brackish marsh occurs from 0.5-15 ppt. Within these salinity ranges, salt-tolerant plants persist in absence of excessive erosion stress. The rate of erosion depends on shoreline orientation, fetch, water depth, bank height, sediment bank composition, shoreline vegetation, and presence of offshore vegetation. Few species can survive the high salinity and frequent inundation of low marshes. Estuarine shrub scrub requires less tidal influx than marshes, and more fresh overland and pore water influence. Estuarine forested wetlands require intermittent flooding, being of short duration with periods of very low flow (Schafale and Weakley 1990).

The hydrology of riverine wetlands is determined by proximity to perennial streams with salinities <0.5 ppt. Overbank flow feeds the adjacent wetlands. Riverine wetlands include tidal and non-tidal freshwater marshes, and bottomland hardwood and riverine swamp forests.

- Freshwater marshes are herbaceous areas flooded for extended periods during the growing season. Communities include sedges, millets, rushes, and giant cane.
- Bottomland hardwood forests and riverine swamp forests are usually found in floodplains, seasonally to permanently flooded. Bottomland hardwood forests contain mostly oaks, sweet gum, green ash, willows, and river birch. Riverine swamp forests contain cypress, black gum, water tupelo, green ash and red maple.

Tidal freshwater wetlands occupy the upper limits of tidal influence where brackish water meets downstream flow (Perillo et al. 2009). They have more diverse plant communities than salt/brackish marshes due to increased soil aeration and lack of salinity stress (Odum et al. 1984; Perillo et al. 2009). Some fish (e.g., carp, sunfish, bass, catfish) spend their entire lives in tidal freshwater marshes (Mitsch and Gosselink 1993). The hydrology of non-tidal freshwater wetlands is more variable, owing to uncertain water budgets. These communities are adapted to survive in varying water levels.

Bottomland hardwood forests are irregularly to seasonally flooded, while riverine swamp forests are semi-permanently to permanently flooded. The timing and duration of flooding affects not only the type of vegetation, but the type and regularity of fish use.

Palustrine wetlands include non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses/lichens, and small, shallow, ponds. Headwater wetlands are palustrine, and develop upstream in systems with intermittent or perennial tributary streams. Some contain intermittent channels with primary water sources of precipitation, overland runoff, and groundwater discharge. Headwater swamps are forested, with moist soils conducive to hardwood communities. Headwater wetlands are critical in buffering harmful effects of land use, thereby protecting downstream waters.

Pocosin wetlands, within the palustrine category, are not generally proximate to surface waters. While they are hydrologically disconnected, the hydrology of the pocosin wetland is primarily determined by groundwater and precipitation. Pocosins are non-riparian wetlands very often formed by perched water tables owing to poor soil conditions. The very word pocosin means “swamp on a hill” in Algonquian.

5.1.3. Distribution

According to the 2011 NLCD, there were ±3,759,729 acres of woody and emergent herbaceous wetlands within the CHPP regions (Jin et al. 2013). This represents a 2.7% decrease in woody wetlands and an 18.9% increase in emergent herbaceous wetlands since 2001. The US Fish and Wildlife Service (FWS) has produced the National Wetlands Inventory (NWI) of the United States since the mid 1970’s. The NWI geospatial dataset classifies wetlands from aerial imagery following the Cowardin et al. (1979) classification system. Within the CHPP management area, most of the NWI data (±8,494,790 acres) is based on imagery from the 1980’s. However, much of the outer coastline (±5,637,832 acres) is based on imagery flown since 2004. For this discussion, the Cowardin classification codes from the NWI data were further classified into the CHPP’s targeted wetland types (salt/brackish marsh, freshwater marsh, bottomland hardwood, swamp forest, and pocosin) (Sutter 1999). In 1994, DCM led an effort to map wetlands in the 20 coastal counties using NWI maps, NRCS soil maps, satellite imagery (1988, 1994), and hydrography maps (USGS Digital Line Graphs). The results showed a total of between 3.1 and 3.9 million acres of unaltered riparian and non-riparian wetlands, respectively (piers and docks spanning marsh were not considered “altered,” and therefore counted as unaltered wetlands), in the CHPP management area at that time. The 1994 DCM maps have not been updated, and therefore are not included in this discussion, although a detailed discussion can be found in the 2005 and 2010 CHPP documents.

Abundance and distribution of targeted wetland types from the NWI are defined in Table 5.1. Salt/ brackish marsh accounted for ±228,146 acres, or 7.5% of target wetland types within the CHPP management area, with the greatest acreage in CHPP Region 2. Freshwater marsh represented ±101,582 acres, accounting for 3.3% of target wetland types, with the greatest acreage also in CHPP Region 2. Bottomland Hardwood/Swamp Forest had ±1,734,102 acres, or 57% of target wetland types, the greatest acreage in Region 1. Pocosins accounted for ±976,049 acres, or 32.1% of target wetland types, with the greatest amount in Region 4.

Table 5.1. Total acreage of wetlands by CHPP region. [Source: NWI data (derived from imagery spanning 1977-2010). Cowardin classifications assigned by the NWI were reclassified into wetland types following (Sutter 1999).

Wetland Type	CHPP Regions						Total Acres (By Wetland Type)	% of Wetland Area
	1	1/2	2	2/3	3	4		
Salt/Brackish Marsh	45,416	576	107,697	9	47,048	27,400	228,146	7.5%
Freshwater Marsh	30,555	0	44,086	0	4,836	22,105	101,582	3.3%
Bottomland Hardwood/ Swamp Forest	705,887	0	549,919	0	53,892	424,405	1,734,102	57.0%
Pocosin	154,610	0	325,773	0	150,232	345,435	976,049	32.1%
Total Wetland Acres	936,468	576	1,027,475	9	256,007	819,345	3,039,880	100.0%
Total Region Acres	3,719,900	54,777	5,851,000	37,166	1,138,270	3,495,690	14,296,803	N/A
% Wetlands in Region	25%	1%	18%	0%	22%	23%	21	N/A

1 = Albermarle Sound and tributaries, 1/2 = Oregon Inlet, 2 = Pamlico Sound and tributaries, 2/3 = Ocracoke Inlet, 3 = Core/Bogue and New/White Oak estuaries, and 4 = Cape Fear River and southern estuaries

5.2. Ecological roles and functions

The services provided by wetlands are vast, including improving the quality of habitats through water control and filtration; protecting upland habitats from erosion; providing abundant food and cover for finfish, shellfish, and other wildlife; and contributing to the economy. Recent research shows the critical importance of even narrow fringe wetland edges for fish utilization and erosion control (Gewant and Bollens 2012; MacRae and Cowan 2010; Minello et al. 2011; Whaley and Minello 2002).

5.2.1. Ecosystem enhancement

Flood control and water quality benefits of wetlands have been extensively studied. Some store flood waters and slowly release them to surface and groundwater systems during periods of low flow (Mitsch and Gosselink 1993). By storing, spreading, and slowing releasing waters, flooding is reduced. Wetland loss has been linked to increased hurricane flood damage. Costanza et al. (2008b) estimated that the loss of 1 acre of coastal wetlands could result in a $13,360 loss in GDP ($14,759 in 2014 dollars), and that U.S. coastal wetlands could provide as much as $23.2 billion/year (25.63 billion/year in 2014 dollars) in storm protection services.

Rooted vegetation consolidates sediment, buffers erosive forces, and improves water clarity for SAV and benthic microalgae (Mitsch and Gosselink 1993; Riggs 2001). Studies have shown that even narrow (7-25m) marsh borders reduce wave energy by 60-95% (Knutson and Inskeep 1982; Morgan et al. 2009). Buffering sediment-laden water allows deposition of suspended solids onto the marsh substrate (Mitsch and Gosselink 1993). Under favorable conditions, toxic chemicals, minerals, and nutrients are retained by adsorption to sediment particles (Mitsch and Gosselink 1993; Wolfe and Rice 1972). The sediment is subsequently deposited, buried, accumulated in peat, decomposed, or otherwise stored. These processes, including nitrogen processing, can prevent nutrient over-enrichment, resulting in oxygen stress, and can remove chemicals from the water through conversion and plant uptake. Forested riparian wetlands in agricultural drainages have been shown to remove ~80% of the phosphorus and 90% of the nitrogen from the water (EPA 2006). Constructed wetland systems can reduce excess nutrients in adjacent waterbodies. These systems remove nitrogen by transforming it into inert nitrogen gas (Song et al. 2014). Research by Song et al. (2014) of UNC Wilmington helped characterize the microbial processes that allow this transformation to occur.

Marshes are silica storing repositories, critical for benthic diatom production (Hackney et al. 2000; Struyf et al. 2005). Maintaining high concentrations of silica is important, as it supports an abundance of diatoms, critical for secondary production of commercial fish and crustaceans (Hackney et al. 2000). Recent studies have revealed the importance of freshwater and coastal marshes in storing silicon (Hackney et al. 2000; Struyf et al. 2005). Temporary and permanent retention of nutrients, such as phosphorus, are facilitated by particle deposition and burial as well as formation of organic matter in the sediment by roots and rhizomes (Mitsch and Gosselink 1993). There is evidence that salt/brackish marshes act as nutrient sources during the growing season, and as sinks in winter and spring (Woodwell et al. 1979). Retention and controlled release of particles, toxic chemicals, and nutrients can improve water quality downstream, hence, “wetland sinks.”

The most active uptake and retention of nutrients in riverine systems can be found in headwater wetlands (Meyer et al. 2007; Peterson et al. 2001; Thompson et al. 1998). These upstream wetlands influence the potential for erosion, flooding, sedimentation, algal blooms, and fish kills downstream. Though non-riparian wetlands are rarely used by fish, they can have a significant effect on riparian water quality. Pocosins cover a vast and continuous expanse of the coastal North Carolina landscape and are connected to surface waters through shallow aquifers. Thus, their effect is less obvious but undeniable.

5.2.2. Productivity

Wetland communities are among the most productive ecosystems in the world (Mitsch and Gosselink 1993; SAFMC 1998b; Teal and Teal 1969). Some of the high primary production (creation of organic compounds through photosynthesis) of wetland vegetation is transferred to adjacent aquatic habitats via detritus and microalgae (Mitsch and Gosselink 1993; Wiegert and Freeman 1990). King and Lester (1995) estimated that an 80 m wide saltmarsh border could provide shore protection savings in the amount of $0.76 to $1.42 million/ha in capital costs, and $14,182/ha in annual maintenance costs.

5.2.2.1. Salt/brackish marsh

Salt marshes are widely recognized as being among the most productive ecosystems in the world, and contributing considerably to the production and transport of nutrients and detrital matter. Primary production in salt/brackish marshes is converted into fish production in several ways. Experiments using sulfur, carbon, and nitrogen isotopes to trace organic matter flow in the salt marshes of Sapelo Island, Georgia found two major sources of organic matter used in fish production: *Spartina* detritus and algae. The relative importance of each source is determined by the feeding mode, size, location, and trophic position of the marsh and consumers (Peterson and Howarth 1987). Benthic microalgae support herbivorous snails, whereas detritus supports sheepshead, mummichogs, and their prey. Algae can be found on marsh grass, intertidal mudflats, and shallow subtidal bottom near the marsh.

5.2.2.2. Freshwater marsh

Lacking saltwater stress, tidal freshwater marshes can be as or even more productive and diverse than saltwater marshes (Mitsch and Gosselink 1993). Frequency and duration of flooding affect productivity. Regularly flooded herbaceous sites are reported to have higher productivity than irregularly flooded (Schafale and Weakley 1990). In general, grasses are more productive than broad leaved species. Since plant material above and below ground must decay to lend productivity to the system, various factors come into play. While temperature, organic export, and energy flow all influence the rates of decay and transport, temperature is most important. Higher temperatures cause faster decay, allowing for the transport of nutrients and detritus. In general, nutrient cycling and budgets in coastal freshwater wetlands are similar to those in salt marshes (Mitsch and Gosselink 1993), however, macrophyte diversity, biomass, and nutrient retention decreases from tidal fresh to tidal salt marshes (Więski et al. 2010). Removal of nitrogen from surface water by freshwater marshes is approximately 50% and phosphorus removal is approximately 10-15% of inputs (Mitsch and Gosselink 1993).

5.2.2.3. Bottomland hardwood and riverine swamp forest

Productivity in riverine forested wetlands may be similar to salt/brackish marsh when stem growth and below ground production are taken into account. The export of detritus from riverine forested wetlands can be significant (Mitsch and Gosselink 1993), but varies with temperature and frequency of inundation. Variation in water budget is key in the productivity of wooded swamps. Floodplain forests with unaltered hydroperiods generally have aboveground net primary productivity in excess of 1000 $g/m^2/yr$ (Taylor et al. 1990). Day et al. (1977) found that high productivities of the floodplain forest are made possible by several subsidies offered by the watershed, including particulate and dissolved organic matter, water, soil (especially clay and silt), and nutrients. These inputs support an increased rate of ecosystem metabolism, reflected in litterfall and nutrient turnover rates, detrital decomposition rates, flushing of refractory organic detritus and metabolic by-products, and the operation of several microbial conversion processes. Additionally, macro- and microfauna during flood periods speed detrital decomposition and participate in floodplain food chains, nutrient cycles, and import/export pathways. Floodplain forests are among the highest in primary productivity of any ecosystem in the southeastern United States (Day et al. 1977). A forested wetland overlaying permeable soil may release up to 100,000 gallons of water per acre per day into the groundwater (Anderson and Rockel 1991).

5.2.2.4. Headwater and pocosin wetland

An estimated 70% of the United States' pocosins occur on North Carolina's coastal plains. Nutrients and other compounds removed by atmospheric deposition into pocosins via rainfall are retained for long periods, and released slowly through lateral flow. Pocosins are hydrologically connected to waters of the coastal plain by broad scale surface flow to adjacent estuaries, and their presence is essential to the continued productivity of these estuaries (Richardson 2003). Such wetlands must be managed to protect the enhanced water quality service they provide and for the function primarily responsible for their existence - that of responding to rising sea level by accretion of sediments (Brinson 1991).

5.2.3. Fish utilization

It is estimated that over 95% of the finfish and shellfish species commercially harvested in the United States are wetland-dependent (Feierabend and Zelazny 1987). In the southeast, fish and shellfish depending on coastal and estuarine wetlands comprise the majority of the commercial catch (Lellis-Dibble et al. 2008)(Table 5.2). In studying the changing environment of the Mississippi River Deltaic Plain (MRDP), (Madden et al. 1988) showed that migratory patterns and food habits of fish assemblages were similar among the fresh, mesohaline, and polyhaline systems. In all three estuaries, the most abundant species were bay anchovy, Atlantic croaker, gulf menhaden, sand seatrout, and hardhead catfish.

5.2.3.1. Salt/brackish marsh

Finfish and shellfish using salt/brackish marsh are categorized based on location and time of use. Year-round residents include small forage species such as killifish, mummichogs, sheepshead minnows, gobies, grass shrimp, bay anchovies, and silversides (SAFMC 1998b). Transient species include those spawned in deeper waters and using marsh habitat for nursery or foraging, such as red drum, flounder, spot, and croaker. Some transients prefer the marsh edge, e.g., red drum and flounder, while others prefer the unvegetated area near the edge, e.g., spot and croaker. Some species are not found in the marsh, but feed on detrital export or microalgae, such as menhaden. Of fisheries in North Carolina, penaeid shrimp and red drum are considered critically linked to the marsh edge (SAFMC 1998b). Limited studies have shown positive correlations between flooding duration and regularity in marsh habitat selection for brown and white shrimp, and blue crab (Minello et al. 2011). Studies of nekton movement have shown a consistent pattern of resident species entering early in the rising tide, and transient species entering mid to late tide (Bretsch and Allen 2006). The depth of migrations among species was also consistent between creeks, days, and years. Variation occurred as summer progressed, with some species, e.g., spot, mullet, and pinfish, moving into deeper water.

Fish use of low salinity marshes in North Carolina was studied by Rozas and Hackney (1984), finding a combination of freshwater and estuarine species. Most abundant were spot, grass shrimp, bay anchovy, and Atlantic menhaden. Seasonal abundance peaks were: (1) spring of juvenile spot, Atlantic menhaden, Atlantic croaker, southern flounder (2) summer of grass shrimp (3) fall of bay anchovy, grass shrimp.

5.2.3.2. Freshwater marsh

Fish utilizing freshwater marshes include largemouth bass, bluegill, warmouth, black crappie, chain pickerel, southern flounder, white perch, mummichog, bay anchovy, inland silversides, river herrings, striped bass, and sturgeon (Mitsch and Gosselink 1993). The nature and degree of association with the marsh is species-dependent. Striped bass and river herring are abundant along and adjacent to the marsh edge. Bluegill, black crappie, largemouth bass, and warmouth are almost exclusive to near shore structures. Mosquitofish are important forage species and “mosquito control agents,” associated with freshwater marsh (Odum et al. 1984). McIvor and Odum (1987) found that when marshes contiguous with tidal creeks become inundated, fish swim with flood tides onto the marsh surface. Because of unfavorable physicochemical conditions, such as high temperatures and low DO, and/or physical constraints of shallow water, studies show that the upper reaches of tidal creeks have a particular absence in predators (Hackney et al. 1976; Rozas and Hackney 1984; Shenker and Dean 1979).

5.2.3.3. Bottomland hardwood and riverine swamp forest

There is a strong relationship between fishery yields and forested river floodplains (Junk et al. 1989; Mitsch and Gosselink 1993; Wharton et al. 1982). Studies have shown fish production to be greater in floodplain sloughs than in the main river (Holder et al. 1970), and in wetlands that dried less often, were connected to intermittent water bodies, and had elevations close to the nearest permanent waterbody (Snodgrass et al. 1996). Fish use of riverine forested wetlands is largely restricted to periods of seasonal inundation. In North Carolina, seasonal high water in riverine systems generally occurs from winter to spring. Summer conditions (falling water levels, increasing temperatures, and low DO) exclude most fish. However, fish adapted to low DO levels, e.g., bowfin, gar, mudminnows, killifish (Wharton et al. 1982), continue to inhabit forested wetlands as long as water remains. A study on fish use of creek floodplains in North Carolina documented several common species using channels in the floodplain (Walker 1984), such as sunfishes, redfin pickerel, bowfin, brown bullheads, killifish, pumpkinseed, shiners, darters, and crayfish. Estuarine-dependent species found in river floodplains include hickory shad, blueback herring (Wharton et al. 1982), and alewife (SAFMC 1998b). At least 20 families and 53 species of fish spawn and/or feed on the floodplain (Walker 1984; Wharton et al. 1982).

5.2.3.4. Headwater and pocosin wetlands

Fish use of normally isolated wetlands (e.g., pocosins along the Alligator and Northeast Cape Fear rivers) depends on many factors. Pocosins that are located directly adjacent to salt/brackish marsh or other riparian wetlands are potential fish habitat. As sea level continues to rise and low-lying pocosins near coastal North Carolina waters transform into marshes, they will become more important as primary nursery areas for estuarine-dependent fish (Brinson 1991). Where pocosins are in close proximity to primary nursery areas, they may have a direct influence on water quality and saltwater stratification (Brinson 1991). Headwater wetlands are not normally occupied by fish, but as has been described, they have a significant impact on the quality of the waters inhabited by the fisheries themselves.

5.2.4. Specific biological functions

5.2.4.1 Nursery

Expanses of vegetated shallow water habitat in riparian wetlands provide food and cover for larval, juvenile and small organisms (Graff and Middleton 2000). Refuge from predators is provided by dense structures, shallow depth, and expanse of water (Rozas and Odum 1987). Large, deep-bodied predators avoid shallows, thereby protecting smaller fish and reducing predation in the shallow tidal creeks.

Salt/brackish marsh

Along with the shallow soft bottom and shell hash borders, salt/brackish marshes along North Carolina's coast are probably the most recognizable nursery habitat for estuarine-dependent species. Detrital export and the shelter found along marsh edges make salt marshes important as nursery areas for many commercially important fish and shellfish (Mitsch and Gosselink 1993). The majority of Primary and Secondary Nursery Areas designated by the MFC are located in these habitats.

Many of the juvenile fish species found in estuarine nurseries were spawned offshore during winter, with larvae transported through inlets and into estuarine waters where they settled in the upper (lower salinity) or lower (higher salinity) reaches of creek systems (Ross 2003). Peak juvenile settlement generally occurs in spring through early summer, depending on water temperature (Ross and Epperly 1985). Settlement in upper reaches is particularly beneficial to spot and croaker, where growth and survivorship are enhanced (Ross 2003).

The DMF's juvenile abundance survey data shows the dominant species in high salinity marshes behind Outer Banks and in Core Sound to include pinfish, blue crab, brown shrimp, pigfish, silver perch, gulf and summer flounder (NCDMF 2009a)(actively updated database, although the date would imply otherwise). Juvenile spot, brown shrimp, striped mullet, and southern flounder predominate the western shores of Pamlico and Core Sounds and their tributaries (Epperly and Ross 1986; Noble and Monroe 1991b). In the Newport River estuary, juvenile southern flounder show preference for marsh edge habitat during fall (Walsh et al. 1999). Juvenile southern flounder are most abundant in more turbid, upper regions of the estuary. In high salinity marshes of Pamlico Sound, spotted seatrout, weakfish, silver perch, and red drum are abundant (Noble and Monroe 1991b). Spring through fall, brackish marshes in the Albemarle-Pamlico estuary are dominated by juvenile Atlantic menhaden, striped mullet (Epperly and Ross 1986), silversides, anchovies (Nelson et al. 1991), and demersal species such as Atlantic croaker, brown shrimp, blue crab, red drum, and southern flounder (Noble and Monroe 1991a; Tagatz and Dudley 1961).

Salt/brackish marsh substrates differ, and some, such as peat, provide important nursery habitat. Peat blocks are generally found along eroding marsh edges serving as firm substrate for sessile invertebrate attachment, and refuge for juvenile blue crabs (D. Eggleston, NCSU, pers. com.).

Freshwater marsh

Freshwater marshes comprise a small portion of riparian wetlands in coastal North Carolina. A study in Virginia found that larval and juvenile fish represented 79% and 59% of the number of fish collected at tidal freshwater and salt marsh sites, respectively (Yozzo and Smith 1997). Anadromous fish pass through freshwater marshes as they make their way to freshwater streams to spawn. For some, tidal freshwater marshes become the nursery area for juveniles (Mitsch and Gosselink 1993). The American eel, being catadromous, spends most of its life in tidal and non tidal marshes and creeks, returning to the ocean to spawn (Lippson et al. 1981). Juveniles of several species, such as menhaden, spot, croaker, spotted trout, summer flounder, black drum, snook, tarpon, and silver perch, have extended their territories into freshwater marshes (Lippson et al. 1981).

Table 5.2. Partial listing of fish and their use of wetland habitat in coastal North Carolina.

	Wetland Functions [1]						
Species*	Nursery	Foraging	Refuge	Spawning	Corridor	Fishery [2]	2014 Stock Status [3]
RESIDENT FRESHWATER OR BRACKISH							
White perch	X			X		X	
Yellow perch	X	X		X		X	C
Catfish	X	X	X	X	X	X	
ANADROMOUS AND CATADROMOUS							
American eel		X	X		X	X	D
Sturgeon spp.	X	X	X		X	X [4]	D
River herring (alewife & blueback herring)	X	X	X	X	X	X	D
Striped bass	X	X	X		X	X	V-Atlantic Migratory C-Alb/Roanoke & Cen/So.
ESTUARINE AND INLET SPAWNING AND NURSERY							
Atlantic rangia clam	X	X	X	X			
Banded killifish	X	X	X	X			
Bay anchovy	X	X		X			
Blue crab	X	X	X		X	X	C
Cobia	X	X			X	X	
Grass shrimp	X	X	X	X			
Mummichog	X	X	X	X			
Naked goby	X	X	X	X			
Red drum	X	X	X		X	X	R
Sheepshead minnow	X	X	X	X			
Silversides	X	X		X			
Spotted seatrout	X	X	X		X	X	D
MARINE SPAWNING, LOW-HIGH SALINITY NURSERY							
Atlantic croaker	X	X	X		X	X	C
Atlantic menhaden	X	X			X	X	C
Shrimp	X	X	X		X	X	V
Southern flounder	X	X	X		X	X	D
Spot	X	X	X		X	X	C
Striped mullet	X	X	X		X	X	V
MARINE SPAWNING, HIGH SALINITY NURSERY							
Black sea bass	X	X	X		X	X	V-south of Hatteras R-north of Hatteras
Pinfish	X	X	X		X	X	
Summer flounder	X	X	X		X	X	V

[1] Sources: (Micheli and Peterson 1999; Minello 1999; Mitsch and Gosselink 1993; NOAA 2001; Odum et al. 1984; Wharton et al. 1982; Wiegert and Freeman 1990).
[2] Existing commercial or recreational fishery. Fishery and non-fishery species are also important as prey.
[3] V=Viable, R=Recovering, C=Concern, D=Depleted, U=Unknown (DMF 2014)
[4] Fishery species under harvest moratorium.
* Scientific names are included in Appendix D.

Freshwater inputs into estuarine systems result in high variability of salinity, turbidity, and other physiochemical gradients (Abril et al. 2002; Gonzalez-Ortegon and Drake 2012). In turn, this variability may impact the nursery function of estuarine habitats (Abril et al. 2002; Elliott and Whitfield 2011; Gonzalez-Ortegon and Drake 2012). However, comparisons between fresh, mesohaline, and polyhaline systems in the Mississippi River Deltaic Plain have shown that the increasingly fresh nursery grounds continue to function in that capacity. In particular, Atchafalaya Bay continues to function as a nursery and feeding area for migratory nekton even with a shift towards freshwater composition (Madden et al. 1988). Alternatively, nektonic communities in European estuaries have shown strong resilience associated with long-term decreases in freshwater inputs (González-Ortegón et al. 2012). Thus, while estuarine habitats experience higher levels of phisiochemical variability than other aquatic habitats, the biological structure and nursury function remain highly resilient over extended time periods (Elliott and Whitfield 2011; González-Ortegón et al. 2012).

Bottomland hardwood and riverine swamp forest

Forested wetlands are important nursery areas for anadromous and resident freshwater species (DMF 2000a; Wharton et al. 1982), and for some transient estuarine species (e.g., spot, croaker, southern flounder, blue crab) (Mallin et al. 2001c). Larval and juvenile river herring have been collected near flooded riverine forested wetlands in North Carolina (DMF 2000b). In a study of blueback herring and alewife in the Lower Roanoke River, Walsh et al. (2005), found eggs and larvae of both to be present from early April through late May, indicating that both species spawned in backwater tributaries, including flooded bottomland hardwood forests. The timing and extent of flooding are critical to fish use of bottomland hardwood and riverine swamp forests. In general, vegetated shoreline inundation during spring and early summer has been correlated with increased year-class strength of largemouth bass, sunfish, and yellow perch (Nelson and Walburg 1977; Ploskey 1986; Strange et al. 1982).

5.2.4.2 Foraging

Salt/brackish marsh

Few aquatic species feed directly on living plant tissue in salt/brackish marsh (e.g., periwinkle), and their productivity is very low compared to that of detritivores and consumers of microalgae (SAFMC 1998b; Steel 1991; Wiegert and Freeman 1990). Decomposition in salt marshes at or near the surface enhances the protein content of detritus for other estuarine organisms (Mitsch and Gosselink 1993). Almost three quarters of the detritus produced in salt marshes is broken down by bacteria and fungi (Teal 1986).

Microbial fungi and bacteria live in and on the sediment and are the primary consumers of the benthic habitat. Meiofaunal organisms forage on the primary consumers, and are then fed upon by larger invertebrates. Foraging invertebrates scour the sediment for algae, detritus and meiofauna. Filter feeders utilize the water column. Several species of reptiles, amphibians, birds, and mammals predate during low tide in remnant pools where organisms have concentrated. Thus, the production of detritus and bacteria from salt/brackish marsh exhibits some of the highest recorded values per unit area of any ecosystem in the world (Wiegert and Evans 1967).

Deegan et al. (2000) concluded that secondary production from salt marsh occurs in close proximity to the marsh. Salt marsh support of offshore fisheries is likely through export of juvenile fish. The exported production of brown and white shrimp is probably the best known and most significant to coastal fisheries (Turner 1977; Wiegert and Freeman 1990).

Freshwater marsh

Compared to salt/brackish marsh, living vegetation in freshwater marsh can be more readily consumed by insects, crayfish, muskrats, waterfowl, and carp (Mitsch and Gosselink 1993). The export of this production in the form of particulate detritus is less understood than that of salt marshes (Mitsch and Gosselink 1993; SAFMC 1998b), although it is probably similarly affected erosion and water exchange. Therefore, the rate of detrital export in slow-moving systems is lower than that of salt marshes.

The detritus remaining in the marsh provides food for meio and macrobenthic communities (Mitsch and

Gosselink 1993; Odum et al. 1984; SAFMC 1998b), as in salt marsh systems. In turn, food is provided for small fish, grass shrimp, crayfish, crabs, and waterfowl. Large fish feeding in the marsh include chain pickerel, bowfin, and gars (Odum et al. 1984). Other aquatic predators (e.g., largemouth bass, crappie) feed along the edges of freshwater marshes where there is deep water nearby (Odum et al. 1984).

Bottomland hardwood and riverine swamp forest

Although riverine forests contain vast stores of organic matter, much of it is not rapidly converted into particulate organic matter for secondary production (Mitsch and Gosselink 1993) because woody material and leaves break down slowly. In spite of this, riverine forested wetlands produce abundant food for invertebrates, such as copepods, ostracods, amphipods, isopods, oligochaetes, flatworms, crayfish, and insects (Mitsch and Gosselink 1993; Wharton et al. 1982). Fish adapted to feed in riverine swamp forests include adult mosquitofish, gar, bowfin, carp and chain pickerel, and early life stages of many other species (Mitsch and Gosselink 1993; Wharton et al. 1982). Others, such as largemouth bass and catfish, are opportunistic predators within the habitat.

5.2.4.3. Refuge

Many small resident species, such as grass shrimp and killifish, find refuge from predators and adverse weather conditions among the dense vegetation of marshes (Graff and Middleton 2000; Pattilo et al. 1997; Rozas and Zimmerman 2000; SAFMC 1998b). Large, less mobile organisms also find refuge in the vegetation. Micheli and Peterson (1999) found that adult blue crabs utilize marsh edge in preference to unvegetated, open water. The structure provided by freshwater marsh vegetation and forested wetland margins provides excellent refuge for sunfish, crappie, largemouth bass, and other ambush predators, as well as slow-moving benthic invertebrates (e.g., crayfish). Numerous studies have documented the preference of freshwater ambush predators for vegetated habitat (Savino and Stein 1989).

5.2.4.4. Spawning

Salt/brackish marsh

The structural complexity of vegetation and intertidal submersion regime in salt/brackish marsh provide spawning habitat for forage species such as killifish, mummichogs, silversides, gobies, and grass shrimp (Anderson 1985; Pattilo et al. 1997). A large majority of the U.S. commercial fishes depend on estuaries and salt marshes for nursery or spawning grounds. Among the more familiar wetland-dependent fishes are menhaden, bluefish, fluke, seatrout, spot, mullet, croaker, striped bass, and drum (Tiner 1984).

Freshwater marsh

A diverse assortment of habitats exists where fresh and saline waters meet in the upper branches of rivers and tributaries. Most recreationally important freshwater species spawn in wetlands. Northern pike, yellow perch, carp, smallmouth bass, largemouth bass, bluegill, and bullhead, are examples of freshwater fish that spawn in wetlands. Tidal freshwater marshes can enhance spawning grounds for migratory fish like striped bass, alewife, blueback herring, hickory shad, white perch, yellow perch, and American shad. Over time, these species have selected spawning and nursery grounds in river areas contiguous to or near areas of maximum tidal freshwater marsh. Anadromous and estuarine-dependent fish make use of the entire fresh-to-salt continuum during their life cycles. All told, tidal freshwater marshes may be one of the more important parts of the estuary.

Bottomland hardwood and riverine swamp forest

The combination of egg-laying structures, abundant food, and relative scarcity of predators (Power et al. 1995) in seasonally flooded wetlands makes them ideal spawning areas. Stems and leaves of wetland vegetation provide surfaces for egg attachment. At least 20 families and up to 53 species of fish spawn and/or feed on the floodplain during inundation. Catfish, sunfish, gar, perch, and sucker are well represented (Wharton et al. 1982). River herring is an important coastal species that spawns adhesive eggs in flooded swamps, oxbows, and along stream edges (DMF 2000b; Wharton et al. 1982). Spawning of river herring in North Carolina occurs in tributaries during elevated spring flows, from March through May (DMF 2000b). Spawning hickory shad use flooded swamps and river tributaries (Funderburk et al. 1991; Pate 1972). Pate (1972) collected hickory shad larvae and eggs in flooded swamps and sloughs off of the Neuse River. River herring spawning activity was surveyed by DMF in riverine forested wetlands in the early 1970's and again in 2008-2009. The data from the original baseline survey was used to map and designate Anadromous Fish Spawning Areas in 2008.

5.2.4.5. Corridor and connectivity

Within the marsh, elevation and proximity to open water affect fish distribution. Rozas and Odum (1987) found that shallow water and greater distance from deep water typically meant lower abundance of large predator fish (Rozas and Odum 1987). Wetlands can enhance the foraging function of adjacent habitats. The movement of pinfish between intertidal marsh and subtidal grass beds could provide an important link in the transfer of secondary production between the marsh and aquatic habitats. Marsh edge is more utilized when adjacent to SAV or shell beds where small organisms can take refuge at low tide. Subtidal structures (e.g., SAV, woody debris) near freshwater wetlands may serve a similar corridor function in wind tide systems. Micheli and Peterson (1999) found that marsh edge provided a corridor function for blue crabs foraging on nearby subtidal oyster reefs, and that adult blue crabs utilized marsh edge habitat in preference to unvegetated, open waters. Fodrie et al. (2014) found that fish utilization of oyster reefs adjacent to saltmarsh or seagrass meadows was proportionally more than equally productive to oyster reefs on isolated sand flats. However, constructing the reef proximate to the marsh dissipated wave action, allowing for sediment deposition and marsh accretion, thereby overtaking the reef. While good for the fish it was not successful for oysters. Additionally, fish that normally show a preference for foraging on reefs were shown to adapt to foraging in marsh when oyster reefs were not present, albeit not to the same nutritional advantage. The study also showed that red drum demonstrated a preference for occupying the border between habitat alternatives (Fodrie et al. 2014).

5.3. Status and trends

5.3.1 History of loss of habitat

In the late 1800s to early 1900s, the greatest loss of wetlands resulted from ditching and draining for agriculture (one important exception was the construction of the Atlantic Intracoastal Waterway, North Carolina's section beginning in 1913). Several large agricultural drainage projects occurred during that period (Heath 1975), resulting in ~1 million miles of drainage ditches and canals throughout the Coastal Plains of North Carolina (Wilson 1962). Much land around the Albemarle-Pamlico estuary was drained to accommodate agriculture and forestry. Studies indicate that North Carolina had approximately 7.2 million acres of wetlands prior to European colonization, of which 95% (6,840,000 acres) was in the Coastal Plains (DWQ 2000b). Dahl (1990) estimated that by the mid-1980s, about 50% of these wetlands remained. The trend in wetland loss for North Carolina mirrors national trends (Dahl 1990).

Prior Converted (PC) wetlands have been subsequently converted to residential or other development, against the directives of the Farm Bill (http://www.ag.senate.gov/issues/farm-bill). About one-third of the loss of wetlands has occurred since 1950 (Bales and Newcomb 1996). Ditching of wetlands was common for flood and vector control until the mid-1970s. Based on national trends during the mid-1970s, the major cause of coastal wetland loss was conversion to deep-water habitat, followed by upland development (Hefner and Brown 1985). Many acres of wetlands were excavated for the Intracoastal Waterway, boat basins, and channels, before applicable laws were implemented. Wetlands are being lost to erosion and shoreline hardening intended to prevent erosion. In 1975, Riggs (2001) mapped 50% of the northeastern coastal North Carolina shoreline. A recent analysis of this same shoreline concluded, conservatively, that over 42 square miles were lost between 1975 and 2000 (Riggs 2001). Pamlico County was not mapped and has the highest rates of erosion (Riggs 2001).

The U.S. Fish and Wildlife Service (USFWS), in coordination with the National Oceanic and Atmospheric Administration (NOAA), released a report documenting wetland trends in the coastal watersheds of the Pacific, Atlantic, Gulf of Mexico and Great Lakes (Dahl and Stedman 2013). Findings indicated that there was an estimated net loss of 361,000 acres of wetlands in the coastal watersheds of the U.S. between 2004 and 2009, representing a 25% increase in loss over the previous reporting period of 1998-2004.

In what is known as the Regulatory Reform Act of 2014, Governor Pat McCrory of North Carolina signed into law Senate Bill 734 on September 18, 2014. Section 54 of the bill increases the allowable impacts for isolated wetlands west of Interstate 95 from 1/10 acre to 1/3 acre. Likewise, the threshold for allowable impacts was raised from 1/3 acre to 1 acre east of Interstate 95. The bill reduces the mitigation ratio for wetland impacts from 2:1 to 1:1 (Assembly 2014).

Losses and degradation of wetlands in coastal watersheds can be directly traced to population pressures (Figure 5.1) and conversion of wetlands to developed or agricultural uses, with resulting changes in water flow, increased pollution, and habitat fragmentation (Dahl and Stedman 2013). Dewatering of peat from groundwater withdrawal has shrunk marsh soils, as pore spaces compact with the loss of pore water, decreasing surface elevation and thus increasing flooding, sometimes drowning marshes (Kearney and Ward 1986).

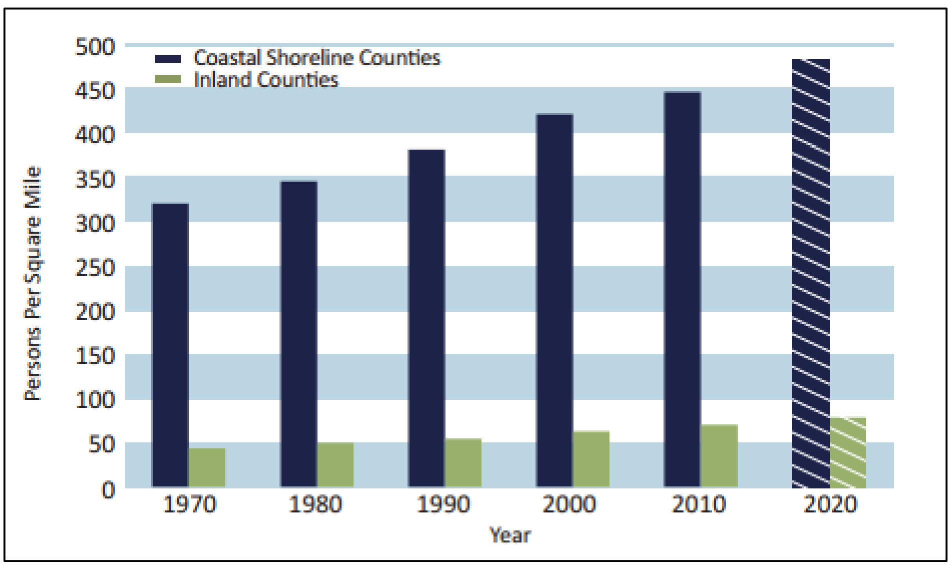


Figure 5.1. Changes in population density in the conterminous United States, 1970 to 2010, with predictions for 2020 (Crossett et al. 2014).

5.3.1.2. Regulatory response to historic losses

Development activities impacting wetlands are currently regulated by federal and state agencies. Numerous federal regulations and incentives affecting wetlands were included in the River and Harbors Act of 1899; the Clean Water Act of 1972 (and amendments); the Coastal Zone Management Act of 1972; the Food Security Act of 1985; the Emergency Wetlands Resources Act of 1986; and the Food, Agriculture, Conservation, and Trade Act of 1990. The primary state laws affecting wetlands were the NC Coastal Area Management Act (CAMA) of 1974 and the NC Dredge and Fill Law of 1969.

The 1899 River and Harbors Act gives the U.S. Army Corps of Engineers (USACE) the authority to regulate activities in navigable waters. These activities include those damaging to wetlands such as impounding, deepening, filling, excavating, and placing structures. Section 404 of the 1972 Clean Water Act (CWA) requires that the USACE regulate the discharge of dredge or fill material into "Waters of the United States" (riparian, estuarine, and headwater wetlands). Permit decisions for activities affecting waters of the United States are decided after consultation with the Environmental Protection Agency (EPA), Fish and Wildlife Service (FWS), National Marine Fishery Service (NMFS), and state agencies (Mitsch and Gosselink 1993). The EPA has the ultimate authority on wetlands and waters of the United States. The USACE acts as the permitting agency under a memorandum of understanding (MOU) with EPA. Section 401 of the CWA gives states the authority to approve, apply conditions, or deny Section 404 permits. The authority is applied in North Carolina by DWR with the 401 Water Quality Certification program.

While Section 404 permits are the most widely used federal management tools protecting wetlands, normal farming, ranching, and silviculture activities are exempt from permits (Bales and Newcomb 1996). "Swampbuster" provisions discourage (through financial disincentives) the draining, filling, or other alterations of wetlands for agricultural use.

The Emergency Wetlands Resources Act of 1986 required states to address wetland protection in their Comprehensive Outdoor Recreation Plans in order to qualify for federal funding. Other wetland protection incentives were provided by the Coastal Zone Management Act, which required coastal states to adopt coastal zone management programs in order to be eligible for federal funding and technical assistance. As a result, the Coastal Resources Commission (CRC) was established under the NC Coastal Area Management Act (CAMA) of 1974. The Division of Coastal Management (DCM) was established as the operational arm of the CRC. Prior to the NC CAMA, dredging and filling of coastal waters was regulated under the 1969 NC Dredge and Fill Law.

In the late 1980's, the federal government began adopting "No Net Loss" policies for wetland protection (Wiebe and Heimlich 1995). However, a major problem of wetland protection remains that of protecting wetlands for public benefit when the majority of converted and remaining wetlands are privately owned. These factors have led to increasing reliance on land acquisition and direct incentives for protecting remaining wetlands.

5.3.1.3. Recent loss of wetland habitat (1999-present)

Within coastal draining river basins, 401 WQCs-permitted wetland impacts over a period of eight fiscal years (FY 1999/2000-2013/2014) indicate a potential conversion of 6,626 wetland acres to non-wetlands (Figure 5.2). Approximately 25% of these wetland impacts did not require mitigation. Among coastal draining river basins, the Cape Fear, Neuse, and Pasquotank had the most impacts (Figure 5.3). It should be noted that Section 401 WQCs (state) precede Section 404 permits (federal) that may never be issued. In addition, some permitted impacts never occur. There were an additional 11,580 acres of pocosin wetlands lost after repeal of the Tulloch Rule, which had required permits for ditching resulting in incidental fallback (see "Regulatory response to recent losses"). However, most of this acreage had its hydrology restored through an intensive state and federal enforcement effort. There is an unquantified amount of wetland acres lost each year to the indirect effects of bulkheads, as well as unauthorized and/or small projects not requiring notification of DWR.[7] The DWR is working to resolve the issue of

[7] Impacts to wetlands less than1/3 acres (east of I-95) or 1/10 acre (west of I-95) and not designated as unique wetlands, or adjacent to ORW, WS-1, WS-22, or contiguous with a state or national Wild and Scenic River (http://portal.ncdenr.org/c/document_library/get_file?p_l_id=38446&folderId=285750&name=DLFE-8521.pdf, February 2015).

tracking unauthorized and cumulative, small impacts (EEP 2004).

Since 2003, DMS no longer summarizes wetland losses by river basin. The DMS now tracks gross mitigation requirements and credits for restoration, enhancement, and high quality preservation. The Basinwide Information Management System (BIMS) database, which contains both 401 WQCs and CAMA Permit records, does not easily facilitate the extraction and summarization of these records, (A. Mueller/DWQ, pers. com., 2009). However, the ability to aggregate and summarize data on wetland impacts is essential for conducting cumulative assessments, as required by CRC rules. The DCM's Coastal Development Activity and Impact Tracking System (CDAITS) is an attempt to provide a central database for recording permits for this purpose. The database is available, but does not include CAMA General Permits.

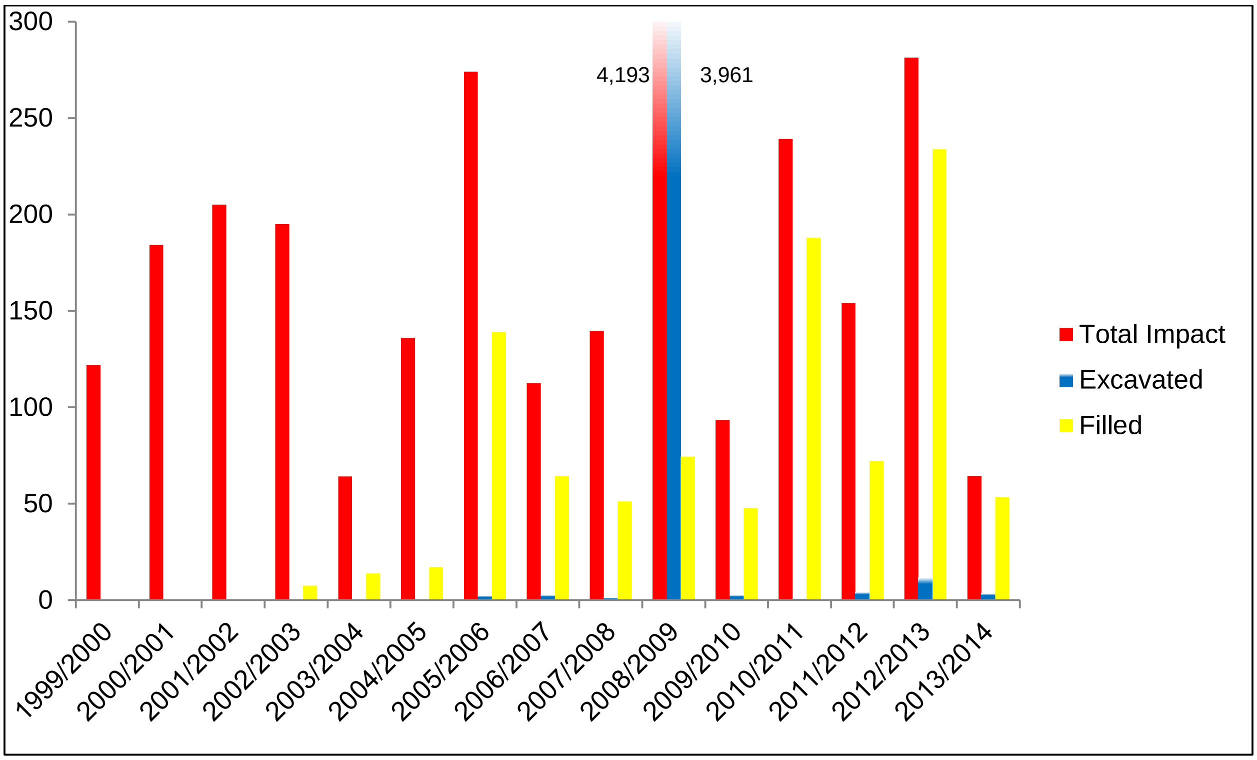


Figure 5.2. Total 401 Permitted Wetland Impacts (acres) during FY 1999/2000-2013/2014 in the seven coastal draining river basins (excluding the Lumber River basin) by fiscal year.

Note: These data are for permanent wetland loss and do not include impacts from CAMA, Corps of Engineers Nationwide Permits 12, 27 and 33, and Corps of Engineers Regional General Permit 030 since these impacts are temporary, impacts to water (e.g., drainage), or impacts for wetland creation, restoration, or enhancement. In addition, vast majority of impacts from FY 2008/2009 occurred during a single project when PCS Phosphate was issued a permit to impact 3,955 acres of wetlands in Beaufort County under DWQ 401 Certification 20080868 Ver. 2.

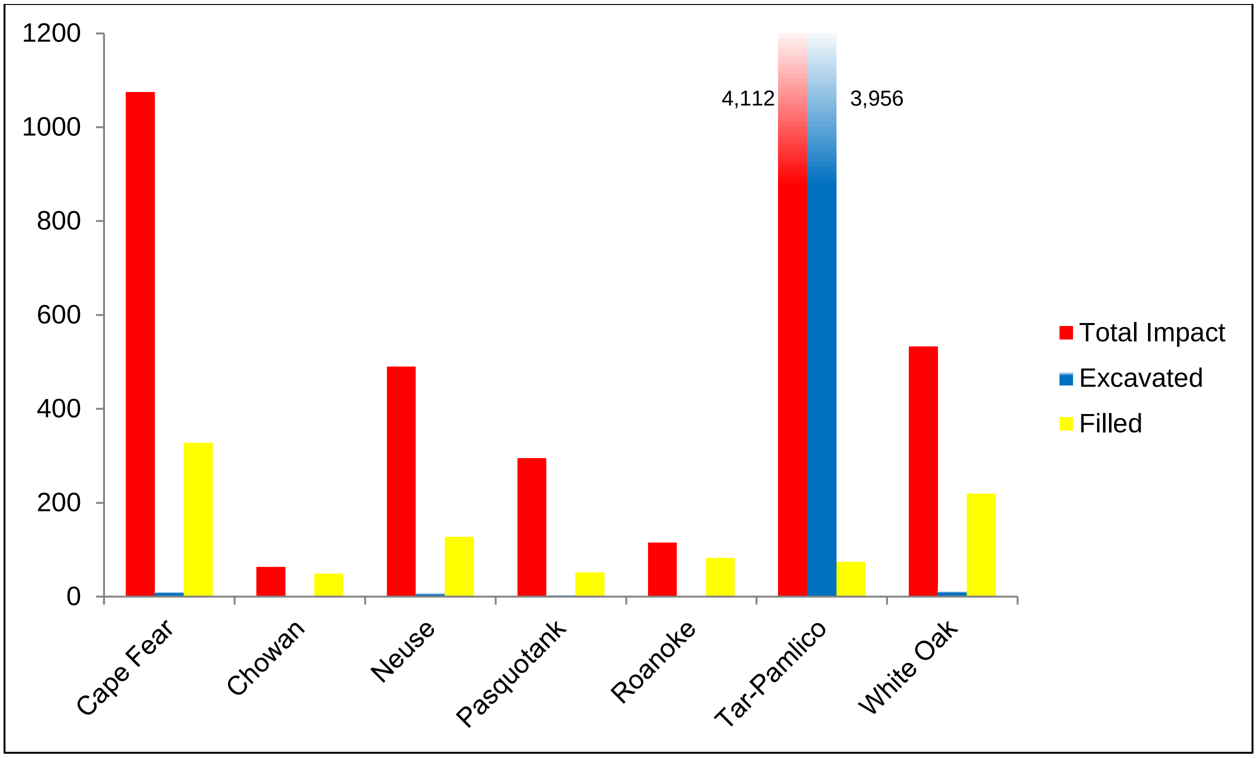


Figure 5.3. Total 401 permitted wetlands impacts (acres) during FY 1999/2000-2013/2014 by coastal draining river basin.

Note: These data are for permanent wetland loss and do not include impacts from CAMA, Corps of Engineers Nationwide Permits 12, 27, and 33, and Corps of Engineers Regional General Permit 030 since these impacts are temporary, impacts to water (e.g., drainage), or impacts for wetland creation, restoration, or enhancement.

Between 2010 and 2014, DCM issued General Permits allowing less than 1 acre/year of coastal wetland disturbance in high and low marsh (Figure 5.4). In total, 1.61 acres of high marsh and 2.16 acres of low marsh were permitted for disturbance during these years (Figure 5.4). Major Permits issued by DCM also allowed less than 1 acre/year of coastal wetland disturbance in high and low marsh between 2010 and 2014 with the exception of 6.51 acres of low marsh in 2012 and 13.46 acres of high marsh in 2013. In total, 15.09 acres of high marsh and 8.72 acres of low marsh were permitted for disturbance during these years (Figure 5.5). The peak in 2012 was due in part to a DOT permit allowing 1.07 acres of impacts to coastal wetlands issued for the Herbert C. Bonner Bridge replacement. The permit allowed for 1.04 acres to be impacted for temporary fill, and 0.03 acres for mechanized clearing (C. Brittingham, DCM, pers. com. 2015). The peak in 2013 is related to the U.S. 17 Wilmington Bypass. The allowable impacts include approximately 12.5 acres for temporary clearing of vegetation, 0.41 acres for temporary excavation, and 0.07 acres for permanent fill in coastal wetlands (C. Brittingham, DCM, pers. com. 2015).

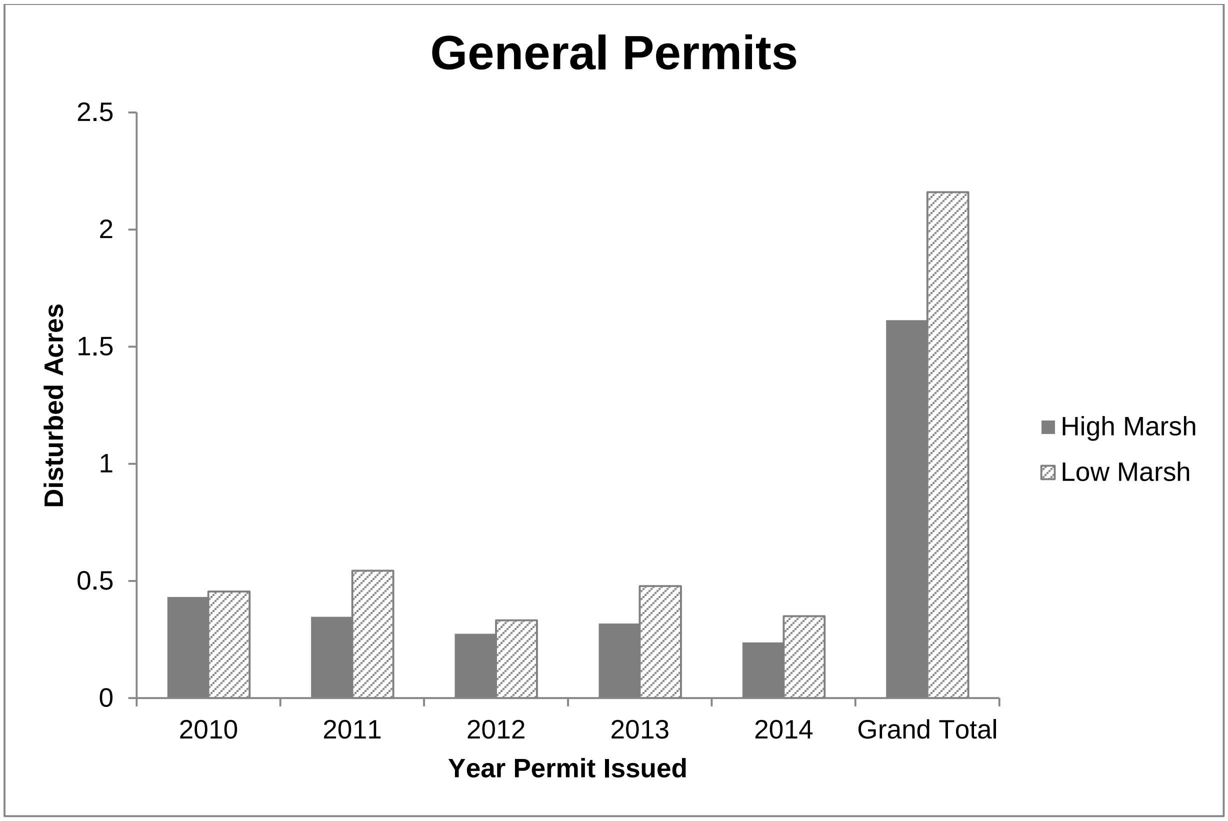


Figure 5.4. DCM General Permits issued between 2010 and 2014.
Permitted acreage represents temporary and permanent disturbance allowed under the permit conditions. It does not represent acreage disturbed upon development completion.

5.3.1.4. Regulatory response to recent losses

Between 1993 and 1998, the Tulloch rule gave the USACE authority to regulate ditching and draining of wetlands by preventing the removal of material that could fall back into the wetlands. Because of this ruling, ditching required a Section 404 permit with a DWR 401 WQC, to ensure that water quality standards were not violated. When the federal court overturned the Tulloch Rule in June 1998, the USACE lost authority to issue permits for wetland ditching unless spoil was actually placed on adjacent wetlands. As a result, thousands of acres of wetlands were drained, primarily in Brunswick, New Hanover, and Pender counties (J. Steenhuis, DWQ, pers. com. 2002). Approximately 9,500 acres of wetlands were impacted in Brunswick County alone (DWQ 1999) and a total of approximately 11,580 acres of wetlands were impacted in the Coastal Plain. These losses are in addition to 401 WQC records. In Brunswick, New Hanover, Pender, and Onslow counties, 24% of the ditching was reported as forestry-related, 6% as agriculture-related, and 70% was done for development or other purposes (J. Steenhuis, DWQ, pers. com. 2002).

In 1999, the state determined wetlands ditching and draining activities to fall under its authority. The EMC adopted a wetland draining policy to ensure that required wetland conditions were maintained. Inspections were made of previously ditched wetlands to determine if the ditching was conducted in a manner that violated wetland standards, and where violations had occurred, property owners were required to restore natural hydrology by filling the ditches. Approximately 50% of the ditched wetlands have been restored.

In 1995, the USACE and EPA issued a joint guidance memo to specify how mechanical site preparation for forestry activities must be conducted in order to maintain a silviculture exemption under Section 404 of the CWA. This memo describes six mandatory BMPs for conducting mechanical site preparation for the establishment of pine plantations. The memo also describes nine wetland types in which a permit is required to conduct such activities; these wetland types are listed below:

1. Permanently flooded, intermittently exposed, and semi-permanently flooded wetlands
2. Riverine Bottomland Hardwood wetlands
3. White Cedar swamps
4. Carolina Bay wetlands
5. Non-riverine forest wetlands
6. Low Pocosin wetlands
7. Wet Marl forests
8. Tidal freshwater marshes
9. Maritime grasslands, shrub swamps and swamp forests

After 1995, silviculture site preparation activities for the establishment of pine plantations in any of the above nine types of wetlands required applicable permits.

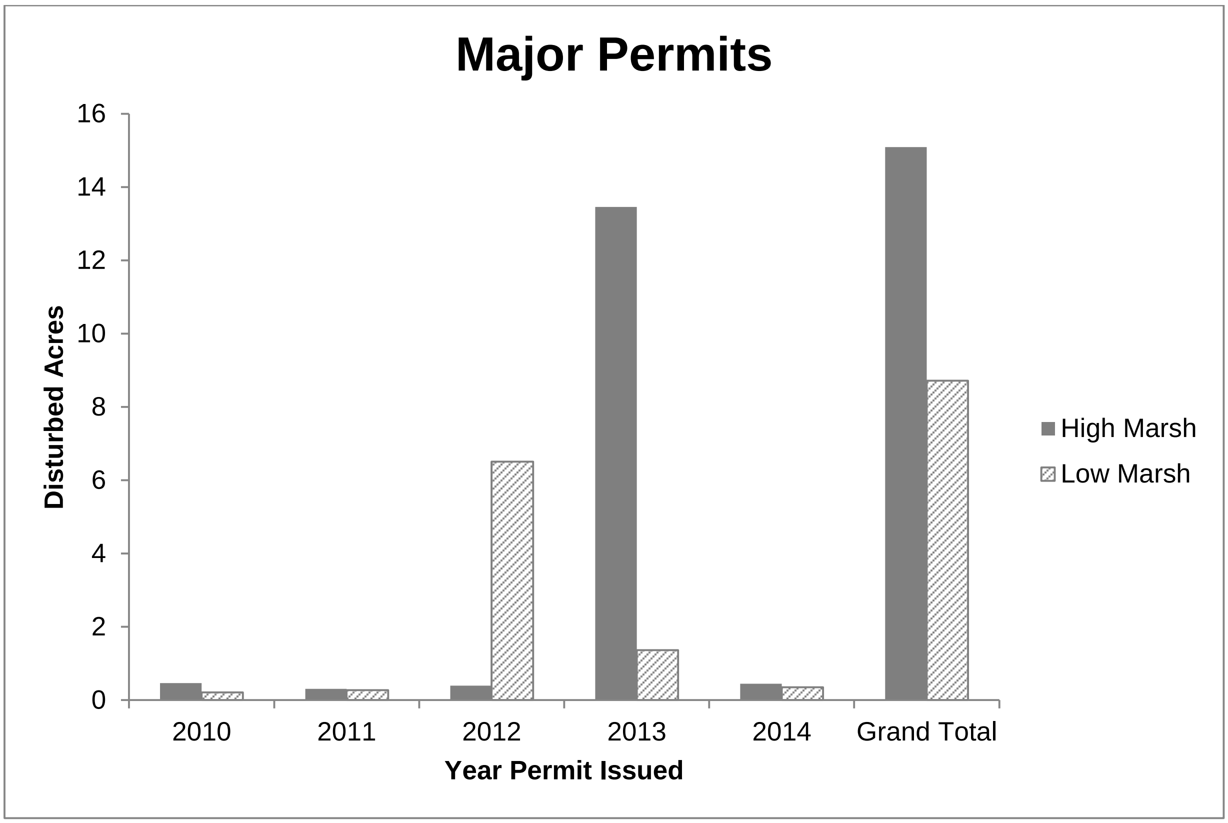


Figure 5.5. DCM Major Permits issued between 2010 and 2014. Permitted acreage represents temporary and permanent disturbance allowed under permit conditions. It does not represent acreage disturbed upon development completion.

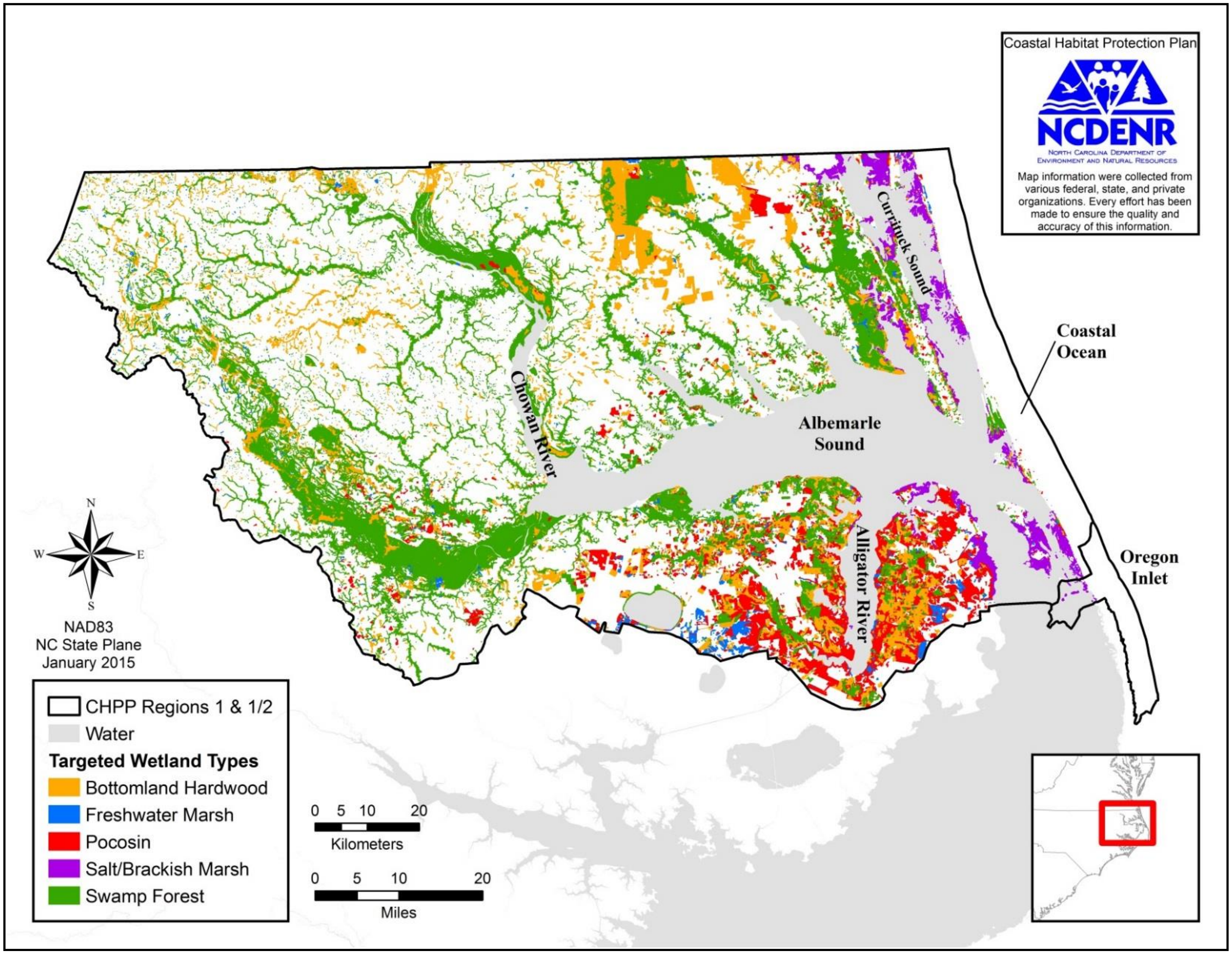
5.3.2. Status of associated fishery stocks

In North Carolina, estimated fish mortality and juvenile abundance indices are used by DMF to determine the status of fishery stocks. Stock status evaluations may also suggest habitat issues for *Concern* or *Depleted* species. Of the fishery stocks with higher relative abundance in wetlands (Table 5.2), five carry a status of *Depleted*, six of *Concern*, two of *Recovering*, and five, *Viable* (DMF 2014). There are approximately equal numbers of *Viable* and *Concern* stocks showing preference for wetland habitat. The wetland-enhanced[8] stocks listed as *Depleted* were American eel, river herring (alewife and blueback herring in Albemarle Sound), sturgeon spp., spotted seatrout and southern flounder. Wetland-enhanced species of *Concern* included the Albemarle Sound Management Area (ASMA) and the Central Southern Management Area (CSMA) striped bass, blue crab, Atlantic croaker, Atlantic menhaden, and spot. The two *Recovering* species were red drum and black sea bass (North of Hatteras). The *Viable* species were striped bass (Atlantic Ocean migratory stock), shrimp, striped mullet, and summer flounder. While most of the concern over declining fish stocks has focused on overfishing, habitat loss and degradation also prevent recovery or make stocks more susceptible to overfishing. Therefore, protection or enhancement of wetland habitat can be especially beneficial to *Depleted* or *Concern* wetland-enhanced species by maximizing recruitment and productivity.

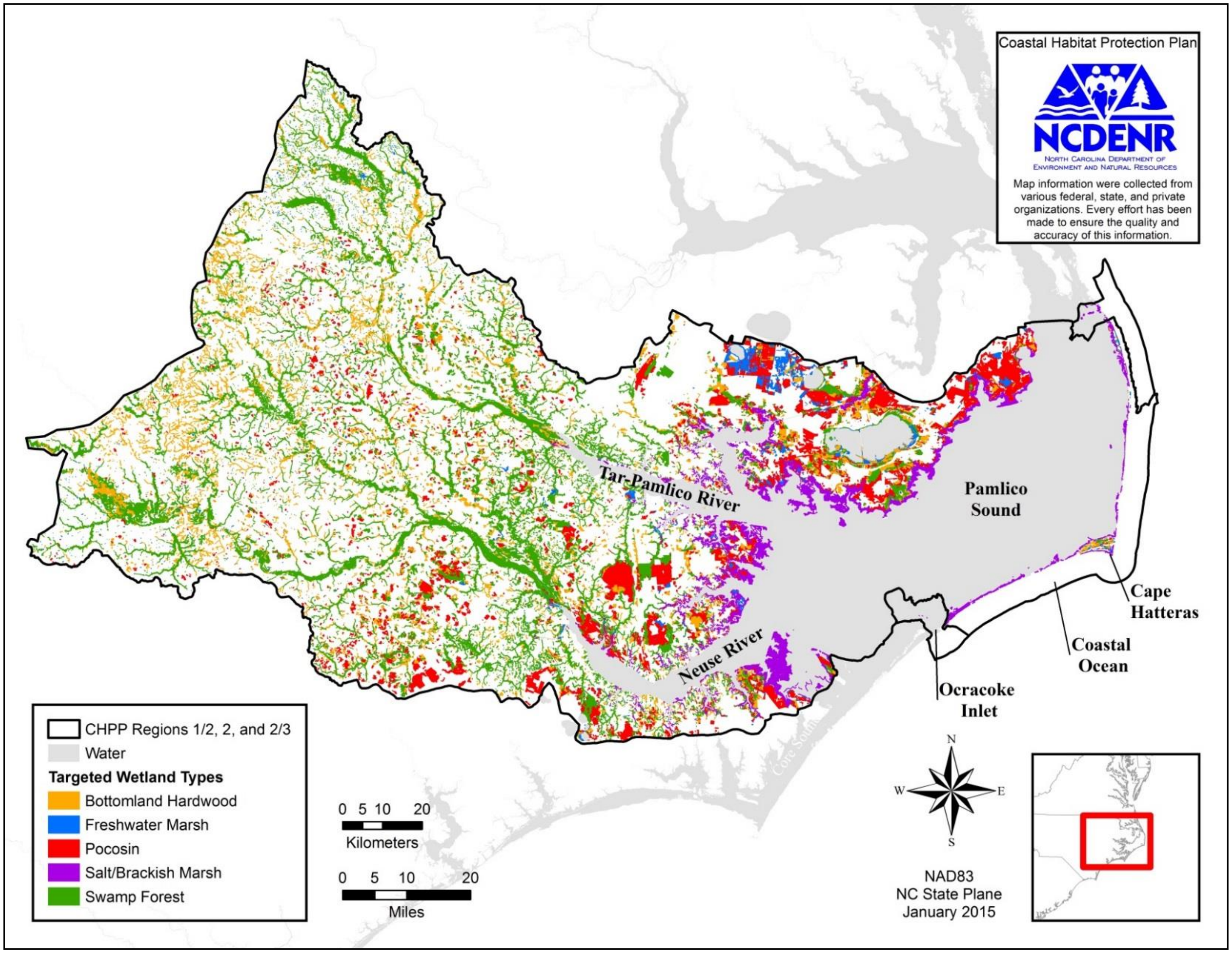
5.4. Wetlands summary

Wetlands are among the most productive ecosystems in the world. They improve the quality of adjacent upland and open-water habitats with their capacity for water storage, nutrient filtration, and protection from erosion and storm damage. Wetlands play a vital role in providing food, cover, and spawning area for finfish and shellfish. It is widely estimated that over 95% of the finfish and shellfish species commercially harvested in the United States are wetland-dependent. Mitigating for a history of wetland alterations may be possible with opportunities such as restoration on conservation lands, re-building marsh islands, and constructing living shorelines. A multi-level approach to the future health of our waters and wetlands involving research, non-profit engagement, and regulatory actions, is needed. Only then will sustainable development and activity be possible.

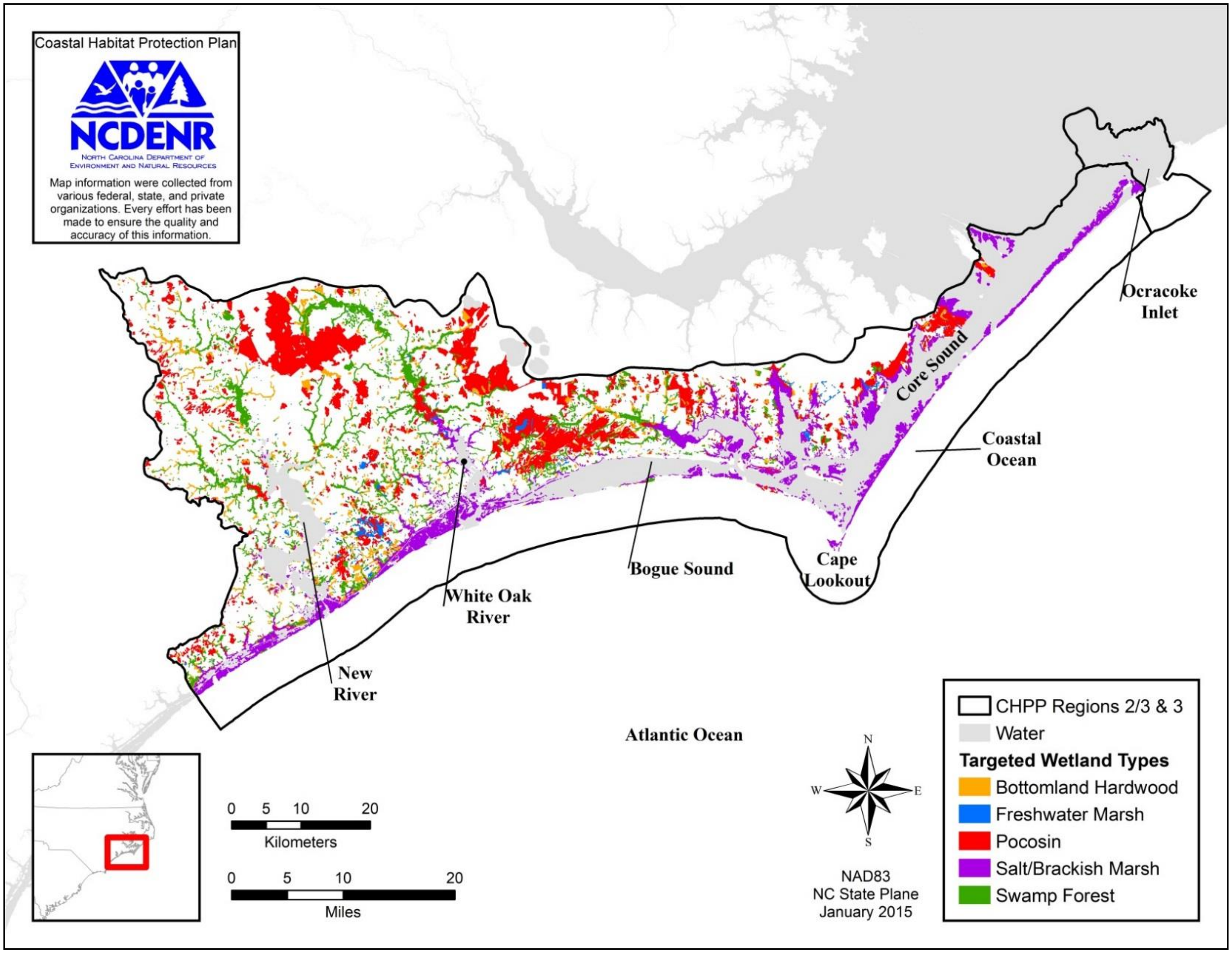
[8] Wetland-enhanced species are those showing some documented preference for wetland habitat.



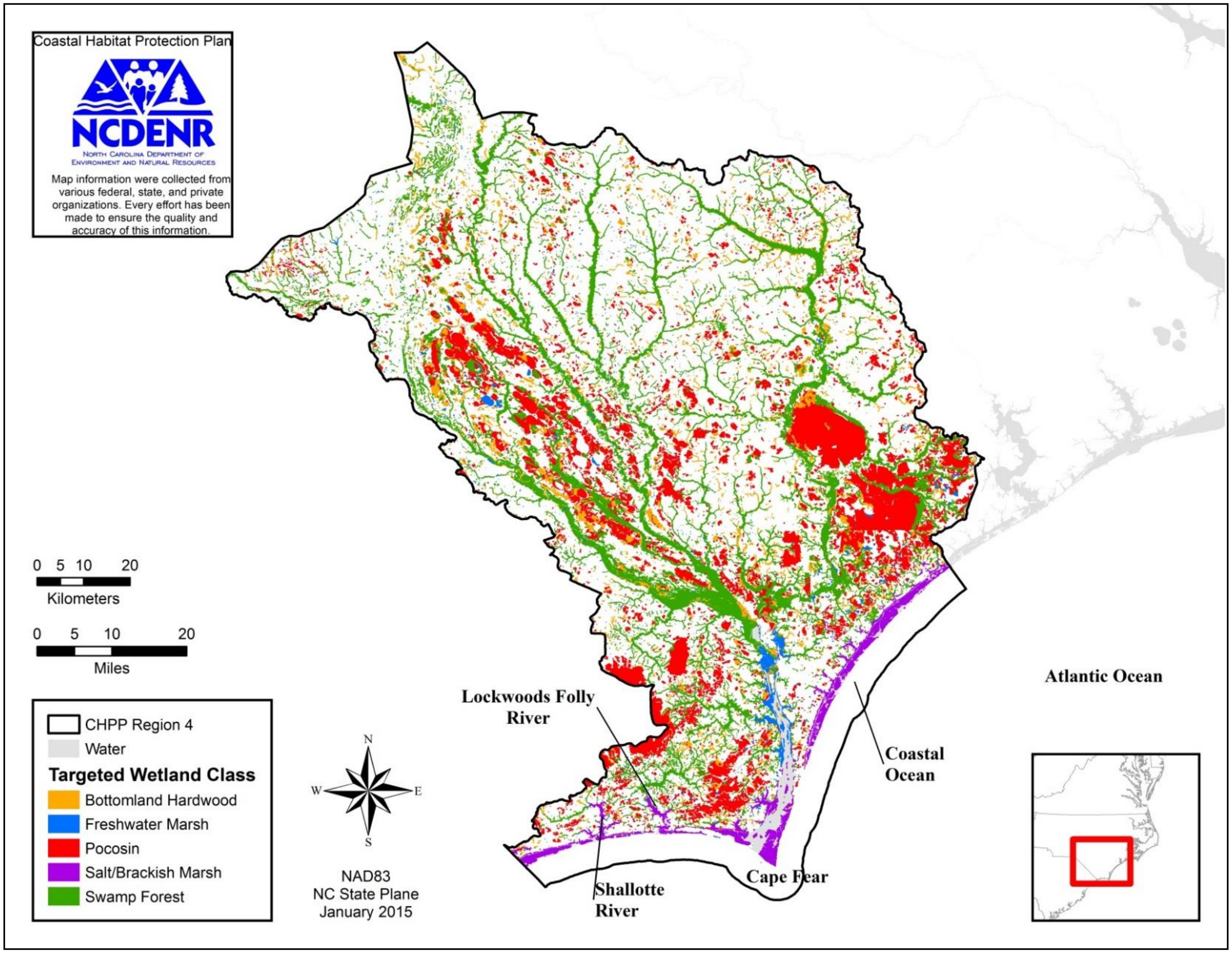
Map 5.1a. Location of targeted wetland types derived from the NWI geospatial dataset for region 1 and 1/2 of the CHPP management area.



Map 5.1b. Location of targeted wetland types derived from the NWI geospatial dataset for regions 1/2, 2, and 2/3 of the CHPP management area.



Map 5.1c. Location of targeted wetland types derived from the NWI geospatial dataset for regions 2/3 and 3 of the CHPP management area.



Map 5.1d. Location of targeted wetland types derived from the NWI geospatial dataset for region 4 of the CHPP management area.

PART II. THREATS

CHAPTER 8. PHYSICAL DISTURBANCES

8.1. Fishing Gear Impacts

The extent of habitat damage from fishing gear varies with gear type, habitat complexity, and amount of contact. The concern has generated many studies, with Rester (2000) and Dieter et al. (2003) compiling bibliographies of the studies. The 1996 reauthorization of the Magnuson-Stevens Fishery Management and Conservation Act required that federal fishery management plans (FMPs) include adverse impacts to essential fish habitat (EFH) as a result of fishing activities (Barnette 2001). Fishing related impacts to fish habitat have been reviewed in federal FMPs for managed species by South Atlantic and Mid-Atlantic Fishery Management Councils and are addressed in DMF FMPs. Few studies have been conducted on passive or static gear effects, but it is generally assumed that these gears have less impact than mobile gears (Barnette 2001). Some studies suggest that it is the cumulative effects rather than the type of gear that is more important (Collie 1998). Effects can be short -term, such as sediment resuspension, or long-term, such as effects on biodiversity, which may be more difficult to measure (Barnette 2001).

8.1.1. Mobile Bottom-Disturbing Fishing Gear

Mobile bottom-disturbing fishing gear is towed or run by power, and includes bottom trawls, oyster and crab dredges, hydraulic clam dredges, clam kicking gear, patent tongs, and haul seines. Most commonly used in North Carolina is the shrimp trawl (Table 8.1), followed by oyster and clam dredges. A legislative report to the Moratorium Steering Committee (MSC 1996) compiled a list of gears used in North Carolina and probable habitat impacts. Trawls and dredges were found to have the greatest potential. Bottom trawling is mostly used on soft bottom in both estuarine and coastal ocean waters, primarily to catch shrimp, and some crabs (Table 8.2).

Table 8.1. Most common mobile bottom-disturbing gear types for commercial fisheries by year and number of trips, DMF 2013.

Year	Clam Dredge[1]	Clam Trawl Kicking	Crab Trawl	Flounder Trawl	Haul Seine	Beach Seine	Oyster Dredge	Shrimp Trawl
1994	407	636	3,824	508	972	862	236	18,989
1995	767	823	2,207	532	961	959	88	19,817
1996	637	1,089	4,308	415	899	870	3	14,622
1997	473	1,120	5,049	237	713	1076	31	16,575
1998	668	1,081	5,710	654	609	690	671	12,201
1999	639	1,176	3,546	517	536	527	942	15,317
2000	735	791	2,223	469	436	822	392	14,082
2001	459	838	2,539	524	429	489	822	10,717
2002	691	879	1,034	667	395	557	621	12,916
2003	431	838	1,693	459	480	125	893	9,886
2004	657	1,026	1,775	491	450	411	1,750	8,380
2005	426	538	1,117	408	431	681	2,342	4,550
2006	386	372	301	389	494	317	2,487	5,711
2007	343	211	157	419	393	242	1,732	6,737
2008	469	423	314	354	364	329	2,688	6,003
2009	355	536	484	340	315	123	4,481	5,745
2010	603	517	273	394	246	183	10,709	5,591
2011	400	286	228	346	197	102	7,434	4,373
2012	492	187	20	108	130	68	2,264	6,195
2013	344	180	85	71	195	57	3,763	5,657
TOTAL	10,382	13,547	36,887	8,302	9,645	9,490	44,349	204,064

[1]Includes hydraulic dredges.

Bottom trawls are conical nets towed behind a vessel, held open by water pressure against a pair of "otter boards" or "doors" attached to the front of the net. Three components of a trawl can dig into the sediment: the doors, the weighted line at the opening of the net, and the tickler chains (sometimes added in front of the net to improve harvest). Dredges are used in clam, oyster, and scallop fisheries. Oyster dredges have metal frames to which bags of metal rings are attached, often with teeth designed to dig into the sediment, towed behind the vessel (Barnette 2001). Oyster dredges are primarily used on shell bottoms. Crab dredges are similar to oyster dredges, with sometimes longer teeth. There was only one crab dredge trip reported in 2013 (NCDMF 2014a).

There are two types of scallop dredges in North Carolina. Bay scallop dredges are used in SAV beds, while sea scallop dredges are used in the coastal ocean off Cape Lookout. Three bay scallop trips and 19 sea scallop trips were reported in 2012-2013. Hydraulic dredges are used primarily in the clam fishery. This dredge has an escalator or conveyor on the vessel, with a sled connected to the conveyor, using water to force clams from the sediment which are then collected by the escalator (NCDMF 2008). Clam kicking is a form of trawling in which propeller is used to dislodge clams from the bottom, then collected in the trawl. Most oyster and clam dredging is done on shell bottoms where the resource is abundant. Clam kicking is only allowed in areas without significant SAV or oyster resources (NCDMF 2008).

Haul and beach seines are large nets used to encircle schools of fish. Beach seines are used on beaches and haul seines may be deployed from a boat. Both scrape the bottom with a lead line. The impact of these gears is unknown and likely minor. Patent tongs are not currently used in North Carolina.

Annual effort in number of trips of commonly used mobile bottom-disturbing gears is shown in Table 8.1 (NCDMF 2014a). Shrimp trawling accounts for most of the effort, followed by oyster dredging. Oyster dredging increased to over 10,000 trips in 2010 due to higher abundances and a good market, but has declined since. Most of the decline is attributed to changes in regulations regarding gear restriction areas for mechanical harvesting of clams and oysters. Most oyster dredging occurs in the Pamlico Sound region, while most clam dredging occurs in the southern region, followed by the Core/Bogue Sound region, which also experiences the majority of clam kicking trips.

Commercial shrimp trawling accounted for the majority of trawl trips 2013. About 75% of shrimp trawl trips occur in estuarine waters (Table 8.2), the remainder in ocean waters, primarily within state territorial waters off the central and southern coast. Total annual estuarine shrimp trawling effort has ranged from 2,944 trips in 2005 to 15,791 trips in 1995 (Table 8.2). The number of estuarine shrimp trawl trips has not exceeded 10,000 trips since 2002. Shrimp trawling effort fluctuates with abundance, but has gradually declined since 1994, due to a number of factors including increasing imports, fuel prices, regulation changes, and retiring fishermen (DMF 2015). In 1999, a recreational commercial gear license (RCGL) became available. With this license, shrimp can be caught recreationally with a trawl, but cannot be sold. Effort from RCGLs are not included in Table 8.2. Surveys of RCGL holders ceased in 2008, but over 2,000 shrimp trawl trips were taken in 2013 (DMF 2015).

Over 99% of crab trawling occurs in estuarine waters (Table 8.2), with the majority in the Pamlico Sound system, followed by Core/Bogue sounds and estuaries. No finfish trawling is allowed in internal waters. All directed flounder trawling occurs in ocean waters, primarily >3 miles offshore. Effort in the nearshore waters (<3 miles) has ranged from 204 trips in 1998 to zero trips in 2012 and 2013 (Table 8.2).

Impacts from mobile bottom-disturbing fishing gear range from changes in community composition from removal of species to physical disruption of the habitat (Barnette 2001). Corbett et al (2004), found an increase in total suspended sediment 1.5 – 3 times above background concentrations for less than a day, and minor impacts on nutrient and chlorophyll *a* concentrations. Wind played a greater role in mixing the water column and altering its nutrient and sediment characteristics.

Bottom trawls, dredges, and other mobile gears can cause rapid and extensive physical damage to hard bottom habitat (Auster and Langton 1999; Freese 2001; NRC 2002; Reed et al. 2007; SAFMC1998a; Wells et al. 2008). Studies have found that scallop dredges cause extensive damage to hard bottom and reduce habitat complexity on soft and shell hash bottom (Auster et al. 1996; Currie and Parry 1996). Habitat complexity is reduced through flattening of mounds, filling of depressions, dispersing shell hash, and removing small biotic cover such as hydrozoans and sponges (Auster et al. 1996; Løkkenborg 2005). Dragged fishing gear removes or damages benthic organisms such as sponges, corals, and macroalgae, often leading to mortality. These gear types displace outcrop seafloor structures. Damage from mobile gear is extensive where the bottom is uneven and there is a concentration of epiflora and/or epifauna. The removal of structure and attached biota reduces species richness, diversity, and habitat complexity (Auster and Langton 1999; NRC 2002; Watling and Norse 1998). Indirect damages to hard bottom occur through altered trophic linkages and nutrient cycles, and increased vulnerability of organisms, and subsequent disease and predation (Auster and Langton 1999; NRC 2002). Trawling reduces mobile benthic invertebrates on hard bottom, limiting food resources available to other reef organisms.

Fishermen avoid hard bottom areas because of potential damage to nets and gear, but there is one type of trawl designed specifically for use in this habitat. Roller-rigged trawls are equipped with large rubber discs to roll over hard bottom without becoming entangled. Several studies have noted significant damage to sponges, hard corals, and soft corals where roller-rigged trawls had been used (Tilmant 1979; Van Dolah et al. 1987). While many sponges and corals can partially recover within one year following trawling, slower-growing species require several years to completely regenerate (Van Dolah et al. 1987). Because of the potential for hard bottom degradation, roller-rigged trawls have been prohibited by federal regulation for the harvest of snapper-grouper south of Cape Hatteras since 1989 (SAFMC 1998a).

Oyster and clam dredges are the primary gears used to harvest on shell bottoms. Oyster dredging reduces the vertical relief of subtidal reefs and results in additional negative impacts, including scattering, which removes shell and oysters, and destabilizes the structure (Lenihan et al. 1999b; Lenihan and Peterson 1998). These effects result in reduced spawning stock biomass, reduced substrate for recruitment, reduced structural complexity for refuge and foraging, and decreased disease resistance. While many factors have contributed to the decline in the oyster fishery, dredging and tonging have most impacted the physical structure of reefs in the Chesapeake Bay (Hargis Jr. and Haven 1988; Rothschild et al. 1994). One full season of simulated oyster dredge harvesting effort reduced the mean height of high profile mounds by 30% (DeAlteris et al. 1999; Lenihan and Peterson 1998).

The use of oyster dredges has been limited by the Marine Fisheries Commission (MFC) in recent years (DMF 2008a), still, historical subtidal oyster beds have not recovered (Lenihan and Peterson 1998), and oysters are listed as a species of *Concern* in the 2014 stock status report (DMF 2014). Degraded water quality, partially due to reduced filtration by oysters from loss of resource, is thought to have impaired full recovery (Jackson et al. 2001; Lenihan and Micheli 2000). The extent of dredge damage to shell bottom depends on trip duration and frequency, and the amount of reef area worked over time (Powell et al. 2001). Some of the damage is offset through cultch planting at 3-4 year intervals (Map 3.4a).

Trawling for shrimp, crabs, and finfish, long haul seining, and crab dredging have similar but reduced impacts on shell bottom habitats (DMF 2001c). The weight and movement of trawl doors or chains towed across the seafloor can disrupt the oyster mound structure, removing the upper layers of shells or scattering oysters (DMF 2001c). Long haul seines dragged through shell bottom can damage oyster mound structures by entangling, uprooting, and scattering shell. Frankenberg (1995) concluded that trawling had a significant negative impact on living shell bottom habitat. South of Pamlico Sound, a significant area is closed to oyster dredging but not trawling. Where bottom disturbing gears are allowed in subtidal habitat, creation, maintenance, and re-establishment of beds may be deterred.

Table 8.2. Annual number of trips reported for shrimp, crab, and flounder trawls in North Carolina estuarine and ocean waters, 1994-2013 (DMF Trip Ticket Data). Trawling is not permitted in Albemarle Sound.

	Shrimp Trawls					Crab Trawls					Flounder Trawls				
	Estuarine Rivers and Sounds[1]			Ocean Waters		Estuarine Rivers and Sounds[1]			Ocean Waters		Estuarine Rivers and Sounds[1]			Ocean Waters	
Year	Core/Bogue	Pamlico	Southern	< 3 miles	> 3 miles	Core/Bogue	Pamlico	Southern	< 3 miles	> 3 miles	Core/Bogue	Pamlico	Southern	< 3 miles	> 3 miles
1994	7,176	4,870	3,066	3,639	238	238	3,531	35	15	5	0	4	1	49	454
1995	7,244	5,185	3,361	3,771	256	207	1,898	101	1	0	1	14	6	88	423
1996	6,069	2,906	2,352	2,970	325	197	4,058	51	2	0	1	5	0	112	297
1997	5,745	4,792	2,722	2,994	322	657	4,193	198	0	1	0	11	2	68	156
1998	4,679	1,864	2,053	3,212	393	542	5,104	63	1	0	0	1	0	204	449
1999	4,867	4,082	2,156	3,939	273	410	3,104	32	0	0	0	0	0	169	348
2000	3,460	5,513	1,942	3,011	156	265	1,911	47	0	0	0	0	0	106	363
2001	3,533	3,180	1,273	2,654	77	397	2,036	106	0	0	0	0	0	104	420
2002	3,763	4,883	1,619	2,598	53	85	870	79	0	0	0	0	0	141	526
2003	3,553	1,752	1,591	2,811	179	112	1,476	105	0	0	0	0	0	62	397
2004	1,806	2,728	910	2,791	145	403	1,210	162	0	0	0	0	0	26	465
2005	1,336	861	747	1,535	71	163	823	125	6	0	0	0	0	11	397
2006	884	1,819	600	2,323	85	51	245	5	0	0	0	0	0	23	366
2007	786	2,922	787	2,196	46	61	96	0	0	0	0	0	0	69	350
2008	674	2,721	832	1,691	85	41	273	0	0	0	0	0	0	24	330
2009	763	2,187	958	1,776	60	37	447	0	0	0	0	0	0	29	311
2010	561	2,053	1,363	1,582	32	88	153	32	0	0	0	0	0	21	372
2011	174	1,956	913	1,297	33	82	123	23	0	0	0	0	0	31	315
2012	942	2,245	1,282	1,689	37	2	18	0	0	0	0	0	0	0	108
2013	765	2,052	1,247	1,583	10	30	44	11	0	0	0	1	0	0	70

[1]Pamlico Area: Pamlico, Croatan, and Roanoke sounds; Pamlico, Bay, Neuse, and Pungo rivers. Core/Bogue Area: Core and Bogue sounds; Newport, White Oak, and North rivers. Southern Area: Masonboro, Stump, and Topsail sounds; Cape Fear, New, Shallotte, and Lockwood Folly rivers; AIWW.

Shearing or cutting of SAV leaves, flowers, or seeds, and uprooting of the plant are most often caused by dragging or snagging by gears such as long haul seines or bottom trawls (ASMFC 2000). Shearing of above ground biomass does not always result in SAV mortality, but productivity is reduced since energy is diverted to replace damaged tissue, and the nursery and refuge functions are reduced in the absence of structure. Auster and Langton (1999), ASMFC (2000), and Collie et al. (2000) discussed impacts of fishing gears on SAV. Belowground effects, such as those from toothed dredges, heavy trawls, and boat propellers, may cause total loss of SAV, requiring months to years to recover. Excessive sedimentation from bottom disturbing fishing gear and propeller wash can bury SAV. Qualitatively, damage to eelgrass meadows from unspecified shellfish harvest dredges was surpassed only by damage from propellers (Thayer et al. 1984). Turbidity from bottom-disturbing gear can reduce clarity, SAV growth, productivity, and survival.

Most trawling in Bogue and Core sounds occurs in or near the AIWW, with some commercial trawling during high tide in shallow regions outside the AIWW. Eleuterius (1987) noted that shallow SAV beds were not affected by trawling but during high tides when beds were accessible. Most SAV in western portions of the Albemarle-Pamlico system is protected from shrimp trawling (Table 8.3). However, crab trawling is allowed in the Pungo, Upper Neuse, and Pamlico rivers (Maps 3.5a-c).

Table 8.3. Mapped bottom habitat acreage of MFC designated areas within Estuarine Bottom Habitat Mapping (EBHM) mapping boundaries.
Note: EBHM areas are not inclusive of all PNAs (DMF 2014). Acreage calculated from GIS layers.

MFC designation	Area (acres) within NC Coastal Waters for GIS layer	Area (acres) within EBHM areas	% of Specific Area that falls within Mapping Area	Area (acres) within EBHM mapped	% Mapped
Crab Spawning Sanctuaries	27,497.72	16,458.36	59.85%	14,798.33	89.91%
Military Restricted Areas	104,452.14	21,718.16	20.79%	19,049.46	87.71%
Seed Management Areas	2,178.54	2,321.79	106.58%	2,321.79	100.00%
Oyster Sanctuaries	228.42	97.22	42.56%	97.22	100.00%
Special Secondary Nursery Areas	35,794.69	31,793.33	88.82%	31,247.32	98.28%
Mechanical Clam Harvest areas	43,899.93	4,0915.49	93.20%	40,089.97	97.98%
Mechanical Oyster Harvest prohibited areas	407,396.56	347,402.79	85.27%	327,801.01	94.36%
Primary nursery areas	44,973.28	48,556.80	107.97%	46,491.35	95.75%
Taking crab with dredges	86,094.68	28,031.02	32.56%	28,030.07	100.00%
Trawl net prohibited	208,591.77	158,268.09	75.87%	152,727.26	96.50%

Bay scallop dredges, in contrast to oyster and crab dredges, cause less severe damage to SAV as they are smaller [not over 50 lb (22.68 kg)] and have no teeth. They are intended to glide over the surface, taking scallops from the bed. Bay scallops depend on SAV for initial post-larval setting, and as such are strongly associated. An evaluation of impacts to eelgrass (*Zostera marina*) from bay scallop dredging in North Carolina found that scallop dredging over grass beds significantly reduced biomass, surface area, and shoot density (Fonseca et al. 1984). The impacts were more severe in soft bottom than in harder bottom. Full recovery was estimated to take up to two years. Because bay scallop populations in North Carolina typically spawn between August and December (Fay et al. 1983b), eelgrass leaves are most needed for attachment of juveniles (the next season's scallop crop) during the winter, which is also the time of maximum fishing effort (Fonseca et al. 1984). However, most damage observed by DMF staff has not been from the dredge, but from the propeller pulling the dredge, particularly when season opening coincides with low tide (T. Murphey, DMF, pers. com. 2015). Most catch is now taken by hand when the season is opened by proclamation. The projected impact of intense scallop dredging on juvenile scallops prompted Bishop et al. (2005) to recommend only hand harvesting methods for bay scallops. The season is opened by proclamation for a specified area when DMF biologists determine there is a sufficient population (NCDMF 2015a). Annual monitoring of populations not only provides data for fisheries management actions, but also provides information on a sensitive environmental indicator.

When hydraulic clam dredging occurs in SAV beds, a swath approximately three feet (0.91 m) wide is excavated (ASMFC 2000), which can also significantly increase local turbidity (ASMFC 2000). Because of the severe bottom impacts, the MFC restricts use of this gear to open sand and mud bottoms, including areas frequently dredged for navigation, such as the AIWW. This gear is not allowed in SAV or oyster beds, a restriction strictly enforced. Clam kicking can also severely damage SAV, reducing plant biomass in eelgrass and shoalgrass beds (Peterson and Howarth 1987). Loss of SAV biomass and time needed for recovery increased as intensity of clam kicking increased (Peterson and Howarth 1987). The probability of historic damage to SAV via kicking seems likely because: (1) kicking was first experimented with in eastern North Carolina during the 1940s, (2) almost 150 kicking vessels operated in 1980 in Carteret County alone, and (3) kicking vessels operate in shallow waters (Guthrie and Lewis 1982). As a part of CHPP implementation, the area allowed for clam kicking was modified by proclamation to clearly avoid all SAV and oysters beds and to establish a buffer of 50-100 feet between the gear and habitat.

Trawl doors have been shown to bring infaunal bivalves to the sediment surface. Gilkenson et al. (1998) and Sanchez et al. (2000) observed more annelids in muddy bottom post trawling in the Mediterranean Sea. Studies in areas that are consistently trawled show that otter trawls negatively affect nematode abundance, production, and genus richness in areas not susceptible to environmental stresses (e.g., wind events) (Hinz et al. 2008). Gear contact can uproot and remove invertebrates attached to the seafloor, such as sponges and worm tubes, and expose them to predators.

Changes to and reduction in the structural complexity of the seafloor, with increases in turbidity from frequent trawling, can reduce success of filter feeding invertebrates by clogging gills and augmenting predation due to increased exposure. A reduction in filter feeders on the subtidal bottom can also result in reduced water clearing capacity (Auster and Langton 1999). Increased turbidity reduces light penetration and consequently, the primary productivity of benthic microflora on the seafloor, as well as phytoplankton in the water column (Auster and Langton 1999). Decreased primary productivity affects demersal zooplankton that support higher trophic layers. The sediment composition of the bottom can also change with frequent trawling. Given the close relationship between sediment size and benthic community structure, this sediment shift will alter the benthic community (Thrush and Dayton 2002). Reduced diversity and abundance of some benthic taxa are commonly observed in areas experiencing intense fishing (Auster and Langton 1999; Thrush et al. 2006), as well as a shift in dominant species and reduction in community stability. Long-lived species, which take more time to recover from disturbance, may be temporarily or indefinitely replaced by short-lived species. However, given the frequency, magnitude, and location of trawling, it is unknown whether these events have a significant negative impact on soft bottom habitat in the estuarine system.

Trawling can affect primary productivity through the connection of bottom and water column processes (DMF 1999). Nutrients released into the water can increase nitrogen and phosphorus levels, stimulating phytoplankton growth and enhancing secondary productivity of herbivorous zooplankton and larger prey (DMF 1999). The increased plant growth can reduce bottom penetrating light and extend the effects of trawling beyond episodic increases in turbidity. Eventually, the remains of plankton and other organisms will settle, adding to the food available to benthic deposit feeders. However, if large amounts of organic matter are resuspended, the increase in plankton can reduce water oxygen levels, causing hypoxia and anoxia (Paerl et al. 1998; West et al. 1994). By resuspending sediments, trawling can make inorganic and organic pollutants available in the water column (DMF 1999b; Kinnish 1992). Such toxins can negatively affect productivity and accumulate in organisms through food chain interactions.

Some feel trawling may mimic natural disturbances and stimulate benthic processes, enhancing fish production. In a literature review of the effects of trawling in estuarine waters, DMF (1999) noted that multiple studies demonstrated the presence and absence of long-term effects of trawling in estuarine waters. No or minimal long-term impacts were reported in MacKenzie (1982), Van Dolah et al. (1991), and Currie and Parry (1996). Of these studies, Van Dolah et al. (1991) was located closest to North Carolina, in a South Carolina estuary. After five months of trawling, Van Dolah et al. (1991) found no significant change in abundance, diversity, or composition of soft bottom habitat. To the contrary, several studies have found trawling to have long-term habitat impacts (Bradstock and Gordon 1983; Brown 1989; Collie et al. 1997; Engel and Kvitek 1998). Benthic community recovery time greatly depends on the effort and intensity of trawls in a given area (Auster and Langton 1999; Watling and Norse 1998), and varies depending on the amount of natural disturbance (weather or macrofaunal).

The impact of trawling and associated bottom changes on fish populations depends in part on each species' habitat dependence (Auster and Langton 1998). Where a demersal species' life stage is obligate on the structural component of a habitat where trawling occurs, particularly for recruitment, there is a greater potential for impact by trawling (Auster and Langton 1998). However, if individuals can move to and survive in alternative habitats, impacts may be less severe (DMF1999).

Primary nursery areas and inlets are "recruitment bottlenecks" for estuarine dependent species . Since larval flounder, shrimp, and Atlantic croaker must pass through inlets to recruit to PNAs, trawling impacts to larval fish in inlets and PNAs could be greater than in ocean or deep estuarine waters. Protection in these areas is therefore very important for estuarine dependent fish and invertebrates. Current MFC restrictions on trawling protect PNAs, however many shallow soft bottom areas are productive but not designated as primary or secondary nursery.

Many studies have been conducted around the world assessing the effects of trawling on soft bottom habitat in offshore waters. A meta-analysis of literature on fishing impacts to continental shelf benthos quantified impacts of otter trawls on subtidal bottom in eastern North America (Table 8.4)(Collie et al. 2000; DMF 1999a). Some conclusions were:

- Otter and beam trawling have fewer negative impacts on benthos than intertidal or scallop dredging or intertidal raking.
- In subtidal areas, sand habitats were least impacted and muddy sand and gravel most impacted.
- In muddy sand, polychaetes and large bivalves were most negatively impacted. Smaller bodied organisms were displaced by pressure waves in front of fishing gear.
- Depth and scale of fishing had insignificant effect on initial impact but significant effect on recovery. Recovery is slower where the spatial scale of impact is larger and in deeper waters where the bottom is more stable.
- Recovery was most rapid in less physically stable habitats such as sandy bottom (recovery in sand, estimated from modeling, was approximately 100 days).
- Benthos most impacted were Anthozoa (corals and anemones) and Malacostraca (crabs, amphipods), while copepods and ostracods were least impacted.
- Benthos had more negative responses to chronic disturbances than to acute.
- Epifaunal organisms are less abundant in areas subjected to intensive bottom fishing.
- Fish and benthos in areas heavily fished shift from communities dominated by high biomass species towards those with high abundance of small-sized organisms.
- Large-scale long-term experiments with and without fishing pressure are needed, to examine and better quantify cumulative fishing impacts and recovery patterns.

Table 8.4. Soft bottom trawl impact studies on the continental shelf of eastern North America.

Reference	Habitat	Depth (m)	Recovery Period (days)
Van Dolah et al. (1991)	Sand	20	180
Van Dolah et al. (1991)	Sand	8	180
Auster et al. (1996)	Sand	30	3,650

These conclusions suggest that the dynamic soft bottom community found in nearshore ocean communities is less impacted by trawling and recovers much quicker than in estuarine systems. However, some long-term impacts to the benthic community may occur, especially to the epibiota, depending on the frequency of trawling and site-specific characteristics. Repeated and prolonged trawling over muddy ocean bottom negatively influences the benthic fauna, decreasing the abundance and diversity of epifaunal invertebrates, possibly altering the food web (Hinz et al. 2008).

Even with a low fishing effort, dredges are considered to be the most habitat destructive fishing gear (Collie et al. 2000; DeAlteris et al. 1999). Because of the gears' teeth, crab and oyster dredges can dig deep into the sediment and cause extensive sediment disturbance. In 2013, mechanical clamming, including kicking and clam dredging, accounted for approximately 7% of the annual hard clam landings (NCDMF 2014a). The dredging and kicking activity creates trenches and mounds of discarded material on soft bottom habitat, redistributing and resuspending sediment (Adkins et al. 1983). Water jets from the hydraulic dredge can penetrate 18 inches into sediments, uprooting living structures (Godcharles 1971). Dredge tracks can remain from days to more than a year, and vegetation recolonization can take months to begin. Recruitment of clams and other benthic invertebrates does not appear to be affected by hydraulic dredging (Godcharles 1971; Peterson et al. 1987). Because of the impacts to habitats, both hydraulic clam dredging and kicking are restricted to open sand and mud bottoms, including areas frequently dredged for navigational. There are approximately 43,900 acres that are potentially available to mechanical clam harvest statewide, with the majority of these located in Core Sound (29,954 acres). These fisheries can be opened by proclamation between December 1 and March 31.

Gillnets are passive fishing gear that can be made active by dragging weighted objects to scare fish into nets. These objects (e.g., weights, chains, cinder blocks) vary in weight, and can disturb the habitat in a manner similar to trawl doors or toothless scallop dredges. In 2007 DMF became aware of active gillnets in PNAs in the spot, mullet, flounder, and speckled trout fisheries. While there was no rule against active gillnets in PNAs, bottom disturbing gears were prohibited. According to T15A NCAC 03J .0103, the director may limit the use of gillnets and the means/methods they are fished. North Carolina Marine Patrol had observed active gillnets being used in PNAs in the central district of the state, and more prevalently in the southern district (DENR 2008). To determine the necessity for further action, an issue paper was written in 2008 by Katy West, DMF, and presented to the MFC in April of 2007. The paper detailed potential impacts from this activity, with options for actions. In August, the MFC recommended action by proclamation. Additionally, there was an NC Sea Grant Fisheries Resource Grant (Kimel et al. 2010) investigating the impacts of active gillnets on PNAs. The study concluded that the bottom impact from the dragged objects represented a low disturbance and that the impact from the boat prop during side-setting was likely more significant. They also noted that the prolonged effects would be greater in low energy environments like bays and creeks than in open high energy areas of the AIWW, rivers, and large sounds. These results, in combination with the low level of effort to this technique, indicated that the short and long term habitat impacts from side-setting and active gillnet fishing would be low. Given this outcome of the study, DMF opted not to take proclamation action.

8.1.2. Hand Harvest Gear Types

The majority of hard clams in North Carolina are harvested by hand harvest methods (NCDMF 2014a), including hand and rake in shallow water (< 1.2 m or 4 ft.) and tongs and bull rakes in deeper waters. The harvest of clams or oysters by tonging or raking on intertidal beds causes damage to living oysters and to the cohesive structure of the reef (Lenihan and Peterson 1998). This destruction is an issue where both mollusks exist, primarily around the inlets in the northern part of the state and on intertidal oyster beds in the south (DMF 2001c). Studies by Noble (1996) and Lenihan and Micheli (2000) quantified the effects of oyster and clam harvest on oyster rocks. The former study found that the density of live adult oysters was significantly reduced where clam harvesting occurred due to incidental shell damage and sedimentation. Conversely, oyster harvesting had little effect on clam populations.

Oyster rocks are protected from mechanical harvest of clams and bull rakes by MFC rules (T15A NCAC 03K .0304 and 03K .0102), Table 8.3. The DMF has also designated some areas as Shellfish Management Areas where enhancement activities are conducted (shell is added and/or oysters are transplanted) and oystering and clamming are restricted or prohibited, except by proclamation (Map 3.4a-b).

Bull rakes and large oyster tongs can uproot SAV, causing substantial damage, while hand rakes are more selective and cause less damage (Thayer et al. 1984). Some effects include removal of shoots and rhizomes and the amount of damage increases with the size of the gear (Peterson et al. 1987).

8.1.3. Passive Capture Techniques

Entanglement gear, such as gillnets, does not cause bottom disturbance and is size selective, allowing passage to smaller species. However, certain sized gillnets can unintentionally capture larger non-targeted species. The gillnets then impede the corridor function of the water column that allows migration of protected species, which, in North Carolina, includes several species of sea turtles and two of sturgeon. All five sea turtles that regularly visit North Carolina are listed as endangered or threatened under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531-1543). The DMF has been issued two Incidental Take Permits under Section 10 of the ESA by NMFS. The permits require DMF to monitor commercial fisheries closely through the observer program and to minimize interactions between the fisheries and these species. This is accomplished through regulations affecting the fishing operations, including mesh size, area/seasonal closures, and net attendance requirements.

Bottom longlines and fish traps can physically damage the structure of hard bottom, and injure or kill associated sessile biota (SAFMC 1998a). However, these fishing gears are of minimal concern as they are not used extensively in state waters. Use of bottom longlines was prohibited by federal regulations in depths of less than 50 fathoms (300 ft) throughout the South Atlantic area as part of Amendment 4 of the Snapper Grouper FMP in 1991 to reduce fishing mortality and habitat damage. Fish traps were also prohibited in federal waters through Amendment 4, with the exception of smaller black sea bass pots, which are allowed if equipped with escape vents and biodegradable panels to release undersize fish and eliminate potential waste from lost pots. In North Carolina state territorial waters, fish traps cannot be used to target snapper-grouper, but are allowed for black sea bass. Nevertheless, black sea bass pots are more commonly used in federal waters and may have a greater impact to hard bottom in those areas.

Pots are used extensively in the crab fishery in North Carolina, primarily in estuarine waters. Most crabs are landed between May and October. Crab pots are wire-mesh boxes measuring approximately 2 by 2 feet. Pots for hard crabs require escape rings, while peeler pots do not (DMF 2013). Pots are weighted to rest on the bottom and can have a variety of habitat impacts. They can smother SAV, damage of hard bottom (Barnette 2001), and are capable of ghost fishing if lost or abandoned. Many states, including North Carolina, have a closed season in which crab pots are required to be removed from the water.

8.1.4. Rod and reel

Although direct impacts of rod and reel gear on hard bottom habitat are considered low, recreational fishing was identified by NMFS as a major concern because of the large number of participants in the fishery (Hamilton 2000). Reef fishes are targeted by many recreational fishermen, and the habitat may receive concentrated use, leading to unknown cumulative impacts. Lost gear and discarded rubbish (especially plastics) can entangle or be ingested by marine life (Sheavly 2007) as well as cause tissue abrasions and partial colony mortality of sessile invertebrates (Chiappone et al. 2005). Roughly 18% of marine debris identified in U.S. waters is comprised of ocean-based items, including fishing line, floats, and buoys (Sheavly 2007). Bauer et al. (2008) found that at Gray's Reef National Marine Sanctuary, the presence and abundance of marine debris, particularly hook and line fishing gear, was directly related to observed recreational boating and fishing activity. In the Florida Keys National Marine Sanctuary, hook and line gear represented 87% of the marine debris removed from about 6.2 acres of hard bottom habitat, although less than 0.2% of the available milleporid hydrocorals, stony corals, and gorgonians were adversely affected (Chiappone et al. 2005; Chiappone et al. 2004). In addition to the potential physical effects of discarded fishing gear, chemical contamination from lost lead sinkers is a concern.

8.2. Navigational Dredging

Navigational dredging is the excavation of sediment for navigation and docking facilities, and sand for beach nourishment. Dredging for drainage purposes is addressed in the Hydrological Alterations chapter.

Early waterfront communities were developed adjacent to deepwater for boating access. With much of the deepwater now built upon, new development often occurs where dredging is needed for boating access. Dredging to create, expand, or maintain deepwater access can occur in shallow subtidal bottom, intertidal habitat, or uplands to form canals, basins, or marinas. Most of North Carolina's estuarine waters are shallow, and are where structured habitats, like wetlands, SAV, and shell bottom exist. They are, consequently at risk to navigational dredging impacts.

Inlets are dredged at variable frequencies to maintain navigation access to the ocean or to protect oceanfront development; some inlet channels have been relocated through extensive dredging to shift erosion patterns. In North Carolina, shipping channels are dredged in ocean waters for access to state ports or to obtain sand from borrow areas for beach nourishment. Other potential reasons for dredging include development and operation of offshore energy facilities, or for installation of infrastructure such as fiber optic cables or utility lines. Maintenance dredging is necessary to preserve water depths for commercial and recreational navigation. The location of channels, (dredged and not) ports, marinas, boat ramps, and multi-slip docking facilities in coastal North Carolina are shown in Maps 8.1a-b.

8.2.1. Location and types of navigational dredging

The U.S. Army Corps of Engineers (USACE) has authority to maintain navigation in the waters of the United States for the purpose of interstate commerce. The USACE dredging can be performed with a sidecast, hopper, clamshell, or pipeline dredge, depending on the size and location of work, and material disposal methods. Material dredged by sidecast is deposited on either side of the channel. Hopper dredges place the material in the nearshore zone (10-18 foot contour), on the beach with direct pumpout capabilities, or in an EPA designated ocean dredged material disposal site. Material dredged by hydraulic pipeline can be placed on nearby beaches or within confined upland diked disposal areas.

Navigational dredging in inlets is allowed year round by the USACE, but is subject to a variety of fish, mammal, sea turtle, and bird moratoria by different federal and state agencies regarding excavation, equipment presence, and spoil placement. Contractors working in the Wilmington and Morehead City port areas and Oregon Inlet are requested to refrain from using hopper dredges in the December to March time period to avoid the taking of sea turtles (J. Richter, USACE, pers. com. 2010).

Commercial navigational channels were dredged through coastal North Carolina by the USACE in the 1930s while creating the Atlantic Intracoastal Waterway (AIWW). The USACE is responsible for maintaining the AIWW. There are now over 1500 miles of navigable channels in the AIWW, including 300 miles in North Carolina. Most of the AIWW is targeted for a 12 ft maintained depth. The AIWW immediately inside of inlets are more vulnerable to shoaling and are dredged more frequently than other areas of the AIWW. Shallow draft inlets are authorized to be maintained at 14 ft or less. These include Bogue, New River, New Topsail, Carolina Beach, Lockwood's Folly, Barden, Oregon, and Masonboro inlets (J. Richter, pers. com. 2015). The latter two are targeted for 14 ft depth, while the others are targeted for 6-8 ft. Ocracoke Inlet is federally authorized for 18 ft. Carolina, Masonboro, and Shallotte inlets are designated borrow areas for beach nourishment.

Inlet dredging by the USACE is done by sidecast or hopper dredge. Associated disturbance can deter or alter summer spawning activity of red drum, weakfish, spotted seatrout, silver perch, and blue crab (Luczkovich et al. 2008), which occurs from May through October, depending on the species. Because spawning activity occurs at night, daytime dredging may have less effect. Possible indirect effects from dredging include reductions in benthic prey and alterations of the acoustic environment.

The USACE procedures for inlet sidecast dredging require working during outgoing tides to reduce sedimentation over marsh, oysters, and SAV, and to prevent refilling of estuarine areas. This has been a logistical challenge with some non-compliance (S. Corbett, MFC, pers. com. 2015). There are two deep draft ports in North Carolina maintained at depths of 45 and 42 ft - the Beaufort and Cape Fear ports, respectively. Maintenance of the federal channels at Morehead City, Wilmington Harbor, and Oregon Inlet is conducted by hydraulic pipeline or hopper dredge.

There are many privately maintained channels serving marinas and docking facilities. Requests for new channels continue as development increases, putting wetlands, SAV, oyster beds, and nursery areas at risk. The southern coast has been modified substantially relative to its small waterbodies, proportion of shallow waters, and amount of developed shorelines.

8.2.2. Disposal of dredge material

Prior to implementation of the Coastal Area Management Act in 1974, dredge material was often used to fill wetlands and low elevation uplands to create land suitable for development. During the initial dredging of the Intracoastal Waterway in the 1930s, numerous spoil islands were created in estuarine waters to store dredge material, converting estuarine waters and wetlands to uplands. Dredge material can be used for beach nourishment (suitable material), put on nearby land, stored on the aforementioned spoil islands, or disposed of in designated ocean dredge material disposal sites.

8.2.3. Impacts

8.2.3.1. Loss of shallow estuarine habitats

An obvious channel dredging impact is the physical loss of shallow habitat, such as wetlands, SAV, or shell bottom, within the dredge footprint. Impacts extend around the dredge footprint from sloughing into the channel and when sedimentation covers nearby SAV or oysters. Dredge and fill activities have historically been recognized as the primary physical threat to SAV (Erftemeijer and Robin Lewis Iii 2006; Orth et al. 2006) and wetlands (Dahl 1990; Hefner and Brown 1985). In the United States, loss of SAV habitat from dredge and fill activities has been particularly severe in bays with major ports or metropolitan areas, such as Tampa, Galveston, and Chesapeake bays (Duarte et al. 2005; Taylor and Saloman 1968).

8.2.3.2. Hard bottom

In ocean waters, channel dredging can damage hard bottom by dislodging corals or colonized rock (live rock), and associated sedimentation can smother coral polyps, as well as injuring live tissue, which may lead to infection or mortality (Erftemeijer et al. 2012; SAFMC 1998a). While state and federal regulatory measures have reduced channel dredging impacts to these habitats (Dahl 2000), small losses are sometimes permitted, resulting in cumulative losses over time.

8.2.3.3. Soft bottom

Deepening of shallow-water soft bottom results in loss of nursery habitat for some estuarine-dependent species (Rozas 1992). When waters are deepened close to the shoreline, predator protection is abated. Productivity is affected because primary and secondary production of the benthic community is higher in shallow habitat, where microalgae thrive on the sediment surface and SAV grow. Fish also grow faster in this environment. Converting shallow habitat to deeper basins and channels reduces this productivity (Wendt et al. 1990). Navigational dredging can similarly lower productivity in deeper waters by temporarily removing existing benthic infauna from the affected areas, reducing food availability to bottom feeding fish and invertebrates (Hackney et al. 1996a; Peterson et al. 2000b). In addition to direct habitat loss, dredging reduces shallow bottom with suitable depth, sediment characteristics, and water clarity for recolonization by wetlands, oysters, or SAV (Funderburk et al. 1991; Stevenson and Confer 1978).

8.2.3.4. Sedimentation and Turbidity

Navigational dredging can adversely affect aquatic habitat by altering sediment characteristics and increasing turbidity and sedimentation. Dredged channels tend to refill with finer sediments and flocculants (Bishof and Kent 1990; DWQ 1990; Thayer et al. 1984). The finer redeposited sediments are more susceptible to resuspension by currents or bottom disturbance from gear or boat wakes, increasing potential for long-term elevated turbidity (Dellapenna et al. 2006b; Schoellhamer 1996b). Chemicals, metals, nutrients, and organic matter that accumulate in the sediment can be released into the water column, causing short-term increases in toxins, algae, and bacterial concentrations, which are then biologically available to organisms (Corbett et al. 2009; Lalancette 1984; Warnken et al. 2003). Redeposited sediment on SAV leaves and elevated turbidity reduce light necessary for SAV survival and retard colonization of unvegetated areas (Thayer et al. 1984; Wilber 2005). When sediment settles on oysters, SAV, and hard bottom, living organisms can be smothered, resulting in mortality or impeded growth (Wilber 2005). Even low levels of siltation affect growth of oyster beds by reducing recruitment of larvae. Spawning habitat for sensitive species such as anadromous fish and mussels, which prefer exposed rock, rubble, and coarse sediment, is degraded by increased turbidity and sedimentation (Bock and Miller 1995). Depending on the severity and extent of turbidity, reefs can be buried or decreased productivity can occur (Crowe et al. 2006; SAFMC 1998a). The biological impacts of dredging are less severe in coarse sediment and strong currents because the sediments lend themselves to shorter suspension times, and the currents can disperse the sediments (Corbett et al. 2004; Schoellhamer 1996b).

Aquatic organism effects from suspended and redeposited sediments associated with channel dredging were summarized in (Wilber and Clarke 2001) and (Wilber 2005). Suspended sediments can clog gills of fish, oysters, and other invertebrates. Turbidity reduces visibility for visually foraging predators, disrupting feeding or causing fish to relocate to less optimal areas. The suspended sediment can also cause abrasion and damage to fish eggs, reduce bivalve pumping and consequently growth rates, and cause mortality, particularly of non-mobile invertebrates (Hackney et al. 1996a; Lindquist and Manning 2001; Reilly and Bellis 1983; Wilber and Clarke 2001). Where dredging occurs near ocean hard bottom, sedimentation can cause sublethal stress to corals and other sessile invertebrates. A meta-analysis by Wilber and Clarke (2001) concluded that the combination of exposure, duration, and concentration of sediments controlled the effect on aquatic organisms. Sediment characteristics, currents, and mobility of organisms were also important. For mobile fish, exposure durations to sediment increases was estimated to range from minutes to hours, with a maximum of one day. For non-mobile organisms, such as bivalves or demersal adhesive fish eggs, maximum exposure duration was estimated to be 3.5 days. Within the one day window of excess sediment exposure for juvenile and adult salmonid and freshwater fish, the response was behavioral or sublethal. Within the 3.5 day window for salmonid and freshwater fish eggs and larvae, the response varied from less than 25% mortality to 75% mortality. The response of estuarine and non-salmonid fish eggs and larvae varied from no effect to less than 25% mortality.

8.2.3.5. Impacts to fish

Fish species using dredged, poorly flushed waterbodies, such as channelized ditches, dead-end canals, or enclosed marinas, are at greater risk to exposure from degraded water quality conditions. These waterbodies can have low DO, high contaminant loading, extreme water temperatures, and rapid salinity changes (Chaillou and Weisburg 1996). Water quality assessments by EPA in Delaware and Maryland coastal bays found that dead end canals had the lowest water quality conditions, with chemical contaminants exceeding guideline values in 91% of canals, DO concentrations exceeding standards in 57% of the canals, and that the benthic community diversity was significantly lower than in other waters (Chaillou and Weisburg 1996). However, dredged waterbodies provide fish habitat, and shallow channelized streams and canals located at the headwaters of PNAs can augment critical nursery habitat. A visual GIS evaluation of over 2,400 fish nursery areas (PNA, SNA and IPNAs) suggested that about 40 designated areas were drainage canals (DMF, unpublished data, 2010).

8.2.3.6. Flow alterations

Channel deepening can alter circulation patterns with several different outcomes (Beck 2009; van Maren et al. 2015; Wilber 2005; Yanosky et al. 1995). Dredging channels can increase tidal amplification, flood flow velocities, and estuarine circulation. Since more sediment is transported with increased velocity, sediment and saline water is transported further up estuary (van Maren et al. 2015; Yanosky et al. 1995). Dredged channels can further concentrate and increase flows within the altered conduit, and reduce flows over shoals and shallower bottom. Slower velocities over the shallow bottom results in less transport of sediment out of the estuary (Beck 2009).

8.3.3.7. Saltwater Intrusion

The dredging and deepening of inlets and waterways can increase saltwater intrusion, causing a change in wetland species composition along the boundary between salt/brackish and riverine wetlands. Saltwater intrusion in the Cape Fear River was documented by Hackney and Yelverton (1990) and Yanosky et al. (1995). The latter concluded that the cause of the saltwater intrusion was channel dredging that began in the late 1800s, the creation of Snow’s Cut connecting the Intracoastal Waterway in Carolina Beach with the lower Cape Fear River, and/or a rise in sea level. The effect of saltwater intrusion on wetlands in the Cape Fear River is readily noted by the dead bald cypress. Yanosky et al. (1995) confirmed higher concentrations of salt elements (chloride, sodium, and bromide) in trees located in areas exposed to a greater extent and frequency to saline waters. In the area of higher impact, approximately 50% of the forested wetland converted to salt marsh over a period of roughly 40 years, and areas once known for rice farming (freshwater) now have salinities ranging from 5-18 ppt (brackish) (Hackney et al. 2007; Hackney and Yelverton 1990).

Data from NOAA /NOS tide gauge stations support that channel deepening has resulted in increased tidal inflow. Data from the Cape Fear River show that during the years of 1935-1999, the average tide range increased at a rate of 542 mm (21 in) per century (Flick et al. 2003), allowing ocean water to reach further upstream. Zervas (2004), looking at the same data for 116 stations in the US, found that four sites, including Beaufort Inlet and Cape Fear River, had statistically significant trends in mean tide range. In Beaufort, mean tidal range increased 0.1 m since the mid-1970s. In the Cape Fear River, tide range increased by about 0.3 m up to the mid-1970s, and then slowed. Both inlets were extensively dredged over the years to support ports. Beaufort Inlet was dredged to 20 ft by 1911, to 35 ft by 1961, and to 47 ft by 1994. The Cape Fear River was dredged to 16 ft by the late 1800s, to 40 ft by 1964, and is currently maintained at 44 ft. The study concluded that the increases in average tide range were most likely due to the alterations in bathymetry of the inlets and river channels (Zervas 2004).

Researchers have hypothesized that deepening of other inlets and estuarine channels in North Carolina, as well as a rise in sea level, has led to an increasing inflow of ocean water, which has gradually increased the salinity of the estuaries (N. Lindquist, UNC-IMS, pers. com. 2015). In 2012, staff at APNEP compiled salinity data from DWQ estuarine monitoring stations to examine long-term (1980-2009) trends in salinity in the Albemarle-Pamlico system. Seven of the nine assessed sub-regions had a slight upward trend in salinity that was statistically significant. The results indicated that mean salinities and fluctuations were primarily associated with proximity to large areas of freshwater or saltwater inputs (APNEP 2012). Some areas in Pamlico Sound that traditionally supported oyster reefs no longer do so because of boring sponge (*Cliona* spp.) infestations which can survive in the current salinity range (22-25 ppt) (N. Lindquist, UNC-IMS, unpublished data, 2014). Boring sponges bioerode calcareous material, which then weakens the organism, allowing other predators such as oyster drills, to continue to weaken and kill the shellfish (Dunn et al. 2014). In fresher (<20 ppt salinity) and intertidal waters, boring sponges cannot survive. Research is underway at the UNC Institute of Marine Sciences (IMS) to compile an historical salinity database in order to assess trends in salinity, and determine the major drivers of the observed trends (e.g., channel deepening, sea level rise, rainfall, runoff) (B. Govoni, DMF, pers. com. 2015).

8.2.4. Benefits of navigational dredging

While navigational dredging can degrade aquatic habitat, it has been used in some instances for beneficial purposes. The mouths of some creeks along the AIWW have shoaled due to suspension and settlement of sediment. In 1995 and 1996, the mouth of Futch Creek in New Hanover County was dredged to increase flushing, lower bacteria levels, and improve water quality. Fecal coliform levels declined and a small amount of additional acreage was opened to shellfish harvesting. As of 2008, the creek continued to maintain better fecal coliform levels since the mouth was dredged (Mallin et al. 2002b; Mallin et al. 2008). However, when Bald Head Creek was similarly dredged to reduce bacterial contamination, water quality did not improve (R. Carpenter, DMF, pers.com. 2010).

The USACE has conducted several restoration projects that involved dredging and filling. In the Cape Fear River, an upland dredge material island was excavated to create shallow meandering creeks with sloped edges supporting fringe marsh. Similarly, in Wanchese, a rock sill was constructed and fill material was removed and contoured to create a wide marsh with shallow tidal creeks. Other beneficial uses of dredge material include creation of bird nesting islands, and enhancement and restoration of wetlands due to losses from previous dredging, interruption of barrier island overwash processes, and sea level rise. The USACE, as mitigation for past channel dredging activities, is planning to establish 42 acres of subtidal oyster habitat in Pamlico Sound, which will be managed as oyster sanctuaries.

8.2.5. Status of navigational dredging

The maintenance frequency for federal channels ranges from two to 12 years, depending on funding availability and severity of shoaling. The areas authorized for navigational dredging by the USACE and the 2015 status are shown in Table 8.5. While approximately 40 miles of beach are approved for disposal, only about 15 miles of beach usually receive dredge material (J. Richter, USACE, pers. com. 2015).

Funding for federally authorized projects is mostly derived from the USACE and DWR. Non-federal channels can be maintained with state and local funding. Federal funding continues to decline for maintenance dredging projects. Subsequently, many channels are not being dredged enough to maintain adequate water depth for recreational and commercial vessels. The Coast Guard closed Oregon Inlet intermittently in the past few years when shoaling made navigation hazardous. State and local governments have looked to other sources to supplement funds. The North Carolina Beach, Inlet and Waterway Association (NCBIWA), was formed to lobby for additional funding for navigational dredging and beach nourishment. In 2013, the General Assembly passed a law creating a fund to support dredging of shallow draft inlets (S.L. 2013-360), or the Shallow Draft Navigation Channel and Lake Dredging Fund. Revenues for the fund are specified to come from increased boater registration and title fees and a portion of the Highway Fund proceeds, and are to be managed by DWR. Approximately $7 million/year has been raised through this law. Dredging of large navigation channels through ocean bottom in North Carolina is limited to entrance channels leading to the state ports in Wilmington and Morehead City via Cape Fear and Beaufort inlets.

Seasonal timing of navigational dredging projects is dependent upon the area, the type of equipment, and the anticipated environmental impacts. Resource agencies have established moratoria to protect species during critical life stages. These moratoria are from sampling data, known fish distribution, and known impacts to a fish or habitat from exposure to turbidity or sedimentation. For example, DMF has regional moratoria for work in designated PNAs, or anadromous fish spawning and nursery areas (Table 8.6). Similarly, WRC has moratoria related to protected species like nesting sea turtles, and NMFS has moratoria for anadromous fish. The USACE and dredge companies sometimes request extensions during the moratorium when they have not completed work or shoaling is a hazard. Requests to work during dredging moratoria have increased in recent years, and are considered on a case-by-case basis.

8.2.6. Summary

Navigational dredging has impacted wetlands, SAV, and shell bottom located in shallow nearshore waters. Sedimentation and turbidity degrades water quality during and following the bottom disturbance. Navigational dredging moratoria are designed to minimize turbidity and other impacts. Federally authorized channels are maintained, but funding shortages have limited the frequency. New federal channels are not being permitted currently, but some private channels are, as developers of shoreline communities' desire deepwater access.

Table 8.5. Ongoing USACE navigational dredge disposal projects on North Carolina ocean beaches (J. Richter, USACE, pers. com. 2015).

Dredging Project	Disposal location	Length limits (mi)	Estimated quantity (cu. yd.)	Comments
Avon Harbor vicinity, Avon	Hatteras Island, south of Avon Harbor and extend north.	3.1	< 50,000 every 5-6 yr.	Beach disposal highly unlikely
Rodanthe Harbor vicinity, Rodanthe	Extends from south end of Pea Island NWR to south of Rodanthe Harbor.	0.9	<100,000 every 5-6 yr	Beach disposal highly unlikely
Rollinson/ Hatteras	Hatteras Island south of Hatteras Harbor and extends 5.85 mi north of Frisco.	5.9	<60,000 every 2-3 yr	Beach disposal highly unlikely
Silver Lake	Southwest end of Ocracoke Island.	0.4	<50,000 every 2-3 yr	Beach disposal highly unlikely
Oregon Inlet	Pea Island south from Oregon inlet.	3.0	~ 1,000,000 every 4-5 yr	
Drum Inlet	Core Banks, extending 1 mi either side	2.0	298,000 initial, 100,000 maint.	Has not occurred in 15+ yr; highly unlikely
Morehead City	Bogue Banks, from Beaufort Inlet west to Pine Knoll Shores	7.3	3,500,000 every 8-10 yr.	DMMP* underway - sand to go on Bogue Banks and offshore of Shackelford.
AIWW, Pine Knoll	Pine Knoll Shores	2.0	<50,000 every 10-12 yr.	
AIWW Bogue Inlet	Bogue Banks from Bogue Inlet east to Emerald Point Villas	1.0	<100,000 /2-3 year	
AIWW, Onslow	Camp Lejeune, from Browns Inlet west	1.6	<200,000 every 3-5 yr	
AIWW, New River Inlet	N. Topsail Beach from inlet west to Maritime Way	1.5	<200,000 / yr	
AIWW	Surf City opposite N.C. 50 bridge	1.0	<75,000 every 5-6 yr (only used in 1996)	Has not occurred since 1996; beach disposal unlikely
AIWW, Topsail Inlet and Creek	Topsail Beach, north of Topsail Inlet	1.0	<75,000 / 2-3 yr	Beach disposal possibly every 2-3 yr but otherwise sidecast
AIWW, Mason Inlet crossing	North end Wrightsville Beach 2000' from Mason Inlet	0.4	<100,000 (not scheduled)	Inlet and AIWW crossing maintained by county due to inlet relocation in 2000.
Masonboro sand bypassing	North end Masonboro Island, south from Masonboro Inlet	1.2	750,000 - 1,000,000 every 4 yr	Usually closer to 5-7 yrs
AIWW, Carolina B. Inlet, Snows Cut	North end of Carolina Beach	1.3	<50,000 / yr	
AIWW	North end of Carolina Beach, south of Carolina Beach Inlet to town limit	0.8	<100,000 / yr	
Cape Fear River, Wilm. Harbor	To Bald Head for first 2 events, then to Caswell and Oak Island for 3rd event; repeat cycle	4.7 mi 1st event, 2.8 mi after	Approx. 1,000,000 every 2 yr	Determined by DMMP, under revision.
Cape Fear River, Wilm. Harbor	Oak Island, Holden Beach	0.2	<30,000 - one time/ 8-10 yrs	Only received one time to date from initial dredging
AIWW Holden Beach	Holden Beach	2.0		5-6 times in recent years with additional local funding
AIWW Ocean Isle	East end Ocean Isle Beach	0.6	50,000-150,000 every 1-2 yr	
Total		**~40**		

Table 8.6. DMF regional moratoria for in-water work. *

District Office	Area	Standard fish moratorium period	Anadromous fish moratorium period
Southern	SC line north through Onslow Co	1 April – 30 September**	1 February – 30 June
Central and Pamlico	Carteret Co north through Long Shoal River, including the Neuse basin above New Bern and all of Tar-Pamlico basin	1 April – 30 September**	1 February – 30 September
Northern - Albemarle (sounds/tribs)	North of Long Shoal River and including the Roanoke River basin	1 April – 30 September	15 February – 30 September (extended to 31 October from Alligator River east)
Northern - Outer Banks (sounds/tribs)	North from Ocracoke Inlet in high energy, sandy estuaries	1 April – 30 September	N/A
Inlets	shoals/channels dynamic	April 1 - 31 July	N/A
WRC		15 Feb – 30 Sep (IPNAs)	15 February – 30 June

* All dates are approximate and dependent on site specific environmental conditions. In the Cape Fear River - use anadromous moratorium north of Snow's Cut, standard moratorium south of Snow's Cut

8.3 Shoreline stabilization

8.3.1. Estuarine shoreline stabilization

8.3.1.1. Description

Estuarine shorelines are dynamic; they accrete and erode over time due to sedimentation, tidal action, storms, boat wakes, and long-term changes in water levels. Shoreline stabilization is the modification of the natural shoreline using hardened structures or organic materials to prevent or reduce erosion. The purpose is to stabilize and protect waterfront property. As shoreline development increases, more property will be threatened by storm events and rising sea level. North Carolina's policies and rules for estuarine shoreline stabilization allow landowners to protect their property from erosion, while attempting to minimize the impacts on natural resources. This section will discuss the effects of various estuarine shoreline stabilization methods on fish habitat and the status of this activity in North Carolina.

There are a variety of methods and structure types to stabilize shorelines (Figure 8.1). These range from natural methods, such as planting wetland vegetation or constructing oyster reefs, to engineered non-living structures. Structures can be vertical (bulkheads) or sloped (riprap revetments, groins, sills). Another option is a hybrid of non-living and natural materials (sills, breakwaters, or groins that incorporate vegetation or shell plantings). The most suitable method, when considering habitat, is the one that alters the natural shoreline function the least while providing the necessary erosion control. This varies based on shoreline type, wave energy, construction accessibility, waterbody size, presence of adjacent structures, and available footprint for the structure. Hardened structures are the traditional method of choice in North Carolina, with bulkheads being the most commonly used.

Erosion control structures impact fish habitat when they alter or degrade the shoreline and shallow submerged habitat. Shallow, sloped shorelines provide refuge and migratory corridors for small and young fish. They support wetland vegetation, SAV, and intertidal oyster reefs, filter and trap pollutants, cycle nutrients, and support higher habitat and fish biodiversity. Erosion control structures can adversely impact fisheries by directly, indirectly, or cumulatively degrading these features (Seitz et al. 2006).

8.3.1.2. Fish Habitat Impacts

The effects of estuarine shoreline stabilization on fish habitat vary by structure and habitat. Natural methods, such as planted vegetation or reef construction, are considered to have the least, or positive, impact, while vertical structures are generally considered to have the greatest impact (DCM 2006).

Bulkheads

Numerous physical, biological, and hydrological impacts have been attributed to bulkheaded shorelines. (Bilkovic and Roggero 2008; Bozek and Burdick 2005; DCM 2006; NRC 2007; Pilkey et al. 1998; Pilkey and Wright 1989; Rogers and Skrabal 2002; Walton and Sensabaugh 1979). Vertical hard structures alter the bathymetry and hydrodynamics of the adjacent bottom, with potentially adverse effects on shallow nursery and wetland habitats. Such structures can increase reflective wave energy, causing scouring at the toe of bulkheads, eroding adjacent shorelines, and deepening adjacent water, thus reducing or eliminating wetland vegetation and shallow subtidal habitat (Berman et al. 2007; Bozek and Burdick 2005; Riggs 2001). Deepening of waters adjacent to the bulkhead allows large predators access to small fish, reducing nursery and refuge functions (Rozas 1987). Marsh vegetation waterward of bulkheads has been shown to experience up to 63% mortality post-construction due to stress from increased turbulence and scour (Garbisch et al. 1973). Similarly impacted is SAV, in some cases.

The changes in water flow and depth at the base of bulkheads prevent wetland vegetation from reestablishing once lost (Berman et al. 2007; Knutson 1977). As water levels swell from storm events or rise from warming sea level, bulkheads obstruct shoreward migration of fringing wetlands (Boorman 1992; Bozek and Burdick 2005; NRC 2007; Titus 1998). Degradation and loss of wetlands affect many fishery species linked to this habitat, including penaeid shrimp, red drum, spotted seatrout, striped bass, and river herring, either directly, due to reduced habitat (SAFMC 1998b; SAFMC 2008b) or indirectly, due to reduced prey (Peterson et al. 2000c; Seitz et al. 2006).

Bulkheads prevent transport of sediment from adjacent shorelines to the intertidal and shallow subtidal zones (Currin et al. 2010; NRC 2007; Riggs 2001). Sediment transport into the estuary is necessary to support continued growth and maintenance of marshes and intertidal habitat over time, which provide critical nursery, feeding, and spawning grounds for fish species. This disconnect is also problematic for aquatic species that move between water and land during their life cycle, such as the eastern mud turtle, yellow-bellied turtle, diamondback terrapin (North Carolina special concern species), and American alligator (federally threatened) that live and feed in the estuarine and riverine waters, but nest above the tide line (Brennessel 2007; USFWS1972; Isdell et al. 2015; Rosenburg 1994; USFWS 2008).

There are many studies finding lower relative abundance/diversity of fishes and invertebrates adjacent to bulkheaded shorelines relative to natural shorelines with marsh, wetlands, oyster reefs, and sills:

- Gittman et al. in press: Comparing shorelines with marsh sills, bulkheads, and natural marsh, marsh sills support higher abundance and diversity of fish and bivalves than bulkheads or natural marsh.
- (Scyphers et al. 2015): In Mobile Bay, Alabama, eroded shorelines with breakwaters constructed of Reef Balls ™ or bagged oyster shell supported a greater number of species of juvenile and small resident fish than control shorelines. Both breakwaters supported low numbers oysters, more on bagged oyster shell.
- (Fodrie et al. 2014): In NC, higher fish catch rates and bivalve abundance at marsh sills than at bulkheads.
- (Lawless and Seitz 2014): Chesapeake Bay, benthic infaunal densities were lower adjacent to bulkheaded shorelines than shorelines with oyster reefs, natural marsh, or riprap.
- (Fear and Currin 2012): In North Carolina, fringe marshes in front of bulkheads had higher abundance of birds and marsh nekton species when compared to bulkheads without marsh.
- (Long et al. 2011): In the Chesapeake Bay, predation pressure on tethered juvenile blue crabs (*Callinectes sapidus*) was higher adjacent to bulkheads than in riprap or marshes.
- (Bilkovic and Roggero 2008): James River, fish community integrity and diversity reduced along bulkhead shorelines w/low and high upland development as to natural and riprap shorelines w/low development.
- (Partyka and Peterson 2008): In the Pascagoula River estuary, Mississippi, epifaunal nekton and infaunal species richness and density were greater at natural shore stabilization than hardened.
- (Bilkovic et al. 2006): Chesapeake Bay, a benthic index of biological integrity and an abundance biomass comparison of the macrobenthic community reduced significantly when developed shoreline >10%.

- (Seitz et al. 2006): In the lower Chesapeake Bay, bivalve abundance and diversity were higher in subtidal habitats adjacent to natural marsh than those adjacent to bulkheaded shorelines.
- (Peterson et al. 2000c): On the Gulf coast, the most abundant fauna along unaltered marsh and beach shorelines including penaeid shrimp, blue crab, naked goby, grass shrimp, drums, Gulf menhaden, and bay anchovy, were also the least abundant along bulkhead or rubble shorelines.
- (Waters and Thomas 2001): NC, lower numbers and diversity of fish occurred along bulkheaded shorelines than forested wetland and riprap shorelines, with particularly low numbers of juvenile anadromous fish.

The cumulative impact of multiple bulkheads can result in significant habitat degradation with associated ecosystem effects (NRC 2007). McDougal et al. (1987) found that nearshore wave impacts increase in relation to the length of the bulkhead. Where a greater proportion of a system is hardened, cumulative impacts on the benthic community are expected, as less marsh can mitigate the reduced ecosystem functions from the altered shorelines (Lawless and Seitz 2014; Seitz and Lawless 2008).

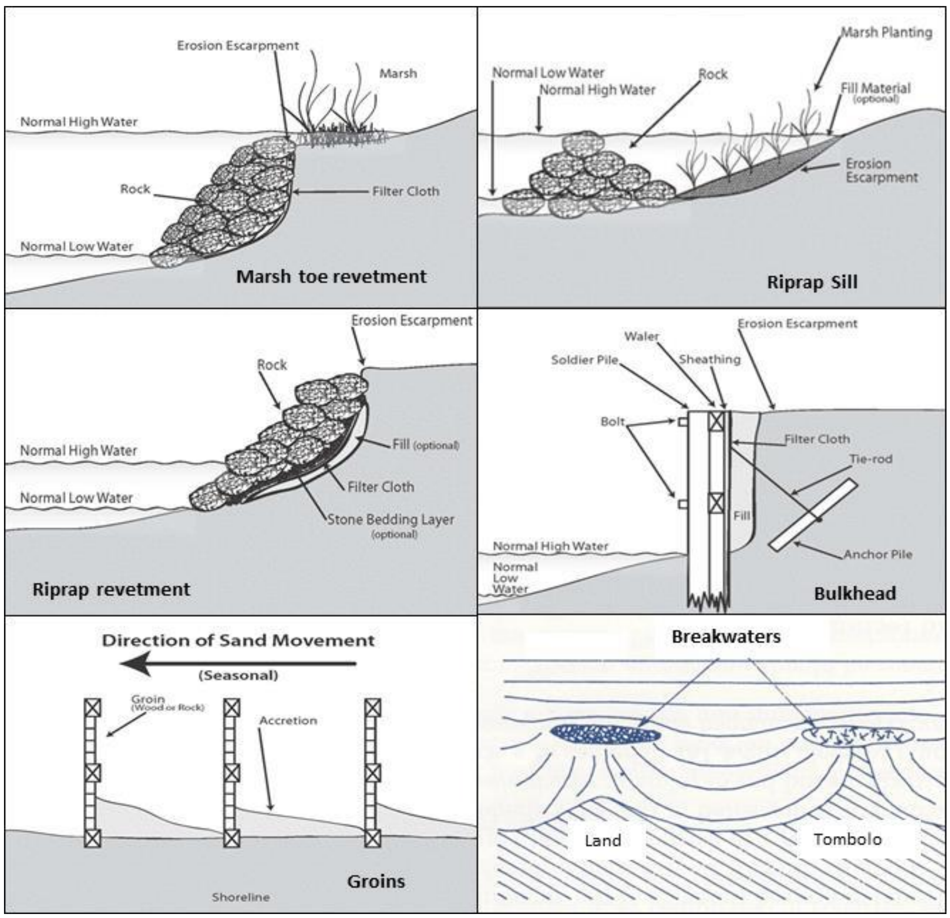


Figure 8.1. Vertical and non-vertical erosion control structures.
Marsh toe revetments constructed of rock, bagged shell, etc. Sills of rock, bagged shell, wood, vinyl, sheetpile, etc. Groins of rock, wood, vinyl, etc. Breakwaters of rock, wood, vinyl, sheetpile. Vegetative plantings, oyster reefs are more passive techniques not shown here. Source of diagrams: DCM website.

Sloped rock structures

Sloped rock structures, such as riprap revetments, possibly breakwaters and groins, are erosion control structures that are used in medium to high energy environments, to a lesser extent than bulkheads. The sloped profiles increase wave refraction to a lesser degree than vertical structures. They dissipate wave energy, resulting in less waterward scour than that of bulkheads. The three-dimensional rock material provides habitat for recruitment of larval shellfish and other invertebrates, and interstitial space provides refuge for juvenile fish (Scyphers et al. 2015; Waters and Thomas 2001). While these structures provide more habitat than bulkheads, they directly impact more shallow bottom area, due to the larger footprint over submerged bottom (DCM 2006).

Groins are designed to build sediment on the leeward side of the structure (Berman et al. 2007). Breakwaters are built parallel to eroding shorelines, for the purpose of reducing wave energy (Price 2006). These sloped rock structures provide varying levels of erosion control while maintaining valuable wetland and shallow intertidal habitat (Currin et al. 2008; DCM 2006; Piazza et al. 2005). Breakwaters can also be vertical structures with openings to allow for the passage of water, which reduces the effect of bottom scour.

Hyporheic zone

Shoreline stabilization structures have the potential to impact the hyporheic zone of the estuarine or coastal ocean system by interrupting the connectivity between the groundwater system and surface waters. In North Carolina, shoreline stabilization is prohibited in large part on the ocean shoreline. On the oceanfront, the potential to affect the hyporheic zone would only apply to shorelines stabilized by sandbags. However, if deleterious impacts from the interruption of the hyporheic zone are determined to be a threat by bulkheads and other stabilizing structures, there are approximately 10,658 miles of estuarine shoreline in subject to stabilization under the rules of the Coastal Area Management Act.

The hyporheic zone is an active ecotone between stream and groundwater (Boulton et al. 1998). Exchanges of water, nutrients, and organic matter occur in response to variations in discharge and bed topography and porosity (Boulton et al. 1998). According to the USDA-Natural Resources Conservation Service (NRCS), the hyporheic zone is the groundwater region where bidirectional flows between the stream and groundwater are common (Triska et al. 1993). Zone 1 vegetation (adjacent to the stream channel) is very important because of potential access to water and pollutants in the hyporheic zone, and should be managed for N uptake and for formation of high organic matter surface soils. Provision of leaf litter and other organic matter to the stream channels may increase denitrification in the channel and hyporheic zone (Lowrance 1997).

The importance of the hyporheic zone to the quality of coastal waters was well recognized during the development of the Chesapeake Bay buffer rules, when Maryland, Virginia, and Pennsylvania agreed to reduce nutrient loading to the Chesapeake Bay by 40% by the year 2000 (Lowrance 1997). It was established in this process that riparian ecosystems were connected to aquatic ecosystems both by direct fluxes and, belowground, through the hyporheic zone (Lowrance 1997), and that if the buffer was to be a success, this must to be taken into account.

Fear et al. (2005) studied seepage rates and the chemical composition of groundwater discharge entering the Neuse River Estuary (NRE) over an annual cycle from July 2005 through June 2006. They found high porewater nutrient concentrations (especially NH_4^+) coupled with the measured seepage rates suggesting that submarine groundwater discharge (SGD) may be an important component of nutrient cycling within the system. Their equations predicted that 21.2 metric tons of N and 2.2 metric tons of P are loaded to the system via SGD annually. The SGD represents a mechanism by which nutrients, especially N, can be transported from the sediments to the water column where they are available to support phytoplankton production.

Fear et al. (2005) addresses side-to-side seiching (oscillations within a waterbody) known to occur in the system (Buzzelli et al. 2002; Reynolds-Fleming 2003), and considers that local small scale nutrient pumping by SGD may become a more important player for main stem productivity due to the cross channel flows created (Buzzelli et al. 2002; Reynolds-Fleming 2003). Localized small scale nutrient pulses added to the system likely make SGD much more important than indicated by its relative contribution to total system nutrient loads as they occur throughout the estuary, throughout the year. The interaction of available organic matter and oxygen and biogeochemical transformations will affect the extent that hyporheic processes influence stream nutrient budgets (Findlay 1995).

Since 1984, DCM has issued permits to bulkhead approximately 633 miles of shoreline, or about 6% of the estimated 10,658 miles of estuarine shoreline[14] in North Carolina (DCM, unpublished data, 2015). Whether the chemical and biological integrity of the surface waters are altered because of the impedance of groundwater is currently unknown.

The abundance of stabilizing structures may cause a break in the natural link between groundwater and the water table with regard to seal level rise, from an elementary perspective. It is possible that by breaking the link, the water table will not be able to interact with the groundwater in a natural fashion, and allow the groundwater to rise accordingly. However, without further research, it may also be speculative (Dr. A. K. Manda, Ph.D., pers. com., 2015).

Living shorelines

Living shorelines are defined as "any shoreline management system that is designed to protect or restore natural shoreline ecosystems through the use of natural elements and, if appropriate, manmade elements" (Estuaries 2015). In areas of low wave energy, erosion can be managed with nonstructural living methods, such as planting of wetland vegetation or oyster shell, or biodegradable organic materials such as natural fiber logs (Berman et al. 2007; Broome et al. 1992; CBF 2007; Rogers and Skrabal 2001; Rogers 1994). These methods can control erosion while providing beneficial ecosystem functions. Currin et al., in press, in comparing erosion rates along shorelines with and without marsh vegetation in the New River, found the greatest erosion occurred on unvegetated sediment banks, and that shorelines with even narrow fringes of marsh had significantly lower erosion rates. Several wetland planting projects have been conducted in North Carolina by conservation groups who have successfully retarded erosion along those shorelines (T. Skrabal, pers. com. 2015). Similarly, loose shell planted adjacent to eroded shorelines and in combination with marsh plantings have successfully recruited oysters, reestablished fringing marshes, and reduced shoreline wave energy in a demonstration project in Rachel Carson National Estuarine Research Reserve (Fear and Currin 2012)(NCCF, unpublished report).

Erosion control structures that include living components, also referred to as hybrid structures, include marsh sills with riprap or bagged oyster shell, marsh toe revetments using oyster shell or riprap, sills comprised of reef balls that recruit oyster spat, or groin fields constructed in low wave energy environments with wetlands (Berman et al. 2007; Broome et al. 1992; CBF 2007; Rogers and Skrabal 2001). A marsh toe revetment is a low sloped rock structure placed at the toe of existing wetland vegetation. Because it is non-vertical, small in scale, does not involve backfill, and is limited to 6 inches above marsh substrate, it protects existing wetland vegetation with minimal impacts. Only in low to moderate energy environments are these methods effective. With marsh sills, riprap or bagged shell is placed parallel to the shoreline at varying distances offshore. The area between the sill and shoreline is sometimes graded, with or without added fill material, to recreate a sloped intertidal area where wetland vegetation is then planted.

One habitat concern with marsh sills is the covering of existing habitat under the footprint of the structure, particularly that of SAV. Another concern is that the area landward of the sill could potentially increase in elevation due to sediment accumulation and therefore not sustain wetlands (Currin et al. 2008). However, a DCM survey of 30 experimental marsh sills in 2009 didn't reveal any conversion of

[14] Number dependent on scale of delineations and boundaries to separate marine, estuarine, and riverine systems.

wetlands to high marsh or uplands behind sills; additionally, since the General Permit for such structures was implemented in 1994, there have been no recognized instances of this happening.

Habitat Tradeoffs

In comparing impacts of stabilization methods, it is important to take into account habitat trade-offs. For example, bulkheads to prevent erosion on high ground can increase water depth adjacent to the structure, resulting in a loss of shallow soft bottom areas near SAV or marsh. In contrast, non-vertical structures, while not causing as much scouring or deepening, may require placement of rock farther out onto submerged lands with a wider footprint. The placement of a rock sill structure further seaward has the potential to create additional wetland or oyster habitat landward of the structure (Geis and Bendell 2008), potentially enhancing water quality, which in turn could enhance growth of SAV.

8.3.1.3. Bulkhead status

Since 1984, DCM has issued permits to bulkhead approximately 633 miles of shoreline through the Major and General Permit processes, which is about 6% of the estimated 10,658 miles of estuarine shoreline[15] in North Carolina (DCM, unpublished data, 2015). These numbers represent repairs, replacements, projects that may not have been accomplished or completed, and changes in processing[16] which could alter record keeping. While the coastwide percentage of stabilization is low, there are local concentrations of bulkheaded shorelines that are much higher than 6% (DMF, unpublished data; Corbett et al. 2008). Numbers appear to increase sharply from 1997 to 2000 and 2002 to 2006, probably due to repairs following damaging hurricanes (during 1996–1999) and to the strong economy of the mid-1990s. The highest number of bulkhead permits issued annually by General Permit occurred in 2006.

To obtain a General Permit for a bulkhead, the structure must be located landward of all wetlands and if waterward of NWL or NHW line, there must be an erosion problem evident on the site. In the years 2010-2014, a total of 54 miles of bulkhead were permitted in coastal counties by General Permit. In the previous five year period (2005-2009), 93 miles were permitted, and five years prior to that (2000-2004), 115 miles were permitted by General Permit (DCM, unpublished data, 2014, Figure 8.2). These numbers include new bulkheads and repairs of existing bulkheads (exceeding maintenance limits).

In the past five years (2010-2014), a total of 13.7 miles of bulkhead were permitted in coastal counties by Major Permit. In the previous five years (2005-2009) 27.7 miles were permitted, and five years prior (2000-2004), 23.4 miles were permitted by Major Permit (DCM, unpublished data, 2014, Figure 8.3).
The DCM has performed mapping to spatially delineate the estuarine shoreline, in which the location and extent structurally modified (e.g., bulkheads, riprap revetments) were identified using aerial imagery (Geis and Bendell 2008). In 2012, the coasts' entire estuarine shoreline was mapped (estimated 10,658 miles). There were 497 miles of bulkhead (n=6,391), 75.9 miles of bulkhead with marsh waterward of the structure (n=1,694), and 17.4 miles of bulkhead with a sediment bank waterward of the structure (n=471), for a total of 590.3 miles and 8,556 discrete structures (DCM 2015).

[15] Number dependent on scale of delineations and boundaries to separate marine, estuarine, and riverine systems.
[16] Prior to 2002 bulkheads landward of MHW and not affecting wetlands (7K .0203) were not entered into database.

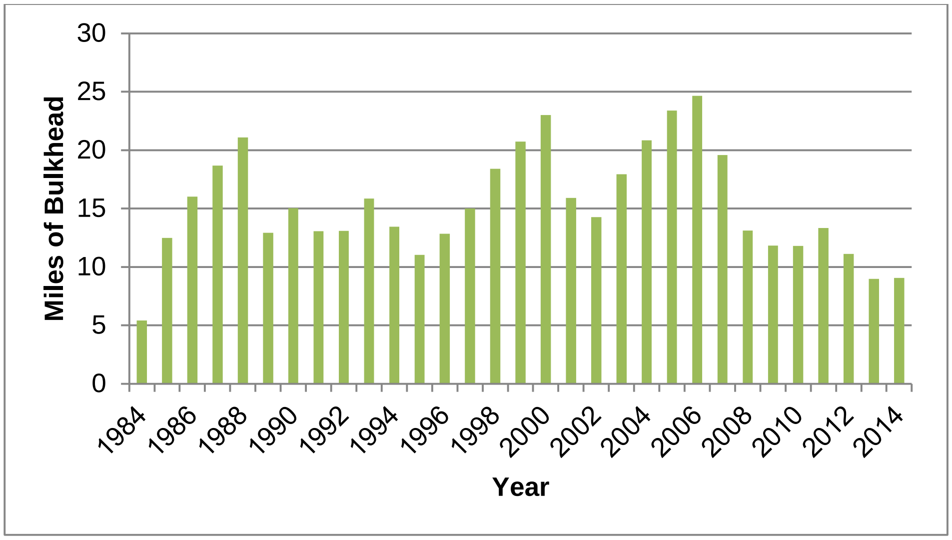


Figure 8.2 Linear miles of bulkhead authorized through DCM General Permit process by year, 1984-2014[2]. Includes new and replacement bulkheads (Source: DCM, unpublished data, 2015).

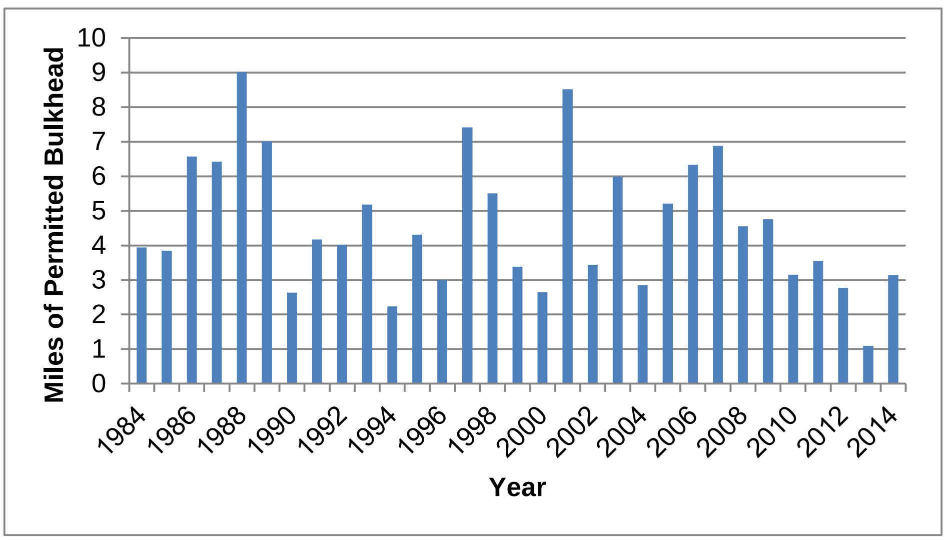


Figure. 8.3. Linear miles of bulkhead authorized through DCM Major Permit process by year, 1984-2014[2]. Includes new and replacement bulkheads (Source: DCM, unpublished data, 2015).

8.3.1.4. Shifting to Alternative Shoreline Stabilization Methods

Although CRC rules state that sloping riprap, gabions, or vegetation, rather than vertical seawalls/ bulkheads should be used where possible [T15A NCAC 07H .0208 (b)(7)(E)], bulkheads continue to be constructed at a rate greater than alternative shoreline protection methods. In addition, bulkheads are sometimes permitted where erosion is not evident. For example, digitization of shoreline alterations along approximately seven miles of estuarine shoreline in New Hanover County found that roughly 39% of the shoreline along protected Pages Creek with a wide marsh fringe and little obvious erosion had been hardened by 2000 (DMF 2001, unpublished report). To increase property owners' understanding of stabilization options, DCM, NOAA, and the Nicholas Institute for Environmental Policy Solutions, with funding from The Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), developed a "Weighing Your Options" brochure (DCM 2009).

Although marsh sill living shorelines were encouraged by the CRC, there are relatively few examples of marsh sills to show landowners and contractors interested in shoreline stabilization. There are a total of 59 marsh sill projects permitted, with the majority in Carteret County (DCM, unpublished data, 2015).

The CHPP Steering Committee requested that DCM conduct a survey to assess the effectiveness of existing marsh sills in controlling erosion and whether adverse impacts to adjacent habitats or properties occurred. A review of the permits approved for marsh sill or living shoreline projects in North Carolina since 2000 was completed by DCM staff in July 2009. There were 19 projects established by major permit and 9 projects under the new General Permit (2000-2009) that were reviewed. The Major Permit projects had an average length of 370 feet, while the General Permit projects averaged 114 feet, and the average height of all projects was 0.5 feet above MHW (B. Bendell, DCM, pers. com., 2010). State and federal agencies (DMF, WRC, DWR, USACE, NMFS) conducted on-site evaluations of marsh sill projects in the fall of 2009 to further evaluate their effectiveness and impacts on adjacent habitats and property. This evaluation concluded that the sills were adequately providing erosion protection, and were not causing habitat impacts. Impacts to adjacent properties were indeterminate (John Fear 2011).

Gittman et al. (2014) evaluated performance of shorelines with unaltered marsh and shoreline stabilization structures after Hurricane Irene (Category 1; 2 m storm surge, 30 hr duration) in 2011. The visual survey found 76% of the bulkheads were damaged to varying extents, while no damage to other shoreline stabilization structures was observed. The study also compared shorelines with marsh and marsh sills, located within 25 km of the storm's landfall, before and after the hurricane. The storm did not affect marsh surface elevations at sites with or without sills, but reduced density of marsh vegetation, which recovered within one year. Their findings suggest that marshes with and without sills were more durable and could protect shorelines better than bulkheads subjected to Category 1 hurricane conditions in some situations. Currin (2011) also assessed erosion control performance after Hurricane Irene at two stabilization projects on Piver's Island. The marsh planting (with waterward oyster reef) and marsh sill sites gained 2-33 mm of sediment. There was no erosion observed in the marsh, sill, or adjacent upland, although areas adjacent to bulkheads and riprap revetment did exhibit some erosion. The findings were consistent with (Gittman et al. 2014) and demonstrated that living shorelines are capable of trapping sediment and controlling erosion in some situations.

The DEQ, WRC, DMS, APNEP and NMFS have been working to promote the use of living shorelines and have developed a Living Shorelines Strategy that is discussed in the Living Shorelines Priority Section.

8.3.2. Ocean shoreline stabilization

In North Carolina, the frequency and magnitude of ocean shoreline stabilization activities have increased over time. These activities include beach nourishment, as part of storm management plans, beach disposal of material from inlet maintenance, sandbag use for temporary shoreline stabilization, and a limited number of terminal groins. These projects face limited borrow sources for beach suitable material, potential negative environmental impacts, and almost certain difficulty in dependable funding.

8.3.2.1. Soft stabilization

Beach bulldozing

Soft stabilization techniques for oceanfront erosion control include beach bulldozing and beach nourishment. Beach bulldozing, also referred to as beach scraping, is a method of short-term erosion protection that has been used in North Carolina for approximately 40 years. Beach bulldozing is the process of mechanically redistributing beach sand from the lower portion of the intertidal beach to the upper portion of the dry beach to create or enhance the dune system. In contrast to beach nourishment, new sediment is not added and the existing beach is not widened. The smaller scale of beach bulldozing and use of on-site sand, and the relatively small area of bulldozing that occurs in subtidal waters, minimize biological impacts to the benthos and fish (Pilkey et al. 1998). However, beach scraping has not been shown to provide any erosion control benefit, and can potentially increase wind erosion of sand where created dunes are left unvegetated (Kerhin and Halka 1981; McNinch and Wells 1992; Peterson et al. 2000a; Tye 1983). The CRC modified specific conditions for beach bulldozing in 2000 to minimize biological impacts, which included time windows for work to be completed, maximum depth of scraping, and replanting of dunes (15A NCAC 07H.1805). There is a federal bulldozing moratorium in North Carolina from May 1 to November 15 for the protection of sea turtles.

Beach nourishment

Beach nourishment is the placement of additional sand to dry and intertidal beach and adjacent shallow waters from upland areas, navigational channels, inlet systems, or submerged mine sites to restore or enlarge a beach. There are generally two categories of USACE projects that result in sand being put on beaches; disposal projects and coastal storm damage reduction projects. Disposal projects consist of the placement of dredged material from maintenance dredging of navigation channels. Specifically, they do not include engineered and constructed profiles designed for protection purposes. Rather, the intent is to take dredged material from navigation dredging and place it on the recipient site. Disposal projects are generally smaller in scale than storm damage reduction projects, and can be expected to have a lesser impact on fish habitat. The sand source for most disposal projects is the adjacent inlet. Sand bypassing is a type of disposal project where sand is moved around physical barriers, such as a jetty or deep port, that interrupt the natural littoral drift along the shoreline. This is done periodically at Masonboro and Oregon inlets.

Storm damage reduction projects use sand from dredged channels, offshore borrow areas, ebb tide delta shoals, or inlet relocation. Erosion rates near inlets are often the greatest due to the influence of strong inlet currents and the natural migration processes of barrier islands. Because of this and the associated risk near inlets, the CRC designated Inlet Hazard Areas along barrier islands. More regulatory restrictions apply in these areas. Beach nourishment is not allowed immediately adjacent to an inlet because of the dynamic nature of the area and the expected low retention time of sand.

Soft stabilization offers a less severe alternative than hard stabilization, with fewer habitat impacts to soft bottom, and some positive effects. For example, wider beaches from properly constructed beach nourishment projects can enhance sea turtle nesting habitat and protect oceanfront development that is important to North Carolina’s economy. However there are potential biological impacts to soft bottom habitat, depending on specific factors of the project and site, which should be considered.

Impacts at sand mining areas

When sand from channel dredging is insufficient for a nourishment project, sand can be “mined” or dredged from the ocean floor, often referred to as borrowing. The ecological impacts of borrowing from the ocean are similar to those from navigational dredging. Those include mortality of benthic organisms and elevated turbidity around the dredged area. Physical recovery of mining sites vary, and have been documented to range from two to 12 years; in some cases the sites may be altered indefinitely (Table 6.4). Because mine sites often refill with finer-grained material than was originally present (NRC 1995; Van Dolah et al. 1998), many borrow areas become unsuitable as future sand sources and benthic species recruitment patterns are altered (Jutte et al. 2001; Van Dolah et al. 1998; Van Dolah et al. 1992).

Mining sand from ebb or flood tidal deltas and nearshore sandbars for nourishment projects alters the sediment budget and may result in accelerated erosion from adjacent beaches (Wells and Peterson 1986). These sand deposits are the source of material for down current shorelines. Removing or reducing these deltas from the system can exacerbate erosion (Roessler 1998).

Table 8.7. Reported biological recovery time at mine sites.

Location	Recovery Time	Reference
North Carolina	6 – 18 months	Posey and Alphin 2001
North Carolina	12 – 24 months	CZR Inc and CSE, Inc 2014
South Carolina	3 – 6 months	Van Dolah et al. 1992
South Carolina	2 – 12.5 years	Van Dolah et al. 1998
South Carolina	11 – 14 months	Jutte et al. 2001b
South Carolina	14 – 17 months	Jutte et al. 2001a
New Jersey	18 – 30 months	USACE 2001

Benthic recovery is affected by excavation methods and site conditions. In cases where benthic recovery is relatively quick, the mine area was not excessively deep (5-10 ft deep) or strong currents facilitated more rapid sand infilling (M. Posey, UNC-W, pers. com. 2010). Studies in South Carolina also indicated that the benthic community appeared to recover more quickly where hopper dredges were used rather than pipeline dredges (Jutte et al. 2001). Van Dolah et al. (1998) observed significant changes in the species composition of the recruited organisms, shifting from dominance by amphipods to mollusks. During the time period monitored (> 12.5 years), the original species composition within the affected area was never restored due to the change in substrate composition (Van Dolah et al. 1998). Impacts to soft bottom benthic communities are more severe and with prolonged recovery when located in areas with little sand movement and where the mine pits are deep (Saloman et al. 1982; USACE 2001).

Siting mines at soft bottom locations known to support seasonal aggregations of demersal fish, such as the critical overwintering area off the Outer Banks for juvenile Atlantic sturgeon, spiny dogfish, and striped bass, or spawning areas or feeding grounds (e.g., inlet shoals used for red drum feeding and spawning) could disrupt or degrade ecological functions that these areas provide (Peterson et al. 1999). In the last decade, there has been increased interest from barrier island municipalities in use of the cape shoals as a sediment source for beach nourishment projects. Boss and Hoffman (2000) collected detailed information on the sand resources for North Carolina's Outer Banks, including specific data about Diamond Shoals. Diamond Shoals extend approximately 11 nautical miles (nm) (20 km) and are about 5.5 nm (11 km) wide. In 2000, the estimated total volume of sand on the shoals was at least 1.66 billion cu yds, with approximately 256 million cu yds in state waters (Boss and C.W.Hoffman 2000). As such, cape shoals are major sand resources for coastal processes. Research on Cape Lookout Shoal found that the cape associated shoals act as a barrier to longshore transport, diverting southerly flow of water and sediment seaward in a tidal-driven headland flow, resulting in net sediment transport and deposition onto the shoal. The shoals are maintained by this sediment transport and serve as a long-term sink for littoral sediment, limiting exchange between adjacent littoral cells and shelf regions (McNinch and Jr 2000; McNinch and Wells 1999). Shoals are classified as EFH and use of the shoals as a borrow area should be studied closely before they are given consideration. A recent study released by the Bureau of Ocean Energy Management (BOEM) found higher abundances and diversity of both vertebrate and invertebrate assemblages in shoal habitats (D. Rutecki 2014).

Dredging for sand from ocean borrow areas can directly or indirectly impact hard bottom via removal, fracturing, injuring, or silting over of hard corals, soft corals, sponges, algae, and other benthic organisms (Blair et al. 1990). Current CRC rules discourage dredging activities within a 500 m buffer of significant biological communities, such as high relief hard bottom areas [T15A NCAC 07H .0208(b)(12)(A)(iv)]. Under this rule, "high relief" is defined as greater than or equal to one-half meter per five meters of horizontal distance. Because reef fishes derive a significant portion of their nutritional requirements within a 500 m "halo" of exposed hard bottom Lindquist et al. (1994b), this sand dredging buffer was recommended by the DCM appointed Ocean Policy Steering Committee around hard bottom areas, including those periodically buried with thin, ephemeral sand layers (DCM 2009).

Within Onslow and Long Bays, low and high profile hard bottom is scattered, making mining difficult to perform without impacting hard bottom. Sand mining off North Topsail Beach in 2015 resulted in a large amount of hard bottom rock being pumped onto the beach, despite pre-project survey work. In 2014, the BOEM and East Carolina University signed a two-year cooperative agreement to evaluate sand resources off North Carolina. Under this agreement, scientists from ECU and the University of North Carolina Coastal Studies Institute (UNC CSI) will work with DCM and a contractor to evaluate and consolidate existing geological and geophysical data offshore. These data will be used to identify and locate potential areas of sand resources, as well as benthic habitat, to aid in regional planning for future beach nourishment projects and reducing impacts to hard bottom.

Due to increasing demand for sand, borrow areas are being increasingly utilized in areas such as Nags Head, Duck, Kill Devil Hills, Rodanthe, Bogue Banks, Topsail, and Brunswick Beaches. Some of these have been completed and others are in the permitting process.

Impacts at intertidal beach and subtidal bottom

Biological impacts of sediment disposal to the intertidal beach community have been studied by (Reilly and Bellis 1983), (Van Dolah et al. 1992), (Hackney et al. 1996a), (Donoghue 1999), (Jutte et al. 1999), (Peterson et al. 2000a), and (CZR Incorporated 1999), among others. Studies of dredge disposal and storm damage reduction projects demonstrate an almost complete initial reduction in the number of benthic invertebrates in the intertidal zone, as well as in the subtidal zone and dry beach. The effect on smaller meio- and microfauna is unknown. The rate of reported biological recovery on nourished intertidal beaches varies from about one month to one year, in some cases longer (Table 6.5).

Factors likely affecting the recovery time of the intertidal beach community include:

- compatibility of deposited material with native sand (sediment grain size)
- seasonal timing of nourishment
- time period between renourishment events on a single site, volume, depth, and length of project
- alteration of the beach geomorphology
- location placed on the beach
- longshore transport conditions (higher transport results in more rapid recruitment)

In the studies referenced above and others, biological impacts persisted longer when supplemented sand was either coarser (McLachlan 1996; Peterson et al. 2000b; Rakocinski et al. 1993; Rakocinski et al. 1996) or finer (Gorzelany and Nelson 1987; NRC 1995) than the existing sand. Increased grain size of the beach can result in significant reduction in species richness and abundance by 1) limiting body size, 2) limiting burrowing performance and other functions in some species, and 3) changing the beach condition to a higher energy swash zone (McLachlan 1996). A decrease in grain size impacts the benthos by 1) smothering organisms, 2) clogging gills from sediment plumes, and 3) decreasing the interstitial space between sediment grains available to small burrowing invertebrates (Rakocinski et al. 1996).

Table 8.8. Reported biological recovery times at nourished ocean beaches.

Location	Biological recovery following beach nourishment	Reference
Bogue Banks, NC	Mole crabs recovered within months, coquina clams and amphipods failed to initiate recovery after one growing season. No follow up sampling.	Peterson et al. 2006
Bogue Banks, NC	On ebb tide delta, where sediment deposited, significant coarsening of sediment, and reductions in spionid polychaetes after 8 mo.	Bishop et al. 2006
Bald Head, Caswell, and Oak Islands	Coquina clams, mole crabs - > 1 year. Abundance declined 1 – 10 times from control. Most severe reductions and longest times of recovery due to season of project – greatest in spring and summer, except Oak Island coquina clams recovered within 1 year – timing of sand deposition allowed summer recruitment.	Versar 2003
Atlantic Beach, NC	More than 3 months. Coquina clams in nearshore overwintering bottom killed initially by turbidity; delayed recruitment and repopulation; Haustoriid amphipods had not recovered after 3 months. Polychaete *S. squamata* recovered 15 – 30 days post nourishment.	Reilly and Bellis 1983
Atlantic Beach, NC	Densities of mole crabs and coquina clams were 86 – 99% lower than control sites, 5 – 10 weeks post-nourishment, during mid-summer.	Peterson et al. 2000b
North Topsail, NC	After 1 year, mole crab, coquina clam, and amphipod abundance remained significantly less than at control sites and body size was significantly smaller. Polychaetes increased in abundance.	Lindquist and Manning 2001
Pea Island, NC	2 – 9 months for coquina clams and mole crabs.	Donoghue 1999
Hilton Head, SC	Density and diversity returned to levels similar to control sites in 6 months.	Van Dolah et al. 1992
Folly Beach, SC	2 – 5 months, depending on benthic group and site, polychaetes recruiting earlier than mollusks.	Jutte et al. 1999
Panama City, FL	Large reductions in abundance and diversity remained after 2 years.	Rakocinski et al. 1993
Manasquan, NJ	Abundance, biomass, and diversity completely recovered after 6.5 months. Recovery quickest when filling completed before low point in seasonal infaunal abundance and where grain size of fill material matched natural beach.	USACE 2001

Similarity between native and introduced sediments is considered the most important factor in the rate of recovery of beach invertebrate populations post-nourishment (Peterson et al. 2000a). Recognizing the problems of sediment incompatibility, and problems resulting from projects at Pine Knoll Shores and Oak Island, the CRC Coastal Hazards Science Panel modified rules regarding sediment compatibility to be more specific and effective [15A NCAC 07H .0312(3)]. New rules became effective in February 2007.

The season and time period between renourishment events are important factors affecting the rate of recovery of a beach community (Dolan et al. ; Donoghue 1999; Versar Inc. 2003). At the Brunswick Beaches project, conducted as part of the Cape Fear harbor deepening project, sand was placed sequentially from east to west: Bald Head Island in spring 2001, Caswell Beach in summer 2001, Oak Island in fall 2001, and Holden Beach in winter 2002. Impacts were observed immediate to the intertidal beach community at all beaches, but the severity of invertebrate reductions and time to recovery was the greatest at beaches nourished in the spring and summer (Versar Inc. 2003). Lindquist and Manning (2001) found that at a beach where dredge material was placed between April and June, and redeposited the following April and June, the abundance of the mole crabs, coquina clams, and amphipods was significantly lower than that of the control beach after one year. Also, mole crabs and coquina clams were significantly smaller in size than at control sites, indicating that repeated disturbance from beach disposal prevented full recovery of populations. Peterson et al. (2000a) argued that recovery could be accelerated if projects were timed to occur before spring recruitment of benthos.

Sand from inlet dredging can be placed in nearshore water (< 30 ft deep) within the beach profile to enhance sand supply on the beach. Such sand placement can delay the duration and reduce the magnitude of the benthos reduction on the beach, but cause additional impacts to subtidal bottom (Donoghue 1999). Monitoring of a nearshore placement project that occurred on an ebb tide delta near Beaufort Inlet in March – April found that after eight months (December), infaunal invertebrates were only 50% as dense as that of the original benthic community, but mobile epifauna had fully recovered (Peterson et al. 1999). In the following two months (December – February), density estimates doubled, as new recruits rapidly entered the area (Peterson et al. 1999). Projects timed to occur in the winter, prior to peak infauna larval recruitment in the summer and fall, speed up the recovery of intertidal benthic organisms within the impacted area (Donoghue 1999).

The addition of sand to the shoreface can negatively affect nearshore hard bottom through burial and sediment redistribution. At a beach nourishment project site in Florida, dramatic decreases in fish species and abundance of individuals was observed following the burial of nearshore hard bottom. The number of species detected 15 months after burial decreased considerably, from 54 to eight (Lindeman and Snyder 1999). The average number of individual fish recorded per transect also declined from 38 to less than one (Lindeman and Snyder 1999). At several other beach nourishment projects in Florida, sand was documented to have redistributed offshore from the beach via cross-shelf currents, covering hard bottom habitat (Continental Shelf Associates 2002; Marsh and Turbeville 1981). Studies in Wrightsville Beach and Atlantic Beach, North Carolina documented movement of sands from the nourished beaches across the shoreface (Reed and J.T.Wells 2000; Thieler et al. 1995; Thieler et al. 1998), with the hard bottom being buried in the vicinities of the projects (R. Thieler, USGS, pers. com. 2015).

Commercial fishermen in the Wrightsville Beach area, where nourishment has been conducted regularly since the 1960s, report that nearshore hard bottoms that were once productive fishing areas are now covered in sand and are no longer fished due to poor yield (W. Cleary, UNC-W, pers. com. 2015). Ojeda et al. (2001) found little to moderate change in percent of seafloor with exposed hard bottom or rocky substrate within two years of a nourishment project off Myrtle Beach, South Carolina. Available data from the study indicated that the nearshore loss of hard bottom seaward of the project was due to localized introduction of new sand from beach fill, but was only somewhat greater than the natural variability occurring from shifting sands (Ojeda et al. 2001). The majority of nourishment projects are located south of Cape Lookout where hard bottom is most abundant, especially in the nearshore.

In summary, the conditions that minimize biological impacts of nourishment projects to the intertidal beach community include, but are not limited to:

- Use of sand similar in grain size and composition to original beach sands.
- Restrict beach nourishment to winter months to minimize mortality of infauna and enhance recovery rates of intertidal benthic organisms, an important prey source for many surf fish (Donoghue 1999).
- Limit time interval between projects to allow full recovery of benthic communities (1-2 years, depending on timing of project and compatibility of sediment).
- Limit length of nourishment projects to provide undisturbed area as a source of invertebrate colonists for the altered beach, and a food source for fish.
- Avoidance of nearshore hard bottom habitats.

Impacts to fish

Beach nourishment can impact fish by reducing food availability, altering preferred topographic features, disturbing spawning, or reducing visibility. Fish and invertebrate species that spend much time in the surf zone and feed on benthic invertebrates, such as Florida pompano, gulf kingfish, Atlantic croaker, spot, and shrimp, would be most vulnerable to beach nourishment activities. Some studies have found insignificant (USACE 2001; Van Dolah et al. 1994) or temporary impacts (Saloman 1974) to fish populations. This may be 1) due to release of nutrients and infauna during sand dredging, 2) because resident fish are wide-foraging, or 3) because migratory fish spend only a portion of their life cycle at the mine site or target beach (Greene 2002). Other researchers suggest that fish are dependent on the amount of available habitat and that any loss represents a decrease in production (Peterson et al. 2001).

Unfortunately, very little monitoring has been done at the level needed to adequately assess and detect the impacts of nourishment projects on fish distribution, feeding, growth, or survival. Although, there have been few studies examining the direct effects of beach nourishment on pelagic fish, several studies have examined the impacts on pelagic fish prey (e.g., polychaetes, copepods, and mollusks). Peterson et al. (2000a) concluded that nourishment projects should be ceased in April or May to reduce the effects of nourishment on *Domax* and *Emerita* populations.

Research is currently being conducted by UNC-Wilmington investigating the effects of beach nourishment on the nursery function of the surf zone by comparing fish and invertebrate assemblages, and the density and nutritional condition of juvenile Florida pompano and gulf kingfish. Initial findings indicate that fish composition and diet differ significantly at nourished beaches compared to natural beaches, potentially affecting diet and growth (Lipton et al. 2010; Perillo 2010).

Preliminary studies of commercial gillnet landings for demersal feeding surf fish in areas with differing levels of beach nourishment activity indicates some relationship may exist between beach nourishment events and low landings (DMF, unpublished data, 2015). More data and analysis is needed to determine if nourishment negatively impacts abundance, CPUE, or landings. Given the increasing numbers of nourishment projects, cumulative impacts on the intertidal and subtidal communities, fish productivity, the benthic community, and the natural barrier island processes can be expected to increase.

Status of beach placement from navigational dredge disposal projects

Uncontaminated sand from navigational dredging projects meeting sediment grain size criteria can be placed on beaches or in a nearshore placement area. Beaches receiving sand from dredged inlets and adjacent waterways are indicated in Table 6.6 and Map 6.3 a-c. Sand from these projects usually covers a relatively short length of beach, generally close to the originating inlet. The amount of sand deposited and the frequency of dredging varies between sites and with the amount of sand available.

Status of beach nourishment from coastal storm damage reduction projects

Coastal storm damage reduction projects are long-term beach nourishment projects specifically designed to reduce storm damage to oceanfront property and infrastructure by increasing the width and height of the beach. To implement a federally authorized and subsidized storm damage reduction project, local governments must follow a lengthy process. A local government must first identify an erosion problem and request a study by the USACE to determine if and how a project could be conducted. While designing these projects, avoiding and minimizing environmental impacts is a primary consideration. The MFC developed a beach nourishment policy in 2000 to provide guidance to help minimize fish habitat impacts (Appendix E). The ASMFC also provided recommendations for conducting and monitoring beach nourishment projects (ASMFC 2002).

The frequency and magnitude of beach nourishment projects on developed beaches have increased over time. From the 1960s to 2000, only nine miles of beach (3% of the ocean shoreline) had ongoing storm damage reduction projects - Wrightsville Beach, Carolina Beach, and Kure Beach. Currituck County, Hatteras, Ocracoke, and Sunset Beach are the only developed barrier island beaches that have not received and are not pursuing beach nourishment. Beach renourishment of federally authorized storm reduction projects generally occurs on three or four year intervals. In recent years, local communities have taken the financial burden of planning and contracting environmental assessments due to lack of federal funding. Similarly, local communities that have been unable to get federally authorized projects, or do not want to wait until federal funding is available, are raising funds to cover the expense. These privately funded projects must undergo a USACE permit review, and are considered one time projects. Oceanfront communities that have, or are in the process of planning, beach nourishment projects are listed in Table 8.9.

TABLE 8.9. Storm damage reduction (beach nourishment) projects ongoing or in the planning stage.

Beach community	Status	Fed. authorized [1]
Duck	Preparing permit application information	N
Kitty Hawk	Preparing permit application information	N
Kill Devil Hills	Preparing permit application information	N
Nags Head	Completed in 2011	N
Rodanthe	Completed one time emergency nourishment in 2014	N
Buxton	Preparing permit application information	N
Bogue Banks	Carteret County Beach Commission was formed to plan and coordinate nourishment and develop a programmatic EIS for all projects on Bogue Island. Sand sources primarily from different dredging projects and funded locally.	Y*
North Topsail Beach	Project using offshore borrow areas in 2015. Excessive amount of limestone rock was dredged onto the beach, requiring beach raking.	N
Surf City	Preparing permit application information	N
Topsail Beach	Preparing permit application information	N
Wrightsville Beach	Last done spring 2014	Y
Carolina Beach	Last done winter 2012/2013	Y
Bald Head	Receives sand regularly from Wilmington Harbor dredging	N
Caswell, Oak Islands	Receives sand regularly from Wilmington Harbor dredging	Y
Holden Beach	Last done in 2009; planning for nourishment and groin on east end	Y*
Ocean Isle	Last done in 2014; planning for nourishment and groin on east end	Y

[1] Non-federally authorized projects are locally funded. Federal funds are not always available for federally authorized projects. Locally funded federally authorized projects are denoted with *.

The value of wider beaches registers to the property owner at a very small scale. A 1995 South Carolina study showed that the addition of one foot in width of beach real estate (from 79' to 80') increased the value of the property by 35% (Pompe and Rinehart 1995). Subsequently, municipalities are increasingly interested in beach nourishment, and guidelines have became necessary to manage limited resources in an effective and environmentally sensitive manner. In 2000, House Billl 1840 was passed requiring DENR to develop a multiyear beach management and restoration strategy and plan. With this bill, DWR and DCM agreed to collaborate on a Beach and Inlet Management Plan (BIMP), which was finalized in April of 2011.

Close to 50% of the states' ocean shoreline is state or federally owned, with the remainder developed. Because of uncertainties regarding future nourishment requests, sand availability, and funding, the BIMP recommends using regional planning and a dedicated state fund to support regional projects.

In 2008, an Ocean Policy Steering Committee was formed to reexamine ocean resource issues and update existing policies on ocean uses. In April 2009, DCM published an ocean policy report (North Carolina Sea Grant 2009) which identified five emerging resource policy issue areas, and provided recommendations for changes. This was to ensure that North Carolina have adaptive rule language. Sand resource management was identified as an emerging issue, and thus the report recommended:

- Identification of regional available sand sources

- Development of a state-level comprehensive plan to protect beaches and inlets
- Comprehensive management of inlet tidal delta sand sources
- Preventing loss to the barrier island system of sand in inlet channels
- Amendment to rules regarding dredging for sand around hard bottom areas
- Incorporation of a sea level rise component to CAMA land use plans

8.3.2.2. Hard stabilization

Jetties and groins

In North Carolina, hard stabilization techniques on oceanfront beaches have been limited to a few jetties, groins, and seawalls. Seawalls (bulkheads) and rock revetments extend parallel to the ocean shoreline. Seawalls are vertical structures, and are primarily designed to prevent erosion and other damage due to wave action. Jetties and groins are constructed perpendicular to the beach, with jetties usually being longer. They are located adjacent to inlets with the purpose of maintaining navigation by preventing sand from entering the inlet. In contrast, terminal groins are structures built at the end of littoral cells to trap and conserve sand at the end of barrier islands, stabilize inlet migration, and widen a portion of the updrift beach. Terminal groins are designed so that when the area behind the groin fills with sand, additional sand will bypass the structure and enter the inlet system.

It is well accepted that hard stabilization techniques along high energy ocean shorelines accelerate erosion in some locations along the shore, partially as a result of the longshore sediment transport being altered (Defeo et al. 2009). The hydromodifications resulting from coastal armoring alters sediment grain size, increases turbidity in the surf zone, narrows and steepens beaches, and results in reduced intertidal habitat and diversity and macroinvertebrate abundance (Dolan et al. 2004; 2006; Dugan et al. 2008; Miles et al. 2001; NRC 1995; Pilkey et al. 1998; Riggs and Ames 2009; Walker et al. 2008; Walton and Sensabaugh 1979). A study looking at the effect of a short groin (95 m) on the benthic community found that the groin created a depositional condition on one side of the structure and erosion on the other, and macroinvertebrate diversity and abundance was significantly reduced within 30 m of the structure, as sand particle size and steepness increased (Walker et al. 2008). The change in benthic community was attributed to the change in geomorphology of the beach. Hard structures along a sandy beach can also result in establishment of invasive epibenthic organisms (Chapman and Bulleri 2003). A secondary impact of hardened structures is that the loss of beach is often managed by implementing nourishment projects, possibly having additional damage to subtidal bottom (Riggs et al. 2009). Anchoring inlets also prevents shoal formation and diminishes ebb tidal deltas, which are important foraging grounds for many fish species. Recognizing that hardened structures are damaging to recreational beaches and the intertidal zone, four states have prohibited shoreline armoring: Maine, Rhode Island, South Carolina, and North Carolina with some exceptions.

Perhaps the greatest impact of terminal groins and jetties is the long-term effects on marine and estuarine ecosystems. By stabilizing the inlet, migration and overwash processes are interrupted, causing a cascade of other effects (Riggs and Ames 2009). In the case of Oregon Inlet, the terminal groin anchored the bridge to Pea Island and greatly reduced the migration of the inlet on the south side. But the continuing migration of the north end of Bodie Island led to an increased need for inlet dredging. The combination of reduced longshore transport of sediment, and the post-storm dune restoration to remove sand from and open NC 12, have prevented overwash processes that allow Pea Island to maintain its elevation over time. With overwash processes disrupted, the beach profile has steepened, and the island has flattened and narrowed, increasing vulnerability to storm damage (Dolan et al. 2006; Riggs and Ames 2009; Riggs et al. 2009). At Oregon Inlet and Pea Island, the accelerated need for beach replenishment is further aggravated by the need to maintain Hwy 12. From 1983 to 2009, approximately 12.7 million cubic yards of sand were added to the shoreline within three miles of the terminal groin (Riggs and Ames 2009).

Dolan (2006) documented that the sand replenishment in this area required to maintain the channel, protect the road, and maintain a beach, resulted in a significant reduction in grain size and mole crab abundance. Mole crabs, an important part of the food web for shorebirds and surf fish, are considered an indicator species for monitoring beach condition.

Jetties obstruct larval and early juvenile fish passage from offshore spawning grounds (Blanton et al. 1999). Successful transport into estuarine nursery areas through the inlet occurs within a narrow zone, parallel to the shoreline, and is highly dependent on along-shore transport processes (Blanton et al. 1999; Churchill et al. 1999; Hare et al. 1999). Obstacles, such as jetties, block the natural passage for larvae into inlets and reduce recruitment success (Blanton et al. 1999; Churchill et al. 1997; Kapolnai et al. 1996). Offshore spawning, estuarine-dependent species that could be impacted by jetties include many of North Carolina's most important commercial and recreational fish species such as menhaden, spot, Atlantic croaker, shrimp, gag, black sea bass, and flounders.

Impacts from jetties and groins may be greatest in coastal areas like the Outer Banks, where there are few inlets. Miller (1992), in reviewing potential impacts of a dual jetty system at Oregon Inlet, estimated that successful passage of winter-spawned, estuarine-dependent larvae through Oregon Inlet could be reduced by 60-100%. The Environmental Impact Statement (USACE 1999) for the Oregon Inlet project concluded the jetties should not be constructed because of this and other concerns. Although there is uncertainty regarding the magnitude of fisheries impacts, jetties and groins would likely reduce larval recruitment into estuarine nurseries (Blanton et al. 1999; Churchill et al. 1997; Kapolnai et al. 1996).

In contrast, where natural coastal barrier island processes, such as overwash and the opening, closing, and shifting of inlets have occurred, the islands have grown in width and elevation and have migrated. Core Banks with Drum Inlet is an example of a barrier island with inlet or inlets that opened and closed throughout time (Mallinson et al. 2008). Drum Inlet initially opened in 1899, but has closed and opened multiple times during storm events. It is possible that other areas that historically had inlets will again in the future (e.g., Buxton Inlet, New Inlet, Ophelia Inlet, Isabel Inlet) (Mallinson et al. 2008). When inlets open, sediment deposition of a flood tide delta aids barrier island migration and widening. Where new inlets form, Mallison et al.(2008) recommends allowing the inlets to remain open, even if temporarily, until a substantial flood tide delta forms, allowing long-term maintenance and stability of the island.

A relatively small amount of North Carolina's developed ocean shoreline is hardened compared to other states, at roughly 6% (Pilkey et al. 1998). In contrast, South Carolina, Florida (east coast), and New Jersey have 27%, 45%, and 50% of their respective shorelines hardened. Existing revetments and seawalls in North Carolina were constructed prior to the CAMA (e.g., Atlantic Beach) or were for the purpose of protecting historic structures (e.g., Fort Fisher). Existing jetties in North Carolina occur at Masonboro and Barden's inlets, terminal groins occur at the Cape Fear River, Oregon and Beaufort inlets, and small groin fields are constructed at Bald Head Island and Hatteras Island.

Sandbags

The use of sandbags is a temporary method of erosion control permitted for protection to imminently threatened structures (shoreline less than 20 feet from structure) while property owners seek more permanent solutions, such as beach nourishment or relocation of the structure. Filled with sand, bags are stacked and perform like seawalls. Sandbag walls may remain in place for up to two years if the protected structure is 5,000 square feet or less, or up to five years if the structure is larger than 5,000 square feet. Sandbags may remain in place for up to five years, regardless of structure size, if the community is taking part in a beach nourishment project. Sandbags may remain in place indefinitely if they are covered with sand and stable natural vegetation. If a storm exposes the bags, they must be removed if their time period has expired. Variances to the rules are available from the CRC. Presently, sandbag structures range in age from newly installed to 28 years in various locations along the coast.

In the 2003 legislative session, House Bill 1028 was approved, putting into law the CRC prohibition on construction of permanent erosion control structures on ocean shorelines. In 2009, Session Law 2009-479 required that the CRC 1) not order the removal of sandbags if a community was actively pursuing beach nourishment or inlet relocation; 2) conduct a study on the feasibility and advisability of use of terminal groins as an erosion control device at the end of a littoral cell or inlet, and present a report to the Environmental Review Commission and the General Assembly by April 1, 2010 (discussed below).

Terminal Groins

The CRC and DCM contracted the above mentioned study to Moffatt and Nichol. Five existing terminal groins were examined to draw conclusions on the effectiveness and impacts of the structures where used before. The study sites included Oregon and Beaufort inlets in North Carolina, Amelia Island/Nassau Sound in northeast Florida, and Captiva Island and St John's Pass on the west coast of Florida. The study documented that constructing terminal groins resulted in the need for periodic nourishment behind the structures (Moffat and Nichol Inc. 2010), without which erosion to adjacent beaches would occur. The long-term maintenance increases the overall costs of terminal groins. The study found that groins reduced erosion rates immediately adjacent to the structure, but showed evidence of increased erosion about two miles downdrift, and opposite of the inlet. The effects could not be directly attributed to the structure due to simultaneous inlet dredging and sand disposal nearby. The CRC subcommittee concluded that use of terminal groins may be feasible but not advisable due to environmental consequences, expense, and uncertainty of long-term impacts, thus voted to state that the study was inconclusive and therefore could not recommend for or against.

On June 28, 2011, SB110 was passed into law amending the CAMA to allow for permitting of up to four terminal groins, to be treated as a pilot program to determine the effectiveness of such structures in North Carolina. Senate Bill 110 contains criteria to be met by the applicant prior to permit issuance. For example, SB110 requires the development of an inlet management plan, commitments to monitor and mitigate for adverse impacts to adjacent beaches, properties, or structures, etc. The bill requires the applicant provide financial assurances for impact mitigation, restoration, and/or groin removal. The first four communities to receive permits would be allowed to construct a terminal groin. The following summaries outline the status of these communities:

Village of Bald Head Island
In early 2014, the Village of Bald Head Island submitted a Draft Environmental Impact Statement (DEIS) for agency and public comment. The DCM provided comment to the USACE. The Village and USACE have incorporated these comments into a Final EIS (FEIS), which was released for agency and public review and comment in August of 2014. A permit application was submitted to DCM on July 25th, 2014. All permits for construction of the terminal groin have been approved. In spring of 2015, a multi-agency pre-construction meeting was held and construction is expected to be completed by late 2015.

Ocean Isle Beach
Following scoping meetings for the proposed project, a DEIS was released in January 2015 by the USACE.

Figure Eight Island Homeowners Association
The Figure Eight Island HOA prepared a DEIS addressing shoreline stabilization options for Rich Inlet. The preferred alternative is construction of a terminal groin with beach fill. The project would involve beach nourishment every five years following groin completion. Proposed impact monitoring would be based on comparing anticipated beach volumes with actual beach volumes along multiple transects. In July, 2012, DCM provided comments on the DEIS to the USACE. The applicant and USACE are in the process of incorporating these comments and those from public and other agencies, into a Supplemental EIS (SEIS). Further, the applicant is investigating potential design modifications that could cause revisions to the SEIS.

Holden Beach
Scoping meetings have been held to discuss a potential project. As of February 2015, the applicant is working with the USACE on the development of a DEIS for this potential project.

Carteret County
Carteret County proposes a terminal groin at Bogue Inlet as one option in response to anticipated erosion over the next 30 years. At this time, it is unclear if the county will be formally pursuing a project.

North Topsail Beach
The Town of North Topsail Beach has expressed an interest in pursuing DCM authorization for a terminal groin, but as of February 2015 it is unclear if they intend to study the option further.

8.4 Marinas, docks, and boating

Docking facilities effect the habitat in which they exist, during construction and for the lifetime of the structure. Such facilities are regulated under T15A NCAC 07H .0208(b), enforced by DCM. This section will explore the ways in which marinas, docks, and the boating activities for which they are constructed affect shallow bottom, SAV, wetlands, shell bottom, hard bottom, and the water column.

8.4.1 Facilities

8.4.1.1. Marinas

The Division of Coastal Management is responsible for permitting marinas and docking facilities under the Coastal Area Management Act (CAMA). The CAMA permitting process requires coordination with the Shellfish Sanitation and Recreational Water Quality Section of DMF (DMF-SS&RWQ), the Division of Water Resources (DWR), US Army Corps of Engineers (USACE), and other federal, state, and local authorities. Authority comes from DCM's governing body, the Coastal Resources Commission (CRC).

A marina is defined by the CRC as any publicly or privately owned dock, basin or wet boat storage facility constructed to accommodate more than 10 boats and providing any of the following services: permanent or transient docking spaces, dry storage, fueling facilities, haul out facilities and repair service [T15A NCAC 07H .0208(b)(5)]. Because of the fragile nature of the areas in which marinas are located, construction alone has the ability to negatively impact the surrounding ecosystem. Upon completion, operation and use of the waters by customers can contribute to degradation of the system.

Direct impacts from marina construction come from pile jetting/driving, shoreline stabilization, excavation, installation of docks, wave attenuation, construction of associated high ground facilities, etc. Lesser recognized impacts are indirect, and come from associated boating activities.

8.4.1.2. Multi-slip docking facilities (MSDFs)

Docking facilities provide varying degrees of impacts depending on location, size, and use. Many docking facilities are composed of several multi-slip docks, thereby avoiding the designation, "marina." Multi-slip docking facilities of 10 slips or less do not meet the definition, and may be allowed in open shellfishing waters. While the accumulation of multi-slip docking facilities has not been directly linked with increasing bacterial contamination and shellfish harvest area closures, the associated residential development has been (Kirby-Smith and White 2004; Kirby-Smith and White 2006).

Multi-slip docking facilities are common amenities in waterfront communities. Developers of coastal subdivisions frequently construct community docks to increase the value of inland lots. While serving as incentives to buyers, the slips regularly go unoccupied. Multi-slip docking facilities with 11-29 slips and vessels less than 25' in length, with no heads or cabins, are considered marinas "with shellfish harvest closure exclusions," per T15A NCAC 18A .0911. The exclusion conditions minimize the risk of bacterial contamination in open shellfish harvest waters and increase siting opportunities for marina developers.

8.4.1.3. Individual docks

The majority of docking facilities are individual docks, with the least impact to resources. An individual dock permitted under the CAMA General Permit process (GP .1200) has the allowance for two slips. This permit can be combined with GP .2200, which allows freestanding moorings, for a combined dockage of four spaces. The number of GPs steadily increased until 2000, and then fluctuated until 2004. Figure 8.4 shows a significant decrease in the number of GPs from then until 2014. While the reason is unknown, the economic decline and the doubling of GP fees in 2005 could have contributed to the downturn.

The impacts from individual docks are less than those from marinas or MSDFs, yet the number of such dock permits far exceeds those of marinas or MSDFs. If properly designed, individual piers may not pose significant threats to soft bottom, PNAs, wetlands, shellfish resources, water column, or beds of SAV.

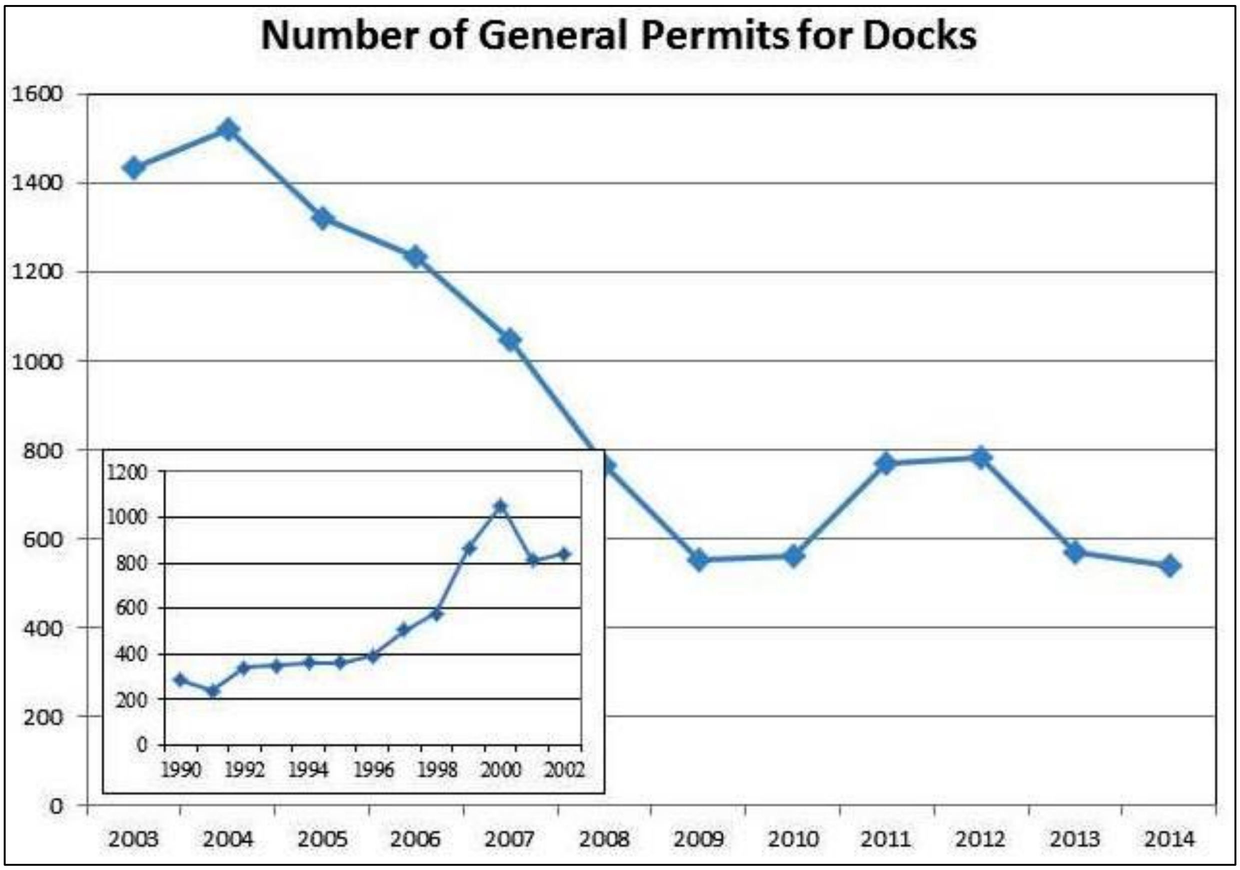


Figure 8.4. Annual number of CAMA general permits issued by the North Carolina Division of Coastal Management for docks, 2003-2014, with inset for 1990-2002 (DCM, unpublished data, 2015).

8.4.2 Potential Impacts

There are many potential impacts related to the construction and operation of marinas, multi-slip docking facilities, and individual docks, from materials to size, location, and use. In simple terms, these potential impacts are:

- docks shade shallow bottom habitat, SAV, and wetlands
- lumber is treated with chemicals
- a concentration of pilings can alter the hydrology of the system
- marinas and community docking systems often require shoreline stabilization
- construction of docking systems often require excavation for basins, canals, and channels

- driving of pilings and installation of docks disturbs and resuspends sediments
- floating docks sitting on substrate for a portion of tide cycle can impair benthic community
- wave attenuation systems, boat ramps, railway or launch systems create additional impacts

Depending on the type of facility, there may be fuel discharge and bottom paint leachate. In eastern North Carolina, many docking facilities are located in tidal areas where docks or vessels are on the bottom during mid to low tides, causing disturbance to substrate and benthic organisms. In other cases, the substrate is excavated during construction of the project. During ingress and egress from docking systems, there is inevitable kicking of shallower connecting creeks during borderline tides, and while inshore boating, fishing for bait or marsh species such as flounder or drum, kicking of the shallow bottom is common, and resuspension of sediments follows. Shallow habitat supporting SAV and marsh can become scarred from propellers, boat wakes destabilize and erode SAV and marsh edges, and bottom sediments can be resuspended through energy of the propeller or jet of the engine.

In 2008, the CRC modified dock and pier rules, giving property owners greater flexibility in facility construction. The new rules provide better protection for shallow water habitat by requiring minimum water depths for docks located in PNAs, SAVs, and shell bottom habitat.

Marinas are regulated by the CRC to prevent, in every case possible, excavation of shellfish, SAV, and wetlands. Marinas cannot be located in or adjacent to areas where shellfish harvesting for human consumption is a significant existing use and a closure to the resource is anticipated. In areas where shellfish waters are closed to harvest or are not a significant resource, this may inadvertently promote development, resulting in further degradation of water quality and degradation of bottom habitat.

8.4.2.1. Sedimentation

An increase in water column turbidity causes a decrease in sunlight penetration and oxygen availability; toxins can be released with sediment, shellfish smothered, and blades of SAV covered. Resuspended sediment can settle onto wetland plants, alter the composition and elevation of substrate, changing the competition between wetland species; sediment can smother benthic organisms and clog finfish gills, alter pH, salinity, temperature, and the chemical composition of the water column.

Piles for dock and pier construction can be installed in two ways. The jetting of pilings uses a water pump with a high energy nozzle to displace sediment. Fines are released into the water column, increasing turbidity for various lengths of time depending on grain size (Denton 2004; Smith 2003). Heavier material settles faster, leaving localized elevated mounds, potentially affecting local flow conditions. Pile driving is a technique consisting of mechanically hammering the piling into the substrate. This method displaces a negligible amount of material compared to jetting, with less impacts, but is more time consuming and expensive.

Navigational dredging for boat basins, canals, or channels produces sediment plumes on a larger scale. Hydraulic pipeline excavation disturbs sediment while “vacuuming” the bottom. Material is piped directly into a containment area on high ground. Small organisms, such as larvae and shellfish can be entrained with the dredge material. The duration of suspension varies from hours to days depending on sediment type, currents, and equipment specifics. Sessile benthic invertebrates can be adversely impacted depending on the suspended sediment exposure (LaSalle et al. 1991). Clamshell bucket dredging employs buckets to remove the substrate, and in theory, close tightly by hydraulics prior to removing the material. In practice, the bucket is often lifted in the process of closing, and material is lost to the water column. Bucket-to-barge excavation employs a simple bucket to remove sediment. The material is removed with a dragline or excavator, and lifted to a barge for transporting and offloading. Material is dragged through the water as the bucket pulls to the surface, and lifted from the surface into the barge. Spillage from the barge is common. This method of material transport is also used by hydraulic clam bucket.

In shallow creeks and sounds with lunar tides, floating docks can cause a release of sediment by settling onto the bottom during low tides, pushing the water from beneath the dock. As floats rise with the tide, the force causes suction, pulling sediments into the water column. As wave action lifts and lowers the float, pumping sediment separates, with coarser materials on the bottom and fines on top.

Boating associated with marinas and docks can cause siltation of shell habitat through bottom scour and resuspension, with an effect similar to oyster dredging . Boat wakes increase wave energies and shoreline erosion, and promote the development of dead margins along intertidal reefs (Grizzle et al. 2002; Wall et al. 2005; Walters et al. 2003). In a study of recruitment and survival of oysters in Mosquito Lagoon, Florida, Wall et al. (2005) found that reefs adjacent to areas with intense boating activity had higher sediment loads, water motion, and juvenile oyster mortality than pristine reefs. Other studies in this system indicated reef migration away from the AIWW, and total reef destruction in response to increased boating activity since the mid twentieth century (Grizzle et al. 2002).

As suspended sediment disperses and settles, it can bury oyster larvae, adults, or shell, deterring successful recruitment from lack of exposed hard substrate (Coen et al. 1999). In some areas, historic reefs have been completely covered with fines and mud (Rodriquez et al. 2006). Oyster eggs and larvae are most sensitive to sediment loading (Davis and Hidu 1969). Excessive sediment and associated algae can reduce growth rates and survival of macrofauna, such as hard clams (Bock and Miller 1995).

Suspended sediments can impact aquatic animals by clogging gills and pores of juvenile fish and invertebrates, resulting in mortality or reduced feeding (Ross and Lancaster 1996). Auld and Schubel (1978) demonstrated reduced hatching success and larval fish survival for several fisheries species in the Chesapeake Bay. Increases in nonfood items ingested by suspension-feeding shellfish and polychaetes lower the nutrient value of their diet and their growth rates (Benfield and Minello 1996; Lindquist and Manning 2001; Reilly and Bellis 1983; SAFMC 1998b). Turbidity has also been found to disrupt spawning migrations and social hierarchies (Reed et al. 1983) and decrease biomass (Aksnes 2007).

Hard bottom in close proximity to shore is more vulnerable to pollutants than offshore, although problem levels of nutrients have generally not been found in North Carolina’s coastal ocean waters. Residues of the organochlorine pesticides DDT, PCB, dieldrin, and endrin have been found in gag grouper, red and black grouper, and red snapper (Stout 1980), indicating that toxins from stormwater runoff are a potential threat to the hard bottom community.

Suspended sediment absorbs toxic chemicals, heavy metals, phosphorus, and bacteria, providing a mechanism for pollutants to be transported downstream where they may be ingested by filter feeding fish and invertebrates (Steel 1991). Sediment allows bacteria to persist longer in the water column than in clear waters (Fries et al. 2008; Jartun et al. 2008; Schueler 1999). Results from the Neuse River Estuary Modeling and Monitoring Project estimated that the amount of nitrogen and organic carbon stored in the upper 2 cm of bottom sediments is ten times more than the amount of total nitrogen content in the entire 3-4 m water column (Luettich et al. 1999). Once sediments are resuspended, contaminants can be released back into the water column. As the oxygen of the water near the sediment interface is reduced, the release of phosphorus, iron, and manganese increases markedly (Wetzel 2001).

Sediment is a significant impairment to water quality in North Carolina. The 2014 DWR Integrated Report on water quality (DWR 2014), based on data collected from 18 ambient stations, shows the highest 2012 turbidity levels in the Cape Fear River near Kelly, NC. In 2014, 6,290 acres of coastal rivers and sounds were impaired due to turbidity.

8.4.2.2. Shading

Shading from docks results in loss of SAV beneath the dock structures (Beal and Schmit 1998; Connell and

Murphey 2004; Loflin 1995; Shafer 1999). In a study in the Indian River Lagoon, Florida, light availability was reduced under docks that were 3 feet and 5 feet high to 11% and 14% of ambient light, respectively, which is less than the minimum shown to be optimal (15-25%) for growth and survival of seagrass (Beal and Schmit 1998). Light availability increased with increasing dock height, and was significantly greater under the higher dock (5 feet). Other studies in Florida found significantly less SAV under docks than in adjacent unshaded areas (Loflin 1995), and no seagrass under docks having light levels less than 14% of surface irradiance (Shafer 1999). Burdick and Short (1999) identified dock height, orientation, and width as the most important factors affecting SAV survival under docks.

Shading of marsh vegetation results in loss of plant growth and vigor. A South Carolina study compared stem densities of *Spartina alterniflora* under docks with stem densities five meters away (Sanger and Holland 2002). Results indicated an average reduction in density of 71% under docks. Shading from the average dock (100m long x 1.22m wide) adversely affected ~87 m² of marsh. Sanger and Holland (2002) surmised that on a built-out scale, these effects could be significant.

In North Carolina, CRC rules allow property owners to waive riparian corridor setback requirements. Further, with neighbor permission, owners of narrow properties (e.g., 30 ft, 40 ft) can construct within riparian areas of others [T15A NCAC 07H .0208(b)(6)(I)]. This can, and does, permit congested docking systems. In areas where marsh is fringed along the edges of creeks or canals, a plethora of docks places a visible burden on the coastal marsh system (Figure 8.5). In this situation, a reduction of 71% in marsh stem density could place a significant burden on the remaining habitat.

In Georgia, two studies found a reduction of ~50% in stem density under docks, resulting in 21-37% reduction in biomass and carbon production per m², estimating that to cause a 0.5-0.9 g dry weight nekton/m^2 reduction in total annual primary nekton production (Alexander and Robinson 2004; Alexander and Robinson 2006). With the increasing proliferation of docks in Georgia, the conclusion was that the cumulative effects from dock shading on critical fish nursery areas should be further assessed.

Pagliosa et al. (2012) studied the influence of piers on functional groups of benthic primary producers and consumers in the channel of Conceicao Lagoon in southern Brazil. They determined the main impact to be light reduction, reducing micropyhytobenthos and macroalgae. Twenty six taxa of macroalgae and twenty six taxa of macrofauna were identified and grouped. The findings, while inconclusive for all groups, showed that shading caused by piers decreased phytobenthic biomass, also evidenced by the reduction of chlorophyll *a,* Pagliosa et al. (2012). "We can conclude that all algal functional groups responded negatively to the abiotic and biotic conditions provided by the piers. Regarding the macrofauna, the primary production reduction and the presence of the new habitats resulted in changes of the analyzed groups. Thus, we concluded that piers exert a negative effect over base-trophic level organisms responsible for bottom-up controls" (Pagliosa et al. 2012).

The presence of docks can alter young-of-year (YOY) fish populations. In the Hudson River, New York and New Jersey, Able et al. (1998) examined the impacts docks had on YOY fish populations under docks. Although most YOY fish tend to utilize complex habitats for refuge from predators, several studies found fewer fish that feed using sight under piers than in adjacent areas (Able et al. 1998; Duffy-Anderson et al. 2003). This difference may be due to reduced light penetration under piers. Young of year winter flounder *(Psuedopleuronectes americanus)*, a species similar to southern flounder (*Paralichthys lethostigma)*, had faster growth rates and consumed more prey in caged areas at pier edges than in those under piers (Duffy-Anderson and Able 1999).

Because of shading impacts to habitat, CRC rules include specific criteria to limit these impacts. Shading rules affecting platform space, dockage, boathouses, etc., allow eight square feet per linear foot of shoreline with a maximum of 2,000 square feet, not including the pier, with some exceptions. This restriction does not apply to marinas. The DCM regulates the width and height of structures in that piers and docking facilities over coastal wetlands shall be no wider than six feet and shall be elevated at least three feet above coastal wetland substrate [T15A NCAC 07H .0208(b)(6)(C)]. If the applicant qualifies for a General Permit, they cannot construct within a PNA, SAV, or shellfish bed, with less than 2' of water, unless pre-approved by DMF and WRC. Floating piers and docks located in PNAs, over shellfish beds, or over beds of SAV shall only be allowed if the water depth between the bottom of the structure and the substrate is at least 18 inches at normal low water or normal water level (T15A NCAC 07H .1200).

8.4.2.3. Excavation and marina design

The CRC rules include use standards related to navigational dredging, [T15A NCAC 7H .0208(b)] to avoid or minimize impacts to PNAs, shellfish beds, SAV, and coastal wetlands.

Soft bottom habitat can be affected by alteration of shoreline configuration, circulation patterns, and changes in bottom sediment characteristics (Wendt et al. 1990). Because benthic microalgae are light dependent, bottom sediments in dredged marinas have reduced light availability due to increased water depth. The difficulty in assessing impacts to soft bottom sediments and benthic habitat is that for the facility to continue operations, excavation must be maintained. Therefore, even if the habitat recovers, impacts will recur. This same fact applies to the loss of wetlands, SAV, and shell bottom within the excavation footprint, and within the slough and adjacent energy zone.

There is a regulatory dilemma regarding the design of basins, caused by the different missions of individual agencies. While DWR is focused on protecting the quality of the water and wetlands, DCM and the USACE also look at protecting navigation and public trust access. Because of this, the DWR recommends marinas designed with open basins to enhance flushing, while DCM and the USACE recommend upland basins and connecting channels to minimize obstruction to navigation.

8.4.2.4. Boating use, propeller scar, wake turbulence

Marinas and docks of all types have one function – to allow for the safe storage, use, and service of marine vessels. There are impacts to all six CHPP habitats from the use of boats, depending on the size of the boat, the competency of the user, the tide schedule during use, the type of activity, and the system in which the activity takes place.

Boating related activities, such as anchoring or diving on hard bottom, can damage this habitat. Anchors and chains from recreational or commercial boats can damage corals and other benthic organisms, creating lesions and leading to infection (SAFMC 1998a). Divers can kick or overturn corals and live rock, resulting in habitat damage. Recreational spearfishing with power heads can damage corals where diving activity is concentrated (SAFMC 1998a). Diver harvest of live rock for the aquarium trade was found to cause extensive destruction and loss of hard bottom, with additional damage occurring when chemicals were used (SAFMC 1998a). Several state and federal regulations provide protection for hard bottom habitat from such destructive harvest techniques. Since 1995, North Carolina has prohibited directed harvest of all coral and live rock in state waters (T15A NCAC 03I .0116). In addition, any live rock or coral incidentally harvested with gear must be returned immediately to the waters from where it was taken. Similar NMFS regulations exist for federal waters, prohibiting the collection of live rock, stony and black corals, fire coral and hydrocoral, and some species of sea fans (SAFMC 1982; SAFMC 1994). Permits may be issued by NMFS to take prohibited coral for scientific, research, and educational purposes, to use chemicals, and to harvest octocorals.

Direct physical impacts from propeller scarring, vessel wakes, and mooring scars have been identified nationally as a major and growing source of SAV loss (ASMFC 1997; Fonseca et al. 1998; Sargent et al. 1995). Propeller scarring of SAV occurs when outboard vessels travel through water that is shallower than the draft of the boat. The propeller blade cuts leaves, roots, and stems, as well as creates a narrow trench, or scar, through sediment (Sargent et al. 1995). Large holes may also be blown where boaters rapidly power off shallow bottom (Kenworthy et al. 2000). Mechanical disturbance to the sediment damages plant rhizomes, which reduces abundance and cover for extensive periods of time. Recovery of SAV can take from two to 10 years, depending on species and local conditions, or in some cases, the habitat may never recover (ASMFC 2000; Zieman 1976). Once started, SAV damage can increase beyond the initial footprint of the scar, due to scour, storms, or biological disturbance such as crab and ray burrowing (Patriquin 1975; Townsend and Fonseca 1998). Where prop scarring is extensive and SAV beds destabilized, the ecological value of the habitat is reduced (Bell et al. 2002; Fonseca et al. 1998).

An effect of boating on wetlands is the loss of vegetation from wave action, although the impact has not been quantified (Riggs 2001; SAFMC 1998b). Erosion from boat traffic along the AIWW and elsewhere is readily observable and is likely responsible for substantial loss of fringing wetland habitat (Riggs 2001). According to the WRC, there were ~219,482 vessels registered in the coastal counties in 2015 (Table 8.10). This is an increase of 111,382 over the 2008 number of 108,100, representing a 103% increase in the number of registered recreational boat owners in the coastal counties in seven years.

Counties with the greatest number of boats are in the tidally driven southern counties of New Hanover, Carteret, Brunswick, and Onslow. Craven, Beaufort, Dare and Pender counties also have a considerable number of registered vessels. Boats less than 16 feet in length comprise almost 42% of all vessels, and boats 19 to 23.9 feet are the second most common boat size, accounting for 21% of all vessels.

There are currently 240 marinas located within 500 meters of a PNA (Table 8.11). Of these, 152 meet the shellfish exclusion necessary to prevent closure of harvest for human consumption (less than 30 vessels, no boats over 24’, no heads, no cabins). There are 33 marinas located within 500 meters of designated Anadromous Fish Spawning Areas.

As of 2014, there are at least 648 marinas within North Carolina CHPP Regions (Table 8.12). Of these, 368 meet the shellfish exclusion necessary to prevent closure of harvest for human consumption (less than 30 vessels, no boats over 24’, no heads, no cabins). The majority of marinas are clustered in high salinity waters, followed by transitional and low salinity (Map 2.1a-b). The greatest numbers of marinas (in descending order) occur in the Core/Bogue, Southern Estuaries, and Neuse subregions.

8.2.4.5. Chemicals, toxins and fecal and microbial contamination

Marinas and boatyards often provide services such as maintenance, wastewater pumpout, pressure washing, sandblasting, and painting that can lead to the introduction of toxins into adjacent waters. To assess the types of activities and potential water quality concerns, DWQ conducted a survey of 141 marinas in the 20 coastal counties in 2007 (DWQ 2008a). They found elevated levels of copper, iron, zinc, and aluminum in the wastewater, with lead, nickel, chromium, arsenic, and cadmium elevated to a lesser extent. High metal concentrations were attributed to sloughing of residual paints from boat hulls during washing, with pressure washing contributing greater loading of copper, zinc, and aluminum. Boats with anti-fowling, or bottom paint, had the highest concentrations of metals in process wastewater compared to water from boats without. The report concluded that due to concentrations of metals generated in the power washing process, and since the majority of the operations are located adjacent to coastal surface waters, the environmental effects are a significant concern. As a result, there are now regulations in place for marinas with wash down and sand blasting facilities.

Boats can be sources of fecal microbial contamination from head discharge, as in the Town of Wrightsville Beach (Mallin et al. 2009a). Because of frequent swimming advisories posted to estuarine beaches, studies were undertaken. In the study by Mallin et al. (2009a), sampling for fecal coliform bacteria and *Enterococcus* bacteria was done at nine locations from 2007-2009. Standards for Enterococcus were exceeded on four occasions at one location and three occasions at two other locations. The DNA fingerprint analysis revealed human fecal bacteria signals at all sites, most frequently at local marinas. Lacking evidence of sewer or septic leaks, discharge from boat heads was indicated.

Table 8.10. Registered recreational boats of different length categories in NC coastal counties (WRC, 2015).

County	Number of boats per boat length interval (feet)							
	< 16 Ft	16 - 16.9 Ft	17 - 17.9 Ft	18 - 18.9 Ft	19 - 23.9 Ft	24 - 30 Ft	> 30 Ft	Total
New Hanover	13,337	3,510	3,145	2,420	7,084	2,486	736	32,718
Carteret	9,462	3,457	2,775	2,362	8,796	2,900	930	30,682
Brunswick	12,019	3,074	1,966	1,792	4,461	1,566	360	25,238
Onslow	10,261	3,091	2,548	1,912	4,235	1,118	308	23,473
Craven	8,040	1,827	1,675	1,374	3,666	1,147	443	18,172
Beaufort	6,412	1,837	1,266	1,252	3,161	1,132	377	15,437
Dare	5,479	1,577	1,105	1,151	3,688	1,587	382	14,969
Pender	5,792	1,516	1,106	802	2,089	565	123	11,993
Currituck	3,911	1,185	807	825	1,668	535	76	9,007
Pamlico	2,755	697	568	517	1,529	775	312	7,153
Pasquotank	2,447	600	479	407	1,059	295	58	5,345
Perquimans	1,924	423	310	273	777	237	37	3,981
Chowan	1,684	452	359	326	821	234	59	3,935
Bertie	1,619	506	361	247	480	105	15	3,333
Hertford	1,585	428	266	247	411	85	16	3,038
Washington	1,278	442	232	239	442	121	21	2,775
Camden	1,029	242	187	181	439	225	25	2,328
Gates	1,127	289	195	162	302	47	5	2,127
Hude	761	330	234	241	550	276	104	2,496
Tyrrell	516	215	105	99	221	102	24	1,282
TOTAL	91,438	25,698	19,689	16,829	45,879	15,538	4,411	219,482

Table 8.11. Marinas and multi-slip docking facilities by CHPP Region within 500 m of AFSA and PNA, between 10 and 29 slips (excluded from shellfish closure), and equal to or greater than 30 slips (DMF, unpub. data, 2014).

	AFSA			PNA		
CHPP Region	Between 10 and 29	≥30	Totals	Between 10 and 29	≥30	Totals
1	18	8	26	0	2	2
1/2	0	0	0	0	0	0
2	5	1	6	53	25	78
2/3	0	0	0	0	0	0
3	1	0	1	35	17	52
4	0	0	0	64	44	108
TOTAL	24	9	33	152	88	240

Table 8.12. Number of multi-slip docking facilities by CHPP Region with between 10 and 29 slips (marinas excluded from shellfish closure), and equal to or greater than 30 slips (DMF, unpublished data, 2014).

	Number of docking facilities		
CHPP Region	> 10 and < 29	≥30	Totals
1	42	37	79
1/2	0	1	1
2	110	55	165
2/3	0	0	0
3	126	100	226
4	90	87	177
TOTAL	368	280	648

Microbial contamination from fecal matter is important because it affects the opening and closing of shellfish harvest waters. Fecal coliform bacteria occur in the digestive tract of, and are excreted in solid waste from, warm-blooded animals. While these bacteria are not harmful to humans or other animals, their presence in water or in filter-feeding shellfish may indicate the presence of other bacteria that are detrimental to human health (DWQ 2000a). Shellfish harvest closures have occurred over time (DMF 2001a; DMF 2001b) leading to a reduction in available harvest areas. Over 442,106 acres of coastal waters were closed to shellfish harvesting in North Carolina as of March 05, 2014, due to high levels of fecal coliform or the potential risk of bacterial contamination (S. Jenkins, pers. com.). The most recent closures have primarily affected the central and southern areas of the coast, which coincides with the largest concentrations of marinas.

Regulated by the EPA, wood used for marine construction can be treated with chromated copper arsenate (CCA) to a minimum retention of 0.60 - 2.50 pounds of preservative per cubic foot (pcf). Marine construction is defined as (abridged): Wood used for pilings, timbers, walers, plywood and framing, stringers and cross bracing. Wood for marine construction for saltwater use (includes brackish) subject to saltwater (or brackish) splash (splash means any member of a marine structure positioned above mean high tide, but subject to frequent wetting from wave action) is treated to a minimum of 0.60 pcf (http://www.epa.gov/oppad001/reregistration/cca/awpa_table.htm).

Laboratory studies by (Weis et al. 1991; Weis et al. 1992) have shown leachate from CCA -treated wood to be toxic to estuarine species. Leaching decreases by about 50% daily once immersed in seawater. Approximately 99% of the leaching occurs within the first 90 days (Brooks 1996; Cooper 1990; Sanger and Holland 2002). Elevated concentrations of metals from CCA-treated wood can be found in organisms living on treated pilings and in areas near pilings (Weis and Weis 1996a; Wendt et al. 1996).

In areas of low water flow, elevated concentrations of chromium, copper, and arsenic were found in fine sediments adjacent to bulkheads constructed of CCA-treated wood, and in organisms living on and around treated pilings (Weis and Weis 1996b; Weis et al. 1998). Dilution appears to reduce these impacts; the bioaccumulation of dock leachates by marine biota did not impact survival of mummichogs, juvenile red drum, white shrimp, or mud snails in South Carolina estuaries characterized by higher flow rates (Wendt et al. 1990). However, tidal flushing thresholds for contaminant impacts have not been identified, and data does not exist to evaluate the dilution capacity of an area.

While the additional colonization of non-mobile epifauna on dock structures within a marina may provide additional biotic diversity and a food source for some fish, high densities of fouling organisms (tunicates, barnacles, bryozoans) in marinas can reduce DO levels due to high respiration rates (Wendt et al. 1990). Toxic substances in fouling organisms bioaccumulate and can become concentrated in successively higher levels of the aquatic food chain (Marcus and Stokes 1985; Nixon et al. 1973).

Metals such as mercury, cadmium, and copper are capable of adversely affecting genetic development in bivalve embryos (Roesijadi 1996). Early developmental stages of bivalve mollusks are most sensitive to metal toxicity. Exposure to organic contaminates has resulted in impairment of physiological mechanisms, histopathological disorders, and loss of reproductive potential (Capuzzo 1996). Reductions in growth and increased mortality have been observed in soft-shelled clams (*M. arenaria*) following oil spill pollution events (Appeldoorn 1981).

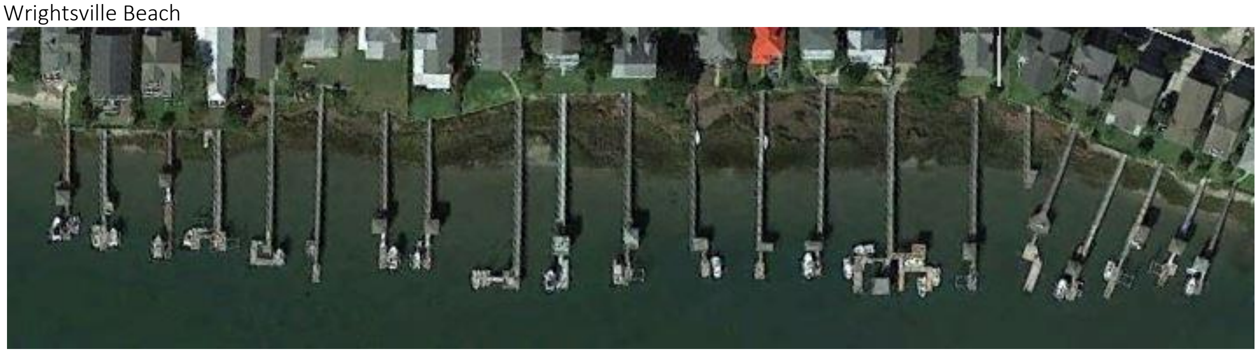
Outboard motors associated with boating have long been associated with contamination of waterways. Two-cycle engines release up to 20% of unburned fuel along with exhaust gases (Crawford et al. 1998). Crawford et al. (1998) compared the PAH output from a two-cycle outboard engine with that from a four-cycle engine. Discharge from the two-cycle contained five times as much PAH as that from the four-cycle. Most of this difference was due to a reduction in discharge of 2 and 3-ring compounds—those that are generally considered acutely toxic—in the four-cycle. However, the comparison found little difference between the levels of discharge of 4- and 5-ring compounds — those generally related to chronic toxicity. Albers (2002) notes that PAH concentrations in the water column are “usually several orders of magnitude below levels that are acutely toxic,” but those in sediments may be much higher. The PAHs related to boating activities can accumulate in bottom sediments (Sanger et al. 1999) to be stirred up by boat traffic (Albers 2002).

8.4.3 Marinas, docks, and boating summary

The combination of possible impacts from docks and marinas could cumulatively lead to significant degradation of coastal habitats, specifically to primary and secondary nursery area functioning. The Division of Coastal Management undertook mapping of the shoreline and docking structures based on 2012 imagery, documenting a total of 29,583 piers, floating docks, and wharfs on a total of 597.3 acres within the 20 coastal counties (DCM 2015). Commenting agencies must consider cumulative impacts of this scale of coastwide development when making permitting decisions, but the research, models, and tools to determine cumulative impacts with scientific certainty are lacking and therefore currently unaddressed by regulatory agencies.

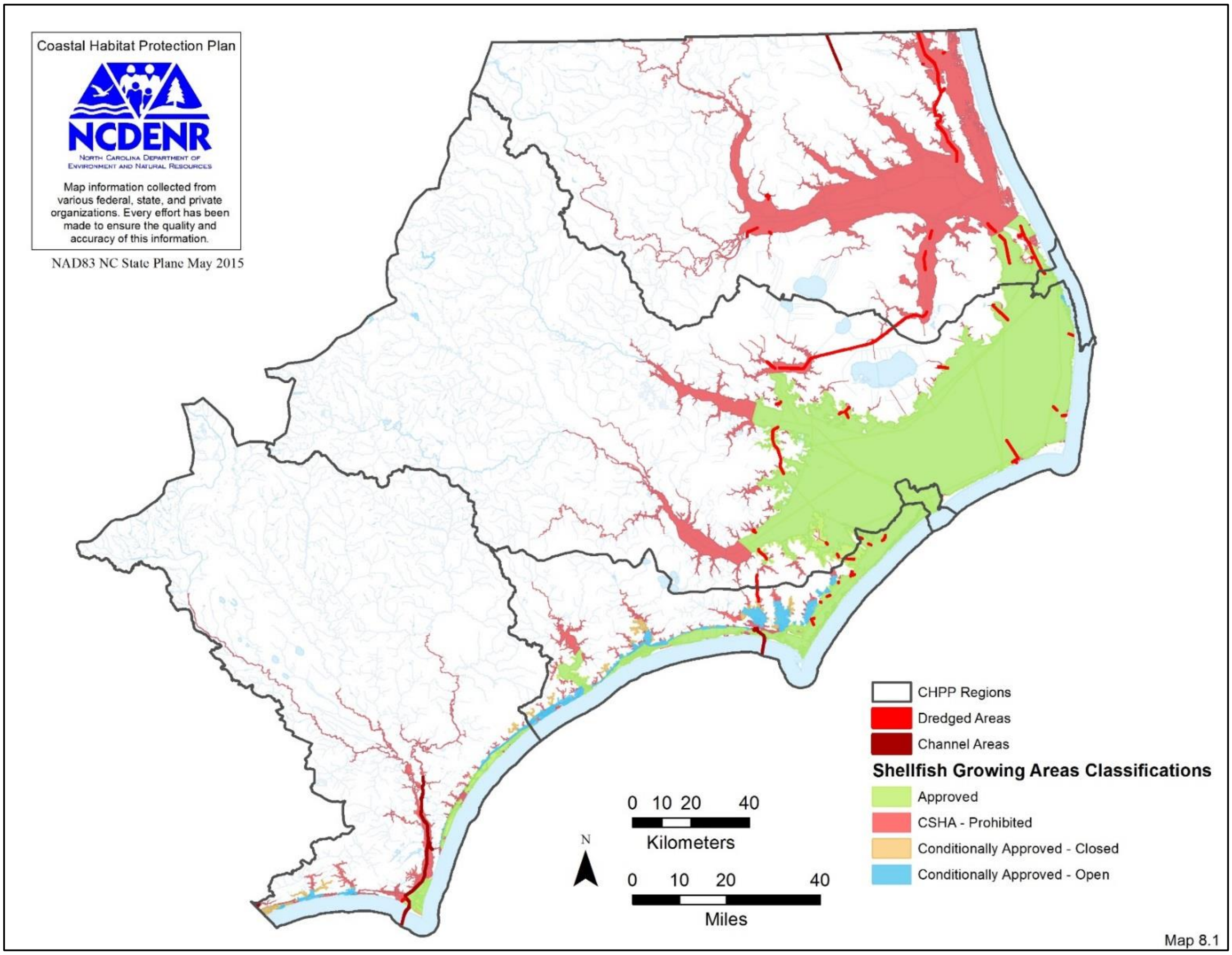
Figure 8 Island

Wrightsville Beach



Holden Beach Ocean Isle Beach

Figure 8.5. Clusters of piers crossing *Spartina alterniflora* marsh



Map 8.1. Federally dredged channels, marinas, and 10-slip docking facilities.

PART III. MANAGEMENT

CHAPTER 13. ECOSYSTEM MANAGEMENT AND STRATEGIC COASTAL HABITATS

Ecosystem management is defined as an approach to maintaining or restoring the composition, structure, function, and delivery of services of natural and modified ecosystems that integrates ecological and socioeconomic perspectives within a geographic framework for the goal of achieving sustainability. Ecosystem management, as a concept, is a broadening of the narrow focus of single species, single habitat, or single threat management to consider multiple species, habitats, and threats that are interdependent. An ecosystem approach is necessary given the interrelationships among species, habitats, and threats. Thus, any management activity that considers multiple species, habitats, and/or threats could be considered ecosystem management. North Carolina's coastal fishery resources (the "fish") exist within a system of interdependent habitats that provide the basis for long-term fish production available for use by people (the "fisheries"). Most fish rely on different habitats throughout their life cycle; therefore, maintaining the health of an entire aquatic system is essential. The integrity of the entire system depends upon the health of areas and individual habitat types within the system.

In recent years, there has been increasing awareness of the need to manage aquatic resources on an ecosystem scale (Beck et al. 2000; NRC 2001; SAFMC 2009). To address habitat biodiversity within the South Atlantic, the South Atlantic Fishery Management Council (SAFMC) is adopting an ecosystem approach to fisheries management with the development of a Fishery Ecosystem Plan (FEP) and Comprehensive Ecosystem-Based Amendment (CE-BA) that will amend all the Council's Fishery Management Plans (SAFMC 2009). Other regional initiatives, such as the Southeast Aquatic Resource Partnership (SARP) developed a Southeast Aquatic Habitat Plan (SAHP) that provides regional watershed conservation and restoration targets (SARP 2008). Ecoregional assessments have been conducted in over half of the ecoregions of the United States to develop conservation priorities (Beck et al. 2000) for regional funding sources. The North Carolina Department of Environment and Natural Resources has developed a conservation planning tool (CPT) to provide guidance for both aquatic and terrestrial conservation efforts in the state.

One of the most challenging aspects of ecosystem management is the setting of management priorities, objectives, and measures of success. Success criteria could take the form of indicator metrics and threshold values. The Albemarle-Pamlico National Estuary Partnership (APNEP) has developed indicator metrics for the Albemarle-Pamlico region (APNEP Albemarle-Pamlico National Estuarine Program 2012). However, there is also a need to set threshold values that reflect a fundamental, destabilizing shift in ecosystem function. The finding of fundamental indicators with threshold values is an essential goal of ecosystem management research (Grossman et al. 2006). Without indicator metrics and threshold values, the management of ecosystems has relied upon maintenance of ecosystem characteristics (i.e., no net loss of wetlands).

There is abundant evidence that structurally complex habitats (i.e., SAV, shell bottom, hard bottom, wetlands) are becoming more rare across the globe, with a corresponding increase in less structured habitats (e.g., soft bottom) (Airoldi et al. 2008). The changes have been linked to coastal development, overfishing, and eutrophication as described in the "Other Stressors" chapter of the CHPP. Maintaining structurally complex habitat is undoubtedly a positive influence on biodiversity.

13.1 Threats and cumulative impacts

Threats and stressors often affect multiple habitats, with a corresponding impact on biodiversity and ecosystem function. Threats and stressors affecting a single habitat have indirect impacts on other habitats depending on their proximity and ecological interactions. For example, reductions in wetland area and filter-feeding shellfish could degrade water quality conditions needed for SAV growth. There are also multiple threats affecting habitat areas that are not necessarily confined to individual property boundaries. A good example is the indirect relationship between degraded water quality along an individual shorefront property and the cumulative contribution of pollution sources upstream of the property. The management of cumulative impacts is an area lacking in state regulatory authority and practices due to the lack of an effective assessment methodology and management tools. The state's best attempts at managing cumulative impacts have been the coastal impervious surface limits, development of Local Watershed Plans (DMS) and Total Maximum Daily Loads (DWR), and acquisition of lands managed for conservation. Though required in the permit process, assessment of cumulative impacts as the basis for determining significant adverse impacts is rarely put forward due to the limitations of existing data, lack of threshold values, and anticipated legal challenges. However, a precedent has been set with the application of impervious surface limits to individual lots, though no limits have been placed on a hydrologic unit basis.

A review of top threats to coastal marine ecosystems across the globe listed habitat loss, overexploitation, eutrophication and hypoxia, pollution, invasive species, altered salinities, altered sedimentation, climate change, ocean acidification, and disease (Crain et al. 2009). In the 2005 and 2010 CHPPs, threats were discussed in the individual habitat chapters. In these chapters, it was evident that most threats affected more than one habitat and all habitats were affected by multiple threats. To reduce redundancies, the 2015 CHPP implemented a new section (Part 2-Existing and Potential Threats) to discuss each threat as a new chapter. Table 13.1 depicts which habitats have documented impacts from a threat category. A qualitative rating of the relative severity of a threat to each habitat is shown. Ratings were determined, utilizing input from agency staff and university scientists, and took into account the type and severity of damage that a threat could have on a habitat and the extent that a habitat is likely to be affected by that threat. From the table it is clear that some alteration sources have potential impact across multiple habitats in a system. The most "cross-cutting" threats include weather events, water quality degradation from nutrients and toxins, dredging for navigation, water-dependent development, and non-native/invasive/introduced species. The synergy of these threats may also exacerbate or mitigate the individual impacts discussed in the habitat chapters.

13.2. Strategic coastal habitats

An important step toward developing ecological thresholds in hydrologic units is the selection of exceptional areas to protect, enhance, or restore. The areas that contribute most to the integrity of the system are the subset of habitat termed strategic coastal habitats. Strategic coastal habitats are defined as specific locations of individual fish habitat or systems of habitat that have been identified to provide critical habitat functions or that are particularly at risk due to imminent threats, vulnerability, or rarity. Location and selection of strategic coastal habitats is an attempt to identify such exceptional areas within the coastal fisheries ecosystem. Exceptional habitat areas are relatively unaltered and represent a proportion of habitat types to maintain.[20] The amount to maintain is adjusted up or down from 30%, based on relative ecological importance, rarity, vulnerability, sensitivity to alteration, and/or historic losses.

Deaton et al. (2006) describe the process for identifying strategic coastal habitats in North Carolina's coastal waters. Using this process and several refinements, three of the four regional assessments have been completed and presented to the Marine Fisheries Commission. Through the analysis, maps of habitats and relative alteration levels were produced, and a network of exceptional areas was selected as

[20] In the SHA region 1 (Albemarle Sound and tributaries), there were 42 habitat types and 18 alteration factors.

strategic coastal habitats (Maps 13.1 -13.3). Currently, strategic coastal habitats and supporting data from Regions 1 (Albemarle Sound), 2 (Pamlico Sound), and 3 (White Oak River Basin) are being used in conservation planning (at the DEQ level) and as information for the CHPP update. Additionally, a Sea Grant research fellowship supported the analysis of DMF sampling data and proximity to altered habitats. The results indicated some correlations between juvenile fish data and cumulative alteration within a 0.5 kilometer radius, with low fish abundance where alteration levels were greater (Ellis 2009). Currently, strategic coastal habitat nominations for regions 1, 2, and 3 have been completed. The strategic coastal habitat assessment for Region 4 (Cape Fear River Basin) will begin this calendar year (2015) should be complete by late 2016. Additional research is needed to verify the relative impact and distribution of cumulative alterations affecting the selection of areas.

TABLE 13.1. Threat sources, impact severities (both measured and potential), and documented interactions with habitats. Shading = relative severity of impact, based on qualitative information; 0% = no impact/unknown, 25% = minor, 50% = moderate, 75% = major.

Threat category	Source and/or impact	Water column	Shell bottom	SAV	Wetlands	Soft bottom	Hard bottom
Physical threats	Bottom disturbing fishing gear				-	-	
	Dredging (navigation channels, boat basins)						
	Estuarine shoreline stabilization						-
	Ocean shoreline stabilization	-	-	-	-		
	Jetties and groins		-	-	-		-
	Mining		-	-			-
Hydrological alterations	Obstructions (dams, culverts, locks)		-	-		-	-
	Water withdrawals		-	-		-	-
	Channelization		-	-		-	-
Water quality degradation	Nonpoint - Development (buildings, roads,non-discharge sewage systems)						-
	Nonpoint - Agriculture (crop and animal)						
	Nonpoint- Forestry					-	-
	Water-dependent development (marinas, docks, boating)				-		-
	Point source discharges				-		-
	Marine debris		-	-	-	-	-
	Microbial contamination			-	-	-	-
	Nutrients and eutrophication						
	Suspended sediment and turbidity				-		-
	Toxic chemicals						
	Ocean acidification			-	-	-	
Other	Disease and microbial stressors	-			-	-	-

	Non-native, invasive or nuisance species						
	Weather events					-	-

The input data and results of strategic coastal habitat assessment should help permit reviewers in assessing cumulative impacts and deciding habitat trade-offs acceptable for development projects. One could estimate how much more altered an area would get with the addition of proposed structures. The habitat trade-off issue is exemplified by the criteria required for constructing marsh-sills instead of vertical bulkheads. In this case, the exchange of soft bottom with shell bottom and wetlands could be justified by comparing representation levels in the region. The question is whether the loss of soft bottom habitats would result in those habitats not meeting their representation levels in the strategic coastal habitat network. The addition of habitats with higher representation levels (i.e., shell bottom and wetlands) and less over-representation could be applied to restoration goals for those habitats in the area. Additionally, the strategic coastal habitat approach could provide input regarding the maintenance of habitat diversity in DMS restoration crediting systems. A basic need of strategic coastal habitat assessment continues to be the development of accurate and contemporary distribution maps for habitats and threats, as well as assessing fish utilization within s.

The strategic coastal habitats are intended to help prioritize conservation, enhancement, and restoration projects that benefit fish and fisheries in coastal North Carolina. Additionally, strategic coastal habitats can serve as sentinel sites for monitoring fish-habitat relationships and can be used in outreach efforts to educate the public on the importance of habitat in supporting coastal biodiversity. A tremendous effort has already identified strategic coastal habitats in three of the four CHPP regions. The final region (Cape Fear River Basin) will be completed soon. A remaining need is the development of ecosystem indicator metrics for strategic coastal habitats, which would not only assist in prioritizing conservation efforts, but would also allow DMF staff to quantitatively monitor the condition, status, and trends of fisheries habitat in jurisdictional waters.

13.3 Other habitat designations and protection programs

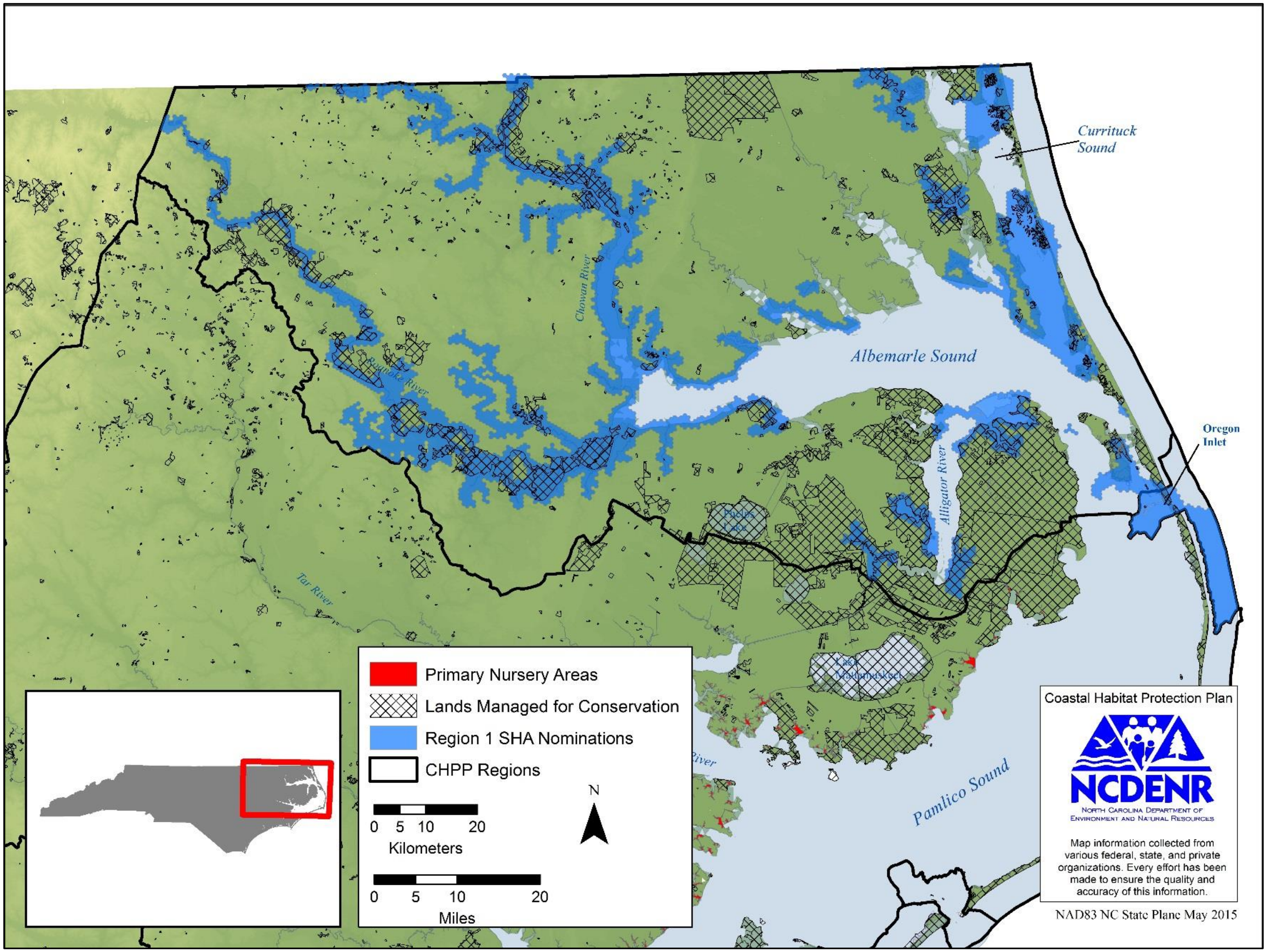
There are several different existing designations used in North Carolina that identify, delineate, and designate functionally important habitat areas. At the federal level, the Magnuson-Stevens Fishery Conservation and Management Act Reauthorization of 1996 (the Sustainable Fisheries Act) requires the National Marine Fisheries Service (NMFS) to amend federal Fishery Management Plans (FMPs) to include provisions for protection of “Essential Fish Habitat” (EFH), defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” In North Carolina, salt marshes, oyster reefs, and seagrass beds are designated EFH for red drum and penaeid shrimp, species managed cooperatively by state and federal authorities. Similar to CHPP “strategic coastal habitats”, federal “Habitat Areas of Particular Concern” (HAPCs) are designated for areas of EFH that are particularly important for managed species or species complexes (SAFMC 1998b).

North Carolina Primary Nursery Areas, first designated by the MFC in 1977, are similar in concept to HAPCs. The MFC/DMF and WRC have designated tens of thousands of acres as nursery areas since 1977 and 1990, respectively, in North Carolina. Approximately 162,000 acres of Coastal Fishing Waters are currently designated by the MFC as Primary, Secondary, and Special Secondary Nursery Areas. About 10,000 acres of Inland Fishing Waters in the coastal area are designated as Inland Primary Nursery Areas, as well as several hundred additional stream miles in the four main rivers draining North Carolina’s coast (Roanoke, Tar-Pamlico, Neuse, and Cape Fear). The state designations are well accepted by the various state and federal regulatory and permitting agencies, as well as by the public.

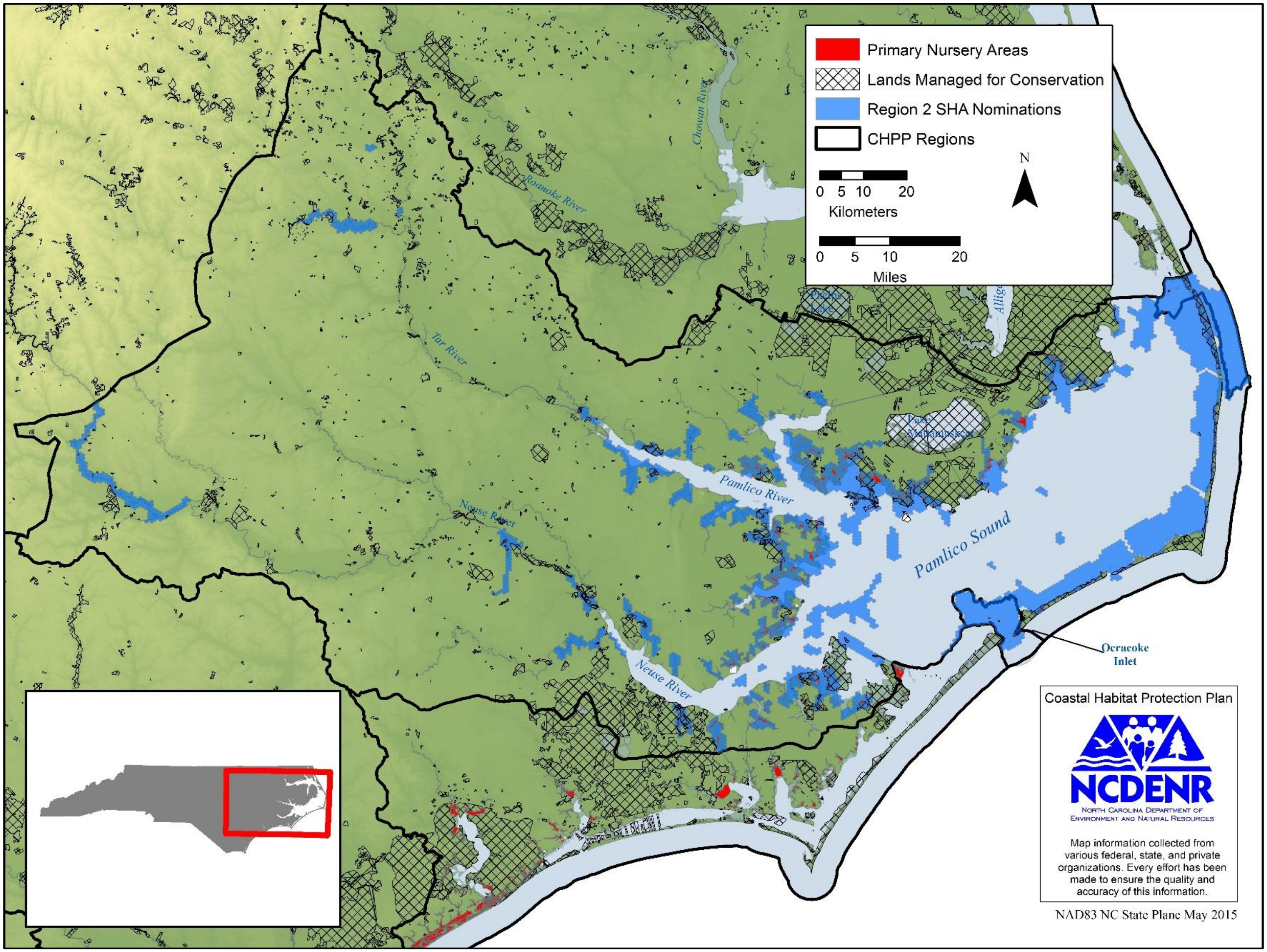
There are specific protections for designated nursery areas included in the rules of all three commissions. For example, an MFC rule [15A NCAC 03N .0104] prohibits use of any trawl net, long haul seine, swipe net, dredge, or mechanical shellfishing gears in Primary Nursery Areas (PNAs). Once an area has been designated as a PNA by the MFC, the area also comes under protection of existing CRC rules [15A NCAC 07H .0208] and EMC rules [EMC rule 15A NCAC 02B .0301(c)] that protect physical and water quality parameters of PNAs as a class.

The existing rule definitions for various fish habitats were revised by the Marine Fisheries Commission in April 2009 [MFC Rule 15A NCAC 03I .0101(4)]. The word "critical" was omitted since all fish habitats, under the ecosystem concept, are critical to a properly functioning system as a whole. The DMF also delineated in rule anadromous fish spawning areas based on sampling conducted from the early 1970s to the present. Although neither CRC nor EMC rules offer any specific protection for anadromous fish spawning areas, regulatory protections exist for other fish habitats, such as submerged aquatic vegetation and shellfish producing areas. Beds of submerged aquatic vegetation are protected from the direct impacts of shellfish dredging and trawling (in some locations [MFC rule 15A NCAC 3J .0104]), and open shellfish harvesting areas are protected from new marina pollution and wastewater discharges [CRC rule 15A NCAC 07H. 0208(5) (E)].

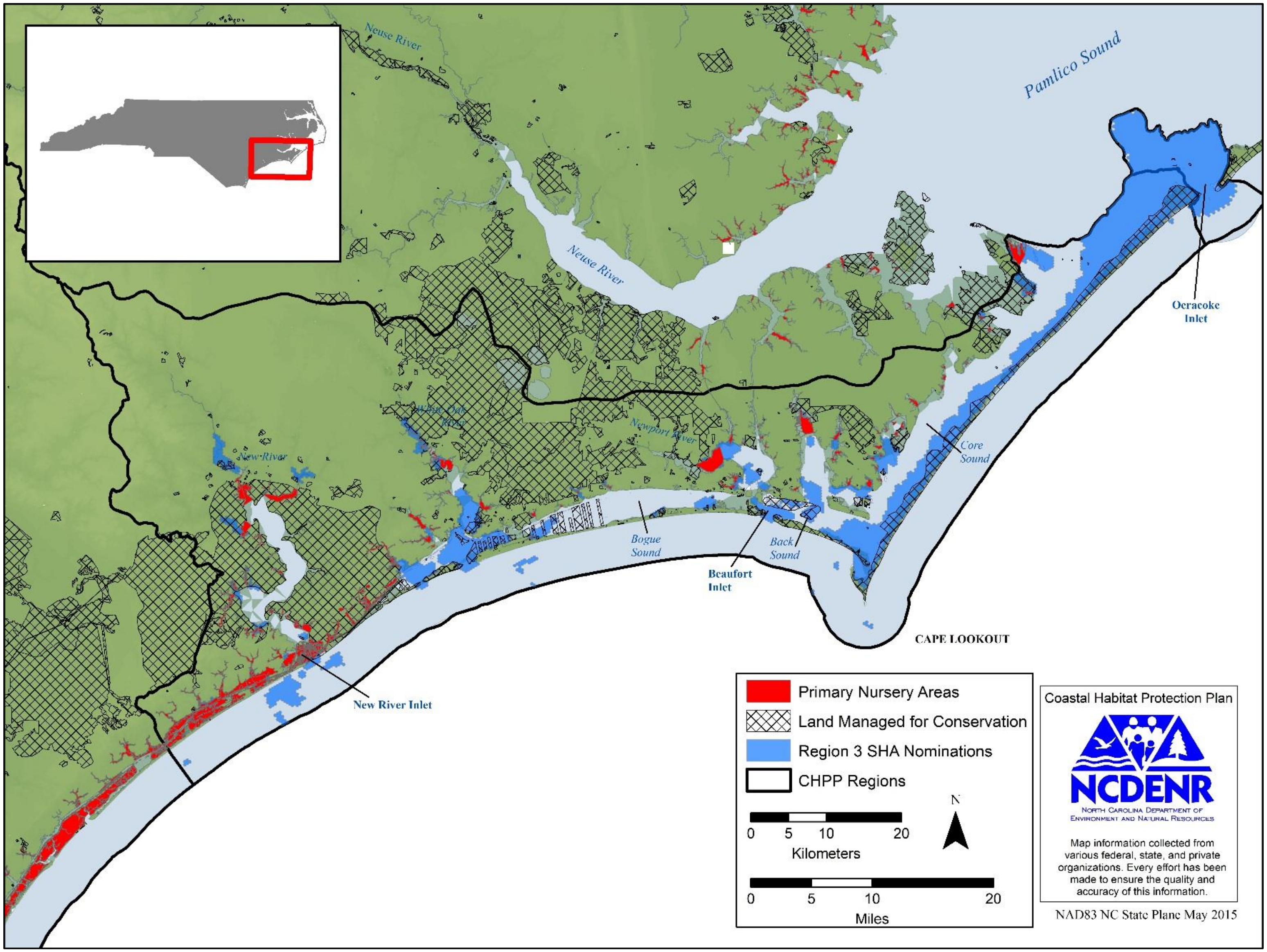
Identification and protection of strategic coastal habitats was meant to improve on the piecemeal protection of individual habitats and functional areas. While Regions 1, 2, and 3 strategic coastal habitats have been identified and approved under the CHPP, they have not been placed in agency rule due to the need to develop site specific management plans for each strategic coastal habitat that will determine if regulatory actions or restrictions are needed.



Map 13.1. Region 1 strategic habitat area nominations presented and approved by the Marine Fisheries Commission in January 2009.



Map 13.2. Region 2 strategic habitat area nominations presented and approved by the Marine Fisheries Commission in November 2011.



Map 13.3. Region 3 strategic habitat area nominations presented and approved by the Marine Fisheries Commission in November 2014.

CH 14. EXISTING PROTECTION, RESTORATION, AND ENHANCEMENT EFFORTS

14.1. Existing Protection Efforts

Preventing loss or degradation of habitat and water quality through management and planning proves to be much cheaper than restoring resources. North Carolina's state agencies rely on a variety of approaches to protect habitat and water quality. Habitat can be protected through regulatory measures, encouragement of Best Management Practices (BMPs), technical assistance, land conservation, outreach and planning. Regulatory designations are used to identify and prioritize areas for protection. State, federal, and interstate agencies have developed policies to provide guidance on managing fish habitat. The MFC has habitat related policies on submerged aquatic vegetation, beach nourishment, and environmental permit review (Appendix E).

14.1.1. Fishing Gear

Habitat protection from fishing gear impacts is accomplished by the MFC primarily through spatial and temporal fishing gear restrictions, particularly in habitat areas designated for their ecological importance. Habitat designations that have gear restrictions include Primary and Secondary Nursery Areas, Oyster Sanctuaries, Crab Spawning Sanctuaries, and No Trawl Areas. Trawling restrictions are found in several rules. For example, trawling is not allowed in Primary or Secondary Nursery Areas, in designated Shellfish Management Areas, Oyster Sanctuaries, and No Trawl Areas (SAV habitat in eastern Pamlico and Core Sounds), as well as portions of some western tributaries of Pamlico Sound). Trawling is prohibited in designated Crab Spawning Sanctuaries from March 1-August 31. Like trawling, mechanical harvest for shellfish is restricted from certain areas by several rules. Prohibited areas include PNAs, Shellfish Management Areas, and Mechanical Methods Prohibited Areas. Mechanical gear included in the latter category includes oyster dredges, hydraulic clam dredges, patent tongs, and rakes towed by engine power. Mechanical harvest for oysters was further restricted in the western bays of Pamlico Sound by the MFC based on FMP recommendations (DMF 2008a). Oyster dredging is not permitted in Onslow, Pender, New Hanover, and Brunswick counties. Maps 3.5a-c depict where trawling and mechanical harvest are restricted. Anadromous Fish Spawning Areas (AFSAs) were designated in MFC rule, but do not have any fishery rules associated with them. The WRC designated Inland Primary Nursery Areas (IPNAs) in inland waters that serve as nursery areas for freshwater and coastal migratory species. While the majority of PNAs occur in the southern portion of the coast (CHPP regions 3 and 4), most AFSAs occur in the northern portion of the coast (Table 14.1).

Table 14.1. MFC and WRC fish habitat designations in CHPP management regions.
Note: Area of PNA, Permanent SNA, and IPNA are not inclusive of tidal areas between mean high water or normal water level and the apparent shoreline (i.e., wetland edge). Miles of AFSA includes streams and shorelines; IPNA and AFSA have some overlap.

CHPP Region	PNA (acres)	SNA (acres)	IPNA (acres)	AFSA (miles)	AFSA (acres)
1	167	168	16,285	2,201	152,968
2	12,370	46,687	8,992	1,450	49,999
3	23,864	0	703	108	830
4	40,525	608	4,404	821	13,518
Total	**76,927**	**47,463**	**30,384**	**4,579**	**217,314**

Federal agencies are also engaged in fish habitat protection in North Carolina waters through designation of Essential Fish Habitat (EFH) and establishment of Marine Protected Areas (MPAs). The Sustainable Fisheries Act of 1996 (SFA) states that habitat loss and degradation contributed to fishery decline, and therefore required through the amended Magnuson-Stevens Act a program be created to protect EFH, defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (SAFMC 2009). Subsets of EFH, referred to as Habitat Areas of Particular Concern (HAPC), were to be geographically identified and designated. For activities with potential adverse effects on EFH, consultation with National Marine Fisheries Service is required so that an assessment can be done and recommendations made to avoid, minimize, or mitigate impacts. Fisheries in North Carolina with designated EFH include penaeid shrimp, estuarine dependent species in the snapper-grouper complex, coastal pelagic species (cobia, Spanish and king mackerel), spiny lobster, and dolphin/wahoo, (Table 14.2). Portions of each CHPP habitats are defined as EFH for at least one of these species.

14.1.2. Coastal Development

Coastal development activities impacting wetlands and other fish habitat are regulated by federal and state agencies. The River and Harbors Act of 1899, the Clean Water Act of 1972, and the Coastal Zone Management Act of 1972 are the most significant federal laws directing the EMC and CRC on avoidance and minimization of development impacts to fish habitat.

States were given the authority to approve, apply conditions, or deny 404 permits by Section 401 of the Clean Water Act (CWA). The authority is applied in North Carolina by DWR with the 401 Water Quality Certification program. While issuance or denial of Section 404 Permits are the most widely used federal management tool protecting wetlands, most farming, ranching, and silviculture activities are exempt from such permits (Bales and Newcomb 1996). The "Swampbuster" provision of the Food Security Act of 1985 (Farm Bill) discourages (through financial disincentives) the draining, filling, or other alterations of wetlands for agricultural use. The majority of wetlands lost to agriculture occurred before 1985.

The Coastal Area Management Act (CAMA), passed in 1974, encourages wetland protection, coastal planning, and rule implementation, to minimize impacts from development activities. The CRC and DCM were established in 1974 and 1978, respectively, to implement the CAMA, stating that coastal resources are to be managed to balance competing uses of and impacts to coastal resources so that the natural ecological conditions and productivity of the beaches, estuaries and coastal system are sustained. Rules focus on activities such as excavation of channels, canals, and boat basins, construction of marinas, estuarine and ocean shoreline stabilization, and development setbacks. The CRC rules state that activities must avoid adverse impacts to PNAs, highly productive shellfish beds, SAV beds, and marshes.

Setbacks and vegetated buffers are utilized by the EMC and CRC to protect wetlands and water quality. Required setback distance varies based on the regulatory designation of the shoreline or waterbody. For example CRC setbacks are greater for property adjacent to the Estuarine Shoreline Area of Environmental Concern (AEC), than for the Public Trust AEC. The EMC requires vegetated riparian buffers adjacent to waters classified as Nutrient Sensitive Waters. Setbacks and buffers are low-cost strategies to reduce and filter nonpoint runoff.

Since the 2010 CHPP, there have been several changes to ocean shoreline stabilization. In 2011, the N.C. General Assembly passed legislation allowing up to four terminal groins in the state's inlets, despite CRC rules prohibiting ocean hardening. Also, more coastal communities are seeking beach nourishment, using non-federal funding, and requesting to conduct work during previously restricted times of year.

The DCM administers the North Carolina Clean Marina program as a voluntary initiative to recognize marina operators for their efforts toward environmental stewardship by implementing Clean Marina BMPs. There are currently 38 certified Clean Marinas in the program.

Table 14.2. Habitats designated Essential Fish Habitat (EFH) or EFH-Habitat Areas of Particular Concern by the South Atlantic Fishery Management Council.
Note: This table only includes habitats and fisheries occurring off NC (SAFMC 2009).

	NC fisheries associated with the habitat designation	
Essential Fish Habitat	**Fisheries/Species**	**Habitat Areas of Particular Concern**
Wetlands		
Estuarine and marine emergent wetlands	Shrimp, Snapper-grouper	Shrimp: State designated areas
Tidal palustrine forested wetlands	Shrimp	
Submerged Aquatic Vegetation		
Estuarine and marine submerged aquatic vegetation	Shrimp, Snapper-grouper, Spiny lobster	Snapper-grouper
Shell bottom		
Oyster reefs and shell banks	Snapper-grouper	Snapper-grouper
Hard bottom		
Coral reefs, live/hardbottom, medium to high rock outcroppings from shore to at least 600 ft where the annual water temperature range is sufficient.	Snapper-grouper, Spiny lobster, coral	Snapper-grouper, migratory pelagics, coral: The Point, Ten Fathom Ledge, Big Rock
Artificial reefs	Snapper-grouper	
Soft bottom		
Subtidal, intertidal non-vegetated flats	Shrimp	
Offshore marine habitats used for spawning and growth to maturity	Shrimp	
Sandy shoals of capes and offshore bars	Coastal Migratory Pelagics	Sandy shoals; Capes Lookout, Fear, Hatteras
Water column		
Ocean-side waters, from the surf to the shelf break zone, including Sargassum	Coastal Migratory Pelagics	
All coastal inlets	Coastal Migratory Pelagics	Shrimp, Snapper-grouper
All state-designated nursery habitats of particular importance (e.g., PNA, SNA)	Coastal Migratory Pelagics	Shrimp, Snapper-grouper
High salinity bays, estuaries	Cobia in Coastal Migratory Pelagics	Spanish mackerel: Bogue Sound, New River
Pelagic Sargassum	Dolphin in Coastal Migratory Pelagics	
Gulf Stream	Shrimp, Snapper-grouper, Coastal Migratory Pelagics, Spiny lobster, Dolphin-wahoo	
Spawning area in the water column above the adult habitat and the additional pelagic environment	Snapper-grouper	

The Coastal Area Management Act requires each of the 20 coastal counties to have a local land use plan in accordance with guidelines established by the CRC, for which the division of provides technical assistance. These plans are a collection of policies and maps to serve as each community's blueprint for growth and are important pro-active elements of coastal management in North Carolina.

14.1.3. Water Quality Management

14.1.3.1. Surface Water Classifications

The EMC protects water quality by classifying surface waters according to the best use of the water (e.g., water supply, aquatic life, shellfish harvest, swimming, and fish consumption) and adopting water quality standards intended to protect the designated uses. Supplemental surface water quality classifications, such as Outstanding Resource Waters and Nutrient Sensitive Waters, are applied to unique high quality waters or degraded waters needing additional water quality protection. Table 14.3 and 14.4 describe the different water quality classifications.

TABLE 14.3. EMC definitions & overview of requirements for primary surface water classifications (15A NCAC 2B .0101).

Primary Classification	Definition **	Overview of Requirements and Restrictions**
C or SC*	Supporting secondary recreation (including swimming on an unorganized or infrequent basis); wildlife; fishing; fish and other aquatic life propagation and survival; agriculture and any other usage, except for primary recreation or water supply.	Basic water quality standards and standard erosion and sediment controls.
B or SB*	Supporting primary recreation (including swimming on an organized or frequent basis) and all uses specified for Class C or SC (and not water supply use).	Adds bacterial standards for Enterococcus in SC waters and allows for restriction of discharges from within the swimming areas.
SA*	Commercial shellfishing waters and all Class SC and SB uses.	More stringent fecal coliform bacteria standard to protect human consumption. No direct discharges.
WS (Water Supply)	Water supply in natural and undeveloped watersheds (WS-I), predominantly undeveloped watershed (WS-II), low to moderately developed watersheds (WS-III), and moderately to highly developed watersheds (WS-IV), plus former or industrial potable water supplies or waters upstream and draining to WS-IV waters (WS-V).	Adds point source restrictions, development activity requirements including setbacks, and BMP requirements for agriculture, forestry, and transportation depending on the WS classification. For WS-I, II and III, more stringent erosion and sediment controls and transportation BMPs are mandated. Site-specific management strategies may also be adopted into rule.
WL or SWL* (Fresh and Salt Water Wetlands)	Wetlands are "waters" as defined by G.S. 143-212(6) and are areas that are inundated or saturated by an accumulation of surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands classified as water of the state are restricted to waters of the United States as defined by 33 CFR 328.3 and 40 CFR 230.3 .	No discharges that would cause adverse impact to existing wetland uses are allowed.

TABLE 14.4. EMC definitions & overview of requirements for supplemental surface water classifications (15A NCAC 2B .0101).

Supplemental Classification	Definition	Overview of Requirements and Restrictions**
ORW (Outstanding Resource Waters)	Unique and special waters that are of exceptional state or national recreational or ecological significance which require special protection to maintain existing uses. These waters have been identified as having excellent water quality in conjunction with at least one important resource value.	No new or expanding discharges. Development density requirements, agriculture, forestry and transportation BMPs mandated, more stringent erosion and sediment controls required, and no new discharging landfills allowed. Site-specific management strategies may be developed and adopted into rule.
HQW (High Quality Waters)	Waters rated as excellent by DWR; Primary Nursery Areas or other functional nursery area; Native and Special Native Trout Waters and their tributaries; WS-I, WS-II and SA waters and waters for which DWR has received reclassification to WS-I or WS-II.	Stricter treatment standards for new or expanding dischargers Development density requirements, agriculture, forestry and transportation BMPs mandated, more stringent erosion and sediment controls required, and possible restrictions on new discharging landfills.
NSW (Nutrient Sensitive Waters)	Waters needing additional nutrient management due to their being subject to excessive growth of microscopic or macroscopic vegetation.	Watershed specific nutrient removal requirements for point sources, agriculture, forestry and transportation, as well as, watershed specific development density and setback requirements. A nutrient management strategy is developed and adopted when the waters are classified.
SW (Swamp Waters)	Waters with low velocities and other characteristics different from adjacent water bodies (generally low pH, DO, high organic content).	Lower pH and DO allowed due to natural background conditions. Otherwise same as Classes C and SC.
UWL (Unique Wetlands)	Wetlands of exceptional state or national ecological significance which require special protection to maintain existing uses. These wetlands may include wetlands that have been documented to the satisfaction of the EMC as habitat essential for the conservation of state or federally listed threatened or endangered species.	Site specific requirements developed as waters are designated.

Point source discharges, i.e., those entering surface waters from a discrete point, are managed by EMC and DWR through effluent standards specified in NPDES permits. In contrast, nonpoint source runoff is managed through a variety of strategies, depending on the source, water classification, and location. There are different stormwater programs throughout the state, but coastal stormwater rules implemented in 2008 apply to new construction in the 20 coastal counties. These rules were implemented since the previous stormwater rules were found to be lacking in the prevention of water quality degradation, particularly in shellfish harvest waters.

In 2013, DWR's Stormwater Permitting Unit administering construction, industrial, municipal and post construction stormwater programs, was transferred to DEMLR to simplify the permitting process. The DEMLR has been working on a Stormwater Fast Track Permitting program to be implemented in 2016. The Stormwater Permitting Unit has also worked with public and private partners to develop a new StormEZ application which introduces the concept of runoff volume matching—pre and post development hydrology, to calculate whether a proposed project meets stormwater requirements. Table 14.5 explains is shorthand the stormwater permitting requirements pre and post 2008.

Retrofitting existing development with appropriate stormwater controls could reduce stormwater runoff from state roads and older urban/suburban built upon areas. The only stormwater retrofit program available to communities is the Conservation Assistance Program (CCAP), administered by the Department of Agriculture and Consumer Service's Division of Soil & Water Conservation (NCDACS, SWC). Funding allocated to this program is very limited.

TABLE 14.5. Development Requirements before and after October 1, 2008 within the 20 coastal counties (NC DEMLR-Stormwater Program).

	All Areas Within the 20 Coastal Counties	
	Requirements Prior to 2008	Requirements as of Oct. 01, 2008
Threshold for Permit Coverage for Any and All Development	Activities that require a CAMA Major Permit or an Erosion and Sedimentation Control Plan (disturbance of one acre or greater)	Activities that require a CAMA Major Permit or an Erosion and Sedimentation Control Plan (disturbance of one acre or greater)
Threshold for Permit Coverage for Non-Residential Development	Same as above	In addition to the coverage requirements above, activities that add more than 10,000 sf of built-upon area
Vegetative Setback Requirement - Redevelopment	30 feet from surface waters (for low density projects only)	30 feet from surface waters for redevelopment projects (for low and high density projects
Vegetative Setback Requirement - New Development	30 feet from surface waters (for low density projects only)	50 feet from surface waters for new development projects (for low and high density projects
Wetlands and Impervious Calculations	Portions of wetlands may be included in the calculations to determine the built-upon area percentage per DWQ Policy (Oct. 05, 2006)	No CAMA jurisdictional wetland areas may be included in the calculations to determine the built-upon area percentage. All other wetlands can be included in the calculations.
	Within the 20 Coastal Counties & Within 1/2 Mi. of Shellfishing Waters (SA) & within 575' of ORW Waters	
Low Density Threshold*	Built-upon area of 25% or less	Built-upon area of 12% or less (maximum built-upon area of 25% for ORW)
Stormwater Control Requirement for High Density Projects	Control and treat the runoff from the first 1.5 " of rainfall	Control and treat runoff generated by 1.5" of rainfall - or - the difference from the pre and post development conditions for the a-year, 24-hour storm, whichever is greater*
Discharge Requirements	No discharge for the first 1.5" of rainfall	No new points of discharge for the design storm (see above)
Types of Stormwater Controls	Infiltration is the only control allowed	All types of stormwater controls are allowed, with some restrictions
	Within the 20 Coastal Counties & Not Within 1/2 Mi. of Shellfishing Waters (non-SA)	
Low Density Threshold	Built-upon area of 30% or less	Built-upon area of 24% or less
Stormwater Control Requirement for High Density Projects	Control the runoff generated by 1.0" of rainfall	Store, control and treat runoff generated by 1.5" of rainfall

14.1.3.2. Reduction Strategies

The EMC designated a number of coastal river basins as Nutrient Sensitive Waters (NSW). In the CHPP region, this includes the Chowan, Neuse, Tar-Pamlico, and New rivers. Nutrient reduction strategies are required for such waters. The Chowan River was designated NSW in 1979. Nutrient reduction strategies, which have been in place for over 20 years have had some success. Strategies recommended to reduce point and nonpoint phosphorus and nitrogen inputs were (DWQ 2002):

- Convert point source discharges to land application systems.
- Require point source effluent limit of 1 mg/l for P and 3 mg/l for N in the North Carolina portion of basins.
- Target funds from Agriculture Cost Share Program to implement BMPs for agricultural nonpoint sources.

Since nutrient reduction strategies were implemented, some reductions in nutrient loads have been achieved and algal blooms have been reduced in frequency and duration. The Chowan River basin met the goal of a 20% nitrogen reduction. Total phosphorus was reduced by 29% in the same time period, although the goal was 35% (DWQ 2002). Despite the reduced nutrient levels, measured chlorophyll *a* and DO concentrations exceeded North Carolina water quality standards on occasion in the mainstem Chowan River, and more than 60% of the time in the upper portion of some tributaries.

The Neuse and Tar-Pamlico river basins were designated as NSW in 1988 and 1989, respectively, as a response to a large number of fish kills and other concerns over deteriorating water quality. To meet the required 30% reduction in total nitrogen requirement, five “Nutrient Reduction Strategies” were developed and implemented.

Agriculture and silviculture are affected by agriculture rule (T15A NCAC 2B .0238) and the nutrient management rule (T15A NCAC 2B .0232). The agriculture rule gives farmers several options. They may participate in developing a Local Nitrogen Reduction Strategy where specific plans for each farm are developed, or implement standard BMPs such as buffers and water control structures. The nutrient management rule applies to anyone applying fertilizer on 50 or more acres of land, such as cropland, golf courses, recreational land, nurseries, or residential or commercial lawns. This rule requires training in nutrient management or development of a nutrient management plan.

The wastewater discharge rule (T15A NCAC 2B .0234) and stormwater rule (T15A NCAC 2B .0235) target reductions in nutrients from point and nonpoint urban development, respectively. The wastewater discharge rule allocates a total maximum discharge limit for basins and divides that amount among different discharger groups. The stormwater rule requires that local governments develop stormwater plans for new development, educate the public on stormwater issues, identify and remove illegal discharges, and identify existing development that could be retrofitted.

The Neuse and Tar-Pamlico riparian buffer rules were designed based on the Lowrance (1997) zonation scheme. Zone 1 must be a 30 ft wide forested area, beginning at mean high water (MHW). Landward of this, Zone 2 must be 20 ft wide and have plant cover where no fertilizer use. The rule applies to all perennial and intermittent streams, lakes, ponds, and estuaries. Man-made ditches are exempt from this rule [T15A NCAC 02B .0233 (6)].

The Nutrient Reduction Strategies in the Neuse and Tar-Pamlico have resulted in the targeted 30% reductions from point source dischargers and agriculture, though the overall goal of a 30% reduction in receiving waters has not been met (DWQ 2009; H. Patt, DWQ, pers. com.). The disparity between source reductions of nutrients and measured concentrations of nutrients in the water column suggests a “lag-time” while excess nutrients stored in sediment are released.

14.1.3.3. Managing Nonpoint Pollution from Silviculture, Agriculture, and Construction

The N.C. Dredge and Fill Law (GS 113-229) requires permitting for construction of roads or ditches within estuarine waters, tidelands, marshlands or state-owned lakes. Silviculture and agriculture (crop and animal) is statutorily exempt from the Coastal Area Management Act under GS 113A-103(5)(b)(4). Federal exemption under Section 404 of the Clean Water Act applies if several conditions are met, such as adhering to BMPs. Each industry has specific BMPs related to their activities. For development, stormwater BMPs are non-mandatory, structural or non-structural means of treating or limiting pollutants and other damaging effects of stormwater runoff to meet required water quality standards. Use of vegetated buffers is one type of BMP that can be effective in reducing nonpoint runoff from any kind of land-disturbing land use.

Silviculture

The purpose of forestry BMPs or guidelines is to avoid long-term conversion of wetlands to uplands, and to minimize water quality impacts to adjacent waters. The regulatory framework under which silviculture operates in wetlands, and associated BMPs, are described in detail within BMP Manual (NC Forest Service 2006). Specific conditions must be achieved for silviculture activities to take place, as defined either by USEPA and USACE guidance documents, or federal rule code:

- Nationwide mandatory 15 BMPs for road construction (33 CFR Part 323.4).
- Nationwide mandatory 6 BMPs for mechanical site preparation for the establishment of pine plantations (Joint Memo to the Field, 1995).
- Guidance from USACE Wilmington District developed in 2004 for the construction or maintenance of forest roads in wetlands of North Carolina.

In North Carolina, silviculture related site-disturbing activities must comply with the performance standards described in the state water quality regulations (TO2 NCAC 60C .0100-.0209) entitled the *Forest Practices Guidelines Related to Water Quality*, abbreviated as FPG's. The statewide FPG's are incorporated as part of the North Carolina Sedimentation Pollution Control Act, (GS 113A-52.1) and cover the full spectrum of forestry activities, including a section that describes requirements for establishing a Streamside Management Zone (SMZ) along intermittent streams, perennial streams, and perennial water bodies. While the primary objective of establishing a SMZ is for water quality protection, a well-managed SMZ can provide multiple benefits, including wildlife cover and habitat; recreation; aesthetic visual screens; and windbreaks. Generally, harvesting is allowed within a SMZ, but should occur in a low impact manner that maintains the integrity of the soil and water resources.

Forestry activities must also comply with riparian buffer protection and maintenance rules described by the nutrient sensitive water strategies within NSW-classified watersheds and laws that prohibit stream obstruction. The NCFS inspects forestry sites across the state for compliance with the aforementioned rules and laws. Of the over 3,800 sites inspected from 2011-2014, compliance with forestry rules and laws increases yearly (Table 10.6, Chapter 10).

In addition to following guidelines of the Forestry BMP manual, wetland and water quality impacts are offset through forest regeneration. During the period between 2010 and 2014 the North Carolina Forest Service (NCFS) recorded 83,949 acres of forest regeneration across the 27 counties that comprise the NCFS coastal operating districts (Table 14.6). Most of the acres reported are for the planting of trees after timber harvests, while some acres were newly established forests upon former pasture or croplands, or were regenerated by in-place seed or stump sprouts.

TABLE 14.6. Forest regeneration in the coastal plain, 2010-2014.

Forest Service District	Reforested Area (acres)
7 (Northeastern Coastal Plain)	27,983
13 (Albemarle-Pamlico Peninsula)	4,812
4 (Central Coastal Plain)	28,589
8 (Southeastern Coastal Plain)	22,565

The Forest Service provides training and education, as well as participating in outreach events across the state on a range of topics including BMPs for erosion & sediment control, and overall water resources protection. Examples include logger training through the ProLogger Program, instruction for college students, water resource conference presentations, and one-on-one assistance. Each year, the Forest Service summarizes its water quality and nonpoint source program accomplishments in an annual "Year in Review," available from its website: http://ncforestservice.gov/water_quality/year_in_review.htm.

Agriculture

Protecting water quality from the impacts of agriculture is promoted through natural resource management with assistance from NCDA&CS, S&WC. The division utilizes financial incentives, technical assistance, and outreach to reduce nutrient loading in river basins. Strategies include BMPs, nutrient management, and riparian buffer protection. Financial incentives are provided through an Agriculture Cost Share Program was authorized in 1983 as a pilot program to address nonpoint source problems in the NSWs but has been extended to all Soil and Water Conservation Districts. As of the 2014 Annual Report, implementation of the strategies promoted by the program had resulted in a 43% reduction in nitrogen loss compared to the baseline data collected in 1991 (NCDA&CS 2014).

To reduce water quality impacts from CAFOs, permitting, training, facility inspections, and odor control standards are in place. The 2007 Swine Farm Act prohibited new lagoon and sprayfield systems and established a swine farm methane capture pilot program.

Construction

The sedimentation of streams, lakes and other waters of the state constitutes a major pollution problem. Sedimentation occurs from the erosion or deposition of soil into the water from ground disturbing activities such as construction and road maintenance.

The Division of Energy, Mineral, and Land Resources (DEMLR), Land Quality Section, administers the Sedimentation Pollution Control Act (SPCA, GS 113A-50). The Sedimentation Control Commission delegates administration of the SPCA to 53 county or municipal governments, while maintaining control at the state level in other areas. Construction site BMPs (e.g., groundcover on slopes, skimmer basins, etc.) are implemented by DEMLR with approved Erosion and Sediment Control Plans (ESCPs) required for projects impacting one acre or more, or requiring a CAMA Permit within a coastal county. Some Local ESCPs require “approved” plans for site impacts starting at 5,500 square feet (one-eighth acre).

The EPA implements federal permitting requirements for stormwater discharges from active construction sites, but also has the authority to delegate permitting responsibilities to states. North Carolina has delegated authority that allows DEQ to issue federal construction stormwater permits. The state Sedimentation Program plays a critical role in meeting federal construction stormwater permitting requirements under the Clean Water Act. The NPDES Construction Stormwater Permit (NCG 010000) is issued automatically for a construction site upon receiving approval of an Erosion and Sediment Control Plan. Effective August 1, 2013, the Stormwater Permitting Unit of DWR, including 29 appropriated and receipt based positions administering the construction, industrial, municipal and post construction stormwater programs, was transferred to DEMLR, Land Quality Section. The Land Quality Section has incorporated cross-training of central and regional personnel and consolidation of forms between the Erosion and Sedimentation Control Program and the Construction Stormwater Program so that one point of contact for meeting both programs' permitting, inspection, and reporting requirements are used to communicate compliance with both program's state and federal provisions.

Mining

The Mining Act of 1971 was enacted by the General Assembly in 1971 to require that no mining be "carried on in the State unless plans for such mining include reasonable provisions for protection of the surrounding environment and for reclamation of the area of land affected by mining." The Act includes broad authority in granting and denying applications for mining permits in order to protect the environment and public safety. The DEQ has broad flexibility in reviewing applications for site-specific mining operations, and may deny a permit if criteria (G.S. 74-51) cannot be met. The DEMLR of DEQ requires submittal of pertinent environmental and public safety information, circulates applications to other agencies for review, and invites public input.

14.1.4 Land Conservation

Land conservation is an effective non-regulatory means of protecting wetlands and water quality. Protected lands are owned and managed by federal, state, county, and municipal governments, as well as conservation organizations, other nonprofit organizations, and land trust properties. Protected lands cover 127,275 acres (34%) of riparian wetlands in coastal NC (Table 14.7). A greater proportion of estuarine and flat/depressional wetlands are within conservation lands than headwater and riverine wetlands.

An estimated 16% of the CHPP region watershed is managed for land conservation by a federal, state, local, or private entity (Table 14.7), including uplands and wetlands. The Natural Heritage Program maintains GIS data on most of the conservation lands within North Carolina. These "Managed Areas" are a diverse collection of properties and easements that are managed to some degree for conservation of biodiversity and ecosystem function. Also included are a number of properties and easements that are not managed for conservation, but are of conservation interest. It should be noted that the analysis for Table 14.7 is focused on wetlands, but land conservation of all terrestrial areas contributes to watershed protection (Table 14.8). Conservation lands often have multiple benefits to the public beyond water quality protection, including recreation, wildlife habitat, scientific research and education opportunities, and aesthetic value. Protection of water quality through land acquisition and deed obligations is a passive and less controversial approach to water pollution management than regulatory measures.

TABLE 14.7. Amount and percentage of hydrogeomorphic wetland class in eastern North Carolina located within lands where conservation is a management goal (http://www.ncnhp.org/web/nhp/managed-areas, June 2015).

Hydrogeomorphic wetland category	Alteration type	Wetlands in conservation lands (acres)	Total wetland acres	Wetlands in conservation lands (%)
Estuarine	Unaltered	100,654.39	228,388.51	44.1%
	Cleared	175.24	339.98	51.5%
	Cutover	228.24	570.88	40.0%
	Drained	4,869.93	31,437.43	15.5%
Flat/depressional	Unaltered	616,600.01	1,482,991.59	41.6%
	Cleared	2,259.53	15,512.60	14.6%
	Cutover	3,161.47	32,187.25	9.8%
	Drained	91,358.11	263,984.94	34.6%
	Impacted	47,533.65	680,832.70	7.0%
Headwater	Unaltered	2,307.58	22,199.08	10.4%
	Cleared	11.14	470.12	2.4%
	Cutover	364.43	2,342.37	15.6%
	Drained	335.40	1,590.52	21.1%
Riverine	Unaltered	17,830.72	76,648.63	23.3%
	Cleared	21.09	1,373.70	1.5%
	Cutover	357.98	3,471.48	10.3%
	Drained	119.84	5,069.09	2.4%
Total Riparian		127,275.98	373901.8	34.0
Total Non-riparian		760912.74	2475509.08	30.7
Total		**888,188.74**	**2,849,410.89**	**31.2**

TABLE 14.8. Percent of watershed managed for land conservation by a federal, state, local, or private entity.

CHPP Watershed	Federal	Local	Private	State	Total
Albemarle	20.95	0.13	1.61	11.73	34.41
Cape Fear	2.39	0.19	1.48	9.52	13.57
Chowan	0.06	0.00	0.13	7.97	8.15
Core/Bogue	32.82	0.37	2.28	3.78	39.24
East coastal ocean	5.57	0.00	0.00	0.03	5.61
Neuse	4.65	0.03	0.54	1.83	7.05
New/White Oak	36.10	0.37	0.26	3.35	40.09
Northeast coastal ocean	0.21	0.00	0.02	0.05	0.27
Ocracoke Inlet	1.94	0.00	4.90	0.00	6.85
Oregon Inlet	2.44	0.00	0.00	0.31	2.75
Pamlico Sound	19.98	0.00	0.08	3.44	23.49
Roanoke	2.88	0.00	4.62	8.33	15.83
South coastal ocean	0.00	0.00	0.01	0.89	0.91
Southeast coastal ocean	3.29	0.00	0.00	0.67	3.96
Southern estuaries	0.00	0.40	6.00	7.77	14.16
Tar/Pamlico	2.38	0.07	0.36	2.37	5.18
Total	**8.98**	**0.10**	**1.14**	**5.92**	**16.14**

The DEQ recognizes the need to coordinate statewide conservation efforts and thus developed the NC Conservation Planning Tool (CPT) to streamline the process of identifying and prioritizing terrestrial and aquatic natural areas for conservation. The CPT approach is based on the “Green Infrastructure” principle, which emphasizes the importance of maintaining an interconnected network of natural areas for ecosystem stability. The geospatial data layers supporting the tool are separated into four assessments considered equally valuable: biodiversity/wildlife habitat, open space/conservation, farmland, and forestry lands.

The state currently has three Conservation Trust Funds including the Parks and Recreation Trust Fund (established 1994), Clean Water Management Trust Fund (established 1996), the Agricultural Development and Farmland Preservation Trust Fund (established 1986). The Natural Heritage Trust Fund (established 1987), was repealed in 2013 and the balance was put into the Clean Water Management Trust Fund. In addition to the state trusts, there are numerous local land trusts. Statewide, a total of 643,319 acres have been acquired through the trust funds. Together, these funds have significantly contributed to protecting coastal habitat and water quality in a manner that the public greatly supports.

Conservation makes economic sense. For every $1 invested in land conservation in NC, there is estimated to be a $4 return in economic value from natural resource goods and services alone (Land 2011) without considering numerous other economic benefits. Land conservation benefits the economy by enhancing tourism and outdoor recreation. In 2006, anglers, hunters, and wildlife viewers spent $2.62 billion, creating $1.26 billion in salaries and wages, supporting 45,200 jobs. Land acquisition benefits the military by acquiring buffers around bases, which aids military training. In 2007, the military contributed 7% to the state’s domestic product and supported 416,000 jobs. Farmland preservation helped agriculture add $32 billion and 120,000 jobs to the state’s economy in 2009.

The Clean Water Management Trust Fund (CWMTF) has contributed greatly to habitat protection. The purpose of the fund is to provide grant assistance for projects that enhance or restore degraded water quality, protect unpolluted waters, establish a network of riparian buffers for environmental, educational, and recreational benefits, provide buffers around military bases, or acquire land to preserve ecological diversity or historic properties. Since established in 1996, CWMTF was provided with $100 million in annually recurring appropriated funds. Funding could go toward land acquisition for conservation easement, riparian buffers, green corridors, or military buffers; habitat and water quality restoration; implementation of innovative stormwater management, or water quality remediation. In 2009, the legislature reallocated the $100 million and changed future funding to be non-recurring. In 2013, funding for wastewater improvement or conventional stormwater projects became ineligible, although an alternative funding source was established. Since the inception of the trust fund in 1996, approximately $100 million was appropriated for water quality and habitat improvements. Since 2008, the funding allocated to the CWMTF has been reduced to approximately 10% of its original amount (Figure 14.1).

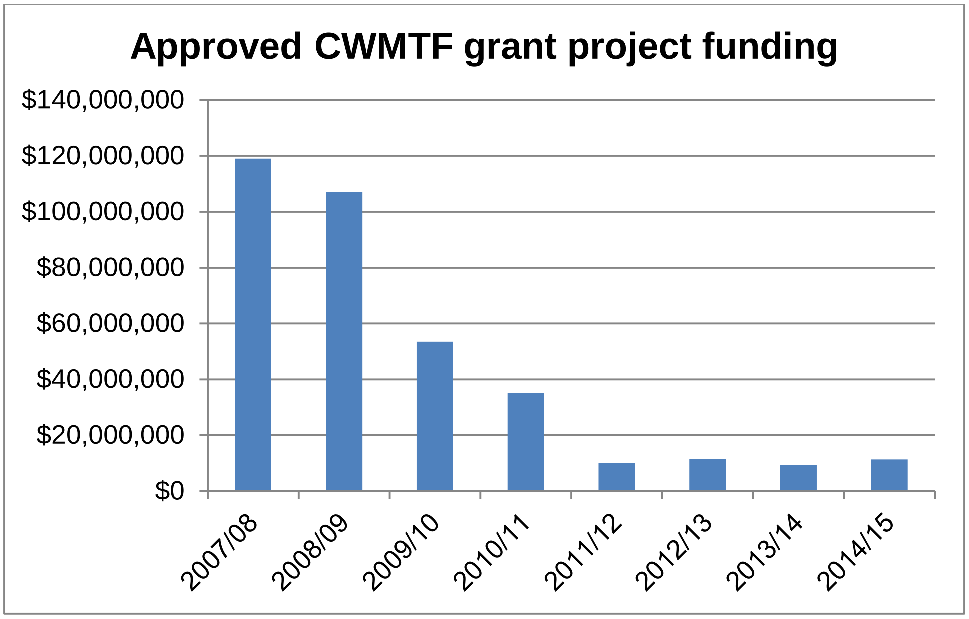


Figure 14.1. Annual expenditures ($) for approved CWMTF projects, all types (Source: Data from Office of Land & Water Stewardship – CWMTF).

14.2. Existing Restoration and Enhancement Efforts

Restoration and enhancement work is done by state and federal agencies and non-governmental organizations. In coastal North Carolina, habitat restoration efforts have focused primarily on shell bottom and wetland habitat.

14.2.1. Shell Bottom

The DMF has a long history of oyster restoration. The earliest state restoration efforts were directed at fishery enhancement, but shifted to increasing effort in oyster habitat restoration through development of no-take sanctuaries. Cultch planting provides hard substrate for oyster larvae to attach. Shell and other hard substrate is a limiting factor for oyster population growth. Harvest on areas planted with shell or marl is controlled by minimum size limit. Once new oysters reach legal size (2-3 yr), harvest of shellfish is permitted. Despite being open to harvest, cultch planting sites enhance shell habitat because 1) shell is put on bottom that did not have existing shell bottom habitat, 2) structure remains after harvest since only legal oysters can be removed, and 3) adult oysters spawn before harvest, contributing to population. Oyster sanctuaries provide protected areas of habitat for over 40 species of finfish and invertebrates. Adult oysters serve as a concentrated sources of brood stock that can release larvae, seeding shell material throughout the system. They provide several ecosystem services including water filtration, sediment stabilization, and nutrient cycling. Oyster Sanctuaries are designated and delineated under T15A NCAC 03R .0117 and are protected from damaging harvest practices under rule T15A NCAC 03K .0209. Strategic siting of sanctuaries and cultch plant sites can optimize benefits to both the ecosystem and shellfish harvest. Shellfish aquaculture also provides temporary habitat and water quality enhancement in areas that did not have a naturally occurring shellfish resource.

With an estimated 90% decline in historic oyster populations in North Carolina and the US (Beck et al. 2011; DMF 2008a; Zu Ermgassen et al. 2012), there is a continued need for oyster habitat restoration. Chapter 12, Priority Habitat Issues, describes in detail ongoing enhancement and restoration efforts of DMF, bottlenecks in expansion, and options to further advance.

Oyster restoration (sanctuaries) and enhancement (cultch planting) work is limited by funding and available cultch material. General Statute 136-123(b) states that no landscaping or highway beautification project undertaken by the Department of Transportation (DOT) or any other unit of government may use oyster shells as a ground cover. The DOT or any other unit of government that comes into possession of oyster shells shall make them available to DEQ, DMF, for use in any oyster bed revitalization programs or any other program that may use the shells.

In 2014-15, the General Assembly passed the Senator Jean Preston Shellfish Sanctuary (SL 2014-120). The purpose of the law was to designate an oyster sanctuary complex in Pamlico Sound that included areas of restored no-take reefs and areas designated for shellfish leasing to facilitate habitat and water quality enhancements, as well as economic growth of the shellfish aquaculture industry. The 2015-16 budget bill includes language that would modify SL 2014-120 to be more effective. The Habitat and Enhancement Section of DMF is in the planning stages of implementing this legislation.

As mentioned in Chapter 3, Shell Bottom Habitat, research documenting the important ecological and economic value of oyster reefs (Breitburg 1998; Coen et al. 1999; Grabowski et al. 2000; Harding and Mann 1999; Lenihan et al. 1998; Lenihan et al. 2001; Peterson et al. 2003b) supports the concept that economic benefits gained from shellfish harvest and ecosystem services of oyster habitat outweigh the costs of oyster restoration and cultch planting. As of 2015, DMF has established 13 Oyster Sanctuaries totaling 177.7 acres, with two others under development (Map 3.4a-b). The sanctuaries are located around Pamlico Sound and constructed of multiple, high profile mounds using mostly Class B Riprap (limestone marl) and shell and seeded shell as part of the research needs. The Nature Conservancy (TNC), the North Carolina Coastal Federation (NCCF), the NMFS Hurricane grant 2001-2006, state appropriations through DMF, and other mitigation sources have provided funding.

Non-governmental organizations (NGOs) and universities are also involved in oyster restoration, with a greater focus on research techniques and community outreach. These sites were designated as Research Sanctuaries (T15A NCAC 03I .0109) or Shellfish Management Areas (T15A NCAC 03K .0103) under proclamation authority of the DMF Director. The NCCF has sponsored sites located in Williston Creek, Everett Bay, Hewlett's Creek, New River near Sneads Ferry, Dicks Bay in Myrtle Grove Sound, Alligator Bay, and the lower Cape Fear shoreline (Map 3.4a-b). The sites are generally monitored for oyster density and abundance, epifaunal coverage, bed height and rugosity, and selected water quality measurements. Other groups involved with oyster restoration include The Nature Conservancy, UNC-Wilmington, Pender Watch, and the Town of St. James.

Oyster restoration as mitigation has also contributed to enhancing shell bottom habitat. The USACE, US Navy, and DOT are the government agencies associated with those projects. The Division of Mitigative Services does not include oyster restoration as a suitable mitigation option.

There are numerous organizations that play a role in the development and monitoring of shell bottom enhancement and restoration. To coordinate various organizations' interests with DMF restoration work, an inter-organizational steering committee was established by the NCCF to draft an oyster restoration plan for North Carolina. In 2014, NCCF organized a workshop to summarize oyster restoration and enhancement progress and to develop guidelines for future restoration. In 2015, based on results of the workshop, the Oyster Restoration and Protection Plan for NC: A Blueprint for Action, 2015-2020 was completed. The plan was presented at the 2015 Oyster Summit to researchers, agencies, NGOs, policy makers, and legislators.

In 2011, The Nature Conservancy, Florida Atlantic University, and the NOAA Restoration Center convened a workshop, and from that beginning stemmed a committee, a handbook, and many workshops on standardizing monitoring techniques and performance criteria to allow for consistent post-restoration assessment of both the eastern and Olympia oysters. This handbook is available for restoration practitioners online at http://www.oyster-restoration.org/wp-content/uploads/2014/01/Oyster-Habitat-Restoration-Monitoring-and-Assessment-Handbook.pdf.

14.2.2. Hard bottom/Artificial reefs

Artificial reefs serve as structured habitat for fish and colonizing organisms. Studies suggest that the additional habitat in an area that was once soft bottom enhances fish production by providing foraging, spawning, and refuge habitat, and increasing an area's carrying capacity (Bohnsack 1989; Brickhill et al. 2005; Grossman et al. 1997; Lindberg 1997). In addition to providing habitat, artificial reefs are used for recreational fishing, and consequently contribute significantly to the coastal economy.

Artificial reefs must be properly designed, sited, and managed to successfully increase production of benthic organisms and fish populations (Brickhill et al. 2005; DMF 1988; Gregg 1995; Strelcheck et al. 2005). The DMF Artificial Reef Master Plan provides siting guidelines and construction standards for artificial reefs in North Carolina (DMF 1988). Some of the habitat-related guidelines are:

- Use non-toxic, stable, and durable materials
- Use materials that provide the degree of habitat complexity and profile appropriate for the targeted reef species, but that will not create a navigation hazard.
- Design for structures with large surface area, interstitial space, and structural complexity.
- Do not site in areas with natural hard bottom, high energy, traditional commercial fishing activities.
- Design to provide proven biologically productive habitat.

The DMF Artificial Reef Program includes 41 ocean reefs, eight estuarine reefs, and 14 estuarine oyster sanctuary fishing reefs. The materials on ocean reefs are ships, box cars, concrete pipe, etc. Estuarine reefs consist of concrete reef balls, concrete pipe, recycled processed concrete, or other materials. In 2009, the Artificial Reef Program shifted its focus toward development of estuarine artificial reefs. Staff monitors artificial reefs periodically for durability and fish use. An interactive map and artificial reef guide are available at http://portal.ncdenr.org/group/mf/habitat/enhancement/artificial-reefs.

14.2.3. Wetlands and Streams

14.2.3.1. Restoring stream connectivity

There have been several projects involving restoring connectivity and flow in rivers to improve diadromous species' access to historic spawning grounds. On the Roanoke River, Dominion Generation, as part of the Federal Energy Regulatory Commission (FERC) relicensing, built two eelways at the Roanoke Rapids Hydroelectric Dam, the most downstream dam on the Roanoke River. The eelways were operational in 2010 through 2014, and have successfully passed over 1.8 million American eels (F. Rohde, NOAA, pers. com. 2015). On the Cape Fear River at the most downstream dam (Lock and Dam #1), the USACE built a natural looking fishway (called a rock-arch ramp) around Lock and Dam #1. The ramp was built as mitigation for navigational dredging operations in the lower Cape Fear River at Wilmington and is designed to pass American shad, blueback herring, striped bass, and potentially Atlantic sturgeon to historic spawning areas near Smiley Falls located on the fall line. Both American shad and striped bass have been documented using the fishway. Spawning substrate for these two species has also been placed downstream of Lock and Dam No. 2 (F. Rohde, NOAA, pers. com. 2015).

14.2.3.2. Wetland and stream mitigation

The loss of wetlands and need for alternative pollution control methods prompted restoration/creation efforts beginning in the late 1980s and early 1990s (Mitsch and Gosselink 1993). The Clean Water Act (CWA) of 1972 and subsequent agreements between the EPA and USACE develop requirements to compensate for wetlands lost to dredge and/or fill activities. In addition to wetland and stream compensatory mitigation, conservation organizations also conduct restoration on a smaller scale.

The 2008 USACE/EPA federal rule specifies the following order of preference: (1) mitigation bank credits, (2) in-lieu fee (ILF) credits, (3) permittee responsible under a watershed approach, (4) permittee responsible in-kind and on-site, and (5) permittee responsible off-site and/or out of kind. The rule also states a preference for mitigation completed in advance of impacts over any particular provider type. The USACE and DWR use the mitigation types in Table 14.9 for determining in-kind mitigation. Off-site mitigation is typically allowed within the same 8-digit USGS hydrologic unit (HU). Wetland mitigation may include restoration, enhancement, creation, or preservation of wetlands.

- <u>Restoration</u> is the re-establishment or rehabilitation of wetlands or stream hydrology into an area where wetland conditions (or stable stream bank and stream channel conditions) have been lost or degraded.
- <u>Enhancement</u> refers to actions taken to increase or enhance wetland functions through the manipulation of either vegetation or hydrology, but not both; an example would be the filling in of ditches in a previously drained wetland area.
- <u>Creation</u> is the establishment of wetlands or stream hydrology into an area where wetland conditions (or stable stream bank and stream channel conditions) were not lost.
- <u>Preservation</u> is the long-term protection of an area with high habitat and/or water quality protection value (e.g., wetland, riparian buffer), generally effected through the purchase or donation of a conservation easement by/to a government agency or non-profit group (e.g., land trust); such areas are generally left in their natural state, with minimal human disturbance or land-management activities.

The types of wetland mitigation count differently toward replacing lost wetland functions. The guidelines for awarding credit for mitigation types are (USACE 2008):

- 1 acre of restoration is equal to 1 credit
- 2 acres of enhancement is equal to 1 credit
- 3 acres of creation is equal to 1 credit
- 5 acres of preservation is equal to 1 credit
- On most permits, enhancement or preservation credits can only be employed after applying planning at least one acre of credit of restoration or creation.

Federal and state agencies have minimum thresholds specifying when mitigation is required for wetland impacts. For DWR, the minimum threshold for mitigation due to 401 permitted impacts is 1.0 acre. The DCM does not have a minimum threshold since rules strongly discourage coastal wetland impacts unless for public projects that could not otherwise occur (15A NCAC 07M .0700). The USACE minimum threshold for mitigation begins at 0.1 acre.

The Division of Mitigation Services currently operates four In-Lieu Fee Mitigation Programs:

1. Statewide Stream and Wetland In-Lieu Fee Program
2. NCDOT Stream and Wetland In-Lieu Fee Program
3. Riparian Buffer In-Lieu Fee Program
4. Nutrient Offset In-Lieu Fee Program

The Statewide Stream and Wetland In-Lieu Fee Program began in 1996 with the establishment of the Wetland Restoration Program (WRP), later expanded to form the Ecosystem Enhancement Program (EEP) in 2003, which is now the Division of Mitigation Services (DMS). The purpose of this program is to provide cost-effective mitigation alternatives to improve the state's water resources. The DMS restoration activities are primarily undertaken as mitigation for present and anticipated losses of stream and wetland acreage. The program was initiated to provide effective, science based, mitigation that would be more successful than independent projects, and would utilize a watershed planning approach.

The DOT Stream and Wetland In-Lieu Fee Program was added through a Memorandum of Agreement (MOA) in 2003 (updated in 2008) between DEQ, DOT, and the USACE. The DOT Stream and Wetland ILF Program provides mitigation to offset unavoidable environmental impacts from transportation-infrastructure improvements. The USACE joined as a sponsor in the MOA. The DOT Stream and Wetland ILF program develops mitigation in advance of impacts.

Both stream and wetland ILFs utilize watershed planning to identify and focus the implementation of restoration, enhancement and preservation projects. The DMS uses river basin watershed plans to identify targeted watersheds where mitigation projects will be concentrated. The DMS also uses regional and Local Watershed Plans (LWPs) to focus restoration work where most needed, guided by local interest and support for developing a plan, information on water quality degradation (restoration potential), ILF mitigation needs due to development (where mitigation banks are unable to provide credit) and compensatory mitigation needs of DOT.

The LWPs prioritize restoration/enhancement projects, preservation sites, and BMPs that provide water quality and hydrologic improvement, habitat protection and other environmental benefits to the local watershed. The strategies include stormwater management projects, water supply protection strategies, land use planning guidelines, and BMPs for reducing sediment pollution and soil erosion. The DMS is committed to funding restoration projects identified in the LWPs through payments made to the Wetlands Trust Fund to satisfy compensatory mitigation requirements.

The Riparian Buffer ILF Program operates in the Neuse, Tar-Pamlico, and portions of the Cape Fear, Yadkin, and Catawba River basins. The program provides compensatory mitigation for riparian buffer impacts in those areas. The Nutrient Offset ILF Program offers nutrient buy-down options for developers in the Neuse, Tar-Pamlico, Jordan Lake, and Falls Lake regulated areas.

Since 2004, DMS records annual mitigation by gross assets divided among 12 categories of wetlands. Projects are listed as assets when land has been secured and the design initiated. Mitigation associated with a specific project may change slightly during design, construction, and monitoring. Only at project closeout are the exact mitigation asset amounts and types determined by the regulatory agencies. The DMS summarizes mitigation assets in terms of gross and remaining assets (after mitigation is applied). Mitigation for streams includes restoration, enhancement, and high quality preservation. The remaining assets represent progress that DMS has achieved to produce mitigation in advance of permits.

In coastal drainage river basins, the total mitigation assets (planned and constructed) in FY 2013-14 were 10,730 acres (Gross Mitigation Credit) (Table 14.9). The total amount of annual mitigation assets has increased over time. As comparison, DMS had 8,311 acres (gross) of credits in 2004/05. Additionally, mitigation assets from private mitigation banks cover an estimated 20% of total assets not accounted for by DMS. In FYs 2013-2015, the DMS reported a 99.56% compliance rate for mitigating permitted stream impacts (Jim Stanfill, DMS, 2015). Mitigation compliance reported for nutrients offset was 99.99% and riparian buffer varied from 58% to 100%. The 58% compliance was in the Randleman Watershed.

Statewide, the total wetland area in North Carolina has declined from 7,175,000 acres in the 1950's to 5,132,634 acres in 2001, for a total loss of over 2 million acres (DWQ 2000b). Mitigating for part of this loss may be possible with progress made through the advanced compensatory mitigation work, as well as restoration on conservation lands, re-building marsh islands, reclaiming wetlands by purchasing agricultural properties and closing ditches, and constructing living shorelines. It should be noted, however, that restored and created wetlands may not function as do their natural counterparts, and require much staff time in monitoring and maintaining for success.

Table 14.9. Gross mitigation credits (planned and constructed) from EEP in coastal draining river basins from FY 2010/2011 to 2013/2014. Note: The Lumber is not included in NC coastal river basins. Credits are calculated using the equation: [Preservation/5] + [Creation/3] + [Enhancement/2] + [Restoration/1].

	Gross Mitigation Assets (Credits)				
Mitigation Type	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Riparian	4,188.47	4,523.88	4,518.32	4,525.77	4,537.72
Non-Riparian	6,649.85	6,290.78	6,250.07	6,083.57	6,057.14
Coastal Marsh	138.57	137.49	137.49	137.49	135.21
Total	**10,976.90**	**10,952.20**	**10,905.90**	**10,746.80**	**10,730.10**

While DMS has successfully completed advanced mitigation (EEP 2010-11; EEP 2008; EEP 2009), much of the current mitigation is focused in particular HUs, whereas wetland and stream impacts are spread more evenly across the state. Thus, while some HUs have already achieved advanced mitigation, others will require additional mitigation credits over the coming years.

The need for a USACE Section 404 permit authorizing the fill or alteration of wetlands or streams triggers the 401 Water Quality Certification process by DWR. However, projects impacting less than 150 linear feet of stream are not required to notify DWR and represent an unknown loss of stream segments. The loss of streams refers to altered hydrologic conditions affecting water quality (e.g., buffer impact, dredge and fill). The intent of mitigation is to maintain natural hydrologic conditions and associated water quality. Watershed restoration plans may target streams and shorelines impaired by nonpoint sources of pollution. Point source pollution is addressed by NPDES permit requirements and Total Maximum Daily Load (TMDL) allocations (see Chapter 10, Water Quality Impacts). Impoundment effects on water quality have only recently been included as a potential violation of the Clean Water Act.

The State of North Carolina did not require mitigation for impacts to intermittent streams prior to 2009, but impacts to these streams were reported. As of 2009, the DWR requires mitigation for impacting a cumulative total of greater than 150 linear feet of intermittent and/or perennial streams (J. Dorney, DWR, pers. com., 2010). However, the permitting is applied to streams as they are mapped on USGS topographic quadrangles. The DWR is currently re-mapping stream channels through the Headwater Stream Spatial Dataset program. The DWR mapping sample watersheds that are then used to develop GIS models by EPA level IV ecoregion. These models are used to predict the location of intermittent and perennial headwater streams (M. Tutwiler, DWR, pers. com. 2015).

The DMS is required to document statewide wetland losses from permitting and gains from mitigation and restoration. The permitted alteration of streams and buffers through 401 certifications and buffer authorizations is tracked by the Wetlands Unit of DWR and sent to DMS. Table 14.10 summarizes the statewide gains and losses of wetlands, streams, and buffers by DWR and compensatory mitigation by DMS from FY 2012/13 to 2014/15. With the exception of a small net gain in wetlands in FY 2014-15, there was a net loss of streams, wetlands, and riparian buffers in the past three years.

TABLE 14.10. Statewide permitting and gains from compensatory mitigation during FY 2012/13, 2013-14, and 2014-15. Data provided by DWR and DMS and reflect permitting by DEQ and compensatory mitigation by DMS.

Wetland/Stream Type	Permitted gains and losses		
Linear feet of streams	FY 2012-13	FY 2013-14	FY 2014-15
Losses	81,473.0	117,694.0	59,498.9
Gains	48,712.0	78,024.0	22,620.0
Net change	-32,761.0	-39,670.0	-36,878.9
Acres of wetlands			
Losses	203.6	98.9	102.1
Gains	197.8	59.9	104.5
Net change	-5.8	-39.0	2.4
Acres of riparian buffers			
Losses	75.6	48.0	56.1
Gains	37.9	21.2	18.2
Net change	-37.8	-26.9	-37.9

14.2.3.3. Other initiatives

Government and private organizations and individuals conduct initiatives independent of DMS local watershed plans. The DMS encourages these wetland restoration organizations and individuals to join in collaborative efforts to protect and restore strategic wetland resources. The Wetlands Reserve Program of the Food, Agriculture, Conservation, and Trade Act of 1990 authorized the USDA to purchase easements from landowners who agree to protect or restore wetlands. By 2008, the total program enrollment in North Carolina had exceeded 34,148 acres.

Other programs restoring streams and riparian buffers include the Conservation Reserve Enhancement Program (CREP) and Agriculture Cost-share Program (ACSP) administered by the Department of Agriculture, Division of Soil and Water Conservation (DSWC). The CREP was designed to pay farmers who place marginal land overlapping stream riparian zones into conservation easements.

To guide regulatory and non-regulatory wetland conservation and restoration efforts, DEQ has developed a conservation planning tool incorporating GIS information supporting prioritization of areas based on myriad of program objectives. Refer to the CPT Report for information on conservation at http://portal.ncdenr.org/web/cpt/cpt-usage.

The rate of wetland losses and gains documented by permit records and DMS reports does not account for functional equivalency, which is the replacement of full ecological functions specific to a wetland type. Criteria for successful mitigation should reflect the ecological functions that need replacing. The North Carolina Wetlands Assessment Method (NCWAM) provides the current guidance for evaluating functional replacement. The monitoring associated with DMS mitigation projects continues for at least 5 years, or until success criteria are achieved (EEP 2005).

In 2009, the MFC approved a compensatory mitigation policy that was incorporated into the “Policies for Protection and Restoration of Marine and Estuarine Resources and Environmental Permit Review and Commenting.” Based on evolving understanding of the needs of compensatory mitigation to protect and enhance the quality of coastal waters and watersheds, the focus and goals of compensatory mitigation should allow an array of options to be applied. The policy recommends:

1) Establishing goals for coastal wetlands based on desired outcomes - protection/restoration of shellfishing waters, PNAs, SAV beds, etc.;
2) Identifying watersheds/areas where these goals can be realistically achieved. The Strategic Habitat Area assessments can be used to identify such locations
3) Utilizing the Rapid Watershed Assessment Procedure (or other assessment methods) to assess watershed

condition and identify problems/solutions;

4) Evaluating and authorizing compensatory mitigation projects based on their ability to contribute to goals established for coastal watersheds. Projects that provide functional replacement, e.g., increased water retention/storage through the use of BMPs, may be approved if documentation is provided that the projects are the most effective mechanism to achieve the goals established for a watershed;
5) Implementing monitoring to support data acquisition necessary to support the strategic coastal habitat process and the effectiveness of projects that have been implemented;
6) Seek funding from all available sources (compensatory mitigation, CWMTF, 319, etc.) to fully implement protection/restoration strategies in coastal watersheds.

14.2.4. Submerged aquatic vegetation

Although protection, rather than mitigation or restoration, is the more environmentally sound and less costly management approach for long-term enhancement of SAV habitat, restoration and/or enhancement is possible in areas of recovering SAV abundance or where human impacts have physically removed the vegetation (Fonseca et al. 1998; Orth et al. 2006; SAFMC 1998b; Treat and Lewis 2006). Restoration requires only replacing SAV where it had recently existed. Successfully restoring SAV to areas where it is not currently present depends on conditions at the site year round. Light penetration, energy exposure, sediment type, and water quality are critical parameters to successful SAV restoration.

In areas of recovering SAV abundance, restoration and enhancement techniques can be used to accelerate the recovery of SAV toward critical density and coverage. Shellfish restoration and aquaculture could enhance water quality conditions, which in turn could enhance SAV growth. This has been observed in clam aquaculture leases in Virginia and North Carolina.

Water-based restoration efforts are warranted in locations where SAV has historically occurred but has declined in spatial extent or density, and is not recovering naturally. An example of this is in Back Bay, Virginia, north of Currituck Sound. Seagrass was abundant in these waters until the 1970s. The decline corresponded to major landscape changes in the northwestern portion of Back Bay’s watershed during the 1970s and 1980s, as new housing developments and farming activities increased. A similar decline was noticed about ten years later in the Knotts Island Bay-Currituck Sound area immediately south of Back Bay. Aerial imagery of SAV from 2007 and observations during 2008 suggest an increase in SAV abundance from 2003-2008 (J. Gallegos, USFWS, pers. obs. 2010).

Breaking wave energy with subsequent improvements in water clarity are being considered in Pamlico Sound as mitigation for SAV impacts from bridge construction. Restoration of SAV through land-based water quality improvements is possible in locations of historical SAV abundance where it is currently absent or reduced. Without adequate water quality conditions, planted SAV will not survive. An example of land-based improvements facilitating SAV restoration is in Wilson Bay, New River. The Jacksonville SAV restoration project improved water quality, wetlands, and oysters in Wilson Bay. Once water quality improved (Mallin et al. 2005), the USACE and the City of Jacksonville conducted the pilot restoration project using several techniques developed and successfully used in the Chesapeake Bay. Plants with seed heads were collected and some were planted in the bay. The seeds of other plants were extracted, germinated and grown in runways, later transplanted into the bay. The plants directly anchored in the bay survived better than the seedlings (P. Donovan-Potts, pers. com. 2010).

Mitigation for impacts to SAV is only allowed by CRC rules if the activity associated with the proposed project has an overriding public benefit. Otherwise, direct impacts to SAV or wetlands are not allowed by DCM policies or CRC rules. Most permitted impacts have involved transportation (bridge construction) or navigation (channel dredging).

Techniques and success criteria for SAV restoration have been developed and evaluated by NOAA’s

Coastal Ocean Office (Fonseca et al. 1998) and others (Ailstock and Shafer 2006; Boustany 2003; Orth et al. 1994; Smart et al. 1998; Treat and Lewis 2006). However, more research is needed to develop viable SAV restoration techniques in North Carolina.

14.3. Outreach and Volunteerism

14.3.1. Litter and Marine Debris

Agency programs and organizations such as NOAA's Marine Debris Program and The Ocean Conservancy (TOC) are involved in monitoring and clean-up efforts. Until April of 2015, North Carolina Big Sweep was a state-wide nonprofit organization whose mission was a litter-free environment. The Big Sweep conducted education events to prevent litter and coordinated an annual Big Sweep event, the state component of the International Coastal Cleanup in which volunteers clean land and waterways. During the 2014 event, North Carolina Big Sweep volunteers collected 102,850 pieces of debris along 1,327 miles of shoreline, totaling some 301,550 lbs. In another 2014 effort, fishermen worked alongside Marine Patrol officers when crab pots are required to be removed from the water by NC General Statute 113-268, to remove derelict pots and marine debris from the water. During this two day period volunteers removed 201 crab pots, while Marine Patrol removed 163; associated shoreline volunteers removed 620 pounds of solid waste and 380 pounds of derelict fishing gear from Roanoke Island. Since 2009, hundreds of volunteers have removed tons of trash from Masonboro Island during annual 4th of July Celebrations. In 2014, more than 75 volunteers helped clean 2.87 tons of trash and recyclables from this island just south of Wrightsville Beach.

14.3.2. NC Coastal Reserve and National Estuarine Research Reserve

The six Coastal Reserve and four National Estuarine Research Reserve sites protect over 42,000 acres of estuarine habitat in N.C. The Reserve is a partnership between the National Oceanic Atmospheric Administration and the N.C. Division of Coastal Management and its purpose is to "promote informed management and stewardship of North Carolina's estuarine and coastal habitats through research, education, and example." The reserve sites are living laboratories and outdoor classrooms and support compatible traditional uses, such as fishing and recreation. Reserve sites are monitored to understand visitor use and the condition of natural resources, including protected and invasive species.

The reserve staff provides numerous workshops for decision makers on issues such as sustainable development, water quality and habitat protection, and coastal resilience. On-site field trips focused on estuarine ecology target K-12 teachers and students and the public. The Reserve's System-Wide Monitoring Program (SWMP) provides long-term data on water quality, weather, biological communities, habitat, and land-use and land-cover characteristics.

CHAPTER 15. MANAGEMENT RECOMMENDATIONS

The scientific information in the preceding chapters demonstrate the importance and vulnerability of coastal fish habitats, and the need for actions to achieve the stated goal of the Coastal Habitat Protection Plan as provided by the North Carolina General Assembly: *"long-term enhancement of coastal fisheries associated with each coastal habitat."* The CHPP Steering Committee, after reviewing the updated information and discussing habitat and water quality issues, made modifications to the CHPP recommendations. These recommendations include management, monitoring, outreach, and research items. Identified research needs were compiled in a separate document. The CHPP Steering Committee selected four priority issues to focus implementation on over the next five years. The recommendations table notes which items address a priority habitat issue.

The draft plan was presented at four Marine Fisheries Commission Advisory Committee meetings in December 2015. Public comments were accepted at those meetings and could be submitted in writing during the month of December. All four advisory committees (Northern, Southern, Shellfish/Crustacean, and Habitat and Water Quality) passed motions to recommend to the Marine Fisheries Commission to support the Coastal Habitat Protection Plan and Source Document. In addition, the Habitat and Water Quality AC recommended further strengthening of the plan's role in protecting and enhancing habitats that support healthy fisheries (Table 15.1).

Public comments were summarized and presented to the CHPP Steering Committee in January, and based on those as well as additional input from some of the steering committee members, some technical changes were made within the Source Document, miscellaneous edits were made to the CHPP, Recommendation 3.1a was modified, Recommendation 3.1d was deleted, and Recommendation 4.5 was modified. The final recommendations are shown in Table 15.2. By approving the CHPP recommendations, the Marine Fisheries, Coastal Management, and Environmental Management commissions commit to working on these recommendations through development of implementation plans. The CHPP Team and Steering Committee will compile a CHPP Implementation Plan for 2016-2018 following finalization of the plan. The focus of actions will be on recommendations that address a priority issue, as indicated in the recommendations table. A separate report of priority research needs will be compiled by the CHPP Team, based on information in the Source Document.

Table 15.1. Summary of public comments on the December 2015 draft CHPP.

Source	Comments
Shellfish/ Crustacean Advisory Committee	Rec. 3.1.a.- modify recommendation to include restoration of intertidal oyster reefs as well as subtidal; on p 24 of CHPP; add some information on the economic value of habitat restoration (RTI study done recently for NCCF could be used).
Northern Advisory Committee	Would like to see more on the effects of agriculture (pesticides, fertilizer, poultry farms) and recommendations to address it; the plan has less teeth than the previous plan and would like to see more; suggested partnering with NCSU Agriculture program; too many exceptions/waivers to rules – no benefit if rules aren't enforced; much erosion of wetlands near Core Point, Pamlico River (near PCS) – there is a need for living shorelines and he is willing to help.
Habitat and Water Quality Advisory Committee	Pratt supported CHPP but wanted the plan to have stronger recommendations that are implemented; concern that water quality wasn't included in the priority issues; concern that compliance monitoring has declined, buffer and stormwater rules are weaker, and these are all proven to be effective at protecting water quality.
Lauren Morris/NC Fisheries Assoc.	Supports the Coastal Habitat Protection Plan; its been neutered to ineffectiveness; consider that water quality also has impacts on the oyster stocks, that you need better water quality to improve the population, and is important to protect.
David Knight/NC Wildlife Federation	Document needs to be beyond politics - can't stop because politics change; CHPP is important for the future of our coast; would prefer if it didn't focus on just certain "priority" issues; sedimentation is a huge problem due to urban development and agriculture; supports different avenues of oyster restoration; need to integrate climate change into the plan; NC Wildlife Federation would like to partner on CHPP implementation.
Heather Deck/Sound Rivers	As the Tar-Pam Riverkeeper, she stressed the importance of protecting and enhancing water quality; she supports the recommendations and proposed sedimentation implementation actions that address assistance to the local sedimentation control programs- better capability of addressing problems in the field; neither river reached its nutrient reduction loading goals and data indicate an increasing negative influence on water quality from poultry farms, which currently don't require permitting.
Terry Pratt	Information compiled is good but DEQ should not go backward on habitat and water quality protection and improvements; Chowan River experiencing algal blooms due to increase in poultry operations; can't endorse the CHPP if it is less protective than previous plans – recommends we (not sure who we is) go to the legislature and ask for more teeth in the plan. A specific example of information needed to be more effective was a recommendation for funding to treat endocrine disrupting chemicals.
James Fletcher	Talked about the negative impacts of endocrine disrupting chemicals and water withdrawals from Lake Gaston; would like to see a recommendation that all treated wastewater be land disposal application and suggested using highway medians for that; would like to see more concrete solutions going to the legislature.
Keith Larick/NC Farm Bureau	Supportive of the intent of the plan. No comments on the recommendations, but provided multiple technical comments regarding agriculture to the Source Document.

Table 15.2. Recommendations, related priority issue, and responsible commission or agency for the long-term enhancement of coastal fisheries associated with coastal habitats.

No.	Recommended Actions	Related Priority Issue(s)	Responsible Commission or Agency [Lead group(s) in bold]
GOAL 1. IMPROVE EFFECTIVENESS OF EXISTING RULES AND PROGRAMS PROTECTING COASTAL FISH HABITATS			
1.1	Continue to ensure compliance with Coastal Resources Commission (CRC), Environmental Management Commission (EMC), and Marine Fisheries Commission (MFC) rules and permits.	sedimentation, oyster restoration, establishing metrics	**CRC/DCM**, **EMC/DWR**,**DEMLR/SCC** **MFC/DMF**
1.2	Coordinate and enhance: a) monitoring of water quality, habitat, and fisheries resources (including data management) from headwaters to the nearshore ocean. b) assessment and monitoring of effectiveness of rules established to protect coastal habitats.	establishing metrics	**DEQ**, DMF, DWR, DCM, DEMLR, WRC, NCFS
1.3	Enhance and expand educational outreach on the value of fish habitat, threats from land use and other activities, and explanations of management measures and challenges.	living shorelines, sedimentation	**DEQ**, WRC, NCFS
1.4	Continue to coordinate among commissions and agencies on coastal habitat management issues.		EMC, CRC, MFC, SCC, DEQ, WRC, SWCC, and cooperating agencies
1.5	Enhance management of invasive species with existing programs. Monitor and track status in affected waterbodies.		DEQ, APNEP, WRC, DACS
GOAL 2. IDENTIFY AND DELINEATE STRATEGIC COASTAL HABITATS			
2.1	Support assessments to classify habitat value and condition by: a) coordinating, completing, and maintaining baseline habitat mapping (including seagrass, shell bottom, shoreline, and other bottom types) using the most appropriate technology b) selectively monitoring the condition and status of those habitats. c) assessing fish-habitat linkages and effects of land use and other activities on those habitats.	establishing metrics	**DMF**, DCM, DWR, DEQ, WRC
2.2	Continue to identify and field groundtruth strategic coastal habitats.	establishing metrics	**DEQ**, MFC/DMF

No.	Recommended Actions	Related Priority Issue(s)	Responsible Commission or Agency [Lead group(s) in bold]
GOAL 3. ENHANCE AND PROTECT HABITATS FROM ADVERSE PHYSICAL IMPACTS			
3.1	Expand habitat restoration in accordance with restoration plan goals, including: a) increasing subtidal and intertidal oyster habitat through restoration. b) re-establishing of riparian wetlands and stream hydrology. c) restoring SAV habitat and shallow soft bottom nurseries.	oyster restoration, living shorelines, sedimentation	**DMF**, DMS, **DWR**/EMC
3.2	Sustain healthy barrier island systems by maintaining and enhancing ecologically sound policies for ocean and inlet shorelines and implement a comprehensive beach and inlet management plan that provides ecologically based guidelines to protect fish habitat and address socio-economic concerns.		**CRC/DCM,** EMC/DWR, MFC/DMF, DWR, WRC, DEQ
3.3	Protect habitat from adverse fishing gear effects through improved compliance.	oyster restoration	**MFC/DMF**
3.4	Improve management of estuarine and public trust shorelines and shallow water habitats by revising shoreline stabilization rules to include consideration of site specific conditions and advocate for alternatives to vertical shoreline stabilization structures.	living shorelines	**CRC/DCM, DWR/EMC**
3.5	Protect and restore habitat for migratory fishes by: a) incorporating the water quality and quantity needs of fish in water use planning and management. b) restoring fish passage through elimination or modification of stream obstructions, such as dams and culverts.		**DEQ**, EMC, DWR, DEMLR, WRC, DMF
3.6	Ensure that energy development and infrastructure is designed and sited to minimize negative impacts to fish habitat, avoid new obstructions to fish passage, and where possible provide positive impacts.		CRC/DCM, EMC/DWR, DEMLR
3.7	Protect and restore important fish habitat functions from damage associated with activities such as dredging and filling.	oyster restoration, living shorelines	CRC/DCM, EMC/DWR
3.8	Develop coordinated policies including management adaptations and guidelines to increase resiliency of fish habitat to ecosystem changes.	living shorelines, sedimentation	DEQ, WRC

No.	Recommended Actions	Related Priority Issue(s)	Responsible Commission or Agency [Lead group(s) in bold]
GOAL 4. ENHANCE AND PROTECT WATER QUALITY			
4.1	Reduce point source pollution discharges by: a) increasing inspections of wastewater discharges, treatment facilities, collection infrastructure, and disposal sites b) providing incentives and increased funding for upgrading all types of discharge treatment systems and infrastructure c) developing standards and treatment methods that minimize the threat of endocrine disrupting chemicals on aquatic life	establishing metrics	**EMC/**DWR
4.2	Address proper reuse of treated wastewater effluent and promote the use of best available technology in wastewater treatment plants (including reverse osmosis and nanofiltration effluent), to reduce wastewater pollutant loads to rivers, estuaries, and the ocean.		**EMC**
4.3	Prevent additional shellfish closures and swimming advisories by: a) conducting targeted water quality restoration activities b) prohibiting new or expanded stormwater outfalls to coastal beaches and to coastal shellfishing waters (EMC surface water classifications SA and SB) except during times of emergency (as defined by the Division of Water Resource's Stormwater Flooding Relief Discharge Policy) when public safety and health are threatened c) continuing to phase-out existing outfalls by implementing alternative stormwater management strategies	sedimentation	**EMC/**DWR, CRC/DCM, DEMLR
4.4	Enhance coordination with, and provide financial/technical support for, local government/private actions to effectively manage stormwater, stormwater runoff, and wastewater.	sedimentation	**DEQ**, DWR/EMC, DCM, DEMLR, SCC,
4.5	Continue to improve strategies throughout the river basins to reduce nonpoint pollution and minimize cumulative losses of fish habitat through voluntary actions, assistance, and incentives, including: a) improved methods to reduce pollution from construction sites, agriculture, and forestry. b) increased on-site infiltration of stormwater. c) encouraging and providing incentives for implementation of Low Impact Development practices. d) increased inspections of onsite wastewater treatment facilities . e) increased use of reclaimed water and recycling.	sedimentation	**DEQ**, DWR/EMC, DCM/CRC, , , SCC, DEMLR, DSWC, DACS, NCFS

No.	Recommended Actions	Related Priority Issue(s)	Responsible Commission or Agency [Lead group(s) in bold]
	f) increased voluntary use of riparian vegetated buffers for forestry, agriculture, and development. g) increased funding for strategic land acquisition and conservation.		
4.6	Maintain effective regulatory strategies throughout the river basins to reduce nonpoint pollution and minimize cumulative losses of fish habitat, including use of vegetated buffers and established stormwater controls.	sedimentation	**EMC,** CRC
4.7	Maintain adequate water quality conducive to the support of present and future mariculture in public trust waters.	oyster restoration	**DEQ**
4.8	Reduce nonpoint source pollution from large-scale animal operations by: a) Ensuring proper oversight and management of animal waste management systems. b) Ensuring certified operator compliance with permit and operator requirements and management plan for animal waste management systems.		**DWR,** DSWC, DACS

Acronym List

APNEP - Albemarle-Pamlico National Estuary Partnership	DSWC - Division of Soil and Water Conservation
CRC - Coastal Resource Commission	DWR - Division of Water Resources
DACS - Department of Agriculture and Consumer Services	EMC - Environmental Management Commission
DCM - Division of Coastal Management	MFC - Marine Fisheries Commission
DEMLR - Division of Energy, Mineral, and Land Resources	NCFS - NC Forest Service
DEQ - Department of Environmental Quality	SCC - Sedimentation Control Commission
DMF - Division of Marine Fisheries	SWCC - Soil and Water Conservation Commission
DMS - Division of Mitigation Services	WRC - Wildlife Resources Commission

Huggett, Doug

From:	Davis, Braxton C
Sent:	Friday, February 12, 2016 1:01 PM
To:	Huggett, Doug
Subject:	Fwd: RE: Dredging Permits/Legislation
Attachments:	waters edge drawing.pdf; waters edge DCM denial.pdf

Sent from my Verizon Wireless 4G LTE DROID
---------- Forwarded message ----------
From: "Davis, Braxton C" <Braxton.Davis@NCDENR.Gov>
Date: Feb 11, 2016 3:21 PM
Subject: RE: Dredging Permits/Legislation
To: "John Ganem (Rep. Chris Millis)" <Millisla@ncleg.net>
Cc: "Rep. Chris Millis" <Chris.Millis@ncleg.net>

Representative Millis and Mr. Ganem,

Thanks for bringing this issue to my attention and my apologies for the delayed response. As you know, the Division of Coastal Management (DCM) administers the NC Coastal Area Management Act (CAMA). In this case, we issued a CAMA Major Permit in 2004 for the construction of a 9-slip docking facility (split into 4-slip and 5-slip sections). At that time, the project was also subject to SEPA, so an Environmental Assessment (EA) was prepared (SEPA analysis is no longer required for CAMA Major Permits).

<u>Permit Background</u>:

At this site, in 2004, water depths at low tide ranged from -1.4' to -2.8' at the northern section of the dock and -3.4' to -3.7' at the southern section of the dock (per DCM field report). Dredging was not proposed or authorized in the 2004 permit. The EA stated that no submerged aquatic vegetation (SAV) was observed or noted in aerial photography within the project area, nor was there mention of the presence of SAV in DCM's field report.

In September 2008, the community applied for a CAMA major permit for dredging in the location of the northern dock section. SAV was then observed in the project area, especially in the area surrounding the northern docks, and noted in the DCM field report. Water depths at that time were reported to have been reduced to -0.5' to -1.5' at normal low water, and the applicant proposed dredging to a depth of up to -4'.

In October 2008, the NC Division of Water Quality (DWQ) sent a letter to Water's Edge HOA stating that it had determined that the dredging would result in "significant adverse impacts to SAV" and therefore DWQ would recommend denial of the state's 401 Water Quality Certification (under the federal Clean Water Act). At that time, the Division of Marine Fisheries and Wildlife Resources Commission also recommended denial of the CAMA permit due to adverse impacts to SAV. Finally, DCM also determined that the proposed dredging was inconsistent with rules of the Coastal Resources Commission that prohibit new dredging in areas containing SAV. As a result of these concerns raised by various resource agencies, the permit request was withdrawn by the applicant.

Recent Permit Denial:

In July 2015, Water's Edge HOA submitted another application to dredge both the northern and southern sections of the 9-slip docking facility. Again, the presence of SAV was noted in the DCM field report. Similar objections and concerns were raised again by the NC Division of Water Resources (DWR, formerly DWQ), Wildlife Resources Commission and DCM. As a result, DCM denied the application on December 4, 2015 due to new dredging of approximately 8,750 square feet of SAV habitat. DWR also denied the 401 Water Quality Certification on December 14, 2015, and the U.S. Army Corps of Engineers denied the application (based solely on the state denials) on December 14, 2015. For reference, I have attached a permit drawing and DCM's denial letter.

Next Steps:

The applicant now has a scoping meeting scheduled with the relevant state and federal agencies on February 29, 2016 to discuss project design alternatives, including potentially reconfiguring the docking facility (an idea proposed by DCM staff). In addition, the applicant is aware that they can apply for variances from the N.C. Coastal Resources Commission (for the CAMA permit denial) and the N.C. Environmental Management Commission (for the 401 Certification denial).

We are not aware of any legislative or CRC rule changes that occurred after the subdivision and docking facility were constructed in 2003-2004 that would have impacted this permit denial – the relevant CAMA statutes, CRC rules, and 401 Certification criteria were all in effect before the existing docks were permitted and constructed.

I hope that a successful project design can be identified through the upcoming scoping meeting, and that this will meet the applicant's needs and satisfy the concerns of the various regulatory and resource agencies involved. I will keep you informed as this progresses.

Thanks again and please let me know if you need anything further,

Braxton

Braxton C. Davis

Director

NC Division of Coastal Management

Department of Environmental Quality

252 808 2808 x202 office

Braxton.Davis@ncdenr.gov

400 Commerce Avenue

Morehead City, NC 28557

Nothing Compares

Email correspondence to and from this address is subject to the

North Carolina Public Records Law and may be disclosed to third parties.

From: John Ganem (Rep. Chris Millis) [mailto:Millisla@ncleg.net]
Sent: Wednesday, February 10, 2016 10:36 AM
To: Davis, Braxton C <Braxton.Davis@NCDENR.Gov>
Cc: Rep. Chris Millis <Chris.Millis@ncleg.net>
Subject: RE: Dredging Permits/Legislation

Braxton,

We just wanted to follow up and see if you had pulled any information together on this issue. Thank you for the help.

John Ganem (Rep. Chris Millis)

NC House of Representatives
300 N. Salisbury Street, Room 609
Raleigh, NC 27603-5925

919-715-9664

From: Davis, Braxton C [mailto:Braxton.Davis@NCDENR.Gov]
Sent: Monday, February 01, 2016 2:28 PM
To: John Ganem (Rep. Chris Millis)
Subject: Re: Dredging Permits/Legislation

John,

I am currently on vacation and will be back in the office on Wed, in the meantime I'll ask staff to pull information together on this issue and will get back to you as soon as possible. Thanks, Braxton

Sent from my Verizon Wireless 4G LTE DROID

On Feb 1, 2016 12:00 PM, "John Ganem (Rep. Chris Millis)" <Millisla@ncleg.net> wrote:

Mr. Davis,

Representative Millis has asked me to forward you the following email from a constituent regarding dredging permits and their issues around their homes. This was initially sent to Commissioner Piepmeyer, however he sent it along to us since CAMA is a State Agency. Mr. Skeen seems to be speaking for multiple people in the area he lives, the issue primarily being that legislation that was passed after their neighborhood was developed and it is preventing them from obtain dredging permits to increase the functionality of their docks.

Mr. Skeen mentioned that there was legislation preventing them from obtaining these permits. What is the legislation that is preventing them from obtaining the permits? Also, is there any way to help these constituents out without changing the legislation? Possibly an avenue they have not explored yet that will help them get the outcome they are seeking? Our office wants to make sure that it is understood that we are taking no sides here, but we want to do our due diligence to the constituents and see if a favorable outcome can be reached. We would hate for them to have to get to the point where they have to challenge the assessed home values to, "reflect the absence of functional dockage."

Thank you for your time looking into this matter.

John Ganem (Rep. Chris Millis)

NC House of Representatives
300 N. Salisbury Street, Room 609
Raleigh, NC 27603-5925

919-715-9664

From: Todd Skeen [tskeen1996@gmail.com]
Sent: Sunday, January 31, 2016 7:28 AM
To: David Piepmeyer
Cc: Michael Mac
Subject: Important issue in your district

Commissioner Piepmeyer:

I write on behalf of Water's Edge at Deerfield Estates, a community in southern Hampstead in need of your support. The issue at hand involves the dredging of 9 docks along the ICWW. We have been unable to get a dredging permit from CAMA, which compromises our riparian rights, diminishes our home values, and ultimately the tax base of Pender County.

After our neighborhood was developed circa 2004, legislation was passed prohibiting dredging when submerged aquatic vegetation is present. Our waters have eel grass, which serves as a pinfish nursery and has resulted in our inability to obtain a dredging permit for several years. Our docks are spitting distance to the channel and prone to shoaling from ubiquitous waterway traffic. We literally have dry land at low tide and are unable to use our boats the majority of the time. While these may seem like 'rich people issues', these are issues that have a direct and negative impact on the tax base of Pender County. We intend to challenge our assessed home values, to reflect the absence of functional dockage, should our dredging campaign be unsuccessful.

We have hired a team of environmental consultants and attorneys to help navigate these muddy waters (pun intended). We have a meeting scheduled with CAMA 2/29/16 to discuss mitigation efforts that may result in a variance from the law. Unfortunately this comes with an estimated price tag of $30,000 and only yields a 50% chance of successful outcome. That's where you come in as a Pender County Commissioner concerned about the erosion of your tax base. Any lobbying efforts on behalf of your constituents would be greatly appreciated and mutually beneficial.

I'm happy to meet with you in person, or attend an upcoming board meeting, to present our case in detail. I look forward to hearing from you and sincerely appreciate your time in considering this matter.

Todd Skeen

108 Great Oak Dr.

MARSHALL, WILLIAMS & GORHAM, L.L.P.

ATTORNEYS AT LAW

WILMINGTON, NORTH CAROLINA

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WILLIAM ROBERT CHERRY, JR.
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cdm@mwglaw.com

May 9, 2016

VIA CMRRR

Waters Edge HOA, Inc.
c/o Chris Blake, Registered Agent
2108 Capital Drive, Suite 102
Wilmington, NC 28405

Re: Application for CAMA Major Development Permit
Our File No. 091738

Dear Chris:

I represent R. L. Blanton & Co., Inc. and Randy L. Blanton. Mr. Blanton received by certified mail on April 18, 2016 an Application for Major Development Permit to the North Carolina Division of Coastal Management for the Waters Edge HOA dated April 1, 2016. I contacted the local CAMA office and requested a date and time to review the entire file. I was informed by the local CAMA office that they did not have on file an application for a Major Development Permit filed by Waters Edge HOA, Inc. on or about the April 1, 2006 timeframe. There had been such an application in 2015, Permit Application No. DEN15-05, but that application had been denied December 4, 2015.

Subsequently, I contacted Jason Dail with CAMA. Mr. Dail informed me that the Waters Edge HOA had attempted to file an application for a Major Development Permit but that the package was incomplete and was not filed. Accordingly, there is no current pending application for my client to respond to.

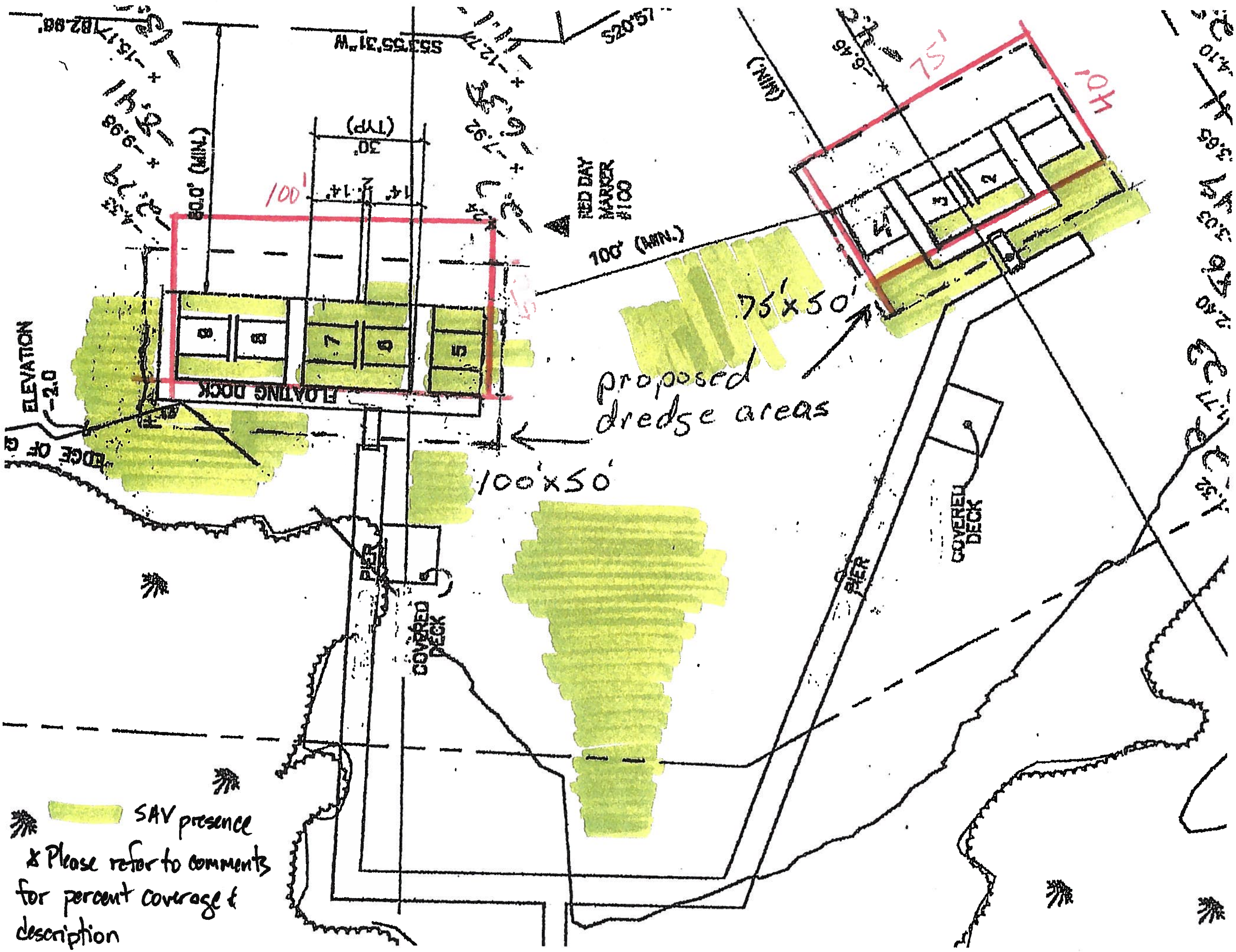
If and when an application for a Major Development Permit is filed, please serve me and my client with the application such that we can respond to it. Please serve my clients by certified mail at 1007 Links Court, Hampstead, NC 28443. Please serve me at my P.O. Box address above.

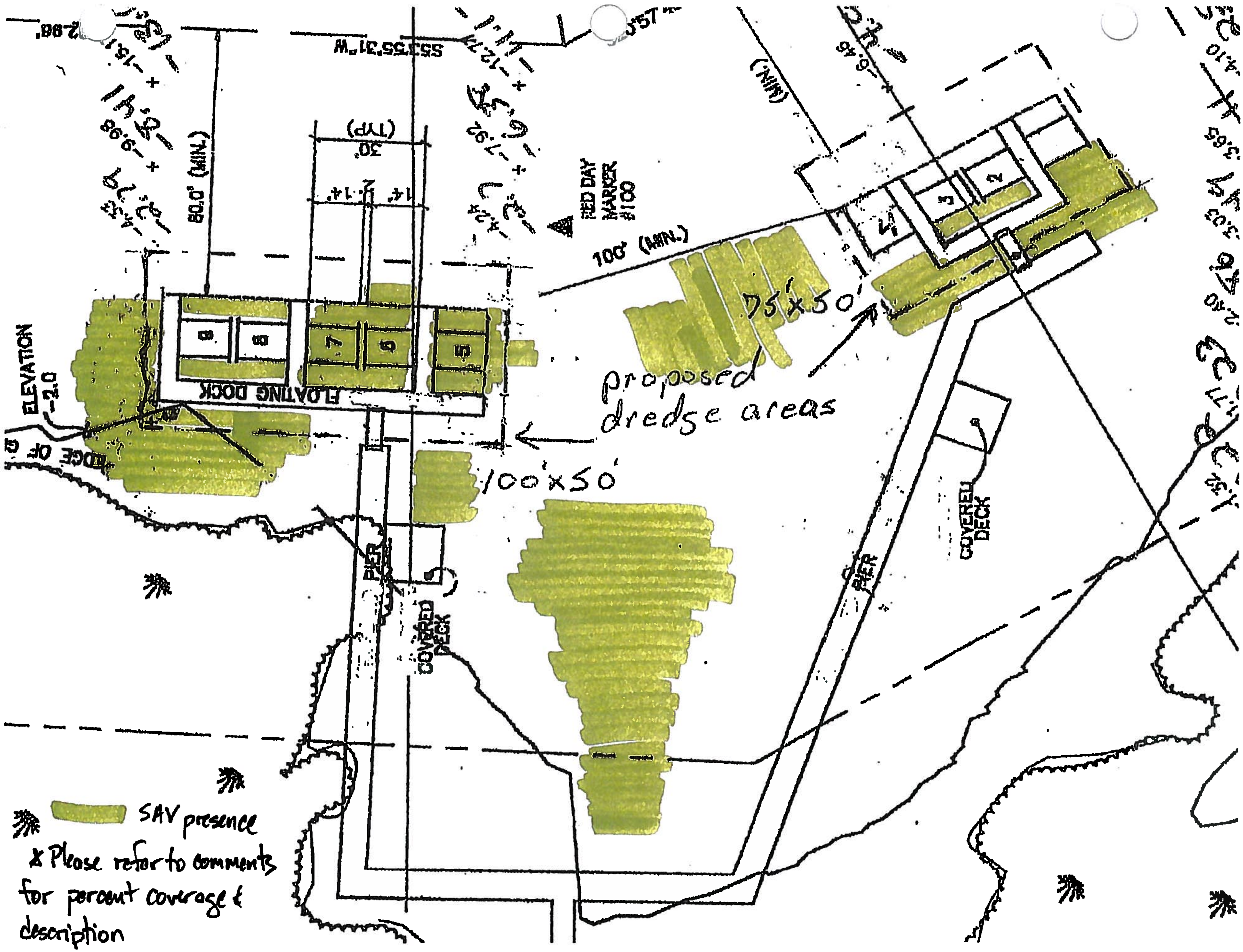
Yours very truly,

MARSHALL, WILLIAMS & GORHAM, L.L.P.

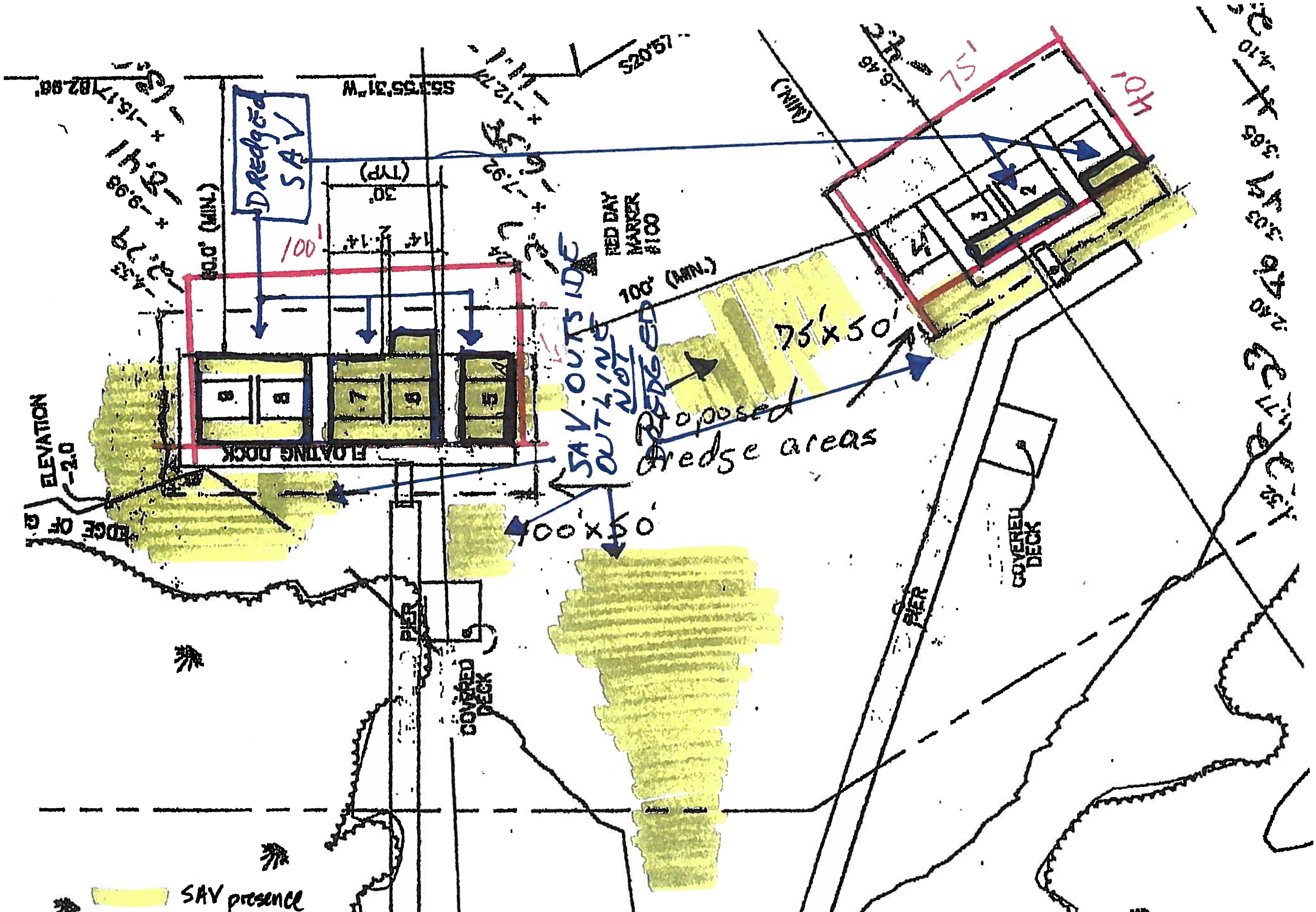
Charles D. Meier

CDM/mv
cc: Randy L. Blanton
Jason Dail


proposed dredge areas
100'x50'
75'x50'
75'
40'
100'
FLOATING DOCK
ELEVATION -2.0
EDGE OF G
RED DAY MARKER #100
100' (MIN.)
60.0' (MIN.)
30' (TYP.)
14'
PIER
COVERED DECK
SAV presence
* Please refer to comments for percent coverage & description



ELEVATION -2.0
FLOATING DOCK
RED DAY MARKER #100
100' (MIN.)
80.0' (MIN.)
30' (TYP)
14'
14'
proposed dredge areas
100'x50'
75'x50'
PIER
PIER
COVERED DECK
COVERED DECK
SAV presence
* Please refer to comments for percent coverage & description



* Please refer to comments for percent coverage & description

Waters Edge Homeowners Association, Inc.
November 30, 2016

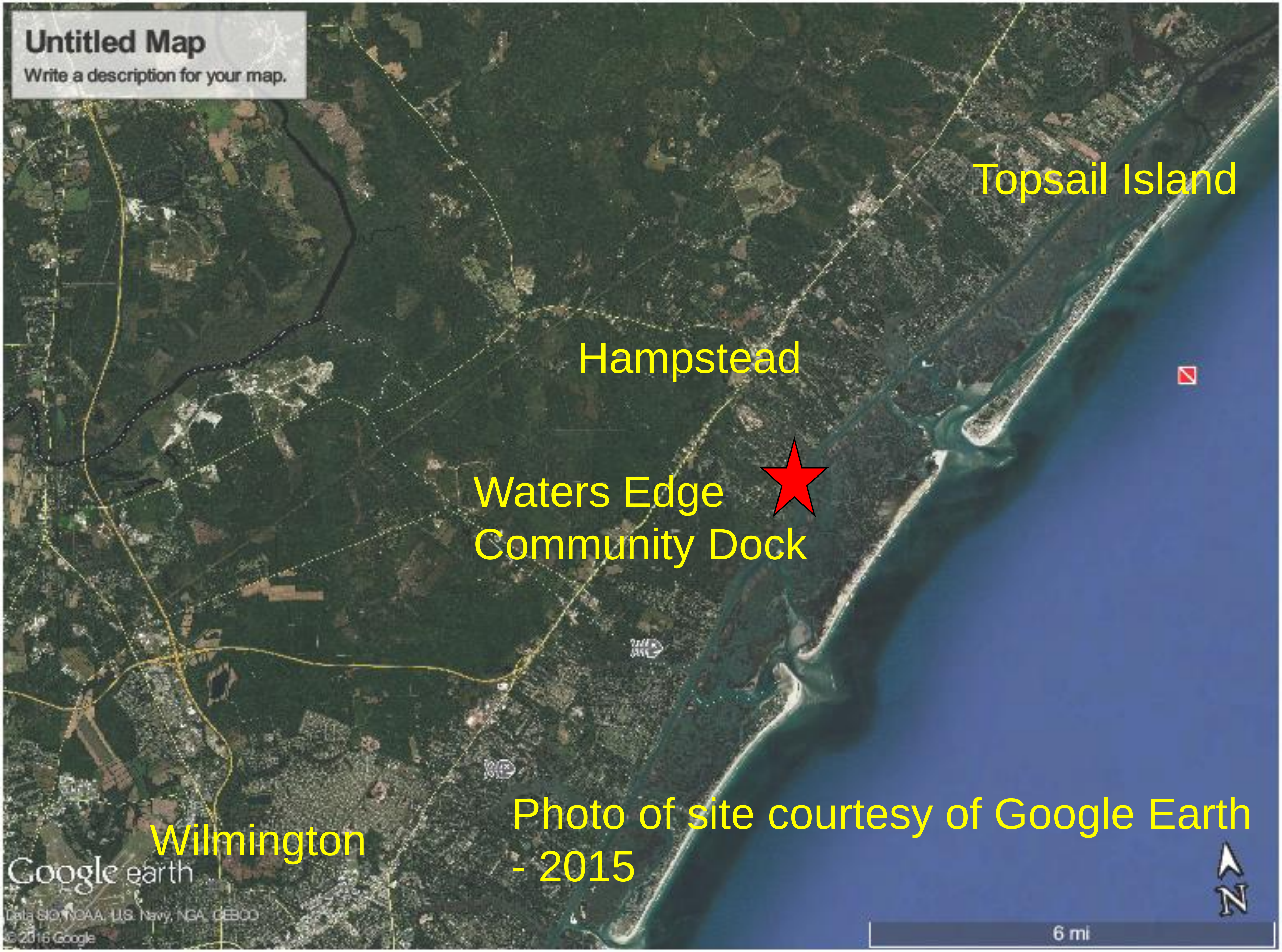
Site Location

Department of Environmental Quality

VARIANCE REQUEST
For
Waters Edge Homeowners Association, Inc.

Project Location: Waters Edge Common Area – Nine-slip community docking facility (AIWW).

Hampstead, Pender County, NC
November 30, 2016


Untitled Map
Write a description for your map.
Topsail Island
Hampstead
Waters Edge
Community Dock
Wilmington
Photo of site courtesy of Google Earth
- 2015
Google earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2016 Google
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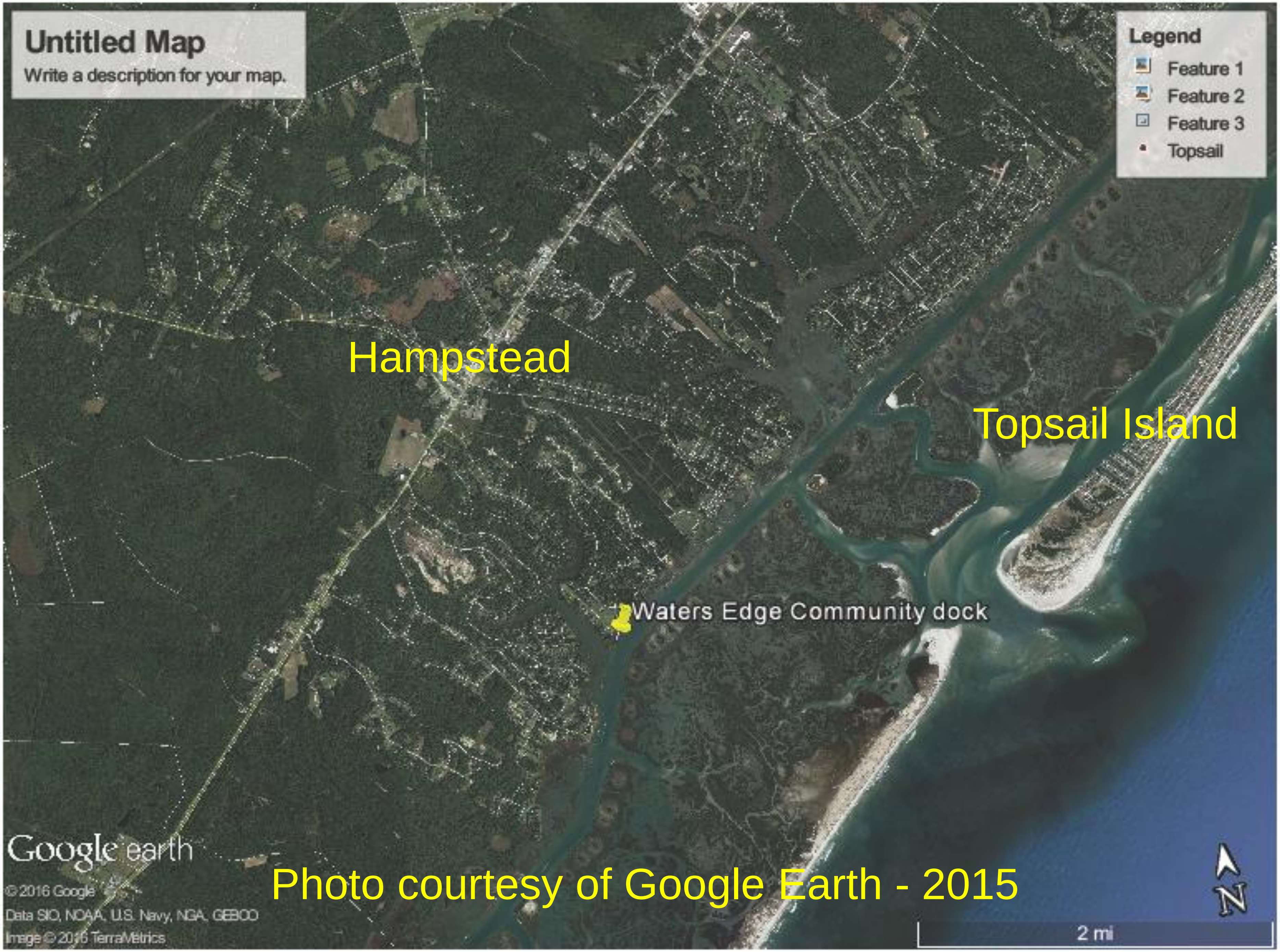
Untitled Map
Write a description for your map.
Legend
Feature 1
Feature 2
Feature 3
Topsail
Hampstead
Topsail Island
Waters Edge Community dock
Google earth
© 2016 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2016 TerraMetrics
Photo courtesy of Google Earth - 2015
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County Home Page (http://w

Waters Edge Community Dock

Search Results Layers

Results List

Details

PARCELS
PIN
(http://gis.pendercountync.gov/TaxCardReader/D
Id=3291-28-2825-0000)
CALCACRES

NAME

ADDR
CITY
STATE
ZIP
PROPERTY ADDRESS (DBLINK.aspx?id=3291-28-2

PROPERTY DESCRIPTON

DATE
SALE_PRICE
Deed Reference
(http://gis.pendercountync.gov/RODSearch/defau
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Plat (TaxDetails.aspx?plat=00420080)
ACCOUNT
TOWNSHIP
ACRES
LAND_VALUE
BUILDING_VALUE
TOTAL_VALUE
DEFERRED_VALUE
SUBDIVISION
ZONE

Overview of Waters Edge Community Dock courtesy of Pender County GIS – Aerial Photo date 2012

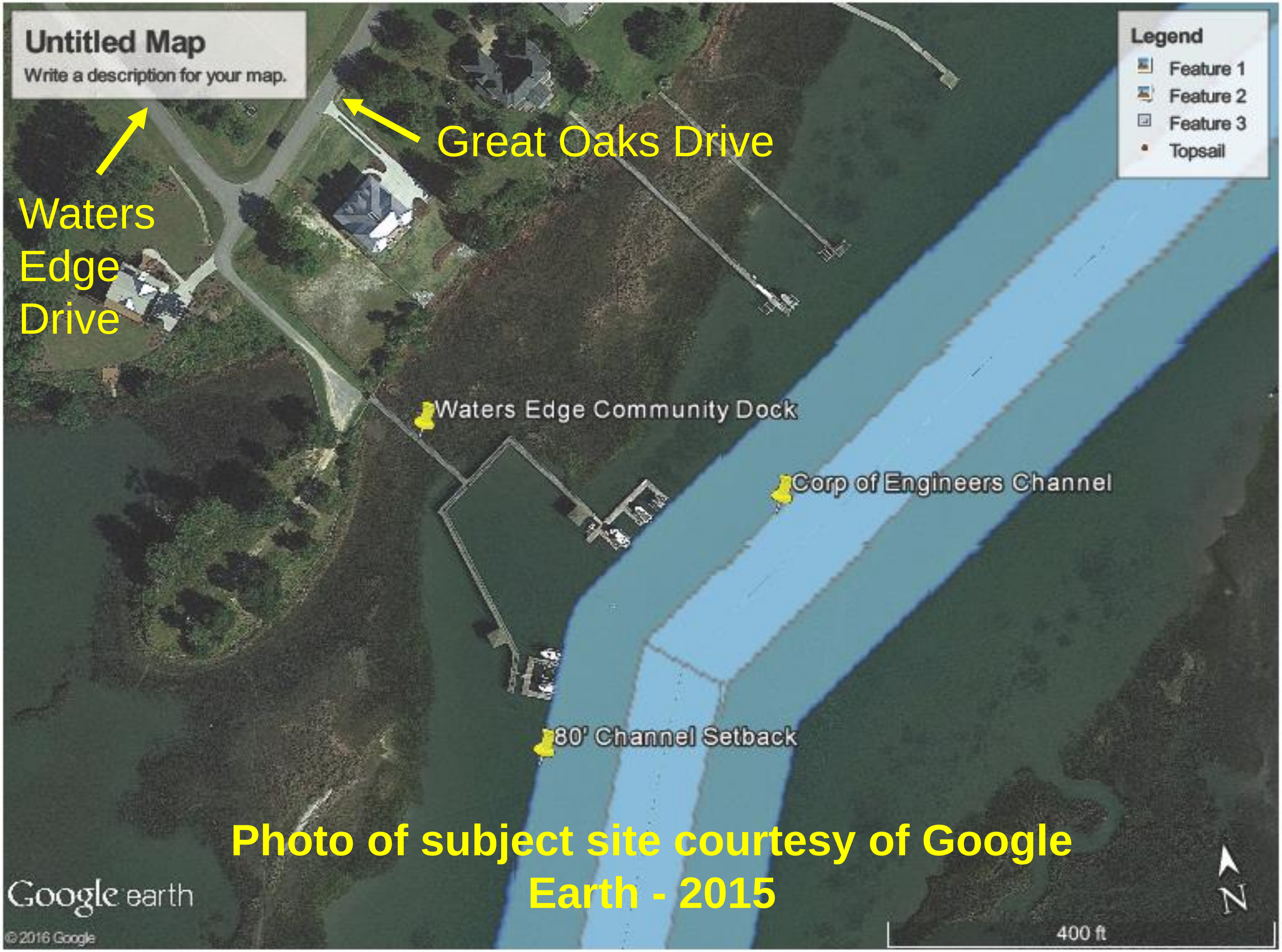
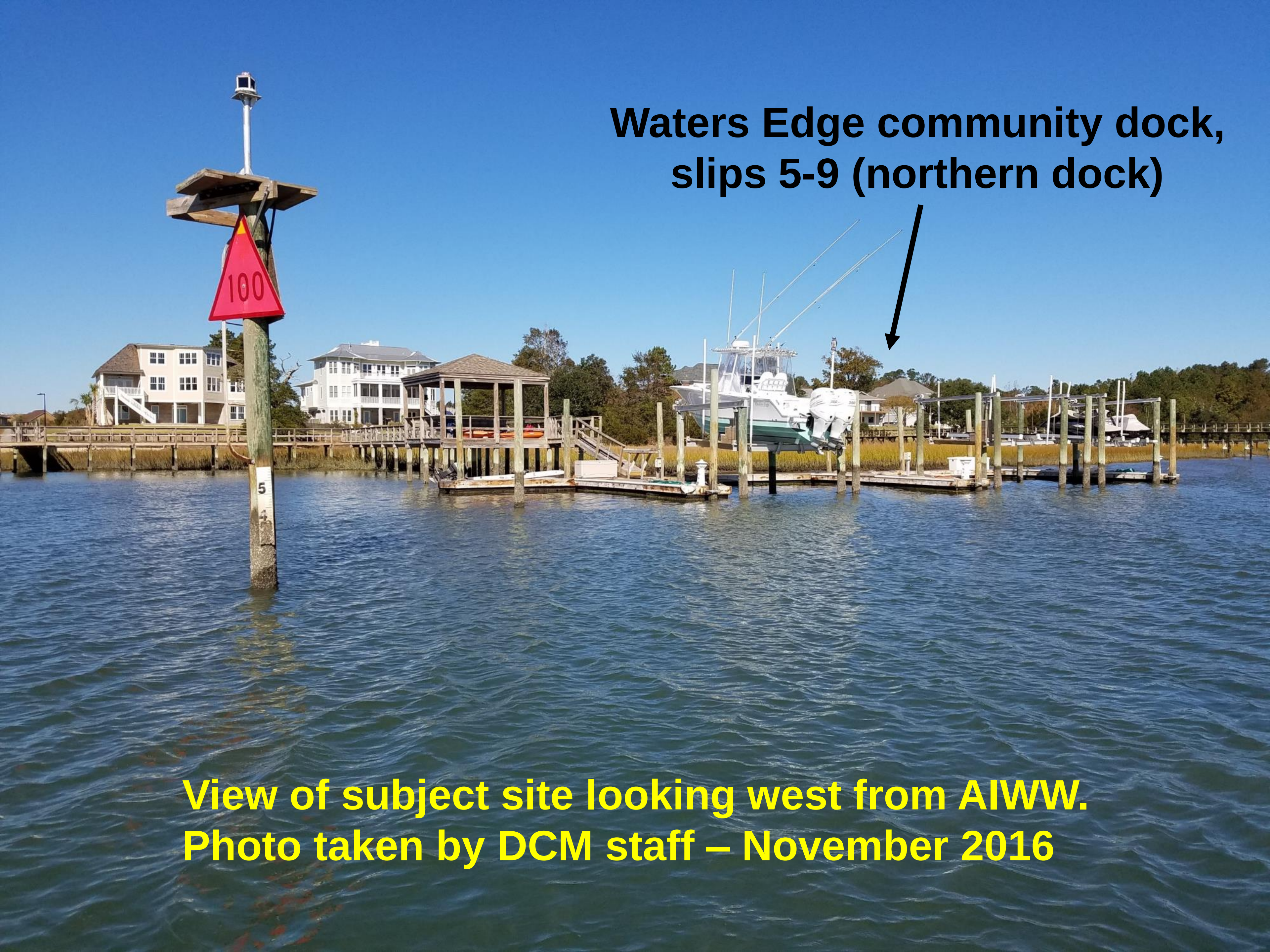


Photo of subject site courtesy of Google Earth - 2015


Waters Edge nine-slip community docking facility (along AIWW)
Southern Dock
Northern Dock
Photo of subject site looking south along AIWW, taken by DCM staff – November 2016


Waters Edge community dock,
slips 5-9 (northern dock)
100
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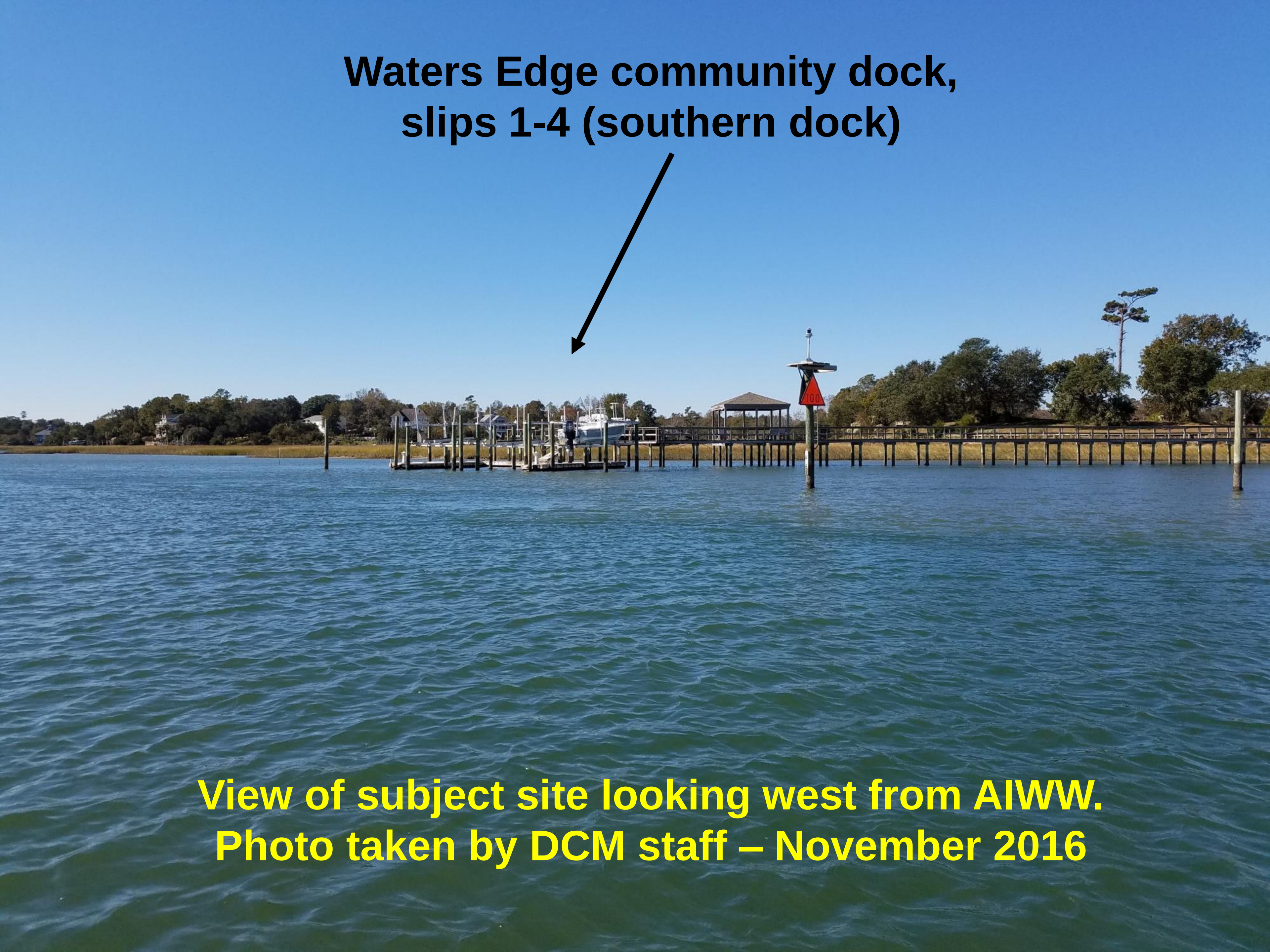
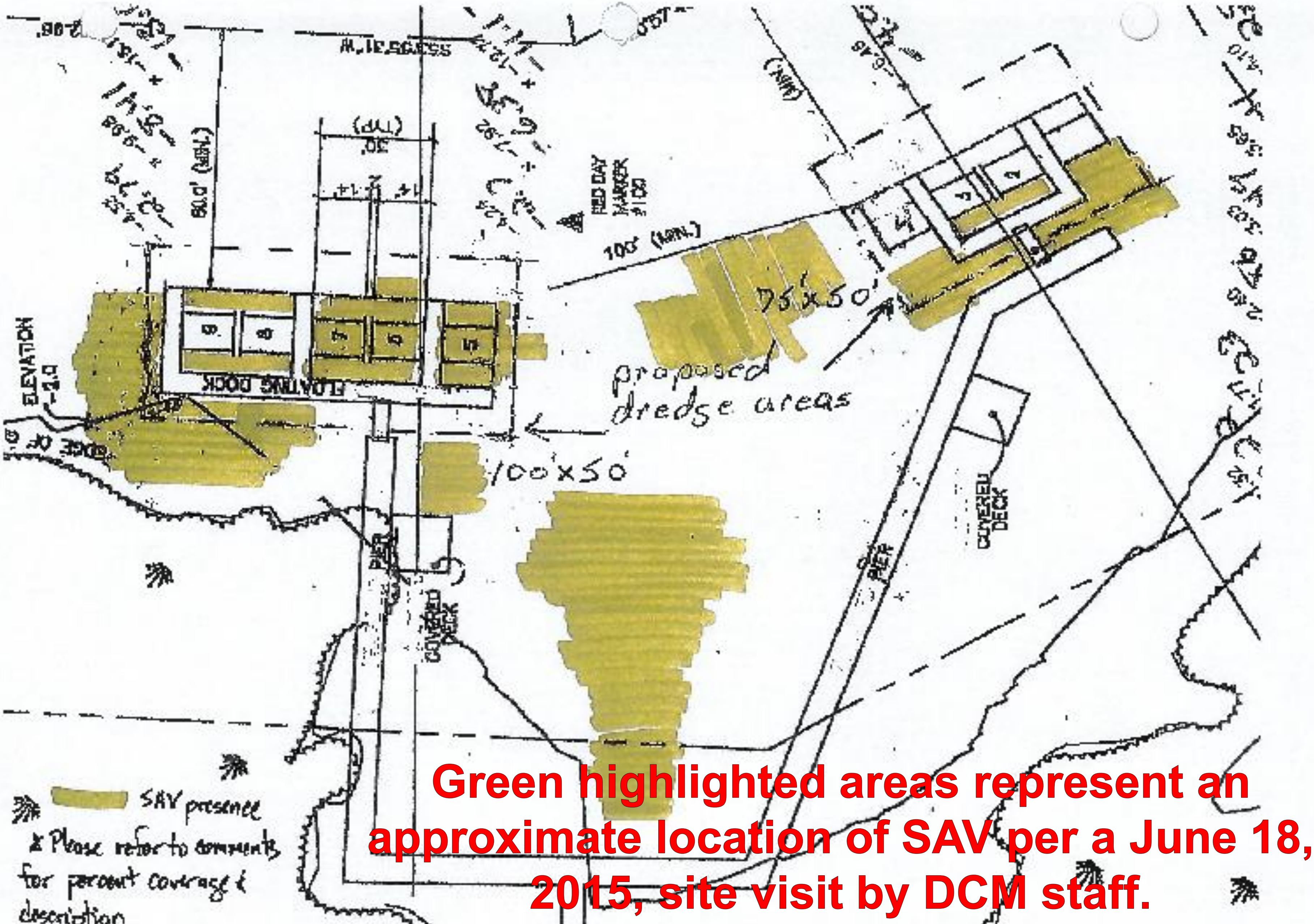
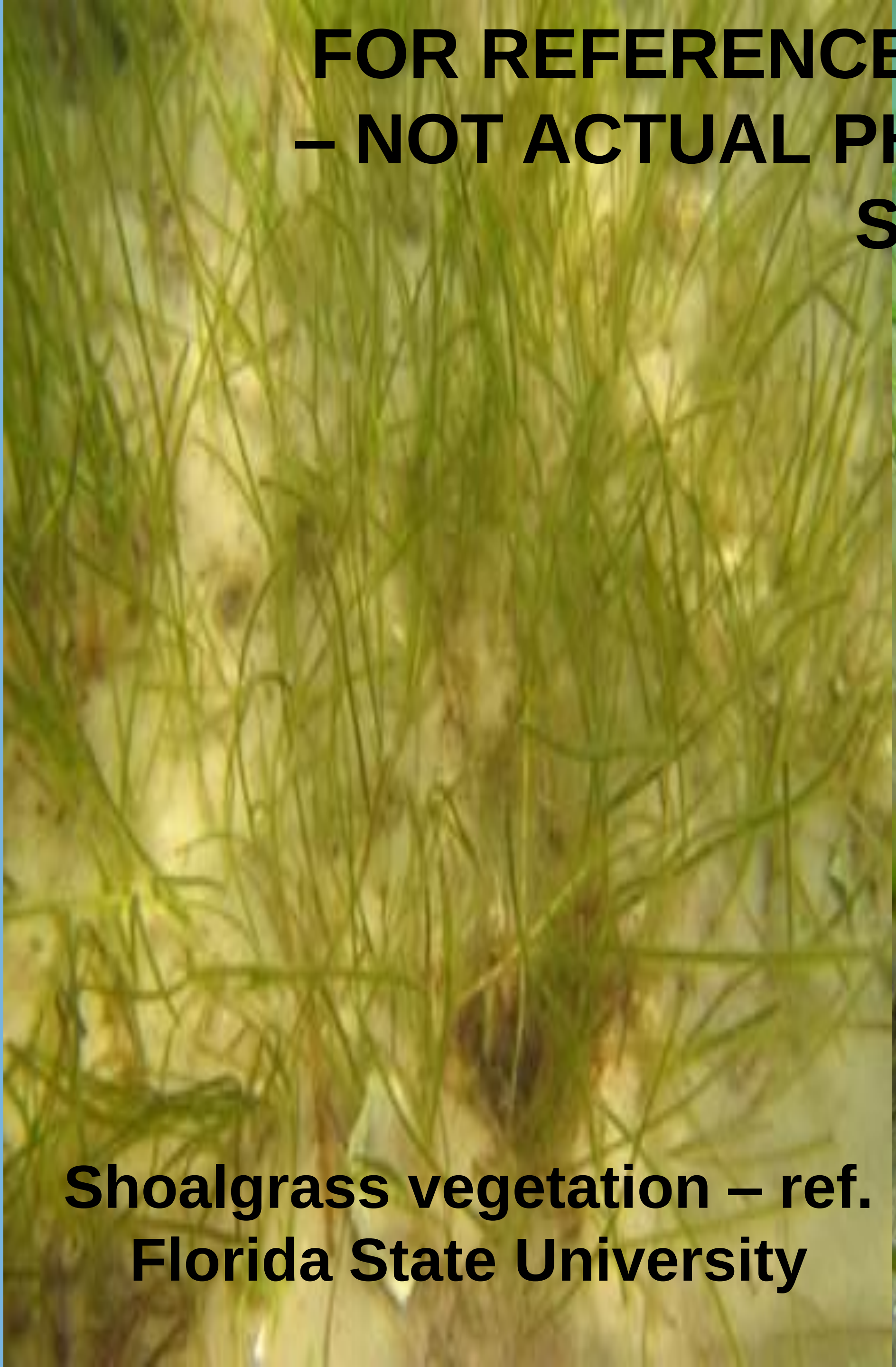
View of subject site looking west from AIWW.
Photo taken by DCM staff – November 2016


Waters Edge community dock,
slips 1-4 (southern dock)
View of subject site looking west from AIWW.
Photo taken by DCM staff – November 2016



Green highlighted areas represent an approximate location of SAV per a June 18, 2015, site visit by DCM staff.

FOR REFERENCE PURPOSES ONLY – NOT ACTUAL PHOTOS OF ON-SITE SAV



Shoalgrass vegetation – ref. Florida State University

Eelgrass vegetation – ref. NOAA Habitat Conservation