2004

Assessment of Forest Habitat in Northern Northampton County

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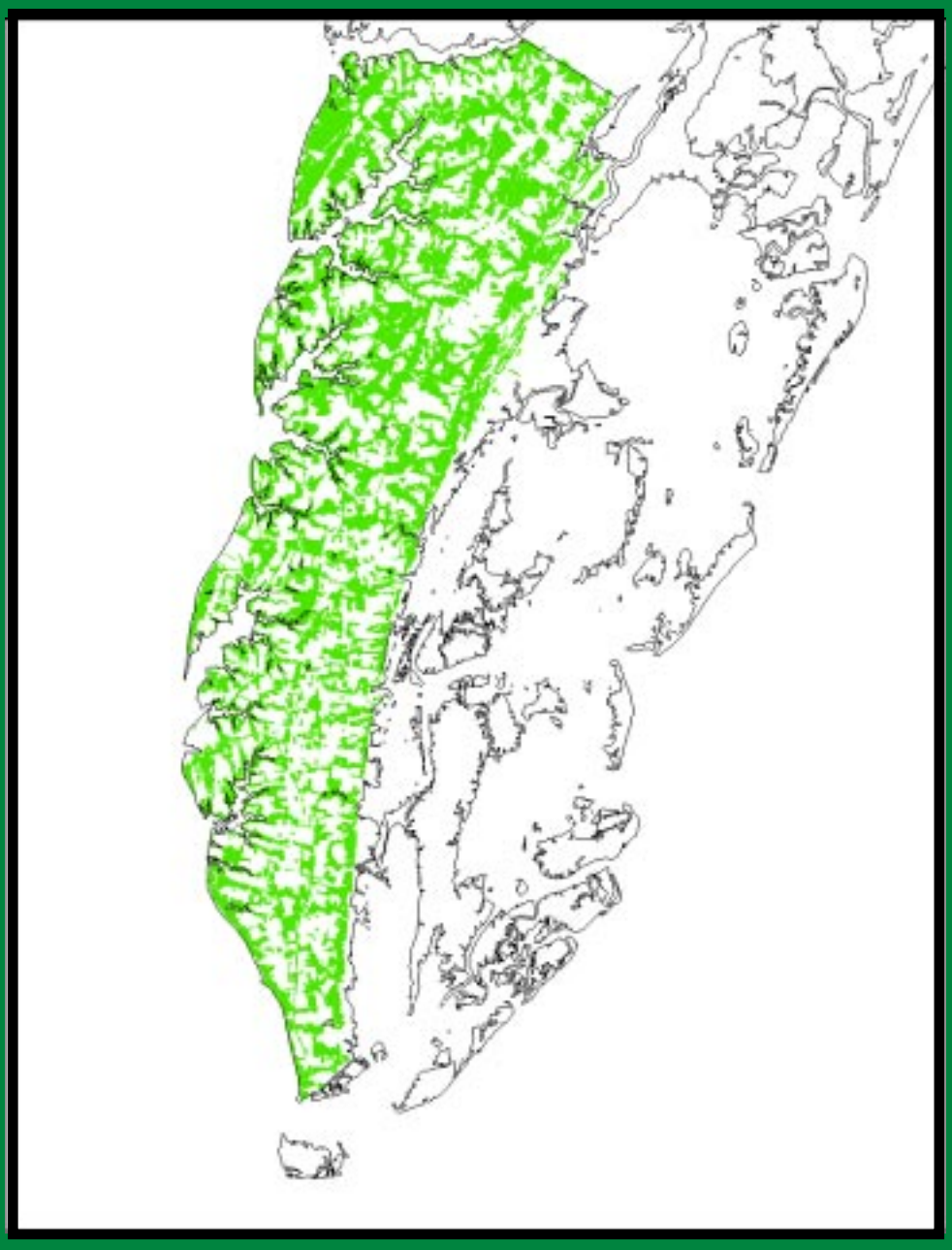

THE CENTER FOR CONSERVATION BIOLOGY
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The Center for Conservation Biology is an organization dedicated to discovering innovative solutions to environmental problems that are both scientifically sound and practical within today's social context. Our philosophy has been to use a general systems approach to locate critical information needs and to plot a deliberate course of action to reach what we believe are essential information endpoints.

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EXECUTIVE SUMMARY

The Eastern Shore of Virginia has remained a relatively isolated rural agricultural community because of limited access. Because of increasing development pressure, many patches of forest habitat on the lower Delmarva Peninsula area are in imminent danger of becoming lost or degraded in the near future, resulting in a cumulative loss of key habitats. Loss of habitat at this critical site may have far-reaching consequences as most of the Neotropical landbirds that breed throughout northeastern North America pass through this area while on fall migration to the Caribbean and Latin America. A recently completed impact study of the Chesapeake Bay Bridge-Tunnel toll reduction predicted that most of the residential and commercial growth triggered would occur within lower Northampton County with approximately 45% of the land permanently lost to development in the near future. Development pressure will be greatest within the bayside corridor that has been designated as the most critical stopover habitat within the concentration area. Subdivision of bayside tracts is now occurring at a rapid rate as land prices have escalated since the toll was reduced in March 2002.

During the production of the forest patch layer for the lower 20 kilometers, and with communications with landowners, the direct effect of development pressure became apparent. Review of Northampton County tax maps revealed the disturbing trend of large blocks of land being subdivided into multiple smaller blocks, as well as increased ownership by land development companies. Review of aerial photography showed that many forest patches had been harvested, and through conversations with landowners, it became apparent that owners were harvesting timber prior to the sale of their land.

The focus of this project was to produce an assessment of forest habitat within the northern 29 km of Northampton County. This assessment was combined with the assessment of the lower 20 km to assist in the identification of significant neotropical migrant stopover habitat and serve as a benchmark for future comparisons to measure the effectiveness of conservation efforts within the lower peninsula. After digitizing the patches from the 2002 Virginia base map imagery, it became apparent that the digitization of forest patches from the 1994 Virginia DOQQs was necessary to assess forest loss over the past 8 years, and thus was included in this project.

This project resulted in the digitization of 2,147 forest patches totaling 13,836 ha from the 1994 imagery and 2,581 patches totaling 13,499 hectares from the 2002 imagery. For analysis purposes only patches with a total area greater than 0.4 ha were included. This resulted in 1,099 patches totaling 13,667 ha from 1994 imagery and 1,209 patches totaling 13,287 ha from the 2002 imagery. Between 1994 and 2002 a gross loss of 821 ha of forested habitat was observed. During this same time period a gross gain of 289 ha was also observed. When combined, the resulting change was a 532 ha (or 3.9%) loss in forested habitat. The data also show a shift toward a greater number of smaller patches.

resulting in a more fragmented landscape.

This data is available from the Center for Conservation Biology as several GIS data layers, and will be continuously updated as additional information is collected on the both the landscape and patch level. With available funding, it is our wish to continue monitoring changes in forest cover as new, updated imagery becomes available. Currently, this product is being utilized to evaluate neotropical forest migrant stopover sites in conjunction with avian research being conducted at the NPOL radar site in Oyster, VA. Federal, state, and local organizations will find this data extremely helpful in making informed decisions regarding prioritization of forested lands for easements and acquisition as well as forest management plans.

BACKGROUND

Context

Birds are essential components of natural ecosystems, effective indicators of environmental health, and the focus of an emerging ecotourism industry that represents a growing portion of the world's economy. During the course of the twentieth century, the living space and infrastructure required by an expanding human population has had a pervasive impact on the natural landscape, resulting in a direct change in the availability and distribution of the habitats required by many bird species. Restoring and maintaining healthy bird populations within these altered landscapes represents one of the most complex conservation challenges for the twenty-first century.

An increased concern for the status of many North American bird populations has resulted in an escalation of monitoring and management efforts. Much of this concern has been focused upon the many species of forest-dwelling neotropical migrants (species that migrate between forested breeding grounds in the temperate latitudes of North America and wintering grounds in Central and South America and the Caribbean) that have exhibited substantial population declines in recent decades. There is increasing evidence that habitat loss and fragmentation are two of the leading causes for the observed population declines (Faaborg et al. 1995, Robinson et al. 1995).

The mid-Atlantic Coastal Plain plays a significant role in the life cycle of many of the most vulnerable bird species in North America. The diversity of habitats available to birds during the breeding and winter periods, along with the strategic geographic position of the region for migrants combine to make this one of the most diverse regions in eastern North America. The region was the site of the first successful European settlement in North America and has been altered by European culture for nearly four centuries. Currently, the urban crescent from Baltimore south to Richmond and east to Norfolk is one of the fastest growing regions in North America. Growth is projected to continue for the foreseeable

future, placing increasing demands on the regions natural resources. The landscape along the Delmarva Peninsula continues to be rural in character. However, migration of residents from New England will place increasing pressures on this landscape in the future (Watts 1999).

Vegetation within the mid-Atlantic Coastal Plain is most closely associated with that of the southeastern Coastal Plain. More than 100 plant species that are centered in the southeast reach their northern range limit in coastal New Jersey. Many more species reach their limit further south within the region. Upland forests remain an important component of the regional landscape. Forests form a natural gradient in composition from pine-dominated forests on the outer Coastal Plain to hardwood-dominated forests on the inner Coastal Plain.

The Eastern Shore of Virginia has remained a relatively isolated rural agricultural community because of limited access. Most of the upland portion of Northampton County (54%) is in agricultural use with forest covering 38%. Forest and shrub is restricted to riparian corridors along creeks, or in small fragmented patches associated with poorly drained soils, or in areas otherwise not farmed. Because of increasing development pressure, many patches of forest habitat on the lower Delmarva Peninsula area are in imminent danger of becoming lost or degraded in the near future, resulting in a cumulative loss of key habitats. Loss of habitat at this critical site may have far-reaching consequences as most of the Neotropical landbirds that breed throughout northeastern North America pass through this area while on fall migration to the Caribbean and Latin America. A recently completed impact study of the Chesapeake Bay Bridge-Tunnel toll reduction predicted that most of the residential and commercial growth triggered would occur within lower Northampton County with approximately 45% of the land permanently lost to development in the near future. Development pressure will be greatest within the bayside corridor that has been designated as the most critical stopover habitat within the concentration area. Subdivision of bayside tracts is now occurring at a rapid rate as land prices have escalated since the toll was reduced in March 2002.

Although the Northampton County Special Area Management Plan did not result in adoption of an ordinance to protect vegetation, the need to find ways to preserve remaining stopover habitat is critical. Last fall, with funding from USGS, the Center for Conservation Biology conducted an assessment of forest patches in southern Northampton County using remote sensing techniques. During the production of the forest patch layer for the lower 20 km, and with communications with landowners, the direct effect of development pressure became apparent. Review of Northampton County tax maps revealed the disturbing trend of large blocks of land being subdivided into multiple smaller blocks, as well as increased ownership by land development companies. Review of aerial photography showed that many forest patches had been harvested, and through conversations with landowners, it became apparent that owners were harvesting timber prior to the sale of their land.

Objectives

The focus of this project is to produce an assessment of forest habitat within the northern 29 km of Northampton County. This assessment will be combined with the assessment of the lower 20 km to assist in the identification of significant neotropical migrant stopover habitat and serve as a benchmark for future comparisons to measure the effectiveness of conservation efforts within the lower peninsula.

METHODS

Study Area

This study was conducted entirely within Northampton County, Virginia (Figure 1). Northampton County is the southern most county on the Delmarva Peninsula. The majority of the upland portions of the county are comprised of a matrix of forested and agricultural land, with an increasing amount of development. The forested portions of Northampton County consist primarily of Oak-Pine forest with some forested wetland and pine plantation.

Assessment Methods

Forest patches were visually identified using 1994 Virginia DOQQ imagery and 2002 Virginia base map imagery, and digitized using ArcView GIS software. During digitizing, patches were separated by roads or 10 meters of treeless land. Linear patches of forest less than 10 m in width were not included unless they connected larger forest patches. For analysis purposes, only forest patches with an area greater than 0.4 ha were included. Analysis of individual patches included area, perimeter, patch center coordinates, ID and distance to the nearest 5 patches, forest composition, forest density, and patch age. Forest composition was determined by a combination of image analysis and area measurements based on visual cover identification. Forest density was determined visually and by actual measurement of stem density. Forest age was determined by visual estimation and actual measurement of tree crown diameter.

Vegetation was measured within three subplots located within 192 30 m radius survey plots. The center of each subplot was 17 m from survey plot center along 120^{o} bearings and consisted of a 5 m radius circle nested within an 11.4 m radius circle (see Figure 2). Within the 11.4 m radius circle, all trees with a diameter at breast height (DBH) greater than 8cm were identified, counted, and placed into DBH size classes. Within the 5 m radius circle, the percentage of ground cover by bare ground, leaf litter, grass, and forbs was estimated. The depth of the leaf litter layer was recorded to the nearest cm, as well as if an organic layer was present or if the ground consisted primarily of sand, rock, or clay. Canopy height at the center of the subplot was measured with a clinometer, and percent

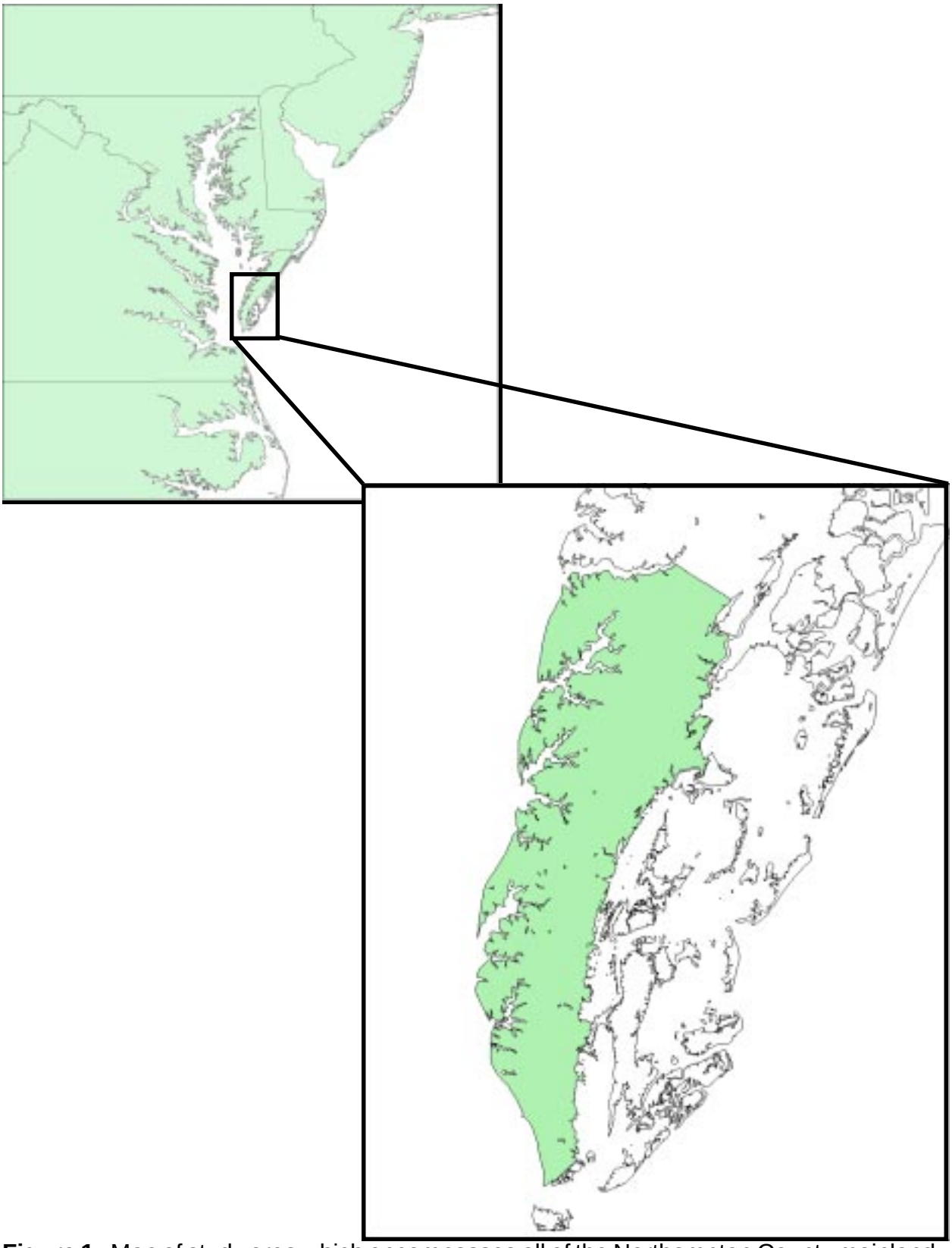

Figure 1. Map of study area which encompasses all of the Northampton County mainland.

total canopy closure was measured with a densiometer. All woody stems less than 8 cm in diameter and greater than 0.5 m tall were identified, counted, and placed into diameter and structure classes, and the proportion of each species that was bearing fruit, had obviously borne, or would obviously bear fruit that season was recorded. At each subplot center, the nearest 2 trees within each DBH class were identified, and the distance from the subplot center and the height were measured.

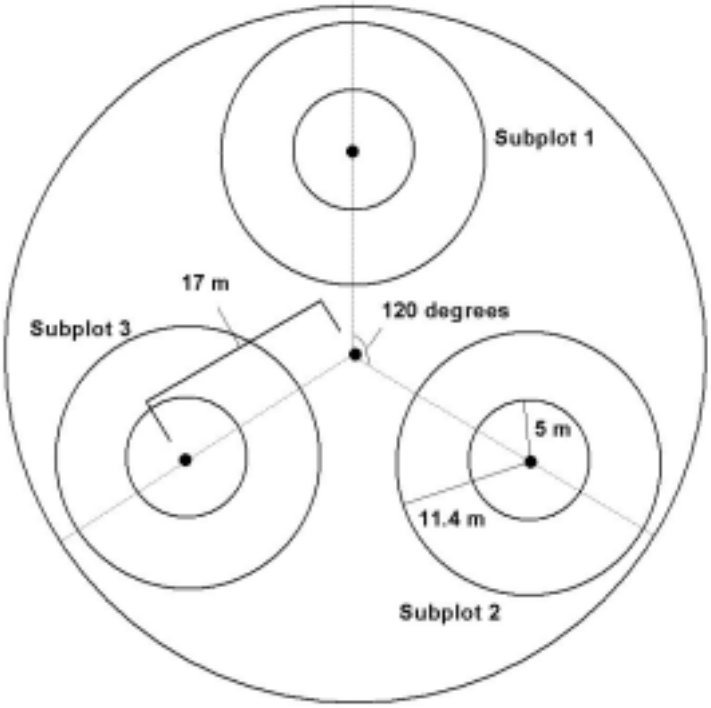

Figure 2. Diagram of vegetation survey plot layout

RESULTS

After the data from the northern portion of the county was combined with the data from the southern portion, efforts resulted in the digitization of 2,147 forest patches totaling 13,836 ha from the 1994 imagery and 2,581 patches totaling 13,499 ha from the 2002 imagery. For analysis purposes, only patches with a total area greater than 0.4 ha were included. This resulted in 1,099 patches totaling 13,667 ha from 1994 imagery and 1,209 patches totaling 13,287 ha from the 2002 imagery. Between 1994 and 2002 a gross loss of 821 ha of forested habitat was observed. During this same time period a gross gain of 289 ha was also observed. When combined, the resulting change was a 532 ha (or 3.9%) loss in forested habitat. The data also show a shift toward a greater number of smaller

patches resulting in a more fragmented landscape.

All layers are available from the Center for Conservation Biology, in ESRI shapefile format (see Table 1 for a list of available layers).

Table 1. Names and Descriptions of available GIS data layers

Layer Name	Description
1994nhforest	1994 forest patches, with associated data
1994nhforestpatches	1994 forest patches greater than 0.4ha, with associated data (including nearest neighbors)
2002nhforest	2002 forest patches, with associated data
2002nhforestpatches	2002 forest patches greater than 0.4ha, with associated data (including nearest neighbors)
gainednhforest1994to2002	Forest patches (greater than 0.4ha) gained from 1994 to 2002, with associated data
lostnhforest1994to2002	Forest patches (greater than 0.4ha) lost from 1994 to 2002, with associated data
1994and2002nhforest	Combined forest patches, 1994 and 2002, with associated data
2003radarvegstructure	Vegetation structure data for 2003 NPOL RADAR bird survey plots
2003radarvegcover	Ground cover data for 2003 NPOL RADAR bird survey plots
2003radarveg2nearest	Tree composition data for 2003 NPOL RADAR bird survey plots

DISCUSSION

As habitat is inevitably lost in the southern portion of the county, it will be increasingly important to protect what remains in the northern portion. This product will be of critical importance to the Virginia Coastal Program in refining its Coastal and Estuarine Land Conservation Program Plan. It will also be an essential tool for other organizations involved in prioritizing land for acquisition and conservation easement efforts, as well as aiding in the development of forest management plans. This product will be available for use by federal, state, and local organizations to assist in prioritization. Coupled with the planned and proposed avian research being conducted at the new Doppler radar site in Oyster, VA, this product will prove invaluable to studies involving the use of forest patches by migratory landbirds, and will continually be updated as new information is collected and as new imagery becomes available.

ACKNOWLEDGMENTS

This project would not have been possible without the efforts of many people. Laura McKay at the Virginia Department of Environmental Quality Virginia Coastal Program provided the opportunity to conduct the study and administrative support. We appreciate the dedicated efforts of Caroline Causey, Pierre Goulet, Joshua Nemeth, Daniel Rauch, Fletcher Smith, Nicholas VanLanen, and Michelle Wilcox in conducting vegetation surveys. Funds from the U.S. Geological Survey allowed for the assessment of the lower 20 km of the County. Lydia Whitaker, Carlton Adams, Renee Peace, Anne Womack, Gloria Sciole, Mark Roberts, and Cheryl Pope provided important administrative support from the College of William and Mary. Lastly, we would like to thank the numerous landowners who allowed access to their properties.

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