

Section 6: Environment

6 Environment

6.1 Introduction

Natural features and conditions of the land are both impacted by and have an effect on settlement patterns. The features of topography, soils, geology, water and vegetation establish the basic suitability and capacity of the land for development, influencing overall land use patterns, economic opportunity, quality of life and the cost of public facilities and services. When land use is not planned to consider impacts to natural resources, the environment can be at risk for permanent alteration and reduction of resources.

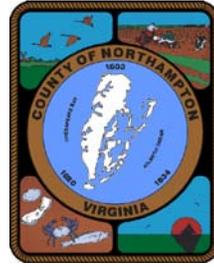
The most obvious and noticeable influence on Northampton County's environment is that it is a long, narrow peninsula between two major water bodies, the Atlantic Ocean and the Chesapeake Bay. Northampton County's fertile soils, extensive marshes and productive waters have provided the foundation for an agricultural economy and a seafood industry that has spanned centuries and supported the inhabitants since the dawn of human occupation. The following section details the most significant baseline data on current and historical environmental and ecological conditions in Northampton County and associated near shore Atlantic waters and the Chesapeake Bay.

6.2 Climate

The climate of Northampton County is classified as temperate with mild winters and warm, humid summers. Latitude, topography, prevailing winds, and the proximity to the Chesapeake Bay and Atlantic Ocean all exert an influence on the climate.

The County generally lies near the mean path of both winter storm tracks and warm moist tropical air from the southwest Atlantic Ocean and Gulf of Mexico during the summer and early fall.

The average temperatures, as recorded from Weather Station Oyster 1 W, are 77.9 degrees F in July and 38.1 degrees F in January. The average annual temperature is 58.6 degrees F. (See Table 6.2)



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Table 6.1 Average Temperature in Northampton County

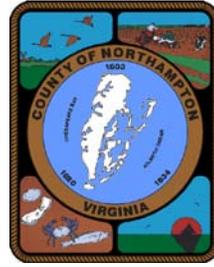
(in Fahrenheit)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average Minimum	29.5	30.9	38.3	46.1	55.5	64.4	69.2	68.4	62.8	52.2	43.4	34.7	49.6
Average Maximum	46.6	48.6	57.6	66.5	74.9	82.5	86.5	85	79.8	70.1	60.9	51.7	67.6
24-Hour Average	38.1	39.8	48	56.3	65.2	73.5	77.9	76.7	71.3	61.2	52.2	43.2	58.6

Source: OYSTER 1 W, NORTHAMPTON COUNTY data derived from NCDC TD 9641 Clim 81 1961-1990 Normals
Oyster 1 W is located at about 37.28 Degrees North and 75.93 Degrees West at Height about 26 feet above Sea Level.

Rainfall, derived from cyclonic weather systems in fall, winter and spring months and from local convection and thunderstorms in summer months, is distributed evenly throughout the year. Precipitation averages about 39.9 inches per year. The average snowfall is about 8 inches. There is an average of 230.5 frost-free days per year. The average first frost is November 15 and the average last frost is March 20.

Prevailing winds are southerly at an average velocity of 10 miles per hour. The Eastern Shore is vulnerable to hurricanes; at least 10 hurricanes caused destruction in this region since 1901. During hurricane periods, coastal lagoons receive a great influx of sediments from wash-over. When storms are of unusual severity, new inlets may be formed or existing ones may be closed. The hurricane season begins in June and extends through November 30.

Northeasterly storms, which occur primarily during the fall and winter, are a more significant cause of erosion along the coastal area than the summer hurricanes. Typical "northeasters" are accompanied by heavy rain and strong northeast winds which may cause unusually high tides and seas, and flooding of exposed coastal and low lying areas. Durations of these storms are variable, but usually persist for two to five days.



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The United States Environmental Protection Agency and National Oceanic and Atmospheric Administration advise that global trends show an increase in atmospheric temperature which in turn, will impact climate, storm systems, drought events, growing seasons, sea levels, and ocean acidity. According to the US EPA, the average annual temperatures in the southeastern United States (including Virginia) are expected to rise by 4 to 9 degrees by 2080. (See, US EPA Climate Change, Southeast Impacts and Adaptations: <http://www.epa.gov/climatechange/impacts-adaptation/southeast.html>.) This warmer weather will cause more evaporation in soils and surface waters – causing an increased need for irrigation to crops and an increase in salinity for shallow estuaries and bays.

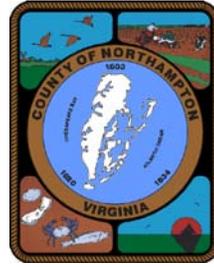
6.2.1 Sea Level Rise

The Mid-Atlantic region has the second highest rate of sea level rise in the United States according to NOAA. Sea levels are rising due to the combined impacts of global warming and land subsidence; the land mass in the Mid-Atlantic is sinking at a rate of approximately 0.1 inch per year. In Virginia, the impacts of sea level rise were analyzed in a January 2013 report by the Virginia Institute for Marine Sciences (VIMS) at the College of William and Mary entitled “Recurrent Flooding Study for Tidewater Virginia.” Recurrent flooding is caused by both the rising sea level and the stronger, more frequent precipitation events and storm surges associated with global warming. Areas that currently experience regular flooding will be flooded more frequently and experience longer periods of inundation. Areas that currently see little or no flooding



Flooding in Bayford

may begin to experience flooding more often. In Northampton County, the Barrier Islands, intertidal areas and marshes, as well as any development in the inundation areas, will be impacted. Sea level rise impacts can be exacerbated by substantial groundwater withdrawals that increase the rate of land subsidence.



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VIMS identified the locations on the Eastern Shore where recurrent flooding is currently a problem and could be expected to increase in a 20 to 50 year time frame under projected climate change and land subsidence scenarios. The estimated rate of sea level rise for Northampton County used in the VIMS study is 1.5 feet over the next 20 to 50 years. The report concludes that of 132,032 acres of Northampton County, 0.46 percent more land acreage and 44 additional miles of road will be flooded over the next 20 to 50 years due to sea level rise with accompanying 3 foot storm surges. Of this additional area, only 0.01 percent is currently developed with housing or commercial structures.

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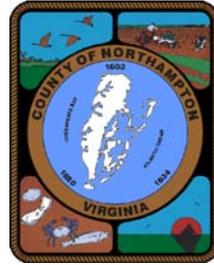
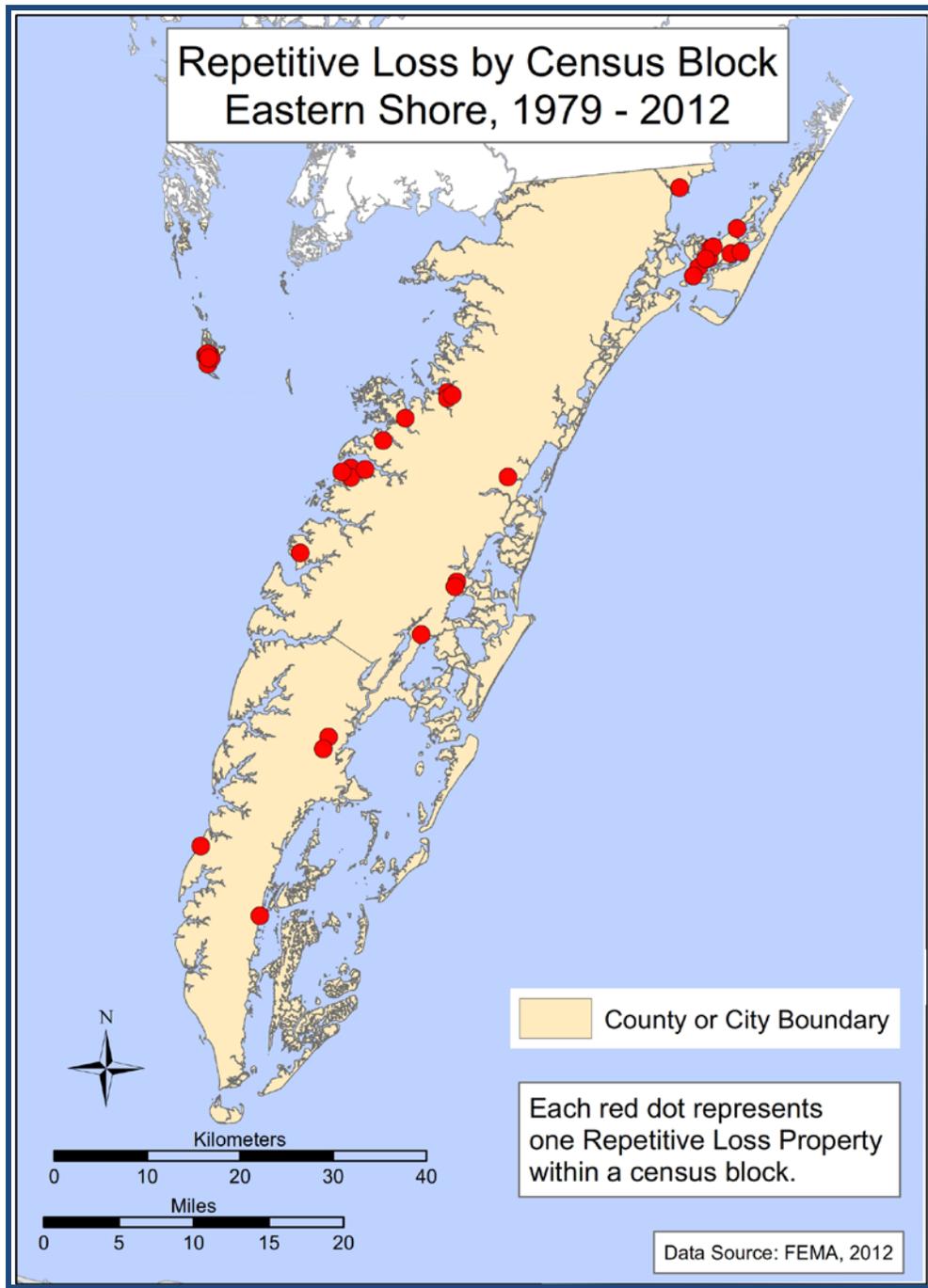


Figure 6.1 Repetitive Loss by Census Block



Source: VIMS Recurrent Flooding Study, page 65

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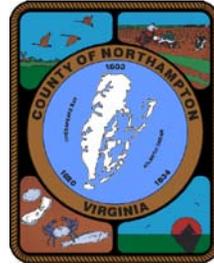
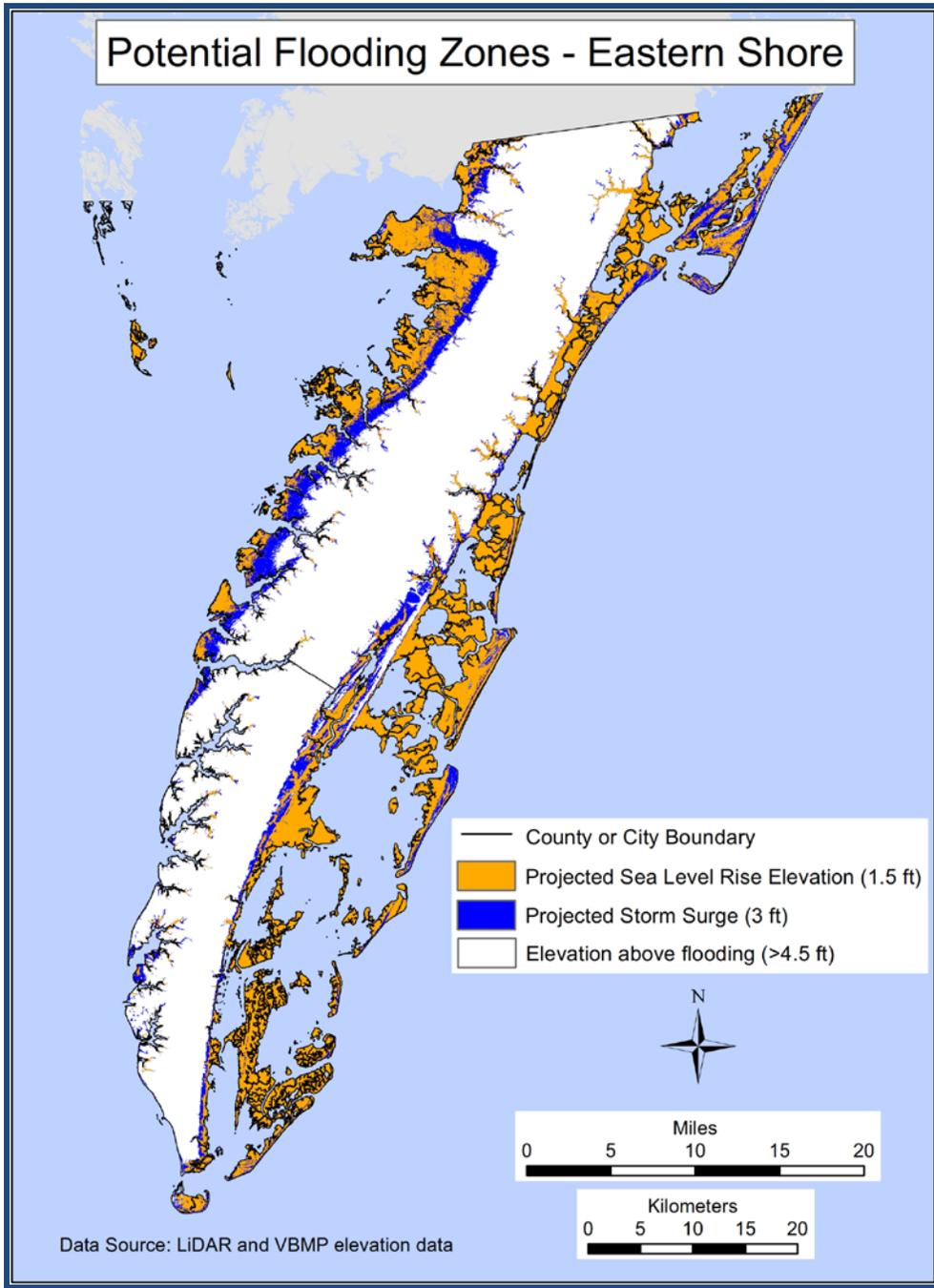
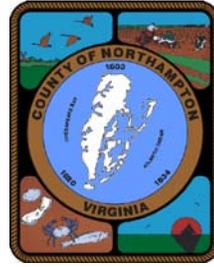


Figure 6.2 Potential Flooding Zones

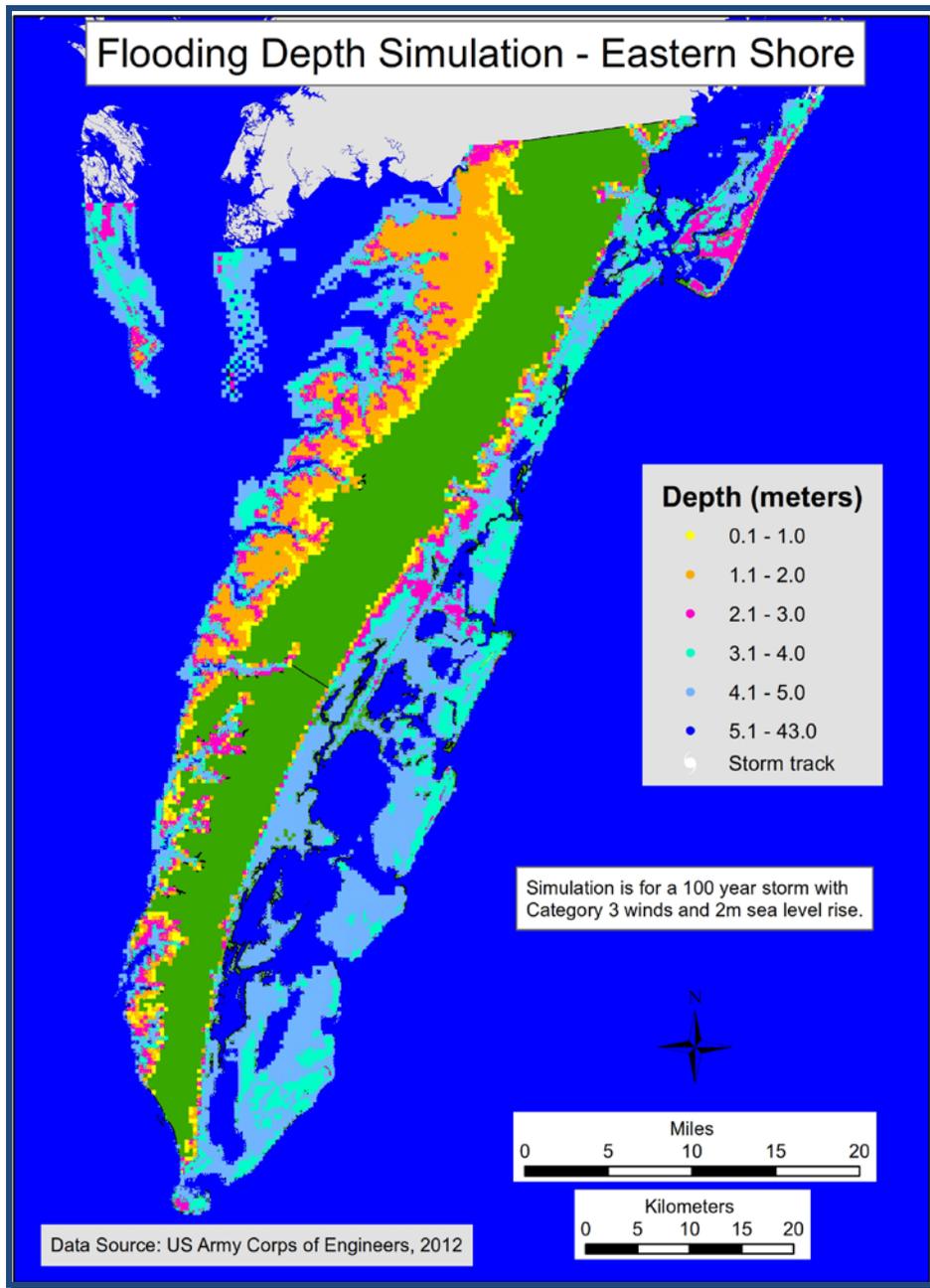


Source: VIMS Recurrent Flooding Study, page 73

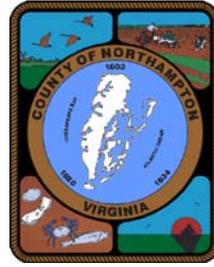


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Figure 6.3 Flooding Depth Simulation

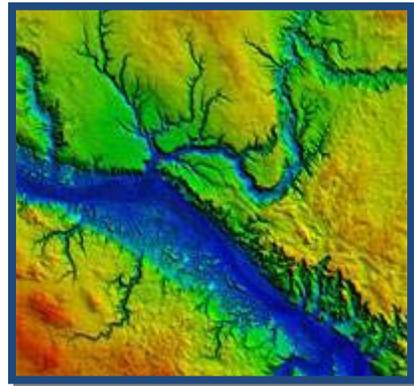


Source: VIMS Recurrent Flooding Study, page 79



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Further data on the potential impacts to Northampton County from sea level rise will be available when more detailed mapping is complete. LiDAR (Light Detection and Ranging), an optical remote sensing technology, has been used to obtain high accuracy elevation data for the Eastern Shore. LiDAR data can be used to update flood insurance maps, hazard mitigation plans, update storm water management plans, document sea level rise and to plan for future development. NOAA's Coastal Service Center has included the Eastern Shore on its Sea Level Rise Coastal Flooding Impact Viewer. The viewer displays potential future sea levels, provides one foot increment sea level rise simulations at the local level, shows areas of uncertainty or low confidence, and overlays social and economic impacts due to sea level rise. The link for the viewer is: <http://www.csc.noaa.gov/digitalcoast/tools/slviewer/>.

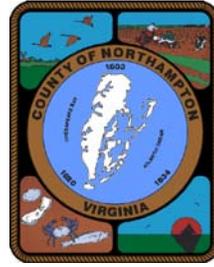


LiDAR example

6.3 Topography

There are three noticeable topographic corridors running the length of the County. The first is the bayside corridor which faces the Chesapeake Bay with a varied coastline consisting of 25-foot bluffs, 50-foot dunes to flat sandy beaches, and marshlands at and below sea level. The entire Bay coast is incised with a complex system of creeks. The middle ridge is the high ground between the Chesapeake Bay and the Atlantic Ocean where elevations range between 25 to 40 feet above sea level. This ridge is visible on topographic maps and is obvious to the naked eye in many places as a pronounced bluff along both the bayside and seaside corridors of the County. Furthermore, this ridge approximates the boundaries between the Atlantic Ocean and Chesapeake Bay drainage basins. The seaside of the mainland drops down from the ridgeline (25 foot contour) to land that is inundated at high tide and emergent at low tide. There is an extensive tidal marsh system between the fast-land on the seaside coast and the barrier islands off the coast with a few deep water channels leading to the Atlantic.

Historically, most of the development in the County was located within the central ridge-corridor. In recent decades, the Bay side has experienced more development because of the many creeks and extensive waterfront land along the Chesapeake Bay and its tributary creeks. Five large creek basins, each with deep water access and unique



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characteristics are located within the Bay drainage area. Most of the development pressures during the last decade have been near this waterfront and this trend is continuing.

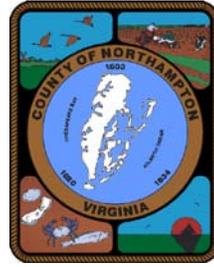
6.4 Soils

Soil types are important in that they have a significant influence on agriculture as well as residential and industrial development. The percentage of the County's total land area in prime or unique soil types has influenced agricultural practices and productivity, making it a significant factor in land use decisions. The ability of soils to absorb septic wastes and their suitability for buildings and roads is one factor that impacts development.

The United States Department of Agriculture, Soil Conservation Service, Soil Survey of Northampton County provides data on soil classifications, suitability, fertility, and other relevant features (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>). It is on file and can be reviewed in the Northampton County Planning & Zoning Department. Figure 6.4 shows the soils types that are present in Northampton County. Table 6.2 lists the soil symbol, the name, and the percent of occurrence in the County.

6.4.1 Septic Suitability & Soil Types

Generally, soils with good septic suitability are the Bojac soils. Those soils that have fair septic suitability are Munden soils. Other soils present in the County are more hydric (high moisture content) and are generally categorized as being poor in septic suitability. Figure 6.4 shows the occurrence of the soil types divided into the three categories according to their septic suitability.



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Table 6.2 Soil Types & Percentage of Occurrence

Map symbol	Soil Name	%
AsE	Assateague sand, 2 to 50 percent slopes	0.3
AtD	Assateague fine sand, 2 to 35 percent slopes, rarely flooded	0.1
BeB	Beaches, 0 to 10 percent slopes	1.2
BhB	Bojac loamy sand, 2 to 6 percent slopes	3.8
BkA	Bojac sandy loam, 0 to 2 percent slopes	17.3
BoA	Bojac fine sandy loam, 0 to 2 percent slopes	19.1
CaA	Camocca fine sand, 0 to 2 percent slopes, frequently flooded	0.8
ChA	Chincoteague silt loam, 0 to 1 percent slopes, frequently flooded	24.4
DrA	Dragston fine sandy loam, 0 to 2 percent slopes	1.1
FhB	Fisherman fine sand, 0 to 6 percent slopes, occasionally flooded	1.2
FmD	Fisherman-Assateague complex, 0 to 35 percent slopes, rarely flooded	0.3
FrB	Fisherman-Camocca complex, 0 to 6 percent slopes, frequently flooded	1.1
MaA	Magotha fine sandy loam, 0 to 2 percent slopes frequently flooded	1.3
MoD	Molena loamy sand, 6 to 35 percent slopes	3.0
MuA	Munden sandy loam, 0 to 2 percent slopes	10.4
NmA	Nimmo sandy loam, 0 to 2 percent slopes	9.2
PoA	Polawana loamy sand, 0 to 2 percent slopes, occasionally flooded	0.8
SeA	Seabrook loamy sand, 0 to 2 percent slopes	0.1
UPD	Udorthents and Udipsamments soils, 0 to 30 percent slopes	0.2
W	Water	4.3

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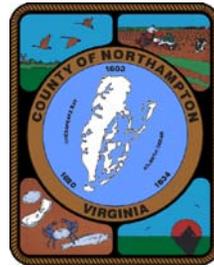
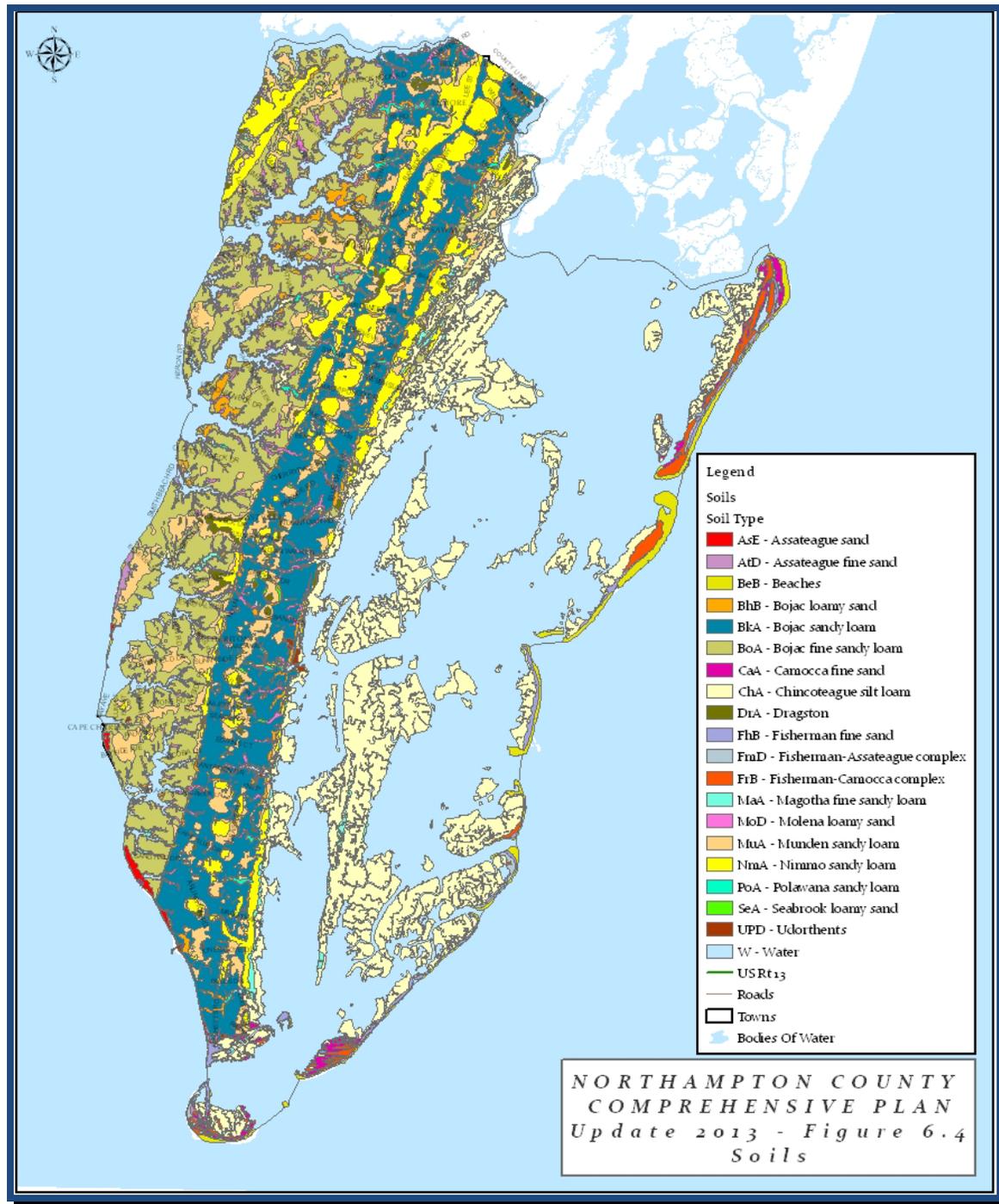


Figure 6.4 Northampton County Soils



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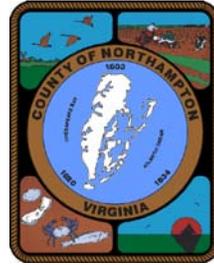
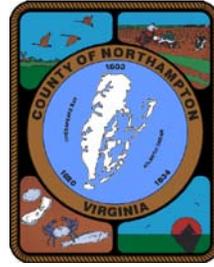


Figure 6.5 Soil Septic Potential





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6.4.2 Agricultural Land Use & Soil Types

Northampton County is well-endowed with excellent soils for agriculture. Those soils present in the County that are well suited to agriculture are the upland soils of Bojac and Munden. They are moderately to excessively well-drained. As shown in Table 6.3, there are several soil types in the County that are classified as “Prime Farmland.”

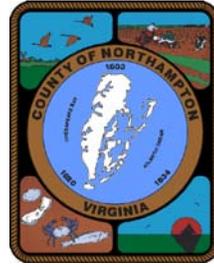
Prime Farmland is a soil classification of the U.S. Department of Agriculture that identifies soil that has major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland or other land, but it is not urban or built-up land or water areas. The soil quality, growing season and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management,



Prime Soils

including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent (7 C.F.R. Section 657.5.). Sometimes farmers also sow a portion of their crops in the lower lying areas where the presence of hydric soils such as Nimmo and Dragston are present; this is to safeguard against total crop failure in the event of extreme drought, which does occasionally occur in this area. In total,

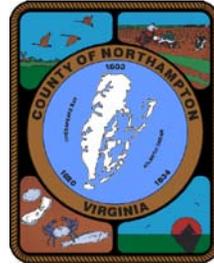


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about 75% of the land in the Northampton County is classified as Prime Farmland as shown in Figure 6.6.

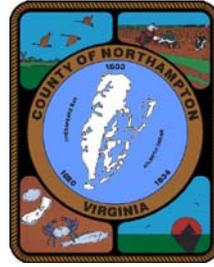
Table 6.3 Prime Farmland Soils

Map Symbol	Map Unit Name	Farmland Classification
AsE	Assateague sand, 2 to 50 percent slopes	Not prime
AtD	Assateague fine sand, 2 to 35 percent slopes, rarely flooded	Not prime
BeB	Beaches, 0 to 10 percent slopes	Not prime
BhB	Bojac loamy sand, 2 to 6 percent slopes	Prime
BkA	Bojac sandy loam, 0 to 2 percent slopes	Prime
BoA	Bojac fine sandy loam, 0 to 2 percent slopes	Prime
CaA	Camocca fine sand, 0 to 2 percent slopes, frequently flooded	Not prime
ChA	Chincoteague silt loam, 0 to 1 percent slopes, frequently flooded	Not prime
DrA	Dragston fine sandy loam, 0 to 2 percent slopes	Prime if drained
FhB	Fisherman fine sand, 0 to 6 percent slopes, occasionally flooded	Not prime
FmD	Fisherman-Assateague complex, 0 to 35 percent slopes, rarely flooded	Not prime
FrB	Fisherman-Camocca complex, 0 to 6 percent slopes, frequently flooded	Not prime
MaA	Magotha fine sandy loam, 0 to 2 percent slopes, frequently flooded	Not prime
MoD	Molena loamy sand, 6 to 35 percent slopes	Not prime
MuA	Munden sandy loam, 0 to 2 percent slopes	Prime
NmA	Nimmo sandy loam, 0 to 2 percent slopes	Prime if



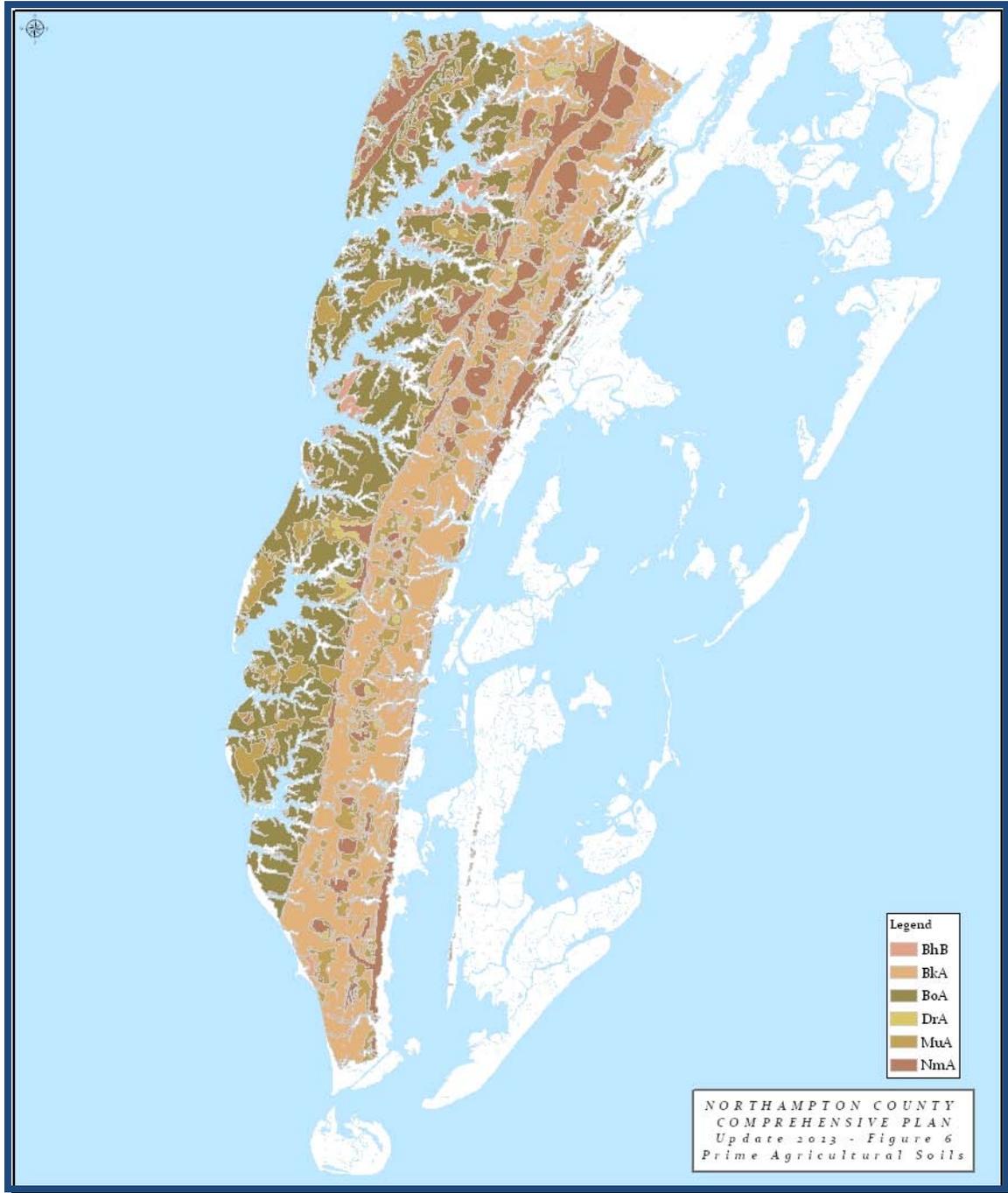
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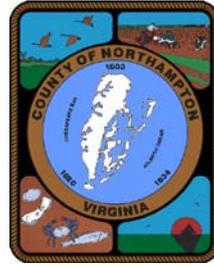
		drained
PoA	Polawana loamy sand, 0 to 2 percent slopes, occasionally flooded	Not prime
SeA	Seabrook loamy sand, 0 to 2 percent slopes	Not prime
UPD	Udorthents and Udipsamments soils, 0 to 30 percent slopes	Not prime
W	Water, less than 40 acres	Not prime



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Figure 6.6 Prime Agricultural Soils





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6.4.3 Hydric Soils

There is a significant part of the County's land area where hydric soils are present. As would be expected, this area includes the tidal marshes and the barrier islands. On the upland portion of the County, hydric soils are concentrated along a north to south axis, from Exmore to Machipongo. Another sizeable block of hydric soils is located on Occohannock Neck. It is estimated that 13,312 acres (about 9.2%) in the County are occupied by these soil types unsuitable for conventional septic systems.

Hydric soils are of particular importance in rural counties such as Northampton because septic systems have been and will continue to be a prevailing method of residential waste disposal. To function properly, septic systems require an adequate vertical separation between the septic absorption area and the seasonally high water table. Determining the suitability of a septic system site is a responsibility and function of the State Health Department. They conduct an on-the-ground inspection (soil borings) and issue the required permit if the site is found suitable. Hydric soils are shown as those being of poor septic suitability on Figure 6.5. With new technology, there are a variety of alternatives to conventional septic systems that provide adequate treatment where public sewers are not available, and where a conventional septic system would not be desirable due to inadequacy of available soils or other reasons.

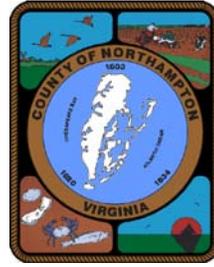
6.4.4 Tidal Wetland Soils & Sandy Beach Soils

The soils making up the tidal wetland areas are Chincoteague and Magotha soils. They occur between the mainland and the barrier islands in the zone between low tide and the lines of the spring and storm tides. Salt water frequently floods these soils.

The soils making up the sandy beaches are the Fisherman, Beaches, Camocca, and Assateague soils. They are present on the barrier islands and on the southern tip of the mainland. They make up the dunes and the tidal marshes adjacent to the ocean. They consist of sandy material subject to erosion and accretion.

6.5 Carolina Bays

Carolina Bays are prominent geomorphic features on the Eastern Shore of Virginia. They are wet, shallow, elliptical depressions that occur along the Atlantic Coastal Plain from Florida to New Jersey. Carolina Bays on the Eastern Shore are present from sea



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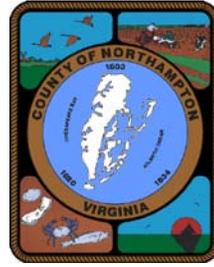
level to the highest elevations on the peninsula but most are found along the central spine of the peninsula. There are over 700 Bays on the Eastern Shore. Figure 6.7 shows the Carolina Bays along the center of the County in the Machipongo area. Complete mapping of the Carolina Bays on the Eastern Shore can be found here: http://cintos.org/SaginawManifold/Planforms/VA_bays/index.html

The structure of a Carolina Bay is marked by a pronounced rim that is usually circular or ellipsoidal in shape. Aerial photographs depict the rim as higher elevation and lighter in color than the interior. The soil type inside the bay is Nimmo, which is indicative of wet, poorly-drained soils. Occasionally the bay rims, which are well drained, are used for building sites, roads, and cemeteries. All bays have been drained by ditching through the rims and were then developed or farmed. A better understanding of the hydrology of this system is an important piece in effectively preserving our ground water resource.

Figure 6.7 Carolina Bays



Source - http://cintos.org/SaginawManifold/Planforms/VA_bays/index.html



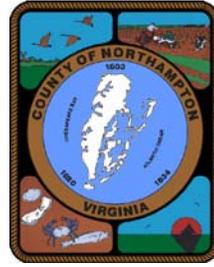
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6.6 Forest Land

Where forested lands exist, they compliment the other components of Northampton County's unique environment by providing habitat for wildlife and opportunities for hunting and other recreational activities. The forested areas in the lower Delmarva are significant for the survival of Neotropical migratory songbirds that utilize the forests for resting and foraging during the fall migration. Forests also function as natural buffers and windbreaks. Forests serve as the most effective filtering agents for sediments and pollutants that might run off into surface waters and they protect groundwater recharge areas as well as preventing erosion on steep slopes. In view of these benefits, the retention and restoration of forested areas warrants consideration in land use planning and establishment of related regulations.

Within the County there are approximately 30,000 acres of forestland. Loblolly pine is the predominant forest type. The three other types of forest present are pine/hardwood, hardwood, and bottomland hardwood. Climate change is expected to impact the forest ecosystems of the Virginia Eastern Shore due to increased spread of disease, invasive species and changes to ideal growth ranges of various plants. (See Southern Forests Futures Project, May 2011. <http://www.srs.fs.usda.gov/futures/>).

The timber industry within the County is only of modest economic scope. The Virginia Department of Forestry ranked Northampton County at number 77 in the state, with an average annual timber sales value of \$557,906 from 1987-2001. Recent years have varied widely: \$222,800 in 2010; \$550,080 in 2009; and \$214,423 in 2008. There are no operating sawmills within the County nor any secondary processors. There is presently only a minimal amount of clearing of forestland for agriculture purposes. Residential home building and the location of mobile homes continues to take place on the fringes of woodlots. Periodically, blocks of timber are harvested as they become mature. Intensive forest management in the County has not been widely practiced principally because of the high costs associated with these practices.



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6.7 Ecological Communities, Flora and Fauna

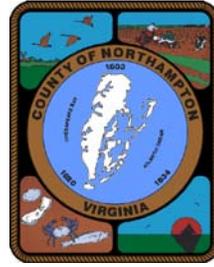
6.7.1. Ecological Communities

Northampton County supports a number of ecological communities, flora and fauna, that are ecologically significant (i.e., unique and/or critical to species survival) and arise from a combination of factors, including location along the Atlantic seaboard, island biogeography, peninsula geomorphology, and location within a major migratory bird flyway. The Virginia Department of Conservation and Recreation, Division of Natural Heritage, characterizes the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations as “Natural Heritage Resources”

Northampton County is currently home to 53 distinct types of Natural Heritage Resources with 180 total occurrences throughout the County. (See Table 1 of DCR Natural Heritage Report included herein and attached hereto as Appendix A). In addition, DCR has identified 33 terrestrial and aquatic conservation sites as areas necessary for the survival of the identified Natural Heritage Resources.

Northampton County supports a number of Maritime Zone Natural Communities that are identified as globally rare and imperiled Natural Heritage Resources. These are identified as:

1. Maritime Dune Grasslands. Coastal grasslands that include saltmeadow cordgrass, American beachgrass, bitter seabeach grass and beach panic grass.
2. Maritime Dune Woodlands. Deciduous, coniferous and broadleaf evergreen woodlands that occur on back dunes protected from regular salt spray. Important as Delmarva Migratory Bird Stopover Habitat.
3. Maritime Upland Forests. Evergreen or mixed coastal forests of sheltered Oceanside or bayside dunes and sand flats protected from salt spray. Dominated by Loblolly Pine; sometimes associated with Southern red oak, black cherry, water oak, sassafras, southern wax myrtle and blueberry. Sparse herbaceous layer.
4. Maritime Dune Scrub. Occupies the somewhat protected maritime back dunes and leeward dune slopes, generally along the inland edges of dune systems in zones sheltered from constant ocean salt spray. Dominant species include Northern bayberry, groundsel-bush, and stunted individuals of



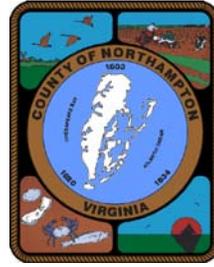
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- loblolly pine, persimmon and black cherry. Important as Delmarva Migratory Bird Stopover Habitat.
5. Maritime Wet Grasslands. These are confined to the barrier beaches and encompass swales and low hollows between secondary dunes. The primary influence is fresh water from rain, but may be flooded from ocean surges. The vegetation is primarily saltmeadow cordgrass, rushes and sedges; with all types uncommon to rare and existing in fragile environments.

At least five rare plants have been identified in the County along the dunal and maritime communities which described above. These are: seabeach needlegrass, beach heather, yaupon holly, sea oats, and Virginia Beach pinweed.

6.7.2. Landbird Migratory Concentration Area

Science has confirmed what recreational birdwatchers have long known; that the southern portions of Northampton County experience a large increase in the number of species and individual birds from approximately mid-August to mid-November of each year. From a global perspective, the southern tip of the Delmarva Peninsula, entirely within Northampton County's jurisdiction, is of vital biological significance to avian biodiversity. Northampton County's scrub/shrubland and maritime forests provide a crucial stopover, feeding and staging area for many of North America's breeding songbirds such as warblers, hummingbirds, orioles, vireos, and thrushes, in addition to hawks, owls, woodcocks and other birds on their southbound migration journey. From vast breeding grounds in the eastern U.S. and much of Canada, migrating birds funnel through the relatively small landmass of the Delmarva Peninsula where they are completely dependent on this area's food and shelter in order to replenish their resources before they fly across the Chesapeake Bay, or even directly over the ocean, to continue on their migration route. Many of these migrants spend the winter months in the tropical forests of Central and South America, hence the name "neotropical migrants." About 70% of all birds breeding in North American forests are neotropical migrants and an estimated 5 to 6 million neotropical migrants funnel through Northampton County on their journey southward.



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Substantial research has concluded that neotropical migrant songbirds become concentrated with the lower 10 km of the Delmarva peninsula, particularly along the wooded Bayside corridor, and entirely within Northampton County.¹ Furthermore, the



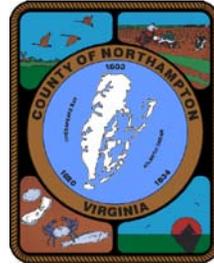
majority of migrants select habitat with the most dense understory vegetation. Additional fieldwork demonstrated that during a two-week

Migratory Birds, Near Southern Tip

period of peak neotropical migration, bayside woodlots experienced a 40% decline in insect mass. These studies demonstrate that neotropical migrants are utilizing the “southern tip” of the Delmarva for rest and refueling before continuing on the long migratory journey. For neotropical migrants, the dense understory not only supplies abundant nourishment but also provides ample cover for protection from migrating raptors. It is important to note that there is a direct relationship between understory density and quantity of food supply. Reduction in existing habitat has a direct correlation to loss of food supply – and a direct per capita (i.e. bird) reduction in food availability.² For some avian species, Northampton County is the last feeding stop before a non-stop flight to the Caribbean or South America. Reduction in food availability would undoubtedly result in large proportions of neotropical migrants failing to obtain food supplies in amounts sufficient to meet their nutritional requirements for a long-distance migration. Thus, significant loss of migratory songbird stopover habitat in Northampton County could lead to severe declines in breeding songbird populations throughout the New England states and Canada.

¹ Spatio-Temporal Patterns of Landbird Migration on the Lower Delmarva Peninsula, by Dr. Bryan D. Watts and Sarah E. Mabey. Sponsored by: DEQ, Virginia Department of Conservation and Recreation (“DCR”), and Virginia Department of Game and Inland Fisheries (“DGIF”), September 1993.

² Ibid.



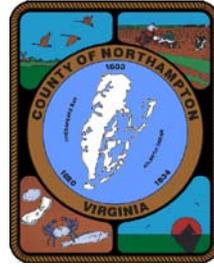
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Another major category of birds utilizing the uplands of Northampton County are the temperate migrants – birds that migrate on a more limited scale, never leaving North America and often spending the entire winter on the Delmarva Peninsula and dependent upon the fruit and seed-bearing vegetations. Although fewer in number of species than neotropical migrants, the temperate migrants outnumber the neotropical migrants by a ratio of 2 to 1 in sheer abundance. In addition, large numbers of both diurnal and nocturnal raptor species are known to utilize the Delmarva Peninsula during the autumn southward migration, taking advantage of the migrant songbird populations as a food supply.

6.7.4 Threatened and Endangered Species

Threatened and Endangered Species are designated by federal or state government, and are afforded special legal protections that regulate any taking, harassing or altering the habitat of these species. In Northampton County, the following species are listed as either threatened or endangered and regulated by either the U.S. government or the Commonwealth of Virginia:

1. Northeastern Beach Tiger Beetle: Federal and state threatened species found along sandy beaches of the eastern shore of the Chesapeake Bay. Population threatened by shoreline development, some types of beach stabilization, recreational use and associated disturbance, pesticides and natural weather events.
2. Kemp's Ridley Sea Turtle: state and federally endangered species.
3. Loggerhead Sea Turtle: federal and state threatened species
4. Green Sea Turtle: federal and state threatened species.
5. Leatherback sea turtle: federal and state endangered species.
6. Delmarva Fox Squirrel: state and federal endangered species.
7. Right Whale: federal and state endangered species.
8. Humpback Whale: federal and state endangered species.
9. Piping Plover: federal and state threatened species
10. Wilson's Plover: state endangered species
11. Peregrine Falcon: state threatened species
12. Gull-billed Tern: state threatened species
13. Bald Eagle: state threatened species, and also protected by the federal Bald and Golden Eagle Protection Act. Threats to this species include human disturbance of nest sites, habitat loss, biocide contamination, decreasing food supply and illegal shooting.



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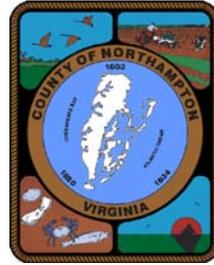
6.7.5. Other Fauna

The barrier islands system within Northampton County includes the barrier islands, the coastal bays and salt marshes, and mainland marshes and watersheds, which support some of the largest nesting populations of colonial waterbirds along the east coast, such as herons, egrets, gulls, terns and skimmers. Several non-colonial waterbird species also utilize the area for nesting and feeding, including oystercatchers, willets, rails and the threatened piping plover. The extensive coastal salt marshes, bays, barrier beaches and interdunal ponds provide high value migration, wintering and breeding habitat for both large numbers and a wide variety of waterfowl species. Large numbers of migratory shorebirds utilize the tidal mud flats and beaches of the islands, marshes and bays – species that include significant proportions of hemispheric populations of whimbrels, dunlins, black-bellied plovers, dowitchers and red knots. The marine waters and marsh system also provides critical feeding, spawning and nursery habitat for many commercial and recreational species of shellfish and finfish.

Although core areas of the barrier islands are protected, many avian species are declining and experiencing nest failure. Declining species include Common Terns, Least Terns, Gull-billed Terns, Black Skimmers, Black Ducks, migrant Canada Geese and several herons. These species are threatened by:

1. Offsite activities (particularly mainland development) resulting in degradation of water quality (nutrient overload, sedimentation, toxins), loss of food supply and reduction in habitat;
2. Severe weather events;
3. Competition and displacement from nesting habitat by aggressive avian species or mammalian and avian predators and direct predation from same;
4. Direct human disturbance from increased recreational use of barrier islands, bays and marshes

Numerous waterfowl winter within Northampton County's bayside creeks, Chesapeake flats and seaside marshes. The U.S. Fish and Wildlife Service stated in their 1971-1974 Atlantic Winter Flyway Survey that the Eastern Shore waterfowl density was 27.3 birds per square mile compared to the state waterfowl density of 1.5 birds per square mile. The average count on the Eastern Shore represents 31% of the state count.



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The only large game in the County is the Virginia white-tailed deer. Small game is plentiful and hunting for cottontail rabbit and gray squirrel is a popular activity. Mourning dove and woodcock are the most frequently hunted upland game birds. Other wildlife are found such as opossum, weasel, skunk, muskrat, red and gray fox, raccoon, river otter, coyote and mink.

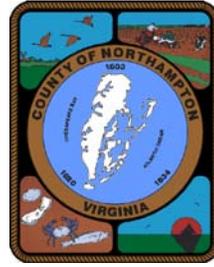
6.8 Water Resources

Northampton County is surrounded by salt water and has no fresh water streams of significance. There are about one dozen tidal creeks in Northampton County and those are largely supplied from groundwater flows with some contribution from surface water runoff, precipitation and tidal inflow. The majority of drinking water needs in the County are met through withdrawals from fresh groundwater wells. Surface waters are not an important source of drinking water but they do provide some irrigation water and are important to shellfish, finfish and other wildlife.

6.8.1 Groundwater Resources

The fresh and salt water resources found within the underground geologic layers of the Northampton County are referred to as "aquifers." The aquifers are comprised of sand, gravel and shell material, which are permeable, and the confining units, which are comprised of clay and silt, and are less permeable and more restrictive of downward groundwater movement. In Northampton County, the unconfined, fresh, water table aquifer is the Columbia aquifer, which is approximately 80 to 100 feet thick. This aquifer is used primarily for private on-site domestic wells and agricultural irrigation. The confined aquifers, in order of increasing depth, are: Yorktown-Eastover (includes upper, middle and lower Yorktown aquifers), St. Mary's Choptank aquifer, Brighteast aquifer, and Potomac aquifers. Fresh groundwater generally occurs below the surface around 300 feet and at shallower depths along the coastlines of the Eastern Shore. It is limited to the Columbia and Yorktown-Eastover aquifers.

Annual precipitation of about 43 inches per year provides the recharge to the Eastern Shore aquifers. Approximately 12 to 24 inches per year of precipitation recharge the shallow Columbia aquifer. Most of this water flows from the middle of the peninsula and discharges to the Chesapeake Bay and the Atlantic Ocean, providing an important source of fresh water for our tidal creeks and bays.



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The clay confining layers that separate the Columbia aquifer from the Yorktown-Eastover aquifer system serve to protect the aquifer from many of the water quality threats. But the clay confining units also act to impede the amount and rate of recharge to the deep Yorktown-Eastover aquifer system. Only a small percentage of the precipitation that recharges the Columbia aquifer contributes to the recharge of the deeper confined aquifer. It is estimated that only 1.2 inches of precipitation recharge the Yorktown-Eastover aquifer system annually.

Figure 6.8 shows the aquifer area ranked in order of recharge value, "5" being of highest value and "1" being of least value. The aquifers on the Eastern Shore are strongly influenced by geology, rainfall and groundwater use.

Water drawn from shallow wells (15'-30') within Northampton County has a high iron content and low pH.

Groundwater quality is generally good in the deep Yorktown-Eastover aquifer system, though localized problems with high iron content have been encountered. High concentrations of iron are more prevalent in shallow wells. Wells associated with the deep Yorktown-Eastover aquifer system did not indicate pollution problems.

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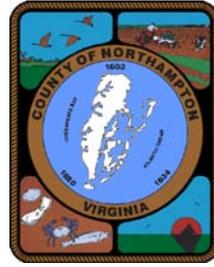
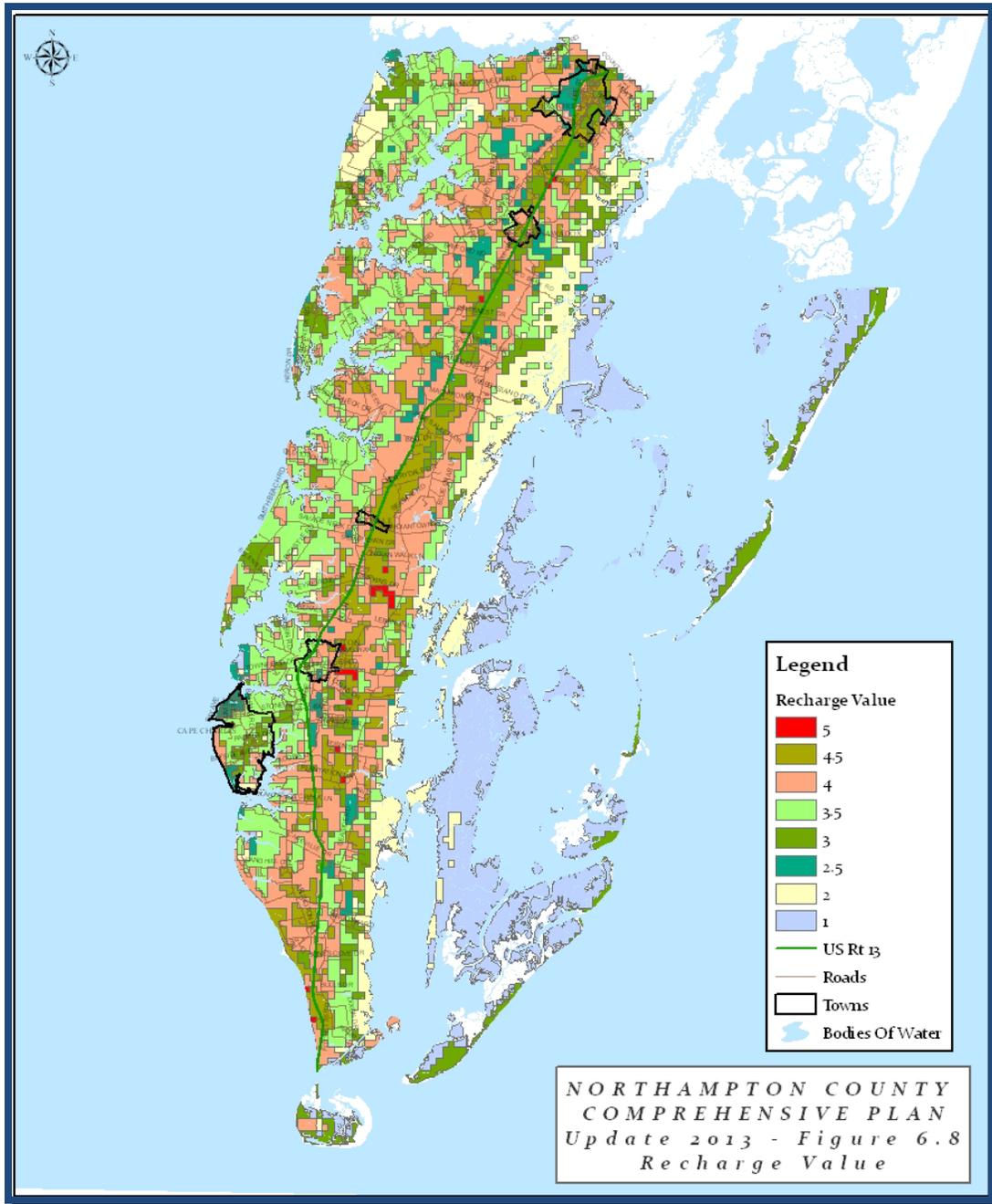
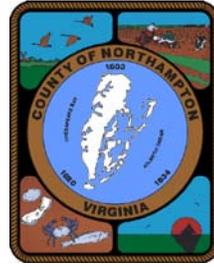


Figure 6.8 Recharge Value





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The Yorktown-Eastover Formation can range in depth from 80 to 600 feet below the land surface, though most wells are pumping from layers between 150 and 300 feet deep.

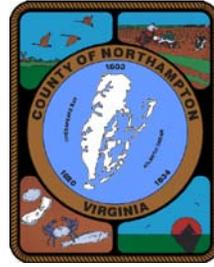
Based on groundwater modeling studies conducted, approximately 11 million gallons per day are recharged to the Yorktown-Eastover aquifer system. However, it should be noted that this recharge value is based on average conditions across the entire Eastern Shore. Depending upon specific site conditions, recharge to the Yorktown-Eastover aquifer system may vary by a factor of two.

The shallow Columbia aquifer is used to a lesser extent. This source is especially amenable to agricultural use since the need for high water quality is not as stringent as it is for drinking water. Some of the highest yields per minute found on the Shore have come from the Columbia aquifer. Unfortunately, the continued use of this source for drinking water supply is limited in many localized areas due to contamination from agricultural runoff and septic system failure. Close monitoring of septic systems is needed to prevent long-term health hazards from occurring.

6.8.2 Ground water Management

Groundwater resources in Northampton County are vulnerable to impacts from saltwater intrusion, impairment to groundwater recharge, over withdrawals, well to well interference and contamination from activities occurring on the land (e.g., poorly operated sewage management, leaking underground storage tanks, chemical spills). A number of local, state and federal authorities have studied and regulated the fresh groundwater resources of the entire Eastern Shore over the past several decades in order to both understand and prevent the loss of the valuable groundwater resources.

On a federal level, the Columbia and Yorktown-Eastover Multi-Aquifer System was designated as a “sole source aquifer” pursuant to Section 1424(e) of the Safe Drinking Water Act by the United States Environmental Protection Agency in 1997, meaning that the aquifer supplies more than 50% of the water needs for the communities with the boundaries; there are no viable alternative sources of sufficient supply; and if contamination were to occur, it would pose a significant public hazard and a serious financial burden to the communities within the aquifer service area (See, 62 FR 17187, April 9, 1997.). Federal funding may be withheld from any project that threatens a designated sole-source aquifer.

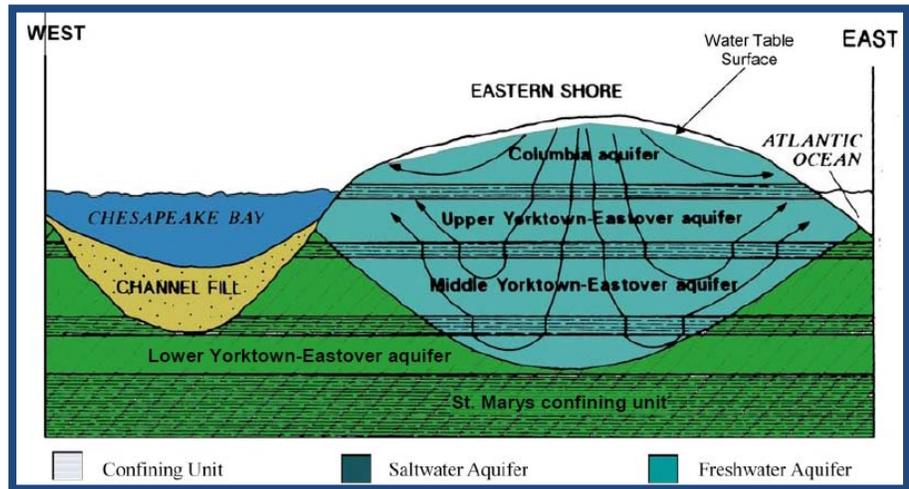


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The Virginia Ground Water Act of 1973 established the duty of the Virginia State Water Control Board to manage groundwater resources and designate Ground Water Management Areas that were considered to be at risk for overdrawing, contamination, or well interference. The Eastern Shore of Virginia, including Northampton County, was designated as a "Ground Water Management Area" in 1976, and became subject to additional water withdrawal regulations under Virginia's Groundwater Management Act of 1992. These regulations prohibit any withdrawals of groundwater at a rate greater than 300,000 gallons per month for purposes of agricultural, industrial, commercial and municipal uses, without a permit from the Virginia Department of Environmental Quality.

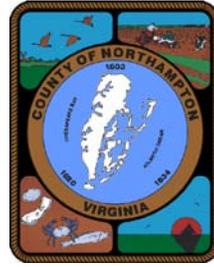
At the request of Accomack and Northampton Counties, in 1990 the bi-county Eastern Shore of Virginia Groundwater Study Committee was formed to oversee the development of a Ground Water Management Plan. On May 5, 1992 the Committee adopted the Groundwater Supply Protection and Management Plan for the Eastern Shore of Virginia. The plan includes a detailed analysis of Eastern Shore groundwater resources and issues and makes recommendations for the protection and management of the groundwater. This plan recommended the protection of open spaces and undeveloped land in the spine recharge area through creation of an overlay protection district. The Plan was updated in 2011.

Another study, Technical Analysis and Justification for Ground Water Ordinances on the Eastern Shore of Virginia, was completed in January 2001 by Malcolm Pirnie for the Accomack-Northampton County Planning District Commission



Eastern Shore aquifer system

(A-NPDC). The report is on file in the Northampton County Planning & Zoning Department.



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The U. S. Geological Survey (USGS) has been working cooperatively with the Virginia Department of Environmental Quality (DEQ) and the A-NPDC to develop an upgraded computer simulation model of the Eastern Shore ground water system. The model will be used to simulate water-level declines and potential saltwater intrusion as a result of current and future pumping. The DEQ is currently using a model developed by the USGS twenty years ago to assess the impact of pumping from additional proposed withdrawals. Once implemented, the new model will allow DEQ to analyze the effect each proposed withdrawal will have on future water levels and salinity before any new application is approved; and they will continue to update the model with the most recent withdrawal data. The ANPDC will also be able to utilize this tool for ground water resources planning.

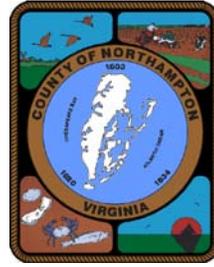
6.9 Shoreline, Wetlands, & Barrier Islands

6.9.1 Shoreline

The Eastern Shore contains 70 percent of Virginia's total oceanside shoreline and 15 percent of the total tidal shoreline. Northampton County has 261.4 miles of shoreline. The majority of the shoreline, 193.7 miles, is located on the bay side, with 39.9 miles located seaside and 27.8 miles located around the barrier islands. Only 62.2 miles of shoreline are beaches (23% of the total shoreline) and 38.7 miles are dunes (14.8% of the total). The rest of the shoreline is low or low with some bluffs.

6.9.2 Wetlands, Dunes, and Marshes

The seaside shoreline grades quite gradually into vast tidal marshes and shallow bays which extend seaward to the barrier islands. Old dune lines are absent and streams are narrow and generally without significant embankments. The immediate shoreline is almost continually fringed with broad marsh, making access to open water difficult except where natural deep water or maintained channels exist. Between this seaside shoreline and the barrier islands is a maze of tidal flats, salt marshes and shallow bays, which constitutes generally one of the finest, most pristine aquatic ecosystems of its kind. Ecologically these areas are extremely rich, supporting a vast array of marine, avian and terrestrial life. The visual quality of these areas is another of their chief attributes.



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Sand dunes, both primary and secondary, are very valuable resources. Primary and secondary dunes are the first line of defense against the sea. When storms occur, dunes act as flexible barriers to high tides and waves. Dunes also act as sand reservoirs to help keep shorelines intact. In addition to providing valuable and inexpensive protection from storms, the dunes provide aesthetic value and serve as wildlife habitats where vegetated.

The County has adopted a wetlands ordinance and established a Wetlands Board. The Board's primary function is to review and pass judgment on applications for permits dealing with proposals that may impact on wetlands.

Figure 6.9 shows the wetlands present in Northampton County that are listed with the National Wetlands Inventory (NWI).

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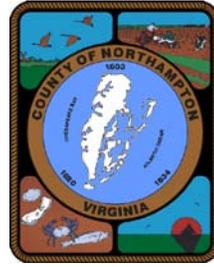
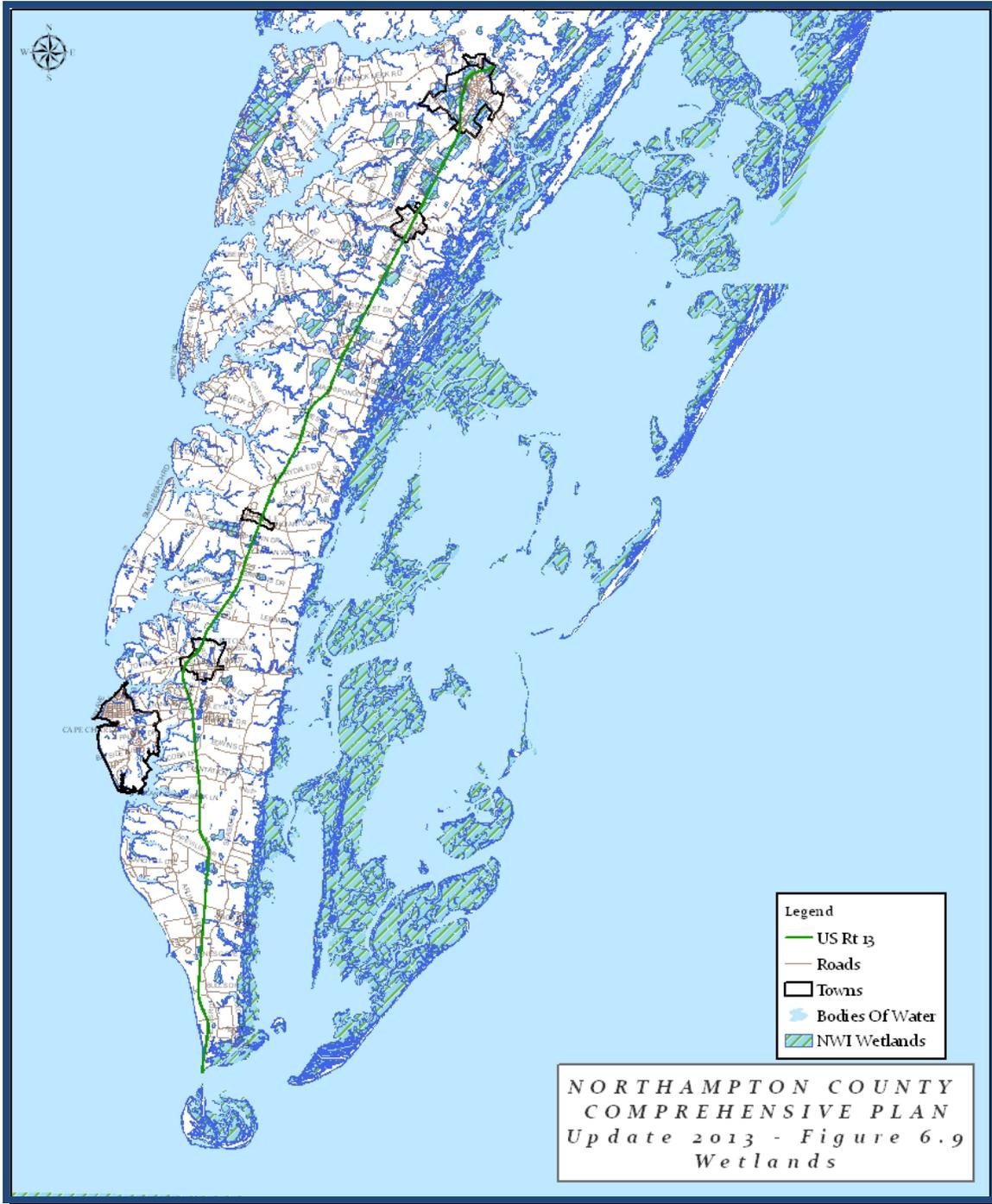
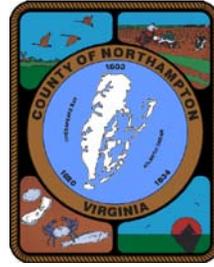


Figure 6.9 Wetlands





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6.9.3 Barrier Islands

Northampton County's barrier islands are among its most important and unique natural resources. For centuries, they played a major role in the history, economy and culture of the area. Although there once were small fishing villages and hunting lodges on the islands, today they are uninhabited. Most of the islands are included in the Virginia Coast Reserve which is an island and salt marsh preserve owned by The Nature Conservancy of Arlington, Virginia. The Virginia Coast Reserve has been designated an International Biosphere Reserve by the United Nations in recognition of the importance and fragility of the ecosystem. Northampton County's islands, together with contiguous islands in neighboring Accomack County, represent the last undeveloped barrier island system on the Atlantic Coast.

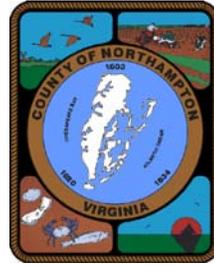
There are nine barrier islands in Northampton County. Hog, Rogues, Cobb, Ship Shoal, Myrtle and Smith Islands are mostly owned by The Nature Conservancy. The Commonwealth of Virginia owns Mockhorn and Wreck Islands; and Fisherman Island, on the tip of the peninsula, is owned by the Federal government and is part of the Eastern Shore National Wildlife Refuge.

The barrier islands play a number of important roles in Northampton County including: protection from storms as buffers to dissipate the energy of the ocean; economic benefits including commercial and recreational fishing; recreation including fishing, hunting, crabbing, clamming, hiking, boating, and bird watching; and nature study as an educational resource, increasing awareness of the importance and rarity of the island system, and protection of threatened species, offering sanctuary to many species of birds, mammals, and reptiles that are threatened or endangered.



Barrier Islands

Because the Virginia Coast Reserve is gaining national and international attention as one of America's last remaining intact barrier island systems, Northampton County benefits through research and educational programs centered around the island system. The University of Virginia has established a National Science Foundation Long



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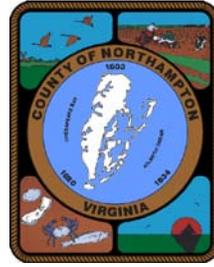
Term Ecological Research Center in Northampton County with its headquarters in the Village of Oyster.

Most of the barrier islands are included either in the Virginia Coast Reserve, the Federal National Wildlife System, or the Virginia Natural Areas Program. Even limited development on any of the islands would drastically alter the system scientifically and aesthetically. In managing the barrier island system, biological diversity has been the priority. It is important to recognize that the island system functions as an interdependent whole. The system includes related natural communities of beaches, dunes, upland forest, extensive salt marshes, bays, creeks, guts, unvegetated wetlands, mainland salt marshes and any seaside mainland which is part of the watershed.

6.9.4 Chesapeake Bay Preservation

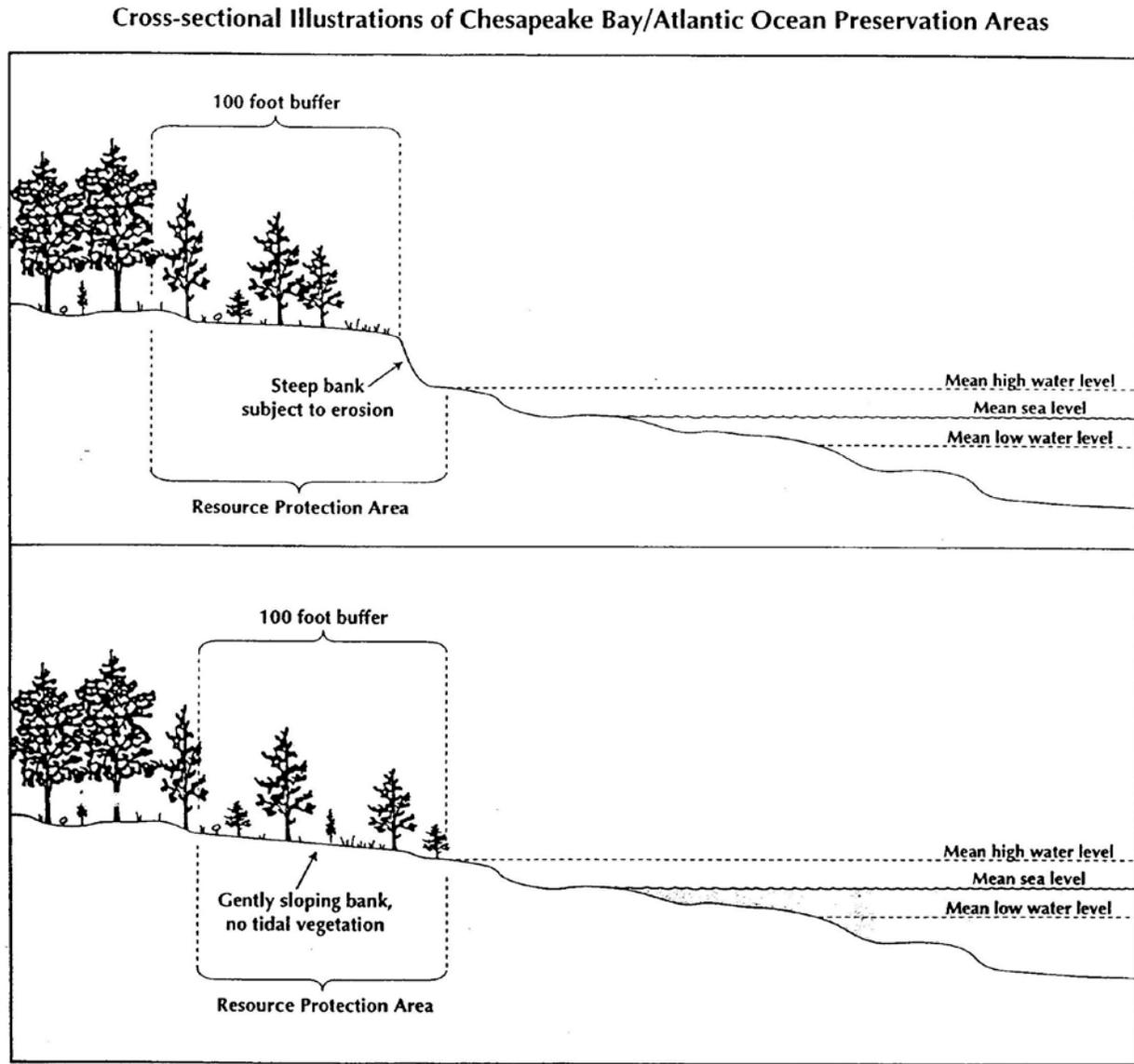
In the 1960's, a decline in the Bay's water quality and productivity was noted. A massive effort to avert further decline was spearheaded by the Chesapeake Bay Commission. A combined major Federal, tri-state, and citizen effort to restore the Chesapeake Bay to its earlier productiveness has been underway for several years. As a result, Virginia enacted the Chesapeake Bay Preservation Act. This Act created a Local Assistance Board charged with developing regulations that provide for the protection of water quality and shoreline habitat. The adopted regulations (promulgated July 1, 1989) are used by local governments in granting, denying, or modifying requests to rezone, subdivide or otherwise consider development of shoreline areas designated as Chesapeake Bay Preservation Areas. In Northampton County, these criteria also apply to the seaside areas.

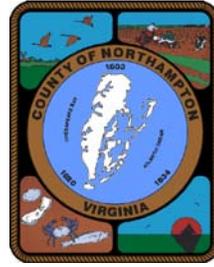
Northampton County has established resource protection areas and resource management areas in accordance with the Chesapeake Bay Preservation Act. Figures 6.9.4 A and B show cross-sections of the protection areas.



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Figure 6.9.4 A

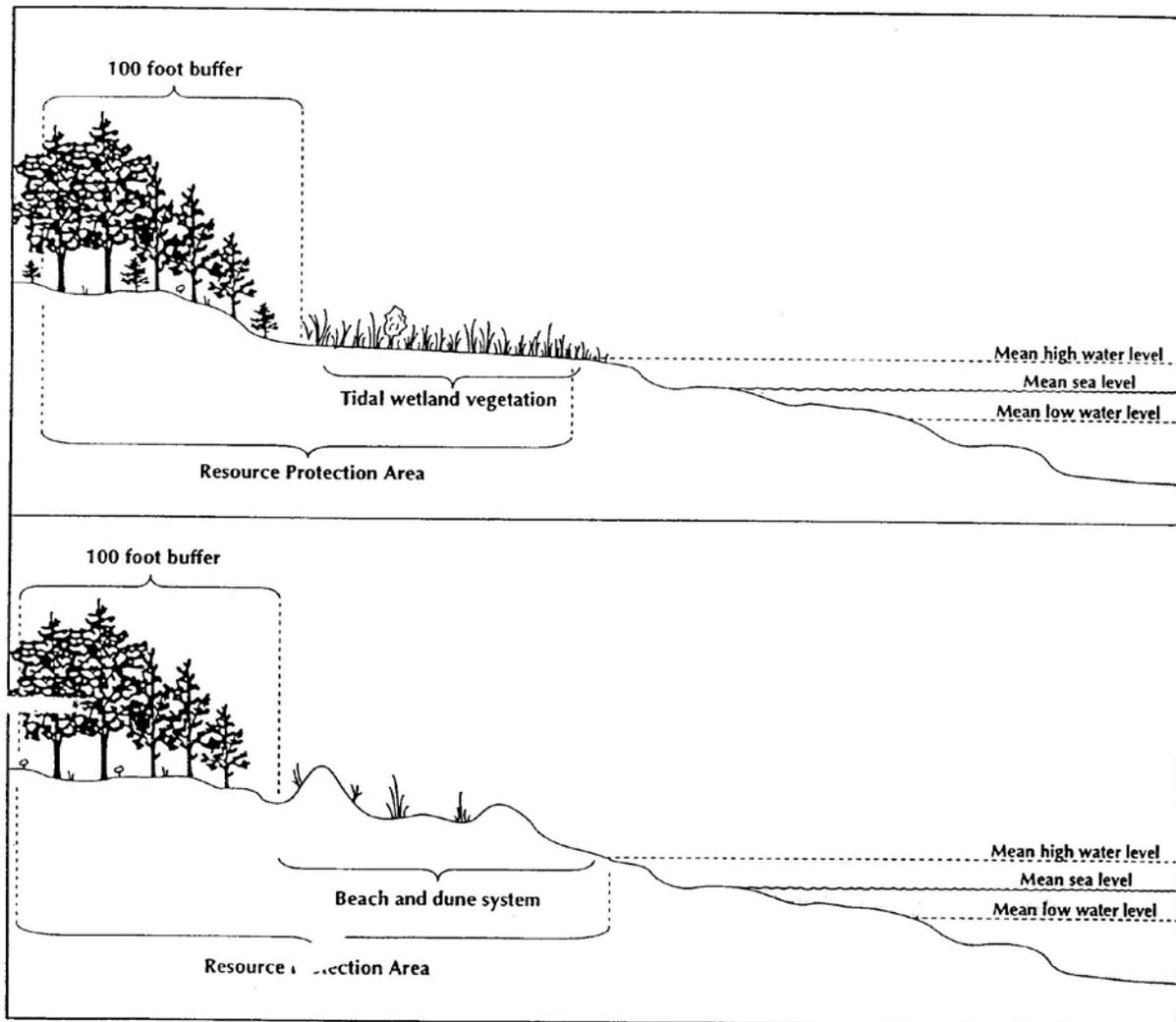




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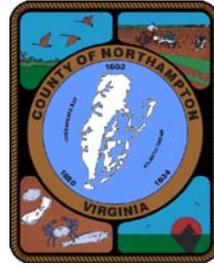
Figure 6.9.4 B

Cross-sectional Illustrations of Chesapeake Bay/Atlantic Ocean Preservation Areas (continued)



6.9.5 Priority Conservation Areas

A collaborative effort between the Virginia Department of Game and Inland Fisheries (DGIF), Virginia Department of Conservation and Recreation – Division of Natural Heritage (DCR-DNH), and Virginia Commonwealth University – Center for Environmental Studies (VCU - CES) was completed in 2009 that combined



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conservation information and priorities into a single data set called Priority Conservation Areas (PCA). The PCA is defined as “lands and surface waters identified as important for conservation of Virginia’s wildlife, plants and natural communities. The identified lands/waters can be used to prioritize areas for preservation, protection or specific management action.” The data set was developed to guide localities in conservation planning. Figure 6.10 shows the PCA.

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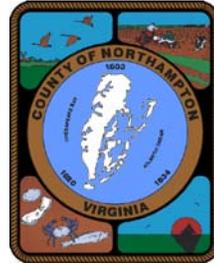
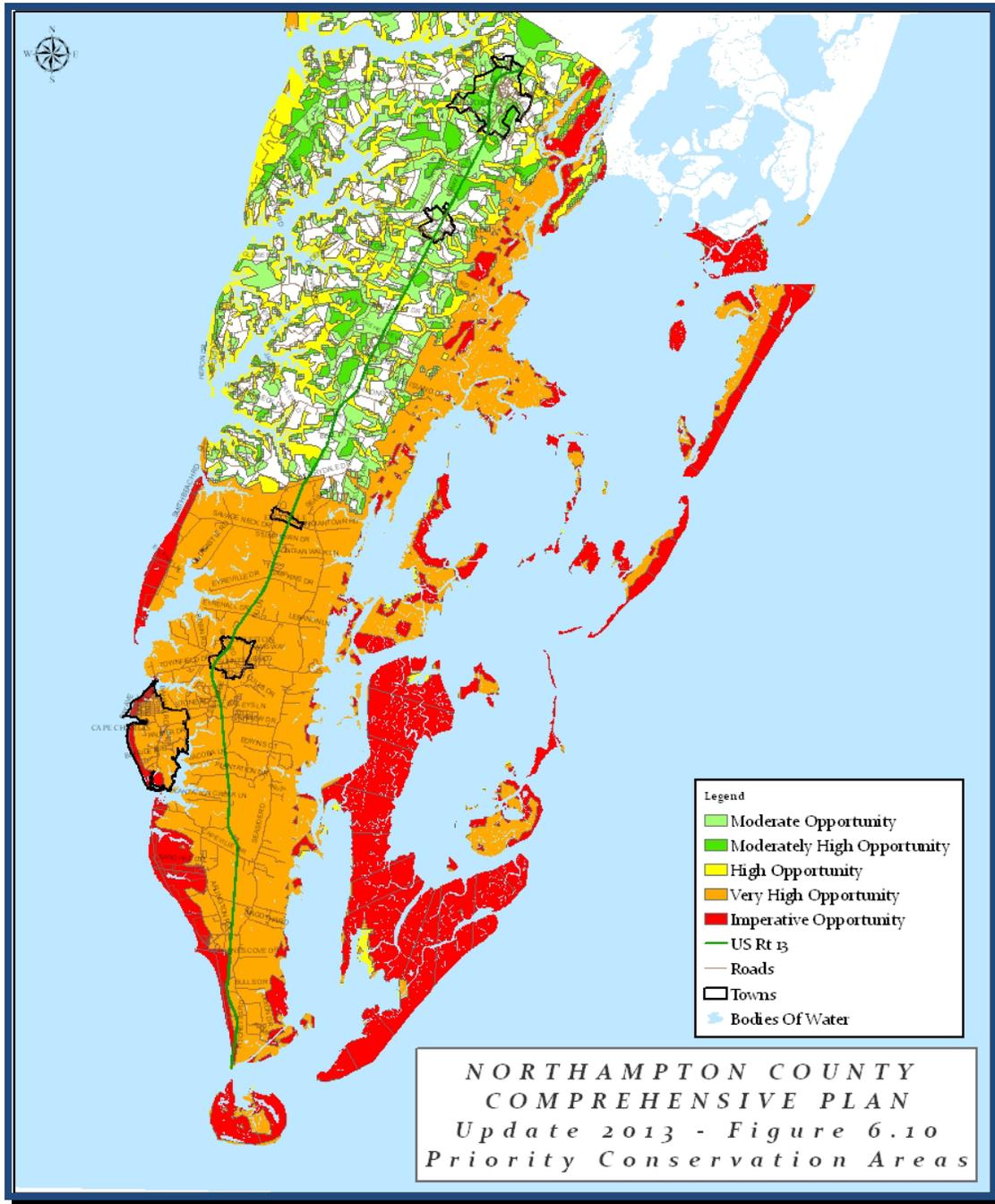
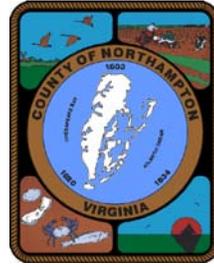


Figure 6.10 Priority Conservation Areas





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6.10 Land Conservation Opportunities

There are several opportunities for land preservation in Northampton County. The use of the term “land protection” in this section is not limited to land being the reason for protection in and of itself. Specific motives for protection are defined by the agencies and organizations administering each program. Each is geared towards different aspects of protection. Some of the more common examples include farmland preservation, habitat protection, open space preservation, water quality protection, and historic preservation. Some programs are aimed at perpetual protection and others target specific timeframes.

There are several programs at the Federal level. The USDA website is a good resource for this information. The National Oceanic & Atmospheric Administration (NOAA) has some programs available as well. Some examples of federal programs are as follows:

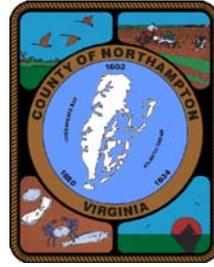
- Farm & Rangeland Protection Program (FRRP)
- Fish & Wildlife Services
- National Resources Conservation Service (NRCS)
- National Wildlife Refuge Association (NWRA)

The Commonwealth of Virginia has several agencies and programs available. The Department of Conservation & Recreation (DCR) and the Department of Environmental Quality (DEQ) are good resources for information. The following list shows some of what is available through the state:

- Cost Share Programs through DCR
- Virginia Outdoors Foundation (VOF)
- State Parks programs
- Virginia Department of Forestry programs

The Virginia Department of Conservation and Recreation has protected five Natural Area Preserves for the Natural Heritage Resources within the County. Those Natural Area Preserves include:

- Cape Charles



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- Magothy Bay
- Savage Neck Dunes
- Wm. B. Trower Bayshore
- Wreck Island

In the private sector there are several organizations with hundreds of programs available. Following is a list of some of the more popular ones:

- The Nature Conservancy (TNC)
- Ducks Unlimited (DU)
- Virginia Eastern Shore Land Trust (VESLT)
- Chesapeake Bay Foundation (CBF)

Northampton County has some conservation tools that can be utilized as well. There is a Conservation District designated in the County's Zoning Ordinance. The County also has an overlay district created for Historic Preservation, but it is not currently being used and has no areas designated for protection or preservation. One conservation tool which is currently in use in the County is the Agriculture/Forestal District (AFD) designation. Each AFD, as it is applied for and approved by the Board of Supervisors, becomes its own district with specific terms and conditions. The County also has a Purchase of Development Rights Program which allows landowners to sell the development rights of their property. Figure 6.11 shows land in the County which is currently protected.

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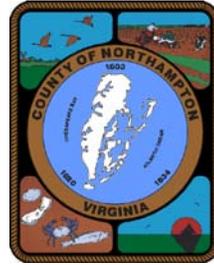
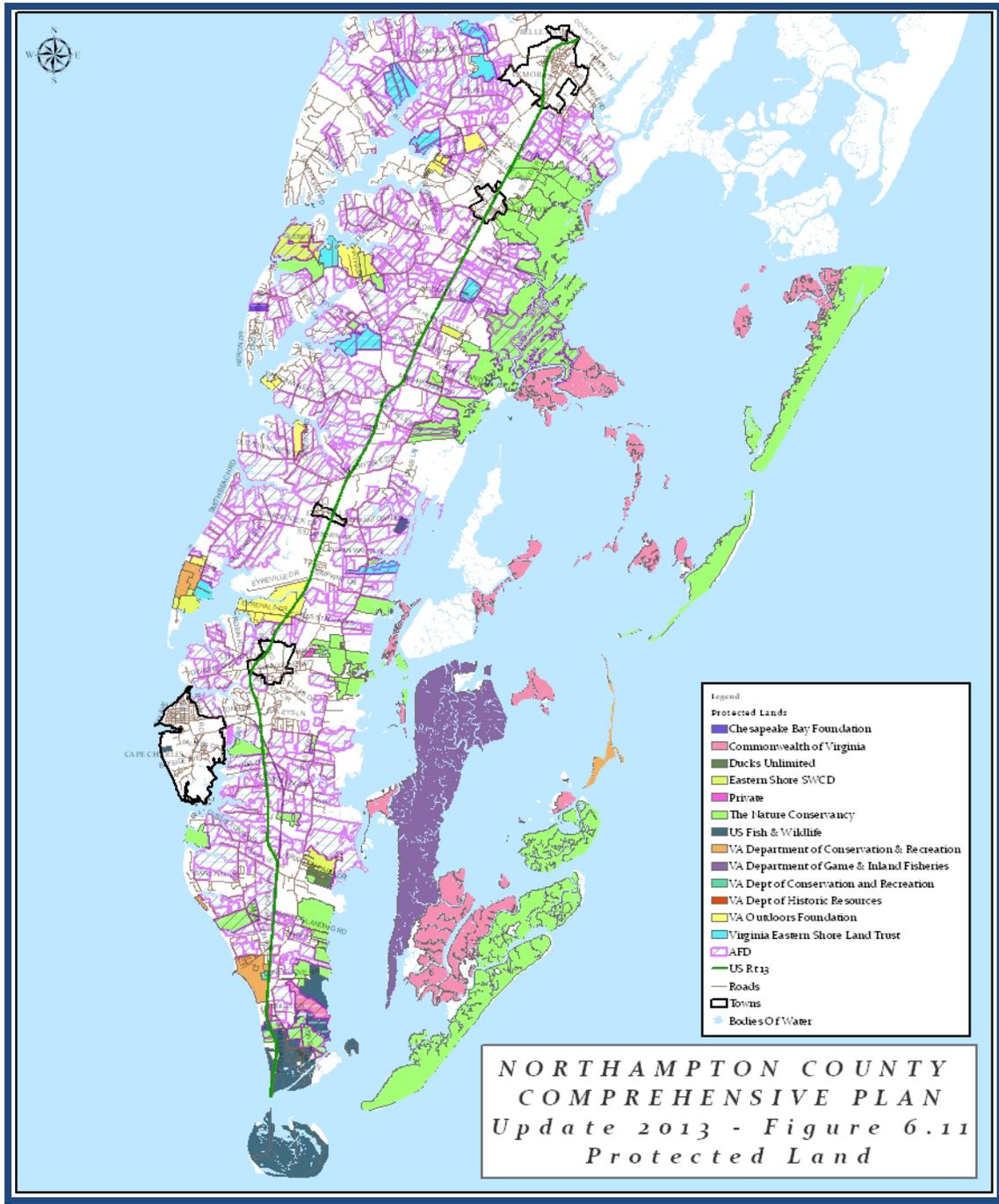
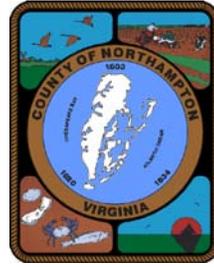


Figure 6.11 Protected Land





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Summary:

- The environment and natural resources of Northampton County are greatly influenced by its location as a peninsula surrounded by two significant water bodies: the Chesapeake Bay and the Atlantic Ocean.
- Northampton County lies within one of the most important migratory flyways in the world, supporting globally significant populations of shorebirds, songbirds and raptors during the annual fall migration. These avian resources provide an opportunity for an expanded tourism season based on bird watching.
- A number of ecologically significant flora and fauna are supported within Northampton County in addition to thirteen species designated as threatened or endangered.
- Northampton County supports a number of Maritime Zone Natural Communities identified as globally rare and imperiled Natural Heritage Resources.
- Northampton County has excellent soils for agricultural crop production, including several types classified as Prime Farmland.
- Tidewater Virginia, including Northampton County, has one of the highest levels of sea level rise in the United States.
- The barrier islands system provides prime nesting and feeding habitat for numerous waterfowl species, habitat for various mammals and reptiles, recreational opportunities, scientific research opportunities, and provides some level of protection from the effects of storms.
- Ground water is the sole source of drinking water in Northampton County, and the county has been designated by the Virginia State Water Control Board as a "Ground Water Management Area." and by the EPA as a sole source aquifer.
- Northampton County has established Resource Protection Areas on the bayside and seaside consistent with standards in the Chesapeake Bay Preservation Act.
- State agencies have mapped Priority Conservation Areas within Northampton County to prioritize areas for preservation, protection or specific management action.