LAKE MATTAMUSKEET WATERSHED RESTORATION PLAN

An anchor to the past, a path to the future

NOVEMBER 30, 2018

PREPARED BY: NORTH CAROLINA COASTAL FEDERATION
On behalf of: Hyde County, U.S. Fish and Wildlife Service, and N.C. Wildlife Resources Commission

TABLE OF CONTENTS

ACKNOWLEDGEMENTS i

ACRONYMS, ABBREVIATIONS and GLOSSARY ii

LIST OF TABLES v

LIST OF FIGURES v

EXECUTIVE SUMMARY 1

INTRODUCTION 3

BACKGROUND 6

HISTORY OF DRAINAGE ALTERATIONS 7

MODERN HYDROLOGY AND LAND USE 8

CURRENT STATE OF THE LAKE 13

EDUCATION and OUTREACH 15

MONITORING 16

STRESSORS and SOURCES 20

WATER QUALITY AND CLARITY ISSUES 20

FLOODING ISSUES 25

MANAGEMENT MEASURES 28

PRIORITY ACTIONS 31

ESTIMATED LOAD REDUCTIONS 38

PLAN IMPLEMENTATION 38

EVALUATION 38

TECHNICAL ASSISTANCE 39

FINANCIAL ASSISTANCE 39

SCHEDULE and MILESTONES 40

REFERENCES 46

APPENDIX A – ESTABLISHMENT OF LAKE MATTAMUSKEET WILDLIFE REFUGE
APPENDIX B – ESTABLISHMENT AND REPEAL OF MATTAMUSKEET DRAINAGE DISTRICT ONE
APPENDIX C – HISTORIC TIMELINE OF WATERSHED DEVELOPMENT ACTIVITIES
APPENDIX D – LAKE MATTAMUSKEET WATERSHED RESTORATION PLAN DEVELOPMENT
APPENDIX E – LOCAL PERSPECTIVES ON LAKE MATTAMUSKEET
APPENDIX F – SERVICE DISTRICT PLAN EXAMPLE: WEST QUARTER
APPENDIX G – FUNDING OPPORTUNITIES FOR PLAN IMPLEMENTATION

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ACRONYMS, ABBREVIATIONS and GLOSSARY

303(d) LIST - Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. A Total Maximum Daily Load, or TMDL, is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards. Category 5 impaired waters require the development of a TMDL.

AIWW – Atlantic Intracoastal Waterway

ARNWR – Alligator River National Wildlife Refuge

BMP - Best Management Practice

CFU - Colony Forming Unit, used to measure fecal coliform concentrations.

COG – Regional Council of Government

CONDITIONALLY APPROVED CLOSED - An area subject to predictable intermittent pollution that may be used for harvesting shellfish for direct market purposes when management plan criteria are met generally during drought conditions.

CONDITIONALLY APPROVED OPEN - An area subject to predictable intermittent pollution that may be used for harvesting shellfish for direct market purposes when management plan criteria are met generally during low rainfall conditions.

CST – Core Stakeholder Team – this eleven-member group met regularly over the course of the watershed plan development to identify water quality and flooding concerns. They developed the goals, objectives and actions to be included in the plan for presentation to the public.

CRP – Conservation Reserve Program

CWA - Clean Water Act

DEGRADED WATERS - General description of surface waters that have elevated pollution levels, including high bacteria levels, pathogens, sediment, low dissolved oxygen, and/or high nutrient levels. This is not a legal description of impairment (see impaired waters definition below).

FECAL COLIFORM - Bacteria that originate in the intestines of warm-blooded animals. Bacteria of the coliform group which will produce gas from lactose in a multiple tube procedure liquid medium (EC or A-1) within 24 plus or minus two hours at 44.5 degrees C plus or minus 2 degrees C in a water bath.

FLOW - The volume of water, often measured in cubic feet per second (cfs), flowing in a stream or through a stormwater conveyance system.

GROWING WATERS - Waters that support or could support shellfish life.

HYDROLOGIC CYCLE - The cycle by which water evaporates from oceans and other bodies of water, accumulates as water vapor in clouds, and returns to oceans and other bodies of water as precipitation or groundwater. Also known as the water cycle.

HYDROGRAPH - A graph showing changes in the discharge of a surface water river, stream or creek over a period of time.

HYDROLOGY - The science dealing with the waters of the earth, their distribution on the surface and underground, and the cycle involving evaporation, precipitation, flow to the seas, etc.

IMPAIRED WATERS - For the purposes of this Plan, any saltwater classified for shellfish harvest (SA) that is not managed as an "Approved Area" by the Division of Environmental Health, or any saltwater classified for swimming (SB) where swimming advisories are being issued. These waters have been listed as impaired on the state's 303(d) list for USEPA.

LIDAR – "Light Detection and Ranging," a remote sensing technology that can measure properties of a target using light.

MAXIMUM EXTENT PRACTICABLE - According to USEPA, actions available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purpose.
MDA - Mattamuskeet Drainage Association, a large agricultural drainage district in eastern Hyde County comprised of 42,500 acres.
MNWR – Mattamuskeet National Wildlife Refuge
MTWG – Mattamuskeet Technical Working Group – The members of the MTWG are biologists and technicians from USFWS and NCWRC who identify, prioritize and conduct monitoring and research at MNWR to inform management actions that can be implemented to improve water quality and restore SAV in Lake Mattamuskeet.
MOIST SOIL MANAGEMENT – The intentional manipulation of water levels to promote germination of native wetland plants that are beneficial to waterfowl and other waterbirds by mimicking the seasonal wet and dry cycles of natural wetlands for the benefit of waterfowl.
NPDES - National Pollutant Discharge Elimination System
NRCS – Natural Resources Conservation Service, a federal agency that administers Farm Bill programs one of which is the Wetland Reserve Program. WRP works with landowners on private lands to conserve natural resources
NFWF – National Fish and Wildlife Foundation
NCDOT - N.C. Department of Transportation
NCDEQ – N.C. Department of Environmental Quality
NCDWR - N.C. Division of Water Resources
NCEMC - N.C. Environmental Management Commission
NCWRC – N. C. Wildlife Resources Commission
PROHIBITED AREA - An area unsuitable for the harvesting of shellfish for direct market purposes.
SA - Saltwater classified by the EMC for shellfish harvesting. These are waters that should support aquatic life, both primary and secondary recreation (activities with frequent or prolonged skin contact), and shellfishing for market purposes.
SB - Saltwater classified by the EMC for swimming.
SC - Saltwater classified by the EMC for fish propagation and incidental swimming. The waters are safe for swimming but have a higher risk of pollution and human illness than SB waters.
SS - Shellfish Sanitation Section, N.C. Division of Marine Fisheries, N.C. DENR. In 2011 the N.C. General Assembly transferred the shellfish and recreational water quality functions of this agency from the N.C. Division of Environmental Health to the N.C. Division of Marine Fisheries.
SAV – Submerged aquatic vegetation.
STAKEHOLDER – Anyone who can affect or be affected by the watershed restoration plan.
STORMWATER - Water from rain that flows over the land surface, picking up pollutants that are on the ground.
TOTAL MAXIMUM DAILY LOAD - Section 303(d) of the Clean Water Act establishes the Total Maximum Daily Load (TMDL) program, a water quality-based approach to regulating waters that fail to meet water quality standards despite the use of pollution control requirements. A TMDL is a calculation of the maximum quantity of a given pollutant that may be added to a water body from all sources without exceeding the applicable water quality standard for that pollutant. States must establish TMDLs for all pollutants that prevent waters from attaining water quality goals. The TMDL helps regulators devise the limitation necessary to meet water quality standards by identifying and quantifying the individual sources contributing to a particular water quality problem.
USACE – U.S. Army Corps of Engineers
USEPA – U.S. Environmental Protection Agency
USFWS – U.S. Fish and Wildlife Service

WATERSHED - The topographic boundary within which water drains into a particular river, stream, wetland, or body of water.
WATER BUDGET – An accounting of the rates of water movement and the change in water storage in all parts of the atmosphere, land surface, and subsurface.
WREP – (Wetland Reserve Enhancement Program) a voluntary program through the NRCS to protect, restore, enhance, and manage high priority wetlands and wildlife habitat. WREP funds can only be used on projects that meet WRP program requirements
WRP - (Wetlands Reserve Program) a voluntary program through the NRCS to preserve and protect wetlands on private property. An incentive program, landowners are compensated financially to restore previously drained farmland into wetlands habitat.

LIST OF TABLES

Table 1: Estimated construction of waterfowl impoundments on private land.....13
Table 2: Monitoring activities conducted at Lake Mattamuskeet and the surrounding region.....19
Table 3: Description of flooding hotspots within the Lake Mattamuskeet watershed 35

LIST OF FIGURES

Figure 1: Map of Hyde County, N.C. General project area outlined 3
Figure 2: Map of the Atlantic Flyway of the United States, extending from Maine to Florida 4
Figure 3: Map of Drainage District 1 and associated canals from 1917-1932. 7
Figure 4: Major land use and crops grown in watershed from 2002-2017 11
Figure 5: Top three crops grown within the watershed since 2002. 12
Figure 6: A map displaying the location of impoundments and year of development. 13
Figure 7: Results of the annual SAV surveys conducted from 1989-2017.....17
Figure 8: The SAV conceptual model developed by Davis and Brinson (1980).....17
Figure 9: The results of water quality sampling conducted since the 1980s 20
Figure 10: Plot of chlorphyll-*a* concentrations in the lake from 2012 – 2017.....21
Figure 11: Plot of total nitrogen concentrations in the lake from 2012 – 2017 21
Figure 12: Plot of total phosphorus concentrations in the lake from 2012 – 2017 22
Figure 13: Plot of turbidity concentrations in the lake from 2012 – 2017 22
Figure 14: Plot of maximum pH values in the lake from 2013 – 2018 23
Figure 15: Plot of maximum water levels in the lake from 2013 – 2018 25
Figure 16: A map displaying the location of flooding hotspots throughout the watershed.....26
Figure 17: Plot of water levels at Bell Island Pier from 2013 – 2018 27
Figure 18: Example of cross-section comparison of conditions along Outfall Canal.....28
Figure 19: A map displaying the potential sheet flow application sites within the watershed 37

EXECUTIVE SUMMARY

Lake Mattamuskeet is located in eastern North Carolina on the Albemarle-Pamlico Peninsula within the heart of Hyde County and the center of the Mattamuskeet National Wildlife Refuge. The present surface area of the lake is around 40,000 acres, which ranks as the largest in the state. The lake has an average depth of just four feet.

In 2016, the lake was listed on the state 303(d) list for impaired waters due to elevated levels of pH and chlorophyll-*a*. The water quality within the lake has drastically declined due to significant increases in nutrients and suspended sediments that have been contributed from over a century of landscape alterations and hydrologic modifications.

In addition, monitoring by the U.S. Fish and Wildlife Service (USFWS) has indicated that the majority of submerged aquatic vegetation (SAV), an important habitat for fish and food source for waterfowl was lost in the lake by 2017. Monitoring results also indicates algae blooms containing a cyanotoxin, cylindrospermopsin, at concentrations that border the federal limits for recreational contact has become a more frequent occurrence.

Flooding issues have also become commonplace throughout the watershed due to a passive drainage system for the lake that relies on gravity in a very low-relief area and is further compromised by rising sea level. There are four major outlet canals that were excavated prior to 1950 to convey water from the lake to the Pamlico Sound. Each of the canals have a set of tide gates that operates on differences in head pressure to ensure Lake Mattamuskeet remains a freshwater system by preventing saltwater intrusion from the Pamlico Sound. Rising sea levels and siltation of the main canals connecting the lake to the Pamlico Sound are thought to be contributing factors in the decline of drainage function, and those conditions are anticipated to exacerbate flooding in the future.

These alarming trends prompted the development of a Watershed Restoration Plan for Lake Mattamuskeet through a partnership between the Hyde County Government, N.C. Wildlife Resources Commission, and U.S. Fish and Wildlife Service. The North Carolina Coastal Federation was retained to develop the plan for approval by the N.C. Department of Environmental Quality's 319 Program.

The initial priority actions of this watershed restoration plan stem around establishing active water-level management capabilities on Lake Mattamuskeet and improve water management within the watershed. This includes creating a formal body that provides managing authority, such as a service district, for active water management within the watershed in close coordination with the Refuge, which would be excluded as party to the formal body since U.S. FWS cannot cede management authority. An additional priority action is to develop a hydrologic and hydraulic model for the watershed to assist with exploring engineered solutions including additional outlets for the lake.

Engineering studies will determine and evaluate the feasibility of placing pumps on the existing main outlet canals and/or redirecting water in current drainage systems/districts that could move

water from the lake to the Alligator River or Pamlico Sound. The strategy being pursued aims to re-establish and replicate the natural movement of water from the lake to the Alligator River drainage rather than the Pamlico Sound since the increased discharge of nutrient rich water could have the potential to negatively impact shellfish habitat. The preferred design alternative is to identify, design, and prioritize projects where water diverted from the lake could be sheet flowed over newly-created or restored wetlands, where nutrients and sediment can be absorbed before discharging into a water body.

INTRODUCTION

Lake Mattamuskeet is located in eastern North Carolina on the Albemarle-Pamlico Peninsula within the heart of Hyde County (Figure 1). It is the largest naturally-formed lake in the state, but it is no longer a "natural lake" due to extensive hydrologic modifications that have occurred over the past 200 years. Most land in eastern North Carolina, and specifically the Albemarle-Pamlico Peninsula, is ditched and drained. Many ditches in Hyde County provided the initial access for logging activities and later for agricultural water management. The drainage provided by these canals has been necessary for the landscape development due to minimal topographic relief and low-lying elevation on the peninsula.

The highest elevation within the Lake Mattamuskeet watershed is approximately nine feet, and the majority of the land is less than five feet above mean sea level. Due to the centuries of landscape alterations, the surface area of the lake decreased from 110,000 acres (pre-1800s) to 40,000 acres (today), and the water quality has drastically declined due to significant increases in nutrients and suspended sediments resulting in an increase in harmful phytoplankton blooms and reduction in water clarity. Flooding issues have also become commonplace throughout the watershed due to a passive drainage system for the lake that relies on gravity in a very low-relief area and is further compromised by rising sea level.

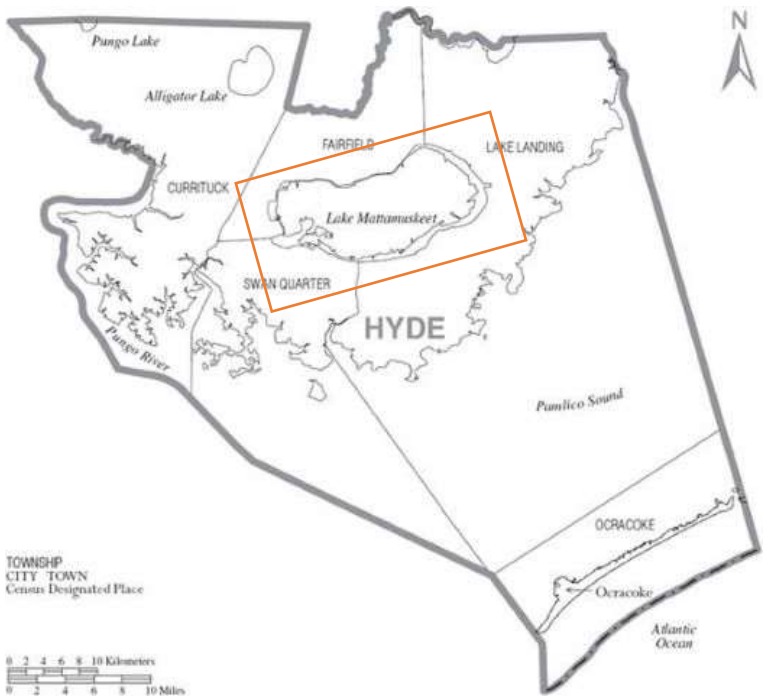

Figure 1: Map of Hyde County, N.C. General watershed area outlined

Treasured for its natural resources and steeped in rich cultural history, the health of the lake is inherently linked to the way of life for Hyde County residents and visitors. In an area where livelihoods depend on farming and guided hunt services, many people in Hyde County are

economically connected to the lake. In the winter, waterfowl and other migratory birds on the lake and surrounding impoundments attract hunters and birdwatchers, who spend money on lodging, meals, guide services, and hunt club memberships. Fishing on the lake and from the banks of the canals, particularly for largemouth bass, white perch, crappie, catfish and blue crabs, draws locals and visitors back in the spring and through the fall. Canoeing and kayaking on the lake offers recreational opportunities as does walking nature trails. Furthermore, the lake vista provides aesthetic and therapeutic qualities that are enjoyed year-round.

Lake Mattamuskeet is a popular destination for fishing, hunting, and wildlife viewing (left, photo by Bill Swindaman). The Mattamuskeet Lodge (center, photo by Gene Davis) offered visitors comfortable lodging, often with views of wildlife. Tundra swans draw huge crowds during 'Swan Days' (right, photo by Lindy Martin.)

Lake Mattamuskeet is also the centerpiece of the Mattamuskeet National Wildlife Refuge (Refuge), which was established in 1934 after the last failed draining and farming project was abandoned [Appendix A]. The purpose of the Refuge is to protect and conserve habitat for migratory birds and other wildlife resources within 50,180 acres of open water, wetlands, impoundments, and forest that is managed by the U.S. Fish and Wildlife Service (USFWS). The

Figure 2: Map of the Atlantic Flyway of the United States, extending from Maine to Florida

Refuge is a premier National Wildlife Refuge for wintering migratory waterfowl along the Atlantic Flyway (Figure 2). From September through March, waterfowl (ducks, geese, and swans) use the lake and surrounding habitat to feed and rest in preparation for their return migration to their breeding grounds.

There are 240 species of birds that are known to use the Refuge. Shorebirds, wading birds, and other bird species can be spotted throughout the year along the lakeshore or flying through the woodlands. Birds of prey, like the osprey, nest in cypress trees and hunt for fish within the lake and adjacent Pamlico Sound. Bald eagles also nest and winter at the Refuge. A variety of amphibians and reptiles are supported by a rich diversity of habitats throughout the Refuge, and larger mammals such as black bears and white-tailed deer live within the mixed loblolly pine forests and adjacent habitats.

In recent decades, residents around the lake have raised concerns about low and high water levels in the lake and surrounding watershed. Lake levels have a direct influence on water quality as a result of limited circulation of water as well as the ability of sunlight to penetrate deeper waters. In 2016, the lake was listed on the state 303(d) list for impaired waters due to elevated pH and chlorophyll-*a*. In addition, monitoring by USFWS has indicated that the majority of submerged aquatic vegetation (SAV), an important habitat for fish and food source for waterfowl was lost in the lake by 2017. Monitoring results also indicates algae blooms containing clyndrospermopsin, a cyanotoxin produced by the cyanobacteria, *Cylindrospermopsin raciborskii*, are occurring at concentrations that border the federal limits for recreational contact, has become a more frequent occurrence. These alarming trends prompted the development of a Watershed Restoration Plan for Lake Mattamuskeet.

This Plan was developed through a partnership between the Hyde County Government (county), the N.C. Wildlife Resources Commission (NCWRC) and U.S. Fish and Wildlife Service (USFWS). It was guided by an inclusive group of core stakeholders as identified by the county and Hyde Soil and Water Conservation District. The North Carolina Coastal Federation (federation) was retained to facilitate stakeholder and public meetings and to develop the plan for approval by the N.C. Department of Environmental Quality's 319 Program. The partners provided information about land use changes over time, water quality and quantity issues, and identified and prioritized possible restoration strategies. The plan identifies three goals and various management actions to protect the current way of life, actively manage the lake water level in accordance with the purpose of the Refuge and mission of the National Wildlife Refuge System per the 1997 National Wildlife Refuge System Improvement Act, and restore the water quality and clarity within the lake. It is important to note that the three goals are designed to work in concert with each other. Actions taken to implement active water management within the watershed have the potential to reduce flooding on private property adjacent to the lake while also improving water quality and clarity within the lake. Improvements to water quality and clarity within the lake will provide direct ecological benefits and protect the way of life in Hyde County. The primary outcomes of each goal are further described below.

PROTECT THE WAY OF LIFE IN HYDE COUNTY:

Maintain existing land uses and industries in the watershed (residential, farming, fishing and tourism) and enhance and maintain the health of the lake's natural resources (waterfowl and wildlife).

ACTIVELY MANAGE THE LAKE WATER LEVEL:

Minimize flooding of residential, business and farm properties. Allow for annual drawdowns as appropriate and in compliance with the Refuge's management objectives defined in its Comprehensive Conservation Plan to establish and maintain submerged aquatic vegetation within the lake, and to establish and maintain a zone of emergent vegetation around the lake periphery.

RESTORE WATER QUALITY AND CLARITY:

Reduce nutrients, sediments and phytoplankton blooms, promote the growth of submerged aquatic vegetation and remove the lake from the NC 303(d) list of impaired waters.

BACKGROUND

Lake Mattamuskeet originally extended over 110,000 acres and was 6-9 feet deep (Forrest, 1999). It existed as a lake with low levels of available nutrients (oligotrophic) with a sandy lake bed and clear water. Inputs of organic matter into the lake from the surrounding watershed was extremely limited prior to the beginning of the Little Ice Age (c. 1600) (Waters et al., 2009). Nutrient inputs into the lake began to increase in the early 1600's when Native American and early European colonist activity is first documented around the lake (Heath, 1975; Forrest, 1999). Waters et al. (2009) identified that from the time of early colonist activity to about 1850 the lake exhibited increased plant and phytoplankton abundance as well as an increase in woody plant material entering the lake. Intense European settlement and land alternation activities around the lake began in the mid-1800's (c. 1850).

The promise of extremely fertile soil motivated a massive engineering project designed to drain and farm the lake bed that resulted in the excavation of three major canals cut from the east side of the lake to the Pamlico Sound between the 1800's and early 1900's. Mattamuskeet Drainage District One was established in 1909 after the passage of Public Law Chapter 509 by the N.C. Legislature (Figure 3)[Appendix B]. The goal of forming the district was to improve the economic conditions of Hyde County as well as oversee the plans to drain and farm the lake bed and adjacent lands. Plans included the establishment of the New Holland community to support the drainage and farming operation, the excavation of additional smaller canals and ditches across the lake, the construction of the pumping plant, and a supporting railroad to transport building materials and later passengers.

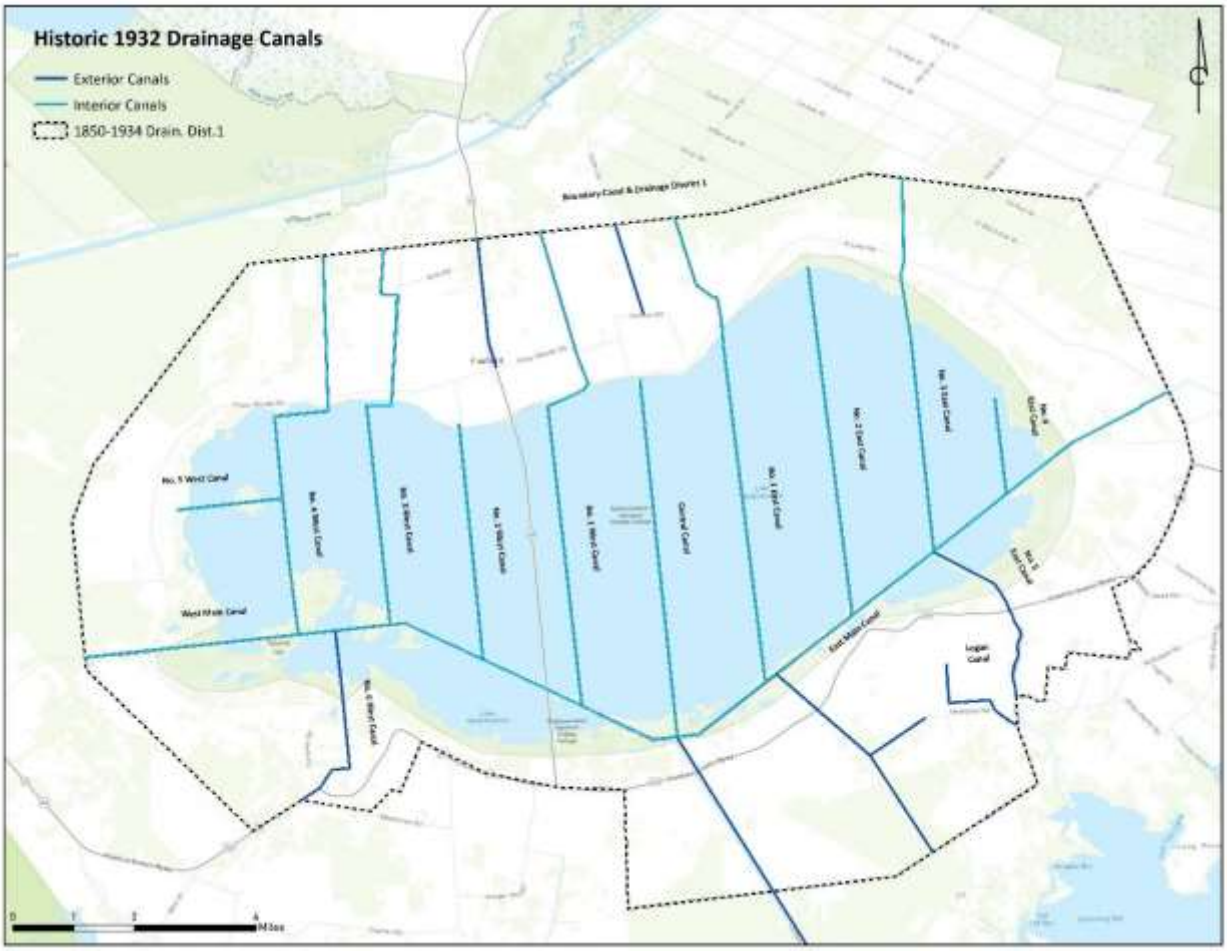

Figure 3: Map of Drainage District 1 and associated canals that were used during the lake bed farming operations from 1917-1932.

HISTORY OF DRAINAGE ALTERATIONS

The lake watershed has undergone many hydrologic changes since the first canal was excavated at Lake Landing to drain the lake for farming in 1838 [Appendix C]. The development of this canal alone reduced the lake to 55,000-acres and an average depth of 4 feet (Heath, 1975; Forrest, 1999). Over the next century, three additional canals (Fairfield, Waupoppin, and Outfall Canals) were dug to further drain the lake, and the world's largest pump station (at the time) was installed in 1916 on Outfall Canal (Heath, 1975; Forrest, 1999). Three separate corporations attempted to farm the lake bed from 1917 – 1932 by directing water to the Pamlico Sound. Every venture ultimately failed, but the third enterprise was able to reclaim the lake bed for more than five years while the pumping plant was in operation (Forrest, 1999; Waters, 2007). The Mattamuskeet Drainage District was dissolved following the establishment of the Mattamuskeet National Wildlife Refuge (Refuge) in 1934 and the lake bed eventually refilled to a capacity of 40,000 acres [Appendix A]. Landowners within the original boundary of Drainage District One retained the right to drain their lands into Lake Mattamuskeet through a Final Decree in 1935 [Appendix B].

During the time the successful farming operation of the lake bed was taking place, the U.S. Army Corps of Engineers (USACE) was completing construction of the Alligator/Pungo cut of the Atlantic Intracoastal Waterway (AIWW). In 1928, the AIWW canal was completed to connect the Pungo River to the Alligator River. Before the cut was completed there was no known water exchange between the two river systems. This massive canal radically changed the hydrology of these two river systems, the community of Fairfield, and the lake. Engineers that designed the waterway expected these changes, and specified that a lock and dam structure be constructed to avoid some of the flooding problems the canal would cause. However, the lock and dam was never constructed.

The next major hydrologic modification within the watershed occurred in 1940 when a causeway was constructed to re-route NC-94 from Fairfield across the lake to an intersection with US-264. This causeway divided the lake into an east and west basin connected through five culverts beneath the roadway, which opened to traffic in 1942. Rose Bay Canal was excavated in 1950 to provide a single hydrologic connection in the west basin to the Pamlico Sound through Rose Bay (Heath, 1975).

About the time the causeway construction was completed, flooding from the Alligator-Pungo cut of the AIWW was recognized to still be a problem. The two water bodies had no natural connectivity prior to the excavation of the canal. Prevailing southwest winds in the summer push water through the cut, over the landscape and eventually to the Alligator River. Prevailing northeast winds in the winter push the water from the Alligator River through the cut, over the landscape and eventually to the Pungo River.

The change in hydrology caused by the construction of the AIWW significantly altered the natural processes by which water is drawn out of the lake. Construction of the AIWW also resulted in increased salinity levels where the lake once discharged. In 1948, USACE reviewed the saltwater intrusion and flooding issues associated with the AIWW. Findings concluded that the AIWW was not solely responsible, but corrective works for Fairfield were recommended and provided at federal expense (Report of Survey of North Carolina Inland Ports and Waterways, 1954). The Fairfield Drainage District was ultimately developed in 1958 after passage of the 1955 Civil Works Appropriation Bill. Dikes were constructed to prevent serious property and crop damage from persistent flooding, and pumps were installed on Fairfield Canal next to NC-94 to provide adequate drainage capacity and direct water towards the natural hydrologic flow path from the lake towards the Alligator River. The Fairfield Drainage District and infrastructure is still in existence today.

MODERN HYDROLOGY AND LAND USE

Since the development of the Fairfield Drainage District, very little of the major infrastructure affecting the hydrology of the lake and adjacent lands within the watershed has changed. No new outlet canals have been excavated and no major pump stations have been installed. However, there have been incremental changes to water management and land use within the watershed [Appendix C]. It is worth noting here the current state and changes that have been documented in the lake and surrounding watershed during this timeframe.

First, the lake water level is not actively managed. Instead, water flows from the lake to the sound when differences in head pressure allow tide gates to open at each outflow canal. The primary function of the tide gates is to ensure Lake Mattamuskeet remains a freshwater system by preventing saltwater from Pamlico Sound from entering the lake. The type of tide gate located at each canal has undergone a progression since they were first installed during the original canal excavation. Pete Campbell, current Refuge Manager, provided a synthesis of information from the Refuge Narratives that details the progression of the tide gates as described below.

"During the 1950's all the original gates from the 1930's were replaced with wooden top hinged flap gates. These gates opened when head pressure in the lake exceeded head pressure in the sound, very similar to the aluminum tide flap gates installed today on the Refuge. During that time the top-hinged flap gates allowed for movements of anadromous and catadromous fish during spring, summer and fall; and movements of salt and freshwater fish and invertebrates between the Pamlico Sound and the lake, resulting in a vibrant and diverse fishery. The young herring and eels represented a large food base for other predatory fish and birds, such as the largemouth bass and osprey. Historically, approximately one-quarter to one-third of visits to the Refuge were related to fishing.

By the 1980's the wooden top-hinged gates had begun to fail due to age and increasing salinity of the water in the canals was a concern. From 1987 to 1988 all of the gates were replaced by fixed wooden stop log structures that had a small stainless steel flap gate built into the bottom third of the structure. These wooden gates were constructed of several stop blocks permanently bolted together. An unintentional impact of these new gates was that the small stainless steel flap gates required a much higher head pressure to open than the previous gates and therefore did not open as frequently or allow the level of water exchange or flow allowed under the previous gates. This led to occasionally higher lake levels that lasted longer into the growing season, large blooms of blue-green algae and cyanobacteria, and a dramatic decline in anadromous and catadromous fish as well as the blue crab population.

Furthermore, these gates did not allow enough flow out of the lake or adequate drainage off farmland that drains to the lake. In response to multiple complaints from farmers and following a site visit by congressional staff from Congressman Walter Jones office, language was added to the FY 2000 Interior Appropriations Bill Senate Report mandating the replacement of all gates on the Refuge with aluminum tide gates of the size that existed prior to their replacement in 1988. Most of the 1988 wooden stop log structures were replaced in 2003, while six remained in place, two at each structure at Outfall, Lake Landing, and Waupoppin canals. Since the new top hinged gates were installed in 2003 that allow the lake to mimic natural water levels, Refuge records indicate that available habitat to waterfowl increased as well as a corresponding increase in wintering waterfowl numbers. In fact, the average wintering waterfowl numbers since 2003 have exceeded all wintering waterfowl numbers during the previous 15 years when the small stainless steel flap gates were in place.

In 2008, the State of North Carolina designated all of Mattamuskeet Refuge as well as the four outfall canals as Anadromous Fish Spawning Areas. The results of research conducted by Dr. Rulifson, Professor at East Carolina University, indicates that anadromous fish need unobstructed fish passage in spring for their spawning run (immigration) and in summer and fall for the

juveniles to depart (emigration). Fish passage studies have highlighted the importance of Lake Landing and Waupoppin canals for migratory fish and crab movements. In 2009, the Refuge received funds from the USFWS Raleigh Ecological Services Office to install 3 side-opening tide gates to improve fish passage. The side opening gates were designed to address issues associated with (1) difficulty in maintenance of top hinged gates, especially when large debris gets stuck under the gate; (2) increasing fish passage, particularly during times of low or no flow when the top hinged gates are shut; and (3) correcting the fact that current fish weirs in the older stop log structures end up above the water line during low water summer months and do not allow for any fish passage during times of low water. Three side-opening fish passage gates were installed during the spring of 2011, replacing 3 of the 6 remaining stop log structures. There was an immediate response of white perch and blue crabs, which greatly improved spring fishing opportunities for those species."

Secondly, since landowners within the original Drainage District One retain the right to drain to the lake some alterations have been made to private property over the last half century to improve water management capabilities (Copeland et al., 1983). This includes tiling of agricultural land, new or improved canals draining private farmlands, and the installation and use of both temporary and permanent pumps. The total area of cultivated land has remained stable at about 10,100 acres according to the National Land Cover Database of 2001, 2006, and 2011 (Figure 4). The total area of planted/cultivated land accounts for approximately 15% of the land use within the watershed. Although there have been some shifts in the percentage of specific crops grown over time, the primary crops grown within the watershed include corn, soybeans, cotton, and wheat (Figure 5). No-till or strip-till farming is not a common practice within the watershed nor is the use of cover crops.

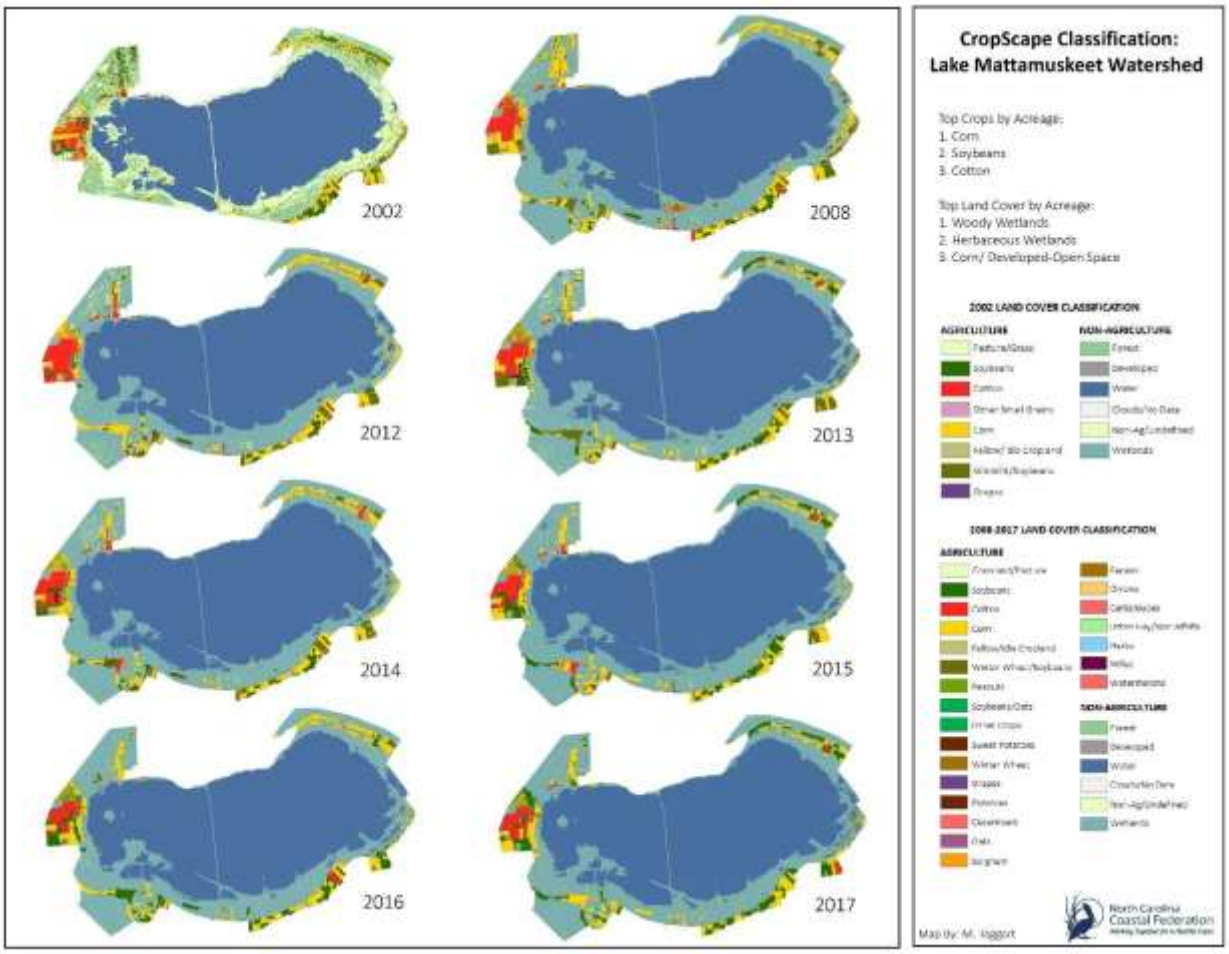

Figure 4: Major land uses and crops grown in the watershed from 2002-2017.

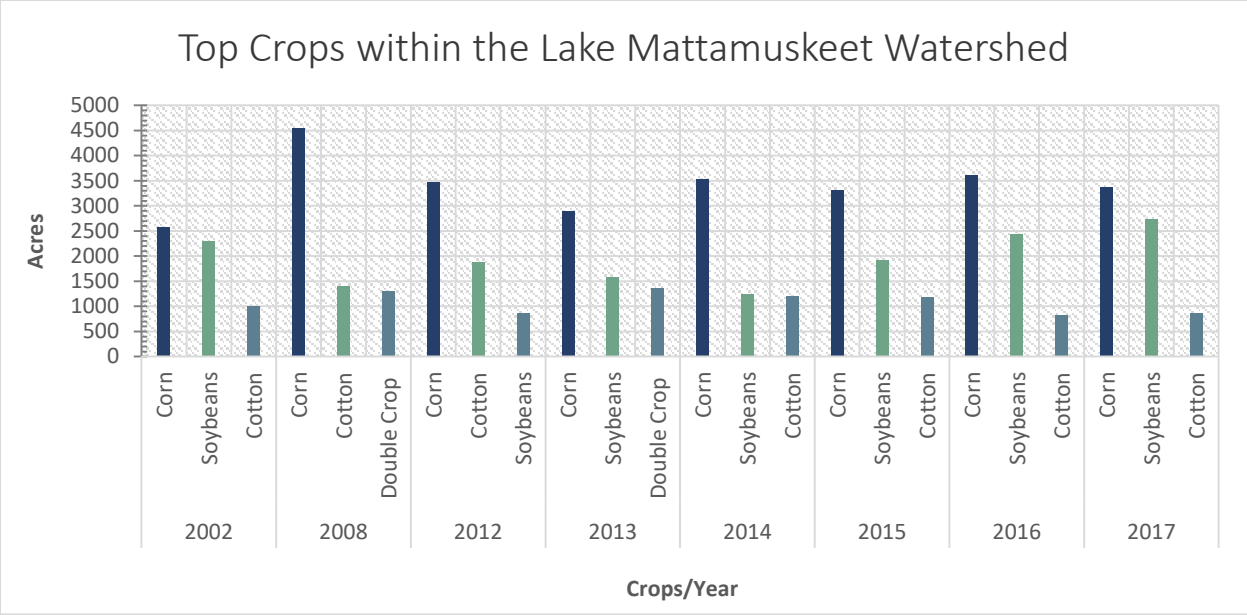

Figure 5: Top three crops, by acre, grown within the watershed since 2002.

Thirdly, there has been an increase in the number of private waterfowl impoundments constructed in the watershed (Figure 6). Prior to 1984, there were a total of 20 impoundments managed by private landowners throughout the watershed. Half of those were located on the northeast boundary along North Lake Road. Two additional impoundments were also constructed in 1984 on private land. In 1995, six impoundments were constructed on the western shore of the lake north of Rose Bay Canal and east of Piney Woods Road. In 1996, there was a single 50-acre impoundment constructed on the west side of Piney Woods Road. Then in 1998, the CRP program prompted the construction of 58 impoundments covering 676 acres.

In total, there are currently 102 waterfowl impoundments located within the watershed, that cover 3,630 acres. There are 87 impoundments on private land that cover 1,140 acres (31.4%) and 15 impoundments on the Refuge that cover 2,490 acres (68.6%) (Figure 6) (Table 1). The 2,490 acres of impoundments on the Refuge were constructed between 1967 and 1980 and use moist soil management techniques that produce stands of natural vegetation for the waterfowl. There are 585 acres (23.5%) located in the west basin and 1,905 acres (76.5%) located within the east basin of the lake.

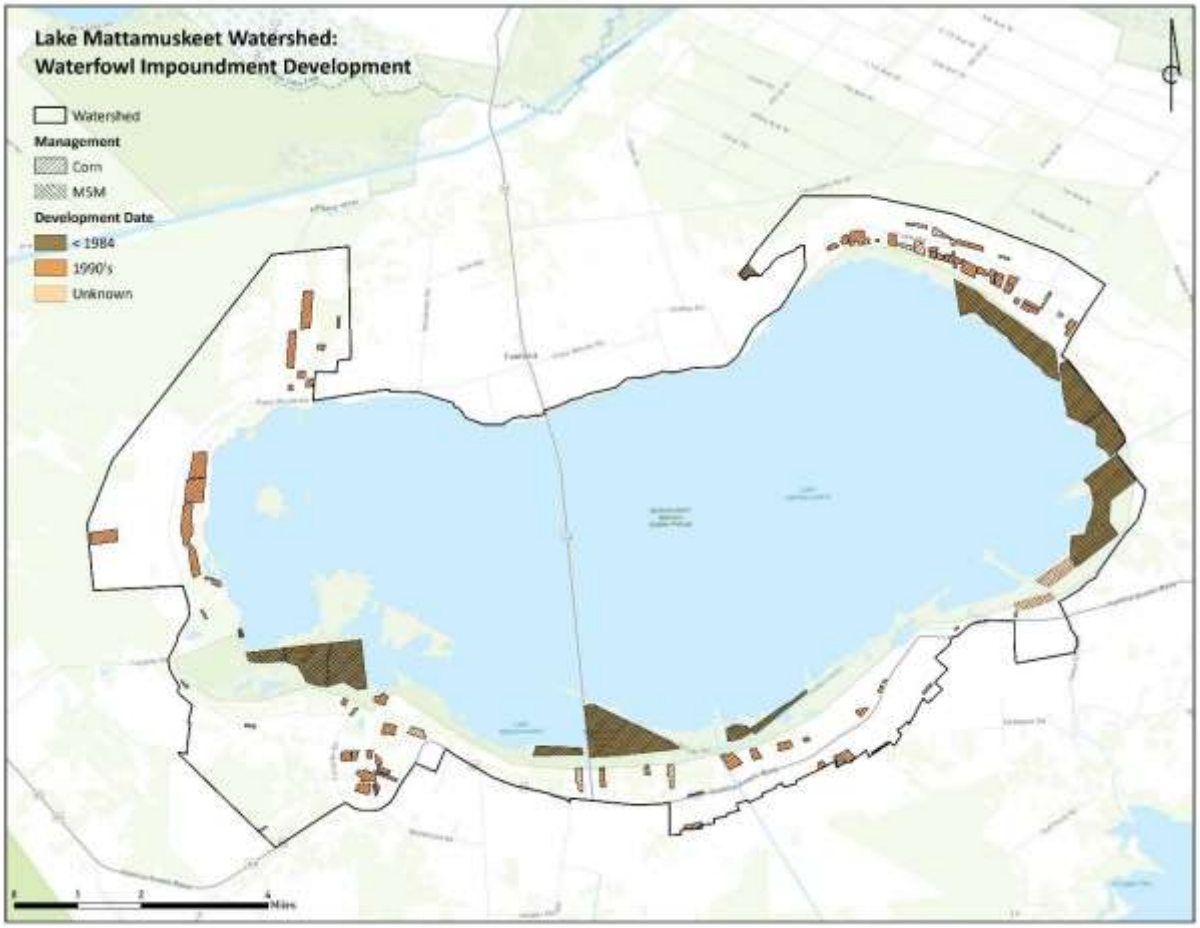

Figure 6: A map displaying the location of impoundments and their approximate year of development.

Estimated Construction Date*	Quantity	Acreage
< 1984/uncertain	20	152.58
1984	2	27.21
1995	6	233.32
1996	1	50.92
1998	58	676.07
Total	**87**	**1,140.10**

*Table 1. Estimated construction of waterfowl impoundments on private land. *Dates were derived from historical NAIP image analysis and cross referenced by Hyde County Soil and Water staff members as well additional public input.*

CURRENT STATE OF THE LAKE

The cumulative impact of the last century of landscape and hydrologic modifications have transformed the lake watershed and ecosystem. Today, areas of the watershed experience chronic flooding and residents have raised concerns about their ability to continue to live and work in the watershed. An inability to actively manage the lake water level has created problems

for residents and farmers in the watershed, and will only be exacerbated as sea level continues to rise.

Properties in the watershed experienced chronic flooding after above average rainfall in 2016.

In addition to the flooding concerns, the lake has experienced major shifts in its ecosystem. Over time the lake has shifted from an SAV to an algal-dominated system. Increased levels of nutrients (eutrophication) have resulted in frequent algal blooms, and increased suspended sediments have decreased light penetration into the water column. The root mass of SAV binds the sediments of the lake bed together, and when coverage of SAV declines the sediments become loose. These loose sediments become suspended throughout the water column by wind and wave action, and by bottom dwelling fish such as common carp. In addition, waters that are drained to the lake also contain suspended sediments. As the lake becomes more turbid, light is unable to penetrate to the bottom of the lake. When light is unable to reach the lake bed, SAV cannot photosynthesize and growth is reduced, coverage decreases, and more sediment becomes suspended in the water column. Measurable declines in SAV coverage have occurred, as this negative feedback cycle persists within the lake. As of 2017, coverage of SAV within Lake Mattamuskeet was mostly absent in both basins (Figure 7). Dense beds of SAV are desired because they maintain water clarity, provide habitat for fish and crab populations, and are a vital food source for waterfowl. This ecological state also supports the way of life in Hyde County.

The increased nutrients and turbidity have also caused a shift to cyanobacterial dominance within the algal community (Waters et al., 2009). Toxic algal blooms were recently sampled, and the results revealed concentrations of cylindrospermopsin that bordered on federal limits for recreational contact and were near the highest concentrations in the country (NCDEQ DWR, 2018). These conditions are indicators of poor water quality and overall health of an aquatic ecosystem.

Today, the lake is considered highly nutrient-rich (hyper-eutrophic). Water and nutrient inputs are still largely derived from precipitation and runoff, but hydrologic and landscape changes have increased the volume of water transported to the lake thereby increasing the nutrient and sediment loads in the lake. Rising sea level has exacerbated some of these issues by decreasing the flushing capacity of the lake (reduced head pressure at the tide gates results in reduced water flow from the lake) and contributes to localized flooding on the land adjacent to the lake.

EDUCATION and OUTREACH

Throughout the development of this watershed restoration plan, the project partners used a variety of education and outreach tools. They felt very strongly that the development of the plan should be a transparent and open process and should provide the public with the information they need to engage in the decision making. The need for outreach and engagement will not end with the submission of this plan, it will continue to be an integral and important part of the plan's implementation moving forward.

The plan used the following outreach and engagement tools in its development:

1) Core Stakeholder Team (CST): a group of core stakeholders were identified by the county and Hyde Soil and Water Conservation District. This 11-member team served as an advisory committee and represented diverse backgrounds, viewpoints, and interests. These stakeholders reviewed draft products, constructed the public meeting agendas, and edited the draft versions of this plan. The CST also engaged with the community and facilitated two-way information sharing throughout the plan development. The CST met a total of 14 times beginning on May 2, 2017 and concluding on November 16, 2018 before the final public meeting [Appendix D].

2) Community Interviews: Dr. Linda D'Anna, a research associate with the UNC Coastal Studies Institute, was contracted to conduct anonymous in-person interviews to learn about local perspectives on Lake Mattamuskeet and the surrounding watershed. These interviews were synthesized and summarized in a final report presented to the stakeholder team [Appendix E].

3) Webpage Development: The federation hosted a project webpage (nccoast.org/lakemattamuskeet) to disseminate news about the development of the plan as well as resources including presentations from the public meetings and a story map.

4) Newsletter service: On the project webpage, interested public were able to sign-up for notifications on the project which included announcements of upcoming public meetings as well as a summary of meetings and major actions/goals to be included in the plan.

5) Flyer Development: A two-page handout was created [Appendix D]. It described the development of the plan, answered frequently asked questions, and provided contact information for the CST members. This was distributed to anyone who signed-up for notifications on the project webpage and also distributed to residents who receive the Hyde Happenings e-newsletter. The USFWS and NCWRC also helped to post this information throughout the watershed as well as various communication platforms.

6) CST-Mattamuskeet Technical Working Group Meetings: Two joint meetings were held with the Mattamuskeet Technical Working Group (MTWG). The MTWG consists of staff from FWS and WRC who have specific expertise in toxicology, hydrology, water quality, and fish and wildlife management. The MTWG works to identify, prioritize, and conduct monitoring and research at the Refuge to inform management actions that can be implemented to improve water quality and restore SAV in Lake Mattamuskeet. The first

joint meeting on January 30, 2018 provided an opportunity for stakeholders to view presentations about monitoring efforts from MTWG members, learn about Best Management Practices (BMPs), and receive updates about ongoing research projects conducted within the watershed by scientists from several academic institutions based in North Carolina. The second joint meeting held on June 6, 2018 served as a working session to prioritize BMPs and identify potential sites for implementation [Appendix D].

7) Quarterly Public Meetings: A total of five (5) public meetings were convened on a quarterly basis at the Hyde County Government Complex. The federation staff delivered presentations about the progress of the plan development and facilitated public engagement through participatory activities to identify data gaps and collect feedback about the likelihood of BMP implementation. Supplemental presentations were provided by members of the MTWG and Principal Investigators of the research projects conducted within the watershed [Appendix D].

8) Public Symposium: The final plan was presented during a public symposium held on December 3, 2018 at Martelle's "Feed House" Restaurant, a community hub, in Engelhard, NC [Appendix D].

As the plan implementation progresses, it will be key to keep the public informed and engaged. Additional outreach and educational steps during the implementation of the plan are identified in the management measures section below.

MONITORING

The members of the MTWG work in partnership through a collaborative agreement to identify, prioritize, and conduct monitoring and research at the Refuge to inform current and future lake management actions. Long-term monitoring datasets are essential to evaluating the effectiveness of management actions and developing research questions that can be addressed through scientific investigation. The MTWG has been working to understand declines in SAV (Figure 7) and water quality through the lens of a conceptual model published by Brinson and Davis (1980) (Figure 8).

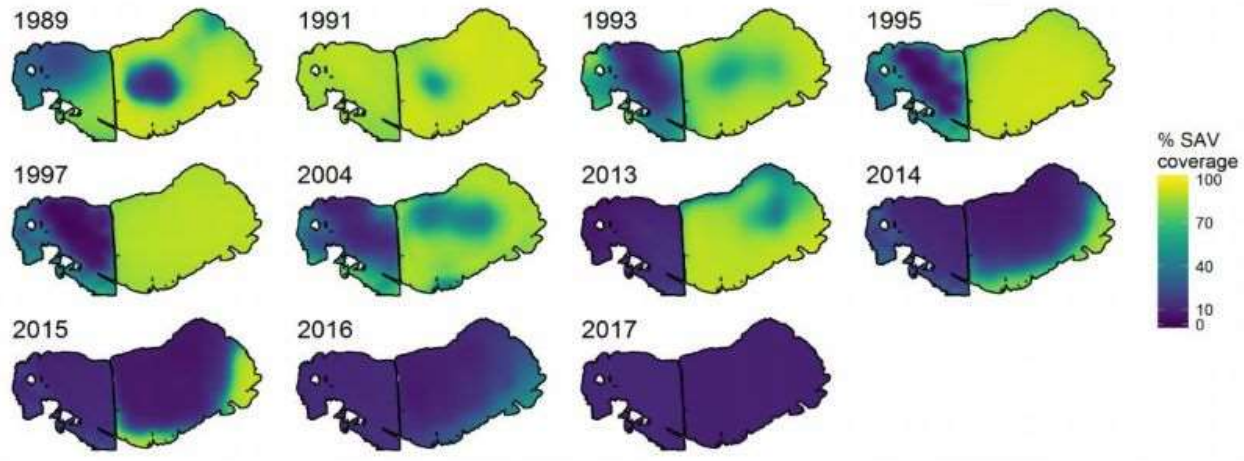

Figure 7: Results of the annual SAV surveys conducted from 1989-2017 (Moorman et al., 2017).

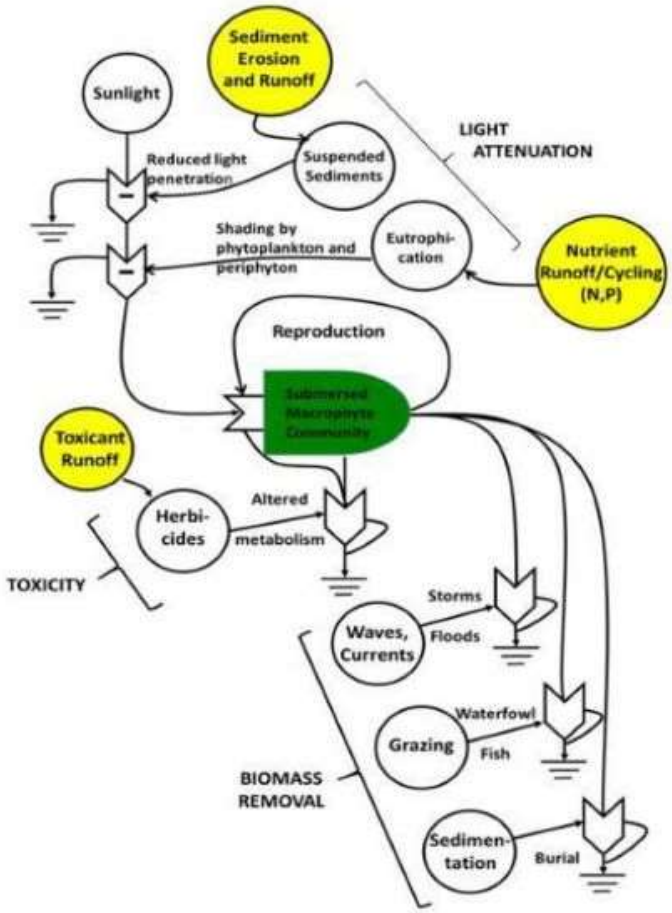

Figure 8: The SAV conceptual model describes light attenuation, toxicity and biomass removal as three general stressors that can be influenced by other specific factors (Davis and Brinson, 1980).

The conceptual model has helped guide and develop recommended monitoring and research needs to advance a science-based approach to improving water quality and clarity and restoring SAV in Lake Mattamuskeet through the development of implementable actions taken in the lake and watershed. The five components outlined by the MTWG for SAV restoration include: 1) monitoring, 2) water level management, 3) suspended sediment reduction, 4) nutrient abatement, and 5) fishery management.

In 2012, the Refuge, NCWRC, NC Division of Water Resources (NCDWR), and the U.S. Geological Survey (USGS) established two real-time water quality monitoring stations in the east and west basins of the lake. The water quality data collected allowed more complete examination of factors that limited regeneration and threatened survival of SAV within the lake. The collaborative water quality and SAV monitoring efforts are described in detail by Moorman et al., (2017); and a list of concurrent monitoring activities that occur at Lake Mattamuskeet and the surrounding region are included below (Table 2).

Monitoring Activity	Frequency, Period of Record	Funding Source and Cost	Justification/SAV management need	Comments
Continuous monitoring of lake levels and water-quality, precipitation, and wind speed	Continuous, September 2012 - present	USFWS, USGS, and NCWRC contributions, $281,600	Data required for watershed model, provides real-time data to assess lake hydrology and water quality, informs public on lake levels	USGS contracted to collect and maintain this data with in-kind assistance from USFWS staff
Real-time monitoring at Rose Bay (Pamlico Sound)	Continuous, September 2013 - present	USFWS as part of refuge operations and I&M program, $27,595	Provides information on water levels in the estuary which could affect outflows	Accomplished in coordination with USFWS I&M program in collaboration with NCSU
Monitoring of water levels, discharge and water-quality in refuge canals	Weekly to monthly, 1977 – 2006, 2013 - present	USFWS as part of refuge operations	Gives an assessment of outflows, ensures gates are properly functioning, monitors saltwater intrusion	Data could be improved with instrumentation that provided for real-time monitoring of outflows
Monitoring of inland fish communities in Lake Mattamuskeet and associated refuge canals	Annually	NCWRC, part of NCWRC operations	Provides an annual assessment of fish community structure in Lake Mattamuskeet and associated refuge canals	Provides justification for sport fish regulations
SAV Monitoring	Annually starting in 2013 with occasional surveys dating back to 1989	USFWS, part of refuge and USFWS migratory game bird program operations	Monitors SAV occurrence and health, our primary indicator of ecosystem health for the lake	
Aerial waterfowl surveys of lake	Annually, 1986 - present	USFWS, part of refuge operations; NCWRC, part of annual mid-winter waterfowl survey	Provides an annual estimate of numbers of waterfowl at Lake Mattamuskeet	Tundra swans are proposed as an indicator species of SAV abundance

Table 2. Monitoring activities conducted at Lake Mattamuskeet and the surrounding region.

STRESSORS and SOURCES

WATER QUALITY AND CLARITY ISSUES

Declining water quality and clarity threatens the uses of the lake by people, fish and wildlife. Since the 1980s, monitoring efforts have identified a significant decline in water quality (Moorman et al. 2017) (Figure 9).

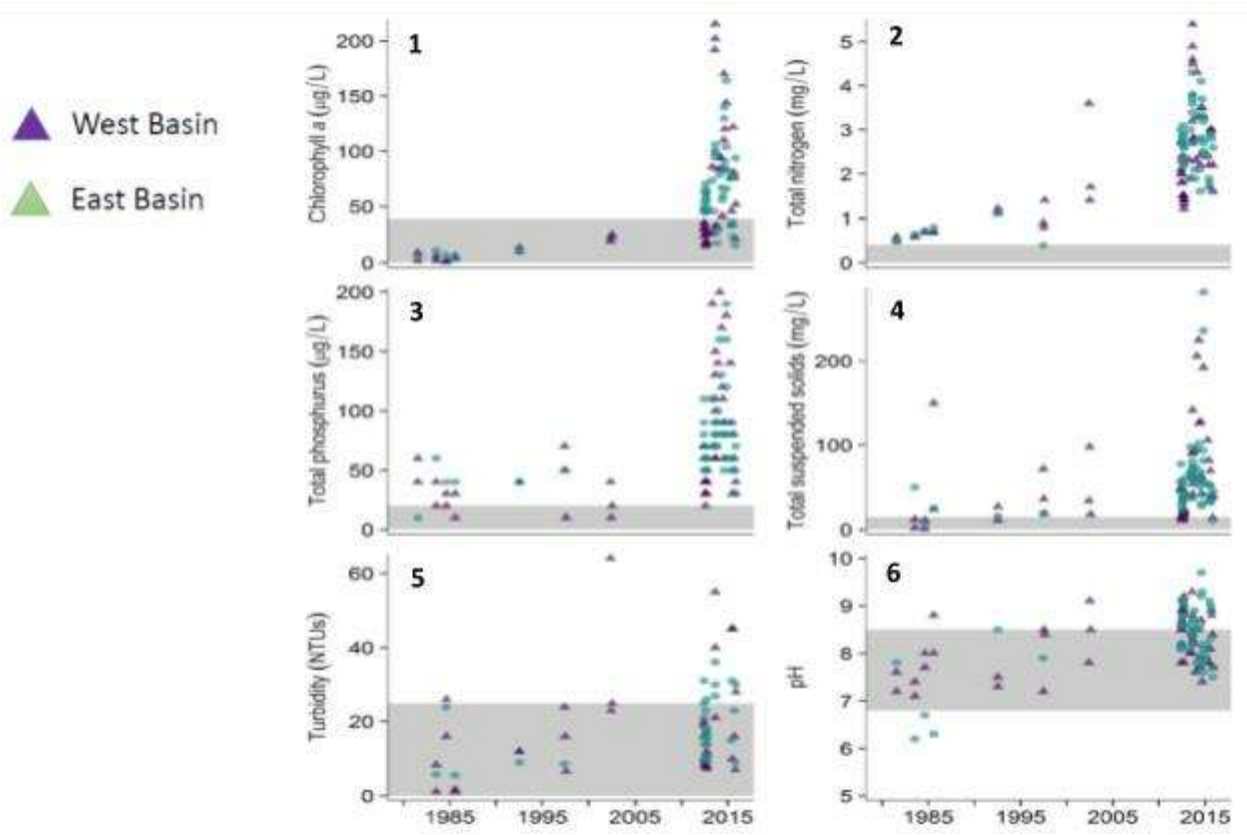

Figure 9: The results of water quality sampling conducted since the 1980s suggest the lake has become more eutrophic. The gray bars on the graphic represent the state or federal thresholds. High levels of chlorophyll-a and pH resulted in the listing of the lake on the NC 303 (d) list of the impaired waters (Moorman et al., 2017).

A summary of the trends of six water quality parameters: 1) chlorophyll-*a*, 2) total nitrogen, 3) total phosphorus, 4) suspended solids, 5) turbidity and 6) pH is described below. Plots that display the results of monthly grab samples collected by Refuge staff since 2012 are included as well for specific parameters. The grab samples are collected near the USGS surface water stations located on the west and east side of NC-94 and analyzed by a NCDWR laboratory. The results of the lake monitoring survey conducted on May 18, 2017 by NCDWR field staff for the Ambient Lakes Monitoring program is also included for reference (NCDEQ DWR, 2018). The NCDWR collected the water sample from station PAS0123A located near the middle of the lake on the east side of NC-94.

1) Chlorophyll-*a* is an algal pigment used as an approximate measure of algal biomass and indicator of nitrogen and phosphorus enrichment. The NC water quality standard is 40 µg/L and results frequently exceeded this threshold after 2012. The NCDWR survey recorded a concentration of 190 µg/L.

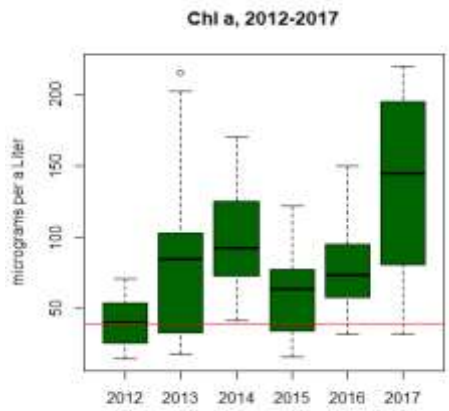

Figure 10: Plot of chlorophyll-a concentrations derived from monthly grab samples collected by Refuge staff within each basin of Lake Mattamuskeet. The red line on the plot marks the NC water quality standard.

2) Nitrogen is an essential nutrient for plants and animals, but excess nitrogen in water contributes to eutrophication. The state of NC does not have a standard for total nitrogen, but the USEPA guideline is a range between 0.32 – 0.41 mg/L. Monitoring results indicate an approximate 400% increase in concentration of total nitrogen within the lake water since the early 1980s (Figure 9). The NCDWR survey recorded a concentration of 4.40 mg/L.

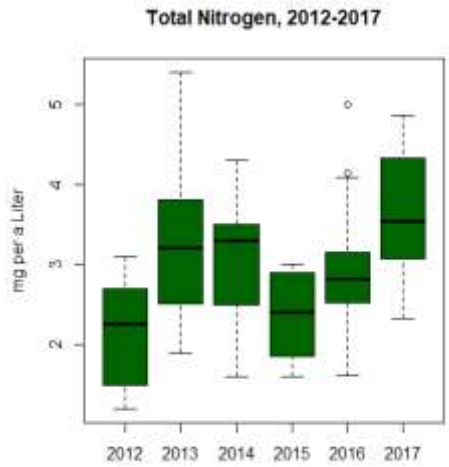

Figure 11: Plot of total nitrogen concentrations derived from monthly grab samples collected by Refuge staff within each basin of Lake Mattamuskeet.

3) Phosphorus is another essential nutrient for plants and animals, but excess phosphorus in waters also contribute to eutrophication. The state of NC does not have a standard for total phosphorus, but the USEPA guideline is a range between 0.008 – 0.02 mg/L. Monitoring results indicate an approximate 100% increase in concentration of total phosphorus within the lake water since the early 1980s. The NCDWR survey recorded a concentration of 0.14 mg/L.

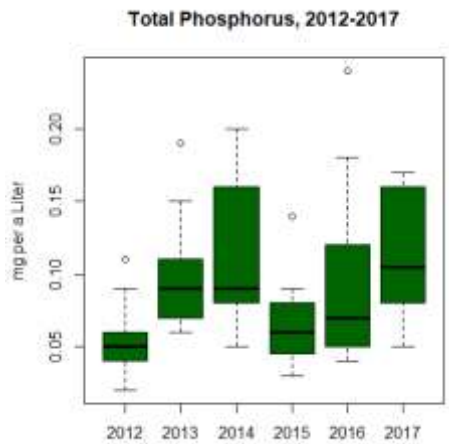

Figure 12: Plot of total phosphorus concentrations derived from monthly grab samples collected by Refuge staff within each basin of Lake Mattamuskeet.

4) Suspended solids are a total quantity measurement of solid inorganic and organic material per volume of water. NC does not have a suspended sediment water quality standard for SC waters, but monitoring results from NCDWR survey recorded a concentration of 206 mg/L.
5) Turbidity is an optical determination of water clarity. Light will attenuate more rapidly from the surface the more turbid a waterbody is. The NC water quality standard is 25 NTUs for turbidity and results of the NCDWR survey measured a value of 80 NTUs.

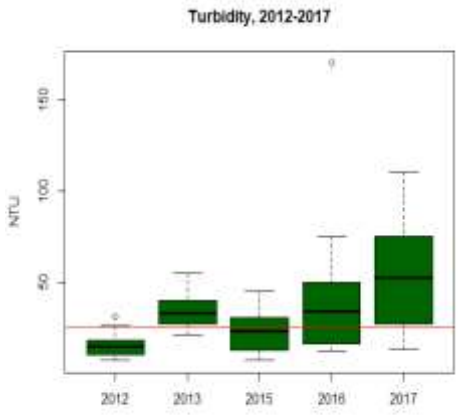

Figure 13: Plot of turbidity values derived from monthly grab samples collected by Refuge staff within each basin of Lake Mattamuskeet. The red line on the plot marks the NC water quality standard.

6) pH is used to indicate the degree of basicity or acidity, ranked on a scale of 0 to 14. The NC water quality standard is between 6.8 and 8.5 standard units and results frequently exceeded this threshold after 2012. High pH values are an indicator of algal blooms, and the NCDWR survey recorded a value of 8.3.

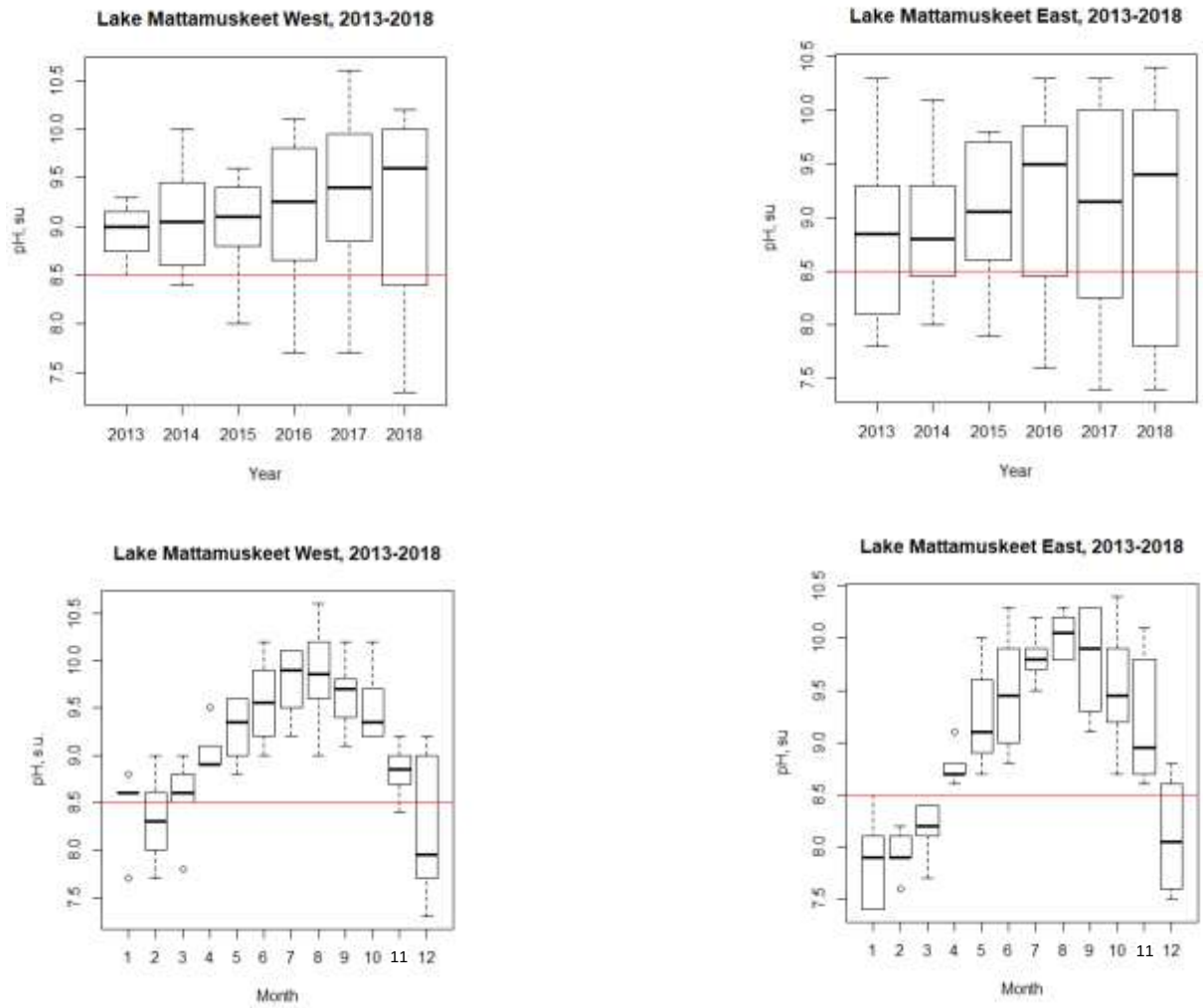

Figure 14: Plot of the maximum water level recorded each month within each basin of Lake Mattamuskeet at the USGS surface water monitoring stations summarized on an annual and monthly basis from January 2013 through November 2018 with data gaps from February – May 2015 and December 2017 – February 2018. The pH value within lake displays a seasonal trend that peaks during the summer. The red line on the plot marks the NC water quality standard.

As a result of the water quality declines, changes in the lake habitats have also occurred. Increased nutrient and sediment loading from the landscape have transitioned the lake ecosystem from 1) a lake that is able to remain healthy with the nutrient and sediment loads it receives and supports SAV to 2) a lake system that has excess nutrients and suspended sediments and cannot support SAV growth. Now, instead of SAV, algae are the dominant plant life in the

lake and source of high levels of chlorophyll-*a* and cyanobacteria, *Clyndrospermopsis raciborskii*, that produces cylindrospermopsin, a cyanotoxin.

There are many potential sources of nutrient inputs to the lake that include agricultural run-off, atmospheric deposition, failing septic systems, and pumping of waterfowl impoundments. The MTWG prioritized monitoring and research needs to identify the concentrations of nutrients derived from both point and non-point sources within the watershed. The details of several recent and ongoing research projects are summarized below.

Dr. Michael Piehler, University of North Carolina - Chapel Hill, collected sediment and water samples from the lake to analyze nutrient levels. Dr. Piehler found that internal sediment nutrient supplies of the lake were lower than predicted. He also found that algae in the lake's water column were stimulated by either nitrogen or phosphorus and to the greatest extent by the combination of nitrogen and phosphorus.

Dr. Randall Etheridge, East Carolina University, is studying two waterfowl impoundments with different management regimes. One impoundment is managed by the Refuge to provide native, seed-producing wetland plants preferred by waterfowl (moist-soil management), and the other is a private impoundment planted with corn and managed by a local farmer. The objective of this study is to determine the potential nutrient input of these management regimes into Lake Mattamuskeet. The results will help to inform if the management of the impoundments can be altered to reduce the nutrients reaching the lake while also maintaining their food production for waterfowl.

Drs. Jesse Fischer and Craig Layman, North Carolina State University, are working with graduate student Ms. April Lamb to understand the potential ecological effects of reducing or removing the carp population from Lake Mattamuskeet once again. Common carp have historically been a nuisance species within Lake Mattamuskeet since the establishment of the Refuge, and a carp removal program was conducted during the 1940s and 1950s to improve water clarity and increase growth of SAV (Cahoon, 1953). Common carp are known as "ecosystem engineers" capable of causing stable state shifts in shallow aquatic ecosystems as a result of increased turbidity from carp grazing that results in a decline of SAV and subsequent shifts in biological assemblages. Modeling shows the loss of SAV is a result of a negative feedback mechanism between increased nutrient loading, increased harmful algal blooms, and increased turbidity, which is possibly exacerbated by an overabundance of invasive common carp (*Cyprinus carpio)* (Figure 8).

Dr. Greg Cope, North Carolina State University, is working with graduate student Ms. Anna Alicea to identify baseline levels of agricultural herbicide concentrations within surface waters of drainage ditches and canals, and evaluate if agricultural herbicides are contributing to SAV declines within Lake Mattamuskeet. The results of the study will be used to determine if alternative herbicides should be applied to agricultural lands and guide the recommendation of BMPs that may reduce agricultural runoff.

FLOODING ISSUES

Water levels within the lake and surrounding watershed are influenced by precipitation rates and frequency; evapotranspiration rates; wind direction, speed, and duration; and water levels in the Pamlico Sound (due to the hydrologic connection at each outflow canal). Continuous water level data is recorded on 15 minute intervals at the USGS surface water sampling stations located within the lake on the west and east side of NC-94 through a partnership with the USFWS and NCWRC. The figures that are included below represent summaries of the maximum water level recorded each month for the past five years on an annual and monthly basis. The yellow line represents when hot spot flooding occurs, and the red line represents when chronic flooding occurs within the watershed as identified by local stakeholders through participatory mapping exercises.

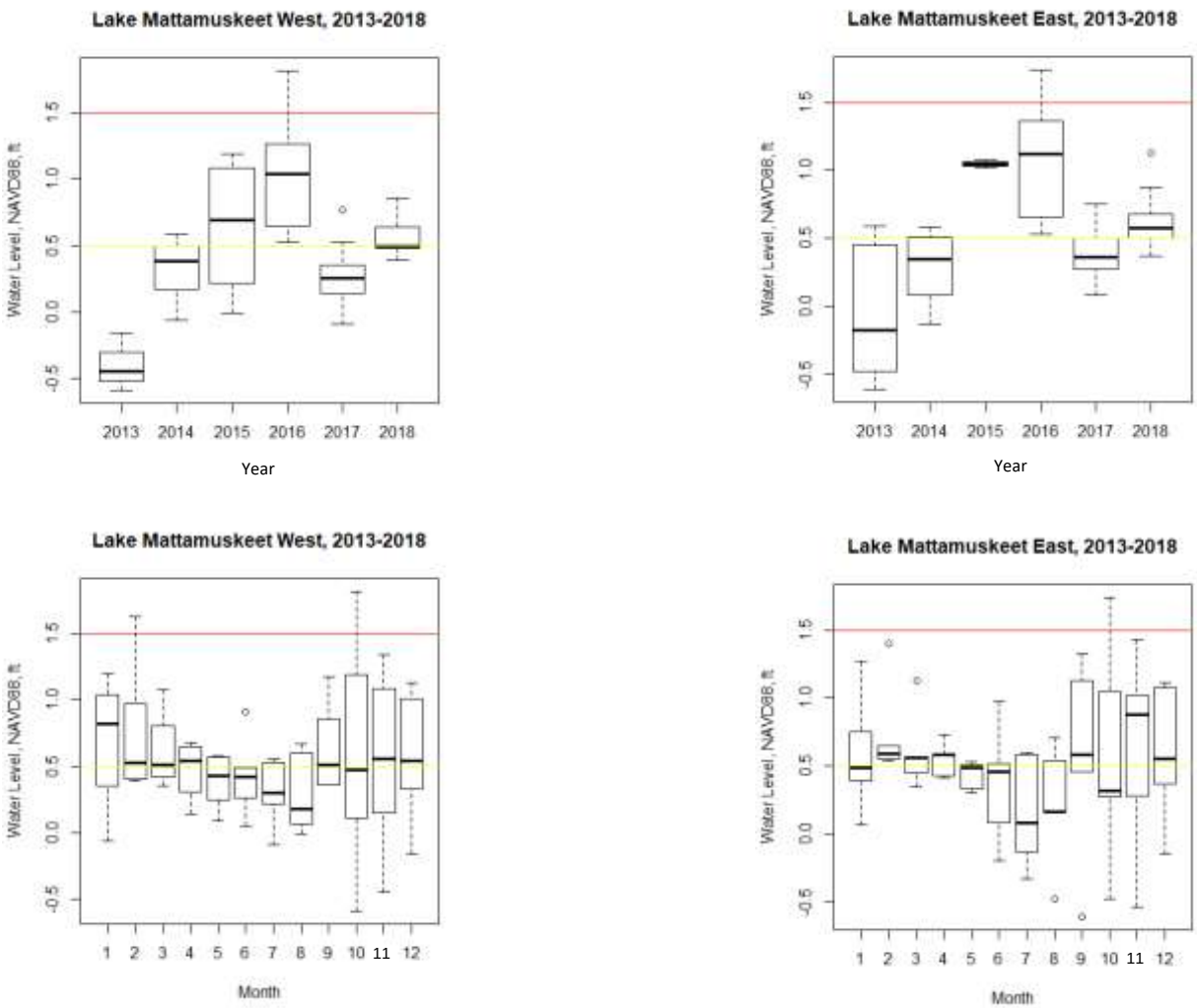

Figure 15: Plot of the maximum water level recorded each month within each basin of Lake Mattamuskeet at the USGS surface water monitoring stations summarized on an annual and monthly basis from January 2013 through November 2018 with data gaps from February – May 2015 and December 2017 – February 2018. *The water level within lake displays a seasonal trend that is the lowest in the summer and highest in the fall. The yellow line represents when hot spot flooding occurs, and the red line represents when chronic flooding occurs throughout the watershed.*

Precipitation is the only direct source of water within the lake and Hyde County receives an average of 55 inches annually. However, in 2016, an unprecedented 79 inches of rain fell within the watershed and many landowners experienced catastrophic flooding from the impact of Hurricane Matthew to the point where septic systems were failing and farmers were unable to access fields or harvest crops. This unprecedented flooding has been an extreme burden on the community. Even during average years of precipitation, some areas of the watershed experience chronic flooding concerns. Many homes, businesses and farms within the lake watershed have been severely impacted by unusually high water levels within the watershed in recent years.

Examples include the inability to use septic systems or drain agricultural fields for extended periods of time. Entire residential communities and hundreds of acres of cropland are regularly flooded during relatively minor precipitation events when combined with wind events that push water in the Pamlico Sound up through the canals preventing the lake from draining (Figure 16). These flooding "hot spots" typically border drainage districts, service districts, and drainage associations that use active water management, such as pumps, to drain water from low-lying land through canals that discharge to the Alligator River or the Pamlico Sound.

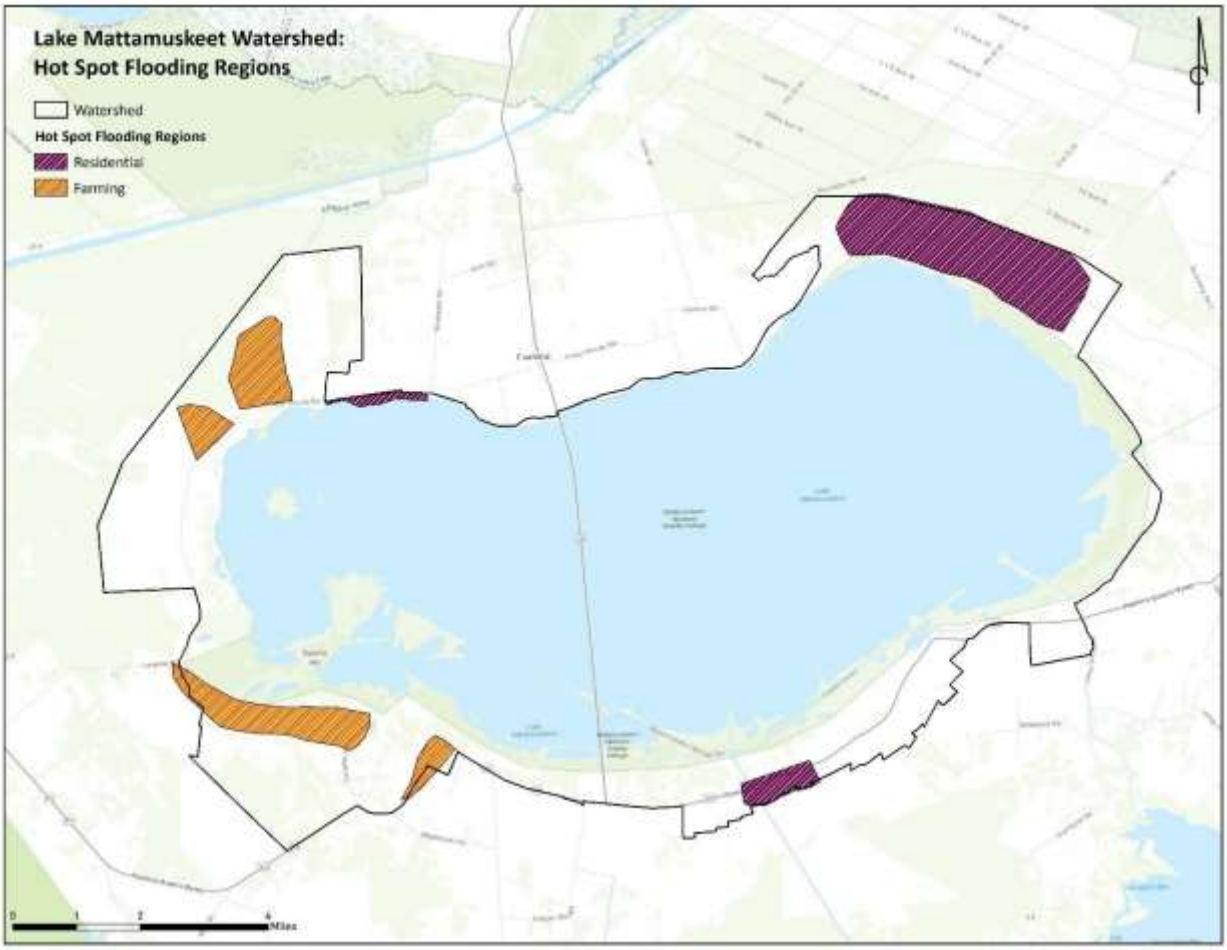

Figure 16: A map displaying the location of flooding hotspots throughout the watershed.

High precipitation events or extended periods of precipitation as well as high water levels in the Pamlico Sound prevent the one-way flap gates located on the main outlet canals from opening, and the passive drainage system for the lake cannot function in the capacity necessary to mitigate flooding. Additionally, if lake levels are consistently high (during spring and early summer), emergent aquatic vegetation around the perimeter of the lake cannot become established. Many of these emergent aquatic plants are important for wildlife habitat and serve as a preferred food sources for waterfowl. The establishment and spread of an exotic common reed (*Phragmites australis*) along the perimeter of the lake over the past two decades also makes it difficult to re-establish natural emergent aquatic vegetation as preferred by resource managers.

Continuous water level data is recorded at a surface water monitoring station mounted to Bell Island Pier, which extends from the Swan Quarter National Wildlife Refuge into Rose Bay. The water level recorded at the Bell Island Pier can indicate whether the flap gate located on Rose Bay Canal would be open or closed based on differences between water levels recorded at the Bell Island Pier and water levels within the west basin of the lake as recorded at the USGS surface water station located to the west of NC-94. The figures that are included below represent summaries of the maximum water level recorded each month for the past five years on an annual and monthly basis. Data collection began in May of 2013 and has been continuous with the exception of a gap in collection from February 2014 to September 2015. The five year range of data is too short of a time frame to infer trends in water level at Rose Bay, especially with the data gap, but it does provide a baseline for reference purposes and future monitoring. The data recorded over the past five years indicate that the highest water levels have historically occurred in March - April and September - October.

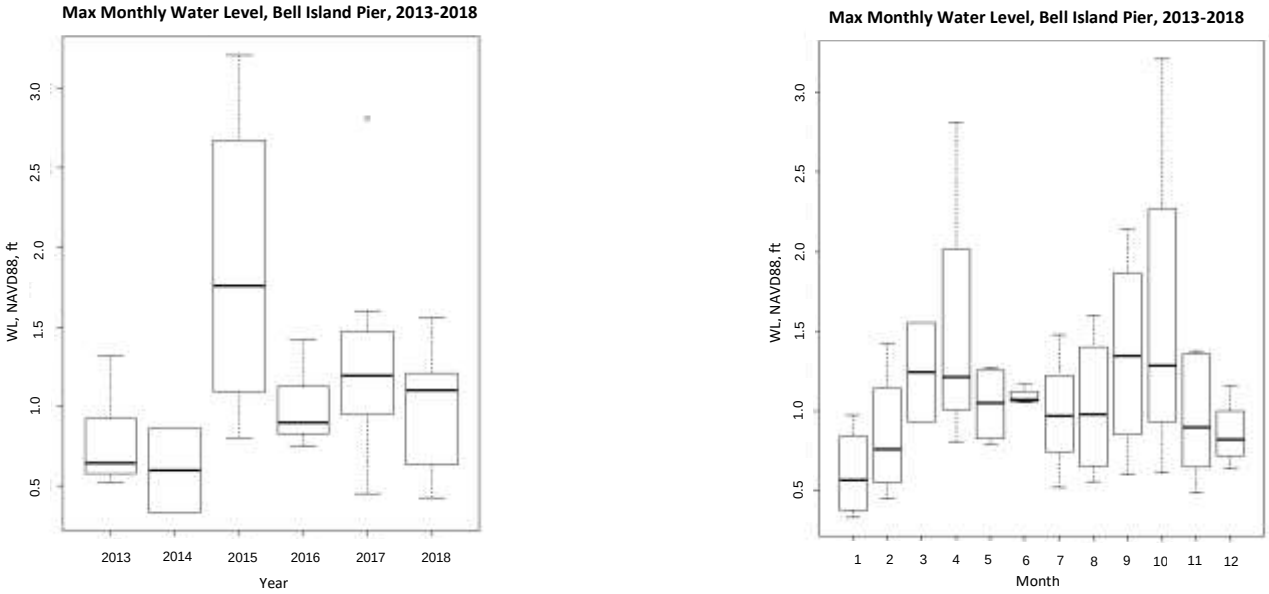

Figure 17: Plot of the maximum recorded water level each month at Bell Island Pier from January 2013 through November 2018 summarized on an annual and monthly basis.

The water levels recorded at the Bell Island Pier can also serve as a proxy to indicate whether drainage from the east basin of the lake to the Pamlico Sound could occur based on other meteorological factors such as wind direction, speed and duration. The water level stations

located on the Pungo River in Belhaven and near Hatteras Inlet at the U.S. Coast Guard Station provide additional reference points.

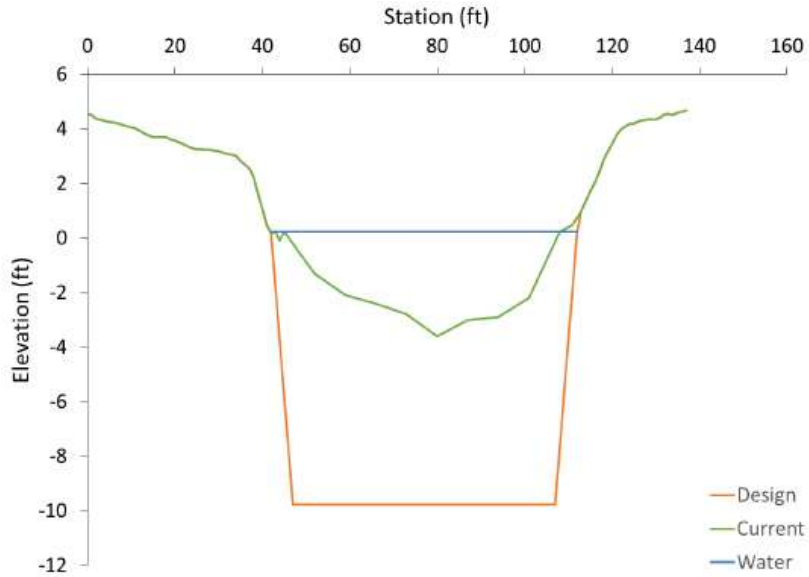

Figure 18. Example of cross-section comparison of conditions along Outfall Canal obtained from bathymetric survey performed in 2017 by Dr. Randall Etheridge, East Carolina University.

Rising sea levels and siltation of the main canals are thought to be contributing factors in the decline of drainage function, and those conditions are anticipated to exacerbate flooding in the future. Dr. Randall Etheridge, East Carolina University, conducted a study in partnership with the Hyde County Soil and Water Conservation District to determine the impact of sedimentation and sea level rise on the four main outlet canals. Dr. Etheridge determined that the cross-sectional area of the outlet canals has been significantly reduced when compared to the design dimensions. For example, Outfall Canal exhibited a minimum of 43% and maximum of 81% reduction in cross-sectional area when compared to the design dimensions (Figure 18).

While dredging the canals may seem like an obvious solution, projections of sea level rise may diminish the drainage capacity over time especially in conjunction with land subsidence. The 2015 Update to the North Carolina Sea Level Rise Assessment Report prepared by the N.C. Coastal Resources Commission Science Panel used existing water level gauge rates from locations at Duck, Oregon Inlet Marina, Beaufort, Wilmington, and Southport to project sea level rise across North Carolina. Estimates varied from a low estimate of 2.4 inches at Southport to a high estimate of 5.4 inches at Duck by 2045. These estimates increased when greenhouse gas emission scenarios developed by the Intergovernmental Panel on Climate Change were used.

MANAGEMENT MEASURES

The stakeholders have considered public input as well as guidance from members of the technical workgroup to identify six key objectives and dozens of actions that can be taken to reach the three goals identified in this plan and begin to mitigate the effects of the stressors and sources identified in the previous section. These include:

Objective 1: Continue managing current projects and collaborations.

Action 1-1: Perform annual review of monitoring methodology and data gap assessment with the Mattamuskeet Technical Working Group (MTWG).

Action 1-2: Continue existing monitoring and research efforts.

Action 1-3: Continue to keep tide gates free of debris.

Action 1-4: Continue to snag and drag outlet canals after storms and as needed to provide flow and access at outlet canals.

Action 1-5: Continue to follow nutrient management plans for agricultural lands.

Action 1-6: Continue to hold regular workgroup meetings and public meetings to keep people informed of the watershed restoration plan progress.

Objective 2: Establish active water-level management capabilities on Lake Mattamuskeet and improve water management within the watershed.

Action 2-1: Create a formal body that provides managing authority for active water management within the watershed in close coordination with the Refuge, which would be excluded as party to the formal body since USFWS cannot cede management authority.

Action 2-2: Perform hydrologic study of the watershed.

a) Develop a hydrologic model of the Lake Mattamuskeet Watershed.
b) Determine the need to replace flap gates with side-opening gates on the lake outlet canals where appropriate.
c) Perform localized hydrologic studies within the watershed where flooding occurs or where there is an identified need to improve or redirect water flow.

Action 2-3: Design engineered plans for active water management within watershed.

a) Determine need and perform maintenance dredging of Refuge boundary canals and lake bottom as resources allow, and consider beneficial use of dredge material.
b) Determine need and perform maintenance dredging of outlet canals (consider beneficial use of dredge material and feasibility after Dr. Etheridge's study is complete).
c) Identify, design, and prioritize projects where managed water could be sheet flowed over created or restored wetlands.
d) Identify where pumps are needed on the lake outlet canals or within the watershed that could move water towards the Alligator River or Pamlico Sound that would otherwise drain to the lake.
e) Evaluate the need to excavate additional outlet canals.
f) Maintain and create new earthen dikes as needed to facilitate water management.

Action 2-4: Facilitate active water management project implementation and evaluate success.

Action 2-5: Continue landowner education and participation in active water management projects.

Objective 3: Determine how to effectively improve and meet water quality standards within the watershed.

Action 3-1: Evaluate water quality monitoring results within the lake watershed.

Action 3-2: Perform carp biomass removal if advisable.

Action 3-3: Identify locations and determine the feasibility and water quality improvement derived from implementing BMPs such as:

a) Stormwater wetlands or detention/retention basins.
b) Filter strips along edges of drainage ditches.
c) Sediment basins/settling ponds on canals draining to lake.
d) Water control structures in drainage ditches.
e) Sediment removal from the lake bottom.
f) Annual soil tests to target fertilization rates for dominant crops.
g) Developing nutrient management and herbicide/pesticide application guidelines.
h) Precision nutrient application with GPS technology
i) Cover crops and/or no-till or strip-till where appropriate
j) Altering water management of croplands, if advisable.
k) Moist soil management on private waterfowl impoundments.
l) Altering water management of impoundments- staged drawdowns.

Action 3-4: Develop specific funding mechanisms to offset costs of installing aforementioned water quality improvement practices.

a) Identify practices that can be funded and secure funding for projects supported by NRCS and NC Soil and Water District or other granting agencies.
b) Incentivize conservation crop rotation, cover crops, residue management practices and structural practices to minimize the potential for nutrient losses.
c) Incentivize moist soil management of private waterfowl impoundments.

Action 3-5: Purchase land or easements within the Lake watershed to treat (i.e. reduce nutrient levels and sediment loads) cropland/impoundment waters.

Objective 4: Ensure septic systems are in compliance.

Action 4-1: Continue to inspect septic systems within the watershed.

Action 4-2: Assist with making improvements to systems as needed.

a) Repair/upgrade septic systems.
b) Consider a no-interest or low-interest loan for septic system improvements.
c) Determine if it is feasible to connect residential properties to municipal sewer.

Objective 5: Make habitat improvements that have a direct water quality or way of life benefit.

Action 5-1: Re-establish submerged aquatic vegetation in Lake Mattamuskeet following a reduction in nutrient and suspended sediment levels and/or a reduction in grazers (e.g. common carp).

Action 5-2: Promote emergent vegetation growth around the periphery of Lake Mattamuskeet by reducing *Phragmites australis* at specific target locations augmented by supplemental planting.

Action 5-3: Manage side-mounted tide gates for fish and larval blue crab passage.

Objective 6: Adapt and evolve the plan based on results.

Action 6-1: Adapt communities in Hyde County and specifically within the lake watershed to become resilient to sea level rise.

Action 6-2: Work with NCDEQ to closely monitor water quality in the impaired waters to determine if the plan is having its intended water quality benefits.

Action 6-3: Conduct annual and five-year assessments on the success of the plan, taking into account improvements in water management on the lake and within the watershed, reductions in nutrients reaching the lake, improvements in lake water clarity, reduction in lake algal blooms, and preservation of the way of life in the watershed.

Action 6-4: Facilitate a framework that will sustain yearly stakeholder discussions including revisions, edits and updates to the plan as it is implemented.

PRIORITY ACTIONS

Actions that have been prioritized for initial investigation identify ways to create active water management in the watershed and improve water quality and clarity in the lake. Specifically, the initial priority actions of this watershed restoration plan stem around Objectives 2: Establish active water-level management capabilities on Lake Mattamuskeet and improve water management within the Lake Mattamuskeet watershed.

Action 2-1: Create a formal body that provides managing authority for active water management within the watershed in close coordination with the Refuge, which would be excluded as party to the formal body since USFWS cannot cede management authority.

The CST consists of a group of individuals that have met on a regular basis throughout the development of the watershed restoration plan. They have contributed their time and knowledge to identifying the key needs and issues to be addressed through the development of a watershed restoration plan. At the conclusion of the plan writing there is no formal process for them to remain involved or obligation of any one entity to implement the watershed restoration plan. For these reasons, the CST have prioritized developing a formal body that will oversee, in coordination with the Refuge, the implementation of the watershed restoration plan.

There are three possible structures that could be explored for such a purpose. In North Carolina, Drainage Districts, Service Districts and Drainage Associations can be developed for the express purpose of providing drainage services and implementing watershed improvement projects.

Drainage Districts:

> Formation: The formation of a drainage district was authorized by Public Law Chapter 509 in 1909. Creating one is similar to a lawsuit and requires 3/5 of residents to approve and 50% of landowners agreeing to participation. The last drainage district was formed in Pitt County in the 1960s. Note: Mattamuskeet Drainage District One was the first drainage district in the state, but it was dissolved in the formation of the Mattamuskeet Wildlife Refuge.

Governance: A drainage district is a quasi-government entity, governed by an elected three-person board of people from within the drainage district boundary.

Authority: The drainage district holds taxing authority. The board is responsible for implementation of the annual drainage, service and maintenance needs of the district.

Pros: Local elected individuals govern the drainage district activities. As a quasi-government entity they are eligible for disaster relief.

Cons: There is no living lawyer in North Carolina with experience in developing a drainage district. They are difficult to form. The legal cost of developing a drainage district is prohibitive.

Service Districts:

Formation: The formation of a service district is authorized by Chapter 153A Article 16 of the current NC General Statutes. Creating one can be done by the local county commissioners after they have been presented with a plan outlining the need and purpose of the service district.

Governance: A service district is governed by the local county commissioners. It may have a locally appointed advisory board to help guide service district's actions.

Authority: The county commissioners set the annual budget for the service district, implementation of the annual actions can be contracted out and overseen by the advisory board within the approved budget and service district plan.

Pros: Compared to developing a drainage district, service districts can be easily formed for a demonstrated need. There is no limitation on the size of a service district. Any assessments collected for the service district will be managed by the county commissioners and can only be used in the district for the described management actions. As an entity managed by the County Commissioners, they would be eligible for disaster relief.

Cons: Some people have expressed concerned that there is no "local" control of the district since the district is managed by the county commissioners who may or may not live in the service district. This can be mitigated somewhat by having a local advisory committee.

Drainage Associations:

Formation: The formation of a drainage association is a private 502(c)12 organization that can be formed for mutual ditch/irrigation benefit.

Governance: A drainage association is governed by a board of directors and the bylaws that are part of the articles of incorporation.

Authority: the board of directors would oversee the annual budget, setting dues and implementing the drainage or irrigation plan for the association.

Pros: Privately run entity can set its budget based on needs

Cons: Since they are not a public entity they have difficulty receiving public assistance after disasters. May have difficulty in acquiring all needed easements for a private association to form.

After consideration of the above structures, the stakeholders are currently in favor of exploring the development of a service district for the Lake Mattamuskeet Watershed, and suggest using the historic boundary of Mattamuskeet Drainage District One as the territory.

The existing Lake Mattamuskeet watershed is currently located within the historic boundary of Mattamuskeet Drainage District One, which was formed through "an Act to authorize the State Board of Education to unite with certain landowners in Hyde County in establishing a drainage district, including Mattamuskeet Lake and the lands adjacent thereto" (N.C. Public Law Chapter 509 of 1909). The Act to establish Mattamuskeet Drainage District One was repealed following the establishment of the Mattamuskeet Wildlife Refuge through Executive Order 6924 in 1934. It is important to note that a Final Decree from the United States Department of Agriculture in 1935 reserved the right of the adjoining land owners to drain their lands into Mattamuskeet Lake.

Four drainage entities have been established (either wholly or partially) within the original boundary of Mattamuskeet Drainage District One since then including the Fairfield Drainage District No. 7, Mattamuskeet Drainage Association, West Quarter Service District, and Slocum Drainage Partnership. The acreage of the Refuge is 50,180 acres and the existing drainage entities extend over 16,836 acres of the former Mattamuskeet Drainage District One which was 102,895 acres. This leaves 35,879 acres of land that is primarily privately owned and managed. Fourteen percent, or 5,021 acres, of that remaining land has been identified as a flooding hotspot.

The details of the service district still need to be evaluated, but the general understanding among the stakeholders is that drainage services could be either contracted from the existing drainage entities or new drainage infrastructure and management could be developed to assist in meeting the drainage needs. The upfront infrastructure and development costs of establishing a new service district could likely be funded by grant or other funding opportunities. The service district would be responsible for using income generated from a levy on private property taxes for the operation and maintenance of drainage services within the district as well as capital improvement projects. The USFWS cannot cede management authority of the Refuge and therefore would not be included as a party of the service district. The Refuge could enter into an MOA with the County as a collaborating partner to contribute to the implementation of the plan's management within the service district. The advisory committee of the service district and the Refuge will also continue regular public meetings and stakeholder team meetings to facilitate the implementation of management measures.

A service district would allow for the desired active water management in the watershed to proceed through coordination of actions and provide an entity who is responsible for responding to drainage needs. The service district advisory board would be responsible for overseeing the water management plan moving forward and local representation on the advisory committee

would bring concerns to the County Commissioner's attention. An example of a service district plan is included as Appendix F.

Developing a service district to oversee the implementation of the plan and ensure proper active water management within the watershed will take some time. It is anticipated that at least 18 months will be necessary to develop the service district plan for the Board of Commissioners to consider. In light of this, the core stakeholder team has recommended that an interim step include the development of an MOU between USFWS, NCWRC, and Hyde County. This MOU will outline an understanding that the three partners will continue to work and collaborate on the implementation of the watershed restoration plan while the formal service district is created. The partners will continue to include stakeholders and meet at regular intervals. They recognize the need to hire a third-party entity to assist in the continued coordination of meetings and advancing the watershed restoration plan.

Action 2-2: Perform hydrologic study of the watershed.

Members of the MTWG and university researchers have worked to develop an understanding of the water budget within the lake's watershed. However, a more refined model to understand the influence of private canals and pumps as well as the impact of wind and other environmental factors is needed to be able to evaluate alternatives for water management. For example, one of the next actions identified by the stakeholders as a priority is to explore engineered solutions including new lake outlets - an improved watershed model would help stakeholders evaluate and understand how pumps at new lake outlets will influence lake levels during various weather conditions.

The modeling study will be developed in three sub-tasks: 1) understanding flow of water in the watershed; 2) understanding lake level fluctuations due to changes in water inputs to the system-taking into account the effects of the tide gates on existing outlet canals as well as wind and tide effects within the lake and Pamlico Sound; and 3) incorporating outcomes of the watershed model to evaluate the existing drainage system and potential benefits of drainage improvements.

A hydrologic model on the watershed scale will be developed to further evaluate precipitation and evapotranspiration rates as well as compute the water inputs to the lake over time. This model will aim to reproduce regional behavior within the watershed (i.e. not focused on single drainage areas and sub-watersheds). The water inputs will be used as boundary conditions to develop the hydraulic model that will be used to identify critical pool elevations within each basin of the lake that lead to flooding and develop thresholds for active lake level management purposes. The results of the hydraulic model will also be used to determine the need for construction of additional outlet canals.

Delineating sub-catchment areas within the watershed and surrounding region, and identifying design limitations based on the existing locations of dikes, gates, plugs, pump locations/capacity/flow direction, and secondary channels will help identify more targeted or sub-basin level hydrology improvements, such as evaluating whether the boundaries of existing entities that provide drainage services on lands adjacent to the Lake Mattamuskeet watershed should be re-delineated to mitigate flooding and increase drainage capacity.

In addition to the overall lake watershed model, localized hydrologic studies within the watershed where flooding occurs or where there is an identified need to improve or redirect water flow are needed. The existing stakeholder team has identified flood prone areas throughout the watershed. There are a total of seven flooding hotspots distributed around the lake. Three of those hotspots are residential zones, while the other four are on agricultural lands.

Flooding Hotspot	Type	Size (ac)	Structures (#)
N. Lake Rd	Residential	2,545	146
New Holland	Residential	298	42
Fairfield	Residential	108	38
Buzzard's Roost Farm 1	Agricultural	954	16
Buzzard's Roost Farm 2	Agricultural	203	33
Whitetail Farms 1	Agricultural	260	0
Whitetail Farms 2	Agricultural	654	13
Total		5,022	288

Table 3. Description of flooding hotspots within the Lake Mattamuskeet watershed.

Working in these localized hotspot areas to remedy the flood concerns will be part of the overall strategic plan and will require focused engineering studies to develop cost estimates and engineered design drawings that can be submitted for permitting.

Action 2-3: Design engineered plans for active water management of the lake watershed.

Engineering studies will determine and evaluate the placement of pumps on the existing main outlet canals and/or redirecting water in current drainage systems/districts that could move water from the lake to the Alligator River or Pamlico Sound. The strategy being pursued aims to re-establish and replicate the natural movement of water from the lake to the Alligator River drainage rather than the Pamlico Sound since the increased discharge of nutrient rich water could have the potential to impact shellfish habitat. The preferred design alternative is to identify, design, and prioritize projects where water diverted from the lake could be sheet flowed over newly-created or restored wetlands, where nutrients and sediment can be absorbed before discharging into a water body.

Infrastructure Improvements

The exact size and placement of pumps is still to be determined and will be informed by the hydrologic model described in Action 2-2. The desired management capacity for the watershed will determine the number of pumps and pump stations needed.

While the CST has discussed evaluating pumps that would discharge to the Pamlico Sound, the strategy being pursued would explore the installation of pumps that would restore hydrologic flows to the northwest. It is believed that water historically flowed to the northwest, but water was re-directed due to hydrologic changes in the watershed. Landowners in this area have volunteered their properties to be part of this potential pumping plan, which would include sheet flowing water over newly-created or restored wetlands for water quality improvements prior to discharging that water into the Alligator River.

An additional benefit of pumping water to the northwest is that currently the Fairfield Drainage District is dependent on a single pumping station to move water to the Alligator River. If they were to ever experience a failure of that pump station, an additional pump station on the northern side of the lake could provide a backup for their drainage needs. Finally, pumping water to the northwest, away from the Pamlico Sound, would help to reduce nutrient and sediment loads to already impaired SA shellfish waters.

Additional Outlet Evaluation

As part of the evaluation of pump locations, one idea that needs further exploration is installing a new outlet on the north side of the west basin of the lake. Currently, the west basin has only one outlet canal. During the summer months, the Rose Bay canal is known for its inability to move water from the lake to Pamlico Sound because often there is not enough head pressure to passively drain water from the lake to Rose Bay, given the prevailing wind direction is from the southwest, the exact orientation of the canal. Therefore, during summer, water from Pamlico Sound is pushed into Rose Bay canal effectively blocking water from discharging from the lake. A new outlet canal with a tide gate on the north side of the west basin would help to alleviate these issues, and may help to improve water circulation and management in the western basin.

Potential Sheet Flow Sites

The CST desires to discharge "clean" water from the lake to surrounding water bodies. They do not want to divert water rich in nutrients, sediments and bacteria from the lake and simply re-distribute it in another location. For this reason, until the water quality in the lake improves, identifying locations where water could be sheet flowed over newly created or restored wetlands within the watershed and surrounding lands is a priority. Sheet flowing water over wetlands reduces the volume of water being directly discharged to the Pamlico Sound or Alligator River while simultaneously decreasing the concentrations of nutrients, sediments, and bacteria as the water infiltrates the soil and is absorbed by vegetation.

To date several potential locations have been identified (Figure 19). Private land owners have volunteered tracts of land located on the northwest boundary of the watershed that would provide a pathway to sheet flow water over prior converted wetlands before eventually discharging to the headwaters of the Alligator River. One of these potential sites includes a 293-acre tract of land that currently has the infrastructure in place to accept water that currently discharges to the lake thereby reducing an input.

Additionally, there are three tracts of land (total = 346 acres) located to the north of the Fairfield Drainage District that water could sheet flow through with additional pumps through existing canals. There has also been discussion about the use of the Gull Rock Game Lands as a prospective site for sheet flow applications to increase the drainage capacity for both the Lake Mattamuskeet watershed and the Fairfield Drainage District.

Additional lands are likely needed and one output of the hydrologic model will be an estimate for how much land is needed to meet water management and treatment needs. The impacts of the altered hydrologic regimes on these lands will need to be further evaluated as well.

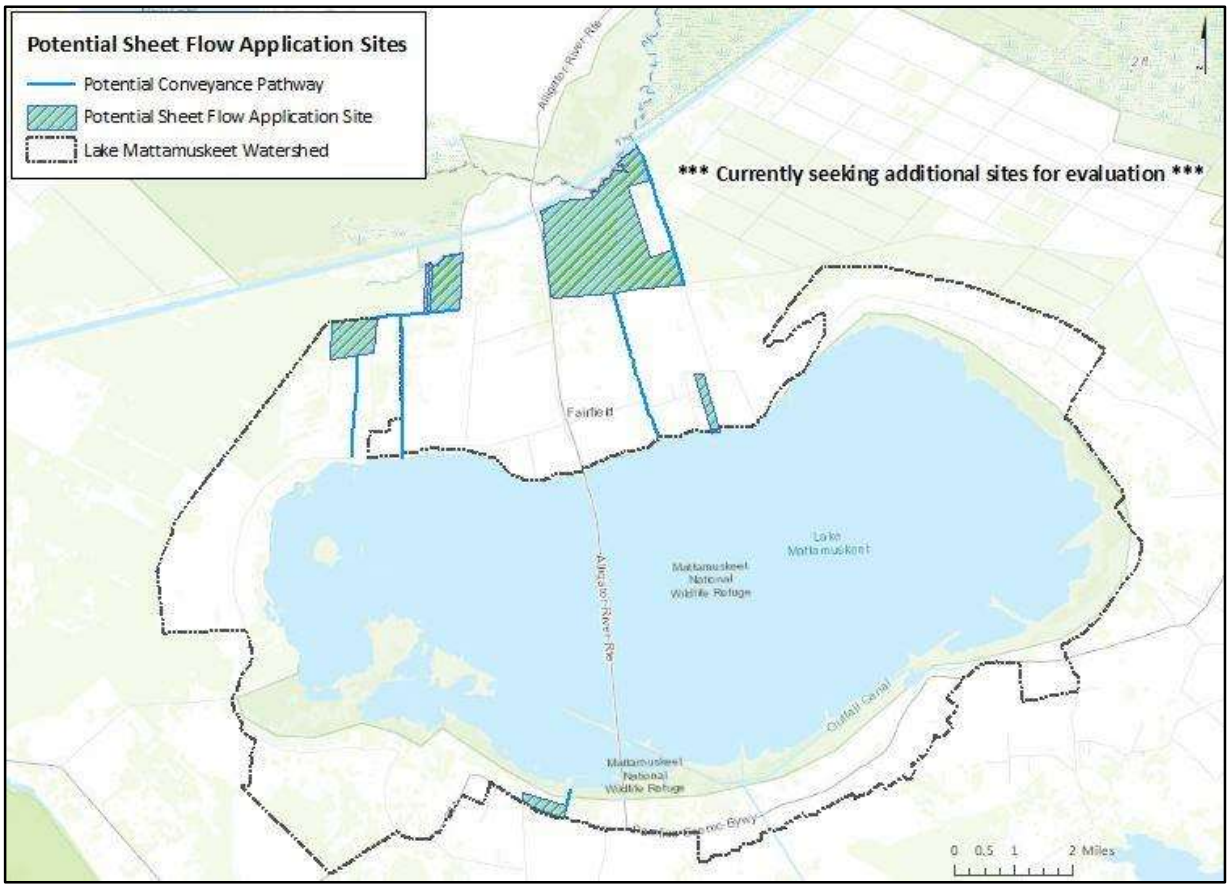

Figure 19: A map displaying the potential sheet flow application sites within and adjacent to the watershed.

Other management measures, listed below, will be prioritized after results from ongoing research projects are received.

- Evaluate whether dredging the main outlet canals and canals within the Refuge boundary to their original design dimensions will increase drainage capacity and alleviate flooding within the watershed in the near-term and long-term.
- Encourage the use of moist soil management on private waterfowl impoundments where feasible with willing landowner participation.
- Provide assistance to landowners interested in alternative applications of fertilizer, herbicide, or pesticide.
- Reduce the common carp population within the lake.
- Plant SAV within the lake experimentally and more broad-scale after some water quality improvements have been documented.

ESTIMATED LOAD REDUCTIONS

The current delineation of the watershed totals 68,173 acres and the Refuge boundary totals 50,180 acres, thereby leaving 17,993 acres of adjacent lands that drain to the lake, or 26.4% of the watershed. A total of 378 acres within the watershed has been identified as potential sheet flow sites, which would result in 2.1% reduction in land area that would otherwise drain to the lake. This percentage will increase once the hydrologic model for the watershed is developed and engineers identify the volume of water that could be re-directed to the potential sheet flow sites. An additional 2,477 acres located outside of the watershed have also been identified for potential sheet flow application. Additional acreage will likely be needed to reach water management and water quality goals. Estimates of the nutrient and sediment load reductions will be generated once the engineered plans are developed that identify the volume of water that could be treated through sheet flow applications. Additional estimates will be tracked as BMPs are implemented within the watershed over time.

PLAN IMPLEMENTATION

The principal funding partners (Hyde County, USFWS, NCWRC) of this watershed restoration plan will consider the development of a memorandum of understanding (MOU) to continue to hold stakeholder meetings and regularly scheduled public meetings. The primary purposes of the stakeholder meetings will be to oversee the implementation of the priority actions, and provide a mechanism to adapt the plan over time. Regularly scheduled public meetings will be held to keep people informed of the watershed restoration plan progress.

EVALUATION

The continuation of existing monitoring efforts conducted at Lake Mattamuskeet and the surrounding watershed (Table 2) will provide immediate feedback about improvements to water quality trends within Lake Mattamuskeet, and the metric for success will be the removal of Lake Mattamuskeet from state 303(d) list. Additionally, the results of the Ambient Lakes Monitoring Program implemented by the NCDEQ DWR will be used to evaluate changes in water quality trends over the long-term.

The return of SAV coverage will serve as a primary indicator of the lake ecosystem health and will be used as the metric to evaluate the effectiveness of each implemented management action/BMP to improve water quality within Lake Mattamuskeet. Refuge staff will conduct annual surveys to evaluate SAV species composition and percent coverage. Since the scope of the MTWG focuses on monitoring efforts within the Refuge it is recommended that representatives from Hyde County Soil and Water Department participate in the MTWG to provide information about land use activities occurring throughout the watershed including the implementation of BMPs to facilitate a more comprehensive evaluation of effectiveness towards improving water quality and SAV restoration.

The residential and farming communities will provide first-hand accounts of the effectiveness of management measures to mitigate flooding issues. These same stakeholders will be able to evaluate if the management actions have improved their way of life.

TECHNICAL ASSISTANCE

The Hyde County Center of the NC Cooperative Extension Office connects farmers, agribusinesses, and communities with vital research-based information and technology. The Extension office can assist growers with problem diagnosis, variety selection, pesticide education, as well as providing agronomic information.

The Hyde County Soil and Water Conservation District is primarily responsible for stormwater management and drainage issues in the County. The USDA-Natural Resources Conservation Service provides a major source of assistance, and enables the Soil and Water Conservation District to provide county residents and landowners with the following: 1) consultative assistance, 2) technical assistance, 3) technical assistance to units of government, and 4) information and education assistance. The North Carolina Agricultural Cost Share Program encourages landowners and its users to apply best management practices (BMPs).

Hyde County participates in the National Flood Insurance Program and existing floodplain management regulations can be found in Chapter 20 – Flood Damage Prevention – in Hyde County's Code of Ordinances. The County also participates in the Community Rating System (CRS) and is a Class 9 community. Activities that receive credit by the CRS program include actions to enhance public safety, reduce flood damage, and enhance environmental protection. Public information activities associated with the CRS program also help to build a knowledgeable constituency interested in supporting and improving flood mitigation measures. The Hyde County Office of Planning and Economic Development oversees the development and implementation of the County Ordinances, the Pamlico Sound Regional Hazard Mitigation Plan (2015), Hyde County Parks and Recreation Master Plan (2014), Hyde County CAMA Land Use Plan (2008). Reviews for consistency should accompany proposed amendments to ordinances and plan updates to avoid with management recommendations provided within this watershed restoration plan.

FINANCIAL ASSISTANCE

Section 205(j) Grant Program

The U.S. Environmental Protection Agency (USEPA) provides states with funding to implement water quality planning activities through the Section 205(j) grant program. Projects funded through this program can involve identifying the nature, extent and cause of water quality problems. Funds can also be used to advance the plans developed to address water quality impairments such as: mapping stormwater infrastructure, conducting engineering designs for stormwater BMPs, and watershed assessments of pollutant sources. Section 205(j) grants are eligible to regional Councils of Governments (COGs), which may partner with any public sector organization to implement projects. The Albemarle Commission is the regional COG for the Lake Mattamuskeet watershed.

Section 319 Grant Program

Through the Section 319 grant program, the USEPA provides states with funding to reduce nonpoint source pollution. Funds may be used to conduct watershed restoration projects such

as stormwater and agricultural BMPs. Projects funded through the Section 319 Grant program must be used to implement an approved watershed restoration plan that includes the nine elements required by the USEPA. State and local governments, interstate and intrastate agencies, public and private non-profit organizations, and educational institutions are all eligible to apply for 319 funding. The annual 319(h) grant application cycle is initiated at the beginning of the calendar year.

National Coastal Resilience Fund

The National Fish and Wildlife Foundation (NFWF) announced the National Coastal Resilience Fund in 2018 to restore, increase and strengthen natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife. The fund aims to:

- Benefit coastal communities by reducing the impact of coastal flooding and associated threats to property and key assets, such as hospitals and emergency routes.
- Benefit coastal communities by improving water quality and recreational opportunities.
- Benefit fish and wildlife by enhancing the ecological integrity and functionality of coastal and inland ecosystems.

Hyde County submitted a proposal to develop a watershed scale hydrologic model and engineer a design to sheet flow water over created or restored wetlands in August 2018. The proposal is currently under review and if funds are awarded, this phase of the project will begin in early 2019. The results of the project will help to inform the development of the service district and its infrastructure needs.

NCDEQ Planning and Management Grant

The NCDEQ Division of Coastal Management helps local governments in the 20 coastal counties fund local planning and management projects.

SCHEDULE and MILESTONES

The implementation schedule is detailed below. The dates listed serve as tentative deadlines. The implementation of the priority actions is dependent on acquiring funding and voluntary interest of private land owners. The priority actions listed in a gray and italicized font are sub-actions.

Objective 1: Continue managing current projects and collaborations.			
Action	Description	Timeline	Partners
1-1	Perform annual review of monitoring methodology and data gap assessment with the Mattamuskeet Technical Working Group (MTWG).	Annually beginning March 2019	MTWG
1-2	Continue existing monitoring and research efforts.	Ongoing	USFWS, NCWRC, USGS, NCDEQ, Research Scientists
1-3	Continue to keep tide gates free of debris.	Ongoing (during weekly monitoring at minimum)	USFWS
1-4	Continue to snag and drag outlet canals after storms and as needed to provide flow and access at outlet canals.	Evaluate annually and post storm events	Hyde County Soil & Water
1-5	Continue to follow nutrient management plans for agricultural lands.	Ongoing	NC Cooperative Extension, Crop Consultants, Farmers
1-6	Continue to hold stakeholder meetings to evaluate watershed restoration plan progress.	Regularly	Waterhsed Stakeholders
1-7	Continue to hold public meetings to keep people informed of the watershed restoration plan progress.	Quarterly beginning March 2019	Hyde County, USFWS, NCWRC
Objective 2: Establish active water-level management capabilities on Lake Mattamuskeet and improve water management within the watershed.			
Action	Description	Timeline	Partners
2-1	Create a formal body that provides managing authority for active water management within the watershed in coordination with the Refuge, which would be excluded as party to the formal body since USFWS cannot cede management authority.	Public hearing by May 1, 2020 to take effect July 1, 2020	Hyde County, FDD, MDA
2-2	Perform hydrologic study of the watershed.	May 1, 2020	Engineers, Research Scientists
2-2a	*Develop a hydrologic model of the Lake Mattamuskeet Watershed.*	*April 1, 2020*	*Engineers, Research Scientists*
2-2b	*Determine the need to replace flap gates with side-opening gates on the lake outlet canals where appropriate.*	*May 1, 2020*	*MTWG/Research Scientists*

2-2c	*Perform localized hydrologic studies within the watershed where flooding occurs or where there is an identified need to improve or redirect water flow.*	*May 1, 2020*	*PLOs, NCDOT, Engineers, Research Scientists*
2-3	Design engineered plans for active water management within the watershed.	June 1, 2021	Engineers, Research Scientists
2-3a	*Determine need and perform maintenance dredging of Refuge boundary canals and lake bottom (consider beneficial use of dredge material).*	*June 1, 2020*	*USFWS, Engineers, Research Scientists*
2-3b	*Determine need and perform maintenance dredging of outlet canals and lake bottom (consider beneficial use of dredge material and feasibility after Dr. Etheridge's study is complete).*	*June 1, 2020*	*PLOs, Engineers, Research Scientists*
2-3c	*Identify, design, and prioritize projects where managed water could be sheet flowed over created or restored wetlands.*	*June 1, 2020*	*PLOs, Engineers, Research Scientists*
2-3d	*Identify where pumps are needed on the lake or within the watershed that could move water towards the Alligator River or Pamlico Sound that would otherwise drain to the lake.*	*June 1, 2021*	*Engineers, Research Scientists, FDD, MDA*
2-3e	*Evaluate the need to excavate additional outlet canals.*	*June 1, 2021*	*Engineers, Research Scientists*
2-3f	*Maintain and create new earthen dikes as needed to facilitate water management.*	*Evaluate annually and post storm events*	*USFWS, Hyde County Soil & Water*
2-4	Facilitate active water management project implementation and evaluate success.	Ongoing and annually before end of fiscal year	Hyde County, USFWS, NCWRC
2-5	Continue landowner education and participation in active water management projects.	Ongoing	Hyde County Soil & Water, NC Cooperative Extension
Objective 3: Determine how to effectively improve and meet water quality standards within the watershed.			
Action	Description	Timeline	Partners
3-1	Evaluate water quality monitoring results within the lake watershed.	Ongoing	MTWG, USGS, NCDEQ
3-2	Perform carp biomass removal if advisable.	December 1, 2020	Research Scientists, MTWG

3-3	Identify locations and determine the feasibility and water quality improvement derived from implementing BMPs such as:	Ongoing	NRCS, NC Cooperative Extension, Hyde County Soil & Water, Research Scientists, Crop Consultants, Farmers, NGOs, PLOs
3-3a	*Stormwater wetlands or detention/retention basins*	*Ongoing*	*Hyde County Soil & Water, PLOs*
3-3b	*Filter strips along edges of drainage ditches.*	*Ongoing*	*NRCS, NC Cooperative Extension, Hyde County Soil & Water, PLOs*
3-3c	*Sediment basins/settling ponds on canals draining to lake.*	*Ongoing*	*NRCS, NC Cooperative Extension, Hyde County Soil & Water, PLOs*
3-3d	*Water control structures in drainage ditches.*	*Ongoing*	*NRCS, NC Cooperative Extension, Hyde County Soil & Water, PLOs*
3-3e	*Sediment removal from the lake bottom.*	*When feasible during drought conditions*	*USFWS*
3-3f	*Annual soil tests to target fertilization rates for dominant crops.*	*Annually*	*NC Cooperative Extension, Crop Consultants, Farmers*
3-3g	*Developing nutrient management and herbicide/pesticide application guidelines.*	*Ongoing*	*NC Cooperative Extension, Crop Consultants, Farmers*
3-3h	*Precision nutrient application with GPS technology.*	*Ongoing*	*NC Cooperative Extension, Crop Consultants, Farmers*

3-3i	*Cover crops and/or no-till or strip-till where appropriate.*	*Ongoing*	*NRCS, NC Cooperative Extension, Crop Consultants, Farmers*
3-3j	*Altering water management of croplands, if advisable.*	*Ongoing*	*NC Cooperative Extension, Crop Consultants, Farmers*
3-3k	*Moist soil management of private waterfowl impoundments.*	*Ongoing*	*NCWRC, PLOs, NGOs*
3-3l	*Altering water management of impoundments - staged drawdowns.*	*Annually at the end of waterfowl hunting season*	*Research Scientists, PLOs*
3-4	Develop specific funding mechanisms to offset costs of installing aforementioned water quality improvement practices.	Annually	NRCS, NGOs, Service District
3-4a	*Identify practices that can be funded and secure funding for projects supported by NRCS and NC Soil & Water District or other granting agencies.*	*Ongoing*	*NGOs, Service District*
3-4b	*Incentivize conservation crop rotation, cover crops, residue management practices and structural practices to minimize the potential for nutrient losses.*	*Ongoing*	*NRCS, NC Soil & Water*
3-4c	*Incentivize moist soil management of private waterfowl impoundments.*	*Ongoing*	*NRCS, NC Soil & Water, NGOs*
3-5	Purchase land or easements within the Lake watershed to treat (i.e. reduce nutrient levels and sediment loads) cropland/impoundment waters.	Ongoing	NGOs, Service District
Objective 4: Ensure septic systems are in compliance.			
Action	Description	Timeline	Partners
4-1	Continue to inspect septic systems within the watershed.	Ongoing	Hyde County Environmental Health Services
4-2	Assist with making improvements to septic systems as needed.	Ongoing	Hyde County Environmental Health Services
4-2a	*Repair/upgrade septic systems.*	*Ongoing*	*PLOs, Hyde County Environmental Health Services*
4-2b	*Consider a no-interest or low-interest loan for septic system improvements.*	*Ongoing*	*NCDEQ, Hyde County, PLOs*

4-2c	*Determine if it is feasible to connect residential properties to municipal sewer.*	*June 30, 2020*	*Swan Quarter and Engelhard Sanitary Districts*
Objective 5: Make habitat improvements that have a direct water quality or way of life benefit.			
Action	Description	Timeline	Partners
5-1	Re-establish submerged aquatic vegetation in Lake Mattamuskeet following a reduction of nutrients and suspended sediment levels and/or a reduction in grazers (e.g. common carp).	Ongoing or dependent on water quality criteria	MTWG
5-2	Promote emergent vegetation growth around the periphery of Lake Mattamuskeet by reducing *Phragmites australis* at specific target locations augmented by supplemental planting.	Ongoing	MTWG
5-3	Manage side-mounted tide gates for fish and larval blue crab passage.	Ongoing	MTWG
Objective 6: Adapt and evolve the plan based on results.			
Action	Description	Timeline	Partners
6-1	Adapt communities in Hyde County and specifically within the lake watershed to become resilient to sea level rise.	Ongoing	FEMA, NCDCM, NC Sea Grant, Research Scientists, Hyde County
6-2	Work with NCDEQ to closely monitor water quality in the impaired waters to determine if the implementation of the plan is providing water quality benefits.	Ongoing	MTWG
6-3	Conduct annual and five-year assessments on the success of the plan, taking into account improvements in water management on the lake and within the watershed, reductions in nutrients reaching the lake, improvements in lake water clarity, reduction in lake algal blooms, and preservation of the way of life in the watershed.	Annually and every five years	MTWG, Watershed Stakeholders
6-4	Facilitate a framework that will sustain yearly stakeholders discussions including revisions, edits, and updates to the plan as it is implemented.	Annually	MTWG, Watershed Stakeholders

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Appendix A

Establishment of Lake Mattamuskeet Wildlife Refuge

LAEO — North Carolina
Mattamuskeet

Executive Order

Establishment of Lake Mattamuskeet Wild Life Refuge

NORTH CAROLINA

By virtue of and pursuant to the authority vested in me as President of the United States, it is hereby ordered (1) that all the following-described tract of land in Hyde County, North Carolina, be, and it is hereby, reserved and set apart for the use of the Department of Agriculture as a refuge and breeding ground for birds and wild animals, and (2) that such portion of said tract as the Secretary of Agriculture may deem proper be reserved for use as a shooting area, to be operated under a cooperative agreement or lease between the said Department of Agriculture and the Department of Conservation and Development of the State of North Carolina, upon such terms and conditions, and under such regulations, as the Secretary of Agriculture may from time to time adopt. With regard to the waters of Mattamuskeet Lake within said area, the Secretary of Agriculture, under such rules and regulations, and upon such terms and conditions as he may from time to time prescribe or approve, may enter into a cooperative agreement or lease with said Department of Conservation and Development of the State of North Carolina whereby said waters may be used for fishing purposes under permit or license issued by the Division of Game and Fish of the said Department of Conservation and Development.

The survey of the said tract was made in September and October 1934, and all bearings in this description are turned from the true meridian and all distances expressed in chains.

Beginning at corner no. 1, common to lands of Jones, Mann & Gibbs and R. W. Harris, in the Mattamuskeet-Swanquarter township line in the east edge of a ditch marked by a 3-in. iron pipe filled with concrete with a brass plug marked "1";

Thence, from said initial point:

N. 53° 31′ W., 102.54 chs., to corner no. 2;
S. 15° 28′ W., 29.65 chs., to corner no. 3;
S. 83° 46′ W., 6.12 chs., to corner no. 4;
N. 57° 20′ W., 34.67 chs., to corner no. 5;
N. 80° 07′ W., 53.07 chs., to corner no. 6;
S. 89° 08′ W., 23.96 chs., to corner no. 7;

S. 60° 55′ W., 26.59 chs., to corner no. 8;
N. 84° 06′ W., 40.61 chs., to corner no. 9;
N. 61° 12′ W., 60.53 chs., to corner no. 10;
N. 19° 44′ W., 26.36 chs., to corner no. 11;
N. 83° 18′ E., 2.29 chs., to corner no. 12;
N. 73° 00′ E., 110.06 chs., to corner no. 13;
N. 1° 16′ W., 41.76 chs., to corner no. 14;
N. 68° 07′ W., 76.18 chs., to corner no. 15;
S. 66° 59′ W., 6.96 chs., to corner no. 16;
N. 11° 18′ W., 40.13 chs., to corner no. 17;
S. 66° 56′ W., 2.01 chs., to corner no. 18;
N. 11° 17′ W., 5.03 chs., to corner no. 19;
N. 66° 55′ E., 10.26 chs., to corner no. 20;
N. 7° 13′ E., 47.79 chs., to corner no. 21;
N. 6° 29′ E., 65.19 chs., to corner no. 22;
N. 32° 58′ E., 50.52 chs., to corner no. 23;
N. 50° 46′ E., 18.71 chs., to corner no. 24;
N. 73° 57′ E., 20.40 chs., to corner no. 25;
S. 25° 22′ E., 7.72 chs., to corner no. 26;
N. 64° 54′ E., 12.72 chs., to corner no. 27;
S. 83° 44′ E., 31.12 chs., to corner no. 28;
N. 5° 53′ E., 5.49 chs., to corner no. 29;
S. 85° 25′ E., 73.65 chs., to corner no. 30;
N. 87° 59′ E., 12.06 chs., to corner no. 31;
S. 80° 19′ E., 7.40 chs., to corner no. 32;
N. 69° 31′ E., 5.33 chs., to corner no. 33;
N. 69° 38′ E., 25.66 chs., to corner no. 34;
S. 84° 37′ E., 38.76 chs., to corner no. 35;
S. 73° 15′ E., 37.23 chs., to corner no. 36;
S. 46° 57′ E., 36.24 chs., to corner no. 37;
S. 71° 56′ E., 49.05 chs., to corner no. 38;
N. 78° 58′ E., 67.81 chs., to corner no. 39;
N. 15° 12′ W., 15.92 chs., to corner no. 40;
N. 72° 16′ E., 82.25 chs., to corner no. 41;
N. 50° 22′ E., 14.77 chs., to corner no. 42;
N. 83° 38′ E., 58.01 chs., to corner no. 43;
N. 88° 32′ E., 67.48 chs., to corner no. 44;
N. 50° 34′ E., 15.06 chs., to corner no. 45;
N. 40° 45′ E., 27.01 chs., to corner no. 46;
N. 32° 59′ E., 22.79 chs., to corner no. 47;
N. 48° 54′ E., 51.15 chs., to corner no. 48;
N. 35° 36′ E., 50.60 chs., to corner no. 49;
N. 43° 27′ E., 30.89 chs., to corner no. 50;
N. 69° 17′ E., 34.35 chs., to corner no. 51;

S. 4° 39′ E.,	6.02 chs.,	to corner no.	52;
N. 77° 39′ E.,	9.40 chs.,	to corner no.	53;
S. 89° 21′ E.,	17.99 chs.,	to corner no.	54;
N. 1° 05′ W.,	4.84 chs.,	to corner no.	55;
S. 77° 25′ E.,	35.60 chs.,	to corner no.	56;
S. 69° 10′ E.,	64.04 chs.,	to corner no.	57;
S. 60° 06′ E.,	40.44 chs.,	to corner no.	58;
N. 16° 43′ E.,	7.12 chs.,	to corner no.	59;
S. 75° 08′ E.,	19.39 chs.,	to corner no.	60;
S. 10° 46′ W.,	13.32 chs.,	to corner no.	61;
S. 61° 03′ E.,	13.94 chs.,	to corner no.	62;
S. 52° 29′ E.,	46.78 chs.,	to corner no.	63;
N. 29° 00′ E.,	3.59 chs.,	to corner no.	64;
S. 59° 11′ E.,	25.97 chs.,	to corner no.	65;
S. 31° 18′ W.,	1.57 chs.,	to corner no.	66;
S. 54° 56′ E.,	12.01 chs.,	to corner no.	67;
S. 32° 43′ W.,	4.00 chs.,	to corner no.	68;
S. 43° 12′ E.,	23.16 chs.,	to corner no.	69;
N. 30° 59′ E.,	9.62 chs.,	to corner no.	70;
S. 53° 56′ E.,	2.24 chs.,	to corner no.	71;
S. 30° 45′ W.,	18.69 chs.,	to corner no.	72;
S. 36° 36′ E.,	12.13 chs.,	to corner no.	73;
S. 42° 19′ E.,	19.72 chs.,	to corner no.	74;
S. 45° 22′ E.,	22.73 chs.,	to corner no.	75;
S. 37° 02′ E.,	39.44 chs.,	to corner no.	76;
S. 30° 27′ E.,	27.30 chs.,	to corner no.	77;
S. 22° 42′ E.,	23.62 chs.,	to corner no.	78;
S. 64° 24′ W.,	3.64 chs.,	to corner no.	79;
S. 21° 27′ E.,	32.36 chs.,	to corner no.	80;
S. 12° 48′ E.,	11.38 chs.,	to corner no.	81;
S. 17° 32′ E.,	14.20 chs.,	to corner no.	82;
S. 9° 19′ W.,	20.43 chs.,	to corner no.	83;
S. 20° 01′ W.,	23.84 chs.,	to corner no.	84;
S. 40° 59′ W.,	26.55 chs.,	to corner no.	85;
S. 38° 10′ W.,	49.18 chs.,	to corner no.	86;
S. 31° 22′ W.,	15.78 chs.,	to corner no.	87;
S. 60° 04′ W.,	10.68 chs.,	to corner no.	88;
S. 48° 41′ W.,	12.18 chs.,	to corner no.	89;
S. 59° 39′ W.,	27.62 chs.,	to corner no.	90;
S. 68° 11′ W.,	4.18 chs.,	to corner no.	91;
S. 68° 20′ W.,	1.87 chs.,	to corner no.	92;
S. 79° 21′ W.,	67.03 chs.,	to corner no.	93;
S. 89° 37′ W.,	14.47 chs.,	to corner no.	94;

S. 82° 14′ W.,	9.40 chs.,	to corner no. 95;
S. 75° 00′ W.,	19.44 chs.,	to corner no. 96;
S. 67° 37′ W.,	16.73 chs.,	to corner no. 97;
S. 79° 21′ W.,	28.16 chs.,	to corner no. 98;
N. 81° 43′ W.,	22.69 chs.,	to corner no. 99;
S. 50° 14′ W.,	8.13 chs.,	to corner no. 100;
S. 38° 56′ W.,	28.74 chs.,	to corner no. 101;
S. 36° 45′ W.,	24.41 chs.,	to corner no. 102;
S. 35° 12′ W.,	23.69 chs.,	to corner no. 103;
S. 29° 04′ W.,	35.21 chs.,	to corner no. 104;
S. 76° 51′ W.,	13.64 chs.,	to corner no. 105;
S. 65° 19′ W.,	3.31 chs.,	to corner no. 106;
S. 65° 20′ W.,	30.88 chs.,	to corner no. 107;
S. 61° 24′ W.,	15.19 chs.,	to corner no. 108;
S. 22° 53′ E.,	7.60 chs.,	to corner no. 109;
S. 80° 05′ W.,	180.96 chs.,	to corner no. 110;
S. 88° 46′ W.,	144.97 chs.,	to corner no. 111;
N. 74° 47′ W.,	16.68 chs.,	to corner no. 112;
N. 81° 05′ W.,	40.22 chs.,	to corner no. 113;
N. 75° 06′ W.,	33.53 chs.,	to corner no. 114;
N. 65° 48′ W.,	43.88 chs.,	to corner no. 115;
N. 54° 43′ W.,	31.93 chs.,	to corner no. 116;
S. 23° 27′ W.,	9.10 chs.,	

to the place of beginning; containing 49,925.05 acres, be the same more or less.

It is unlawful within this reservation: (*a*) To hunt, trap, capture, willfully disturb, or kill any wild animal or bird of any kind whatever, to take or destroy the nests or eggs of any wild bird, to occupy or use any part of the reservation, or to enter thereon for any purpose, except under such rules and regulations as may be prescribed by the Secretary of Agriculture; (*b*) to cut, burn, or destroy any timber, underbrush, grass, or other natural growth; (*c*) willfully to leave fire or to suffer it to burn unattended near any forest, timber, or other inflammable material; (*d*) after building a fire in or near any forest, timber, or other inflammable material, to leave it without totally extinguishing it; and (*e*) willfully to injure, molest, or destroy any property of the United States.

All persons are hereby informed that sections 52, 53 (as amended), and 84 (as amended) of the Criminal Code of the United States (secs. 106, 107, 145, title 18, U. S. C.) and section 14 of the Migratory Bird Conservation Act of February 18,

1929 (sec. 715*m*, title 16, U. S. C.) prescribe penalties for the commission of the offenses enumerated in the preceding paragraph.

This refuge shall be known as the "Lake Mattamuskeet Wild Life Refuge".

FRANKLIN D ROOSEVELT

THE WHITE HOUSE,

December 18, 1934.

[No. 6924]

U. S. GOVERNMENT PRINTING OFFICE: 1934

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Biological Survey

Division of Land Acquisition

State North Carolina Project Mattamuskeet

County Hyde Tract No. 3 part

Tract Name New Holland Corporation

INSTRUMENT

Final Decree

(Deed, judgment, lease, etc.)

From I. M. Meekins, Judge of the U. S. District Court.

Acres 410.34 Total cost $2,595.14

Date Title Vested April 9, 1935 (Declaration filed)

Reservations Subject to the right of the adjoining land owners to drain their lands into Mattamuskeet Lake.

Remarks Purchased with funds made available by the Resettlement Administration.

Entered

IN THE DISTRICT COURT OF THE UNITED STATES
FOR THE EASTERN DISTRICT OF NORTH CAROLINA
WASHINGTON DIVISION.

UNITED STATES OF AMERICA Vs. 49,925.05 Acres of Land, more or less, in Hyde County, North Carolina, Mattamuskeet Drainage District, et al.	FINAL DECREE

This day comes the petitioner in the above entitled cause, the United States of America, by J. O. Carr, United States Attorney, and moves the Court to enter final judgment in the above entitled cause, adjudging that the United States of America is the owner in fee absolute in and to all of the real estate described and mentioned in the petition filed in this cause, and it appearing to the Court that all of the lands mentioned, with improvements thereon, which are described in the petition were conveyed to the United States of America by virtue of a certain deed, dated October 30, 1934, executed by the New Holland Corporation, and duly recorded in the office of Register of Deeds for Hyde County, North Carolina, with the exception of a few small tracts or lots excepted in said deed, and that the petitioner caused to be properly filed a declaration of taking relating to those tracts excepted from the operation of said deed and paid into the registry of this court a sum adjudged to be reasonable compensation therefor, and thereby became the absolute owner of same, and further that a petition in condemnation was filed at the request of the Federal Emergency Relief Administrator of the United States of America, the authority entitled by law to acquire the lands mentioned in the petition and also under the authority of the Attorney General of the United States and that in said petition and declaration of taking a statement of authority under which and the public use for

170

which the said lands were being acquired was set out, together with a proper description of said lands sufficient for the identification thereof, accompanied by a plan or map showing the location and boundaries of said lands, and that all proper and necessary parties entitled to assert any claim, right, title, or interest in and to any parts of said lands were named in the petition as defendants and that those residing within the State of North Carolina were personally served with copy of petition and summons issued in this cause, and that those returned not to be found, after due diligence by the Marshal, were properly served by publication of notice of summons as required by law, and the Court finds as a fact that all proper and necessary parties are properly before the Court, and that each and every one of said defendants claiming or asserting any right, title, or interest in the lands described, who filed answers, have had their day in court and their claims adjudicated and just compensation awarded when so entitled, and that all others are forever enjoined and estopped from asserting any claim relating to said premises and that the petitioner, the United States of America, is the owner in fee absolute of all those certain tracts or parcels of land mentioned and described in said petition and declaration of taking, and judgment on the declaration of taking, the latter being duly recorded in Hyde County, generally known and referred to as Lake Mattamuskeet Wild Life Refuge, and being the same land heretofore owned and conveyed by the State Board of Education of the State of North Carolina, together with all buildings, pumping plant, machinery, equipment, fixtures, telephone lines, power lines, ditches, canals, rights-of-way, easements, and all improvements thereon, with all privileges and appurtenances thereunto belonging or in anywise appertaining to said tract.

The Court having fully considered said condemnation proceeding, declaration of taking, and judgment on the declaration of taking, the issuance of process and the service of the same as provided by law, the return of commissioners appointed by the Court, and the confirmation of said report and all other acts in connection with this proceeding, ADJUDGES, ORDERS AND DECREES

that the United States of America be and it is the owner in fee absolute of all that certain tract or parcel of land, situate, lying and being in the County of Hyde, State of North Carolina, generally referred to as Lake Mattamuskeet Wild Life Refuge, and being described by metes and bounds in the deed hereinabove referred to, including the exceptions therein noted, and also fully and completely described in the petition, declaration of taking, and judgment on the declaration of taking, together with all buildings, pumping plant, machinery, equipment, fixtures, telephone lines, power lines, ditches, canals, rights-of-way, easements, and all improvements thereon, with all privileges and appurtenances thereunto belonging or in anywise appertaining to said tract. Said deed and judgment on the declaration of taking, having been filed and recorded among the public records of Hyde County, are hereby referred to by way of further identification of said tract. All orders and decrees entered in the above entitled proceeding are hereby in all respects ratified and confirmed.

This the 8 day of Oct., 1936.

I. M. Meekins
Judge of the United States District Court for the Eastern District of North Carolina.

I, S. A. Ashe, Clerk, United States District Court for the Eastern District of North Carolina, through and by J. B. Respess, Deputy Clerk for the Washington Division of said Court, hereby certify that the foregoing is a true and correct copy of the Final Decree rendered in the foregoing entitled case, and that the same is on file in my office as a part of the records of said office and of the judgment roll in such case.

IN WITNESS WHEREOF I have hereunto set my hand and seal this 8th day of October, 1936.

S. A. ASHE, Clerk,
United States District Court

By J. B. Respess
J. B. Respess
Deputy Clerk.

HYDE COUNTY,

I, Wm. I. Cochran, Clark of the Superior Court of Hyde County, hereby certify that the foregoing certificate of S. A. Ashe, Clerk of the United States District Court for the Eastern District of North Carolina, is in due form. Let the said Final Decree with the certificate of the Clerk of the United States District Court, and this certificate, be recorded.

This the 16th. day of October, 1936.

Wm I Cochran

Clerk Superior Court.

Filed April 8, 1935, Washington Division.

UNITED STATES OF AMERICA

IN THE DISTRICT COURT OF THE UNITED STATES

FOR THE EASTERN DISTRICT OF NORTH CAROLINA

UNITED STATES OF AMERICA, Petitioner,	
VS.	DECLARATION OF TAKING
49,925.06 acres of land, more or less in Hyde County, North Carolina; Mattamuskeet Drainage District, et al.	

I, Harry L. Hopkins, Federal Emergency Relief Administrator, acting in such capacity and duly authorized by the provisions of the National Industrial Recovery Act (48 Stat. 195) and by Executive Order No. 6252 and by Executive Order No. 6985, dated March 6, 1935, do hereby make and cause to be filed this Declaration of Taking, under and in accordance with the Act of Congress approved February 26, 1931, (46 Stat. 1421) and Acts supplementary thereto and amendatory thereof, and declare that:

(1) On July 16, 1934, the Federal Emergency Administrator of Public Works and the Special Board of Public Works appointed by the President of the United States in accordance with Section 203, Title 2, of the National Industrial Recovery Act, authorized and approved a Land Program submitted by the Director of the Land Program of the Federal Emergency Relief Administration, involving the expenditure of $25,000,000, for the acquisition of lands in connection with projects, including among others:

> Demonstration Wild Life Projects: These include projects in which the land to be purchased is to be used primarily to carry out the program of the Biological Survey of the Department of Agriculture.

The Biological Survey, Department of Agriculture, submitted through the Director of the Land Program to the Administrator of the Federal Emergency Relief Administration for his adoption, the project known as the Lake Mattamuskeet Migratory Bird Refuge which included among others, the acquisition of the lands and property hereinafter described, and said project was so adopted.

(2) In connection with the said project there was submitted a form of agreement for the purchase of lands executed by the New Holland Corporation on July 19, 1934. This agreement provided for the conveyance to the United States of the lands hereinafter described and shown on the annexed plot

entitled Mattamuskeet Lake Migratory Bird Refuge 1934. This agreement was supplemented by the New Holland Corporation on August 1, 1934. By this supplement the New Holland Corporation undertook to fully terminate or otherwise dispose of to the satisfaction of the Attorney General all rights and easements of the Mattamuskeet Drainage District in and to the pumping plant, canals, levees, roadways and other property within said Mattamuskeet Lake Migratory Bird Refuge area. The said agreement, as so supplemented, was entered into by Aubrey Williams, Acting Federal Emergency Relief Administrator, on August 13, 1934. By deed dated October 30, 1934 recorded at Book 56 of Deeds, page 59, Hyde County, North Carolina, records the New Holland Corporation conveyed to the United States all of the lands hereinafter described and platted and shown on the annexed map with the exception of 410.34 acres, more or less, the conveyance of which was delayed pending the approval of title by the Attorney General. The New Holland Corporation on the 20th day of February, 1935, informed the Director of the Land Program of the Federal Emergency Relief Administration that it would not be able to comply with the Attorney General's requirements, and requested that condemnation proceedings be brought in accordance with the provisions of the said agreement.

(3) The lands and property hereinafter described are necessary and required for immediate use by the United States in connection with the construction thereon of useful public works in furtherance of the National Industrial Recovery Program, including headquarters buildings, roads, dikes, dams, and other constructions making the said area suitable for use as a migratory waterfowl refuge. In the opinion of the Federal Emergency Relief Administrator it is necessary and advantageous to the United States that the said lands be acquired by condemnation under judicial process as authorized by Act of Congress approved August 1, 1888 (25 Stat. 257, 258), and in accordance with the provisions of the Declaration of Taking Act hereinabove referred to. In arriving at this determination it is deemed necessary that the lands and property be made immediately available in order that construction contracts may be let and in order that the pumping plant machinery may be removed from the old pumping plant buildings, and the said buildings remodeled and rebuilt for headquarters use. It is also deemed desirable that the estimated award for the lands and property hereinafter described be paid into the registry of the United States District Court in order that the Court may in its discretion make disbursements therefrom as provided in said Declaration of Taking Act.

4. A general description of the lands and property taken follows:

TRACT NO. 1

All the lands excepted from the New Holland Corporation Deed to the United States dated October 30, 1934, Lots 2 and 9, Block 100, consisting of about 2.00 acres, described in Book 40 of Deeds page 35, Hyde County, North Carolina, records: Lot 4, Block 100, about 1.00 acre (Book 40 of Deeds p. 39); Lot 8, Block 107, about .50 acres (Book 40 of Deeds p. 90); Lot 12, Block 115, about 1.07 acres, (Book 40 of Deeds p. 52); Lot 3, Block 103, about 1.00 acre (Book 40 of Deeds p. 348); Lot 4, Block 103, about 1.00 acre (Book 40 of Deeds p. 31); Lot 7, Block 110, about 1.00 acre (Book 40 of Deeds p. 48); Lots 3,4,5, Block 70 about .31 acre (Book 40 of Deeds p. 416); Lot 9, Block 19, about 1.00 acre (Book 40 of Deeds page 322); Lot 5, Block 19, about .13 acre (Book 40 of Deeds p. 110); Lot 6, Block 103, about .33 acre (Book 40 of Deeds p. 337); Lot 1, Block 66, about 1.00 acre (Book 40 of Deeds p. 169); Lot 11, Section 14 E., about 120.00 acres (Book 40 of Deeds p. 174); Lot 12, Section 14 E., about 120.00 acres (Book 40 of Deeds p. 129); Lot 9, Section 42 W., about 120.00 acres (Book 40 of Deeds p. 118); Lots 1,2,3,4,33,34,36, and SE 1/4, Sec. 11, W., about 40 acres (Book 40 of Deeds p. 392); Lots 1 and 2, Block 70, about 2.00 acres (Book 40 of Deeds p. 565).

TRACT NO. 2

All outstanding rights, titles, claims, interest and property, both real and personal, not now owned by the United States of America, in and to the pumping plant, machinery, site, and real estate used, or set apart to be used, in connection therewith, lying and being within Mattamuskeet Lake Wild Life Refuge Area consisting of 49,925.05 acres in Hyde County, North Carolina, described as follows:

THE LAKE MATTAMUSKEET WILD LIFE REFUGE AREA

The survey of the said tract was made in September and October 1934, and all bearings in this description are turned from the true meridian and all distances expressed in chains.

Beginning at Corner No. 1, common to Lands of Jones, Mann & Gibbs and R. W. Harris, in the Mattamuskeet-Swanquarter township line in the east edge of a ditch marked by a 3-in. iron pipe filled with concrete with a brass plug marked "1"; Thence, from said initital point; N. 53degrees 31' W., 102.54 chains, to Corner No. 2; S. 15 degrees 28' W., 29.65 chains, to Corner No. 3; S. 83 degrees 46' W., 6.12 chains, to Corner No. 4; N. 57 degrees 20' W., 34.67 chains, to Corner No. 5; N. 80 degrees 07' W., 53.07 chains, to Corner No. 6; S. 89 degrees 08' W., 23.96 chains, to Corner No. 7; S. 60 degrees 55' W., 26.59 chains, to Corner No. 8; N. 84 degrees 06' W., 40.61 chains, to Corner No. 9; N. 61 degrees 12' W., 60.53 chains, to Corner No. 10; N. 19 degrees 44' W., 26.36 chains, to Corner No. 11; N. 83 degrees 18' E., 2.29 chains, to Corner No. 12; N. 73 degrees 00' E., 110.06 chains, to corner No. 13; N. 1 degree 16' W., 41.76 chains, to corner No. 14; N. 68 degrees 07' W.,76.18 chains, to corner No. 15; S. 66 degrees 59' W., 6.96 chains, to corner No. 16; N. 11 degrees 18' W., 40.13 chains, to corner No. 17; S. 66 degrees 56' W., 2.01 chains, to corner No. 18; N. 11 degrees 17' W., 5.03 chains, to corner No. 19; N. 66 degrees 55' E., 10.26 chains, to corner No. 20; N. 7 degrees 13' E., 47.79 chains, to corner No. 21; N. 6 degrees 29' E., 65.19 chains, to corner No. 22; N. 32 degrees 58' E., 50.52 chains, to corner No. 23; N. 50 degrees 46' E., 18.71 chains, to corner No. 24; N. 73 degrees 57' E., 20.40 chains, to corner No. 25; S. 25 degrees 22' E., 7.72 chains, to corner No. 26; N. 64 degrees 54' E., 12.72 chains, to corner No. 27; S. 83 degrees 44' E., 31.12 chains, to corner No. 28; N. 5 degrees 53' E., 5.49 chains to corner No. 29; S. 85 degrees 25' E., 73.65 chains, to corner No. 30; N. 87 degrees 59' E., 12.06 chains, to corner No. 31; S. 80 degrees 19' E., 7.40 chains to corner No. 32; 69 degrees 31' E., 5.33 chains, to corner No. 33; N. 69 degrees 38' E., 25.66 chains, to corner No. 34; S. 84 degrees 37' E., 38.76 chains, to corner No. 35; S. 73 degrees 15' E., 37.23 chains, to corner

No. 36; S. 46 degrees 57' E., 36.24 chains, to corner No. 37; S. 71 degrees 56' E., 49.05 chains, to corner No. 38; N. 78 degrees 08' E., 67.81 chains, to corner No. 39; N. 15 degrees 12' W., 15.92 chains, to corner No. 40; N. 72 degrees 16' E., 82.25 chains, to corner No. 41; N. 50 degrees 22' E., 14.77 chains, to corner No. 42; N. 83 degrees 38' E., 58.01 chains, to corner No. 43; N. 88 degrees 32' E., 67.48 chains to corner No. 44; N. 50 degrees 34' E., 15.06 chains, to corner No. 45; N. 40 degrees 45' E., 27.01 chains, to corner No. 46; N. 32 degrees 59' E., 22.79 chains, to corner No. 47; N. 48 degrees 54' E., 51.15 chains, to corner No. 48; N. 35 degrees 36' E., 50.60 chains, to corner No. 49; N. 43 degrees 27' E., 30.89 chains, to corner No. 50; N. 69 degrees 17' E., 34.35 chains, to corner No. 51; S. 4 degrees 39' E., 6.02 chains, to corner No. 52; N. 77 degrees 39' E., 9.40 chains, to corner No. 53; S. 89 degrees 21' E., 17.99 chains, to corner No. 54; N. 1 degree 05' W., 4.84 chains, to corner No. 55; S. 77 degrees 25' E., 35.60 chains, to corner No. 56; S. 69 degrees 10' E., 64.04 chains, to corner No. 57; S. 60 degrees 06' E., 40.44 chains, to corner No. 58; N. 16 degrees 43' E., 7.12 chains, to corner No. 59; S. 75 degrees 08' E., 19.39 chains, to corner No. 60; S. 10 degrees 46' W., 13.32 chains, to corner No. 61; S. 61 degrees 03' E., 13.94 chains, to corner No. 62; S. 52 degrees 29' E., 46.79 chains, to corner No. 63; N. 29 degrees 00' E., 3.59 chains, to corner No. 64; S. 59 degrees 11' E., 25.37 chains, to corner No. 65; S. 31 degrees 18' W., 1.57 chains, to corner No. 66; S. 54 degrees 56' E., 12.01 chains, to corner No. 67; S. 32 degrees 43' W., 4.00 chains, to corner No. 68; S. 43 degrees 12' E., 23.16 chains, to corner No. 69; N. 30 degrees 59' E., 9.62 chains, to corner No. 70; S. 53 degrees 56' E., 2.24 chains, to corner No. 71; S. 30 degrees 45' W., 18.69 chains, to corner No. 72; S. 36 degrees 36' E., 12.13 chains, to corner No. 73; S. 42 degrees 19' E., 19.72 chains, to corner No. 74; S. 45 degrees 22' E., 22.73 chains, to corner No. 75; S. 37 degrees 02' E., 39.44 chains, to corner No. 76; S. 30 degrees 27' E., 27.30 chains, to corner No. 77; S. 22 degrees 42' E., 23.62 chains, to corner No. 78; S. 64 degrees 24' W., 3.64 chains, to corner No. 79; S. 21 degrees 27' E., 32.36 chains, to corner No. 80; S. 12 degrees 48' E., 11.38 chains to corner No. 81; S. 17 degrees 32' E. 14.20 chains, to corner No. 82; S. 9 degrees 19' W., 20.43 chains, to corner No. 83; S. 20 degrees 01' W., 23.84 chains, to corner No. 84; S. 40 degrees 59' W., 26.55 chains, to corner No. 85; S. 38 degrees 10' W., 49.18 chains, to corner No. 86; S. 31 degrees 22' W., 15.78 chains, to corner No. 87; S. 60 degrees 04' W., 10.68 chains, to corner No. 88; S. 48 degrees 41' W., 12.18 chains to corner No. 89; S. 59 degrees 39' W., 27.62 chains, to corner No. 90; S. 68 degrees 11' W., 4.18 chains, to corner No. 91; S. 68 degrees 20' W., 1.87 chains, to corner No. 92; S. 79 degrees 21' W., 67.03 chains, to corner No. 93; S. 89 degrees 37' W., 14.47 chains, to corner No. 94; S. 82 degrees 14' W., 9.40 chains, to corner No. 95; S. 75 degrees 00' W., 19.44 chains, to corner No. 96; S. 67 degrees 37' W., 16.73 chains, to corner No. 97; S. 79 degrees 21' W., 28.16 chains, to corner No. 98; N. 81 degrees 43' W., 22.69 chains, to corner No. 99; S. 50 degrees 14' W., 8.13 chains, to corner No. 100; S. 38 degrees 56' W., 28.74 chains, to corner No. 101; S. 36 degrees 45' W., 24.41 chains, to corner No. 102; S. 35 degrees 12' W., 23.69 chains to corner No. 103; S. 29 degrees 04' W., 35.21 chains, to corner No. 104; S. 76 degrees 51' W., 13.64 chains, to corner No. 105; S. 65 degrees 19' W., 3.31 chains, to corner No. 106; S. 65 degrees 20' W., 30.88 chains, to corner No. 107; S. 61 degrees 24' W., 15.19 chains, to corner No. 108; S. 22 degrees 53' E., 7.60 chains, to corner No. 109; S. 80 degrees 05' W., 180.96 chains, to corner No. 110; S. 88 degrees 45' W., 144.97 chains, to corner No. 111; N. 74 degrees 47' W., 16.68 chains, to corner No. 112; N. 81 degrees 05' W., 40.22 chains, to corner No. 113; N. 75 degrees 06' W., 33.53 chains, to corner No. 114; N. 65 degrees 48' W., 43.88 chains, to corner No. 115; N. 54 degrees 43' W., 31.93 chains, to corner No. 116; S. 23 degrees 27' W., 9.10 chains, to the place of beginning; containing 49,925.05 acres, be the same more or less.

5. The estate taken for said public uses is the full fee simple title thereto.

6. A plat showing the lands taken is annexed hereto as schedule A, and made a part hereof.

and property with all improvements thereon and all appurtenances thereto and including any and all interests whatsoever in said lands and property other than that of the United States of America is Two Thousand Five Hundred Eighty-five Dollars and Fourteen Cents ($2,585.14), which sum is hereby deposited in this Honorable Court for the use and benefit of persons entitled thereto. In arriving at this estimate consideration has been given to the fact that the New Holland Corporation obtained a judgment for $74,350.73 at the October term 1934 of the Hyde County Superior Court against the Board of Drainage Commissioners of the Mattamuskeet District, which judgment represents advancements heretofore made to the said Drainage District by the New Holland Corporation, and that said judgment is enforceable against all property of the said Drainage District lying within the boundaries undertaken to be conveyed by the New Holland Corporation to the United States of America.

5. In my opinion the ultimate award for said lands and property will not exceed the amount authorized to be expended therefor.

IN WITNESS WHEREOF, I have signed this Declaration of Taking on this 16th day of March, 1935, at Washington in the District of Columbia.

(Signed) HARRY L. HOPKINS
Federal Emergency Relief Administrator.

Form 40

NOTICE OF SETTLEMENT OF CLAIM

A-50989

Certificate No. 0344079

GENERAL ACCOUNTING OFFICE

Claim No. 0265493

Washington, D. C., DEC 3 1934, 193

Misc.

New Holland Corporation,
c/o The Attorney General of the
United States,
Washington, D. C.

Warrants to issue
as noted below:

I have certified that there is due you from the United States, payable from the appropriation(s) indicated, the sum of
THREE HUNDRED ELEVEN THOUSAND NINE HUNDRED
FORTY-TWO AND 67/100 Dollars ($311,942.67)
on account of

the acquisition of a tract of land in Hyde County, North Carolina to be acquired as a migratory bird refuge.

03/5671 National Industrial Recovery, 1933-1935, Federal Emergency Relief Administration - Surplus Relief.

Warrants to issue:-
One for $5,000, one for $10,000 and one for $296,942.67 to be transmitted to the Attorney General of the United States for delivery to the payee upon the vesting in the United States of a valid fee simple title to the land conveyed, free of all encumbrances.

The inclosed Treasury check is in settlement of said claim(s).

J. R. McCARL,
Comptroller General of the United States.

By J. H. Roe

To claimant(s).

NOTE.—If this settlement is believed to be incorrect in any particular and the matters relied upon by claimant to support such view are clearly stated in a request for review filed with the Comptroller General of the United States at Washington, D. C., within one year from the date hereof, the settlement will thereupon be reviewed under his personal supervision. The inclosed check should not be cashed if its amount includes any item upon which review is requested, but unindorsed should accompany the request for review.

33-104-34-1

16—35a U. S. GOVERNMENT PRINTING OFFICE: 1930

File: LB-NC 14-1

OFFICE OF THE ATTORNEY GENERAL

WASHINGTON, D. C.

February 15, 1938.

Honorable Henry A. Wallace,
Secretary of Agriculture,
Washington, D. C.

Dear Mr. Secretary:

I have the honor to report the final examination of the abstract of title, other related papers and the transcript of record in proceedings entitled United States of America v. 49,925.05 Acres of land in Hyde County, North Carolina, Mattamuskeet Drainage District, et al., No. 321-L at Law, in the District Court of the United States for the Eastern District of North Carolina, Washington Division, concerning the acquisition, under the provisions of existing legislation for use in connection with the Lake Mattamuskeet Migratory Bird Refuge project, of 410.34 acres of land in Hyde County, North Carolina, and all outstanding rights, titles, claims, interest and property, both real and personal, not owned by the United States, in and to the pumping plant, machinery, site and real estate used or set apart to be used in connection therewith, lying and being within the exterior lines of the said 49,925.05 acres of land.

The amount of the award is $2,685.14.

The land and property rights acquired are more particularly described in the copy of the declaration of taking contained in said transcript.

The abstract of title was prepared by O. L. Williams, Esquire, Attorney at Law, and W. B. Rodman, Jr., Esquire, Attorney at Law, and the final certificate of Mr. Williams, dated October 30, 1936, is in satisfactory form.

Copy

Hood Stone
Land Utilization Division

May 4, 1938

As disclosed by the abstract of title, other related papers and the transcript of said proceedings, I find that the condemnation proceedings have been conducted regularly and that a valid title to said land and property rights is vested in the United States of America, subject to the rights of the owners of the lands originally situated within the boundaries of the Mattamuskeet Drainage District to have their lands drain into Mattamuskeet Lake as such lands did drain or could have drained prior to the creation of the District without charge or expense.

The abstract of title, original deed from the New Holland Corporation to the United States of America, transcript of record, receipt of the Clerk of the Court for the award, and related papers are enclosed.

Respectfully,

/s/ Homer Cummings

Attorney General.

Appendix B

Establishment and Repeal of Mattamuskeet Drainage District One

five of North Carolina: *Provided further,* that the State Board Education shall deduct from said appropriation biennially the sum of seven thousand five hundred dollars for rural libraries, as provided in section four thousand one hundred and seventy-nine of the Revisal of one thousand nine hundred and five of North Carolina."

Proviso: sum retained for rural libraries.

Sec. 3. That no county needing aid from this appropriation for a four-months school term in every district shall receive any funds therefrom until it shall have levied the special tax herein required of it for that purpose.

Counties not to receive aid unless levying special tax.

Sec. 4. That all laws and clauses of laws in conflict with this act be and the same are hereby repealed.

Sec. 5. That this act shall be in force from and after its ratification.

Ratified this 5th day of March, A. D. 1909.

CHAPTER 509.

AN ACT TO AUTHORIZE THE STATE BOARD OF EDUCATION TO UNITE WITH CERTAIN LANDOWNERS IN HYDE COUNTY IN ESTABLISHING A DRAINAGE DISTRICT, INCLUDING MATTAMUSKEET LAKE AND THE LANDS ADJACENT THERETO.

The General Assembly of North Carolina do enact:

Section 1. The State Board of Education is hereby authorized to unite with the owners of the lands adjacent to Mattamuskeet Lake, in Hyde County, in a petition to establish a drainage district which shall include the lands covered by the waters of said lake and the lands adjacent thereto; the said petition to be filed in accordance with the terms and provisions, except hereinafter modified, of the general drainage law enacted at this session of the General Assembly.

State board of education authorized to unite in petition.

Sec. 2. The classification of lands according to benefits received, as set forth in sections twelve and thirty-one of said drainage law, shall not apply to the lands owned by the State Board of Education, but shall apply to all other lands in said drainage district. The State of North Carolina is to pay three-fourths (¾) of the total costs of establishing said drainage district and draining and diking the lands included in said district, but in no event shall the State pay more than three hundred thousand dollars ($300,000).

Classification of lands.

State to pay three-fourths of costs.

Limit of amount.

Sec. 3. Two members of the board of drainage commissioners provided for in section nineteen of the general drainage law shall be appointed by the State Board of Education and one appointed

Appointment of drainage commissioners.

Corporate name

by the court before which the petition is filed. The corporate name of said district shall be the "Board of Drainage Commissioners of Mattamuskeet District," and the State Treasurer shall be the *ex officio* treasurer of said board.

Cost of repairs and maintenance.

Sec. 4. After the lands in said drainage district are drained and diked, the costs of repairs and maintenance shall be borne equally by all the lands in said district.

Payment of interest on bonds.

Sec. 5. The interest on the bonds provided for in section thirty-four of the general law shall for three years be paid by the Board of Drainage Commissioners of Mattamuskeet District out of the general funds in the hands of said board. The State of North Carolina shall be liable for only three-fourths (¾) of the face value of said bonds, and a statement to this effect must be written on the face of said bonds. Said bonds shall not be sold for less than par and accrued interest at the time of sale. The State shall be reimbursed by the State Board of Education for all money it expends on said drainage district, with interest at six (6) per cent on the same, out of the first proceeds that the State Board of Education shall receive from the sale of lands in said drainage district.

Limit of liability of state.

Bonds not to be sold below par. Reimbursement to state.

Land of state and of board of education discharged of lien.

State discharged of liability.

Sec. 6. When the State shall pay the three-fourths (¾) of the total costs of said improvements assumed by it, its land and the land of the State Board of Education shall be forever discharged from all lien or claim on account of said bonds; and if the State shall, after said lands are drained and diked, sell the said lands or any part thereof, it shall be discharged from any and all liability for costs of maintenance and improvements, the said costs for improvements to be collected out of the land itself.

Action discretionary with board of education.

Sec. 7. It is not mandatory upon the State Board of Education to unite in the petition mentioned in section one hereof, but it may do so, or may make such other disposition of its lands under and adjacent to Mattamuskeet Lake as it may deem proper.

Sec. 8. This act shall be in force from and after its ratification.

Ratified this the 5th day of March, A. D. 1909.

CHAPTER 510.

AN ACT TO ISSUE BONDS TO CARRY OUT THE ACT OF 1907, FOR THE CARE OF THE INSANE OF THE STATE.

Preamble.

Whereas a bill was introduced in the General Assembly of one thousand nine hundred and seven carrying an appropriation of five hundred thousand dollars ($500,000) to be expended by a State Hospital Commission in providing for the care of all the mental defectives of the State; and whereas said bill provided for bonds to be issued by this State to the amount of said appropria-

Preamble.

SUBCHAPTER IVA. REPEALS.

Article 26A.

Repeal of Acts.

§ 113-377.8. Repeal of certain public, public-local, special and private acts.

The following public, public-local, special and private acts are hereby repealed: Chapter 36 of the Public Laws of 1901; Chapter 113 of the Public Laws of 1901; Chapter 260 of the Public Laws of 1901; Chapter 308 of the Public Laws of 1901; Chapter 326 of the Public Laws of 1901; Chapter 370 of the Public Laws of 1901; Chapter 431 of the Public Laws of 1901; Chapter 435 of the Public Laws of 1901; Chapter 475 of the Public Laws of 1901; Chapter 589 of the Public Laws of 1901; Chapter 673 of the Public Laws of 1901; Chapter 702 of the Public Laws of 1901; Chapter 771 of the Public Laws of 1901; Chapter 131 of the Public Laws of 1903; Chapter 414 of the Public Laws of 1903; Chapter 520 of the Public Laws of 1903; Chapter 631 of the Public Laws of 1903; Chapter 650 of the Public Laws of 1903; Chapter 658 of the Public Laws of 1903; Chapter 668 of the Public Laws of 1903; Chapter 732 of the Public Laws of 1903; Chapter 752 of the Public Laws of 1903; Chapter 86 of the Public Laws of 1905; Chapter 265 of the Public Laws of 1905; Chapter 283 of the Public Laws of 1905; Chapter 351 of the Public Laws of 1905; Chapter 363 of the Public Laws of 1905; Chapter 500 of the Public Laws of 1905; Chapter 560 of the Public Laws of 1905; Chapter 386 of the Public Laws of 1907; Chapter 572 of the Public Laws of 1907; Chapter 690 of the Public Laws of 1907; Chapter 811 of the Public Laws of 1907; Chapter 977 of the Public Laws of 1907; Chapter 426 of the Public Laws of 1909; Chapter 466 of the Public Laws of 1909; Chapter 585 of the Public Laws of 1909; Chapter 755 of the Public Laws of 1909; Chapter 871 of the Public Laws of 1909; Chapter 525 of the Public-Local Laws of 1911; Chapter 547 of the Public-Local Laws of 1911; Chapter 572 of the Public-Local Laws of 1913; Chapter 587 of the Public-Local Laws of 1913; Chapter 402 of the Private Laws of 1913; Chapter 58 of the Public-Local Laws, Extra Session of 1913; Chapter 211 of the Public-Local Laws, Extra Session of 1913; Chapter 30 of the Public Laws of 1915; Chapter 180 of the Public Laws of 1915; Chapter 610 of the Public-Local Laws of 1915; Chapter 599 of the Public-Local Laws of 1917; Chapter 202 of the Public-Local Laws, Extra Session 1920; Chapter 114 of the Public-Local Laws of 1921; Chapter 384 of the Public-Local Laws of 1921; Chapter 432 of the Public-Local Laws of 1921; Chapter 439 of the Public-Local Laws of 1921; Chapter 157 of the Public-Local Laws, Extra Session of 1921; Chapter 130 of the Public-Local Laws of 1923; Chapter 352 of the Public-Local Laws of 1923; Chapter 533 of the Public-Local Laws of 1923; Chapter 548 of the Public-Local Laws of 1923; Chapter 461 of the Public-Local Laws of 1925; Chapter 623 of the Public-Local Laws of 1925; Chapter 228 of the Public-Local Laws of 1927; Chapter 208 of the Public-Local Laws of 1929; Chapter 42 of the Public Laws of 1933; Chapter 51 of the Public Laws of 1933; Chapter 241 of the Public-Local Laws of 1933; Chapter 575 of the Public-Local Laws of 1933; Chapter 365 of the Public-Local Laws of 1935; Chapter 368 of the Public-Local Laws of 1935; Chapter 509 of the Public-Local Laws of 1935; Chapter 513 of the Public-Local Laws of 1935; Chapter 352 of the Public Laws of 1937; Chapter 266 of the Public-Local Laws of 1937; Chapter 632 of the Public-Local Laws of 1937; Chapter 265 of the Public Laws of 1939; Chapter 138 of the Public-Local Laws of 1939; Chapter 179 of the Public-Local Laws of 1939; Chapter 335 of the Public-Local Laws of 1941; Chapter 221 of the Special Laws of 1947; Chapter 485 of the Special Laws of 1947; Chapter 1017 of the Special Laws of 1947; Chapter 1031 of the Special Laws of 1949.

Provided that any public, public-local, special or private law herein repealed may be covered by a regulation of the Board of Conservation and Development to effectuate the same privileges or protection therein provided upon the petition of either the representative or senator from that county or district filed within six months from the date of ratification. (1951, c. 1045, s. 2.)

Appendix C

Historic Timeline of Watershed Development Activities

A History of Development Within Lake Mattamuskeet and Surrounding Watershed

1800s Watershed Boundary

360-1584- Inputs of organic matter into the lake from the surrounding catchment is extremely limited leaving Lake Mattamuskeet with clear water, a sandy lakebed and few nutrients to support aquatic plant growth. [6]

1773- Lake Mattamuskeet covers 110,000 acres and is 6-9' deep. An attempt by the Provincial Congress to dig a canal to Pamlico Sound fails, along with another attempt by an appointed drainage board in 1789. [2, 3]

1825- The NC legislature gifts ownership of the lake to the State Literary Board with the expectation they will improve and sell the surrounding lands to support public education. [2, 3]

Late 1830's- The State Literary Board assigns $200,000 ($4.5 million today) to the construction of canals to drain Mattamuskeet, Pungo and New Lakes. [3]

1838- Lake Landing Drainage Canal is dug by hand approximately 10-15' deep and 15-25' wide extending 7 miles from Lake Mattamuskeet to Pamlico Sound at Wysocking Bay. When complete, drainage to the sound reduces the lake from 110,000 to 55,000 acres. [2, 3]

1849- Fairfield Canal is dug north to the Alligator River, providing drainage and transportation for the city of Fairfield. [3]

Drainage District 1 Influenced Watershed Boundary

1860- **Heightened European settlement and land alterations dramatically increase organic matter input to the lake.** These nutrients support the growth of phytoplankton within the lake over the following decades. [3, 4, 6]

1909- NC Public Law 509 is passed authorizing the State Board of Education and around 550 Hyde County landowners to establish the Mattamuskeet Drainage District. The district is overseen by a Board of Commissioners to drain the lake and provide additional drainage for approximately 50,000 acres of surrounding private owned farmland. [2, 3]

1911- Lake Mattamuskeet is sold to the Southern Land Reclamation Company (SLRC) who layout a plan to subdivide the lakebed into commercial and residential properties and develop a town.[3]

1913- The Board of Commissioners drafts a drainage plan and hires A.V. Wills & Sons to construct Outfall Canal, 76 miles of canals interior to the lake and a pumping plant.[2, 3]

1914- Outfall Canal is constructed via mechanical dredge at 7 miles long, 60' wide at the base and 70' wide at the top. [2, 3]

1916- A steam powered pumping station is built at the north end of Outfall Canal. The SLRC, now called New Holland Farms, Inc., reclaims around 20,000 acres of the lakebed and develops the town of New Holland. [2, 3]

1918- Due to financial strain and pump failures, the real estate project is sold to North Carolina Farms who encounter the same problems after draining the lake in 1920. [3]

1919- Construction on the revised 1913 drainage plan is completed, resulting in 130 miles of canals along the lakebed. [2]

1920-1923- Roads in New Holland are laid out and graded. By 1923, 125 people live in the town of New Holland. [2]

1921- The 35-mile New Holland, Higginsport and Mt. Vernon Railroad extending from Wenona in Washington County to the pumping plant at New Holland opens its doors to passengers .[2]

1923- The state acquires NC Farms and the Mattamuskeet Drainage District after the company declares bankruptcy and the district is unable to collect drainage tax and continue operations. The pumping plant is shut down. [2]

1926- The project is purchased by New Holland Corporation who abandon the earlier plan of selling parcels of the lakebed as real estate and instead pump the lake and transition the lakebed into a large commercial farm. [2]

1928- **Construction of the Alligator/Pungo cut of the Atlantic Intracoastal Waterway (AIWW) is completed** raising issues of flooding and saltwater intrusion around Fairfield. [2, 5, 10]

1930- Lateral canals along the lakebed are now excavated using ditching machines instead of day laborers. [2]

1933- The latest farming project is abandoned. As water levels rise, large-mouth bass, black crappie and white perch enter the lake from surrounding canals when gates open in winter, creating sportfishing opportunities within the lake.[3]

Drainage District 1 Influenced Watershed Boundary

1934- **Lake Mattamuskeet Migratory Waterfowl Refuge is formed** when the Government purchases 49,925 acres from New Holland Corporation. Owners within the original boundary of the Mattamuskeet Drainage District retain the right to drain into the lake. Despite turbid water conditions, refuge managers begin transplanting submerged aquatic vegetation (SAV) along the lakebed to improve habitat for migratory birds.[4, 7, 11]

1937- Waupoppin Canal is constructed via mechanical dredge, improving flow to Pamlico Sound and lowering lake levels. Sport fishing declines as fish populations shift from large-mouth bass and crappie to perch and carp. [1, 3, 4]

1940-1949- The refuge initiates a carp removal program to improve water clarity and support fish diversity. Local fishermen are employed by the refuge to use pound or fyke nets. No net reduction in population is measured.[1]

1942- **NC Highway 94 is completed dividing the lake into two basins.** [4]

1948- The Corps of Engineers reviews saltwater intrusion and flooding issues associated with the AIWW. The review finds the AIWW is not solely responsible, but recommends corrective works be provided to Fairfield at federal expense. [10]

1949- Around 100,000 striped bass fingerlings from Weldon Hatchery are distributed within Lake Mattamuskeet.[12]

1949-1952- Drag seines used for carp removal combined with a series of lake drawdowns during the summer, which occurred naturally via gravity flow once flashboards were pulled, increases biomass of carp removed. Over 1.6 million pounds of carp and 1 million pounds of catfish are removed from the lake and surrounding canals. Rose Bay Canal is constructed via mechanical dredge in 1950. [1, 3, 6, 11]

1951-1952- Carp and catfish removal improves water clarity and 15,000 acres of SAV volunteer along the lakebed. Emergent vegetation attractive to waterfowl expands along the shoreline. [1, 4]

1955- The Civil Works Appropriation Bill authorizes funding for the construction of a pumping plant and dam with control gates on Fairfield Canal near the Intracoastal Waterway. [10]

1958- Fairfield Drainage District is established to prevent saltwater intrusion and flooding from the AIWW. [10]

1960- Phytoplankton remain dominant within the west basin of the lake while macrophytes, such as SAV, dominate the east basin. Lake grasses are now considered an important part of the lake Mattamuskeet ecosystem. [4, 11]

Current Watershed Boundary

1980- **Water quality parameters associated with eutrophication are measured within the lake.** These parameters include chlorophyll a, total phosphorous and nitrogen, total suspended solids, turbidity and pH.[4]

Mid 1990's- SAV loss begins within deep regions of the west basin.[4]

1998-2003- Large expanses of lakebed are exposed due to extended drought. In 2003, substantial rainfall increases lake levels.[11]

2002- Samples of chlorophyll *a* and pH exceed state guidelines for the first time since sampling began in 1981. [4]

2008- An extensive fish kill occurs within the lake due to algal blooms resulting in low levels of dissolved oxygen. [SOURCE]

2012- The refuge initiates a water quality monitoring program in collaboration with NCDWR and USGS. Real time monitoring stations across the lake measure water level, clarity, dissolved oxygen, pH, temperature, salinity and conductivity. Monthly during the growing season, grab samples are analyzed for chlorophyll *a,* nutrients and suspended solids and occasional testing of pesticides and cyanotoxins begins. [4, 9, 11]

2012-2015- 68% of chlorophyll *a* and 32% of daily median pH samples exceed state guidelines; turbidity samples exceed state guidelines for the first time.[4]

2013-2014- SAV loss begins within deep regions of the east basin following a sharp decline in water quality due to increased suspended sediments, nutrients and phytoplankton. [4]

2014- The USFWS and NCWRC form the Mattamuskeet Collaboration Team, tasked with establishing goals and actions to address the conservation challenges of the reserve and Lake Mattamuskeet. The Mattamuskeet Technical Working Group, consisting of scientists from both agencies, is formed and tasked with identifying approaches to improving lake water quality. [11]

2016- **The lake is listed as an EPA 303(d) Impaired Water due to elevated pH and chlorophyll *a* levels.[4, 8]**

2017- USFWS, NCWRC, and Hyde County fund the development of a Mattamuskeet Watershed Restoration Plan. Monitoring results suggest no significant difference in water quality between the two basins as previously reported and surveys conducted by the USFWS indicate that all SAV is effectively gone from both basins.[4, 6, 11]

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Appendix D

Lake Mattamuskeet Watershed Restoration Plan Development

Lake Mattamuskeet Watershed Restoration Plan
Core Stakeholders/Project Team Roles and Responsibilities- FINAL 9.25.17

Core Stakeholders Charge

The Core Stakeholders of the Lake Mattamuskeet Watershed Restoration Planning process are responsible for directing the development of a watershed restoration plan for the Lake and its surrounding watershed and representing the various viewpoints, uses and goals of the Lake watershed's many stakeholders. They will serve as a sounding board and advisory committee for the duration of the plan development and prioritize key action items for inclusion in the final plan. Core Stakeholder's roles and responsibilities will include:

- Provide a wide range of backgrounds and ideas that will help to inform the plan development;
- Engage with the community and facilitate two-way information sharing throughout the plan development;
- Establish ground rules and expectations for the group dynamics;
- Agree upon meeting frequency and commit to attending all stakeholder and public meetings for the duration of the plan development (18 months);
- Provide guidance and recommendations on actions necessary to adequately protect, manage and restore the Lake and its surrounding watershed to include: assist in filling data gaps, identify strategies and recommend future research or management needs;
- Help to identify key community members that could provide additional insight and guidance in developing action items to include in the plan;
- Provide advice on the agenda for public meetings;
- Provide guidance and review of work products;
- Prioritize action items to include in the final *Watershed Restoration Plan*;
- Provide timely review (i.e. within one week of receiving), edits and approval throughout the plan development to the following:
    - Stakeholder and public meeting notes;
    - Versions of the *Watershed Restoration Plan* as it evolves;
    - Additional communications pieces developed for the plan- such as the plan summary and press releases.

Meeting Frequency

It is anticipated that the Core Stakeholders will meet on a regular basis, at a minimum once between public stakeholder meetings, at a maximum monthly. Attendance at the quarterly public meetings is also required.

Composition

The Stakeholder group will have no more than 11 members. Members are selected by Hyde County Soil and Water and Hyde County based on their ability to represent the following stakeholders:

- Hyde County Government
- Hyde County Soil and Water Board
- U.S. Fish and Wildlife Service
- N.C. Wildlife Resources Commission
- Representatives from residential communities (Fairfield, St. Lydia and North Lake Road)
- Representatives from farming community
- Representatives from waterfowl impoundment owners
- Representative from Hospitality Business owners
- Representatives from Fairfield Drainage District
- N.C. Department of Transportation (advisory role)
- Army Corps of Engineers (advisory role)
- Natural Resources Conservation Service (advisory role)

Members Include:

Name	Stakeholder Group Represented	Phone Number(s)	Email
Daniel Brinn	Hyde Drainage	252 926 7253 (o) 252 943-7973 (m)	dbrinn@hydecountync.gov
Michael Cahoon	Farming Community	252 944-5384	Michaelcahoon1961@gmail.com
Pete Campbell	U.S. Fish and Wildlife Service, Mattamuskeet National Wildlife Refuge	252 926 4021 (o) 252 944-6495 (m)	Pete_campbell@fws.gov
Doug Howell	N.C. Wildlife Resources Commission	252 482 5943 (o) 252 287 5694 (m)	Doug.howell@ncwildlife.org
Art Keeney	Residential Community	252 925-1084 (h) 252 945-6660 (m)	Art.keeney@yahoo.com
Bill Rich	Hyde County	252 333-2596 (m)	brich@hydecountync.gov
Ben Simmons	Farming Community Fairfield Drainage District	252 944-3070 (m)	twsbcsiii@aol.com
Pat Simmons	Hospitality Industry		
JW Spencer	Hyde Soil and Water Board	252 926-4061 (h) 252 944-6793 (m)	Jwspencer6793@gmail.com
James Topping	Residential	252 943-4214	Ruggedhunter14@gmail.com
Joey Ben Williams	Impoundments	252 944-3807(m)	williamsfarm@embarqmail.com

Technical advisors include: Kris Noble, Drs. Michelle Moorman, Randall Etheridge and Mike Piehler, additional advisors will be identified

Staff support includes: Erin Fleckenstein, Todd Miller, Linda D'Anna (contractor)

Lake Mattamuskeet Watershed Restoration Plan

Project Team Meeting

May 2, 2017
11:00-12:30
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

11:00 am Welcome, Introductions

11:05 am Review Memorandum of Agreement

11:15 am Communications Discussion
- Webpage
- Press Releases
- Email Lists

11:35 am Calendar
- Monthly Core Project Team Meetings- in person or via phone: propose next meeting on June 5th 3:00 p.m.
- Technical Advisors- TWG plus additional advisors as needed
- Draft schedule of Public Meetings
  7:30 pm at Mattamuskeet School Cafeteria
  - June 27, 2017
  - October 3, 2017
  - January 16, 2018
  - April 24, 2018
  - June 19, 2018
  - September 18, 2018

12:00 pm Introduce Linda D'Anna
- Background and Interest
- Questions from Project Partners

12:10 pm Discussion of plan for first month- month and a half

12:25 pm Wrap up and Next Steps

12:30 pm Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Project Team Meeting

June 8, 2017
10:00-2:30
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

10:00 am	Welcome, Introductions
10:05 am	Review/Approve Previous Meeting Minutes
10:10 am	Review/Finalize Procedural Questions- Erin - Stakeholder List- process for finalizing composition - Review Draft Roles/Responsibilities - Contact Information for Stakeholders
10:45 am	Review Communications Pieces- Caroline - Press Release - Flyer - Webpage
11:30 am	Review Possible Interview Questions/Generate Interviewee list- Linda
12:15 pm	Lunch
1:00 pm	Preview Watershed Mapping Products- Mackenzie Taggart
2:00 pm	Discuss Draft Agenda for June 27 public meeting
2:30 pm	Wrap up and Next Steps
2:45 pm	Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting

June 27, 2017
5:00-7:30 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

5:00 pm	Stakeholder Team Dinner
5:30 pm	Meeting Commences- Welcome and Introductions
5:35 pm	Project Overview/Recap - Overview of signed MOA
5:45 pm	Project Timeline and Milestones- Coastal Federation -Work Undertaken since last public meeting
6:00 pm	Stakeholder Roles/Responsibilities- Erin
6:15 pm	Review Communications Pieces
6:30 pm	Overview of Interview Process and Goals- Linda
6:45 pm	Overview of Mapping Products/Watershed Characterization- MacKenzie
7:00 pm	Questions/Discussion of any clarification needed
7:15 pm	Discuss Draft Agenda for August 8 public meeting -Review future public meeting schedule
7:25 pm	Wrap up and Next Steps - Set next stakeholder meeting
7:30 pm	Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting

August 8, 2017

4:00-6:30 p.m.

Hyde County Government Complex

30 Oyster Creek

Swan Quarter, NC 27885

4:00 p.m.	Welcome and Introductions, as needed
4:05 p.m.	Committee Chair
4:10 p.m.	Overview- Outline of Watershed Restoration Plan Report Elements
4:20 p.m.	Watershed Characteristics
4:40 p.m.	Timeline of Lake Management and Water Quality Concerns
5:00 p.m.	Possible Actions to be evaluated, ideas presented to date
5:45 p.m.	Update on Public Interview Process- Linda D'Anna
5:55 p.m.	Set Next Stakeholder Meeting Date
6:00-6:30 p.m.	Dinner, provided
7:00 p.m.	Public Meeting

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting

October 4, 2017
4:00-6:00 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

4:00 p.m.	Welcome/Call to Order- Bill Rich
4:05 p.m.	Overview and approval of previous meeting minutes- Bill Rich
4:10 p.m.	Set Key Goals and Develop Preliminary List of Benchmarks for Lake Mattamuskeet Watershed Plan- Erin/Todd - Improve Water Quality - Prevent Problem Floods - Maintain Existing Uses of Lake and Watershed
4:45 p.m.	Review/Discuss Public Comments received to-date- Group Discussion
5:30 p.m.	Other Project Updates - Mapping/Watershed Characterization/Timeline updates- MacKenzie - Public Interview process- Linda - Additional follow up from August public meeting- Erin
5:45 p.m.	Proposed November Public Meeting Agenda Topics- Erin - Water quality status and trends (research updates) - Present stakeholder's proposed goals discussion - Map sub-watershed/catchment areas?
5:55 p.m.	Confirm Next Stakeholder Meeting Date/Time November 7, 2017 4:00 p.m.
6:00 p.m.	Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting

November 7, 2017
3:30-5:30 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

3:30 p.m.	Welcome/Call to Order- Bill
3:35 p.m.	Overview and Approval of Previous Meeting Minutes- Bill
3:40 p.m.	Discuss Summary Goal Statements and Preliminary Benchmarks- Erin
4:20 p.m.	Review Updated Timeline and Watershed Characterization- MacKenzie
4:50 p.m.	Story Map Overview- Michael
5:05 p.m.	Update on Public Interviews Conducted to-date- Linda
5:15 p.m.	Additional Public Engagement- Margaret Garner
5:20 p.m.	Review any Coordination Needed for Public Meeting
5:25 p.m.	Confirm Next Stakeholder Meeting Date/Time January xx, 2018 4:00 p.m. Next Public Meeting- February 6, 2018
5:30 p.m.	Adjourn to Dinner
7:00 p.m.	Public Meeting Begins

Agenda for Core Stakeholder Meeting
with Technical Working Group Members
Jan. 30, 2018
9:00-4:00 pm
Mattamuskeet NWR Conference Room

Intention for the meeting:

- All of the watershed restoration plan core stakeholders will feel grounded in the science being conducted within the lake watershed that supports the development of a watershed restoration plan.
    - Understanding the research and results of the work that have been conducted on the lake and surrounding watershed and
    - Understanding the proposed future research being conducted within the watershed and how it will contribute to the development of the plan.
- Causes of the water quality impairment and water level concerns, if known, will be detailed and discussed
- Preliminary discussions about various best management practices (moist soil management; carp removal and sediment removal will be discussed)
- Future meetings/presentations will focus on remedial actions, steps that can be taken to improve the lake water level and water quality and the feasibility of these actions.

Agenda

1) **9:00-9:15:** Introduction/ Ground Rules (15 minutes) : Coastal Fed

2) **9:15 – 10:00**: Stakeholders lay out importance of the lake to them, concerns and values

3) **10**:**00-10:10**: Hydrology (10 minutes)
    a. What is the Mattamuskeet watershed?
    b. How much water is in Lake Mattamuskeet?

4) **10:10- 11:00**: Field trip (Outfall WCS): Operation of tide gates and what we know about them and their influence on flows

5) **11:00- 11:20:** Hydrology II (5 min w/ 15 minutes Q/A; 5 minutes eval)
    a. The Lake Mattamuskeet Water Budget – a discussion of where the water comes from and where it goes in Lake Mattamuskeet

6) **11:30 – 12:05:** Water-quality (10 minutes w/ 20 minutes for Q/A; 5 minutes eval)
    a. Why are we concerned about water quality at Lake Mattamuskeet?
    b. What water quality trends have been observed in the Lake?

7) **12:05-12:45 pm: Lunch**

8) **12:45 – 3:00 pm:** On-going research that can inform our selection of BMPs: Speed presentation (5 minutes)/Questions (15 minutes)
    a. What do we know? And what don't we know?
    b. What are we going to learn that will help guide the restoration process? And when will we know it?
    c. What data gaps are we going to be left with?
        i. Joe Fuller: Moist Soil Management
        ii. Dr. Michael Piehler's: SAV restoration and in-lake nutrient sources
        iii. Dr. Jesse Fisher: Carp removal
        iv. Dr. Randall Etheridge's: Watershed inputs (from duck impoundments) and canal flow research
        v. Dr. Greg Cope: Pesticides

9) **3:00-3:15 pm: Evaluations/Break**

10) **3:15 – 4:00 pm:** Open Group discussion: Coastal Federation will facilitate and evaluations will be completed

11) **Adjourn**

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting

February 6, 2018
4:30-5:30 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

4:30 p.m.	Welcome/Call to Order- Bill
4:35 p.m.	Overview and Approval of Previous Meeting Minutes- Bill
4:40 p.m.	Update from Joint TWG-Stakeholder meeting- Bill/Erin -how to view presentations from meeting
4:45 p.m.	Review Plan Development Timeline -Erin
4:55 p.m.	Story Map Overview- Michael
5:10 p.m.	Update on Public Interviews Conducted to-date- Linda
5:15 p.m.	Review draft fact sheet on SAV- Tentative Item- Michelle Moorman
5:20 p.m.	Review any Coordination Needed for Public Meeting
5:25 p.m.	Confirm Next Stakeholder Meeting Date/Time February xx, 2018 Next Public Meeting May
5:30 p.m.	Adjourn to Dinner

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting Agenda

March 28, 2018
3:00-5:00 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

3:00 p.m.	Welcome/Call to Order- Bill Rich
3:05 p.m.	Overview and Approval of Previous Meeting Minutes- Bill Rich
3:10 p.m.	Public Interviews- Summary of Results and Discussion- Linda D'Anna
3:45 p.m.	Overview of BMPs and Actions to Explore- Michael Flynn
4:20 p.m.	Drainage Districts, Service Districts and Associations, Oh My!- Daniel Brinn
4:40 p.m.	Next Steps- prioritizing actions and objectives, planning/agenda for public meeting, draft plan elements
4:55 p.m.	Confirm Next Stakeholder Meeting Date/Time- May 8, 2018 3:30 -5:30 p.m. stakeholder meeting 5:30-6:30 p.m. Dinner 7:00-8:30 p.m. public meeting
5:00 p.m.	Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting Agenda

May 8, 2018
3:30 - 5:30 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

3:30 p.m.	Welcome/Call to Order- Bill Rich
3:35 p.m.	Overview and Approval of March 28th meeting minutes- Bill Rich
3:40 p.m.	Draft Plan Elements- Coastal Federation and Stakeholders
	Feedback discussion on Introduction/Background
	Distribution of Interview Findings – Linda D'Anna
3:50 p.m.	Review timeline for remainder of project- Coastal Federation
4:00 p.m.	Review and Discuss Proposed Action Matrix- update with feasibility info and stakeholder feedback
5:15 p.m.	Preview of public meeting materials
5:30 p.m.	Adjourn to Dinner

Lake Mattamuskeet Watershed Restoration Plan

Joint Technical Workgroup- Stakeholder Team Meeting
Agenda

June 6, 2018
10:00 a.m. - 3:30 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

10:00 a.m.	Welcome, Introductions as needed
	Review/approval of May meeting minutes
	Review Goal Statements- final edits/approval, discussion as needed
	Review initial ranking of proposed actions
	Discuss rankings, need to remove certain actions, need to add some actions
	Consensus on priority actions
12:30 p.m.	Adjourn to Lunch
1:00 p.m.	Discuss specifics of how and where to implement priority actions
	--Management structure
	--Mapping of potential project locations
	--Form groups to delve further into top priority actions
3:30 p.m.	Adjourn until next meeting: July 10, 2018

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting Agenda

August 21, 2018
2:00 - 4:30 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

2:00 p.m. Welcome/Call to Order - Bill Rich

2:05 p.m. Overview and approval of June 6th meeting minutes - Bill Rich

2:10 p.m. Update on formation of a Drainage District – Daniel Brinn
- Next Steps
- Legal Assistance

2:30 p.m. Feasibility of working with existing Drainage Districts – Erin Fleckenstein/Michael Flynn
- Mattamuskeet Drainage Association
- Fairfield Drainage District

2:45 p.m. Potential sheet flow locations – Erin Fleckenstein/Michael Flynn

3:00 p.m. Development of watershed scale hydrologic model – Dr. Randall Etheridge/Dr. Raymond Smith

3:30 p.m. Preview of public meeting materials and draft plan - Michael Flynn

4:15 p.m. Funding Next Steps of the Plan Development – Erin Fleckenstein
- NFWF National Coastal Resilience Fund application submission
- NCDEQ DCM Planning and Management grant

4:30 p.m. Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting Agenda

October 1, 2018
2:00 - 4:30 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

2:00 p.m. Welcome/Call to Order – Bill Rich

2:05 p.m. Overview and approval of August 21st meeting minutes – Bill Rich

2:10 p.m. Update on formation of a Service District – Daniel Brinn/Pete Campbell
- Coordination with Hyde County Commissioners
- Legal Assistance
- USFWS Participation

2:30 p.m. Review of draft plan – Erin Fleckenstein

2:45 p.m. Review of schedule and milestones – Michael Flynn

4:00 p.m. Preview of public meeting materials - Michael Flynn
- Press Release
- Agenda
- Presentation
- Public availability of draft plan

4:30 p.m. Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Stakeholder Team Meeting Agenda

November 16, 2018
10:00 a.m. - 12:00 p.m.
Hyde County Government Complex
30 Oyster Creek
Swan Quarter, NC 27885

10:00 a.m. Welcome/Call to Order – Bill Rich

10:05 a.m. Overview and approval of October 1st meeting minutes – Bill Rich

10:10 a.m. Review of schedule and milestones – Erin Fleckenstein

10:15 a.m. Summary of final public meeting – Erin Fleckenstein

10:20 a.m. Review of public comments – Michael Flynn

10:30 a.m. Review of plan revisions – Michael Flynn

11:00 a.m. Preview of public symposium materials - Michael Flynn
- Agenda
- Outreach Document

11:15 a.m. Summary of presentation to EMC – Pete Campbell

11:20 a.m. Update on grant proposals – Michael Flynn
- NFWF – Coastal Resilience Fund
- Clean Water Management Trust Fund
- NCDEQ 319(h) Grant Program
- FEMA HMGP
- Other funding sources

11:45 a.m. WRRI Annual Conference – Michael Flynn

12:00 p.m. Adjourn

Lake Mattamuskeet Watershed Restoration Plan Meeting

First Public Meeting

August 8, 2017

7:00-8:30 p.m.

Hyde County Government Complex, Swan Quarter

7:00 p.m.	Welcome
7:05 p.m.	Overview of Progress to Date, Public Meeting Schedule: Bill Rich
7:15 p.m.	Ways to Stay Engaged in the Process: Erin Fleckenstein
7:25 p.m.	Stakeholders and their Roles/Responsibilities: J.W. Spencer
7:30 p.m.	Community Interviews: Linda D'Anna
7:40 p.m.	Community Engagement- Citizen Science: Grant Parkins
7:55 p.m.	Review Draft Maps of lake characteristics: Erin Fleckenstein
8:20 p.m.	Question and Comment Period
8:30 p.m.	Adjourn

Lake Mattamuskeet Watershed Restoration Plan Meeting

Second Public Meeting

November 7, 2017

7:00-8:30 p.m.

Hyde County Government Complex, Swan Quarter

7:00 p.m. Welcome

7:05 p.m. Update on Stakeholder Progress- Erin Fleckenstein, NC Coastal Federation

- Stakeholder meetings and composition
- Draft Goals for Plan

7:15 p.m. Water Quality Trends and SAV in the Lake- Michelle Moorman, US Fish and Wildlife

7:30 p.m. Waterfowl Trends in the Lake- Doug Howell, NC Wildlife Resources Commission

7:45 p.m. Results of Watershed Mapping and Survey Effort- Randall Etheridge, ECU

- Summary of mapping and survey results
- Preliminary outline of identified problems and potential solutions

8:15 p.m. Next Steps of Plan Development- Erin Fleckenstein

8:20 p.m. Question and Comment Period

8:30 p.m. Adjourn

Lake Mattamuskeet Watershed Restoration Plan Meeting

Third Public Meeting
February 6, 2018
7:00-8:30 p.m.
Hyde County Government Complex, Swan Quarter

7:00 p.m. Welcome

7:05 p.m. Update on Stakeholder Progress- Erin Fleckenstein, NC Coastal Federation

- Overview of Draft Goals for Plan

7:10 p.m. Briefing on Joint Meeting of TWG-Stakeholders- Bill Rich

7:20 p.m. Story Map overview- Coastal Federation

7:40 p.m. Characterizing the Watershed- Coastal Federation

- Updated Land use Maps
- Timeline of Lake Watershed Changes

8:00 p.m. Update on County Canal Maintenance- Daniel Brinn

8:10 p.m. Next Steps of Plan Development- Erin Fleckenstein

8:15 p.m. Public Input- Ideas of what to do for the lake

8:30 p.m. Adjourn

Lake Mattamuskeet Watershed Restoration Plan Meeting

Fourth Public Meeting
May 8, 2018
7:00-8:30 p.m.
Hyde County Government Complex, Swan Quarter

7:00 p.m.	Welcome
7:05 p.m.	Update on Plan Development Progress- Erin Fleckenstein, NC Coastal Federation
7:10 p.m.	State of the Lake and Proposed Strategies for Restoration - Linda D'Anna & Michael Flynn
7:45 p.m.	Review Matrix of Actions
	Determining feasibility of strategies
	July 10 - Draft Priority Actions, opportunity for review/input
	Sep 18 – Draft Plan, opportunity for review/input
8:15 p.m.	Question and Answer
8:30 p.m.	Adjourn

Take Action for Lake Mattamuskeet

Are you worried about flooding on your property?

Have you wondered why the lake water isn't clear anymore?

Have you wondered where all the grass in the lake has gone?

For the last year, a group of people has come together to explore solutions for these problems and develop a plan for fixing them. If you're concerned about the lake and how it is impacting you and your property, **we want to hear from you.**

Here's how you can get involved:

- Visit **www.nccoast.org/lakemattamuskeet** to:
  - Learn more about the problems and what is being done to make the lake healthy again.
  - Submit comments about your concerns or ideas to restore the lake and improve conditions for people living around the lake.
  - Sign up to receive email updates as the plan is being developed.
- Attend the next public meetings on **May 8, Jul. 10 and Sep. 18** from 7:00-8:30 p.m. at the Hyde County Government Complex in Swan Quarter.
- Contact Erin Fleckenstein (252) 473-1607 or erinf@nccoast.org.
- Reach out to your stakeholders who are guiding this process (reverse side).

Please see the back of this handout to learn about what we know so far about flooding, water quality and grass.

This project is a partnership of:

HYDE COUNTY SOIL & WATER CONSERVATION DISTRICT

North Carolina Wildlife Resources Commission

The County of Hyde

North Carolina Coastal Federation

Here's what we understand so far about…

…why land around the lake is flooding more frequently and for longer stretches of time:
The movement of water out of Lake Mattamuskeet is controlled by water control structures on each of the four main canals that connect the lake to Pamlico Sound and Alligator River. Water levels within the watershed vary depending on water levels in the sound, wind direction and rainfall. Over the past decades, rising sea levels and silting in the main canals have resulted in a poorly functioning drainage system. The lake depends on passive gravity drainage and cannot be lowered during periods of high tide.

…why the lake water is not clear any more:
Since the 1980's, water quality declines have been monitored in the lake. Results consistently show pH and chlorophyll a levels above normal limits, indicating algae blooms in the water. These blooms are caused by excess nutrients in the water, such as nitrogen and phosphorus. Toxic algal blooms have also been monitored. These blooms have some of the highest concentrations of algal toxins in the country, bordering on federal limits for recreational contact.

…why the grass has gone missing from the lake:
The algae blooms are blocking sunlight from making it to the lake bottom. When this happens for long periods of time, grass begins to disappear. As grass is lost from the lake, the sediment on the bottom that was held together by grass roots becomes loose. These loose sediments are stirred up by wind as well as bottom feeding carp, and they drift in the water, preventing light from reaching the lakebed. Without light, new grass can not start growing and this leads to more areas of loosened lakebed, more sediment in the water, and less grass. As of 2017, Lake Mattamuskeet has lost all grass beds. Dense beds of grass are desired because they help maintain clear water, support fish and crab populations, and provide food for waterfowl.

Stakeholder Committee Members

Daniel Brinn — Hyde Drainage: 252-926-7252 (o), 252-943-7973 (m), dbrinn@hydecountync.gov
Michael "Slim" Cahoon — Farming Community: 252 944-5384, Michaelcahoon1961@gmail.com
Pete Campbell — U.S. Fish and Wildlife Service: 252-926-4021 (o), 252-944-6495 (m), Pete_campbell@fws.gov
Doug Howell — N.C. Wildlife Resources Commission: 252-482-5943 (o), Doug.howell@ncwildlife.org
Art Keeney — Residential Community: 252-945-6660 (m), Art.keeney@yahoo.com
Bill Rich — Hyde County: 252-333-2596 (m), brich@hydecountync.gov
Ben Simmons — Farming Community & Fairfield Drainage District: 252-944-3070 (m), twsbcsiii@aol.com
Pat Simmons — Hospitality Industry
JW Spencer — Hyde Soil and Water Board: 252-926-4061 (h), 252-944-6793 (m), Jwspencer6793@gmail.com
James "Booboo" Topping — Residential Community: 252-943-4214, Ruggedhunter14@gmail.com
Joey Ben Williams — Impoundments: 252-944-3807 (m), williamsfarm@embargmail.com

Upcoming public meetings are scheduled for **May 8, Jul. 10 and Sep. 18 from 7:00-8:30 p.m.**
at the Hyde County Government Complex in Swan Quarter.

Lake Mattamuskeet Watershed Restoration Plan Meeting

Fifth Public Meeting
July 10, 2018
7:00-8:30 p.m.
Hyde County Government Complex, Swan Quarter

7:00 p.m. Welcome – Bill Rich, Hyde County

7:05 p.m. Progress to date - Erin Fleckenstein, NC Coastal Federation

7:10 p.m. Priority actions as agreed upon by the stakeholder team - Michael Flynn, NC Coastal Federation

7:20 p.m. Technical Presentations and Research Updates

- Different types of drainage districts - Daniel Brinn, Hyde County Soil and Water
- Conditions of outlet canals – Randall Etheridge, ECU
- Water quality within the lake and sediment - Olivia Torano, UNC
- Moist Soil Management - Doug Howell, NCWRC
- Carp removal study - Jesse Fischer, NCSU

8:20 p.m. Question and Comment Period – Panel

8:30 p.m. Adjourn

POSTPONED

Lake Mattamuskeet Watershed Restoration Plan Meeting

Fifth Public Meeting
September 18, 2018
7:00-8:30 p.m.
Hyde County Government Complex, Swan Quarter

7:00 p.m. Welcome – Bill Rich, Hyde County

7:05 p.m. Progress to date - Erin Fleckenstein, NC Coastal Federation

7:10 p.m. Priority actions as agreed upon by the stakeholder team - Michael Flynn, NC Coastal Federation

7:20 p.m. Technical Presentations and Research Updates

- Different types of drainage districts - Daniel Brinn, Hyde County Soil and Water
- Conditions of outlet canals – Dr. Randall Etheridge, ECU
- Water quality within the lake and sediment – Dr. Michael Piehler, UNC
- Moist Soil Management - Doug Howell, NCWRC
- Carp removal study – Dr. Jesse Fischer, NCSU

8:20 p.m. Question and Comment Period – Panel

8:30 p.m. Adjourn

POSTPONED

Lake Mattamuskeet Watershed Restoration Plan Meeting

Fifth Public Meeting
October 16, 2018
7:00 - 8:30 p.m.
Hyde County Government Complex, Swan Quarter

7:00 p.m. Welcome – Daniel Brinn, Hyde County

7:05 p.m. Update on Plan Development - Erin Fleckenstein, NC Coastal Federation

7:10 p.m. Priority actions as agreed upon by the stakeholder team - Michael Flynn, NC Coastal Federation

7:20 p.m. Technical Presentations and Research Updates

- Carp removal study – April Lamb, NCSU
- Conditions of outlet canals – Dr. Randall Etheridge, ECU
- Hydrologic modeling of Lake Mattamuskeet – Dr. Randall Etheridge, ECU
- Facilitating active water management - Daniel Brinn, Hyde County Flood Control

8:10 p.m. Next Steps – Michael Flynn, NC Coastal Federation

8:15 p.m. Question and Comment Period – Panel

8:30 p.m. Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Public Symposium
December 3, 2018
10:00 a.m. - 2:00 p.m.
Martelle's Feed House Restaurant in Engelhard, NC

10:00 a.m. Welcome – Bill Rich, Hyde County

10:05 a.m. Watershed restoration plan development - Erin Fleckenstein, NC Coastal Federation

10:15 a.m. Priority actions as agreed upon by the stakeholder team - Michael Flynn, NC Coastal Federation

10:30 a.m. Water Quality Concerns and Solutions – Panel Discussion

- Water quality monitoring – Wendy Stanton, USFWS
- Feasibility of common carp exclusion and vegetation restoration – April Lamb, NCSU
- Impact of waterfowl impoundments – Dr. Randall Etheridge, ECU
- Implementing BMPs – Allie Mulligan, Hyde County Soil and Water
- Conservation programs – Bill Edwards, NRCS

11:15 a.m. Coffee Break

11:30 a.m. Active Water Management – Panel Discussion

- Conditions of outlet canals – Dr. Randall Etheridge, ECU
- Hydrologic model development – Dr. Raymond Smith, ECU
- Facilitating active water management – Daniel Brinn, Hyde County
- Local drainage management –
    - Wilson Daughtry, Mattamuskeet Drainage Association
    - Joey Ben Williams, Fairfield Drainage District

12:30 p.m. Lunch

1:30 p.m. Plan Implementation – Panel Discussion with Hyde County, NCWRC, and USFWS

2:00 p.m. Adjourn

Lake Mattamuskeet Watershed Restoration Plan

Public Symposium

When:
Monday, December 3, 2018
10:00 a.m. – 2:00 p.m.

Where:
Martelle's Feed House Restaurant
33301 US-264
Engelhard, NC 27824

Contact:
Michael Flynn
michaelf@nccoast.org
252-473-1607

The unveiling of the Lake Mattamuskeet Watershed Restoration Plan will be held on Monday, December 3rd to review the final plan that was developed over the past eighteen months. The agenda includes a summary of the current lake condition and overview of the priority actions that were selected by the core stakeholder team. Additional presentations and panel discussions will focus on water quality concerns and solutions, active water management at the watershed scale, and outline the next steps for implementation of the plan. The event is free to attend and includes lunch, but registration is required.

Please visit nccoast.org/lakemattamuskeet to register and review the draft plan.

The Lake Mattamuskeet Watershed Restoration Plan was developed through a partnership between Hyde County, N.C. Wildlife Resources Commission, and U.S. Fish and Wildlife Service. The North Carolina Coastal Federation facilitated stakeholder and public meetings and developed the plan for approval by the N.C. Department of Environmental Quality's 319 Program.

Appendix E

Local Perspectives on Lake Mattamuskeet

Local perspectives on Lake Mattamuskeet and the surrounding landscape

Linda D'Anna
Coastal Studies Institute
for the
Lake Mattamuskeet Watershed Restoration Plan

1. Introduction

The Lake Mattamuskeet watershed covers over 68,000 acres in Hyde County, North Carolina and is home to many farms, residences, and businesses. Local livelihoods and recreational opportunities in the watershed rely on the lake. As the largest naturally-formed lake in the state, the Lake itself covers over 40,000 acres and is the centerpiece of the Mattamuskeet National Wildlife Refuge. The Refuge was designated in 1934 because of its importance to the health and survival of waterfowl populations, and present-day refuge management efforts remain focused on protecting and conserving migratory birds and other wildlife through the protection of wetlands.

Water quality and water quantity (i.e. the level of the lake's water) are central issues for refuge management and the surrounding community. To address these issues, Hyde County, NC Wildlife Resources Commission, and US Fish & Wildlife Service are collaborating to develop a watershed restoration plan for the region. This plan will describe the current health and status of the lake and watershed, articulate a vision for how the lake and watershed should function, and identify management options to reduce watershed flooding and improve lake health. This research informs those plan objectives by documenting how neighboring landowners and other local stakeholders conceptualize the lake's status, threats to the lake's condition, issues related to the associated watershed, and potential solutions to those concerns. This research builds on the findings of a survey of county residents regarding hydrology that indicated that water quality, flooding, bacterial contamination, water clarity, and wildlife diversity were key concerns (pers. comm. R. Etheridge, ECU). Respondents in that study identified water level as the biggest issue and noted that stormwater, agricultural water, and saltwater intrusion had the greatest negative effects on water quality.

Specifically, the research questions ask:

- What information about conditions in and around the lake do people possess?
- What are people's concerns about the lake and its watershed, and why are these threats/concerns important to them?
- What solutions do people think could address the threats and concerns?

2. Methods

This study takes a qualitative approach to data collection and analysis. The goal of qualitative research is to create an indicative sample as opposed to a statistical one. Data collection relied on conducting semi-structured interviews with a purposive, non-proportional quota sample of watershed residents. Purposive sampling targeted interviewees to ensure an appropriately

diverse set of respondents who had the requisite knowledge and background to engage with the interview's subject matter. Interviewees were engaged and knowledgeable stakeholders who live, work, and/or own land within the lake watershed and adjacent landscape. Interviewees included individuals involved in farming, who manage waterfowl impoundments, or have some other connection to land around the lake. Initial interviewees were identified based on recommendations from Hyde County government. Subsequent interviewees were identified by a snowball method where each interviewee was asked to suggest the names of other potential interviewees. Interview participation was confidential. Sixteen interviews were conducted, with an average recorded length of 80 minutes. (Recordings ranged from 51 minutes to 2 hours and 7 minutes.) Nine of the interviewees lived or worked on the east side of the lake, seven on the west basin. All were resident property owners.

While the interviews followed a question guide, their semi-structured format and the open-ended nature of the questions was intended to provide the opportunity for interviewees to talk about what mattered to them about the Lake and watershed not just the interviewer's preconceived ideas of what was important. Instead of following a strict set of survey questions, interviews were more conversational, allowing the interviewer to ask follow-up questions and interviewees to follow tangents. For these reasons, no two interviews were exactly the same. While this kind of questioning results in qualitative data not a quantitative measure of answers, it can provide a sense of the prevalence of perceptions and attitudes. Questions covered topics related to water-related property issues, water level in the lake and watershed (assessment of issues, impacts, potential solutions to issues), the lake's health (assessment of issues, impacts, potential solutions to issues), and watershed management. Interviews also discussed the kinds of information about the lake watershed that were of interest to interviewees and typical sources of information.

Interviews were audio recorded, and the recordings were transcribed. Transcripts were analyzed and coded using NVivo v.10 software. Coding is an analysis process in which transcripts are broken apart into component parts, and each part is given a label or code that identifies what topic(s) the interviewee is talking about. All portions of all transcripts labeled with a particular code are then analyzed for common themes, shared properties, and unique attributes.

3. Results and Discussion

3.1. Importance of the Lake

Interviewees discussed the importance of Lake Mattamuskeet, both to themselves as individuals and, more broadly, to the county as a whole, in terms of the variety of benefits and values supplied by the lake. The lake and watershed matter instrumentally and symbolically to interviewees in four main ways: economic, ecological, personal enjoyment, and cultural identity. Most interviewees stressed the importance of the lake watershed to the Hyde County economy.

> "That's probably the biggest effect on Hyde County, that part of our economy. We have so few things. That's become a big part of it."

The migratory waterfowl and other birds on the lake and surrounding private impoundments attract hunters and birdwatchers, who spend money on lodging, restaurants, guide services, and hunt memberships. Recreational fishing, particularly for bass, was also cited as a big draw for visitors. Some thought there was room for growth of the hunting and fishing sectors, that the resources could be better taken advantage of and advertised more widely to provide even more of an economic benefit to the area. Still, interviewees agreed that the money visitors spend in the county has a large local impact. In addition, a couple interviewees explained that because so many residents pursue a diverse livelihood, drawing income from a variety of sources, the lake economy benefits many people who live around it.

> "This is heaven on earth. The lake has made it that, there's no getting around it. The lake is why the people are still here that are here…The lake is what has kept a few of these little communities alive one way or the other, either with hunting or fishing or birdwatching."

In an area without many livelihoods beyond farming and commercial fishing, many people in Hyde County are connected economically to the lake in some fashion.

A watershed ecosystem that can maintain that lake economy was important to interviewees, but the habitat and biodiversity values of the lake mattered to interviewees for reasons other than their contributions to the local economy.

> "We've got an abundance of wildlife here I've seen nowhere else. Diversity of wildlife I've seen nowhere else."

The productivity of the watershed's ecosystem was valued by interviewees in and of itself, with some rating the local wildlife more highly than that in other places they had visited. The wildlife and lake system were also important to interviewees recreationally, as a place to spend time and enjoy a variety of activities, both alone and with family or friends. However, a couple of interviewees suggested that improved or additional access areas to the lake and adjoining resources would enhance recreational opportunities for locals and visitors alike. Interviewees mentioned fishing, crabbing, and hunting at the lake as children and adults. They also spend time walking, birdwatching, canoeing, and kayaking. The lake also has important aesthetic and therapeutic values for interviewees. Several of them described how much they enjoy just looking at the lake, appreciating its beauty and the sounds of water and nature.

> "I'm just in awe of it when I ride across the lake. It's still just beautiful to me. … If you ride out on the lake to one of the culverts and listen to the water, that's almost as much of an

> appeal to me as going to the ocean and listening to the water. Peaceful and kind of out of touch."

Even among those interviewees who commented on the lake's beauty, there were individuals who pointed out how they did not spend any time involved in activities directly on or around the lake.

> "And I've just taken it for granted. I don't fish and don't hunt. I haven't taken advantage of what's around me and I realize that."

Interviewees like this one suggested that while they may take the lake for granted at times, it has important value to them.

Despite some interviewees who identified as spending little time on the lake, the lake was a key factor in how many described their home county and local identity. Interviewees described strong feelings of connection to Hyde County.

> "But all this we're talking about affects Hyde County. And it's very important to me what goes on in Hyde County. … I just hope that there are things done to improve life in Hyde County. That's the main thing. That's what's important."

Changes to the lake, both good and bad, were perceived as directly affecting the county itself. Interviewees viewed Lake Mattamuskeet as an important part of the local way of life and heritage. For example, in a discussion of the importance of hunting to Hyde County, one interviewee underscored the connection between heritage and youth hunts.

> "It's all about keeping that heritage alive in Hyde Co. and getting the kids involved in goose hunting by setting it more around the holidays. 5 days around Thanksgiving and 5 around Christmas when the kids are out of school and can spend time with dad and granddad."

Interviewees were clear about the connection between life in the county and the status of the lake watershed. Referring to the lake as the "biggest advantage" for all those around it, interviewees hoped their grandchildren would be able to enjoy it in the future and continue to be able to make a living from the land around it, if they chose to do so. Interviewees also noted that everyone around the lake cares for and about it and would be willing to do what they can to maintain its health and viability.

3.2. Concerns

3.2.1. Flooding/Water Quantity

Many interviewees, particularly farmers, said that the level of the lake depends on and changes according to cycles in weather and rainfall.

> "I think it's just a cycle. That cycle may be several years. If you come back here three years from now and we've been through three years of annual rainfall 15 or 20 inches below normal, it'd be a totally different thing. This has happened before, it's going to happen again."

For these interviewees, the high level over the last couple of years was not something that had not occurred in the past, and conditions would change in due course with the cycle, i.e. levels would decline with the lower rainfall portion of the cycle. There did not seem to be much concern that the cycle was changing or becoming more extreme. Instead, after an extended rainy period, it just takes a long time for the water to get out of the lake just like land in the county takes a long time to drain when the water is not pumped off.

Other interviewees indicated that recent flooding was different and worse than what they remembered happening in the past. While a couple of these interviewees presented this flooding as only affecting a limited number of properties, homes, and residents, most of them considered the flooding conditions in the watershed a critical issue.

> "But it stood in the yards in the last few years the worst I have seen it since I was a boy. It affects everything we do. If you're around the lake, you border the lake, it influences what you do at your house…If you have a nice house and waters stands around it and under it all the time, that's quite a problem."

Interviewees pointed to a range of problems the flooding has caused for property owners and residents, from needing to wear boots to walk in their yards and not being able to mow grass to issues with septic tanks and difficulties digging graves. Even interviewees whose drainage is managed by drainage districts experienced the impact of high lake levels on their soils.

Several interviewees pointed to changes in development patterns within the watershed, shifting from the lake rim or ridge around the lake to other, lower areas that perhaps just happened to be drier during the 1970s and 1980s, as contributing to present-day flooding problems.

> "And when you build on land that low, when water is up, it's going to be wet."

These interviewees seemed to suggest that certain locations around the lake were at elevations that were just too low for building and development.

Farming and residential interviewees were not concerned about direct impacts of low lake levels. Instead, they advocated for lowering the lake level. Farmers in particular did not seem to think there was such a thing as too low for their interests while pointing out that if the lake was extremely low that likely meant there was a drought, which could be difficult for them. Interviewees recognized that lower lake levels mean the edges of the lake are exposed and can support emergent vegetation, which is important for wildlife while high water in the lake erases this resource, contributing to lower bird numbers at the lake and visitor disappointment. Interviewees suggested that the impacts of low lake levels would be directly felt by fishing interests around the lake, including hotel/motel operators and recreational fishermen. Access by boat to the canals where fishing tends to concentrate or to the culverts along Highway 94 would likely be compromised. Low lake levels could also negatively affect those who rely on the lake as a water source to flood impoundments. Interviewees were concerned that the loss of those fishing and potentially hunting opportunities could cost the community financially.

Recognizing that different interests prefer different lake levels, interviewees broadly agreed that they did not want to be the one to have to decide what would be a good level for the lake.

> "What water level is sufficient, huh? You ask 100 people, you get 100 different answers."

Interviewees felt that one cannot control level AND make everyone happy. There are too many different opinions and agendas for there to be a "happy medium" suited everybody.

Since level depends on rainfall and wind and because lake drainage is gravity-fed, interviewees stated that the only controls on level are the water control structures or gates in the lake's four main outlet canals.

> "And right now, the water level can't be kept down. Nobody can do anything about it other than the flood gates that are in here. It's going to be like it has been since 1934."

With drainage through the main outlet canals the only means of reducing the level of the lake, interviewees suggested three main factors that could be affecting the drainage capacity of those canals and leading to high water levels in the lake and flooding in the lowest-lying areas within the lake watershed: refuge management, siltation of canals, and sound height. Despite largely widespread recognition that drainage from the lake is gravity fed through gates that open under positive head pressure, some interviewees questioned the role of refuge management in keeping the level high with a few stating that refuge management did indeed hold water in the lake. They believe that the refuge can choose to keep the gates closed when lake level and associated pressure is high, speculating about political pressure from individuals and groups from outside the area that prefer deeper water for their fishing and duck hunting interests.

The second factor that interviewees believe has contributed to high water and flooding is sedimentation or filling in of the outlet canals. Combined with lack of regular maintenance and dredging along the full length of the canals, according to interviewees, sedimentation has led to smaller, shallower canals. As a result, the canals cannot move enough water quickly enough to alleviate flooding conditions.

Finally, interviewees talked about the relationship between lake level and sound height. Some referred to this as sea level rise, while others talked about winds or abnormally high tides pushing sound water into the canals, but in either case, these interviewees agreed that sound level was preventing the lake from discharging the way it had in the past. Interviewees also discussed the relationship between the canal sedimentation and sound height.

> "If you haven't got outlets, the water's not going to run off. You only have so much low tide and when the tide goes out you have to be able to get rid of the water as quick as you can out of the lake. Because the tides are running higher now I think than they used to. There's a lot of difference if you have a trickle running out at low tide or if you have a canal full of water running out."

Interviewees agreed that watershed management should be prepared to take advantage of sound conditions that are amenable to moving water out of the canals and lake when those opportunities present themselves.

3.2.2. Health/Water Quality

Many interviewees offered less information about the health of the lake or quality of the water within it, either expressing limited concern about it or explaining that they did not know enough to discuss it.

> "I really don't know how I could even comment on the health of the lake. Because I don't study it. I don't fish it, I don't hunt it, I'm not on it, so I really can't say…The only view of the lake is to go across on 94. What I see there, it looks fine. Looks healthy to me…I've never been involved or had any issue with the quality of the water in the lake. It's never been a concern to me. Or been something you hear in the community."

Interviewees can see the level of the lake and resulting flooding, but changes in quality are less noticeable to them. Some connected health to level, suggesting that the high level of the lake and associated poor flushing made the lake less healthy. It seemed like interviewees had begun hearing about about changes to the lake or were aware that studies were being done.

> "Evidently, it's not in good health. Especially this side of the lake, the west end. … But my understanding is that they consider it dead water. And why I'm not sure."

For interviewees like this one, the idea that lake health and water quality had declined was not foreign; rather, they did not heard enough about it to really comment or discuss the underlying reasons for the changes.

Interviewees did discuss a variety of changes in the ecology of lake and watershed that they have noticed over time. Several talked about how the edge of the lake has changed due to higher water levels. In addition to the disappearance of the emergent zone vegetation, interviewees noted the loss of trees, particularly large pines, adjacent to the lake and the increased abundance of cypress knees and Phragmites. They suggested that these changes in vegetation and habitat have impacted species usage for forage and cover. Others had heard or noticed there was not much submerged aquatic vegetation remaining in the lake. The loss of both submerged and emergent vegetation translated to interviewees as less food for ducks and other waterfowl.

> "I don't think the birds are going to stick around if we don't try to actively recover parts of the lake. I'm not sure we're going to have this resource for long. They will look for other places to feed."

For some interviewees, the changes in lake vegetation portended future changes in the bird populations that visit and use the lake and refuge.

In addition to current and future changes in bird populations, interviewees noted declines in other wildlife, including frogs and fish.

> "The other thing is something has impacted the amount of fish that are surviving in the lake. Fishing was way better than it is now. … Bass fishing on the lake used to be excellent. Why it's not as good as it used to be, I have no idea."

A few interviewees commented on the presence of fewer game fish and more "trash" fish in the lake, but none could offer an explanation for the shift. They wondered about connections to lake level, water quality, and cycles, and whether predator trash fish were eating the young of the game fish.

Discussions with interviewees about lake health and water quality included considerations of changes in watershed practices and land use that may have contributed to the declining state of the lake. One factor interviewees pointed to was the increase from only a few waterfowl impoundments near the lake to many that tend to dump their pent up water at the same time and over a short period of time.

> "I don't have any idea how many impoundments there are, but it's a lot. I know there's been a lot down here where I live. If you dumped all of them in a week's time, you're putting no telling how many thousands of gallons of water back in. In my opinion this is a problem when it's all dumped back in. And that wouldn't be a problem if farmers farmed like we did years ago when we didn't have the chemicals."

Pumps are recognized as critical to draining impoundments quickly in order to be able to prepare the land for planting the next round of crops, but several interviewees were concerned about what chemicals might be pumped out of the impoundments along with all the water. The private impoundments around the lake allow the region to support greater numbers of ducks. Turning agricultural acreage where corn was grown and harvested into impoundments where corn is grown and eaten by ducks created an additional nutrient load deposited into the lake or associated drainage by the ducks.

Interviewees posited that a second factor in the lake's health might be lake level. Deeper water in the lake may have restricted light penetration, which inhibited growth and survival of SAV. The high level of the lake, regardless of whether that is the result of management not opening the gates, the sound being high enough to prevent the gates from the opening, or some other factor, indicated to many interviewees that the lake is not flushing sufficiently. One interviewee likened it to a toilet that can't flush. Another suggested that since the water quality problems began on the west side of the lake, the basin with only one main outlet canal, they might be tied to drainage and lake level. As with level, interviewees also tied the inability of the lake to flush and drain well to sedimentation of the outlet canals that restricts flow. While many interviewees stressed the importance of adequate maintenance of the canals, including sediment removal, some also acknowledged the difficulty in getting the requisite government permits to do such dredging work.

A few interviewees suggested that more land in the watershed may be draining water to the lake more quickly than it did historically. This includes land that has been cleared of trees during these interviewees' lifetimes as well as agricultural land that has had its drainage re-routed and pumped to the lake. In discussing these changes in land use or practice, interviewees did not blame the individuals for making the changes; they were quick to point out these choices were the individuals' rights. They were just as quick to say that no one in the lake watershed would want to harm the lake or would not want to change practices to help the lake if it would not affect their ability to do business or cost them a lot of money.

One change in practice that concerned some interviewees was potential growth of agricultural acreage in cotton.

> "Probably no cotton grown the state since the 50s until the last 20 years now probably. But cotton is, I've heard people say,

> sometimes sprayed as much as 30 times in the process of growing it. A whole lot of chemicals that go into a cotton crop."

Interviewees were concerned about the role of chemicals, particularly pesticides, in the changes to the lake, including declines in vegetation and fish populations. One interviewee worried that people had become careless in their application of these "poisons". Other interviewees were less worried about the present day impact of pesticides, fertilizers, and other agricultural chemicals because the expense of these chemicals leads farmers to be frugal with them.

Farming interviewees were well aware that other stakeholders in the watershed were concerned about the impact of agricultural practices on the lake. One way they countered these perceptions was to suggest that the proportion of the lake watershed that is farmed is relatively small.

> "And the watershed that drains into the lake is so small. ... And then if you want to look at what that watershed is and how much of it is agriculture, then that's really small, because most of it is woodland, marshland, that's draining into the lake. It's just not much farmland. As far as you can affect change to the lake because of what the drainage is."

For these interviewees, agricultural acreage is not the dominant element in lake's small watershed, which suggests to them that it cannot be causing major change in the lake. Another theme articulated by farmers, as well as other interviewees, was that without proper testing, the actual impact of agriculture on the lake remains largely unknown.

> "We hear a lot that pointed at us, too, as farmers. I don't believe a whole lot of opinions, I like to see somebody test it and put the science behind it before they actually say anything. …We spray pesticides. Everybody knows that. … And fertilizer for crops. It's things like that in any kind of watershed. We certainly try to – any of that stuff we apply, I don't want to put it out there if I don't have to because it costs me money. That's just one thing that gets pointed at us. Anything I can do to minimize that I will."

These farmers echoed other interviewees, pointing out that they want to minimize their use of chemicals and help the lake watershed in other practical ways so long as such changes do not have high costs or otherwise negatively affect their ability to do business.

3.3. Proposed Solutions

Following discussion of concerns and problems, interviews covered ideas about how to address the issues facing the lake and watershed. Critically, interviewees broadly recognized the

complexity of the issues and that there would be no "quick fixes" to what is going on in and around the lake.

> "It didn't get to this point overnight, which means it won't get to a better point overnight. I don't think there's a quick fix. I just wish I knew what the fix might be."

A key factor in why interviewees do not think watershed issues can be solved quickly is the sense that the root causes of the problems have yet to be clearly articulated.

> "But I'm extremely disappointed nobody says what the problem is. And I don't know how you're going to address this problem if you don't know what it is. Are you going to address everything in the world?"

Interviewees like this one were concerned that without a clear problem statement restoration would be impossible at worst or scattershot and costly at best. Compounding these concerns about the perceived lack of a problem statement, among interviewees who were aware of changes in water quality there were additional critiques that these changes had not been tracked better and treated seriously until they became problematic.

> "It's surprising that you have a resource this important and water quality was never really paid attention to until it was to late."

Three main themes emerged from interviewees' ideas about how to address water quantity and quality issues in the lake and watershed: maintaining existing drainage from the lake, adding new drainage from the lake, and changing draining patterns in the watershed. Nearly all interviewees discussed ideas centered on improving water flow from the lake to the sound through the existing outlet canals including canal/ditch maintenance, gate maintenance, and utilization of pumps. Several interviewees pointed to the debris, limbs, weeds, and trash that encumbers many of the roadside ditches and inhibits water movement. They advocated for coordinating state and federal efforts or funds to keep these ditches clean.

For many interviewees, a key component of improving drainage, alleviating flooding, and promoting flushing for water quality concerns was to clean out the four major outlet canals: remove silt and sediment from the bottoms and sides of these canals from the lake all the way to the sound. Even though the parts of the canals on refuge property have been cleaned out at various times over the last 40 or so years, interviewees asserted that the entire lengths of canals have not, some not since the time they were constructed.

> "But cleaning out the canals can be done. That seems to be doable to me. And would help the situation. … Certainly it isn't doing the job that it used to do. So that's adding to the problems that the lake's having, that's adding to the people that have

> problems in the low-lying areas. Drainage seems to be the obvious thing to me that could do the most good."

Attending to drainage by cleaning out the canals was considered an obvious or a common sense solution to many interviewees. Yet they also recognized critical realities that would complicate the work, including permitting, costs, and questions about what entity or agency would have oversight of the actual work. They recognized a need to be strategic in terms of predominant wind and flow direction in prioritizing which canal to start with or which canal to clean if there is only enough money to do one. A couple of interviewees suggested dredging the lake bottom as well the canals, both to address flooding concerns and the contribution of resuspension of sediments to water quality and clarity problems. Interviewees also suggested finding ways to utilize local expertise in earth moving.

In addition to regular canal maintenance, interviewees also suggested improving gate management and maintenance to keep the water control structures free of debris and trash so they can operate properly, allowing water to flow unimpeded when needed and preventing salt water from entering the lake at other times. Interviewees were aware that some of the older gates had been replaced, in some instances swapping out the top-hinged gates with side-opening versions.

> "If they had more of those barn door opening they'd let the water out with getting stopped up so much."

They perceived these barn door gates as more responsive and capable of moving a greater volume of water, and, perhaps even more importantly, not as susceptible as top-hinged gates to getting clogged with grass, trash, and other debris.

Another potential solution for sluggish water flow that interviewees discussed was to pump water out of the lake through the outlet canals.

> "The only way you're going to do it is pump it out. It isn't going to go out by itself."

The thinking among some interviewees was that since so much of the rest of the land in the county was under pump, the lake could be as well, and it would help both wildlife and residents. Other interviewees were concerned about the realism of pumping the lake.

> "The problems are endless with this thing. … But oh yeah, "we're going to pump it" is easy to say. Moving water is a job."

According to this interviewee, part of what makes moving water a job is having to consider so many questions like, how much water needs to be moved, how long would it take, how much money would it cost, how many pumps would it require. Other interviewees echoed these concerns as they questioned whose decision it would be to turn the pumps on or off and hinted

at concerns with leaving that kind of decision-making with refuge management. An interviewee thought if nothing else, perhaps there could be some assistance for the county to acquire emergency pumps for use during times of heavy rain to help drain landowners in the lake watershed.

A second set of suggested solutions focused changing or adding new drainage in the watershed.

> "In order to help the west end it needs to be another outlet. Whether that outlet needs to dug from here [pointing to map of the lake] to the sound or from here [pointing to map of the lake] back to the Alligator River … I don't know. Nor do I know what politician would appropriate money for that, but that would probably help the west end some."

Several interviewees discussed the utility of adding another outlet on the west basin of the lake. Others were more equivocal, suggesting that maintaining the outlets the lake already has might be enough.

Interviewees also discussed ways to improve drainage in areas that have been identified as flooding hotspots around the lake. One set of ideas focused on changing the boundaries of existing drainage entity structures to include portions of the watershed along North Lake Road that flood consistently. Areas along the southern rim of the lake, particularly near the New Holland and St. Lydia communities, which also flood consistently, are likely not near enough to existing drainage entities, including Slocum Drainage, to be added to them. Instead interviewees discussed the potential of creating a new citizen-driven coordinated drainage entity to organize landowners on the south side of the lake. Another idea centered on building a new dike and drainage ditch that could drain land that backs up to the refuge property into neighboring Outfall Canal.

> "Coming out of right there, on down there, all the way as far as you can see and then back on around that way, is the same kind of thing I'm talking about. Get that on that end so that the water will have something to drain into … So all that up there is in pretty good shape. And it's only a quarter of a mile from the back doors of these people. So I think that would work. That's been there as long as I can remember."

This interviewee explained that such a set-up would be similar to existing drainage between the lake and private property in another location on the south side of the lake on the west side of highway 94.

A third theme among the possible solutions that interviewees discussed revolved around changing the way water enters the lake. A few interviewees discussed the possibility of moving water into retention areas before it enters the lake.

> "Like someone could say: I have 400 acres that doesn't grow well, maybe I can get a decent soil rate to contain water from my farm and these other two farms."

Water that currently is pumped or flowing into the lake could be redirected into retention areas where sediments and other particulates could settle out of the water before it entered the lake. Interviewees agreed that landowners might be willing to enter easements and create retention areas on their land as long as they were convinced that it was not going to cost them any money or impact their taxes. The second way interviewees suggested altering inputs to the lake focused on the drainage practices used for impoundments.

> "…it's going to be a tricky thing to control with the farmers having the right to drain. If they want to do it on a volunteer basis, they could pull one board at a time. … And maybe cycle between the farmers. Do a few one week and others later."

Interviewees felt that if letting water out of the impoundments slowly helped reduce entrainment of nutrients or chemicals, then that could be something that managers would be willing to do. Interviewees offered conflicting assessments of how many impoundments were pumped out at the end of hunting season compared to drained by gravity-fed flow, but they all stressed that the timing of drainage is critical as farmers need to get the land ready to plant. Another suggestion focused on the refuge's impoundments and raised the possibility of building up their levees so that water from the surrounding land could be pumped into them rather than directly into the lake.

3.4. Additional Themes

3.4.1. Data and Information

Interviewees stressed the need for lake and watershed restoration to be a scientific data-driven process. Part of this concern was that they felt that there was still no clear understanding of precisely how the lake is impaired and of what exactly has caused the impairments.

> "If they could ever pinpoint that. That's tough to do, I think. For something they could pinpoint and say if you make these changes, we'll try to incorporate that in what we do, from my perspective."

Some farming interviewees like this one seemed to suggest that they realized that defining specific causes or sources of impairment might be difficult, but having that kind of refined explanation would build incentive for them to potentially change their farming practices or behaviors.

Additionally, interviewees were clear that the availability of more scientific information, presented in straightforward, though not watered-down, ways was important to many in the surrounding watershed and communities. For example, the utility to the public of some of the indices that are used to monitor water depth in the lake could be improved by better relating them to real numbers and real situations that are relatable to people. They were clear that the source of the information was important, demonstrating a prioritization of what they considered unbiased or neutral data sources.

> "If you have somebody that's unbiased that doesn't have a dog in the fight they'll put it out there, they'll let whoever is interested read it for what they want to read it for. You just hear so many different opinions it's hard to decipher sometimes from actual scientific research, unbiased research."

Interviewees suggested a variety of potential means of disseminating that information, indicating there may not be one preferred best way. These included continued public meetings with presentations by researchers, maintaining a watershed restoration website that posts data and studies, stories on the local news, and public mailings. One interviewee also mentioned that one way to keep residents informed about the restoration planning process or upcoming meetings and activities would be to share information with local churches and ask for their help in sharing it with their congregations.

Beyond information that illuminates lake and watershed impairments, interviewees also had specific questions and interests. Some of the questions demonstrated additional topics for information sharing and community education. For example:

- How can the west and east sides be so different, if they are?
- If there is no grass in the lake, why are the edges grown up in weeds?
- Are lake level and salinity connected, and if so, how?
- When/if water levels in the lake go back down, will the emergent vegetation come back on it's own or will the area be contaminated from cyanobacteria?

Others showed the importance of making the data from ongoing monitoring efforts easily accessible so people can stay up to date on conditions in the lake. For example:

- What is the water level in the lake
- What is the muck depth in the lake?
- What are the phosphorus levels?
- What is the salinity and how does it fluctuate?

3.4.2. Taxes, Regulations and Control

When asked about what comes to mind at hearing the word "restoration", one interviewee said the following, which draws together the threads of a theme from the interviews about local impacts – both impacts that local restoration activities and actions can have on the lake and watershed and the impacts of those efforts on local residents:

> "It conjures up to me that somehow somebody is going to try to manage this situation. And it's either going to be through some kind of taxation, somehow it's going to have to be funded, so greater taxes. There's going to be more restrictions on what can be done around the lake. As I've said in the past, I don't know that we can make that much difference. …When I say restoration I see there might be some restrictions on use of property. Could be good. Might be something that we need. But I'm not much for regulations."

Like other interviewees, this individual suggested that restoration would require regulating behaviors in the watershed, particularly those involved in farming and impoundments, but was unconvinced that such changes in practices could have other than a limited capacity to actually improve lake health and watershed drainage. Several interviewees also discussed concern and opposition regarding new taxes or costs associated with addressing watershed drainage and lake issues. One interviewee stated that new dikes and drainage would help too few people to justify taxing other properties and residents and instead suggested buying flooding properties and adding them to the refuge footprint. Another interviewee saw the value in changing the boundaries of existing drainage entities or creating new ones, work which would likely require dike construction and rerouting drainage, but maintained that economics and politics would prevent such work from happening and suggested that securing long-term funding and getting permits to build new dikes or undertake other major infrastructure projects would be next to impossible.

Another concern about restoration in the Lake Mattamuskeet watershed was about controlling interests. Interviewees questioned how control and decision-making would be balanced between the federal interests of the refuge and the local interests of the county. They wondered what this balance would look like broadly, as in who would oversee the final plan, and who would have say so for specific watershed changes. For example, if pumps were installed on outlet canals, who would decide when to turn them on and off? Interviewees expressed their beliefs that the local impacts of restoration decision-making would need to be a priority.

> "But I would not like to see a plan developed without the impact on the people it's going to affect. That doesn't make any sense."

4. Conclusions

Findings from interviews with varied stakeholders in the Lake Mattamuskeet watershed supported and developed many of the findings of a 2017 hydrology survey of Hyde County residents. The primary concern among interviewees was lake level and watershed flooding, which was attributed mainly to poor outlet canal maintenance and higher sound water. Interviewees questioned the importance of perceived shifts in land use and practices in the

watershed to flooding issues, which suggests these might be appropriate areas for additional information gathering and dissemination. They made numerous suggestions about how to address flooding and lake level issues, but were clear-eyed about the challenges in any proposed solution, including costs, permits, and oversight. Interviewees possessed less information about water quality and lake health, but demonstrated an awareness of mounting water quality issues and ecological changes in the lake and surrounding landscape and an interest in scientific information from neutral sources that could clarify some of the details of those issues. Interviewees described the critical importance of the lake and watershed for the economy and livelihoods of the region as well as biodiversity, recreation, enjoyment, and local identity. They agreed that no resident would want to knowingly do things that would negatively impact the lake's and watershed's capacities to function, but any plan or proposed set of restoration actions would need to take account of local impacts, including restricting behaviors, personal costs, and future generations' ability to make a living from the land around the lake.

Appendix F

Service District Plan Example: West Quarter

Article 16.

County Service Districts; County Research and Production Service Districts; County Economic Development and Training Districts.

Part 1. County Service Districts.

§ 153A-300. Title; effective date.

This Article may be cited as "The County Service District Act of 1973," and is enacted pursuant to Article V, Sec. 2(4) of the Constitution of North Carolina, effective July 1, 1973. (1973, c. 489, s. 1; c. 822, s. 2.)

§ 153A-301. Purposes for which districts may be established.

(a) The board of commissioners of any county may define any number of service districts in order to finance, provide, or maintain for the districts one or more of the following services, facilities and functions in addition to or to a greater extent than those financed, provided or maintained for the entire county:

(1) Beach erosion control and flood and hurricane protection works.
(2) Fire protection.
(3) Recreation.
(4) Sewage collection and disposal systems of all types, including septic tank systems or other on-site collection or disposal facilities or systems.
(5) Solid waste collection and disposal systems.
(6) Water supply and distribution systems.
(7) Ambulance and rescue.
(8) Watershed improvement projects, including but not limited to watershed improvement projects as defined in Chapter 139 of the General Statutes; drainage projects, including but not limited to the drainage projects provided for by Chapter 156 of the General Statutes; and water resources development projects, including but not limited to the federal water resources development projects provided for by Article 21 of Chapter 143 of the General Statutes.
(9) Cemeteries.
(10) Law enforcement if all of the following apply:
    a. The population of the county is (i) over 900,000 according to the most recent federal decennial census, and (ii) less than ten percent (10%) of the population of the county is in an unincorporated area according to the most recent federal decennial census.
    b. The county has an interlocal agreement or agreements with a municipality or municipalities for the provision of law enforcement services in the unincorporated area of the county.
    c. Repealed by Session Laws 2008-134, s. 76(c), effective July 28, 2008.
(11) Services permitted under Article 24 of this Chapter if the district is subject to G.S. 153A-472.1.

(b) The General Assembly finds that coastal-area counties have a special problem with lack of maintenance of platted rights-of-way, resulting in ungraded sand travelways deviating from the original rights-of-way and encroaching on private property, and such cartways exhibit poor drainage and are blocked by junk automobiles.

(c) To address the problem described in subsection (b), the board of commissioners of any coastal-area county as defined by G.S. 113A-103(2) may define any number of service

districts in order to finance, provide, or maintain for the districts one or more of the following services, facilities and functions in addition to or to a greater extent than those financed, provided or maintained for the entire county:

(1) Removal of junk automobiles; and

(2) Street maintenance.

(d) The board of commissioners of a county that contains a protected mountain ridge, as defined by G.S. 113A-206(6), may define any number of service districts, composed of subdivision lots within one or more contiguous subdivisions that are served by common public roads, to finance for the district the maintenance of such public roads that are either located in the district or provide access to some or all lots in the district from a State road, where some portion of those roads is not subject to compliance with the minimum standards of the Board of Transportation set forth in G.S. 136-102.6. The service district or districts created shall include only subdivision lots within the subdivision, and one or more additional contiguous subdivisions, where the property owners' association, whose purpose is to represent these subdivision lots, agrees to be included in the service district. For subdivision lots in an additional contiguous subdivision or for other adjacent or contiguous property to be annexed according to G.S. 153A-303, the property owners' association representing the subdivision or property to be annexed must approve the annexation. For the purposes of this subsection: (i) "subdivision lots" are defined as either separate tracts appearing of record upon a recorded plat, or other lots, building sites, or divisions of land for sale or building development for residential purposes; and (ii) "public roads" are defined as roads that are in actual open use as public vehicular areas, or dedicated or offered for dedication to the public use as a road, highway, street, or avenue, by a deed, grant, map, or plat, and that have been constructed and are in use by the public, but that are not currently being maintained by any public authority.

(e) The board of commissioners of a county that adjoins or contains a lake, river, or tributary of a river or lake that has an identified noxious aquatic weed problem may define any number of noxious aquatic weed control service districts composed of property that is contiguous to the water or that provides direct access to the water through a shared, certified access site to the water. As used in this subsection, the term "noxious aquatic weed" is any plant organism identified by the Secretary of Environmental Quality under G.S. 113A-222 or regulated as a plant pest by the Commissioner of Agriculture under Article 36 of Chapter 106 of the General Statutes. (1973, c. 489, s. 1; c. 822, s. 2; c. 1375; 1979, c. 595, s. 1; c. 619, s. 6; 1983 (Reg. Sess., 1984), c. 1078, s. 1; 1989, c. 620; 1993, c. 378, s. 1; 1995, c. 354, s. 1; c. 434, s. 1; 1997-456, s. 24; 2005-433, s. 10(b); 2005-440, s. 1; 2008-134, s. 76(c); 2011-100, s. 1; 2015-241, s. 14.30(v).)

§ 153A-302. Definition of service districts.

(a) Standards. – In determining whether to establish a proposed service district, the board of commissioners shall consider all of the following:

(1) The resident or seasonal population and population density of the proposed district.

(2) The appraised value of property subject to taxation in the proposed district.

(3) The present tax rates of the county and any cities or special districts in which the district or any portion thereof is located.

(4) The ability of the proposed district to sustain the additional taxes necessary to provide the services planned for the district.

(5) If it is proposed to furnish water, sewer, or solid waste collection services in the district, the probable net revenues of the projects to be financed and the extent to which the services will be self-supporting.

(6) Any other matters that the commissioners believe to have a bearing on whether the district should be established.

(a1) Findings. – The board of commissioners may establish a service district if, upon the information and evidence it receives, the board finds that all of the following apply:

(1) There is a demonstrable need for providing in the district one or more of the services listed in G.S. 153A-301.

(2) It is impossible or impracticable to provide those services on a countywide basis.

(3) It is economically feasible to provide the proposed services in the district without unreasonable or burdensome annual tax levies.

(4) There is a demonstrable demand for the proposed services by persons residing in the district.

Territory lying within the corporate limits of a city or sanitary district may not be included unless the governing body of the city or sanitary district agrees by resolution to such inclusion.

(b) Report. – Before the public hearing required by subsection (c), the board of commissioners shall cause to be prepared a report containing:

(1) A map of the proposed district, showing its proposed boundaries;

(2) A statement showing that the proposed district meets the standards set out in subsection (a); and

(3) A plan for providing one or more of the services listed in G.S. 153A-301 to the district.

The report shall be available for public inspection in the office of the clerk to the board for at least four weeks before the date of the public hearing.

(c) Hearing and Notice. – The board of commissioners shall hold a public hearing before adopting any resolution defining a new service district under this section. Notice of the hearing shall state the date, hour, and place of the hearing and its subject, and shall include a map of the proposed district and a statement that the report required by subsection (b) is available for public inspection in the office of the clerk to the board. The notice shall be published at least once not less than one week before the date of the hearing. In addition, it shall be mailed at least four weeks before the date of the hearing by any class of U.S. mail which is fully prepaid to the owners as shown by the county tax records as of the preceding January 1 (and at the address shown thereon) of all property located within the proposed district. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed and his certificate is conclusive in the absence of fraud.

(d) Effective Date. – The resolution defining a service district shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board of commissioners.

(e) Exceptions For Countywide District. – The following requirements do not apply to a board of commissioners that proposes to create a law enforcement service district pursuant to G.S. 153A-301(a)(10) that covers the entire unincorporated area of the county:

(1) The requirement that the district cannot be created unless the board makes the finding in subdivision (a1)(2) of this section.

(2) The requirement in subsection (c) of this section to notify each property owner by mail, if the board publishes a notice of its proposal to establish the district, once a week for four successive weeks before the date of the hearing required by that subsection.

(f) Exceptions for Article 24 District. – The following requirements do not apply to a board of commissioners that proposes to create a service district pursuant to G.S. 153A-301(a)(11) that covers the entire unincorporated area of the county:

(1) The requirement that the district cannot be created unless the board makes the finding in subdivision (a1)(2) of this section.

(2) The requirement in subsection (c) of this section to notify each property owner by mail, if the board publishes a notice of its proposal to establish the district, once a week for two successive weeks before the date of the hearing required by that subsection. (1973, c. 489, s. 1; c. 822, s. 2; 1981, c. 53, s. 1; 1995, c. 354, s. 2; 2005-433, s. 10(c).)

§ 153A-303. Extension of service districts.

(a) Standards. – The board of commissioners may by resolution annex territory to any service district upon finding that:

(1) The area to be annexed is contiguous to the district, with at least one eighth of the area's aggregate external boundary coincident with the existing boundary of the district; and

(2) That the area to be annexed requires the services of the district.

(b) Annexation by Petition. – The board of commissioners may also by resolution extend by annexation the boundaries of any service district when one hundred percent (100%) of the real property owners of the area to be annexed have petitioned the board for annexation to the service district.

(c) Territory lying within the corporate limits of a city or sanitary district may not be annexed to a service district unless the governing body of the city or sanitary district agrees by resolution to such annexation.

(d) Report. – Before the public hearing required by subsection (e), the board shall cause to be prepared a report containing:

(1) A map of the service district and the adjacent territory, showing the present and proposed boundaries of the district;

(2) A statement showing that the area to be annexed meets the standards and requirements of subsections (a), (b), and (c); and

(3) A plan for extending services to the area to be annexed.

The report shall be available for public inspection in the office of the clerk to the board for at least two weeks before the date of the public hearing.

(e) Hearing and Notice. – The board shall hold a public hearing before adopting any resolution extending the boundaries of a service district. Notice of the hearing shall state the date, hour and place of the hearing and its subject, and shall include a statement that the report required by subsection (d) is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than one week before the date of the hearing. In addition, the notice shall be mailed at least four weeks before the date of the hearing to the owners as shown by the county tax records as of the preceding January 1 of all property located within the area to be annexed. The notice may be mailed by any class of U.S. mail which is fully

prepaid. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and his certificate shall be conclusive in the absence of fraud.

(f) Effective Date. – The resolution extending the boundaries of the district shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board. (1973, c. 489, s. 1; c. 822, s. 2; 1981, c. 53, s. 2.)

§ 153A-303.1. Removal of territory from service districts.

(a) Standards. – A board of commissioners may by resolution remove territory from a service district upon finding that:

(1) One hundred percent (100%) of the owners of real property in the territory to be removed have petitioned for removal.

(2) The territory to be removed no longer requires the services, facilities, or functions financed, provided, or maintained for the district.

(3) The service district was created only to provide the services listed in G.S. 153A-301(a)(4) or G.S. 153A-301(a)(6) or both.

(4) The service district does not have any obligation or expense related to the issuance of bonds.

(b) Report. – Before the public hearing required by subsection (c) of this section, the board shall cause to be prepared a report containing:

(1) A map of the district highlighting the territory proposed to be removed, showing the present and proposed boundaries of the district; and

(2) A statement showing that the territory to be removed meets the standards and requirements of subsection (a) of this section.

The report shall be available for public inspection in the office of the clerk to the board for at least 10 days before the date of the public hearing.

(c) Hearing and Notice. – The board shall hold a public hearing before adopting any resolution reducing the boundaries of a district. Notice of the hearing shall state the date, hour, and place of the hearing and its subject and shall include a statement that the report required by subsection (b) of this section is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than seven days before the hearing. In addition, the notice shall be mailed at least two weeks before the date of the hearing by any class of U.S. mail which is fully prepaid to the owners as shown by the county tax records as of the preceding January 1 (and at the address shown thereon) of all property located within the territory to be removed. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and the certificate shall be conclusive in the absence of fraud.

(d) Effective Date. – The resolution reducing the boundaries of the district shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board. (2013-402, s. 1.)

§ 153A-304. Consolidation of service districts.

(a) The board of commissioners may by resolution consolidate two or more service districts upon finding that:

(1) The districts are contiguous or are in a continuous boundary;

(2) The services provided in each of the districts are substantially the same; or

(3) If the services provided are lower for one of the districts, there is a need to increase those services for that district to the level of that enjoyed by the other districts.

(b) Report. – Before the public hearing required by subsection (c), the board of commissioners shall cause to be prepared a report containing:

(1) A map of the districts to be consolidated;

(2) A statement showing the proposed consolidation meets the standards of subsection (a); and

(3) If necessary, a plan for increasing the services for one of the districts so that they are substantially the same throughout the consolidated district.

The report shall be available in the office of the clerk to the board for at least two weeks before the public hearing.

(c) Hearing and Notice. – The board of commissioners shall hold a public hearing before adopting any resolution consolidating service districts. Notice of the hearing shall state the date, hour, and place of the hearing and its subject, and shall include a statement that the report required by subsection (b) is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than one week before the date of the hearing. In addition, the notice shall be mailed at least four weeks before the hearing to the owners as shown by the county tax records as of the preceding January 1 of all property located within the consolidated district. The notice may be mailed by any class of U.S. mail which is fully prepaid. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and his certificate shall be conclusive in the absence of fraud.

(d) Effective Date. – The consolidation of service districts shall take effect at the beginning of a fiscal year commencing after passage of the resolution of consolidation, as determined by the board. (1973, c. 489, s. 1; c. 822, s. 2; 1981, c. 53, s. 2.)

§ 153A-304.1. Reduction in district after annexation.

(a) When the whole or any portion of a county service district organized for fire protection purposes under G.S. 153A-301(2) has been annexed by a municipality furnishing fire protection to its citizens, and the municipality had not agreed to allow territory within it to be within the county service district under G.S. 153A-302(a), then such county service district or the portion thereof so annexed shall immediately thereupon cease to be a county service district or a portion of a county service district; and such district or portion thereof so annexed shall no longer be subject to G.S. 153A-307 authorizing the board of county commissioners to levy and collect a tax in such district for the purpose of furnishing fire protection therein.

(b) Nothing in this section prevents the board of county commissioners from levying and collecting taxes for fire protection in the remaining portion of a county service district not annexed by a municipality.

(c) When all or part of a county service district is annexed, and the effective date of the annexation is a date other than a date in the month of June, the amount of the county service district tax levied on property in the district for the fiscal year in which municipal taxes are prorated under G.S. 160A-58.10 shall be multiplied by the following fraction: the denominator shall be 12 and the numerator shall be the number of full calendar months remaining in the fiscal year following the day on which the annexation becomes effective. For each owner, the product of the multiplication is the prorated fire protection payment. The finance officer of the city shall obtain from the assessor or tax collector of the county where the annexed territory was located a

list of the owners of property on which fire protection district taxes were levied in the territory being annexed, and the city shall, no later than 90 days after the effective date of the annexation, pay the amount of the prorated fire protection district payment to the owners of that property. Such payments shall come from any funds not otherwise restricted by law.

(d) Whenever a city is required to make fire protection district tax payments by subsection (c) of this section, and the city has paid or has contracted to pay to a rural fire department funds under G.S. 160A-58.57, the county shall pay to the city from funds of the county service district an amount equal to the amount paid by the city (or to be paid by the city) to a rural fire department under G.S. 160A-58.57 on account of annexation of territory in the county service district for the number of months in that fiscal year used in calculating the numerator under subsection (c) of this section; provided that the required payments by the county to the city shall not exceed the total of fire protection district payments made to taxpayers in the district on account of that annexation. (1987, c. 711, s. 1; 2008-134, s. 76(b); 2017-102, s. 14.4(b).)

§ 153A-304.2. Reduction in district after annexation to Chapter 69 fire district.

(a) When the whole or any portion of a county service district organized for fire protection purposes under G.S. 153A-301(2) has been annexed into a fire protection district created under Chapter 69 of the General Statutes, then such county service district or the portion thereof so annexed shall immediately thereupon cease to be a county service district or a portion of a county service district; and such district or portion thereof so annexed shall no longer be subject to G.S. 153A-307 authorizing the board of county commissioners to levy and collect a tax in such district for the purpose of furnishing fire protection therein.

(b) Nothing in this section prevents the board of county commissioners from levying and collecting taxes for fire protection in the remaining portion of a county service district not annexed into a fire protection district. This section does not affect the rights or liabilities of the county, a taxpayer, or other person concerning taxes previously levied. (1989, c. 622.)

§ 153A-304.3. Changes in adjoining service districts.

(a) Changes. – The board of county commissioners may by resolution relocate the boundary lines between adjoining county service districts if the districts were established for substantially similar purposes. The boundary lines may be changed in accordance with a petition from landowners or may be changed in any manner the board deems appropriate. Upon receipt of a request to change service district boundaries, the board of county commissioners shall set a date and time for a public hearing on the request prior to taking action on the request.

(b) Report. – Before the public hearing required by subsection (a) of this section, the board of county commissioners shall cause to be prepared a report containing all of the following:

(1) A map of the service district and the adjacent territory showing the current and proposed boundaries of the district.

(2) A statement indicating that the proposed boundary relocation meets the requirements of subsection (a) of this section.

(3) A plan for providing service to the area affected by the relocation of district boundaries.

(4) The effect that the changes in the amount of taxable property will have on the ability of the district to provide services or to service any debt.

The report shall be available for public inspection in the office of the clerk of the board for at least two weeks before the date of the public hearing.

(c) Notice and Hearing. – The board shall hold a public hearing before adopting any resolution relocating the boundaries of a service district. Notice of the hearing shall state the date, hour, and place of the hearing and its subject, and shall include a statement that the report required by subsection (b) of this section is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than one week before the date of the hearing.

(d) Effective Date. – The resolution changing the boundaries of the districts shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board. (2005-136, s. 1.)

§ 153A-304.4. Reduction in law enforcement service district after annexation.

When any portion of a county law enforcement service district organized under G.S. 153A-301(10) is annexed by a municipality, and the effective date of the annexation is a date other than a date in the month of June, the amount of the county law enforcement service district tax levied on each parcel of real property in the district for the fiscal year in which municipal taxes are prorated under G.S. 160A-58.10 shall be multiplied by the following fraction: the denominator shall be 12 and the numerator shall be the number of full calendar months remaining in the fiscal year following the day on which the annexation becomes effective. For each parcel of real property in the portion of the district that is annexed, the product of the multiplication is the amount of the law enforcement service district tax to be refunded if the taxes have been paid, or released if the taxes have not been paid. The finance officer of the county shall obtain from the assessor or tax collector of the county a list of the owners of the real property on which law enforcement service district taxes were levied in the territory annexed, and the county shall pay the refund amount, if applicable, to the owner as shown on the records of the tax assessor of the real property as of the January 1 immediately preceding the date of the refund. Refund payments shall come from any funds not otherwise restricted by law. (2008-134, s. 76(a).)

§ 153A-305. Required provision or maintenance of services.

(a) New District. – When a county defines a new service district, it shall provide, maintain, or let contracts for the services for which the residents of the district are being taxed within a reasonable time, not to exceed one year, after the effective date of the definition of the district.

(b) Extended District. – When a county annexes territory to a service district, it shall provide, maintain, or let contracts for the services provided or maintained throughout the district to the residents of the area annexed to the district within a reasonable time, not to exceed one year, after the effective date of the annexation.

(c) Consolidated District. – When a county consolidates two or more service districts, one of which has had provided or maintained a lower level of services, it shall increase the services within that district (or let contracts therefor) to a level comparable to those provided or maintained elsewhere in the consolidated district within a reasonable time, not to exceed one year, after the effective date of the consolidation. (1973, c. 489, s. 1; c. 822, s. 2.)

§ 153A-306. Abolition of service districts.

Upon finding that there is no longer a need for a particular service district and that there are no outstanding bonds or notes issued to finance projects in the district, the board of commissioners may by resolution abolish that district. The board shall hold a public hearing before adopting a resolution abolishing a district. Notice of the hearing shall state the date, hour and place of the hearing, and its subject, and shall be published at least once not less than one week before the date of the hearing. The abolition of any service district shall take effect at the end of a fiscal year following passage of the resolution, as determined by the board. (1973, c. 489, s. 1; c. 822, s. 2.)

§ 153A-307. Taxes authorized; rate limitation.

A county may levy property taxes within defined service districts in addition to those levied throughout the county, in order to finance, provide or maintain for the districts services provided therein in addition to or to a greater extent than those financed, provided or maintained for the entire county. In addition, a county may allocate to a service district any other revenues whose use is not otherwise restricted by law.

Property subject to taxation in a newly established district or in an area annexed to an existing district is that subject to taxation by the county as of the preceding January 1.

Property taxes may not be levied within any district established pursuant to this Article in excess of a rate on each one hundred dollars ($100.00) value of property subject to taxation which, when added to the rate levied countywide for purposes subject to the rate limitation, would exceed the rate limitation established in G.S. 153A-149(c), unless the portion of the rate in excess of this limitation is submitted to and approved by a majority of the qualified voters residing within the district. Any referendum held pursuant to this paragraph shall be held and conducted as provided in G.S. 153A-149. (1973, c. 489, s. 1; c. 822, s. 2.)

§ 153A-308. Bonds authorized.

A county may issue its general obligation bonds under the Local Government Bond Act to finance services, facilities, or functions provided within a service district. If a proposed bond issue is required by law to be submitted to and approved by the voters of the county, and if the proceeds of the proposed bond issue are to be used in connection with a service that is or, if the bond issue is approved, will be provided only for one or more service districts or at a higher level in service districts than countywide, the proposed bond issue must be approved concurrently by a majority of those voting throughout the entire county and by a majority of the total of those voting in all of the affected or to-be-affected service districts. (1973, c. 489, s. 1; c. 822, s. 2.)

§ 153A-309. EMS services in fire protection districts.

(a) If a service district is established under this Article for fire protection purposes under G.S. 153A-301(2), (including a district established with a rate limitation under G.S. 153A-309.2), and it was not also established under this Article for ambulance and rescue purposes under G.S. 153A-301(7), the board of county commissioners may, by resolution, permit the service district to provide emergency medical, rescue, and/or ambulance services, and may levy property taxes for such purposes under G.S. 153A-307, but if the district was established under G.S. 153A-309.2, the rate limitation established under that section shall continue to apply.

(b) The resolution expanding the purposes of the district under this section shall take effect at the beginning of a fiscal year commencing after its passage. (1983, c. 642; 1989, c. 559.)

§ 153A-309.1. Reserved for future codification purposes.

§ 153A-309.2. Rate limitation in certain districts – Alternative procedure for fire protection service districts.

(a) In connection with the establishment of a service district for fire protection as provided by G.S. 153A-301(2) [G.S. 153A-301(a)(2)], if the board of commissioners adopts a resolution within 90 days prior to the public hearing required by G.S. 153A-302(c) but prior to the first publication of notice required by subsection (b) of this section, which resolution states that property taxes within a district may not be levied in excess of a rate of fifteen cents (15¢) on each one hundred dollars ($100.00) of property subject to taxation, then property taxes may not be levied in that service district in excess of that rate.

(b) Whenever a service district is established under this section, instead of the procedures for hearing and notice under G.S. 153A-302(c), the board of commissioners shall hold a public hearing before adopting any resolution defining a new service district under this section. Notice of the hearing shall state the date, hour and place of the hearing and its subject, and shall include a map of the proposed district and a statement that the report required by G.S. 153A-302(b) is available for public inspection in the office of the clerk to the board. The notice shall be published at least twice, with one publication not less than two weeks before the hearing, and the other publication on some other day not less than two weeks before the hearing. (1985, c. 724.)

§ 153A-309.3. Rate limitation in certain districts – Fire protection service districts for industrial property.

(a) Any area in a service district for fire protection established pursuant to G.S. 153A-301(a)(2) may be removed from that district by resolution of the county board of commissioners and a new service district simultaneously created for the area so removed if the area is an industrial facility (and appurtenant land and structures):

(1) Subject to a contract not to annex by a municipality under which the owner of the industrial property is obligated to make payments in lieu of taxes equal to or in excess of fifty percent (50%) of the taxes such industry would pay if it were annexed and is current in making such payments.

(2) Actively served by an industrial fire brigade which meets the standards of the National Fire Protection Association and the requirements of the North Carolina Occupational Safety and Health Standards for General Industry (Title 29 Code of Federal Regulations Part 1910 incorporated by reference in 13 NCAC 07F.0101) for industrial fire brigades.

(b) Prior to removing such area from the service district and simultaneously creating a new district of that same area, the board shall hold a public hearing. Notice of the hearing shall state the date, hour, and place of the hearing and its subject. The notice shall be published at least once not less than one week before the date of the hearing. In addition, the notice shall be mailed at least two weeks before the date of the hearing to the owners as shown by the county tax records as of the preceding January 1 of all property located within the area to be removed and a new district created. The notice may be mailed by any class of U.S. mail which is fully prepaid. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and his certificate shall be conclusive in the absence of fraud.

(c) In any district created under this section from area removed from an existing district, the county may not levy or collect property taxes for the purpose of financing fire protection pursuant to this Article in excess of a rate of three and one-half cents (3.5¢) on each one hundred dollars ($100.00) of property valuation subject to taxation.

(d) If any district established under this section ceases to meet the tests established by subdivisions (a)(1) and (a)(2) of this section, the board of commissioners may by resolution abolish that district and annex that territory to the district from which it was removed after a public hearing under the same provisions as set out in subsection (b) of this section.

(e) Any resolutions adopted under this section become effective the first day of July following their adoption. (2005-281, s. 1.)

§ 153A-310. Rate limitation in certain districts – Alternative procedure for ambulance and rescue districts.

(a) In connection with the establishment of a service district for ambulance and rescue as provided by G.S. 153A-301(7) [G.S. 153A-301(a)(7)], if the board of commissioners adopts a resolution within 90 days prior to the public hearing required by G.S. 153A-302(c) but prior to the first publication of notice required by subsection (b) of this section, which resolution states that property taxes within a district may not be levied in excess of a rate of five cents (5¢) on each one hundred dollars ($100.00) of property subject to taxation, then property taxes may not be levied in that service district in excess of that rate.

(b) Whenever a service district is established under this section, instead of the procedures for hearing and notice under G.S. 153A-302(c), the board of commissioners shall hold a public hearing before adopting any resolution defining a new service district under this section. Notice of the hearing shall state the date, hour and place of the hearing and its subject, and shall include a map of the proposed district and a statement that the report required by G.S. 153A-302(b) is available for public inspection in the office of the clerk to the board. The notice shall be published at least twice, with one publication not less than two weeks before the hearing, and the other publication on some other day not less than two weeks before the hearing. (1985, c. 430, s. 1.)

Part 2. County Research and Production Service Districts and Urban Research Service Districts.

§ 153A-311. Purposes for which districts may be established.

The board of commissioners of any county may define a county research and production service district in order to finance, provide, and maintain for the district any service, facility, or function that a county or a city is authorized by general law to provide, finance, or maintain. Such a service, facility, or function shall be financed, provided, or maintained in the district either in addition to or to a greater extent than services, facilities, or functions are financed, provided, or maintained for the entire county. (1985, c. 435, s. 1.)

§ 153A-312. Definition of research and production service district.

(a) Standards. – The board of commissioners may by resolution establish a research and production service district for any area of the county that, at the time the resolution is adopted, meets the following standards:

(1) All (i) real property in the district is being used for or is subject to covenants that limit its use to research; or scientifically-oriented production, technology, education; or associated commercial, residential, or institutional purposes; or

for other purposes specifically authorized pursuant to the terms and conditions of the covenants, or (ii) if all the real property in the district is part of a multijurisdictional industrial park that satisfies the criteria of G.S. 143B-437.08(h), all such real property in the district is subject to covenants that limit its use to research or scientifically oriented production, associated commercial or institutional purposes, or other industrial and associated commercial and institutional uses.

(2) The district (i) contains at least 4,000 acres or (ii) satisfies the criteria of G.S. 143B-437.08(h).

(3) The district (i) includes research and production facilities that in combination employ at least 5,000 persons or (ii) satisfies the criteria of G.S. 143B-437.08(h).

(4) Repealed by Session Laws 2012-73, s.1, effective June 26, 2012.

(5) A petition requesting creation of the district signed by at least fifty percent (50%) of the owners of real property in the district who own at least fifty percent (50%) of total area of the real property in the district has been presented to the board of commissioners. In determining the total area of real property in the district and the number of owners of real property, there shall be excluded (1) real property exempted from taxation and real property classified and excluded from taxation and (2) the owners of such exempted or classified and excluded property.

(6) Repealed by Session Laws 2012-73, s.1, effective June 26, 2012.

(7) There exists in the district an association of owners and tenants, to which at least seventy-five percent (75%) of the owners of nonresidential real property belong, which association can make the recommendations provided for in G.S. 153A-313. This subdivision shall not apply to a research and production service district that satisfies the criteria of G.S. 143B-437.08(h).

(8) There exist deed-imposed conditions, covenants, restrictions, and reservations that apply to all real property in the district, provided that the covenants, restrictions, and reservations shall not be effective against the United States as long as it owns or leases property in the district but shall apply to any subsequent owner or lessee of such property.

(9) No part of the district lies within the boundaries of any incorporated city or town.

The Board of Commissioners may establish a research and production service district if, upon the information and evidence it receives, the Board finds that:

(1) The proposed district meets the standards set forth in this subsection; and

(2) It is impossible or impracticable to provide on a countywide basis the additional or higher levels of services, facilities, or functions proposed for the district; and

(3) It is economically feasible to provide the proposed services, facilities, or functions to the district without unreasonable or burdensome tax levies.

(a1) Additional Uses. – A developer of a research and production service district established prior to June 1, 2012, may amend the covenants that limit the use of real property in the district to include any of the following uses: research; or scientifically-oriented production, technology, education; or associated commercial, residential, or institutional purposes; or for

other purposes specifically authorized pursuant to the terms and conditions of the covenants. A research and production service district is presumed to be in compliance with the standards in subsection (a) of this section if the district met the standards in subsection (a) of this section, as that subsection was enacted at the time of the establishment of the district.

(b) Multi-County Districts. – If an area that meets the standards for creation of a research and production service district lies in more than one county, the boards of commissioners of those counties may adopt concurrent resolutions establishing a district, even if that portion of the district lying in any one of the counties does not by itself meet the standards. Each of the county boards of commissioners shall follow the procedure set out in this section for creation of a district.

If a multi-county district is established, as provided in this subsection, the boards of commissioners of the counties involved shall jointly determine whether the same appraisal and assessment standards apply uniformly throughout the district, or, in the case of a multijurisdictional industrial park that satisfies the criteria of G.S. 143B-437.08(h), whether there is a current need in each participating county to levy a tax, which determination shall be made by each participating county's board of commissioners. This determination shall be set out in concurrent resolutions of the boards. If the same appraisal and assessment standards apply uniformly throughout the district, the boards of commissioners of all the counties shall levy the same rate of tax for the district, so that a uniform rate of tax is levied for district purposes throughout the district. If the boards determine that the same standards do not apply uniformly throughout the district, the boards shall agree on the extent of divergence between the counties and on the resulting adjustments of tax rates that will be necessary in order that an effectively uniform rate of tax is levied for district purposes throughout the district. In the event that one or more of the boards of commissioners in one or more of the counties participating in a multijurisdictional industrial park that satisfies the criteria of G.S. 143B-437.08(h) determines that there is no current need to levy a tax for all or part of the property meeting said requirements within its jurisdictional boundaries, then that county or those counties shall be under no obligation to do so. That county or those counties participating in a multijurisdictional industrial park that satisfies the criteria of G.S. 143B-437.08(h) that choose to levy a tax for all or part of the property meeting said requirements within its jurisdictional boundaries may do so without setting an effectively uniform rate of tax as described above, provided such rate shall not exceed the rate allowed in G.S. 143B-317(b).

The boards of commissioners of the counties establishing a multi-county district pursuant to this subsection may, by concurrent resolution, provide for the administration of services within the district by one or more counties on behalf of all the establishing counties.

(c) Report. – Before the public hearing required by subsection (d), the board of commissioners shall cause to be prepared a report containing:

(1) A map of the proposed district, showing its proposed boundaries;
(2) A statement showing that the proposed district meets the standards set out in subsection (a); and
(3) A plan for providing one or more services, facilities, or functions to the district.

The report shall be available for public inspection in the office of the clerk to the board for at least four weeks before the date of the public hearing.

(d) Hearing and Notice. – The board of commissioners shall hold a public hearing before adopting any resolution defining a district under this section. Notice of the hearing shall state the

date, hour, and place of the hearing and its subject, and shall include a map of the proposed district and a statement that the report required by subsection (c) is available for public inspection in the office of the clerk to the board. The notice shall be published at least once not less than one week before the date of the hearing. In addition, it shall be mailed at least four weeks before the date of the hearing by any class of U.S. mail which is fully prepaid to the owners as shown by the county tax records as of the preceding January 1 (and at the address shown thereon) of all property located within the proposed district. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed and his certificate is conclusive in the absence of fraud.

(e) Effective Date. – The resolution defining a district shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board of commissioners. (1985, c. 435, s. 1; 2009-523, s. 3(a); 2012-73, s. 1.)

§ 153A-313. Research and production service district advisory committee.

(a) The board or boards of commissioners, in the resolution establishing a research and production service district, shall also provide for an advisory committee for the district. Such a committee shall have at least 10 members, serving terms as set forth in the resolution; one member shall be the representative of the developer of the research and production park established as a research and production service district. The resolution shall provide for the appointment or designation of a chair. The board of commissioners or, in the case of a multi-county district, the boards of commissioners shall appoint the members of the advisory committee. If a multi-county district is established, the concurrent resolutions establishing the district shall provide how many members of the advisory committee are to be appointed by each board of commissioners. Before making the appointments, the appropriate board shall request the association of owners and tenants, required by G.S. 153A-312(a), to submit a list of persons to be considered for appointment to the committee; the association shall submit at least two names for each appointment to be made. Except as provided in the next two sentences, the board of commissioners shall make the appointments to the committee from the list of persons submitted. In addition, the developer of the research and production park shall appoint one person to the advisory committee as the developer's representative on the committee. In addition, in a single county district, the board of commissioners may make two additional appointments of such other persons as the board of commissioners deems appropriate, and in a multi-county district, each board of county commissioners may make one additional appointment of such other person as that board of commissioners deems appropriate. Whenever a vacancy occurs on the committee in a position filled by appointment by the board of commissioners, the appropriate board, before filling the vacancy, shall request the association to submit the names of at least two persons to be considered for the vacancy; and the board shall fill the vacancy by appointing one of the persons so submitted, except that if the vacancy is in a position appointed by the board of commissioners under the preceding sentence of this section, the board of commissioners making that appointment shall fill the vacancy with such person as that board of commissioners deems appropriate.

Each year, before adopting the budget for the district and levying the tax for the district, the board or boards of commissioners shall request recommendations from the advisory committee as to the level of services, facilities, or functions to be provided for the district for the ensuing year. The board or boards of commissioners shall, to the extent permitted by law, expend the

proceeds of any tax levied for the district in the manner recommended by the advisory committee.

(b) In the event that the research and production service district satisfies the criteria of G.S. 143B-437.08(h), the board of directors for the nonprofit corporation which owns the industrial park shall serve as the advisory committee described in subsection (a) of this section. (1985, c. 435, s. 1; 2009-523, s. 3(b); 2012-73, s. 1.)

§ 153A-314. Extension of service districts.

(a) Standards. – A board of commissioners may by resolution annex territory to a research and production service district upon finding that:

(1) The conditions, covenants, restrictions, and reservations required by G.S. 153A-312(a)(8) that apply to all real property in the district also apply or will apply to the property to be annexed, provided that the covenants, restrictions, and reservations shall not be effective against the United States as long as it owns or leases property in the district but shall apply to any subsequent owner or lessee of such property.

(2) One hundred percent (100%) of the owners of real property in the area to be annexed have petitioned for annexation.

(3) The district, following the annexation, will continue to meet the standards set out in G.S. 153A-312(a).

(4) The area to be annexed requires the services, facilities, or functions financed, provided, or maintained for the district.

(5) The area to be annexed is contiguous to the district.

(b) Report. – Before the public hearing required by subsection (c), the board shall cause to be prepared a report containing:

(1) A map of the district and the adjacent territory proposed to be annexed, showing the present and proposed boundaries of the district; and

(2) A statement showing that the area to be annexed meets the standards and requirements of subsection (a) of this section.

The report shall be available for public inspection in the office of the clerk to the board for at least four weeks before the date of the public hearing.

(c) Hearing and Notice. – The board shall hold a public hearing before adopting any resolution extending the boundaries of a district. Notice of the hearing shall state the date, hour and place of the hearing and its subject, and shall include a statement that the report required by subsection (b) of this section is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than four weeks before the hearing. In addition, the notice shall be mailed at least four weeks before the date of the hearing by any class of U.S. mail which is fully prepaid to the owners as shown by the county tax records as of the preceding January 1 (and at the address shown thereon) of all property located within the area to be annexed. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and the certificate shall be conclusive in the absence of fraud.

(d) Effective Date. – The resolution extending the boundaries of the district shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board. (1985, c. 435, s. 1; 2012-73, s. 1.)

§ 153A-314.1. Removal of territory from districts.

(a) Standards. – A board of commissioners may by resolution remove territory from a research and production service district upon finding that:

(1) The removal has been recommended by a vote of two-thirds of the eligible votes of the owners and tenants association.

(2) One hundred percent (100%) of the owners of real property in the territory to be removed have petitioned for removal.

(3) The territory to be removed no longer requires the services, facilities, or functions financed, provided, or maintained for the district.

(b) Report. – Before the public hearing required by subsection (c) of this section, the board shall cause to be prepared a report containing:

(1) A map of the district highlighting the territory proposed to be removed, showing the present and proposed boundaries of the district; and

(2) A statement showing that the territory to be removed meets the standards and requirements of subsection (a) of this section.

The report shall be available for public inspection in the office of the clerk to the board for at least 10 days before the date of the public hearing.

(c) Hearing and Notice. – The board shall hold a public hearing before adopting any resolution reducing the boundaries of a district. Notice of the hearing shall state the date, hour, and place of the hearing and its subject and shall include a statement that the report required by subsection (b) of this section is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than seven days before the hearing. In addition, the notice shall be mailed at least two weeks before the date of the hearing by any class of U.S. mail which is fully prepaid to the owners as shown by the county tax records as of the preceding January 1 (and at the address shown thereon) of all property located within the territory to be removed. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and the certificate shall be conclusive in the absence of fraud.

(d) Municipal Annexation Allowed Under General Law. – The general law concerning annexation, Article 4A of Chapter 160A of the General Statutes, shall apply to any territory removed from the district under this section, notwithstanding any local act to the contrary.

(e) Effective Date. – The resolution reducing the boundaries of the district shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board. (2003-187, s. 1; 2012-73, s. 1.)

§ 153A-315. Required provision or maintenance of services.

(a) New District. – When a county or counties define a research and production service district, it or they shall provide, maintain, or let contracts for the services for which the district is being taxed within a reasonable time, not to exceed one year, after the effective date of the definition of the district.

(b) Extended District. – When a territory is annexed to a research and production service district, the county or counties shall provide, maintain, or let contracts for the services provided or maintained throughout the district to property in the area annexed to the district within a reasonable time, not to exceed one year, after the effective date of the annexation. (1985, c. 435, s. 1.)

§ 153A-316. Abolition of districts.

A board or boards of county commissioners may by resolution abolish a research and production service district upon finding that (i) a petition requesting abolition, signed by at least fifty percent (50%) of the owners of nonresidential real property in the district who own at least fifty percent (50%) of the total area of nonresidential real property in the district, has been submitted to the board or boards; and (ii) there is no longer a need for such district. In determining the total area of nonresidential real property in the district and the number of owners of nonresidential real property, there shall be excluded (1) real property exempted from taxation and real property classified and excluded from taxation and (2) the owners of such exempted or classified and excluded property. The board or boards shall hold a public hearing before adopting a resolution abolishing a district. Notice of the hearing shall state the date, hour, and place of the hearing, and its subject, and shall be published at least once not less than one week before the date of the hearing. The abolition of any district shall take effect at the end of a fiscal year following passage of the resolution, as determined by the board or boards. If a multi-county district is established, it may be abolished only by concurrent resolution of the board of commissioners of each county in which the district is located. (1985, c. 435, s. 1; 2012-73, s. 1.)

§ 153A-316.1. Urban research service district (URSD).

(a) Standards. – The board of commissioners of a county may establish one or more urban research service districts ("URSD" as used in this Part) that meets the following standards:

(1) The URSD is wholly within a county research and production service district located partly within that county.

(2) The URSD is located wholly within that county.

(3) The URSD is not contained within another URSD.

(4) A petition requesting creation of the URSD signed by at least fifty percent (50%) of the owners of real property in the URSD who own at least fifty (50%) of total area of the real property in the URSD has been presented to the board of commissioners.

(b) Report. – Before the public hearing required by subsection (c) of this section, the board of commissioners shall cause to be prepared and adopted by it a report. The report shall be available for public inspection in the office of the clerk to the board for at least four weeks before the date of the public hearing. The report shall contain the following:

(1) A map of the proposed URSD, showing its proposed boundaries.

(2) A statement showing that the proposed URSD is for the purpose of providing urban services, facilities, or functions to a greater extent than (i) in the entire county and (ii) in the county research and production service district.

(3) A plan for providing one or more services, facilities, or functions to the URSD.

(c) Hearing and Notice. – The board of commissioners shall hold a public hearing before adopting any resolution defining a URSD under this section. Notice of the hearing shall state the date, hour, and place of the hearing and its subject, and shall include a map of the proposed URSD and a statement that the report required by subsection (b) of this section is available for public inspection in the office of the clerk to the board. The notice shall be published at least once not less than one week before the date of the hearing. In addition, it shall be mailed at least four weeks before the date of the hearing by any class of U.S. mail that is fully prepaid to the owners, as shown by the county tax records as of the preceding January 1, of all property located within the proposed URSD. The person designated by the board to mail the notice shall certify to

the board that the mailing has been completed, and the designated person's certificate is conclusive in the absence of fraud.

(d) Effective Date. – The resolution defining a URSD shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board of commissioners. (2012-73, s. 1; 2012-194, s. 62.5.)

§ 153A-316.2. URSD advisory committee.

(a) Members. – The board of commissioners, in the resolution establishing a URSD, shall also provide for an advisory committee for the URSD. The committee shall have at least 10 members, serving terms as set forth in the resolution. The resolution shall provide for the appointment or designation of a chairperson. The board of commissioners shall appoint the members of the USRD [URSD] advisory committee. Before making the appointments, the board shall request the association of owners and tenants, required by G.S. 153A-312(a), to submit a list of persons to be considered for appointment to the committee. The association shall submit at least two names for each appointment to be made. Except as provided in subsection (b) of this section, the board of commissioners shall make the appointments to the committee from the list of persons submitted.

(b) Additional Members. – In addition to the members provided in subsection (a) of this section, the developer of the research and production park established as a research and production service district shall appoint one person to the URSD advisory committee as the developer's representative on the committee. The board of commissioners may make two additional appointments of such other persons as the board of commissioners deems appropriate.

(c) Vacancy. – Whenever a vacancy occurs on the committee in a position filled by appointment by the board of commissioners, the board, before filling the vacancy, shall request the association to submit the names of at least two persons to be considered for the vacancy, and the board shall fill the vacancy by appointing one of the persons so submitted, except that if the vacancy is in a position appointed by the board of commissioners under subsection (b) of this section, the board of commissioners making that appointment shall fill the vacancy with such person as the board of commissioners deems appropriate.

(d) Advisory Role. – Each year, before adopting the budget for the URSD and levying the tax for the URSD, the board of commissioners shall request recommendations from the URSD advisory committee as to the level of services, facilities, or functions to be provided for the URSD for the ensuing year. The board of commissioners shall, to the extent permitted by law, expend the proceeds of any tax levied for the URSD in the manner recommended by the URSD advisory committee. (2012-73, s. 1.)

§ 153A-316.3. Extension of URSD.

(a) Standards. – A board of commissioners may by resolution annex territory to a URSD upon finding that:

(1) The conditions, covenants, restrictions, and reservations required by G.S. 153A-312(a)(8) that apply to all real property in the URSD also apply or will apply to the property to be annexed, provided that such covenants, restrictions, and reservations shall not be effective against the United States as long as it owns or leases property in the URSD but shall apply to any subsequent owner or lessee of such property.

(2) One hundred percent (100%) of the owners of real property in the area to be annexed have petitioned for annexation.
(3) The URSD, following the annexation, will continue to meet the standards set out in G.S. 153A-316.1(a).
(4) The area to be annexed requires the services, facilities, or functions financed, provided, or maintained for the URSD.
(5) The area to be annexed is contiguous to the URSD.

(b) Report. – Before the public hearing required by subsection (c) of this section, the board shall cause to be prepared a report. The report shall be available for public inspection in the office of the clerk to the board for at least four weeks before the date of the public hearing. The report shall contain the following:

(1) A map of the URSD and the adjacent territory proposed to be annexed, showing the present and proposed boundaries of the URSD.
(2) A statement showing that the area to be annexed meets the standards and requirements of subsection (a) of this section.

(c) Hearing and Notice. – The board shall hold a public hearing before adopting any resolution extending the boundaries of a URSD. Notice of the hearing shall state the date, hour, and place of the hearing and its subject, and shall include a statement that the report required by subsection (b) of this section is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than four weeks before the hearing. In addition, the notice shall be mailed at least four weeks before the date of the hearing by any class of U.S. mail that is fully prepaid to the owners, as shown by the county tax records as of the preceding January 1, of all property located within the area to be annexed. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and the certificate shall be conclusive in the absence of fraud.

(d) Effective Date. – The resolution extending the boundaries of the URSD shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board. (2012-73, s. 1.)

§ 153A-316.4. Removal of territory from URSD.

(a) Standards. – A board of commissioners may by resolution remove territory from a URSD upon finding that:

(1) The removal has been recommended by a vote of two-thirds of the eligible voters of the owners and tenants association.
(2) One hundred percent (100%) of the owners of real property in the territory to be removed have petitioned for removal.
(3) The territory to be removed no longer requires the services, facilities, or functions financed, provided, or maintained for the URSD.
(4) The county has not financed any project for which taxes levied on the URSD provide debt service pursuant to G.S. 153A-317.1(c).

(b) Report. – Before the public hearing required by subsection (c) of this section, the board shall cause to be prepared a report. The report shall be available for public inspection in the office of the clerk to the board for at least 10 days before the date of the public hearing. The report shall contain the following:

(1) A map of the URSD highlighting the territory proposed to be removed, showing the present and proposed boundaries of the URSD.

(2) A statement showing that the territory to be removed meets the standards and requirements of subsection (a) of this section.

(c) Hearing and Notice. – The board shall hold a public hearing before adopting any resolution reducing the boundaries of the URSD. Notice of the hearing shall state the date, hour, and place of the hearing and its subject, and shall include a statement that the report required by subsection (b) of this section is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than seven days before the hearing. In addition, the notice shall be mailed at least two weeks before the date of the hearing by any class of U.S. mail that is fully prepaid to the owners, as shown by the county tax records as of the preceding January 1, of all property located within the territory to be removed. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and the certificate shall be conclusive in the absence of fraud.

(d) Effective Date. – The resolution reducing the boundaries of the URSD shall take effect at the beginning of a fiscal year commencing after its passage, as determined by the board. (2012-73, s. 1.)

§ 153A-316.5. Required provision or maintenance of services in URSD.

(a) New URSD. – When a county defines a URSD, it shall provide, maintain, or let contracts for the services for which the URSD is being taxed within a reasonable time, not to exceed one year, after the effective date of the definition of the URSD. When a county defines a URSD, it may designate the developer of the research and development park established as a research and production service district in which the URSD is located as an agent that may contract with any local government for the provision of services within the URSD.

(b) Extended URSD. – When a territory is annexed to a URSD, the county shall provide, maintain, or let contracts for the services provided or maintained throughout the URSD to property in the area annexed to the URSD within a reasonable time, not to exceed one year, after the effective date of the annexation. (2012-73, s. 1.)

§ 153A-316.6. Abolition of URSD.

A county board of commissioners may by resolution abolish a URSD upon finding that (i) a petition requesting abolition, signed by at least fifty percent (50%) of the owners of nonresidential real property in the URSD who own at least fifty percent (50%) of the total area of nonresidential real property in the URSD, has been submitted to the board or boards; (ii) there is no longer a need for such URSD; and (iii) the county has not financed any project for which there is outstanding debt serviced by tax revenues levied within the URSD. In determining the total area of nonresidential real property in the URSD and the number of owners of nonresidential real property, there shall be excluded (i) real property exempted from taxation and real property classified and excluded from taxation and (ii) the owners of such exempted or classified and excluded property. The board or boards shall hold a public hearing before adopting a resolution abolishing a URSD. Notice of the hearing shall state the date, hour, and place of the hearing and its subject, and shall be published at least once not less than one week before the date of the hearing. The abolition of any URSD shall take effect at the end of a fiscal year following passage of the resolution, as determined by the board. (2012-73, s. 1.)

§ 153A-317. Research and production service district taxes authorized; rate limitation.

(a) Tax Authorized. – A county, upon recommendation of the advisory committee established pursuant to G.S. 153A-313, may levy property taxes within a research and production service district in addition to those levied throughout the county, in order to finance, provide, or maintain for the district services provided therein in addition to or to a greater extent than those financed, provided, or maintained for the entire county. In addition, a county may allocate to a district any other revenues whose use is not otherwise restricted by law. The proceeds of taxes only within a district may be expended only for services provided for the district.

Property subject to taxation in a newly established district or in an area annexed to an existing district is that subject to taxation by the county as of the preceding January 1.

(b) Limit. – Such additional property taxes may not be levied within any district established pursuant to this Article in excess of a rate of ten cents (10¢) on each one hundred dollars ($100.00) value of property subject to taxation or, in the event that the research and production service district satisfies the criteria of G.S. 143B-437.08(h), such additional property taxes may not be levied within said district in excess of a rate of twenty cents (20¢) on each one hundred dollars ($100.00) value of property subject to taxation.

(c) Public Transportation. – For the purpose of constructing, maintaining, or operating public transportation as defined by G.S. 153A-149(c)(27), in addition to the additional property taxes levied under subsections (a) and (b) of this section, a county, upon recommendation of the advisory committee established pursuant to G.S. 153A-313, may levy additional property taxes within any district established pursuant to this Article not in excess of a rate of ten cents (10¢) on each one hundred dollars ($100.00) value of property subject to taxation. Such property taxes for public transportation may only be used within the district, or to provide for public transportation from the district to other public transportation systems or to other places outside the district including airports. (1985, c. 435, s. 1; 2009-523, s. 3(c); 2009-527, s. 6; 2012-73, s. 1.)

§ 153A-317.1. Urban research service district taxes authorized; rate.

(a) Tax Authorized. – A county, upon recommendation of the advisory committee established pursuant to G.S. 153A-316.2, may levy property taxes within a URSD in addition to those levied throughout the county, and in addition to those levied throughout the county research and production service district, in order to finance, provide, or maintain for the URSD services provided therein in addition to or to a greater extent than those financed, provided, or maintained both for the entire county and for the county research and production service district. Only those services that cities are authorized by law to provide may be provided. In addition, a county may allocate to a URSD any other revenue not otherwise restricted by law.

(b) Rate. – Property subject to taxation in a newly established URSD or in an area annexed to an existing URSD is that subject to taxation by the county as of the preceding January. The maximum tax rate set forth in G.S. 153A-317 shall not apply to the URSD. The additional property taxes within any URSD may not be levied in excess of the rate levied in the prior year by a city that:

(1) Is the largest city in population that is contiguous to the county research and production service district where the URSD is located.

(2) Is located primarily within the same county the URSD is located.

(c) Use. – The proceeds of taxes levied within a URSD may be expended only for the benefit of the URSD. The taxes levied for the URSD may be used for debt service on any debt issued by the county that is used wholly or partly for capital projects located within the URSD, but not in greater proportion than expense of projects located within the URSD bear to the entire

expense of capital projects financed by that borrowing of the county. For the purpose of this subsection, "debt" includes (i) general obligation bonds and notes issued under Chapter 159 of the General Statutes, (ii) revenue bonds issued under Chapter 159 of the General Statutes, (iii) financing agreements under Article 8 of Chapter 159 of the General Statutes, and (iv) special obligation bonds issued by the county. (2012-73, s. 1.)

§ 153A-317.2: Reserved for future codification purposes.

§ 153A-317.3: Reserved for future codification purposes.

§ 153A-317.4: Reserved for future codification purposes.

§ 153A-317.5: Reserved for future codification purposes.

§ 153A-317.6: Reserved for future codification purposes.

§ 153A-317.7: Reserved for future codification purposes.

§ 153A-317.8: Reserved for future codification purposes.

§ 153A-317.9: Reserved for future codification purposes.

§ 153A-317.10: Reserved for future codification purposes.

Part 3. Economic Development and Training Districts.

§ 153A-317.11. Purpose and nature of districts.

The board of commissioners of any county may define a county economic development and training district, as provided in this Part, to finance, provide, and maintain for the district a skills training center in cooperation with its community college branch in or for the county to prepare residents of the county to perform manufacturing, research and development, and related service and support jobs in the pharmaceutical, biotech, life sciences, chemical, telecommunications, and electronics industries, and allied, ancillary, and subordinate industries, to provide within the district any of the education, training, and related services, facilities, or functions that a county or a city is authorized by general law to provide, finance, or maintain, and to promote economic development in the county. The skills training center and related services shall be financed, provided, or maintained in the district either in addition to or to a greater extent than training facilities and services are financed, provided, or maintained in the entire county. A district created under this Part is a special tax area under Section 2(4) of Article V of the North Carolina Constitution. (2003-418, s. 1; 2004-170, s. 38.)

§ 153A-317.12. Definition of economic development and training district.

(a) Standards. – The board of commissioners may by resolution establish an economic development and training district for an area or areas of the county that, at the time the resolution is adopted, meet the following standards:

(1) All of the real property in the district primarily is being used for, or is subject to, a declaration of covenants, conditions, and restrictions that limits its use

primarily to biotech processing, chemical manufacturing, pharmaceutical manufacturing, electronics manufacturing, telecommunications manufacturing, and any allied, ancillary, or subordinate uses including, without limitation, any research and development facility, headquarters or office, temporary lodging facility, restaurant, warehouse, or transportation or distribution facility.

(2) The district includes at least two pharmaceuticals manufacturing or bioprocessing facilities occupying sites in the district containing in the aggregate at least 425 acres owned by publicly held corporations.

(3) The bioprocessing and pharmaceuticals manufacturing facilities in the district employ in the aggregate at least 1,600 persons.

(4) The district includes an industrial park consisting of at least 60 acres within a noncontiguous parcel of at least 625 acres now or formerly owned by an airport authority.

(5) The district's zoning classifications permit the uses listed in this section.

(6) All real property in the district is either zoned for or is being used primarily for pharmaceutical, biotech, life sciences, chemical, telecommunications, or electronics manufacturing or processing or allied, ancillary, or subordinate uses.

(7) The district shall include a skills training center situated on a tract containing not less than eight acres, which facility shall be designed and staffed to provide relevant training to prepare existing or prospective employees of targeted industries for jobs in one or more of the pharmaceutical, biotech, life sciences, chemical, telecommunications, and electronics industries and allied, ancillary, or subordinate industries. The training center shall be completed within a reasonable period after the creation of the district.

(8) At the date of creation, no part of the district lies within the boundaries of any incorporated city or town.

(9) There exists a uniform set of covenants, conditions, restrictions, and reservations that applies to all real property in the district other than property owned by the federal, State, or local government.

(10) There exists in the district an association of owners and tenants to which owners of real property representing at least fifty percent (50%) of the assessed value of real property in the district belong, which association can make the recommendations provided for in G.S. 153A-317.13.

(11) A petition requesting creation of the district signed by owners of real property in the district who own real and personal property representing at least fifty percent (50%) of the total assessed value of the real and personal property in the district has been presented to the board of commissioners. In determining the assessed value of real and personal property in the district and the owners of real property, there shall be excluded: (i) real property exempted from taxation and real property classified and excluded from taxation and (ii) the owners of such exempted or classified and excluded property. Assessed value shall mean the most recent values determined by the county for the imposition of taxes on real and personal property.

(b) Findings. – The board of commissioners may establish an economic development and training district if, upon the information and evidence it receives, the board determines that:

(1) The proposed district meets the standards set forth in subsection (a) of this section;

(2) Economic development of the county will be served by providing selected skills training in a facility designed specifically to address the needs of targeted industries such as pharmaceuticals, biotech processing, telecommunications, electronics, and allied, ancillary, or subordinate supplies or services to induce existing industries and targeted industries to improve and expand their facilities and new industries to locate facilities in the district, thereby providing employment opportunities for the residents of the county;

(3) It is impossible or impractical to provide training facilities and services on a countywide basis to all existing and future employers in the county to the same extent as such training services are intended to be furnished within the district; and

(4) It is economically feasible to provide the proposed training facilities and services in the district without unreasonable or burdensome tax levies.

(c) Report. – Before the public hearing required by subsection (d) of this section, the board of commissioners shall cause to be prepared a report containing all of the following:

(1) A map of the proposed district showing its proposed boundaries.

(2) A statement showing that the proposed district meets the standards set out in subsection (a) of this section.

(3) A plan for providing the skills training center and training services to the district.

The report shall be available for public inspection in the office of the clerk to the board for at least four weeks before the date of the public hearing.

(d) Hearing and Notice. – The board of commissioners shall hold a public hearing before adopting any resolution defining a district under this section. Notice of the hearing shall state the date, hour, and place of the hearing and its subject and shall include a map of the proposed district and a statement that the report required by subsection (c) of this section is available for public inspection in the office of the clerk to the board. The notice shall be published at least once not less than one week before the date of the hearing. In addition, it shall be mailed at least four weeks before the date of the hearing by any class of U.S. mail which is fully prepaid to the owners as shown by the county tax records as of the preceding January 1 (and at the address shown thereon) of all property located within the proposed district. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and the certificate shall be conclusive in the absence of fraud.

(e) Effective Date. – The resolution creating a district shall take effect at the beginning of the fiscal year commencing after its passage or such other date as shall be determined by the board of commissioners. (2003-418, s. 1.)

§ 153A-317.13. Advisory committee.

(a) Creation. – The board of commissioners, in the resolution establishing an economic development and training district, shall also provide for an advisory committee for the district. The committee shall consist of five members, serving terms as set forth in the resolution. The

resolution shall provide for the appointment or designation of a chair. The board of commissioners shall appoint the members of the advisory committee as provided in this section.

(b) Membership. – Three of the five committee members shall represent the association of owners and tenants, as required by G.S. 153A-317.12(a)(10), and two members shall represent the county. Before making the appointments representing the association, the board of commissioners shall request the association to submit a list of persons to be considered for appointment to the committee. The association of owners and tenants shall submit at least two names for each appointment to be made and the board of commissioners shall make the appointments to the committee representing the association from the list of persons submitted to it by the association. Whenever a vacancy occurs on the committee in a position filled by an appointment by the board of commissioners representing the association of owners and tenants, the board, before filling the vacancy, shall request the association to submit the names of at least two persons to be considered for the vacancy, and the board shall fill the vacancy by appointing one of the persons so submitted.

(c) Advisory Duties. – Each year, before adopting the budget for the district and levying the tax for the district, the board shall request recommendations from the advisory committee as to the type and level of services, facilities, or functions to be provided for the district for the ensuing years. The board of commissioners shall, to the extent permitted by law, expend the proceeds of any tax levied for the district in the manner recommended by the advisory committee. (2003-418, s. 1.)

§ 153A-317.14. Extension of economic development and training districts.

(a) Standards. – A board of commissioners may by resolution annex territory to an economic development and training district upon finding that:

(1) The conditions, covenants, restrictions, and reservations required by G.S. 153A-317.12(a)(1) that apply to all real property in the district, other than property owned by the federal, State, or local government, also apply or will apply to the property, other than property owned by the federal government, to be annexed.

(2) One hundred percent (100%) of the owners of real property in the area to be annexed have petitioned for annexation.

(3) The district, following the annexation, will continue to meet the standards set out in G.S. 153A-317.12(a).

(4) The reasonably anticipated training needs of the existing companies in the area to be annexed and of new companies that may locate within the expanded area can be met by the skills training facility located in the district.

(5) The area to be annexed is either contiguous to a lot, parcel, or tract of land in the district or at least 500 acres in the aggregate counting all parcels proposed for annexation. A property shall, for purposes of this section, be deemed to be contiguous notwithstanding that it may be separated from other property by a street, road, highway, right-of-way, or easement.

(6) If any of the area proposed to be annexed to the district is wholly or partially within the extraterritorial jurisdiction of a municipality, then it shall be necessary to first obtain the affirmative vote of a majority of the members of the governing body of the municipality before the area can be annexed.

(b) Report. – Before the public hearing required by subsection (c) of this section, the board shall cause to be prepared a report containing all of the following:

(1) A map of the district and the territory proposed to be annexed showing the present and proposed boundaries of the district.

(2) A statement that the area to be annexed meets the standards and requirements of subsection (a) of this section.

The report shall be available for public inspection in the office of the clerk to the board for at least four weeks before the date of the public hearing.

(c) Hearing and Notice. – The board shall hold a public hearing before adopting any resolution extending the boundaries of a district. Notice of the hearing shall state the date, hour, and place of the hearing and its subject and shall include a statement that the report required by subsection (b) of this section is available for inspection in the office of the clerk to the board. The notice shall be published at least once not less than four weeks before the hearing. In addition, the notice shall be mailed at least four weeks before the date of the hearing by any class of U.S. mail which is fully prepaid to the owners as shown by the county tax records as of the preceding January 1 (and at the address shown thereon) of all property located within the area to be annexed. The person designated by the board to mail the notice shall certify to the board that the mailing has been completed, and the certificate shall be conclusive in the absence of fraud.

(d) Effective Date. – The resolution extending the boundaries of the district shall take effect at the beginning of the fiscal year commencing after its passage or such other date as shall be determined by the board. (2003-418, s. 1.)

§ 153A-317.15. Required provision or maintenance of skills training center.

(a) New District. – When a county creates a district, it shall provide, maintain, or let contracts for the skills training center for which the district is being taxed within a reasonable time, not to exceed one year, after the effective date of the creation of the district.

(b) Extended District. – When a territory is annexed to a district, the county shall provide, maintain, or let contracts for any necessary additions to the skills training center to provide the same training provided throughout the district to existing and new industries in the area annexed to the district within a reasonable time, not to exceed one year, after the effective date of the annexation. (2003-418, s. 1.)

§ 153A-317.16. Abolition of economic development and training districts.

A board of county commissioners may by resolution abolish a district upon finding that a petition requesting abolition, signed by at least fifty percent (50%) of the owners of real property in the district who own at least fifty percent (50%) of the real and personal property in the district based upon the most recent valuation thereof, has been submitted to the board and that there is no longer a need for such district. In determining the total real and personal property in the district and the number of owners of real and personal property, there shall be excluded: (i) property exempted from taxation and property classified and excluded from taxation and (ii) the owners of such exempted or classified and excluded property. The board shall hold a public hearing before adopting a resolution abolishing a district. Notice of the hearing shall state the date, hour, and place of the hearing and its subject and shall be published at least once not less than one week before the date of the hearing. The abolition of any district shall take effect at the end of a fiscal year following passage of the resolution, as determined by the board. (2003-418, s. 1.)

§ 153A-317.17. Taxes authorized; rate limitation.

A county may levy property taxes within an economic development and training district, in addition to those levied throughout the county, for the purposes listed in G.S. 153A-317.11 within the district in addition to or to a greater extent than the same purposes provided for the entire county. In addition, a county may allocate to a district any other revenues whose use is not otherwise restricted by law. The proceeds of taxes within a district may be expended only to pay annual debt service on up to one million two hundred thousand dollars ($1,200,000) of the capital costs of a skills training center provided for the district and any other services or facilities provided by a county in response to a recommendation of an advisory committee.

Property subject to taxation in a newly established district or in an area annexed to an existing district is subject to taxation by the county as of the preceding January 1.

Such additional property taxes may not be levied within any district established pursuant to this Article in excess of a rate of eight cents (8¢) on each one hundred dollars ($100.00) value of property subject to taxation. (2003-418, s. 1; 2004-170, s. 39.)

The Commissioners decided to turn the $700.00 appropraited in the FY '80-'81 Budget over Octagon House Fund. The funds will be used to set up a section in the octagon house for The funds had been appropriated for renovating the old fire station for a library, in E

A group studying the possibility of creating a special district for flood control betwe Double & Bay Canals met with the Commissioners. They reported that 75% of the landowner the project, and recommended that further planning be done on the project. Upon motion b Carrish, seconded by Edward A. O'Neal, BE IT RESOLVED that the County will request the U Conservation Service to continue planning the project.

Paul Wilson presented a program on how his firm could assist the County in attracting in

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Scott Coble, Joyce Caraway, & the Board of Education presented the FY '81-'82 Hyde Count Budget to the Commissioners

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Jack Mann reported that the County has submitted a new application to the State for get the County Dumps certified. He reported that he will meet with Earl Moore tomorrow conc the problem the Water System has experienced with the Department of Transportation tearin water valves. The need to install water pumps on the Fairfield - Engelhard Road was dis Mann is waiting to obtain the pump prices. The possibility of using a windmill to gener for the water system was discussed. Jack reported that the Water System has saved appro $13,000.00 on chemicals this fiscal year.

Mr. Don Flowers, from the Albermarle Regional Planning & Development Commission, discuss work of the Commission with the Board.

The meeting adjourned at 4:15 p. m.

APPROVED
May 14 1981
J. B. Berry
CHAIRMAN
BOARD OF COMMISSIONERS

THE HYDE COUNTY BOARD OF COMMISSIONERS HELD ITS REGULAR MEETING ON MONDAY, JUNE 1,

Commissioners J. B. Berry, and Irvin Carrish opened the meeting at 10:00 a. m. Commissio appointee J. B. Cahoon also attended the meeting.

Linda Bassnight reported that tax collections were 1.% below last year's level. Collectio for May were submitted and approved. The value of the Hazel White Property in Currituck was discussed. Mrs. Bassnight also discussed bills proposed in the Legislature that would the tax base.

THE HYDE COUNTY BOARD OF COMMISSIONERS HELD ITS REGULAR MEETING ON MONDAY AUGUST 3, 1981.

Commissioners J. B. Berry & Irvin S. Garrish opened the meeting at 10:00 a. m.

Joseph B. Cahoon was sworn into the office of County Commissioner. A copy of the oath is filed in the minute docket folder, located in the County Manager's Office.

Upon motion by Joseph B. Cahoon, seconded by Irvin S. Garrish, BE IT RESOLVED that Woodrow Spencer is appointed to serve a two year term on the Hyde County Jury Commission.

Upon motion by Irvin S. Garrish, seconded by J. B. Berry, BE IT RESOLVED that Joseph B. Cahoon is appointed to serve as Vice-Chairman of the Hyde County Board of Commissioners.

Upon motion by Irvin S. Garrish, seconded by Joseph B. Cahoon, BE IT RESOLVED that the jailers will be paid $25.00 per day, per 24 hours of service.

Linda Basnight reported that tax tickets should be ready to mail by the end of next week.

The Commissioners decided that the County will pay for the violation Wadell Emory received for not having an inspection sticker on the garbage truck. The windshield had been replaced, and the inspection sticker was overlooked.

Cliff Swindell reported on the number of contractors who were able to obtain their electrician licenses.

Cliff Swindell reported that a Corps permit for the Gull Rock Channel Project should be received within the next three weeks. He also reported that State Funds, for the project, are in tact. The project will be advertised for bids, as soon as a Corps Permit is received.

The Commissioners discussed the possibility of the fire departments taking over the Rescue Squads in Hyde County.

The Commissioners reviewed the Grand Jury's Report concerning recommendations for improvements that need to be made to the Hyde County Courthouse.

Upon motion by Joseph B. Cahoon, seconded by Irvin S. Garrish, BE IT RESOLVED that J. B. Berry is appointed to represent Hyde County on the Albemarle Commission's Road Committee.

Chairmen Jay Swindell & Hiatt Cahoon for the West - Quarter & Double - Bay Watershed Projects presented a formal report on the need to establish separate districts for flood control. One report was submitted for both projects, with the understanding that the project would be split into two separate projects when the districts are organized.

John Fletcher discussed county law enforcement with the Commissioners.

Cliff Swindell reported that Tom Lynch has resigned as Director of Social Services effective 8-31-81.

Cliff Swindell reported that the Water System has purchased a small Ford Pick-up.

ORDINANCE #9

AN ORDINANCE TO CONTROL DOGS WITHIN THE OCRACOKE TOWNSHIP OF HYDE COUNTY, NORTH CAROLINA.

RESOLUTION

Re: Minutes August 3, 1981

CONCEPT FOR TREATMENT OF WEST, QUARTER, DOUBLE AND BAY WATERSHEDS HYDE COUNTY, NORTH CAROLINA

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
RALEIGH, NORTH CAROLINA

FOR

HYDE COUNTY BOARD OF COUNTY COMMISSIONERS

June 1981

I. Planning area and Resources

The planning area is a group of farming operations located in Hyde County, North Carolina. There are approximately 7200 acres of area within the watershed. Approximately 5300 acres are planted to crops and 1900 acres in woods. Recent studies indicate that about 50 percent of the 5300 acres are planted in corn and the balance is soybeans and wheat. Usually soybeans are planted after wheat in the same year. The elevation of the project area ranges from one to six feet mean sea level.

II. The Problems

Field observation, records, and interviews with local land owners indicate that high winds tides caused by hurricane and annual high winds inundates the existing drainage ditches and flood cropland sufficiently to permeate the cropland areas with salt water. The slainity of the salt water is sufficient to cause complete crop kill over the area flooded and causes considerable salt damage to the soil that reduces or cut crop production for several years after flood damages occur.

III. Sponsors Objectives

The sponsors objective is to prevent saline tides from entering the principal outlet channels of West, Quarter, Double and Bay. They also want to protect the cropland area from being flooded by salt water that enters at locations where the topography is low.

Several alternatives were discussed and presented to the local people at two public hearings. The alternative selected was "Protection of the area from 25 year tide elevation". This alternative would require construction of a dike around approximately 1/3 of the project area. The exising roads at an elevation of 4.7 mean sealevel would serve as a dike for part of the area and to protect the cropland area from overland flood of tides that enter at locations where topography is low.

IV. Selected Plan

At a public meeting in Devember, 1980, the landowners selected the alternative "Protection of the Area from flooding from a 25 year Tide Elevation". The estimated cost for this alternative is as follows.

(a) Total cost - Construction	$ 1,200,000
(b) Engineering and Administration	264,000

These costs are 100% SCS

(B) Operation, Maintenance and Replacement Cost which includes:

1. Mowing Dike	$ 1500.00
2. Cleaning gates	900.00
3. Dike Maintenance	2000.00
4. Gate and structure replacement	2500.00
	$ 6900.00

(C) Estimated Value of Easement and Land Rights Required to Construct the Dike.

Land Rights: Right of Way for dike and gates

1. maximum width 150' , This will be less where height of fill is less than 5 feet.

2. Number of acres in R-O-W (estimated)

$$\frac{150' \text{ wide X } 30{,}100 \text{ linear feet}}{43560} = 104 \text{ acres}$$

Estimated value = 104 acres @ 500/acre = $52,000

V. The Special Use District will be responsible to:

(a) Furnish all easements and right-of-ways whatever the cost.
(b) Do the necessary maintenance to dike and gates as necessary to facilitate operation of the system as designed.
(c) Replace gates, pipe and repair the dike as needed.
(d) Provide crossings of the inside borrow ditch or any other drainage ditch where crossings are necessary or desired by land ownership.
(e) Pay for any administration required to organize districts, operate and maintain the system and administer construction of the dike that is incurred by the special use district.

1/ Cost Base January 1981

THE HYDE COUNTY BOARD OF COMMISSIONERS HELD ITS REGULAR MEETING ON MONDAY, JANUARY 17, 1983.

Chairman Michael T. Swindell opened the meeting with prayer at 9:30 a. m. All five Commissioners attended the meeting.

Upon motion by Irvin S. Garrish, seconded by J. B. Berry, BE IT RESOLVED that the minutes for the meeting held on 1-4-83 are approved as they are recorded.

Morgan Harris presented a county seal for identifing county vehicles, and other uses. Cliff Swindell will check on the cost of having the decales made and their cost. He will also check on the possibility of having department names printed that will identify the department name on the vehicles. Mr. Swindell will look into the possibility of having small seals printed for other uses.

Irvin Garrish reported that N. C. Department of Transportation Officials are looking at the condition of N. C. Highway 12. These Officials will meet with the Commissioners later this afternoon.

Billy Williams reported that the Soil Conservation Service has completed engineering plans for the West & Quarter Canals and Double & Bay Canals Project. A scoping meeting, for the project, will be held on 1-20-83 in Raleigh.

Roy Selby, from the Eastern North Carolina Health Systems Agency, reported that the Ocracoke Health Center will apply for a grant from the Z. Smith Reynolds Foundation. The Center will ask for a new ambulance, a new fire pumper, and the addition of an ambulance porch on the Ocracoke Medical Center. Commissioners decided to write a support letter for the project.

Mr. Selby also discussed the use of a helicopter for taking patients to the hospita who live on Ocracoke Island.

The Board discussed a public hearing that will be held concerning the FY '82 Communit Development Program. The hearing will be held on 1-26-83. Commissioners Swindell & Harris will attend the meeting.

Morgan Harris discussed the need to clarify the role of the Medical Examiner in Hyde County. Cliff Swindell reported that Roland Dale is setting up a meeting to discuss the matter, Cliff Swindell will talk to Roland Dale concerning this matter.

Cliff Swindell reported that the U. S. Army Corps of Engineers has approved a project calling for a 10' depth in the Swan Quarter Channel. State has recommended that no further archaeological investigation be made on the project. Upon motion by Morgan Harris, seconded by J. B. Berry, BE IT RESOLVED that the Board supports this project.

Upon motion by Morgan Harris, seconded by Joseph B. Cahoon, BE IT RESOLVED that Budge Revisions in the following departments are approved: ABC Rehabiltation, Court Facilities Fund, Jail and Sheriff. Copies of the revisions are filed in the minute docket folder located in the County Manager's Office.

Upon motion by J. B. Berry, seconded by Morgan Harris, BE IT RESOLVED that the Board entered in an executive session with Roland Dale, and Thomas Ritter, Branch head of t jail & Detention Branch, at 11:04 a. m. The executive session ended at 12:20 p. m.

Morgan Harris recommended that Cliff Swindell contact Mr. Will Wyatt concerning the possibilty of him drawing plans for rennovating the Hyde County Jail.

The State will consider funding other community development projects on 5-2-83. Mr. Holland recommended that the County should not apply for other projects that were denied last fall at this time.

Patricia Cahoon, Lois Carawan, Edith Simpson, Ron Jones, Maclyn Gibbs, Betty Spencer and Ann Tomlinison met with the Commissioners to discuss general business of the Hyde County Rescue Squad. Dan Gibbs will check the Swan Quarter Ambulance monthly for maintenance. Wade Selby will check the Engelhard Unit once a month. Doug Gibbs will handle problems with vehicles. He should be called. The Squad expressed a desire for a raise of $60.00 per month per employee FY '83-84 Budget.

Rufus Croom, Sam Cox, Kirby Ballance, John Fletcher, and the project committees met with the Board, and presented a progress report on the West & Quarter, and Double & Bay Watershed Projects.

Upon motion by J. B. Berry, seconded by Irvin S. Garrish, BE IT RESOLVED that Linda Midgette be reappointed to a four year term to represent Hyde County on the Tideland Mental Health Board.

The Board discussed the need to make new appointments to the Health Board. The Commissioners will seek to have equal representation on the Board from all parts of the county. Cliff Swindell will contact Willie Shooter concerning this matter. Appointments will be tabled until the next meeting.

Upon motion by Joseph B. Cahoon, seconded by Irvin S. Garrish, BE IT RESOLVED that a Budget Revision for the Tax Office Travel Budget is approved.

Upon motion by Irvin S. Garrish, seconded by Michael T. Swindell, BE IT RESOLVED that a Budget Revision for the Board of Elections is approved.

Upon motion by Joseph B. Cahoon, seconded by Morgan H. Harris, BE IT RESOLVED that a Budget Revision for the Court Facilities Fund is approved.

Upon motion by Morgan H. Harris, seconded by Joseph B. Cahoon, BE IT RESOLVED that a Budget Revision in the ABC Rehabilitation Fund is approved.

All Budget Revisions are filed in the Minute Docket Folder located in the County Manager's Office.

Larry Ditto presented a check to Chairman Swindell for $105,814.00 for Payments in Lieu of Taxes for the Swan Quarter & Mattamuskeet National Wildlife Refuges.

Mike Swindell reported that the N. C. Department of Transportation has funds available for paving in front of fire departments. Mike asked the Board for permission to request the work for the Scranton Volunteer Fire Department, and to check with the Engelhard Volunteer Fire Department to see if paving is needed. Permission was granted.

Morgan Harris reported that students from Mattamuskeet School have won a quiz bowl. Upon motion by Morgan Harris, seconded by Joseph B. Cahoon, BE IT RESOLVED that the Board will send a letter of congratulations to Mattamuskeet School for winning the quiz bowl.

Morgan Harris presented a proposed sign for the courthouse facility. Upon motion by Irvin Garrish, seconded by J. B. Berry, BE IT RESOLVED that two new signs will be erected.

Eddie Cahoon discussed the mosquito control program for the coming season. Different techniques for controlling mosquitos were discuss. The Board decided to hold a public hearing on 3-21-83 at 7:30 p. m. to discuss the mosquito control program.

Upon motion by Michael T. Swindell, seconded by Morgan H. Harris, BE IT RESOLVED that the Board will send a letter of support to David Gossett concerning the Slade Creek Group's State Permit. The letter will state that the projett will not interfere with the County's Land Use Plan.

Upon motion by Joseph B. Cahoon, seconded by Irvin S. Garrish, BE IT RESOLVED that the Board entered into an executive session with Paulene Berry to discuss personnel matters at 11:30 a. m.

Upon motion by Joseph B. Cahoon, seconded by Morgan H. Harris, BE IT RESOLVED that the executive session ended at 11:55 a. m.

Upon motion by Michael T. Swindell, seconded by Irvin S. Garrish, BE IT RESOLVED that the meeting adjourned at 12:00 noon.

THE HYDE COUNTY BOARD OF COMMISSIONERS HELD ITS REGULAR MEETING ON MONDAY APRIL 2, 1984.

Chairman J. B. Berry called the meeting to order at 9:35 a. m. Commissioner Michael T. Swindell offered prayer. Commissioners Cahoon & Harris were also present. Commissioner Garrish was absent due to sickness.

Upon motion by Joseph B. Cahoon, seconded by Morgan H. Harris, BE IT RESOLVED that the minutes for the meeting held on 3-19-84 are approved as they are recorded.

Upon motion by Morgan H. Harris, seconded by Michael T. Swindell, BE IT RESOLVED that Budget Revisions in the following departments are approved: Sheriff, and Health. Copies of the revisions are filed in the minute docket folder located in the County Manager's Office.

Linda Basnight reported that $42,104.03 had been collected in taxes during the month of March. 86.36% of taxes levied in FY '83-'84 have been collected.

Members of the West - Quarters Double - Bay Steering Committes met with the Board concerning these watershed projects. The Board confirmed its support for the committees in their efforts to implement Plan 5 for the watershed projects.

Bill Smithwick and Eddie Cahoon met with the Commissioners concerning the North Carolina State Building Codes.

RESOLUTION

WHEREAS, the section of US Highway 264 in Hyde County is in poor condition, and continues to deteriorate rapidly; and

WHEREAS, US Highway 264 is the only US Highway serving Hyde County, and due to its poor condition it is unsafe for the volume of traffic which it carries; and

WHEREAS, emergency funds from the N. C. Department of Transportation are needed for the repairs on US Highway 264 in Hyde County.

NOW THEREFORE BE IT RESOLVED

That the Hyde County Board of Commissioners hereby requests the N. C. Department of Transportation to provide emergency funding for the repair of US Highway 264 in Hyde County.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to: Governor James B. Hunt, Jr., Senators Melvin R. Daniels, Jr., and J. J. Harrington, Rep. Howard B. Chapin, Mr. Bill Roberson, Sec. NC [redacted] Transportation, Mr. T. G. Joyner, Highway Commissioner, Mr. W [redacted] & Mr. Earl Moore, with the N. C. Department of Transportation [redacted]

DONE & ORDERED in open meeting

J. B. Berry, Chairman
Hyde County Board of Commissioners

The foregoing resolution was offered by Joseph B. Cahoon, seconded by

John Robertson presented a report on the FY '82 Community Development Program. The close out hearing for the program, will be held at 10:00 a. m. on 11-5-84.

John Fletcher met with the Board to discuss the old bank lot, in Swan Quarter. The lot will possibly be used for public or employee parking. The possibility of renting the O'Neal building for storage was tabled. There was a general discussion concerning the collection of judgements issued by the court.

The Commissioners toured the Hyde County Jail, and the Old Bank Building Parking Lot.

The County Manager reported that the Corps of Engineers will begin dredging Far Creek by the middle of February 1985.

Mr. George Shoe, & Mr. Rick Gardner met with the Board concerning the Ocracoke Jail Project.

Rufus Croom, Hiatt Cahoon, Billy Williams, Roger A. Spencer, and John Fletcher met with the Board concerning the West & Quarter, and Double & Bay Supplement Swan Quarter Watershed Work Plan. The work plan was approved by the Board, and signed by the Chairman J. B. Berry. The work plan is on file in the minute docket folder located in the County Manager's Office.

The Commissioners directed the County Manager to notify the Department of Transportation of the Board's desire to name the section of N. C. Highway 12 on Ocracoke Island the "Irvin S. Garrish Highway".

The General Financial Statement for the three month period ended 9-30-84 was presented by Emily Thomas, Finance Officer. Total revenue received for this period is $424,172.93, or a little less than 16% of the total revenue budgeted. Expenditures for the period is $561,094.25 or approximately 21% of the total budgeted. The three month period represents 25% of the fiscal year gone. Expenditures have been $136,921.00 more than revenues.

Bank balance is $64,660.41, with investments recorded at $1,083,855.01. Total assets show $1,304,948.81 with liabilities and reserves recorded at $252,979.70, making fund balance for this period: restricted by State Statute $6,806.30, appropriated for FY '84-'85 Budget $209,491.00, and unappropriated $835,671.81. It was reported that as of 10-15-84 $48,691.19 has been distributed to the school for Fines & Forfeitures.

Upon motion by Michael T. Swindell, seconded by Morgan H. Harris, BE IT RESOLVED that Budget Revisions in the following departments are approved: Cultural Arts, Save Our Youth Grant, & Court Facilities Fund. All Budget Revisions are filed in the minute docket folder located in the County Manager's Office.

At 3:35 p. m. the meeting was recessed until 8:00 p. m., when the meeting will reconvene at the ADAP Center in Fairfield.

The meeting reconvened in the ADAP Center in Fairfield at 8:15 p. m. All five Commissioners were present. Six residents of the community attended the meeting.

There was general discussion held concerning the County's Hurricane & Emergency Plans. There was also some discussion concerning who attends various meetings representing Hyde County.

The County's Revaluation Schedule was discussed. The County's Solid Waste Program was discussed. Janet Russ reported on the Vial of Life Program. The program offers a process for alerting EMTS and other medical professionals about medication that patients are using.

Upon motion by Morgan H. Harris, seconded by Irvin S. Garrish, BE IT RESOLVED that the meeting adjourned at 9:30 p. m.

Minute Docket Folder 1984

Adopted October 15, 1984

Supplemental Watershed Agreement No. 1

between the

Hyde County Board of Commissioners

Pamlico Soil and Water Conservation District

(Referred to herein as Sponsors)

and the

Soil Conservation Service
United States Department of Agriculture

(Referred to herein as SCS)

Whereas, the watershed plan for Swan Quarter Watershed, State of North Carolina, executed by the Sponsors named therein and SCS, became effective on the 20th day of October, 1965; and

Whereas, in order to carryout the watershed plan for said watershed, it has become necessary to modify said watershed agreement, and

Now, therefore, the Secretary of Agriculture through SCS and the Sponsors hereby agree upon the following modifications of the terms, conditions, and stipulations of said watershed agreement;

(1) The Hyde County Board of Commissioners hereby agree to become one of the local organizations sponsoring said watershed project.

(2) The name of the Supplemental Watershed Plan will be known as the West, Quarter, Double, and Bay Watershed.

(3) Agricultural drainage is hereby deleted as a project purpose.

(4) Three pump stations known as No. 1, 2, and 3 are hereby deleted on Mill Ditch, West Canal, and Lake Mattamuskeet area.

(5) The flood prevention dike is reduced from 17.7 miles to 6.1 miles.

(6) The number of tide gates under the dike is increased from 16 to 23.

(7) The stream channel improvement (inside of dike) is reduced from 19.1 miles to 2.9 miles and the purpose changed from flood prevention and drainage to single purpose flood prevention.

(8) Add 28 water control gates along the 2.9 miles of channel improvement.

(9) Add 6 water control gates along US 264.

Paragraph number 1 is modified to read as follows:

The Hyde County Board of Commissioners will acquire such land, easements, or rights-of-way as will be needed in connection with works of improvement (estimated cost $57,360) without cost to the federal government.

Paragraph number 3 is modified to read as follows:

The percentage of construction cost of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization (Percent)	Service (Percent)	Estimated Construction Cost (Dollars)
Dike	0	100	1,829,000
Channel improvement	0	100	452,650

Paragraph number 4 is modified to read as follows:

The percentage of cost for installation services to be borne by the Sponsoring Local Organization and by the Service area as follows:

Improvement	Sponsoring Local Organization (Percent)	Service (Percent)	Estimated Installation Cost (Dollars)
Dike	0	100	402,380
Channel improvement	0	100	99,583

Paragraph number 5 is modified to read as follows:

The Hyde County Board of Commissioners will let, administer and bear the cost of administering contracts. The Sponsors

and SCS will each bear the cost of project administration that each incurs, estimated to be $48,200 and $182,532, respectively.

Paragraph number 8 is modified to read as follows:

The Hyde County Board of Commissioners will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

Paragraph number 9 is deleted.

A new paragraph number 9 is added to read as follows:

A separate agreement will be entered into between SCS and sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

Paragraph number 12 is modified to read as follows:

This plan may be amended or revised only by mutual agreement of the parties hereto, except that SCS may deauthorize funding at any time it determines that the sponsor has failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsor or recoveries by SCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between SCS and the sponsor(s) having specific responsibilities for the measure involved.

Paragraph number 14 is modified to read as follows:

The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15.1-1t.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.

Paragraph number 15 is added and reads as follows:

The sponsors (or name of sponsor) assure that uniform and equitable treatment will be given to persons displaced from

their homes, businesses, or farms as required by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 as implemented by 7 CFR Part 21. The costs of relocation payments will be shared by the sponsors and SCS as follows:

	Sponsors (or name of Sponsor) (Percent)	Service (Percent)	Estimated Relocation Cost (Dollars)
Relocation Payments	15.5	84.5	0 1/

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost shared in accordance with the percentages shown.

The Sponsors and SCS further agree to all terms, conditions, and stipulations of said Watershed Agreement not modified herein.

Seconded by : J.B. Berry

At the August 3, 1987 regular meeting of the Hyde County Commissioners.

Resolved that a levy be assessed on all lands in the Swan Quarter Watershed Project, created for flood control as a special service district, at the following rates:

Class I lands $1.00 per acre
Class II lands .66 per acre
Class III lands .33 per acre

Be it further resolved that said classes be established by the Committees of landowners in the district with the technical assistance of the Soil Conservation Service; and that soil levying be for the fiscal year 1988.

Passed For 5 votes Against 0 votes

Upon motion by J.B. Cahoon and seconded by Alton M. Ballance, BE IT RESOLVED that Budget Revision #01, 02-88, Health Department, #7 Sheriff, #8 Rescue, are approved. Copies are filed in the Minute Docket Folder in the Register of Deeds office.

Upon motion by J.B. Cahoon and seconded by J.B. Berry, BE IT RESOLVED that any employee will be required upon leave without pay or retirement to remit to the County the total premium amount due for a period of 6 months or 1 year. If either of these periods include June premium and the premium increases for July-August and future, the increase will be expected to be paid by employee also. This policy applies to present and future employees on leave without pay and/or employees retiring.

Upon motion by Alton M. Ballance and seconded by J.B. Cahoon, BE IT RESOLVED that Miss Linda Mayo be paid at Salary Grade 17, step 9 until a local Health Director is hired. Mr. Berry was opposed.

Upon motion by J.B. Cahoon and seconded by Alton M. Ballance, BE IT RESOLVED that Mr. Eddie Cahoon be allowed to hire a part-time carpenter until 1-01-88, to be paid from the Clerk Typist II position salary. The Cl. Typist II position will be filled 1-01-88.

Upon motion by J.B. Berry and seconded by James R. Topping, BE IT RESOLVED that the Cl. Typist II position for Inspections be advertised for and filled. Mr. J.B. Cahoon and Mr. Alton Ballance were opposed. Mr. Allen Credle voted in favor breaking the tie.

The Board adjourned for lunch at 12:20p.m. The meeting reconvened at 1:50p.m.

Upon motion by J.B. Cahoon and seconded by Alton M. Ballance BE IT RESOLVED that Mr. J.B. Cahoon's motion to hire Mr. Eddie Cahoon a part-time carpenter until 1-01-88 be rescinded.

Upon motion by James R. Topping and seconded by J.B. Cahoon, BE IT RESOLVED that Mr. J.B. Berry's motion to fill the Cl. Typist II position for the Inspections Dept. be rescinded.

Upon motion by Alton M. Ballance and seconded by James R.Topping, BE IT RESOLVED that the Board go into executive session with Mr. Eddie Cahoon and the County Attorney to discuss personnel matters at 2:05p.m.

Mr. Eddie Cahoon left the executive session at 2:15p.m.

Upon motion by Alton M. Ballance and seconded by J.B. Cahoon, BE IT RESOLVED that the board come out of executive session at 2:20p.m.

Meeting Minutes

Board of County Commissioners
Hyde County

Monday, October 7, 2013

Chairman Barry Swindell called the Regular Meeting of the Hyde County Board of Commissioners to order on Monday, October 7, 2013, in the Hyde County Government Center, Multi-Use Room, and the Ocracoke School Commons Room using electronic conferencing equipment.

The following members were present on the mainland: Commissioners Anson Byrd, Earl Pugh, Jr., Dick Tunnell and Barry Swindell; Attorney Fred Holscher; County Manager Bill Rich; Deputy Clerk to the Board Averi Simmons; and, members of the public.

The following members were present on Ocracoke: Commissioner John Fletcher, Public Information Officer Sarah Johnson, and members of the public.

Following opening prayer by Commissioner Byrd and pledge of allegiance, the meeting was called to order.

Agenda:

Chairman Swindell asked for any changes to the October 7, 2013 meeting agenda. Commissioner Pugh moved to approve the agenda as presented by the Deputy Clerk. Mr. Fletcher seconded the motion. The motion passed on the following vote: Ayes – Byrd, Fletcher, Pugh, Tunnell and Swindell; Nays – None; Absent or not voting – None.

Consideration of Minutes:

Commissioner Fletcher moved to approve the September 3, 2013 Regular Meeting Minutes of the Hyde County Board of Commissioners as presented by the Deputy Clerk. Mr. Byrd seconded the motion. The motion passed on the following vote: Ayes – Byrd, Fletcher, Pugh, Tunnell and Swindell; Nays – None; Absent or not voting – None.

Public Hearing:

Rate Increase Based on Swan Quarter & West Quarter Dike Assessments

Commissioner Byrd made a motion to open the public hearing. Mr. Tunnell seconded the motion. The motion passed on the following vote: Ayes – Byrd, Fletcher, Pugh, Tunnell and Swindell; Nays – None; Absent or not voting – None.

The purpose of this public hearing was to gain public input regarding the recommended increase in tax rates for the Swan Quarter and West Quarter Special Service Districts (SSD's). The reason for needing to increase the tax rates is to generate funds for increased repairs needed for general maintenance and larger expenses and repairs.

The recommendation to the County Commissioners was the following:

Change the West Quarter assessment to a per $100 tax value basis with the rate being set at $0.35 per $100 value, and raise the Swan Quarter assessment from $0.06 per $100 to $0.10 per $100 tax value.

These assessments would increase revenues for Swan Quarter and West Quarter SSD's by $26,700 and $66,000 respectively.

Questions/Comments from the Public and Commissioners:

Timmy Hodges, Swan Quarter – Wanted to know what would be the maintenance proposal for West Quarter & Swan Quarter Special Service Districts. Mr. Brinn stated that the West Quarter maintenance plan was to refurbish the existing gates using the same method as the Bay structures, which is to remove the gates, C&C machine, sand blast, apply cold tar epoxy and then reinstall. The existing gates will be replaced with stainless steel gates as the finds become available. The Swan Quarter maintenance would consist of replacing the gates as necessary with gator gates, and to replace the aluminum tiles where necessary. Mr. Hodges then asked what general statute gives the Board the right to raise rates. Mr. Brinn replied that NCGS §153A-185.3a grants this power to the County. Mr. Hodges stated that he doesn't feel he's getting out of it (the tax) what he should and shouldn't have to pay it. He said the county took his land and is seeing no benefit.

Clerk's Note: NCGS §153A-185 – *Authority to Make Special Assessments* states the following:
(3) Acquiring, constructing, reconstructing, extending, renovating, enlarging, maintaining, operating, or otherwise building or improving
b. Watershed improvement projects, drainage projects and water resources development projects (as those projects are defined in G.S. 153A-301).

Commissioner Byrd asked how much revenue would be generated by increasing the rates. Mr. Brinn stated that the revenues would increase by

Odessa Jarvis, Swan Quarter – Asked where the West Quarter Dike begins. Mr. Brinn stated that West Quarter begins at Hydeland Canal. She then asked if property outside of the dike is taxed. Mr. Brinn stated that property outside of the dike is not taxed, as it doesn't benefit from the dike. Ms. Jarvis then asked how marshland and woodland is assessed. Mr. Brinn explained that only the marshland within the dike is taxed, and that assessment along with woodlands is based on the assessed value through the Tax Office.

Commissioner Tunnell stated that you can ride around the dike and see all the land that is protected by the dike and gates. He stated that ten years ago the land just behind the dike wouldn't even grow grass. He says there are at least 1,000 acres directly protected by the dike.

Commissioner Fletcher made a motion to close the public hearing. Mr. Pugh seconded the motion. The motion passed on the following vote: Ayes – Byrd, Fletcher, Pugh, Tunnell and Swindell; Nays – None; Absent or not voting – None.

Public Comments:

Chairman Swindell called for comments from the public.

There were no public comments at this time.

Employee Recognition: Glen Credle

Manager Rich has decided to restart Employee of the Month.

Glen Credle is a Hyde County native from the Sladesville community. Glen has been married to his wife Valerie for 37 years and has 2 boys. He graduated from Mattamuskeet High School in 1972 and attended Elizabeth State University for two and a half years. Glen worked for Hamilton Beach for six years and then later joined the Hyde County family when he became a dispatcher for the Hyde County Sheriff's Office. Glen worked for the Sherriff about one year before transferring to the Water Department where he has been ever since.

As of October 22, 2013 Glen has worked for Hyde County for 29 years. Glen was asked to be present at the North Carolina Waterworks Operator Association annual meeting in Raleigh this year where he was presented with a Life Membership Certificate of Achievement for his years of service. Mr. Berry stated that he is very proud of Mr. Credle and hopes that he will continue his service to Hyde County beyond his upcoming retirement.

Commissioner Swindell commended Mr. Credle for his wealth of knowledge in locating water lines. Mr. Credle was then thanked and congratulated by Mr. Berry, Manager Rich, and the Board. Manager Rich asked Mr. Credle to spin the Wheel of Thanks, and received a $25 gift certificate to Bare Necessities Convenience Store.

HYDE COUNTY
SOIL & WATER
CONSERVATION DISTRICT

History of the West Quarter & Swan Quarter SSDs

The idea of protecting the greater Swan Quarter Area with a dike was conceived in the 1940s and the original work plan was developed in 1965.

The West Quarter special service district was completed in 1995 after 8 years and 7 phases. It consists of 6 major tide gate structures and 6 miles of earthen dike.

The Swan Quarter Special Service District began in 2003 and was completed in 2011. It has a total of 75 tide gates, 4500ft of vinyl sheet piling and 11 miles of earthen dike.

Combined these Service Districts protect 11069 Acres of land and approximately $62,000,000 in property value.

Current Assessments

The Assessment for the West Quarter SSD is based on proximity to the dike and is $1.00, $0.66, and $0.33 per acre respectively. This assessment amount has remained unchanged since its adoption in August 1987. (Minute Docket Book16, page 268) The income from this assessment for 2012 was $3907.31. The assessment for 2013 was $3,950.56

The Assessment for Swan Quarter is $0.06 per $100 property value as adopted in June, 2010. The income for this assessment for 2012 was $16,066.66. The income for this assessment for 2013 was $15,640.50

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Assessment Usage

- A portion of the money collected goes towards annual general maintenance with the remainder being put in a fund for larger expenses and repairs.
- Of the $3,907.31 collected for West Quarter in 2012 $3,587.00 was spent on general maintenance leaving $319.81 to be rolled forward in reserves.
- Of the $3,950.56 collected for West Quarter in 2013 $4,010.25 was spent on general maintenance leaving (**-$59.69**)to be pulled from West Quarter reserves.
- Of the $16,066.66 collected for Swan Quarter in 2012 $4,950.26 was spent on general maintenance leaving $11,116.40 to be rolled forward in reserves.
- Of $15,640.50 collected for Swan Quarter in 2013 $9,522.50 was spent on general maintenance and CAMA & NRCS required treatment of the Coastal Mitigation Site leaving $6,118.00 to be rolled forward in reserves.

Leaking Tide Gate Structures

Over the last three years several non routine issues have been identified regarding tide gates including gasket failure, design and manufacturing defects, and electrolysis.

Replacing Gaskets and mitigating rodent damage on the majority of the 75 Aluminum gates on Swan Quarter SSD is Expensive since these gates must be removed to be worked on. Some of these gates have only been submerged for a few years and are already showing sighs of severe electrolysis.

The 17 large tide gates on West Quarter have severe electrolysis damage that has already caused 2 gates to leak.

Bay Structures gate leaked so severely that it was pulled for inspection and it was so badly damaged that replacement was considered.

Cost Estimates for Tide Gate Replacements

•Since these gates are made using a proprietary cast iron and monell alloy it is not possible to replace the metal lost due to electrolyses by welding or casting.

•Waterman Industries, the manufacturer of the gates now in place provided an estimate for a new gate. The estimate was $65,920.00 and did not include a new flange. (Estimated lifespan 25 years)

•Two Local Machine shops were contacted for estimates fabricating new gates using 100% stainless steel construction. Although formal quotes were not received the fabrication cost was estimated to be $20,000.00 to $25,000.00 for the gate and flange. (Estimated life 50 to 75 years)

•Because the fund balance was only $21,406.51 for the entire West Quarter Service District other options for refurbishing the gate were explored.

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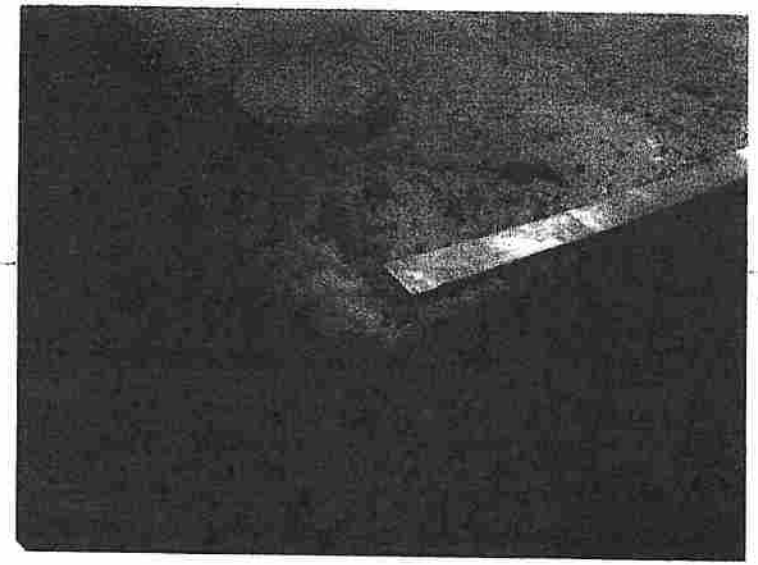
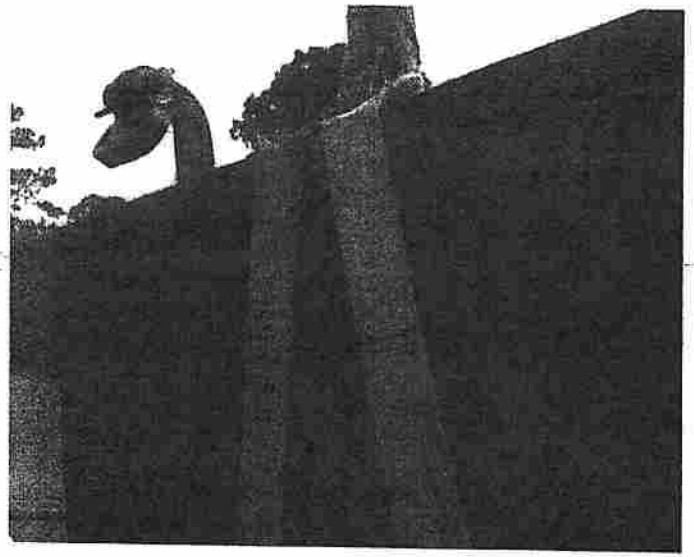
Actual Cost of Bay Structure Tide Gate Repair

•Electrolysis had eaten away the portion of the gate that held the stainless gasket in place.
•It was determined the only way to fix the gate was to machine away the perimeter leaving a flat surface where the stainless gasket had been
•Total Cost of removing, transporting, machining, cleaning painting and re-installing the gate=$3150.00
•This can only be done once to each gate and the cost of refurbishing the remaining gates using this method would be approximately $50,400.00 assuming no greater damage is discovered.





HYDE COUNTY
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Operation & Maintenance of Special Service District

•On August 5, 2002 the Hyde County Commissioners entered into an Operation and Maintenance Agreement with the Natural Resources Conservation Service. This agreement is referenced to in Minute Docket Book 17 Page 763. The practice covered in this agreement is identified as the Swan Quarter Watershed – Dike.

•This agreement outlines specific requirements in maintaining the Swan Quarter Watershed – Dike to function as it was originally designed.

•Failure to maintain the functionality of the Dike properly would result in the county being required to reimburse the federal government for the financial assistance provided by the Natural Resource Conservation Service.

•Total Project Cost- $13,236,469

HYDE COUNTY
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CONSERVATION DISTRICT

Recommendation from Swan Quarter Watershed Steering Committee

•The Swan Quarter Watershed Steering Committee met on Tuesday, June 4, 2013 @ 8:00 am for the purpose of discussing Swan Quarter and West Quarter Dike. The committee reviewed yearly budget, operation and maintenance issues on tidegates and current assessment rates.

•The recommendation to the County Commissioners is as follows,

•Change the West Quarter assessment to a per $100 tax value basis with the rate being set at $0.35 per $100 value

•Raise the Swan Quarter assessment from $0.06 per $100 to $0.10 per $100 tax value.

Appendix G

Funding Opportunities for Plan Implementation

FUNDING OPPORTUNITIES FOR GOVERNMENTAL ENTITIES

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Acres for America	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	N/A	1:1 w/ 5:1 competitive	April
Agricultural Develpment and Farmland Preservation Trust Fund	NCDA&CS	Nonprofit conservation organizations, county agencies in partnerships wuith farmers or landowners	North Carolina	N/A	50/25/25	December
Army Corp of Engineers Section 206 Aquatic Restoration Grant	USACE	Non-federal sponsor	US	$ 5,000,000.00	50/50 after first $100,000 in study, then 65/35 for design and construction	None
Asheville Merchants Fund	under CFWNC	Non-profits, gov entities	Buncombe County	$ 25,000.00	N/A	March
Biltmore Lake Charitable Fund	under CFWNC	Non-profits, gov entities	Enka-Candler Communities	N/A		April
Black Mountain – Swannanoa Valley Endowment Fund	under CFWNC	non-profit, govs, educational, religious orgs serving Black Mountain and Swannanoa Valley	Buncombe County	$ 10,000.00	N/A	March
Bringing Back the Natives/More Fish	National Fish and Wildlife Foundation	Local, state, federal, and tribal governments and agencies, special districts, non profits, and schools and universities	US	$ 100,000.00	1 to 1	July
Cashiers Community Fund	under CFWNC	Non-profits, gov entities	Greater Cashiers Community	$ 10,000.00	N/A	July
Cheoah Fund	Brookfield Smoky Mountain Hydropower	Non-profits, state or federal agencies, federally recoginzed tribes, individuals or corporations	Cheoah and Little Tennessee River basins	N/A	N/A	1-Sep
Cherokee Preservation Foundation Large Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	N/A	N/A	
Cherokee Preservation Foundation Small Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	$ 20,000.00	N/A	
Clean Water Management Trust Fund	NC DC&NR	State agency, local gov't, nonprofits	North Carolina	N/A	0	Early Feb
Clean Water State Revolving Fund	NCDEQ/USEPA	States, counties, cities, towns, private & public entities	US	1/2 amount available per funding cycle	Closing fee of 2%	March & September
Conservation Community Cost Share	NCDA & DSWC	Homeowners, businesses, schools, parks, and publicly owned lands	North Carolina	N/A	25/75	3-Feb-17
Conservation Reserve Enhancement Program (CREP)	NCDA & CS- DSWC	Local, state, or tribal governments or non-governmental organizations	US	N/A	0	None
Developing the Next Generation of Conservationists	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	$ 50,000.00	1 to 1	November
Drinking Water State Revolving Fund Loan Program (DWSRF)	US EPA	Local gov, water corporations	NC	N/A	N/A	N/A
Environmental Solutions for Communities	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	N/A	N/A	N/A
Farm Bill Programs	USDA-NRCS	Local, state, or tribal governments or non-governmental organizations, and owners or renters of agricultural land	North Carolina	No max	0	None
Developing the Next Generation of Conservationists	NFWF	State and Federal agency, local gov't, nonprofits & institutions	US	$ 50,000.00	1 to 1	31-Jan-17
Forest Legacy Program	NC Forest Service	State, local gov't, private land trusts. Landowners	North Carolina	N/A	0	None
Kate B. Reynolds Charitable Trust	Trust	Non-profits, gov entities	NC	N/A	N/A	February, August
Lowe's Home Improvements Community Partners Grant	Lowes	Nonprofit organizations, municipalities, and public agencies	US	$ 25,000.00	0	May, August
National Fish and Wildlife Grants	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	N/A	N/A	N/A

FUNDING OPPORTUNITIES FOR GOVERNMENTAL ENTITIES

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
National Wildlife Refuge Friends	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	$ 15,000.00	1 to 1 to be competitive	July
NC Division of Mitigation Services	NCDMS, NCDOT	Private & Public entities	North Carolina	N/A	Fee Schedule Used	N/A
NCCF Duke Energy Water Resources Grant	NC Community Foundation via Duke Energy	501c3, Fed, State, local gov	service area	$ 100,000.00	0	April, Oct
NCDEQ 205j Planning Grant	NCDEQ/USEPA	NC Councils of Government	North Carolina	N/A	0	September
NCDEQ 319	NC DEQ/USEPA	State, local gov'ts, including COGs, Inter and Intra state agencies, public and private nonprofit (including academic) organizations and institutions	North Carolina	N/A	60/40	April
NCDEQ Water Resources Development Grant	NC DEQ	Local gov't and local political subdivisions	North Carolina	N/A	50/50	Jan 1, July 1
NCDOJ Environmental Enhancement Grant	NC Department of Justice via Smithfield Agreement	State and Federal agency, local gov't, nonprofits & institutions	North Carolina	$ 500,000.00	50/50	October
North Carolina Appalachian Regional Commission (NC Rural Development)	NC Department of Commerce	Local governments	29 Counties in WNC	N/A	N/A	January, March, May, July, September, November
North Carolina Humanities Council Grassroots Grants	NCHC	Any organization with a humanities focus	NC	$ 2,000.00	N/A	Rolling
North Carolina Humanities Council Large Grants	NCHC	Any organization with a humanities focus	NC	$ 25,000.00	N/A	June
North Carolina Humanities Council Planning Grants	NCHC	Any organization with a humanities focus	NC	$ 750.00	N/A	Rolling
Parks and Recreation Trust Fund	NC Parks	NC Counties and incorporated municipalities	North Carolina	$ 500,000.00	50/50	December
Partners for Fish and Wildlife in North Carolina	USFWS	All landowners including private individuals, partnerships, corporate owners, nonprofits, and local governments	North Carolina	N/A	30-60%	None
People in Need Grants	under CFWNC	Non-profits, gov entities	Mountain communities	$ 20,000.00	N/A	September
Pigeon River Fund	under CFWNC	Non-profits, gov entities	Haywood,Madison, Buncombe	$ 30,000.00	N/A	March, September
Public Works and Economic Development	US Economic Development Administration	State, local gov'ts, including COGs, Inter and Intra state agencies, public and private nonprofit (including academic) organizations and institutions	US	N/A	N/A	None
Ramble Charitable Fund	under CFWNC	Non-profits, gov entities	Buncombe County	$ 7,500.00	N/A	April
Resilient Communities Program	NFWF/Wells Fargo	State, and local governments, educational institutions, and nonprofit organizations	US	$ 500,000.00	1 to 1	July
Rutherford County Endowment	under CFWNC	non-profit, govs, educational, religious orgs serving Rutherford County	Rutherford County	$ 10,000.00	N/A	March
Sisters of Mercy of North Carolina Foundation, Inc.	SMNC Foundation	Any	24 counties in Western NC	N/A	N/A	December
Sudden and Urgent Needs (SUN) Grants	under CFWNC	Non-profits, gov entities	Western NC	$ 10,000.00	N/A	Rolling
The Cannon Foundation, Inc.	Cannon Foundation	Governmental entities, non-profits open more than 5 years, churches	throughout NC, rural areas	N/A	Match required	Rolling
The Fund for Southern Communities	Fund for Southern Communities	Organizations with total budget below $150,000	Georgia, NC, SC	$ 5,000.00	N/A	September

FUNDING OPPORTUNITIES FOR GOVERNMENTAL ENTITIES

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Urban & Community Forestry Grant Program	NC Forest Service	State, local gov't, pubic educ institutions, IRS approved 501c3	North Carolina	$ 15,000.00	50/50	March
US EPA Environmental Education Grant	US EPA	local, tribal, or state education agency, college, university, non-profit, noncommercial educational broadcasting entity	US	$ 91,000.00	25/75	6-Apr-16
US Fish and Wildlife Grants	USFWS	Commercial organizations, foreign entities, Indian tribal governments, individuals, institutions of higher education, nonprofit organizations, and state and local governments	US	N/A	N/A	N/A
Wells Fargo Foundation Environmental Grants	Wells Fargo	Non-profits, gov entities, tribal entities	Triad and Western North Carolina	N/A	N/A	invitation-only
Wetland Program Development Grant	USEPA	States, tribes, local governments, interstate associations, and intertribal consortia, and nonprofits	US	$ 400,000.00	25%	May
Women For Women	under CFWNC	Non-profits, gov entities	Western NC	$ 3,300.00	N/A	July
Z. Smith Reynolds Foundation		charitable, tax-exempt, 501(c)(3)s, colleges/universities, religious entities, gov't	North Carolina	$ 35,000.00	0	Temporarily Suspended

FUNDING OPPORTUNITIES FOR TRIBAL ENTITIES

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Bringing Back the Natives/More Fish	National Fish and Wildlife Foundation	Local, state, federal, and tribal governments and agencies, special districts, non profits, and schools and universities	US	$100,000	1 to 1	July
Cherokee Preservation Foundation Large Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	N/A	N/A	
Cherokee Preservation Foundation Small Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	$ 20,000.00	N/A	
Conservation Reserve Enhancement Program (CREP)	NCDA & CS- DSWC	Local, state, or tribal governments or non-governmental organizations	US	No max	0	None
Farm Bill Programs	USDA-NRCS	Local, state, or tribal governments or non-governmental organizations, and owners or renters of agricultural land	North Carolina	No max	0	None
North Carolina Humanities Council Grassroots Grants	NCHC	Any organization with a humanities focus	NC	$ 2,000.00	N/A	Rolling
North Carolina Humanities Council Large Grants	NCHC	Any organization with a humanities focus	NC	$ 25,000.00	N/A	June
North Carolina Humanities Council Planning Grants	NCHC	Any organization with a humanities focus	NC	$ 750.00	N/A	Rolling
Partners for Fish and Wildlife in North Carolina	USFWS	All landowners including private individuals, partnerships, corporate owners, nonprofits, and local governments	North Carolina	N/A	30-60%	None
Sisters of Mercy of North Carolina Foundation, Inc.	SMNC Foundation	Any	24 counties in Western NC	N/A	N/A	December
The Fund for Southern Communities	Fund for Southern Communities	Organizations with total budget below $150,000	Georgia, NC, SC	$ 5,000.00	N/A	September
US EPA Environmental Education Grant	US EPA	local, tribal, or state education agency, college, university, non-profit, noncommercial educational broadcasting entity	US	$ 91,000.00	25/75	6-Apr-16
US Fish and Wildlife Grants	USFWS	Commercial organizations, foreign entities, Indian tribal governments, individuals, institutions of higher education, nonprofit organizations, and state and local governments	US	N/A	N/A	N/A
Wells Fargo Foundation Environmental Grants	Wells Fargo	Non-profits, gov entities, tribal entities	Triad and Western North Carolina	N/A	N/A	invitation-only
Wetland Protection Development Grant	USEPA	States, tribes, local governments, interstate associations, and intertribal consortia, and nonprofits	US	$400,000	25%	May

FUNDING OPPORTUNITIES FOR NON-PROFITS

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Acres for America	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	No max	1:1 w/ 5:1 competitive	April
Agirculture Cost Share Program	NCDA & CS- DSWC	Landowner or renter of existing agricultural operation	North Carolina	No max	25:75	N/A
Agricultural Develpoment and Farmland Preservation Trust Fund	NCDA&CS	Nonprofit conservation organizations, county agencies in partnerships wuith farmers or landowners	North Carolina	N/A	50/25/25	December
Army Corp of Engineers Section 206 Aquatic Restoration Grant	USACE	Non-federal sponsor	US	$5,000,000	50/50 after first $100,000 in study, then 65/35 for design and construction	None
Asheville Merchants Fund	under CFWNC	Non-profits, gov entities	Buncombe County	$ 25,000.00	N/A	March
Biltmore Lake Charitable Fund	under CFWNC	Non-profits, gov entities	Enka-Candler Communities	N/A		April
Black Mountain – Swannanoa Valley Endowment Fund	under CFWNC	non-profit, govs, educational, religious orgs serving Black Mountain and Swannanoa Valley	Buncombe County	$ 10,000.00	N/A	March
Bringing Back the Natives/More Fish	National Fish and Wildlife Foundation	Local, state, federal, and tribal governments and agencies, special districts, non profits, and schools and universities	US	$100,000	1 to 1	July
Cashiers Community Fund	under CFWNC	Non-profits, gov entities	Greater Cashiers Community	$ 10,000.00	N/A	July
Cherokee Preservation Foundation Large Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	N/A	N/A	
Cherokee Preservation Foundation Small Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	$ 20,000.00	N/A	
Clean Water Management Trust Fund	NC DC&NR	State agency, local gov't, nonprofits	North Carolina	No max	0	Early Feb
Clean Water State Revolving Fund	NCDEQ/USEPA	States, counties, cities, towns, private & public entities	US	1/2 amount available per funding cycle	Closing fee of 2%	March & September
Community Foundation of Burke County	Burke County	Non-profits	Burke County	N/A	N/A	July
Conservation Community Cost Share	NCDA & DSWC	Homeowners, businesses, schools, parks, and publicly owned lands	North Carolina	No max	25/75	3-Feb-17
Conservation Reserve Enhancement Program (CREP)	NCDA & CS- DSWC	Local, state, or tribal governments or non-governmental organizations	US	No max	0	None
Corporation for National and Public Service	CNCS	Community organizations	US	N/A	N/A	N/A
Developing the Next Generation of Conservationists	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	50,000	1 to 1	November
Environmental Solutions for Communities	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	N/A	N/A	N/A
Farm Bill Programs	USDA-NRCS	Local, state, or tribal governments or non-governmental organizations, and owners or renters of agricultural land	North Carolina	No max	0	None
Five Star & Urban Waters Restoration Grant	NFWF	State and Federal agency, local gov't, nonprofits & institutions	US	$ 50,000.00	1 to 1	31-Jan-17
Forest Legacy Program	NC Forest Service	State, local gov't, private land trusts. Landowners	North Carolina	N/A	0	None
Gannett Foundation	Gannett Foundation	Non-profits	Asheville	$ 5,000.00	N/A	February, August

FUNDING OPPORTUNITIES FOR NON-PROFITS

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Huffman-Cornwell Foundation	Huffman-Cornwell Foundation	Non-profits	Burke County	N/A	N/A	Rolling
Kate B. Reynolds Charitable Trust	Trust	Non-profits, gov entities	NC	N/A	N/A	February, August
Lowe's Charitable and Educational Foundation	Lowe's	Non-profits, educational institutions	Across U.S., Canada and Mexico	$ 100,000.00	N/A	
Lowe's Home Improvements Community Partners Grant	Lowes	Nonprofit organizations, municipalities, and public agencies	US	$25,000	0	May, August
Mary Reynolds Babcock Foundation	MR Babcock Foundation	Non-profits	Southeastern United States		70% match required	
Mebane Foundation	Mebane Foundation	Non-profits		N/A	N/A	July, January
Melvin R. Lane Fund	under CFWNC	Non-profits	Western NC	$ 50,000.00	N/A	
National Fish and Wildlife Grants	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	N/A	N/A	N/A
National Wildlife Refuge Friends	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	$15,000	1 to 1 to be competitive	July
NC Division of Mitigation Services	NCDMS, NCDOT	Private & Public entities	North Carolina	No max	Fee Schedule Used	N/A
NCCF Duke Energy Water Resources Grant	NC Community Foundation via Duke Energy	501c3, Fed, State, LG	service area	$ 100,000.00	0	April, Oct
NCDEQ 319	NC DEQ/USEPA	State, local gov'ts, including COGs, Inter and Intra state agencies, public and private nonprofit (including academic) organizations and institutions	North Carolina	No Max	60/40	April
NCDOJ Environmental Enhancement Grant	NC Department of Justice via Smithfield Agreement	State and Federal agency, local gov't, nonprofits & institutions	North Carolina	$500,000	50/50	October
New Belgium Brewing Company	New Belgium Brewing	Non profit organizations	states that sell their product	$ 5,000.00	0	Various
North Carolina GlaxoSmithKline Foundation	GSK	Non-profits	NC	N/A	N/A	Quarterly
North Carolina Humanities Council Grassroots Grants	NCHC	Any organization with a humanities focus	NC	$ 2,000.00	N/A	Rolling
North Carolina Humanities Council Large Grants	NCHC	Any organization with a humanities focus	NC	$ 25,000.00	N/A	June
North Carolina Humanities Council Planning Grants	NCHC	Any organization with a humanities focus	NC	$ 750.00	N/A	Rolling
Park Foundation	Park Foundation	Non profit organizations	United States	N/A	0	January, March, July, and September
Partners for Fish and Wildlife in North Carolina	USFWS	All landowners including private individuals, partnerships, corporate owners, nonprofits, and local governments	North Carolina	N/A	30-60%	None
People in Need Grants	under CFWNC	Non-profits, gov entities	Mountain communities	$ 20,000.00	N/A	September
Pigeon River Fund	under CFWNC	Non-profits, gov entities	Haywood,Madison, Buncombe	$ 30,000.00	N/A	March, September

FUNDING OPPORTUNITIES FOR NON-PROFITS

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Public Works and Economic Development	US Economic Development Administration	State, local gov'ts, including COGs, Inter and Intra state agencies, public and private nonprofit (including academic) organizations and institutions	US	N/A	N/A	None
Ramble Charitable Fund	under CFWNC	Non-profits, gov entities	Buncombe County	$ 7,500.00	N/A	April
Resilient Communities Program	NFWF/Wells Fargo	State, and local governments, educational institutions, and nonprofit organizations	US	$500,000	1 to 1	July
Rutherford County Endowment	under CFWNC	non-profit, govs, educational, religious orgs serving Rutherford County	Rutherford County	$ 10,000.00	N/A	March
Sierra Nevada Brewing Co.	Sierra Nevada Brewing Company	Non profit organizations	US	N/A	0	21 days advance
Sisters of Mercy of North Carolina Foundation, Inc.	SMNC Foundation	Any	24 counties in Western NC	N/A	N/A	December
Sudden and Urgent Needs (SUN) Grants	under CFWNC	Non-profits, gov entities	Western NC	$ 10,000.00	N/A	Rolling
The Cannon Foundation, Inc.	Cannon Foundation	Governmental entities, non-profits open more than 5 years, churches	throughout NC, rural areas	N/A	Match required	Rolling
The Fund for Southern Communities	Fund for Southern Communities	Organizations with total budget below $150,000	Georgia, NC, SC	$ 5,000.00	N/A	September
The Glass Foundation	Glass Foundation	Non-profits	Western NC	$ 100,000.00	N/A	December, April, June
The Mary Duke Biddle Foundation	MD Biddle Foundation	Art, education, charities	NC, NYC			
Urban & Community Forestry Grant Program	NC Forest Service	State, local gov't, pubic educ institutions, IRS approved 501c3	North Carolina	$15,000	50/50	March
US EPA Environmental Education Grant	US EPA	local, tribal, or state education agency, college, university, non-profit, noncommercial educational broadcasting entity	US	$ 91,000.00	25/75	6-Apr-16
US Fish and Wildlife Grants	USFWS	Commercial organizations, foreign entities, Indian tribal governments, individuals, institutions of higher education, nonprofit organizations, and state and local governments	US	N/A	N/A	N/A
Wells Fargo Foundation Environmental Grants	Wells Fargo	Non-profits, gov entities, tribal entities	Triad and Western North Carolina	N/A	N/A	invitation-only
Wetland Protection Development Grant	USEPA	States, tribes, local governments, interstate associations, and intertribal consortia, and nonprofits	US	$400,000	25%	May
Women For Women	under CFWNC	Non-profits, gov entities	Western NC	$ 3,300.00	N/A	July
Z. Smith Reynolds Foundation		charitable, tax-exempt, 501(c)(3)s, colleges/universities, religious entities, gov't	North Carolina	$ 35,000.00	0	Temporarily Suspended

FUNDING OPPORTUNITIES FOR AGRICULTURAL ENTITIES

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Agirculture Cost Share Program	NCDA & CS- DSWC	Landowner or renter of existing agricultural operation	North Carolina	No max	25:75	N/A
Agricultural Develpoment and Farmland Preservation	NCDA&CS	Nonprofit conservation organizations, county agencies in partnerships wuith farmers or landowners	North Carolina	N/A	50/25/25	December
Army Corp of Engineers Section 206 Aquatic Restorati	USACE	Non-federal sponsor	US	$5,000,000	50/50 after first $100,000 in study, then 65/35 for design and construction	None
Conservation Community Cost Share	NCDA & DSWC	Homeowners, businesses, schools, parks, and publicly owned lands	North Carolina	No max	25/75	3-Feb-17
Conservation Reserve Program (CRP)	USDA-NRCS	Farmers & Ranchers	US	N/A	N/A	None
Corporation for National and Public Service	CNCS	Community organizations	US	N/A	N/A	N/A
Environmental Quality Incentives program (EQIP)	USDA-NRCS	Owners of land in agricultural or forest production or persons engaged in livestock, agricultural or forest production	US	No max	0	None
Farm Bill Programs	USDA-NRCS	Local, state, or tribal governments or non-governmental organizations, and owners or renters of agricultural land	North Carolina	No max	0	None
Forest Legacy Program	NC Forest Service	State, local gov't, private land trusts. Landowners	North Carolina	N/A	0	None
NC Division of Mitigation Services	NCDMS, NCDOT	Private & Public entities	North Carolina	No max	Fee Schedule Used	N/A
Partners for Fish and Wildlife in North Carolina	USFWS	All landowners including private individuals, partnerships, corporate owners, nonprofits, and local governments	North Carolina	N/A	30-60%	None

FUNDING OPPORTUNITIES FOR EDUCATIONAL ENTITIES

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Acres for America	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	No max	1:1 w/ 5:1 competitive	April
Black Mountain – Swannanoa Valley Endowment Fund	under CFWNC	non-profit, govs, educational, religious orgs serving Black Mountain and Swannanoa Valley	Buncombe County	$ 10,000.00	N/A	March
Bringing Back the Natives/More Fish	National Fish and Wildlife Foundation	Local, state, federal, and tribal governments and agencies, special districts, non profits, and schools and universities	US	$100,000	1 to 1	July
Cherokee Preservation Foundation Large Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	N/A	N/A	
Cherokee Preservation Foundation Small Grants	Cherokee Preservation Foundation	Non-profits, educational institutions, federal/state/local govs, tribal organizations	Tribal land locations	$ 20,000.00	N/A	
Conservation Community Cost Share	NCDA & DSWC	Homeowners, businesses, schools, parks, and publicly owned lands	North Carolina	No max	25/75	3-Feb-17
Corporation for National and Public Service	CNCS	Community organizations	US	N/A	N/A	N/A
Developing the Next Generation of Conservationists	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	50,000	1 to 1	November
Environmental Solutions for Communities	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	N/A	N/A	N/A
Learning Links	under CFWNC	Public schools	Multi-county	$ 800.00	N/A	September
Lowe's Charitable and Educational Foundation	Lowe's	Non-profits, educational institutions	Across U.S., Canada and Mexico	$ 100,000.00	N/A	
National Fish and Wildlife Grants	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	N/A	N/A	N/A
National Wildlife Refuge Friends	NFWF	State, and local governments, educational institutions, and nonprofit organizations	US	$15,000	1 to 1 to be competitive	July
NCDEQ 319	NC DEQ/USEPA	State, local gov'ts, including COGs, Inter and Intra state agencies, public and private nonprofit (including academic) organizations and institutions	North Carolina	No Max	60/40	April
North Carolina Humanities Council Grassroots Grants	NCHC	Any organization with a humanities focus	NC	$ 2,000.00	N/A	Rolling
North Carolina Humanities Council Large Grants	NCHC	Any organization with a humanities focus	NC	$ 25,000.00	N/A	June
North Carolina Humanities Council Planning Grants	NCHC	Any organization with a humanities focus	NC	$ 750.00	N/A	Rolling
Partners for Fish and Wildlife in North Carolina	USFWS	All landowners including private individuals, partnerships, corporate owners, nonprofits, and local governments	North Carolina	N/A	30-60%	None
Public Works and Economic Development	US Economic Development Administration	State, local gov'ts, including COGs, Inter and Intra state agencies, public and private nonprofit (including academic) organizations and institutions	US	N/A	N/A	None

FUNDING OPPORTUNITIES FOR EDUCATIONAL ENTITIES

Funding Source	Funder	Recipient Details	Location Restrictions	Grant Max	Match Required	Due Date
Resilient Communities Program	NFWF/Wells Fargo	State, and local governments, educational institutions, and nonprofit organizations	US	$500,000	1 to 1	July
Rutherford County Endowment	under CFWNC	non-profit, govs, educational, religious orgs serving Rutherford County	Rutherford County	$ 10,000.00	N/A	March
Sisters of Mercy of North Carolina Foundation, Inc.	SMNC Foundation	Any	24 counties in Western NC	N/A	N/A	December
The Fund for Southern Communities	Fund for Southern Communities	Organizations with total budget below $150,000	Georgia, NC, SC	$ 5,000.00	N/A	September
The Mary Duke Biddle Foundation	MD Biddle Foundation	Art, education, charities	NC, NYC			
Urban & Community Forestry Grant Program	NC Forest Service	State, local gov't, pubic educ institutions, IRS approved 501c3	North Carolina	$15,000	50/50	March
US EPA Environmental Education Grant	US EPA	local, tribal, or state education agency, college, university, non-profit, noncommercial educational broadcasting entity	US	$ 91,000.00	25/75	6-Apr-16
US EPA Environmental Education Grant	US EPA	state education or environmental agency				
US Fish and Wildlife Grants	USFWS	Commercial organizations, foreign entities, Indian tribal governments, individuals, institutions of higher education, nonprofit organizations, and state and local governments	US	N/A	N/A	N/A
Women For Women	under CFWNC	Women and girls	Western NC	$ 3,300.00	N/A	July
Z. Smith Reynolds Foundation		charitable, tax-exempt, 501(c)(3)s, colleges/universities, religious entities, gov't	North Carolina	$ 35,000.00	0	Temporarily Suspended

These resources highlight many different opportunities or provide links to other grants

Resource	Funder	Recipient Details	Location Restrictions
Capacity Grants(links to WNC nonprofit pathways)	LINKS TO WNC Nonprofit Pathways	Various	
Catalog of Federal Funding Sources for Watershed Protection	US EPA	Various	
Community Foundation of Henderson County	Henderson County	Non-profits	Henderson County area
Community Foundation of Western NC (CFWNC)	Various	Various	Western NC
Duke Energy Foundation	Various	Various	Duke Energy service area.
EPA Research Fellowships		Various	
EPA Research Grants		Various	
EPA Research Grants, Fellowship, and SBIR list serv	US EPA	Various	
EPA Water Pollution Control Grants	US EPA	Various	
Federal Grants		Various	
Financial Tools and Funding Sources for Environmental Programs	US EPA	Various	
Foundation Center's Funding finder	Foundation Cetner	Various	
Golden LEAF Foundation	GoldenLeaf	Non-profits, gov entities	Priority for strengthening North Carolina's long-term economy, especially in tobacco-dependent, economically distressed, and/or rural communities.
Kresge Foundation	Kresge Foundation	Various	Various
National Center for Envrionmental Research Listserv		Various	
North Carolina Environmental Education Listing	NCEE	Various	
North Carolina Parks	Various	Various	Various
Polk County Community Foundation	Various	Various	Polk County
Southeastern Environmental Education Alliance	Various	Various	
The Duke Endowment	Various	Various	NC SC
Transportation Equity Act (TEA-21)	USDOT	Various	
USDA - Water and Ag Info Center	USDA	Various	
Watershed Financing- Moving Beyond Grants	US EPA	Various	
Western North Carolina Nonprofit Pathways	builds skills, no funds	Various	Western NC

ADDENDUM TO:

LAKE MATTAMUSKEET WATERSHED RESTORATION PLAN

An anchor to the past, a path to the future

NOVEMBER 30, 2018

PREPARED BY: NORTH CAROLINA COASTAL FEDERATION
On behalf of: Hyde County, U.S. Fish and Wildlife Service, and N.C. Wildlife Resources Commission

The information provided in this addendum is included to supplement the content within the Lake Mattamuskeet Watershed Restoration Plan to sufficiently address the criteria requirements of the Environmental Protection Agency's (EPA) Nine Minimum Elements. The addendum was submitted to the N.C. Division of Water Resources for review on July 22, 2019.

TABLE OF CONTENTS

LIST OF TABLES .....

LIST OF FIGURES .....

ESTIMATE OF POLLUTANT LOAD REDUCTIONS 1

Hydrologic Restoration via Sheet Flow Application 2

Calculating Nitrate Removal from Restored Wetlands 2

Agricultural Buffer Restoration 3

Waterfowl Impoundment Management 5

Common Carp (*Cyprinus carpio*) Removal 6

ESTIMATES OF REQUIRED TECHNICAL AND FINANCIAL ASSISTANCE 6

Monitoring and Research 6

Maintain Existing Efforts 6

Future Research 7

Modeling/Engineering Design 7

Infrastructure Improvements/Project Construction 8

Establishment of a Service District 8

Operation and Maintenance 8

Common Carp (*Cyprinus carpio*) Removal 8

INTERIM MILESTONES 8

Active Water Management 9

Water Quality Improvements 9

REFERENCES 11

LIST OF TABLES

Table 1: Nutrient load reduction estimates based on implementing vegetated filter strips……..4
Table 2: Runoff and pollutant load reductions for vegetated filter strip……5

LIST OF FIGURES

Figure 1: Classification of existing drainage ditches within the Lake Mattamuskeet Watershed……4

ESTIMATE OF POLLUTANT LOAD REDUCTIONS

The Lake Mattamuskeet Watershed is located within the Tar-Pamlico River Basin and drains to the Pamlico Sound (sub-basin 03020105). The Tar-Pamlico Nutrient Management Strategy includes a set of rules (15A NCAC 02B .0255 - .0261) designed to equitably regulate sources of nutrient pollution in the basin including wastewater, stormwater, and agricultural nutrient sources as well as protect riparian buffers and mandate training for professionals that apply fertilizer. The rules went into effect in 2001 and seek to reduce nitrogen levels in the estuary by 30% and cap phosphorus levels at a 1991 baseline. According to the Tar-Pamlico Basinwide Water Resources Management Plan 2014 Summary, "full implementation of the nutrient reduction strategy has been a measured process and was reached in 2006."

However, monitoring has identified excess amounts of nitrogen and phosphorus in the lake, which have caused problems including low oxygen levels, extensive fish kills, and harmful algal blooms. In 2016, Lake Mattamuskeet was listed on the state 303(d) list of impaired waters due to elevated levels of pH and chlorophyll-*a*. The concentration of chlorophyll-*a* within the lake has been measured close to 200µg/L during the peak growing season, and the pH value reached 11 s.u. in June 2019.

In addition, monitoring by the U.S. Fish and Wildlife Service (USFWS) indicates submerged aquatic vegetation (SAV) has not been present in the lake since 2017. Monitoring results also indicate algae blooms have become a more frequent occurrence and contain a cyantotoxin, cylindrospermopsin, at concentrations that can impair recreational use. In fact, USFWS staff posted warning signs about health risks associated with harmful algal blooms during the first day of boating season (March 1 – November 1) at the Mattamuskeet National Wildlife Refuge in 2019.

This water quality issue is complicated by a decline of drainage capacity throughout the watershed, and a passive drainage system for the lake that relies on gravity in an area with minimal topographic relief. These problems are exacerbated further by rising sea level. The initial priority actions identified within the watershed restoration plan stem around establishing active water-level management capabilities in the Lake Mattamuskeet watershed that maintain or improve drainage capacity of lands in the watershed and improve water quality through land use best management practices (BMPs), wetland restoration and sheet flow application of drainage waters.

Information about a) drainage management on the surrounding landscape and the associated flow rates as well as b) nutrient and sediment concentrations within drainage ditches are needed. This data will be used to quantify the pollutant loads from sources within the watershed and develop pollutant load reduction targets to meet water quality goals. A coarse nutrient load reduction of 80% is the estimated target required to reduce the concentration of chlorophyll-*a* from 200µg/L to 40µg/L based on a theoretical linkage (EPA, 2008). The coarse target will be used until the watershed characterization is better refined through the development of the hydrologic and hydraulic model for the watershed. Nutrient load reduction estimates have been generated for each of the proposed management actions. These estimates provide an initial step to quantify reductions that can be obtained from implementing this watershed restoration plan.

Hydrologic Restoration via Sheet Flow Application

The strategy being pursued aims to re-establish and replicate the natural movement of water from the lake towards the Alligator River rather than the Pamlico Sound. The preferred design alternative is to identify, design, and prioritize projects where water diverted from the lake could be sheet flowed over newly-created or restored wetlands. The sheetflow application would allow nutrients to be assimilated and sediment to fall out before eventually reaching a water body such as the Atlantic Intracoastal Waterway (AIWW). This restoration strategy has the dual benefit of 1) restoring historic flow paths and 2) directing drainage water to where it can sheetflow across restored wetlands as opposed to discharging in sensitive and already degraded shellfishing waters. To date, several locations have been identified for potential sheet flow applications both within and adjacent to the Lake Mattamuskeet Watershed.

One private landowner has volunteered tracts of land located within the northwest boundary of the watershed that would provide a pathway to sheet flow water over prior converted wetlands before eventually connecting to the AIWW. The particular parcel is 293 acres in size, and three-fourths of the parcel is currently enrolled in easement programs (through the Wetlands Reserve Program (WRP), and the Conservation Reserve Enhancement Program (CREP)). The owner is willing to enroll the remaining ~70 acres in the Emergency Watershed Protection-Floodplain Easement Program (EWP-FPE) or similar conservation program.

A roughly 600-acre parcel of actively farmed land, located to the south and immediately adjacent to the aforementioned parcel, belongs to the same property owner and currently drains to the lake. An engineering firm will be contracted, once funding is acquired, to develop an engineered design to redirect drainage water from the 600-acre parcel to the 293-acre parcel via sheet flow before connecting to the AIWW.

Calculating Nitrate Removal from Restored Wetlands

Dr. Tiffany Messer performed mesocosm experiments over a two-year time period from September 2012 to September 2014 as part of her dissertation research under the direction of Dr. Michael Burchell, North Carolina State University. This study evaluated the nitrate removal capacity of two restored wetlands receiving agricultural drainage water. The studies used Hyde County soils and loaded the wetlands at nutrient concentrations similar to what has been observed through monitoring efforts in and around Lake Mattamuskeet. Based on these mesocosm experiments, “utilizing restored wetlands to treat agricultural drainage water is a promising method to reduce N exports to downstream sensitive ecosystems,” (Messer et al., 2017).

Messer et al. (2017) found that nitrate removal rates ranged from 0.001 to 6.5 lbs/ac/d within mineral soils and 0.001 to 4.4 lbs/ac/d within organic soils during the growing season when water temperatures were above 53°F. However, when average water temperatures were below 53°F in both the growing and non-growing season the nitrate removal rates ranged from 0.05 to 1.4 lbs/ac/d and 0.03 to 2.5 lbs/ac/d in mineral and organic soils respectively.

Extrapolating this to estimate load reduction from potential sheet flow projects for Lake Mattamuskeet, the following was considered: for seven months of the year, during the growing season, the average daily low temperature is above 53°F. Meaning, the average daily low temperature is below 53°F for the remaining five months during the non-growing season. The soils of the potential sheet flow site are primarily organic and categorized as Pungo muck and Bellhaven muck according to the Natural Resources

Conservation Service (NRCS) Web Soil Survey. Based on this information it is estimated that the nitrogen load reduction that would occur from implementing the sheet flow strategy described above could range from a maximum estimate of 2,654 lbs/d of nitrate when temperatures are above 53°F, to 1,484 lbs/d of nitrate when temperatures are below 53°F. Therefore, the annual estimated load reduction that could potentially occur from redirecting the drainage water from the 600-acre parcel would be a maximum of 79,631 lbs/yr based on the average number of days pumping is thought to be needed per year. The federation and partners are seeking funding to perform a project site assessment and develop a preliminary engineered design for this priority management strategy.

Two other potential sheet flow application sites have been identified to date and are in need of further evaluation. The overall effectiveness of this strategy will be dependent on identifying sufficient areas for sheet flow application. Studies conducted by Chescheir et. al (1991) in neighboring Dare and Tyrrell County indicated that sheet flow application can reduce total nitrogen, total phosphorus and sediment by nearly 80 percent when the ratio of drained land to wetland area was 5:1. Even when the ratio of drained land to wetland was as high as 18:1, reductions of 30-60 percent were observed. (Chescheir et.al, 1991). By extension, this indicates that if stakeholders can identify ~1,000-4,000 acres for sheet flow application, 30-80% of nutrients and sediment currently draining to the lake can be reduced.

Agricultural Buffer Restoration

Riparian buffers and filter strips are an effective method of reducing nutrient inputs to waterways. According to NCDWR, nutrient offset credits for agriculture riparian buffer restoration is 75.76 pounds of N/acre/year load reduction, and 4.88 pounds of P/acre/year load reduction. However, due to a variety of factors, it is not common practice for farmers to implement vegetated buffers between cropland and a drainage ditch. Without a buffer strip, the farmer is able to maximize harvestable cropland and facilitate access for ditch maintenance purposes. Proper incentives are necessary to encourage implementation by landowners to offset a loss in revenue associated with a reduction in the acreage of harvestable cropland. The North Carolina Agriculture Cost Share Program provides such an incentive, and is locally administered through the Hyde Soil and Water Conservation District.

A GIS-based analysis was performed to estimate the linear length of primary drainage ditches within the watershed that are not buffered by vegetation. The National Hydrography Dataset was used to delineate the location of surface water ditches, and 2018 orthoimagery was used as a reference to identify whether or not vegetative buffers were present. Based on this desktop analysis, it was determined that there are four distinct geographic areas that cover the perimeter of the watershed where the use of vegetative buffers could reduce the nutrient and sediment load entering into those specific ditches that eventually drain to the lake (Figure 1) (Table 1).

The minimum flow length through a filter strip is recommended to be 20 feet as per the Natural Resources Conservation Service (NRCS) Conservation Practice Standard (Code 393). The linear length of the existing un-buffered ditches was multiplied by the minimum flow length to calculate the area where filter strips could be installed. The nutrient load reduction was then estimated for both nitrogen and phosphorus in the table below. One caveat of this estimate is that it only accounts for installing filter strips on one side of the drainage ditch. There may be instances where agricultural land drains to both sides of the ditch. Therefore, the nutrient load reduction estimate in the table below is conservative in nature.

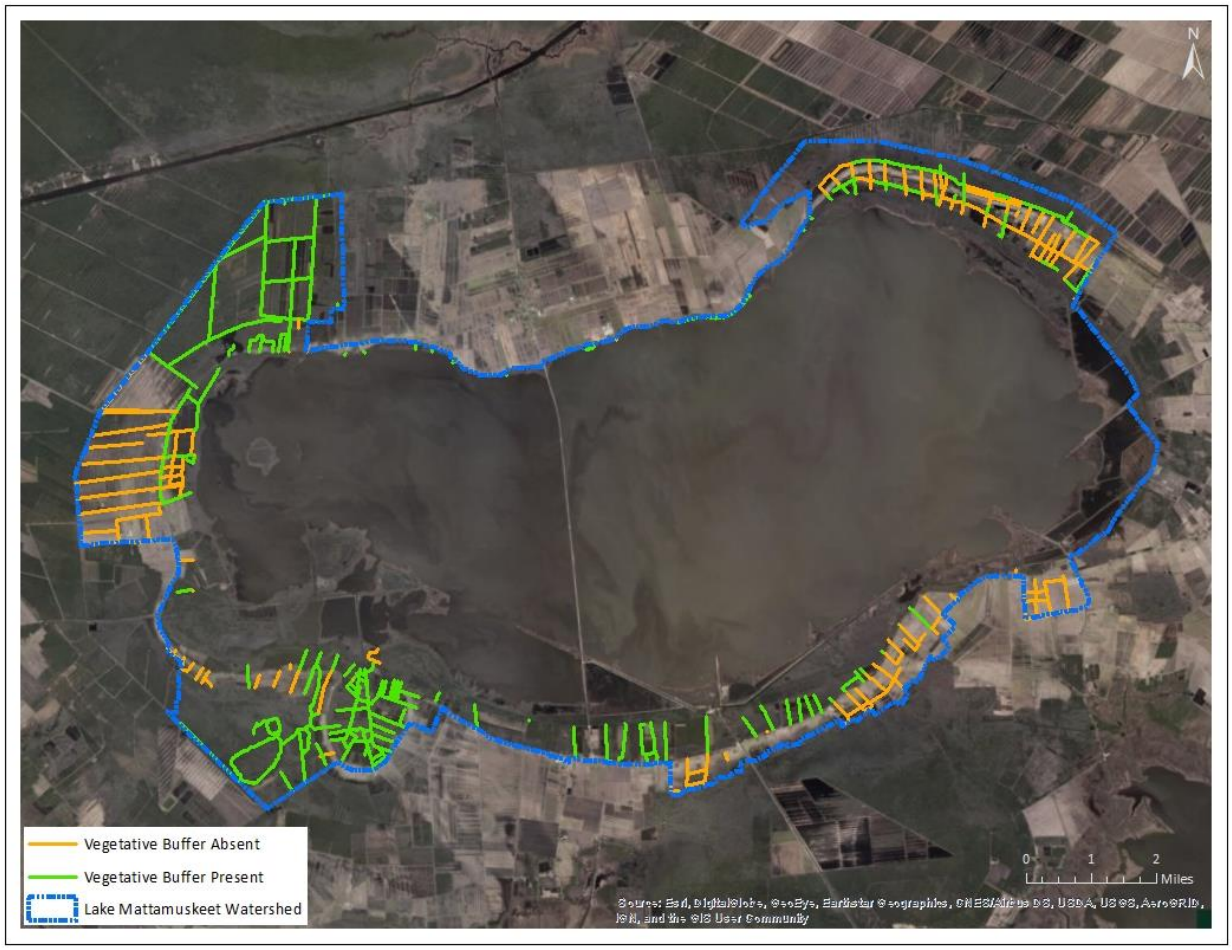

Figure 1. Classification of existing drainage ditches within the Lake Mattamuskeet Watershed.

Location	Un-buffered Ditch Length (miles)	Buffer Width (feet)	Area (acres)	Nitrogen Reduction (pounds/year)	Phosphorus Reduction (pounds/year)
Piney Woods Rd (NW)	17.3	20	41.9	3,177.33	204.66
North Lake Rd (NE)	14.8	20	35.9	2,718.18	175.09
New Holland (SE)	11.9	20	28.8	2,185.56	140.78
SR 1304 (SW)	3.6	20	8.7	661.18	42.59
Total	**47.6**	**20**	**115.4**	**8,742.25**	**563.12**

Table 1. Nutrient load reduction estimates (pounds/year) based on implementing vegetated filter strips on existing ditches within the watershed that are currently un-buffered.

The table below shows the compelling results on the effective widths of vegetated filter strips from a five-year study conducted in the Tar Pamlico Basin by North Carolina State University (Table 2) (Line and Osmond, 2007). Specific nutrient load reduction estimates could be generated using the table if water quality sampling and monitoring is conducted within targeted ditches that do not currently have a vegetated buffer to assist with determining the width that would be most appropriate to reduce the desired nutrient and sediment load in the most cost effective manner as possible.

	Runoff	TSS	TP	DP	TKN	NH_3	NO_3	TN
Width < 15 ft*								
number of studies	11	13	11	7	4	6	6	5
median (%)	20	58	54	4	69	57	24	58
mean (%)	22	57	47	6	67	40	28	38
Width 15-30 ft*								
number of studies	12	15	12	6	5	5	5	6
median (%)	46	81	68	48	76	67	57	62
mean (%)	47	82	68	28	76	43	49	66
Width >30 ft*								
number of studies	7	9	7	1	2	2	2	3
median (%)	65	91	90	90	89	88	82	82
mean (%)	66	85	86	85	89	88	40	84

*Table 2. Runoff and pollutant load reductions (%) for vegetated filter strip (Line and Osmond, 2007) (*measurements of width were converted from metric to standard units).*

Waterfowl Impoundment Management

Dr. Randall Etheridge, East Carolina University, is studying two waterfowl impoundments with different management regimes. One impoundment is managed by the Refuge to provide native, seed-producing wetland plants preferred by waterfowl (moist-soil management), and the other is a private impoundment planted with corn and managed by a local farmer. The objective of this study is to determine the potential nutrient input of these management regimes into Lake Mattamuskeet. The results will help to inform if the management of the impoundments can be altered to reduce the nutrients reaching the lake while also maintaining their food production for waterfowl.

Common Carp (*Cyprinus carpio*) Removal

Common carp are known as "ecosystem engineers" capable of causing stable state shifts in shallow aquatic ecosystems as a result of increased turbidity from carp grazing that results in a decline of SAV and subsequent shifts in biological assemblages. Modeling shows the loss of SAV is a result of a negative feedback mechanism between increased nutrient loading, increased harmful algal blooms, and increased turbidity, which is possibly exacerbated by an overabundance of invasive common carp.

Master's student April Lamb has been working with her advisor Dr. Jesse Fischer at North Carolina State University to evaluate the feasibility of common carp exclusion and targeted vegetation restoration within Lake Mattamuskeet. Population density estimates determined there to be 971,220 carp with a biomass of approximately 4,475,053 million pounds within the lake. Common carp are roughly 1% phosphorus and 6.5% nitrogen as measured by live weight. Therefore, the estimated nutrient load reduction associated with a large scale common carp removal program would be 44,750 pounds of phosphorus and 290,878 pounds of nitrogen. Carp exclusion fences will be installed at tide gates of each outfall canal and at the five culverts that pass under NC-94 causeway that bisects the lake to minimize the reinvasion threat of common carp. A long-term maintenance biomass removal program will also be explored.

The removal of common carp will not have an immediate impact on phytoplankton blooms since the removal will not immediately impact the nutrient bioavailability within the water column of the lake. However, the biomass removal will reduce a source of nutrients that concentrate within the sediment through decomposition and eventually interact with the water column through resuspension and bioturbation. The biomass removal is anticipated to drastically reduce bioturbation, which would then improve water clarity and provide a higher probability for SAV restoration to occur.

ESTIMATES OF REQUIRED TECHNICAL AND FINANCIAL ASSISTANCE

Monitoring and Research

The members of the Mattamuskeet Technical Working Group are comprised of staff scientist from USFWS and NCWRC. They work through a collaborative agreement to identify, prioritize, and conduct monitoring and research at the Refuge. The results of their efforts are used to inform current and future lake management actions. USFWS and NCWRC have dedicated staff and funding to allow this collaboration to continue. No new funds for this staff level coordination are needed. However, ensuring continued support of their existing monitoring efforts and new funding for identified research needs will be important.

Maintain Existing Efforts

Long-term monitoring datasets are essential to evaluating the effectiveness of management actions and developing research questions that can be addressed through scientific investigation.

Continuous monitoring of lake levels and water quality as well as precipitation and wind speed occurs at real-time monitoring stations located within each basin of the lake through a contract between USFWS ($35,000), NCWRC ($20,000), and USGS ($5,000). Total financial contributions of $60,000 per year are required to maintain this monitoring effort.

Monitoring of water levels, discharge, and water quality in the canals on the Refuge is performed on a weekly basis and monthly grab samples are collected by USFWS staff through regular operations at an annual cost of $4,000 and $5,000 respectively. The cost of maintaining this effort could increase if additional water quality parameters are analyzed or the sampling frequency increases.

Real-time monitoring of the water level at Rose Bay initially cost approximately $30,000 to install the water level station accomplished through coordination with the USFWS Refuge Inventory and Monitoring Branch in collaboration with North Carolina State University. Since March 2019, a new radar system to monitor real-time water depth was installed through grant funding and will be maintained by the North Carolina Flood and Inundation Mapping program.

In the spring, the NCWRC staff annually sample inland fish communities within Lake Mattamuskeet and associated canals within the Refuge boundary ($5,000). SAV monitoring is performed by the USFWS staff on an annual basis ($2,500) as part of the Refuge and USFWS migratory game bird program operations. Aerial waterfowl surveys are performed annually by both the USFWS as part of Refuge operations, and NCWRC staff as part of the mid-winter waterfowl survey. The cost of conducting the mid-winter waterfowl survey ranges between $7,000 - $15,000 per year and accounts for several hours of staff time and the use of aircraft provided by the USFWS.

Total cost to maintain existing monitoring efforts is estimated to be: $83,500- $91,500.

Future Research

Specific research efforts have focused on answering questions related to the drainage capacity within the four main outlet canals, effects of nutrient loading through sediment resuspension within the lake, common carp population and biomass estimates, concentrations of agricultural herbicides within drainage ditches, effectiveness of SAV restoration techniques, and nutrient concentrations of water discharged from both conventional and moist soil management style impoundments. Some of this research has already been completed while some remains ongoing. The information provided from these current and future studies is critical to the success of the watershed restoration efforts. However, providing a cost estimate for future research is challenging at this time as it will require information and recommendations generated from ongoing studies.

Based on previous research projects funded in the watershed and on the lake, it is estimated that $200,000 a year would provide sufficient funding to support future research priorities.

Modeling/Engineering Design

The strategy being pursued aims to re-establish and replicate the natural movement of water from the lake towards the Alligator River rather than toward the Pamlico Sound. The preferred design alternative is to identify, design, and prioritize projects where water diverted from the lake could be sheet flowed over newly-created or restored wetlands where nutrients and sediment can be absorbed before eventually connecting to a water body.

In order to systematically evaluate the various alternatives proposed to restore water quality a detailed engineering analysis is required to select the most cost-effective and most environmentally acceptable pathway(s) to provide an additional outlet for the lake via sheet flow applications that restore the natural hydrology of the region. The development of watershed scale model, evaluation of potential sheet flow sites, and engineered designs that could be used to obtain permits has a cost estimate of $250,000.

Private landowners have volunteered tracts of land that could provide a pathway to sheet flow water over prior converted wetlands. Each of these sheet flow projects will require engineered designs. It is estimated that each project will cost $100,000-$200,000 to fully design. It is not yet known how many total projects will come from this watershed restoration plan, but based on similar experiences in the neighboring

Mattamsukeet Drainage Association, an estimate of 10-15 projects is reasonable. Therefore, total engineering/design costs are roughly estimated to be $1.75M.

Infrastructure Improvements/Project Construction

In general, it is expected that infrastructure improvements and construction of the identified projects will cost 10 times the design cost. With design/engineering costs estimated at $1.75M, it is safe to estimate a $17-20M investment in implementing the infrastructure improvements. This estimate is in keeping with similar work being done to implement active water management and wetland restoration projects within the Mattamuskeet Drainage Association and North River Wetlands Preserve.

Establishment of a Service District

A cost estimate of $30,000 was suggested by Hyde County staff for the legal fees associated with title searches and preparation of documents and materials in advance of a public hearing for the establishment of a service district based on experience from the establishment of the Swan Quarter and West Quarter Special Service Districts, which are both located in Hyde County.

Operation and Maintenance

The details of the service district still need to be evaluated, but the general understanding among the stakeholders is that drainage services could be either contracted from the existing drainage entities or new drainage infrastructure and management could be developed to assist in meeting the drainage needs. The upfront infrastructure and development costs of establishing a new service district could likely be funded by grant or other funding opportunities. The service district would be responsible for using income generated from a levy on private property taxes for the operation and maintenance of drainage services within the district as well as capital improvement projects. The USFWS cannot cede management authority of the Refuge and therefore would not be included as a party of the service district. The Refuge could enter into an MOA with Hyde County as a collaborating partner to contribute to the implementation of the plan's management within the service district.

Representatives from the Mattamuskeet Drainage Association suggested using an assessment fee of $30 per acre/year as an average cost estimate to fund active water management within a newly established service district based on assessment fees that are used in adjacent drainage management entities. This cost estimate accounts for both operation, maintenance, and future upgrades. The area of land within the watershed but outside the Refuge boundary that would be incorporated into a service district totals 17,993 acres, and the total annual cost estimate would be $539,790 to operate and maintain.

Common Carp (*Cyprinus carpio*) Removal

The Mattamuskeet Technical Working Group is pursuing funding opportunities to perform the biomass removal through the submission of an application to the Fiscal Year 2022 National Wildlife Refuge System Large Invasive Species Project Allocation. The budget to perform the biomass removal identifies costs of $750,000 as payment to contracted fishermen for removal of 5 million pounds of common carp based on a rate of 15 cents per pound; and $250,000 for equipment, monitoring, and maintenance of common carp exclusion gates, monitoring equipment, nets, seine traps, etc.

INTERIM MILESTONES

One of the priority management actions includes conducting annual and five-year assessments for the purpose of adapting and evolving the watershed restoration plan based on results. These assessments

will specifically consider water management improvements on the lake and within the watershed, reductions in nutrients reaching the lake, improvements in lake water clarity, reduction in algal blooms within the lake, and preservation of the way of life in Hyde County. The following interim milestones have been identified as measures that can be used to evaluate the success of implementing priority management actions.

Active Water Management

The implementation of active water management capabilities within the lake and watershed is a critical component of the watershed restoration plan. There are several interim milestones associated with this goal that include:

- Perform hydrologic study of the watershed - May 1, 2020
- Create a formal body that provides managing authority for active water management within the watershed in coordination with the Refuge, which would be excluded as a party to the formal body since USFWS cannot cede management authority.
    - Hold public hearing by May 1, 2020 to take effect July 1, 2020.
- Design engineered plans for the pilot project to re-direct drainage from a 600-acre parcel that currently drains to the lake to an adjacent 293-acre parcel within the watershed via sheet flow before eventually discharging towards the AIWW - December 1, 2020
    - Complete construction - December 1, 2021
- Design engineered plans for active water management within the watershed - June 1, 2021

Water Quality Improvements

The actions of active water management and water quality improvements are intimately tied. By designing and installing sheet flow application projects to help with managing water volume, water quality will also be improved.

Since removing the lake from the 303(d) list is one of the goals of the watershed restoration plan, reducing the chlorophyll-*a* concentrations within the lake by 10µg/L per year until the water quality standard of 40µg/L is reached shall be used as an interim milestone to evaluate the effectiveness that both nutrient load reductions and active water management within the watershed has on water quality within the lake. This interim milestone will be used as benchmark once active water management activities are implemented. The pH value of the water within the lake should shift from basic to neutral as chlorophyll-*a* concentrations are lowered and subsequently fewer phytoplankton blooms.

Nutrient reductions and water quality improvements will be assessed annually and at 5-year intervals, and include:

- Increasing light attenuation coefficient (k) for the lake.
- Increasing secchi disk measurements for the lake.
- Gradual declining nitrogen (mg/L) and phosphorus (mg/L) levels overtime based on lake-wide grab samples (Total P is 100% greater than 1980 levels; Total N is 400% greater than 1980 levels).
- Completing up to three pilot projects on actively farmed lands to determine the efficacy of a variety of nutrient management BMPs (e.g. filter strips, no-till, check weirs, etc.) within the watershed.

The performance of a common carp (*Cyprinus carpio*) removal program is anticipated to not only remove a significant source of nitrogen and phosphorus within the lake, but also improve water clarity by reducing bioturbation and subsequent turbidity. A proposal to perform this removal has been submitted by the Mattamuskeet Technical Working Group for submission to the Fiscal Year 2022 National Wildlife Refuge System Large Invasive Species Project Allocation. The proposal targets as close to 100% common carp biomass removal as possible. An operational management plan will go into effect after the large scale removal, and an annual 5% biomass return rate will be used to measure the effectiveness of the management activities to keep the common carp population in control.

The return of SAV coverage will serve as a primary indicator of the lake ecosystem health and will be used as the principal metric to evaluate the effectiveness of each implemented management action/BMP to improve water quality within Lake Mattamuskeet. Since the SAV restoration component is anticipated to occur over the long-term, a goal of observing 25% coverage within the lake over the next decade will be used as the interim milestone. Afterwards, the same rate increase of 25% over five year increments will be used as an interim milestone until 100% coverage is reached.

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