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Shoreline Evolution: Westmoreland County, Virginia Potomac River and Rappahannock River Shorelines

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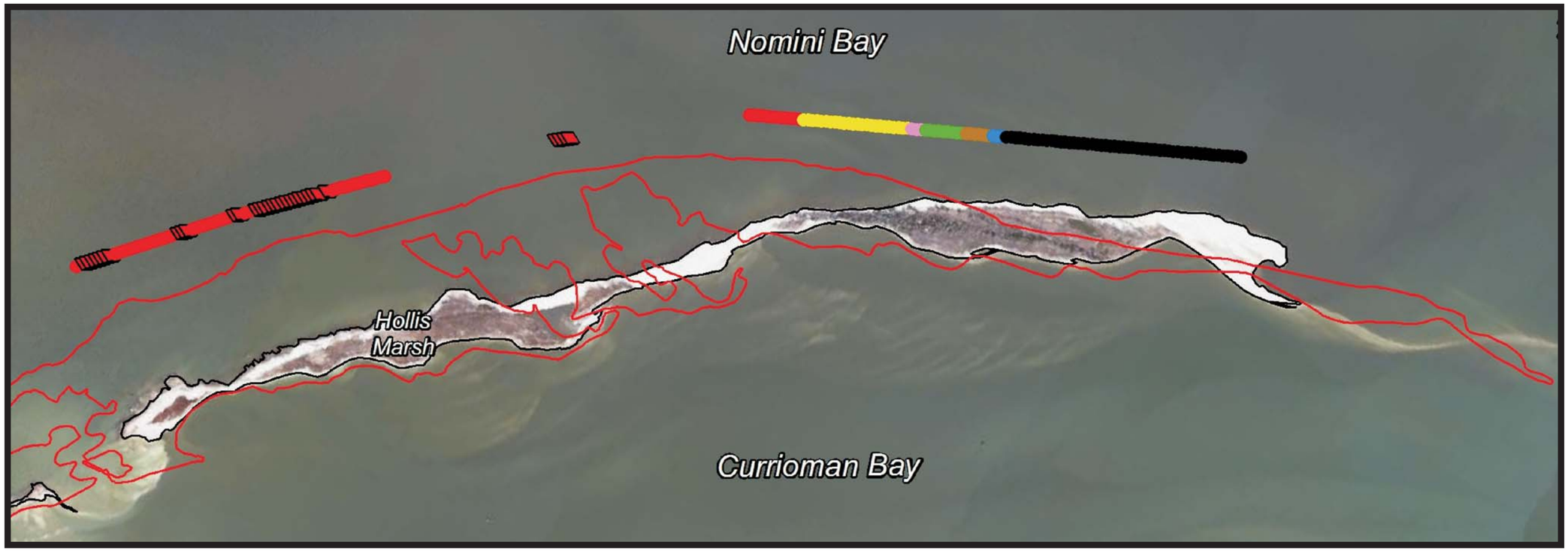

Shoreline Studies Program
Virginia Institute of Marine Science
College of William & Mary
Gloucester Point, Virginia

September 2012

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Data Summary Report

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September 2012

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1 Introduction

Westmoreland County is situated along the Potomac River and Rappahannock River (Figure 1). Through time, the County's shoreline has evolved, and determining the rates and patterns of shore change provides the basis to know how a particular coast has changed through time and how it might proceed in the future. Along Chesapeake Bay's estuarine shores, winds, waves, tides and currents shape and modify coastlines by eroding, transporting and depositing sediments.

The purpose of this report is to document how the shore zone of Westmoreland County has evolved since 1937. Aerial imagery was taken for most of the Bay region beginning that year and can be used to assess the geomorphic nature of shore change. Aerial photos show how the coast has changed, how beaches, dunes, bars, and spits have grown or decayed, how barriers have breached, how inlets have changed course, and how one shore type has displaced another or has not changed at all. Shore change is a natural process but, quite often, the impacts of man, through shore hardening or inlet stabilization, come to dominate a given shore reach. In addition to documenting historical shorelines, the change in shore positions along the rivers and larger creeks in Westmoreland County will be quantified in this report. The shorelines of very irregular coasts, small creeks around inlets, and other complicated areas will be shown but not quantified.

2 Methods

2.1 Photo Rectification and Shoreline Digitizing

An analysis of aerial photographs provides the historical data necessary to understand the suite of processes that work to alter a shoreline. Images of the Westmoreland County Shoreline from 1937, 1953, 1969, 1994, 2002 and 2009 were used in the analysis. The 1994, 2002 and 2009 images were available from other sources. The 1994 imagery was orthorectified by the U.S. Geological Survey (USGS) and the 2002 and 2009 imagery was orthorectified by the Virginia Base Mapping Program (VBMP). The 1937, 1953 and 1969 photos are part of the VIMS Shoreline Studies Program archives. The historical aerial images acquired to cover the entire shoreline were not always flown on the same day. The dates for each year are:
1937 - March 4, April 4, 7, and 17; May 7 and 31;
1953 - October 2, 3, 11, and 26; November 2 and 27
1969 - December 5 and 11;
The 2002 and 2009 were all flown in February, March, and April of their respective years. We could not ascertain the exact dates the 1994 images were flown.

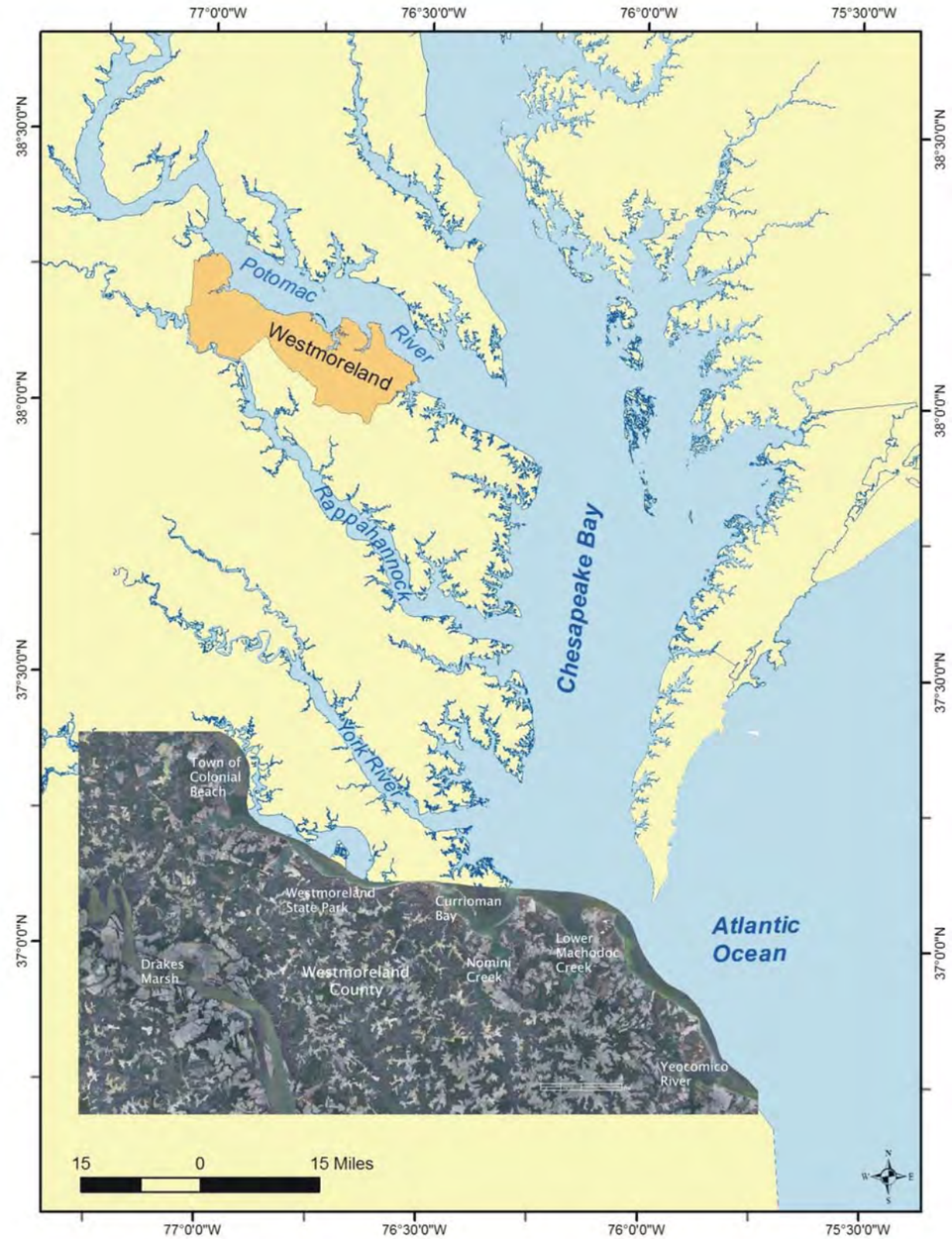


Figure 1. Location of Westmoreland County within the Chesapeake Bay estuarine system.

The 1937, 1953 and 1969 images were scanned as tiffs at 600 dpi and converted to ERDAS IMAGINE (.img) format. These aerial photographs were orthographically corrected to produce a seamless series of aerial mosaics following a set of standard operating procedures. The 1994 Digital Orthophoto Quarter Quadrangles (DOQQ) from USGS were used as the reference images. The 1994 photos are used rather than higher quality, more recent aerials because of the difficulty in finding control points that match the earliest 1937 images.

ERDAS Orthobase image processing software was used to orthographically correct the individual flight lines using a bundle block solution. Camera lens calibration data were matched to the image location of fiducial points to define the interior camera model. Control points from 1994 USGS DOQQ images provide the exterior control, which is enhanced by a large number of image-matching tie points produced automatically by the software. The exterior and interior models were combined with a digital elevation model (DEM) from the USGS National Elevation Dataset to produce an orthophoto for each aerial photograph. The orthophotographs were adjusted to approximately uniform brightness and contrast and were mosaicked together using the ERDAS Imagine mosaic tool to produce a one-meter resolution mosaic .img format. To maintain an accurate match with the reference images, it is necessary to distribute the control points evenly, when possible. This can be challenging in areas given the lack of ground features and poor photo quality on the earliest photos. Good examples of control points were manmade features such as road intersections and stable natural landmarks such as ponds and creeks that have not changed much over time. The base of tall features such as buildings, poles, or trees can be used, but the base can be obscured by other features or shadows making these locations difficult to use accurately. Most areas of the County were particularly difficult to rectify, either due to the lack of development when compared to the reference images or due to no development in the historical and the reference images.

Once the aerial photos were orthorectified and mosaicked, the shorelines were digitized in ArcMap with the mosaics in the background. The morphologic toe of the beach or edge of marsh was used to approximate low water. High water limit of runup can be difficult to determine on the shoreline due to narrow or non-existent beaches against upland banks or vegetated cover. In areas where the shoreline was not clearly identifiable on the aerial photography, the location was estimated based on the experience of the digitizer. The displayed shorelines are in shapefile format. One shapefile was produced for each year that was mosaicked.

Horizontal positional accuracy is based upon orthorectification of scanned aerial photography against the USGS digital orthothophoto quadrangles. For vertical control, the USGS 30m DEM data was used. The 1994 USGS reference images were developed in accordance with National Map Accuracy Standards (NMAS) for Spatial Data Accuracy at the 1:12,000 scale. The 2002 and 2009 Virginia Base Mapping Program's orthophotography were developed in accordance with the National Standard for Spatial Data Accuracy (NSSDA). Horizontal root mean square error (RMSE) for historical mosaics was held to less than 20 ft.

2.2 Rate of Change Analysis

The Digital Shoreline Analysis System (DSAS) was used to determine the rate of change for the County's shoreline (Himmelstoss, 2009). All DSAS input data must be managed within a personal geodatabase, which includes all the baselines created for Westmoreland County and the digitized shorelines for 1937, 1953, 1969, 1994, 2002 and 2009. Baselines were digitized about 200 feet, more or less, depending on features and space, seaward of the 1937 shoreline and encompassed most of the County's main shorelines but generally did not include the smaller creeks. It also did not include areas that have unique shoreline morphology such as creek mouths and spits. DSAS generated transects perpendicular to the baseline about 33 ft apart, which were manually checked and cleaned up. For Westmoreland County, this method represented about 70 miles of shoreline along 11310 transects.

The End Point Rate (EPR) is calculated by determining the distance between the oldest and most recent shoreline in the data and dividing it by the number of years between them. This method provides an accurate net rate of change over the long term and is relatively easy to apply to most shorelines since it only requires two dates. This method does not use the intervening shorelines so it may not account for changes in accretion or erosion rates that may occur through time. However, Milligan *et al.* (2010a, 2010b, 2010c, 2010d) found that in several localities within the bay, EPR is a reliable indicator of shore change even when intermediate dates exist. Average rates were calculated along selected areas of the shore; segments are labeled in Appendix A and shown in Table 1.

Using methodology reported in Morton *et al.* (2004) and National Spatial Data Infrastructure (1998), estimates of error in orthorectification, control source, DEM and digitizing were combined to provide an estimate of total maximum shoreline position error. The data sets that were orthorectified (1937, 1959, and 1969) have an estimated total maximum shoreline position error of 20.0 ft, while the total maximum shoreline error for the four existing datasets are estimated at 18.3 ft for USGS and 10.2 ft for VBMP. The maximum annualized error for the shoreline data is $\pm$0.7 ft/yr. The smaller rivers and creeks are more prone to error due to their lack of good control points for photo rectification, narrower shore features, tree and ground cover and overall smaller rates of change. These areas are digitized but due to the higher potential for error, rates of change analysis are not calculated. Many areas of Westmoreland County have shore change rates that fall within the calculated error. Some of the areas that show very low accretion can be due to errors within the method described above.

The Westmoreland County shoreline was divided into 47 plates (Figure 2) in order to display that data in Appendices A and B. In Appendix A, the 2009 image is shown with only the 1937 and 2009 shorelines to show the long-term trends along. In Appendix B, one photo date and the associated shoreline is shown on each. These include the photos taken in 1937, 1953, 1969, 1994, 2002 and 2009.

3 Summary

The rates of change shown in Table 1 are averaged across large sections of shoreline and may not be indicative of rates at specific sites within the reach. Some areas of the County, where the shoreline change rates are categorized as accretion, have structures along the shoreline which results in a positive long-term rate of change due to the structures themselves. Some of the areas with very low accretion, particularly in the smaller creeks and rivers, may be the result of errors within photo rectification and digitizing wooded shorelines.

Hollis Marsh has the largest erosion rate in Westmoreland County. Other Potomac River shoreline is eroding, but much more slowly. This is likely do to the nature of the material. Hollis Marsh is a low, marsh and sand island that is easily overwashed in storms. Much of the main Potomac River shoreline which is exposed to the same wave climate consists of high, consolidated banks that slump when their base of bank erodes providing material to the shoreline. This results in a lower erosion rate because the shoreline accretes and the slump material must erode away before base of bank erosion occurs again.

This also occurs along Westmoreland's Rappahannock River shoreline. The relatively lower bank shorelines and marshes in segment T erode more quickly than the high banks in sections of shoreline.

Table 1. Average end point rate of change (ft/yr) between 1937 and 2009 for segments along Westmoreland County's shoreline. Segment locations are show on maps in Appendix A.

Segment Name	Location	Average Rate of Change (ft/yr)
A	Rosier Creek	-0.7
B	Potomac River, Mouth of Rosier Creek to Bluff Point	-0.1
C	Potomac River, Town of Colonial Beach	0.1
D	Monroe Bay	-0.2
E	Potomac River, Sebastian Point to Paynes Point	-0.7
F	Mouth of Mattox Creek, Wirt Wharf	-0.1
G	Potomac River, Church Point to Westmoreland State Park	-1.1
H	Potomac River, Westmoreland State Park to Haulover Inlet	-0.8
I	Nomini Bay, Hollis Marsh	-4.0
J	Currioman Bay, Haulover Inlet to Nomini Creek	-0.6
K	Nomini Creek including Buckner Creek	-0.3
L	Nomini Bay, White Point to Kingcopsico Point	-0.3
M	Lower Machodoc Creek	-0.8
N	Potomac River, Grapevine Point to Ragged Point	-1.1
O	Potomac River, Ragged Point to Jackson Creek	-0.9
P	Potomac River, Jackson Creek to Sandy Point	-2.2
Q	Potomac River, Sandy Point to Lynch Point	-1.4
R	Yeocomico River	-0.5
S	Rappahannock River, Richmond County Line to Layton Landing Rd.	-0.4
T	Rappahannock River, Layton Landing Rd. to Blind Point	-1.2
U	Rappahannock River, Blind Point to King George County Line	-0.4

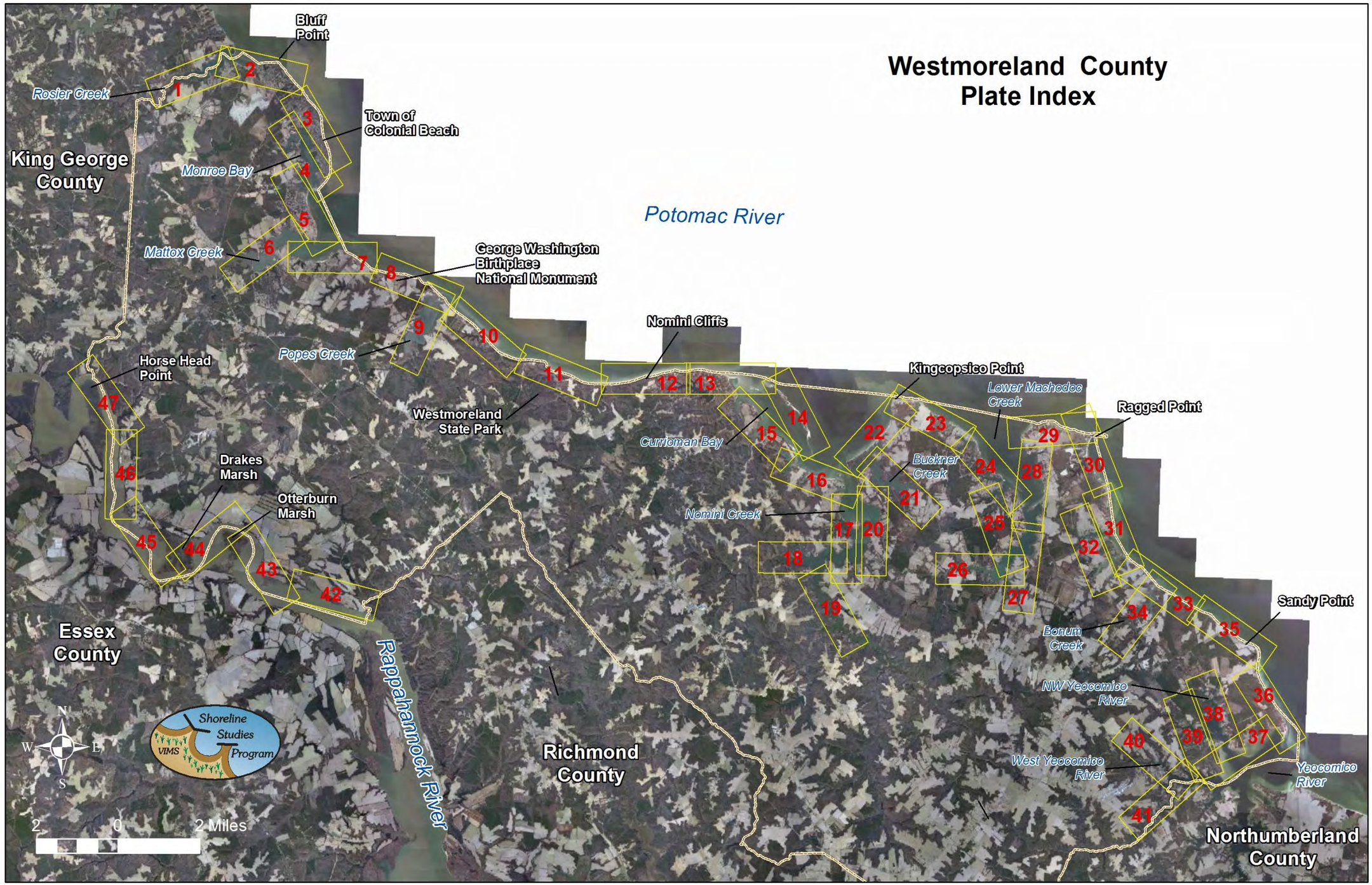


Figure 2. Index of shoreline plates.

4 References

Himmelstoss, E.A., 2009. “DSAS 4.0 Installation Instructions and User Guide” in: Thieler,E.R., Himmelstoss, E.A., Zichichi, J.L., and Ergul, Ayhan. 2009 Digital Shoreline Analysis System (DSAS) version 4.0 — An ArcGIS extension for calculating shoreline change: U.S. Geological Survey Open-File Report 2008-1278.

Milligan, D. A., K.P. O’Brien, C. Wilcox, C. S. Hardaway, JR, 2010a. Shoreline Evolution: City of Newport News, Virginia James River and Hampton Roads Shorelines. Virginia Institute of Marine Science. College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/NewportNews/1NewportNews_Shore_Evolve.pdf

Milligan, D. A., K.P. O’Brien, C. Wilcox, C. S. Hardaway, JR, 2010b. Shoreline Evolution: City of Poquoson, Virginia, Poquoson River, Chesapeake Bay, and Back River Shorelines. Virginia Institute of Marine Science. College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/Poquoson/1Poquoson_Shore_Evolve.pdf

Milligan, D. A., K.P. O’Brien, C. Wilcox, C. S. Hardaway, JR, 2010c. Gloucester County, Virginia York River, Mobjack Bay, and Piankatank River Shorelines. Virginia Institute of Marine Science. College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/Gloucester/1Gloucester_Shore_Evolve.pdf

Milligan, D. A., K.P. O’Brien, C. Wilcox, C. S. Hardaway, JR, 2010d. Shoreline Evolution: York County, Virginia York River, Chesapeake Bay and Poquoson River Shorelines. Virginia Institute of Marine Science. College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/York/1York_Shore_Evolve.pdf

Morton, R.A., T.L. Miller, and L.J. Moore, 2004. National Assessment of Shoreline Change: Part 1 Historical Shoreline Change and Associated Coastal Land Loss along the U.S. Gulf of Mexico. U.S. Department of the Interior, U.S. GeologicalSurvey Open-File Report 2004-1043, 45 p.

National Spatial Data Infrastructure, 1998. Geospatial Positional Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy. Subcommittee for Base Cartographic Data. Federal Geographic Data Committee. Reston, VA.

Appendix A

End Point Rate of Shoreline Change Maps

Shoreline change rate segments are shown on the top map. The calculated rates of change for each transect within the segment were averaged to determine an average rate of change as shown in Table 1 of the report.

Note: The location labels on the plates come from U.S. Geological Survey topographic maps, Google Earth, and other map sources and may not be accurate for the historical or even more recent images. They are for reference only.

Plate 1	Plate 9	Plate 17	Plate 25	Plate 33	Plate 41
Plate 2	Plate 10	Plate 18	Plate 26	Plate 34	Plate 42
Plate 3	Plate 11	Plate 19	Plate 27	Plate 35	Plate 43
Plate 4	Plate 12	Plate 20	Plate 28	Plate 36	Plate 44
Plate 5	Plate 13	Plate 21	Plate 29	Plate 37	Plate 45
Plate 6	Plate 14	Plate 22	Plate 30	Plate 38	Plate 46
Plate 7	Plate 15	Plate 23	Plate 31	Plate 39	Plate 47
Plate 8	Plate 16	Plate 24	Plate 32	Plate 40	

Shoreline Change Rate Segments

A

Rosier Creek

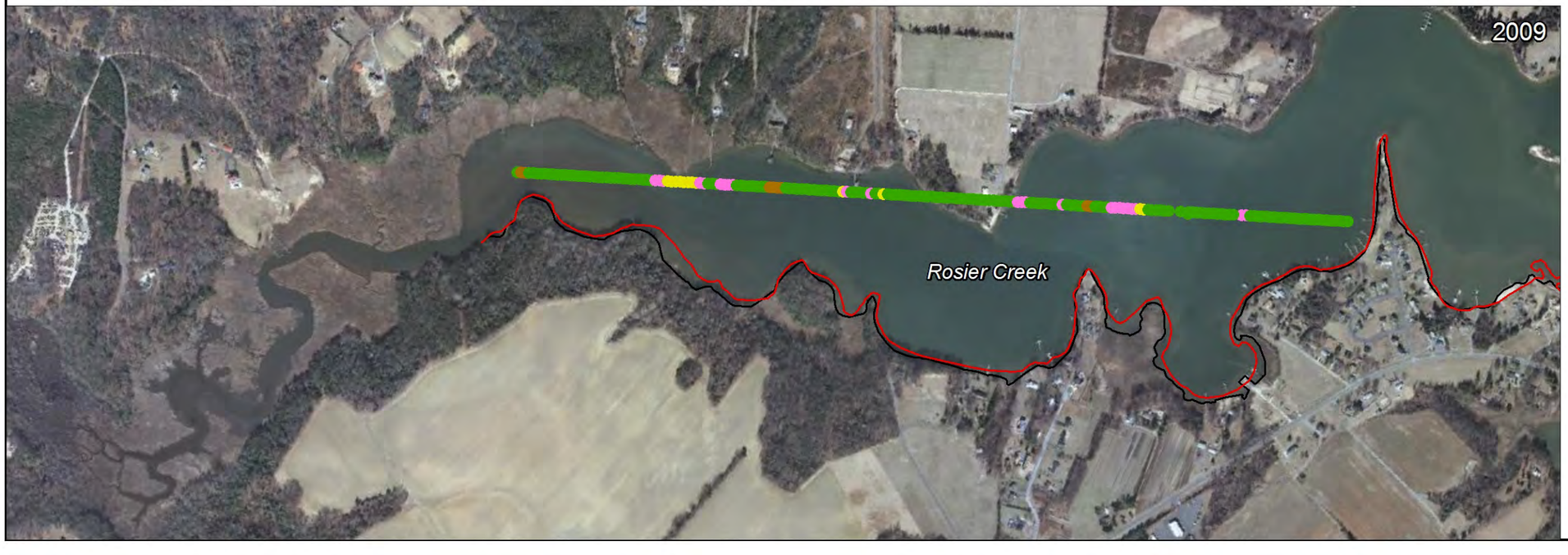
Westmoreland County Virginia

Plate 1

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



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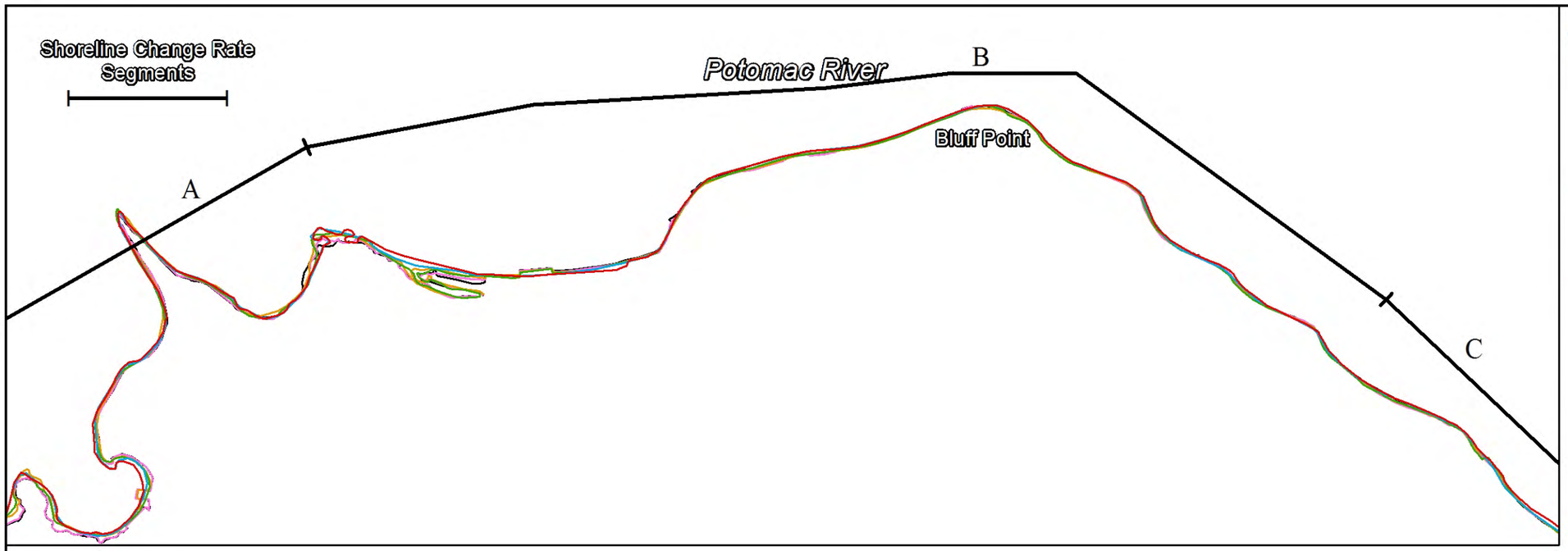


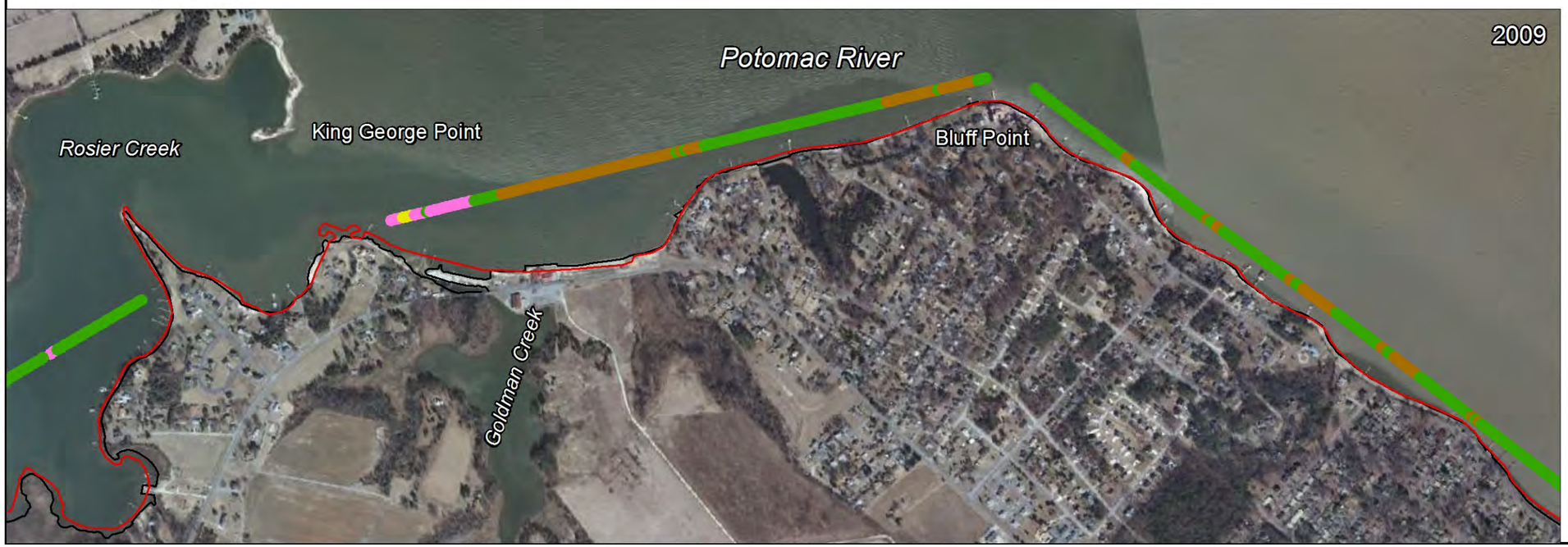
Westmoreland County Virginia

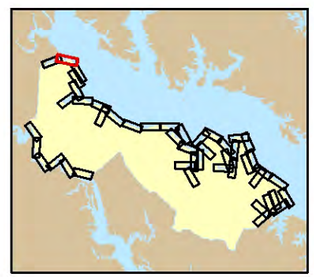
Plate 2

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)





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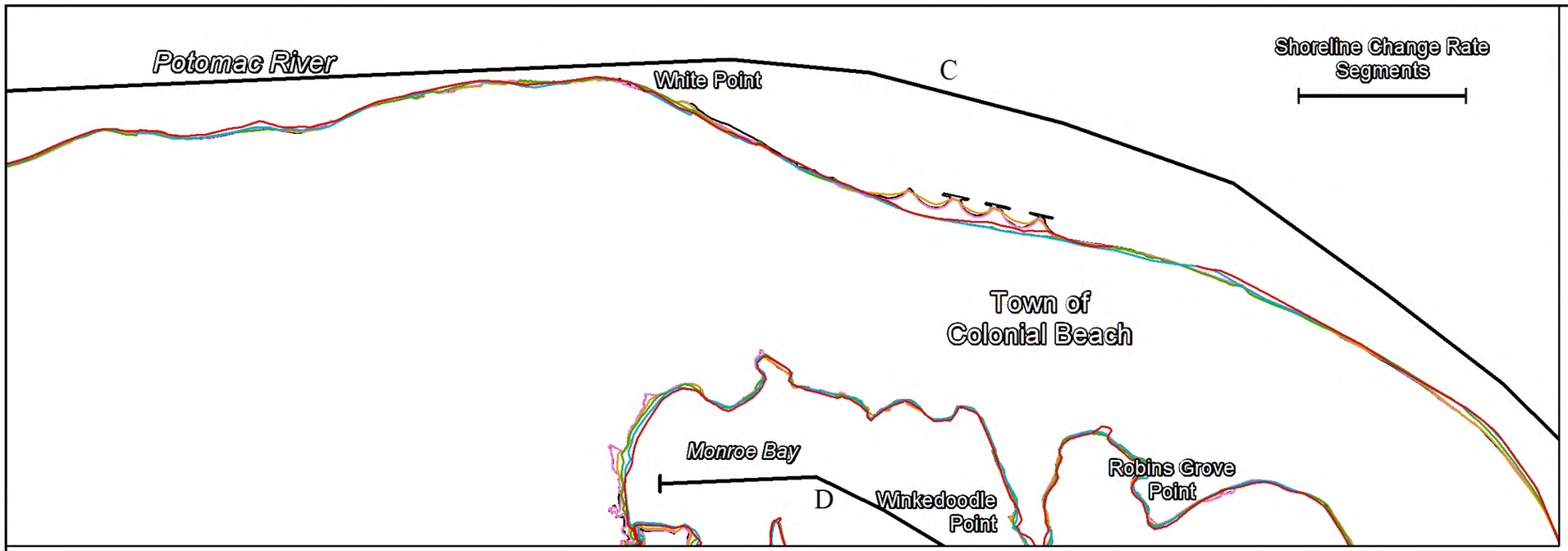
Westmoreland County Virginia

Plate 3



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
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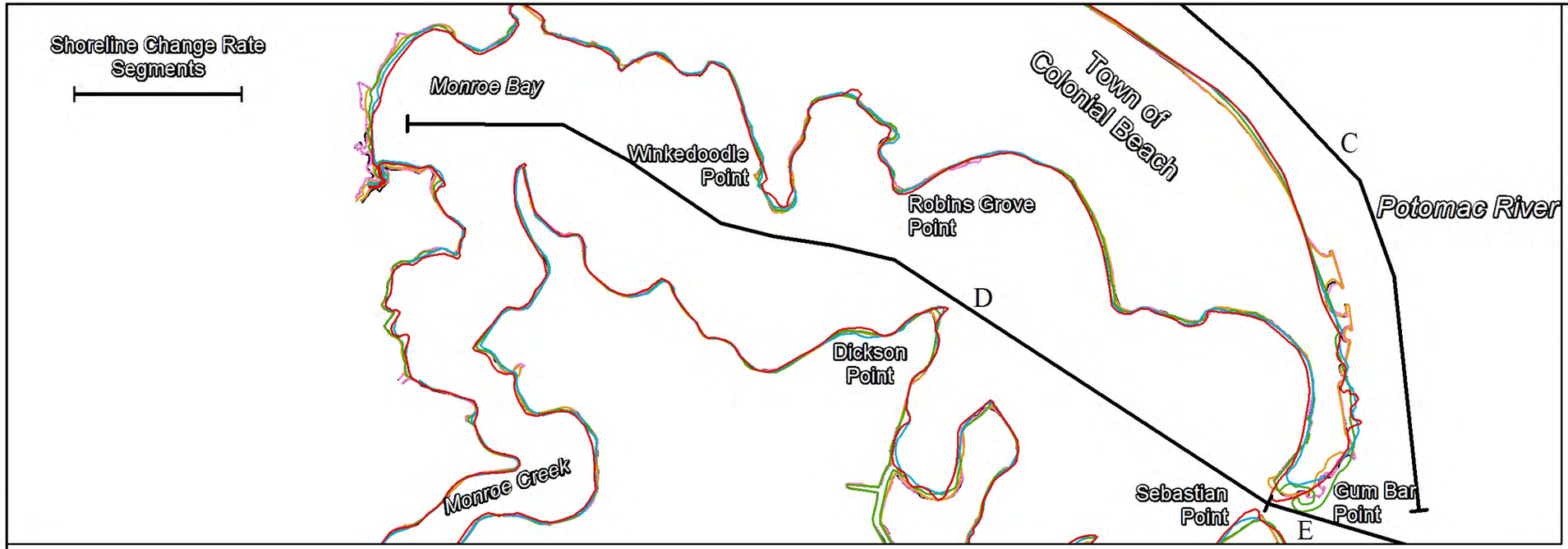
Westmoreland County Virginia

Plate 4



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
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Shoreline Studies Program VIMS

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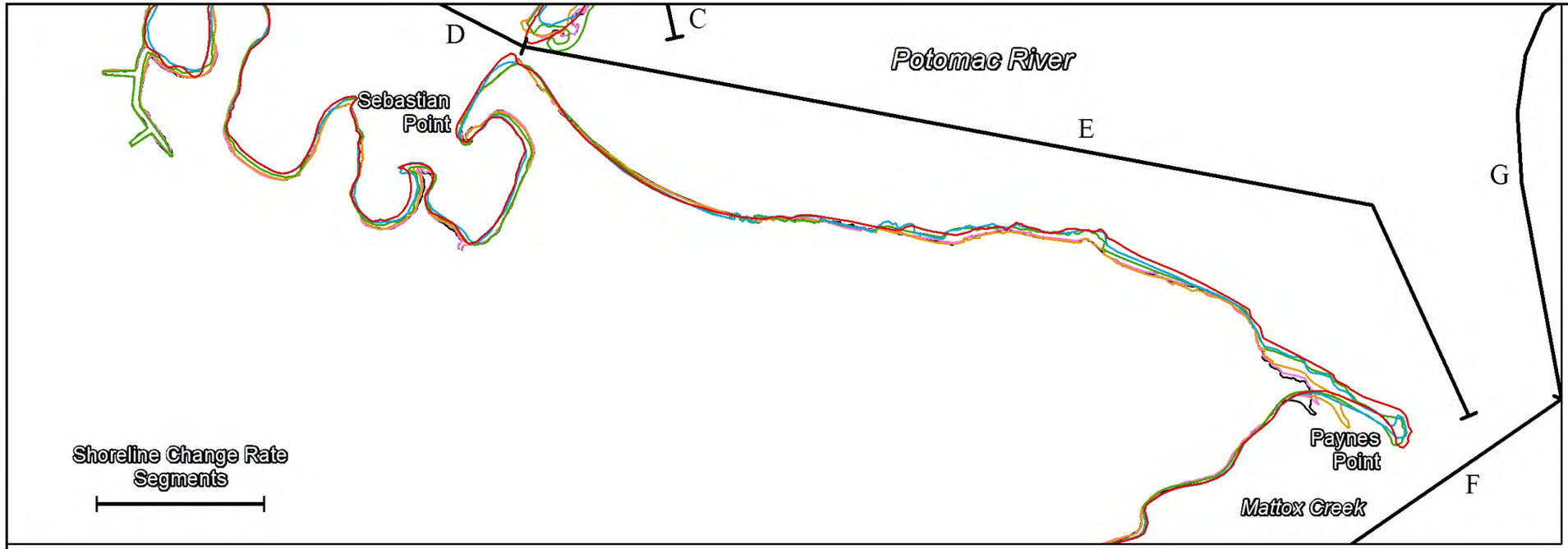
Westmoreland County
Virginia

Plate 5



1937 Shoreline
1994 Shoreline
1953 Shoreline
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Shoreline Rates of Change

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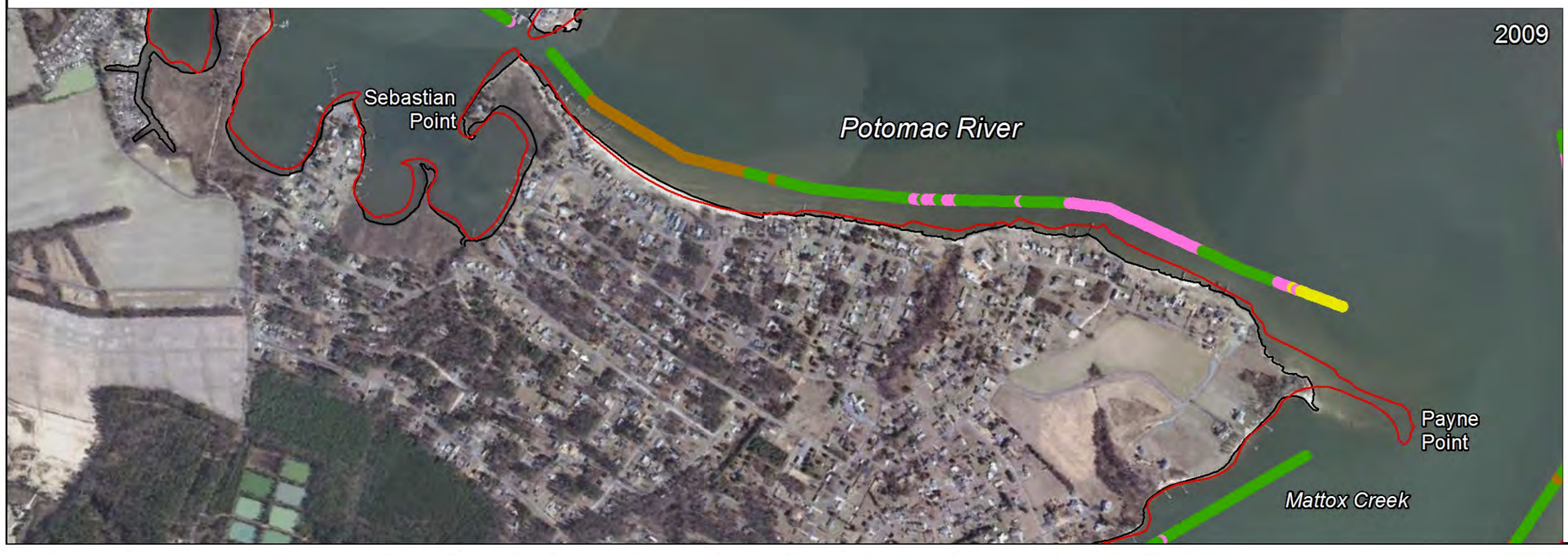

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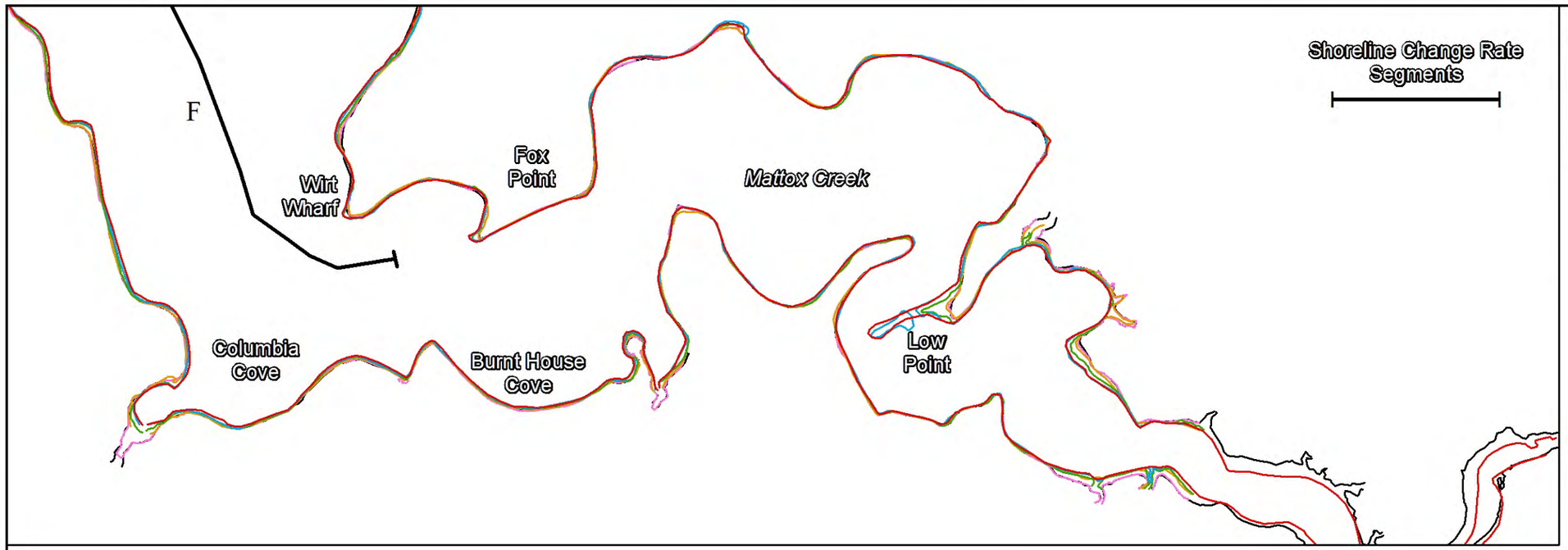
Westmoreland County
Virginia

Plate 6



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

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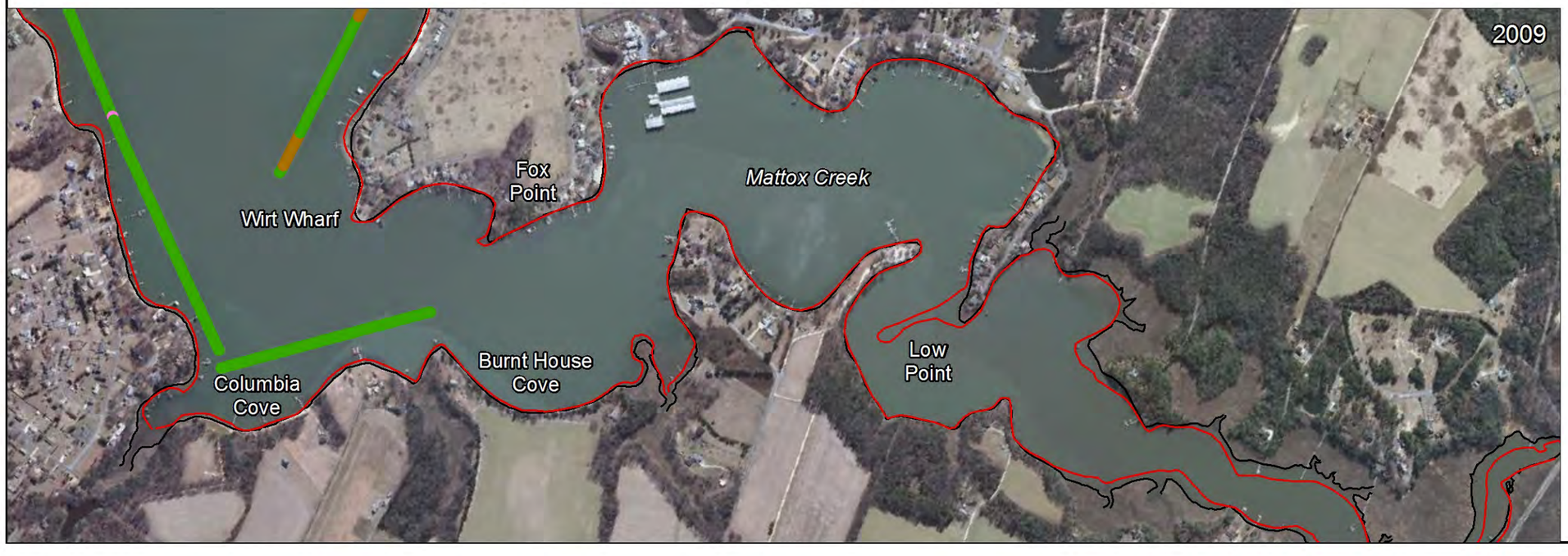

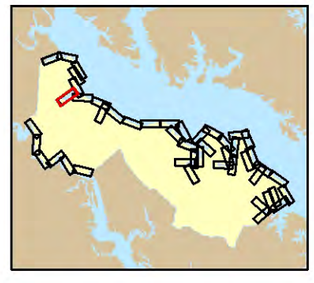

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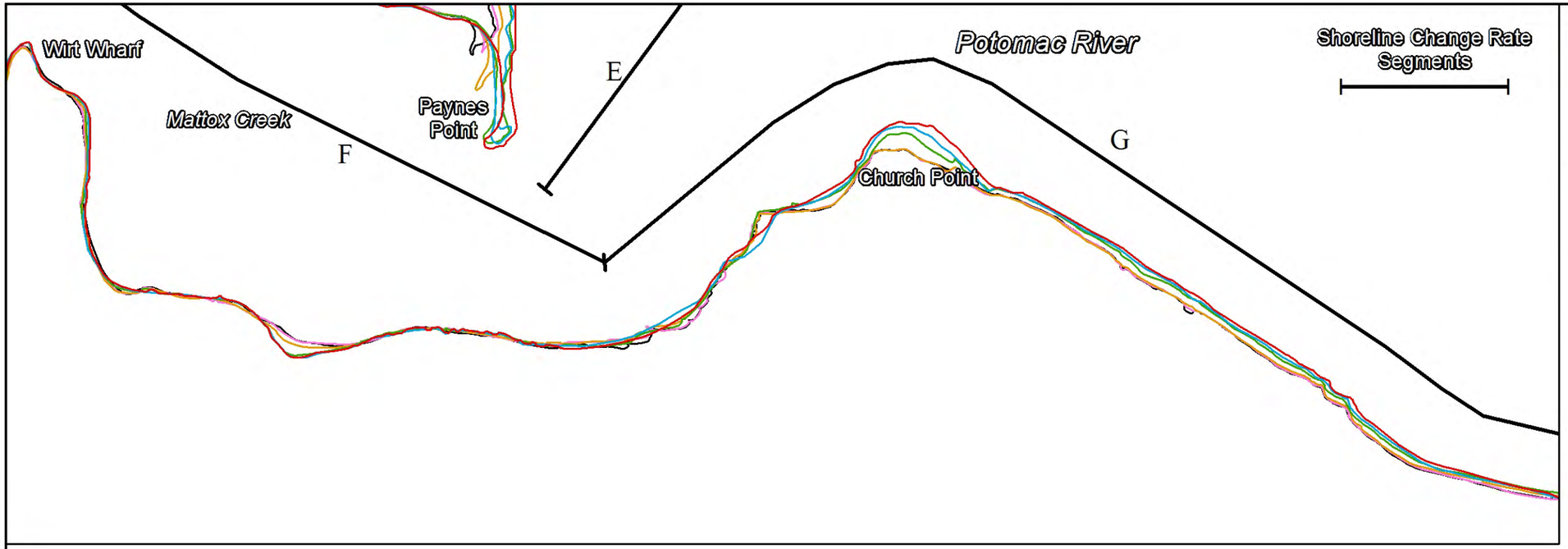

Westmoreland County Virginia

Plate 7

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

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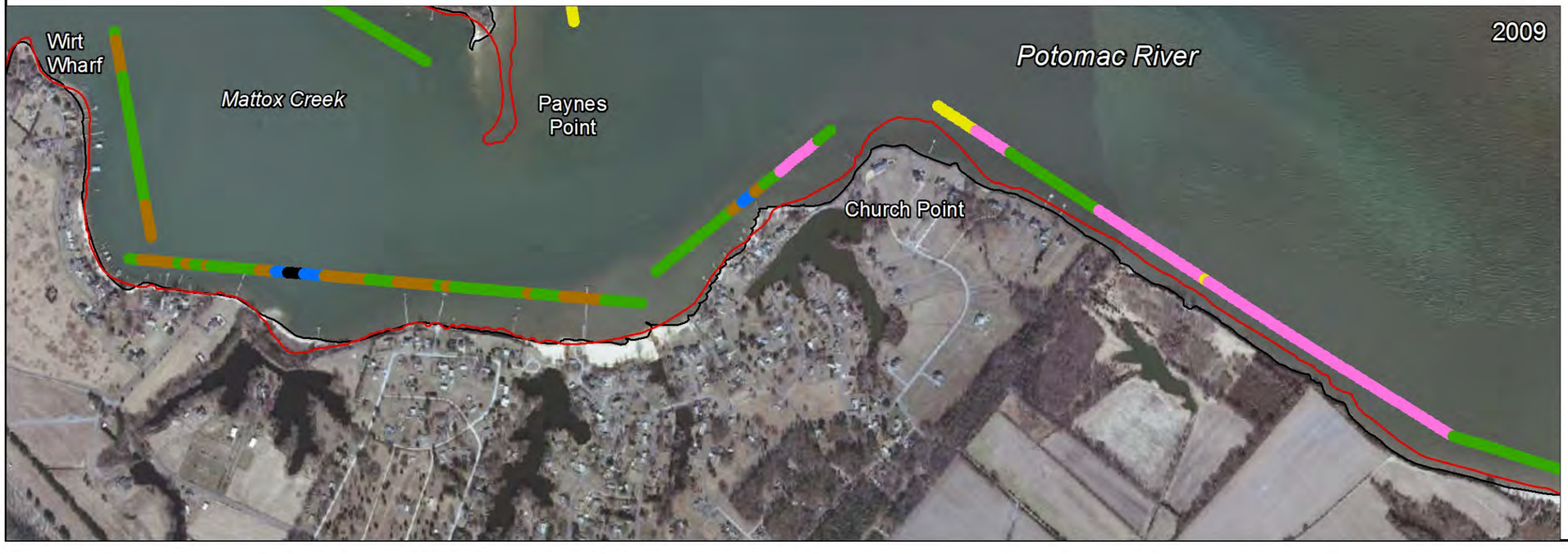

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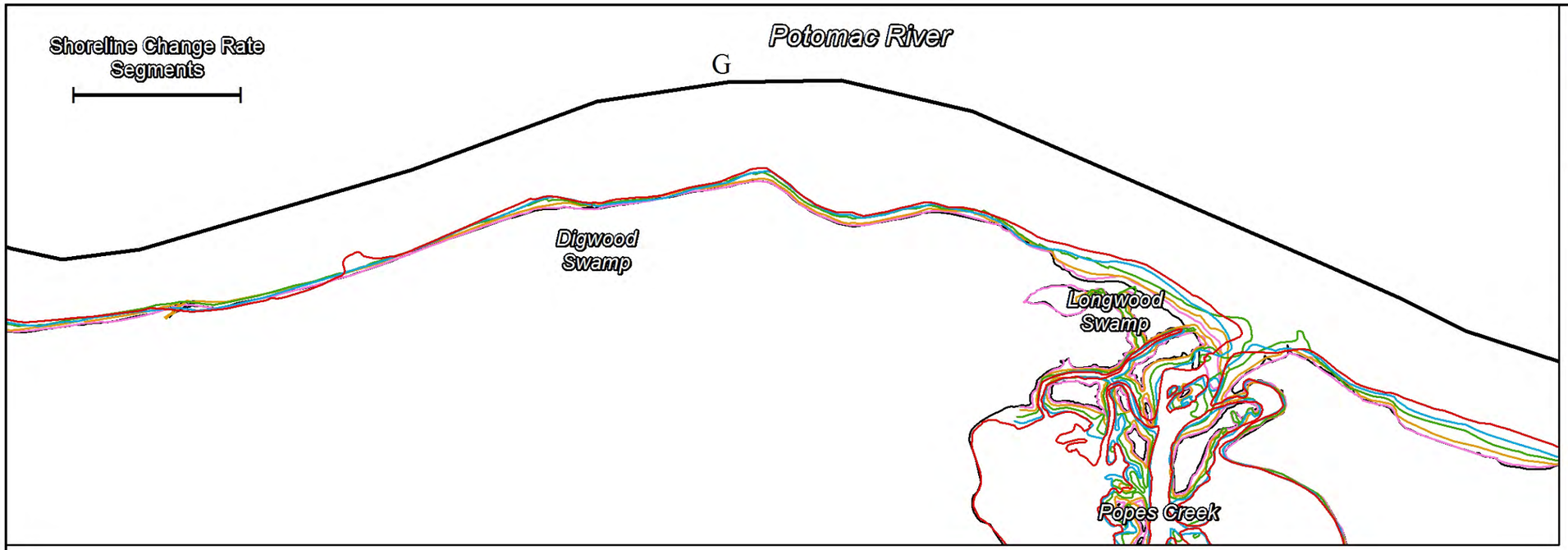
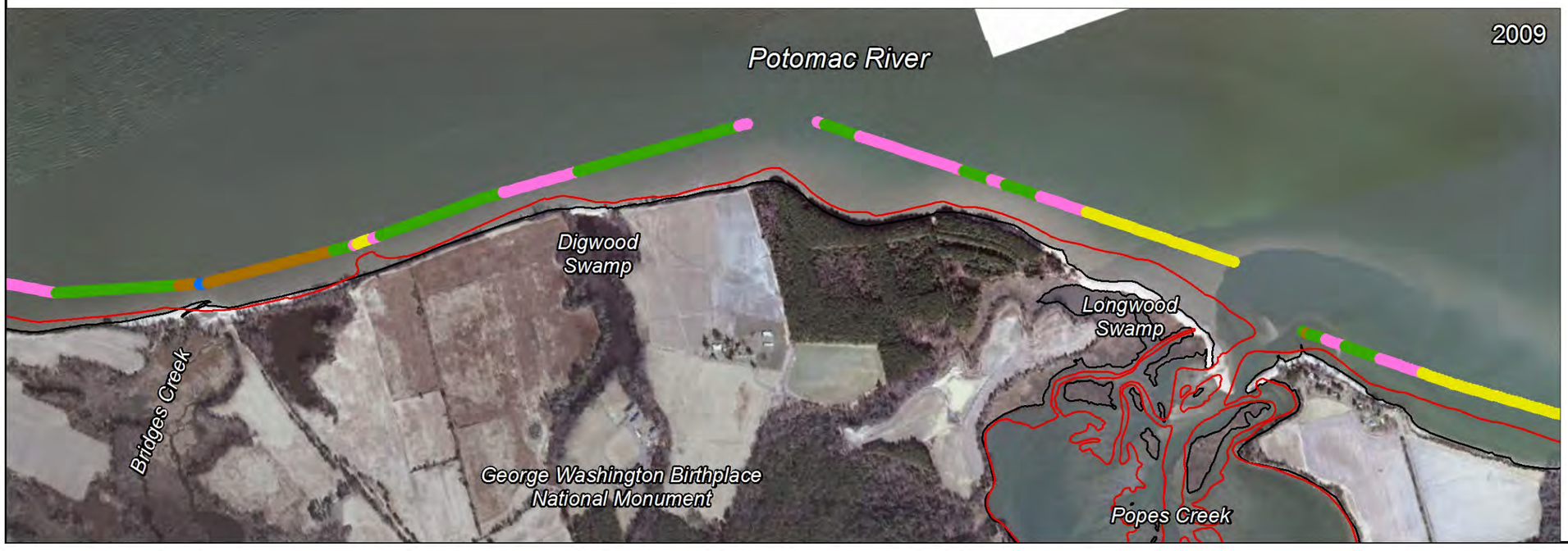
Feet

Westmoreland County Virginia

Plate 8





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- Low Erosion: -1 to -2 (ft/yr)
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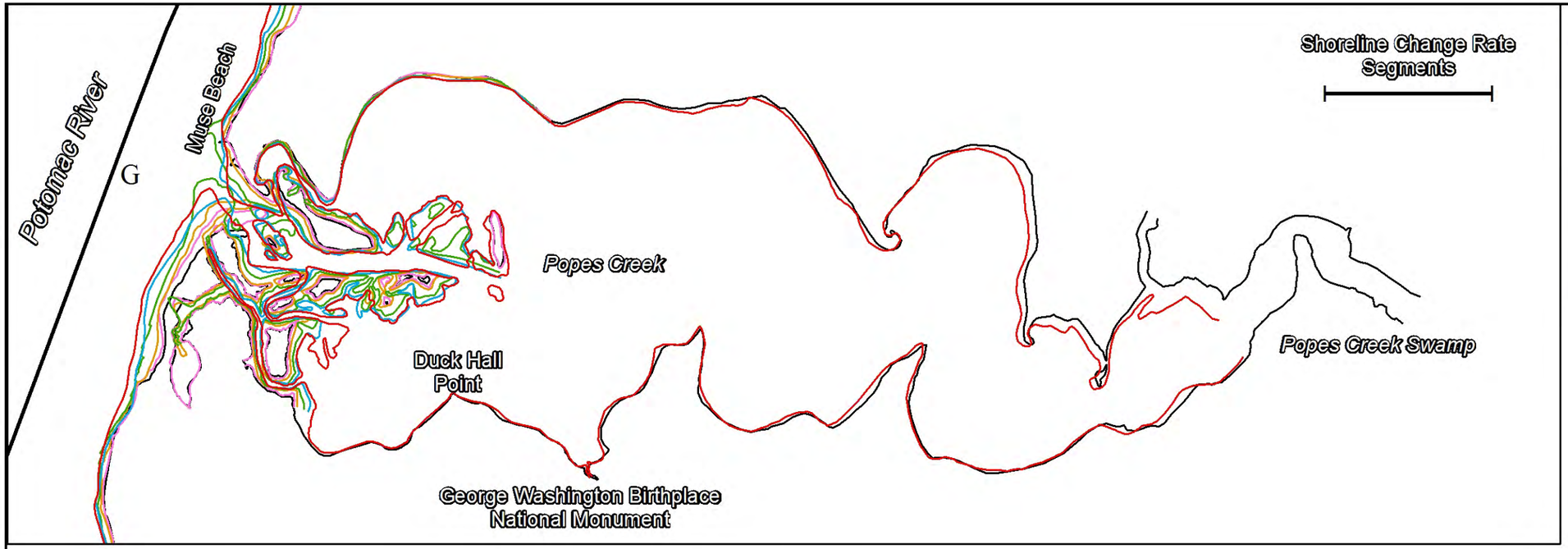
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County
Virginia

Plate 9



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 10

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

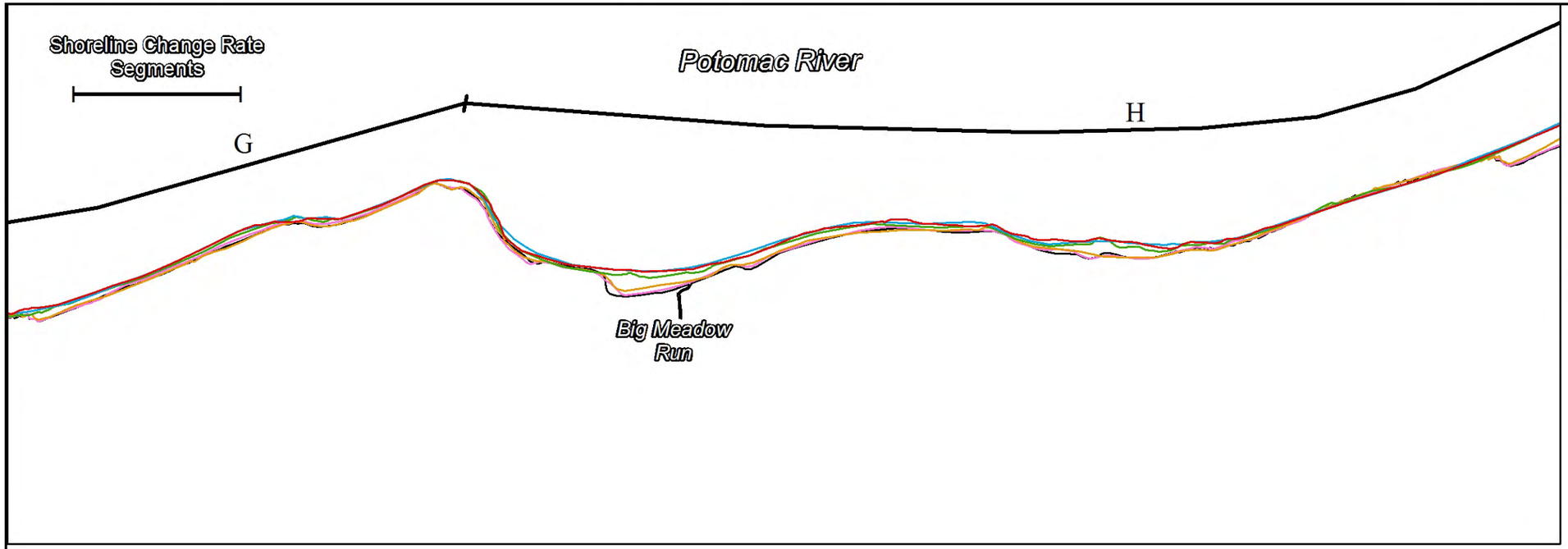
Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



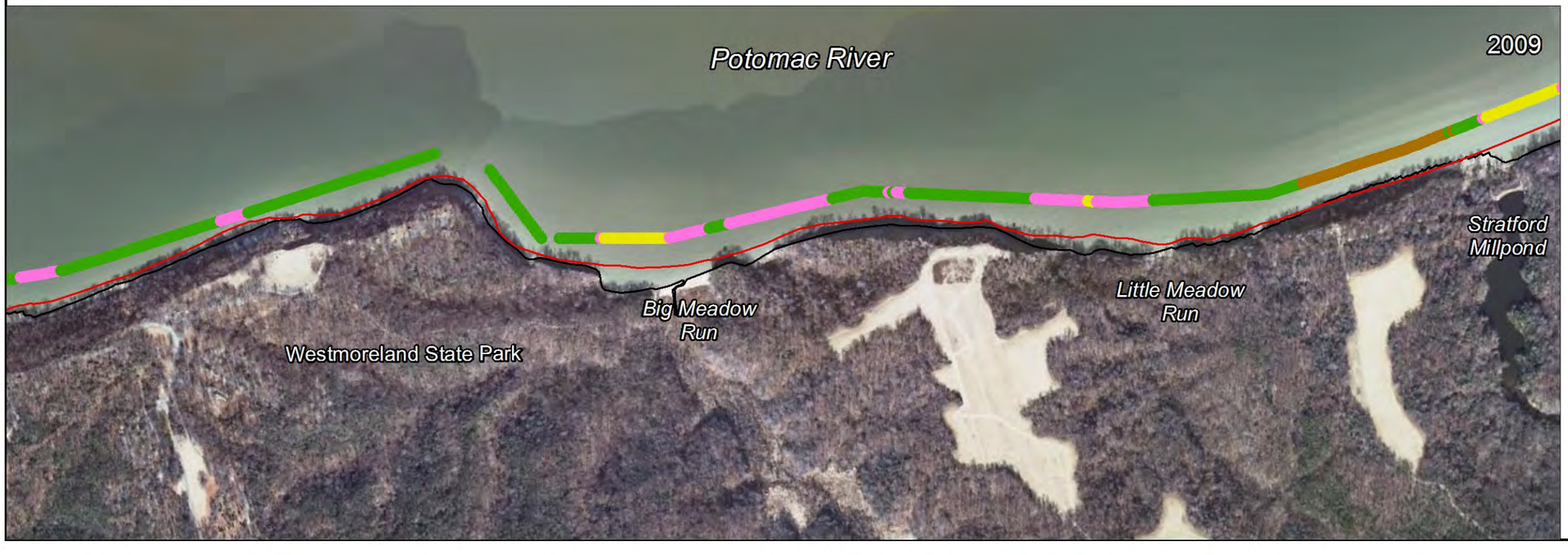
Westmoreland County Virginia

Plate 11

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Shoreline Change Rate Segments

Potomac River

H

Nomini Cliffs

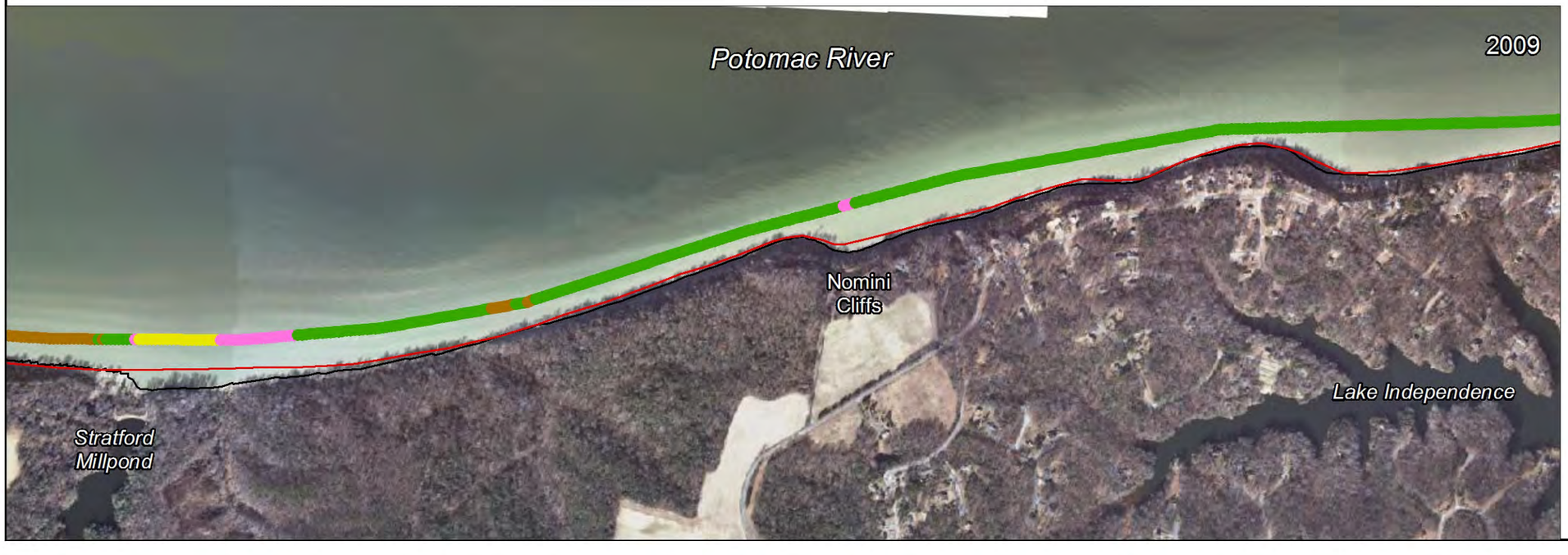
Westmoreland County Virginia

Plate 12

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



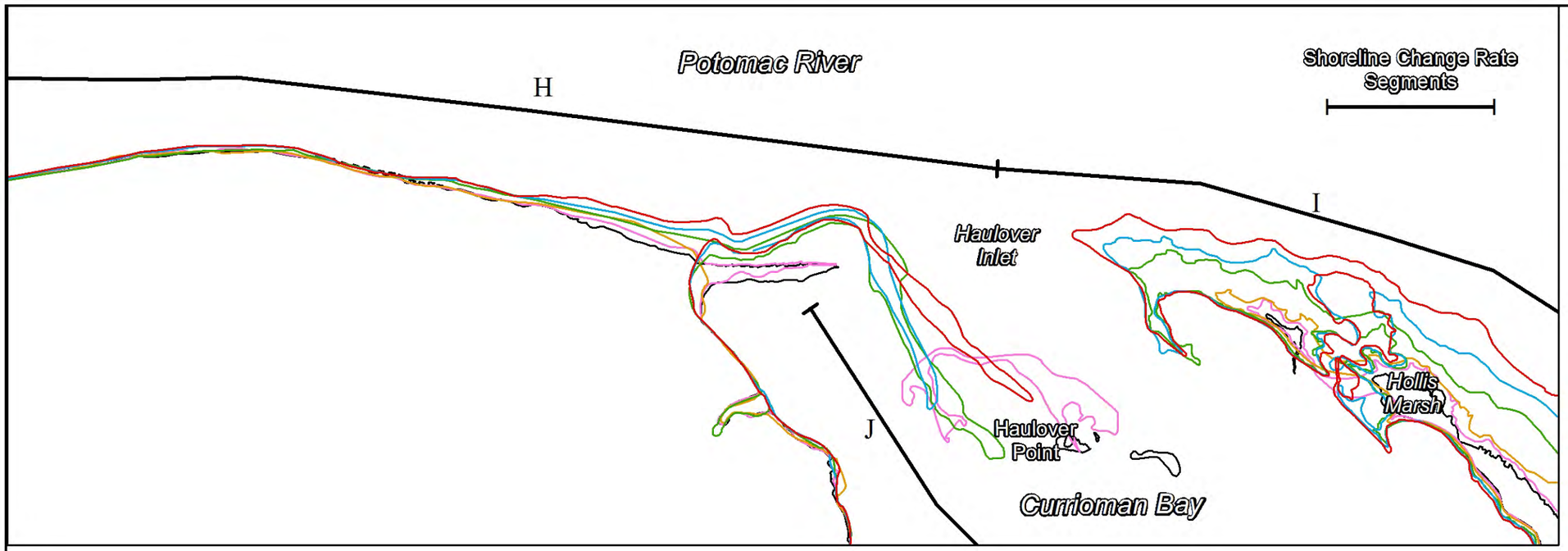
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 13



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program VIMS

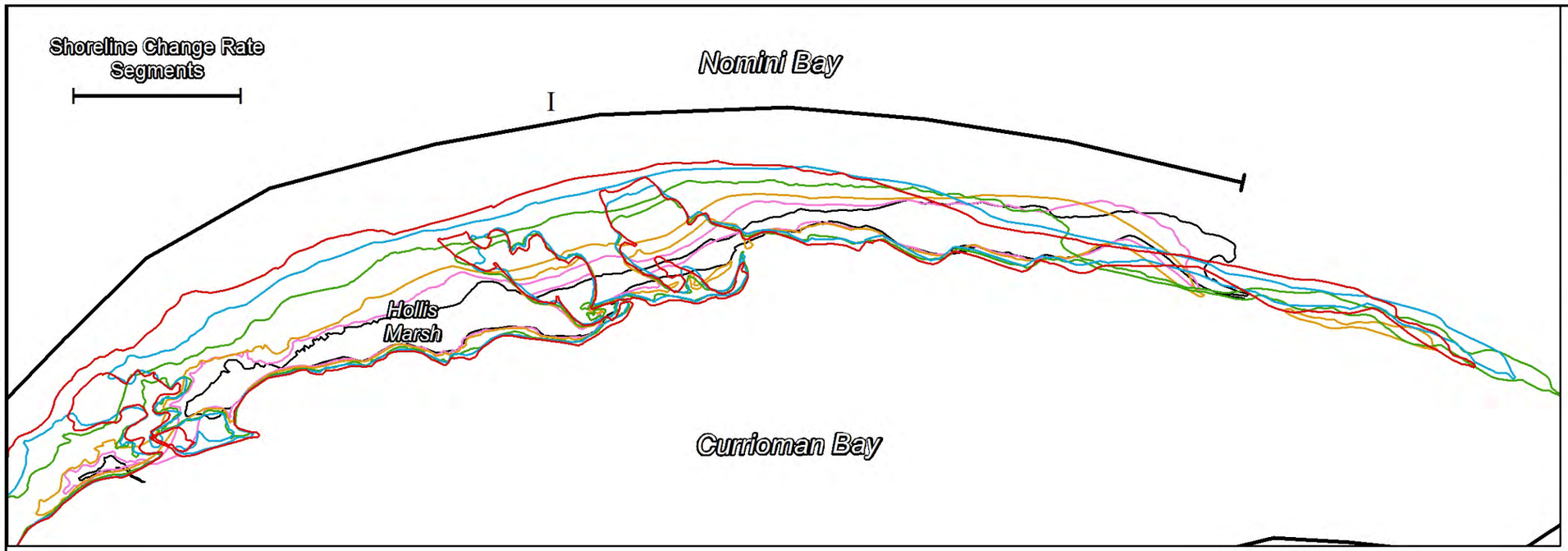
N

1,000 0 1,000

Feet

Westmoreland County Virginia

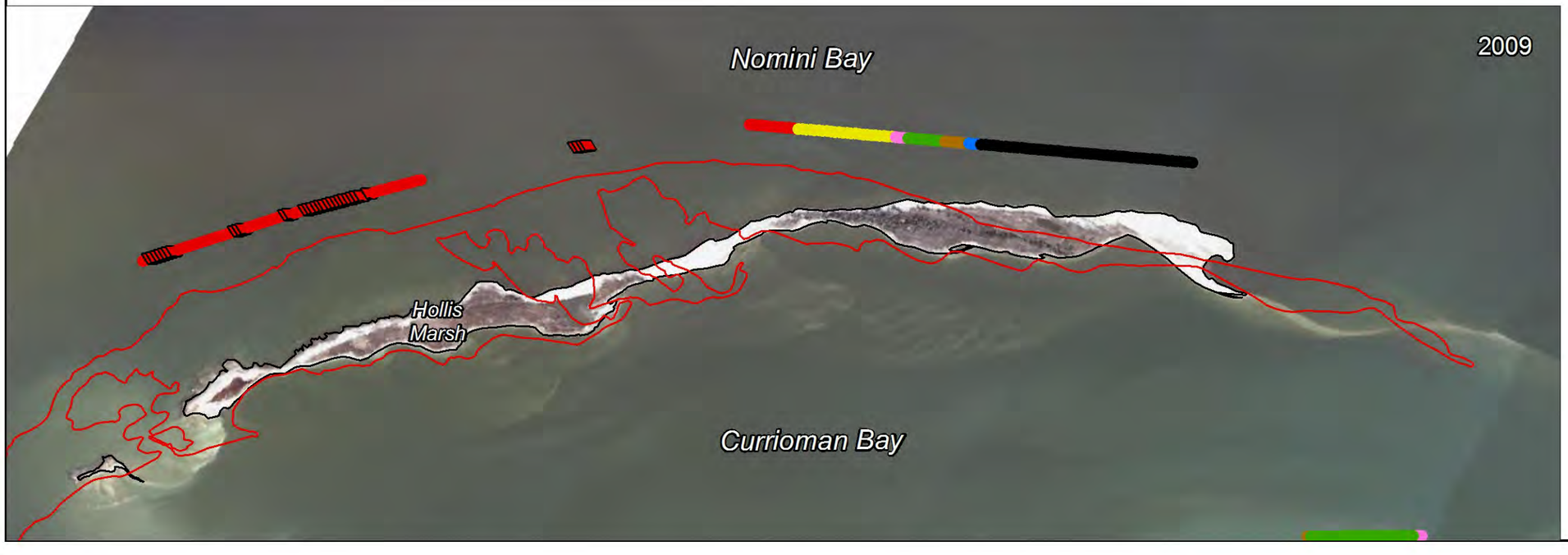
Plate 14



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 15

Currioman Bay

J

Currioman Creek

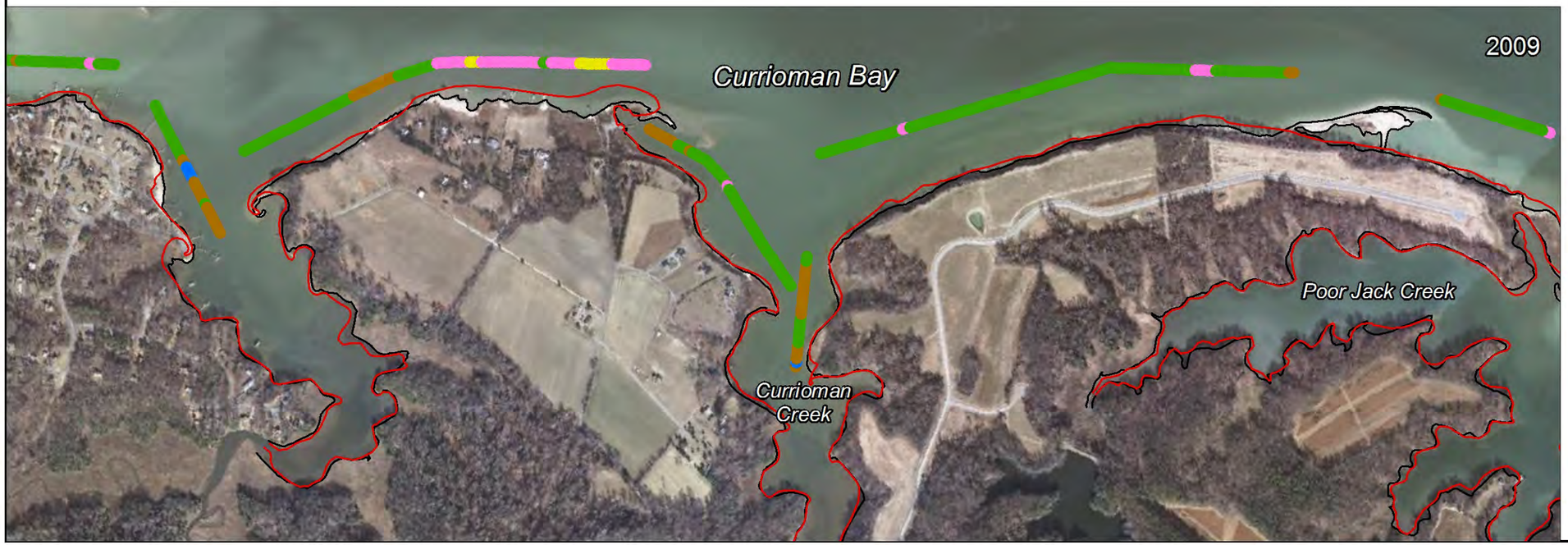
Poor Jack Creek

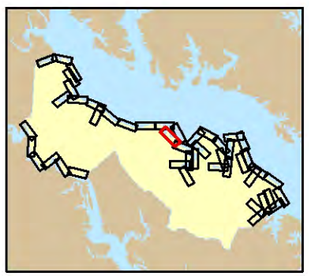
Shoreline Change Rate Segments

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)





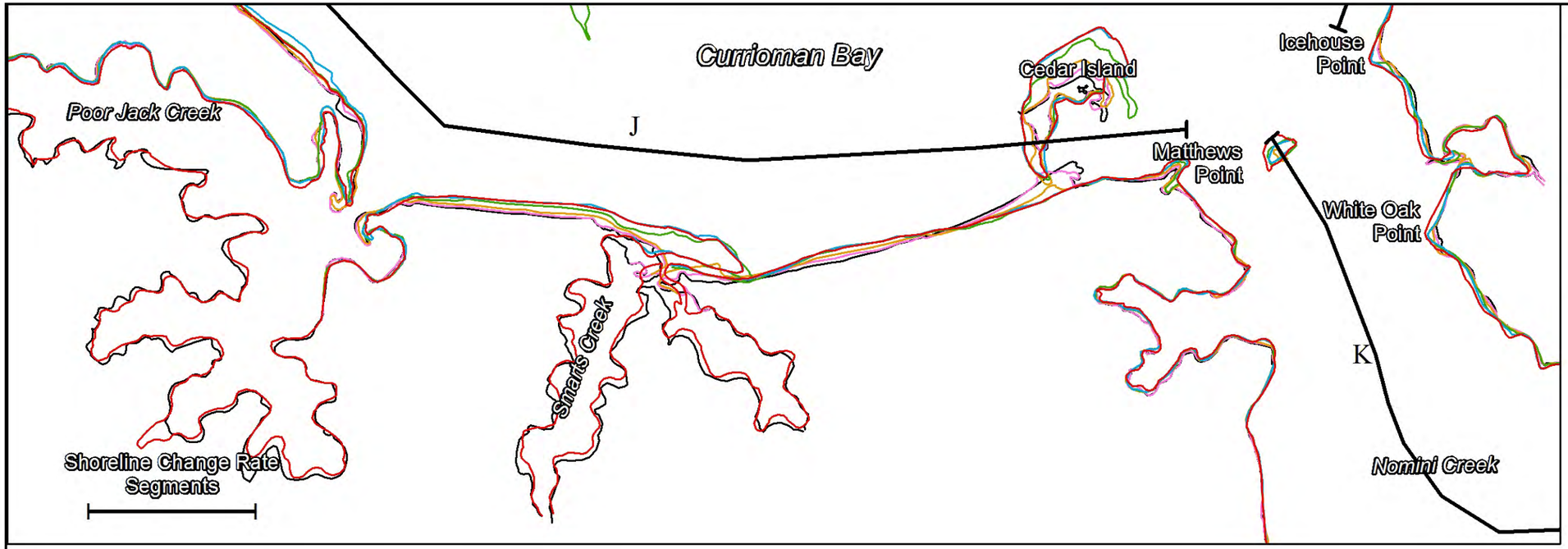
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

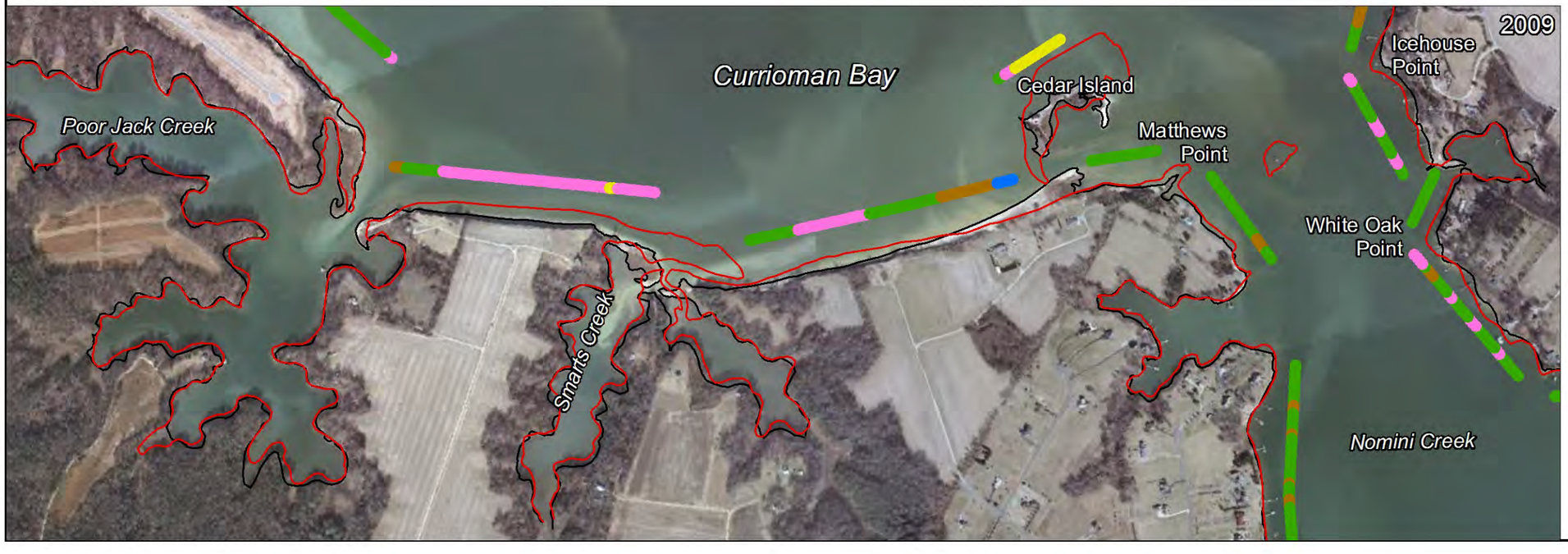
Plate 16



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



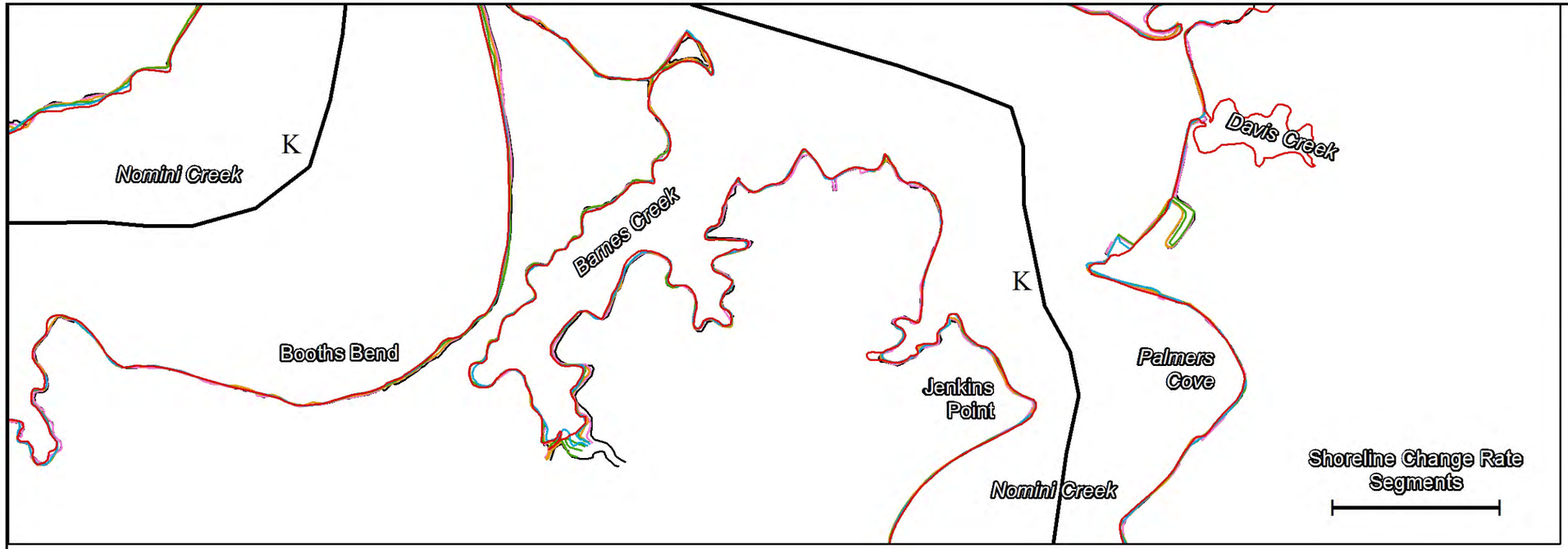
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 17



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

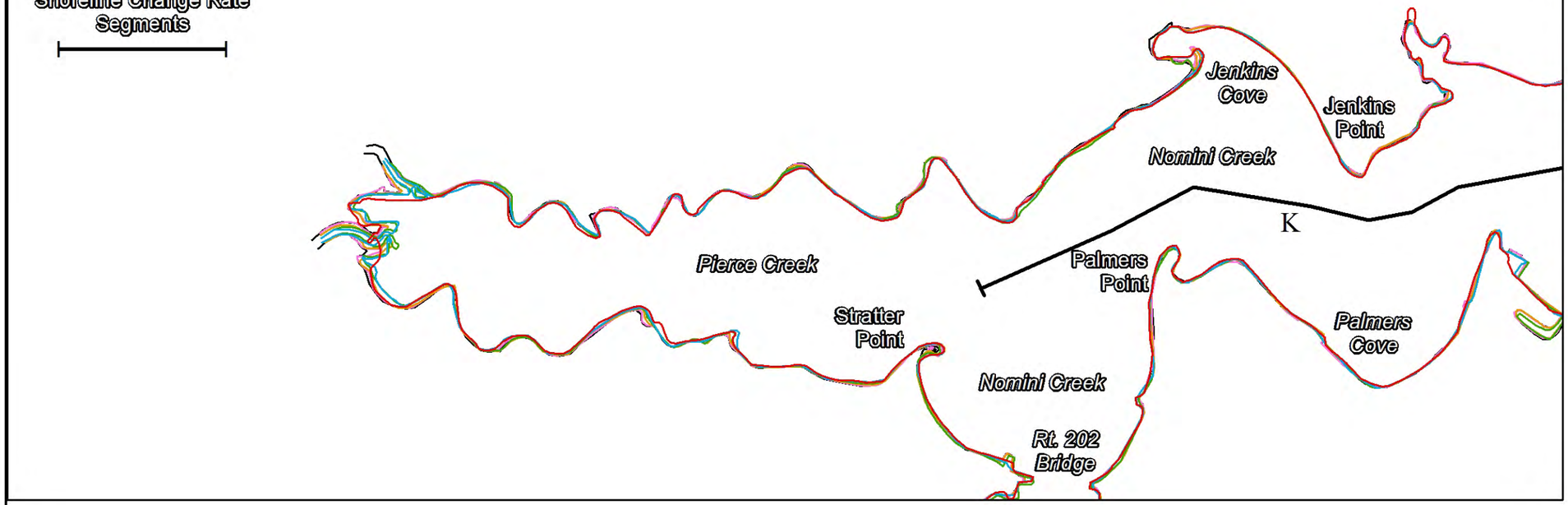
Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County Virginia

Plate 18

Shoreline Change Rate Segments



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
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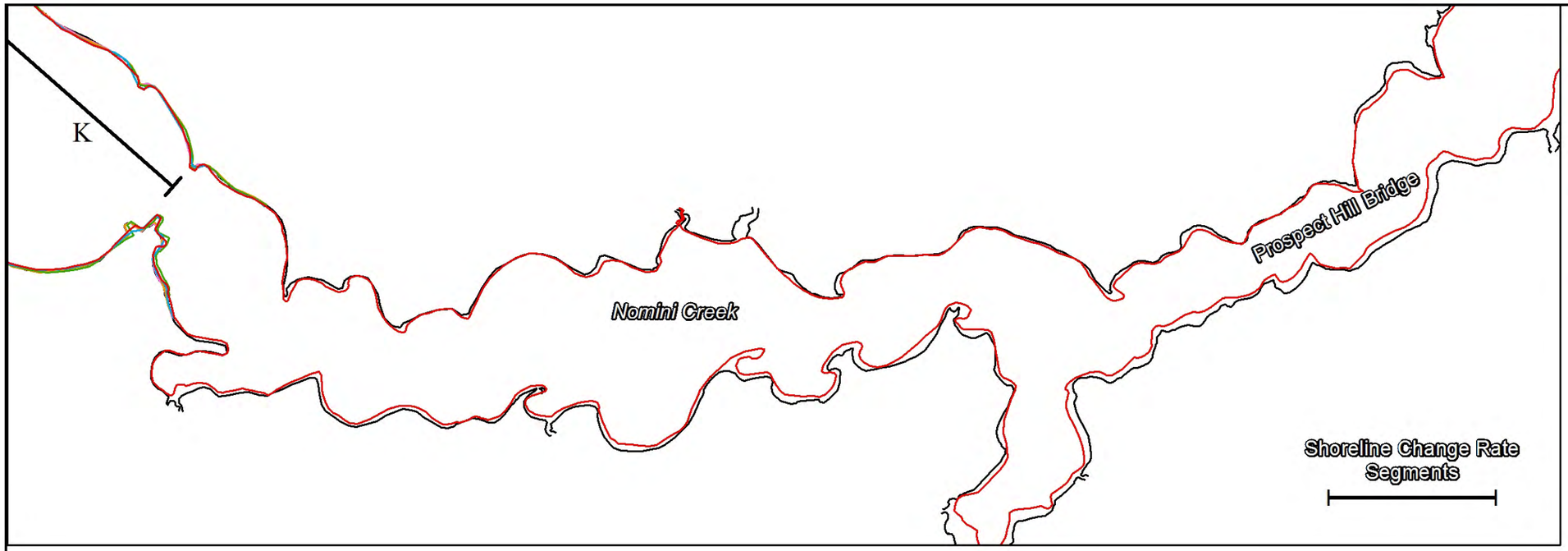
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County Virginia

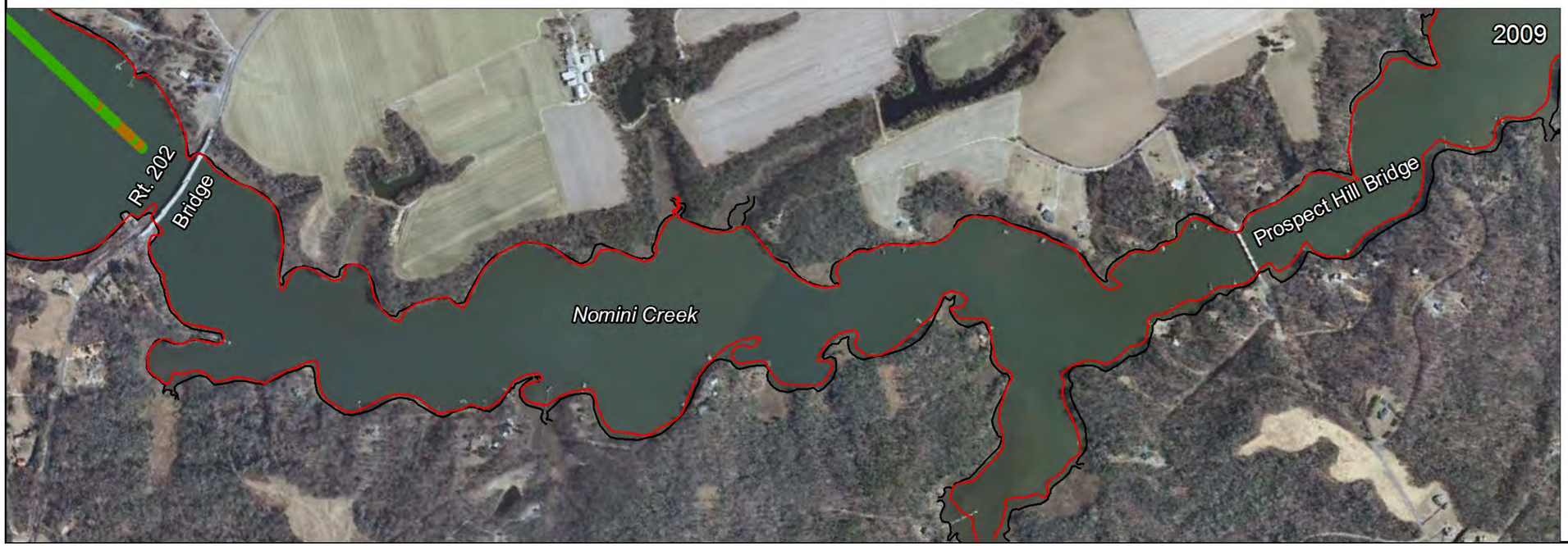
Plate 19

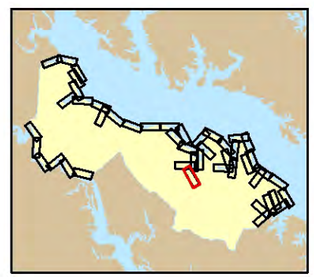


1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)





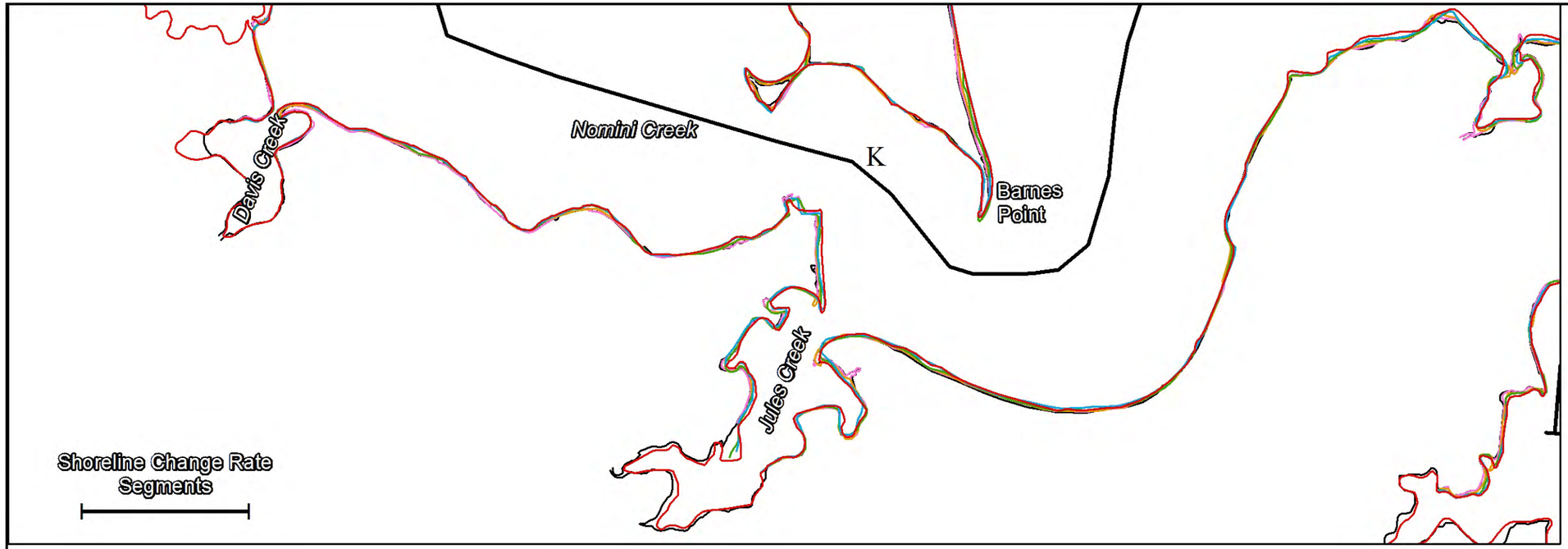
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

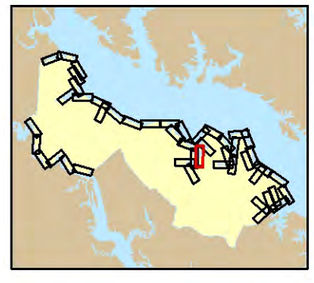
Plate 20



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

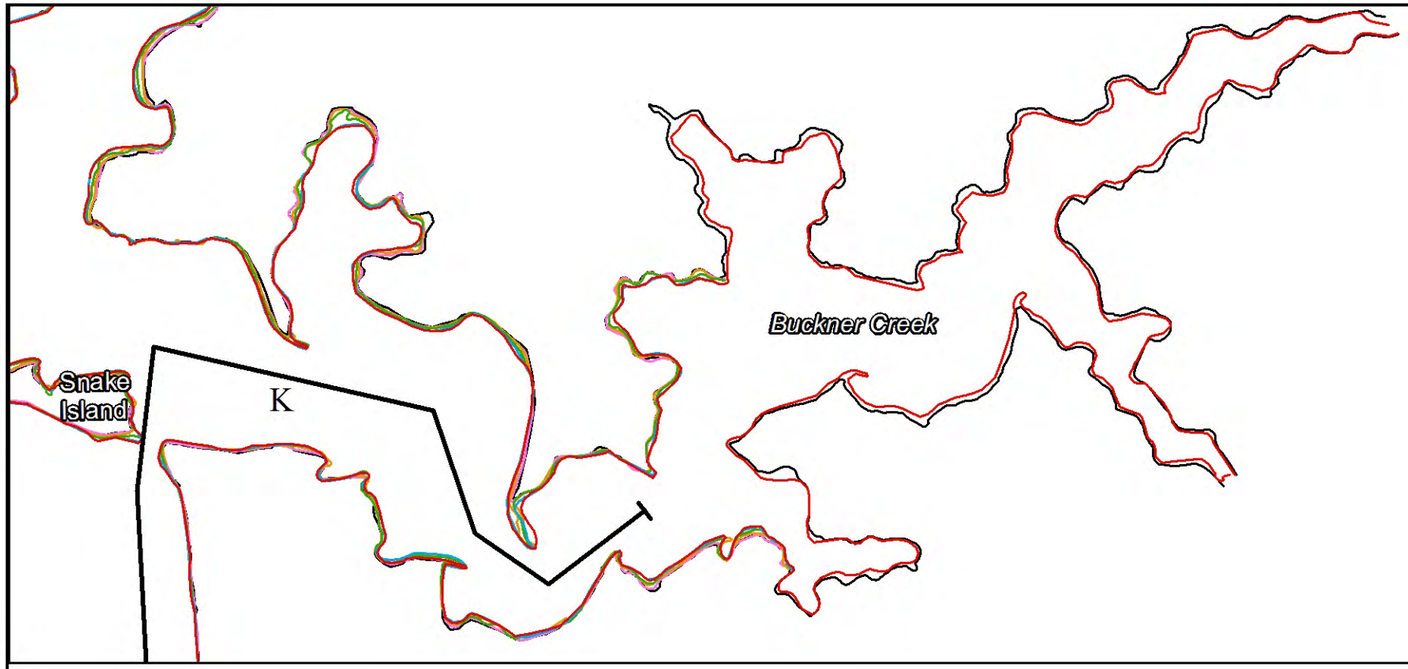
- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet



Shoreline Change Rate Segments

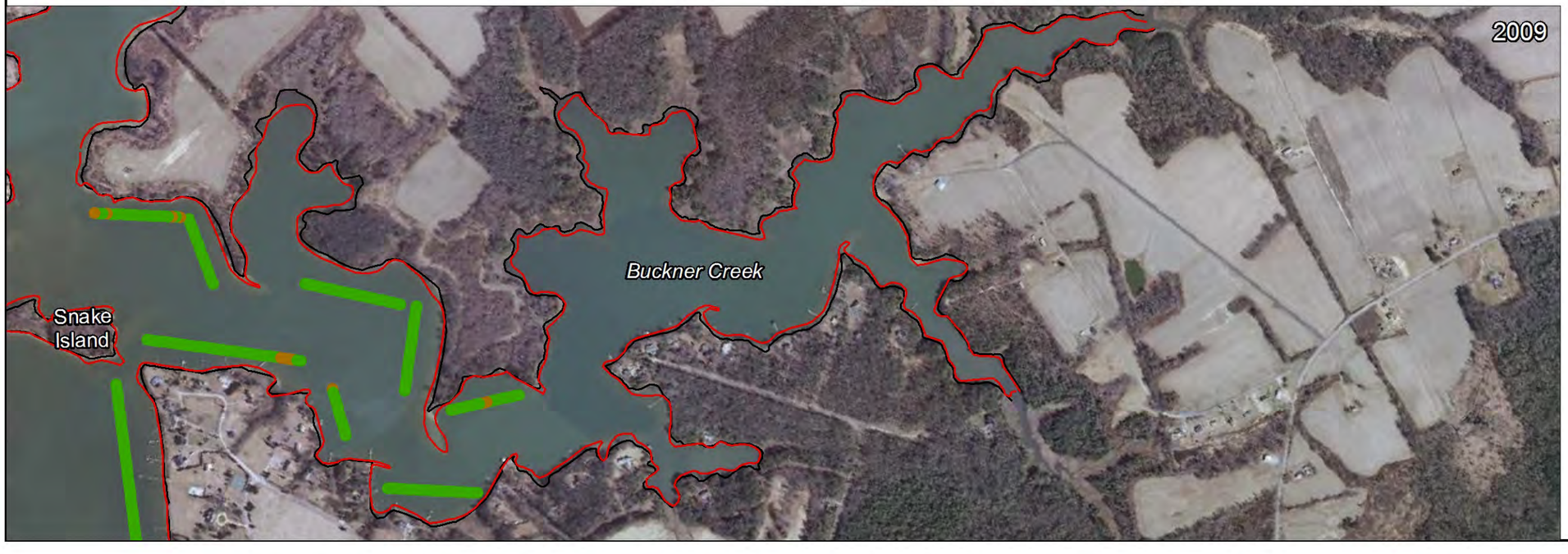
Westmoreland County Virginia

Plate 21

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



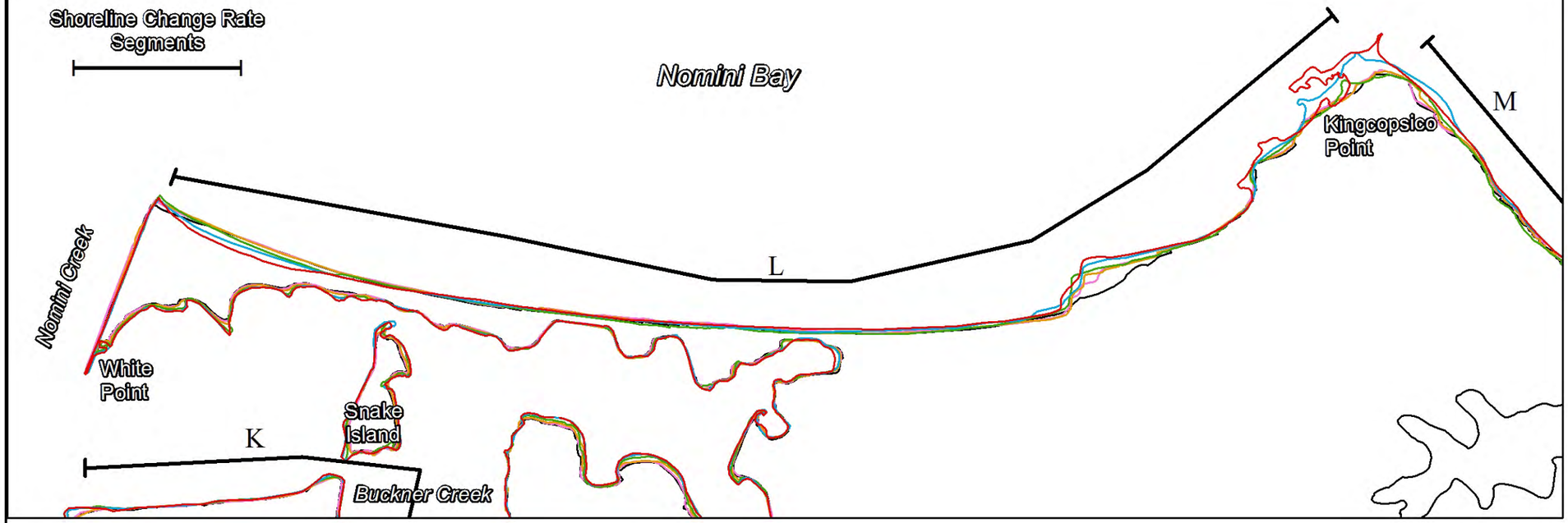
Shoreline Studies Program VIMS

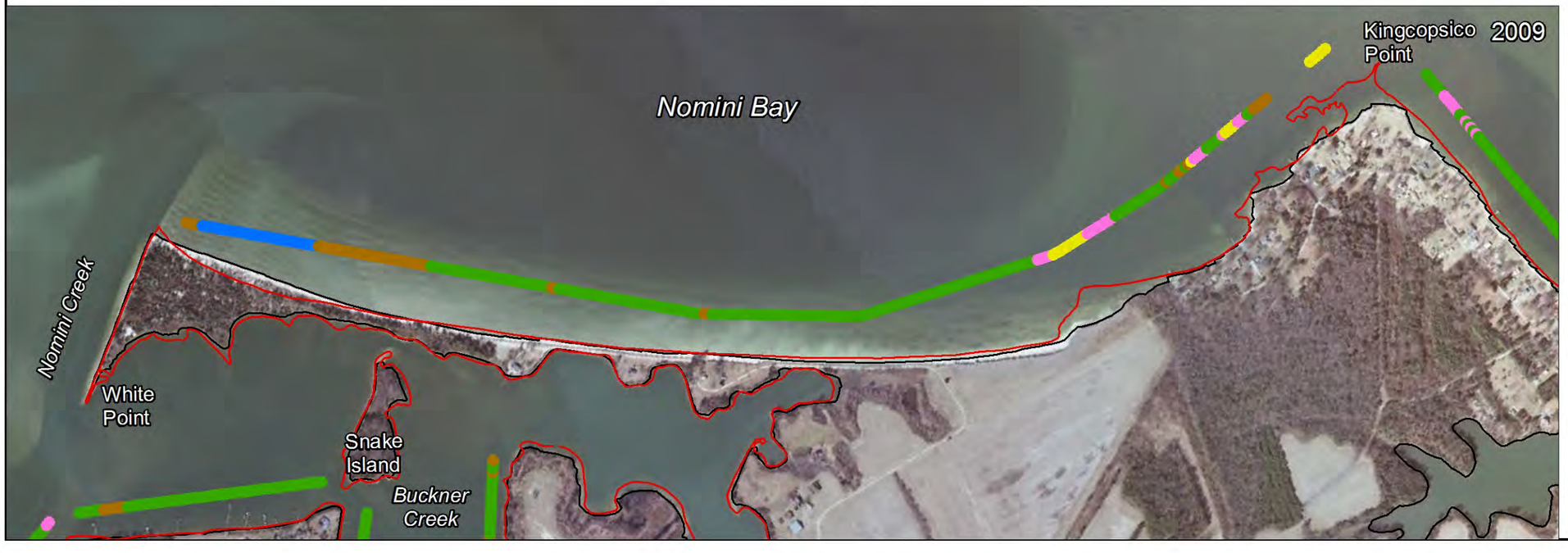
1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 22





1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

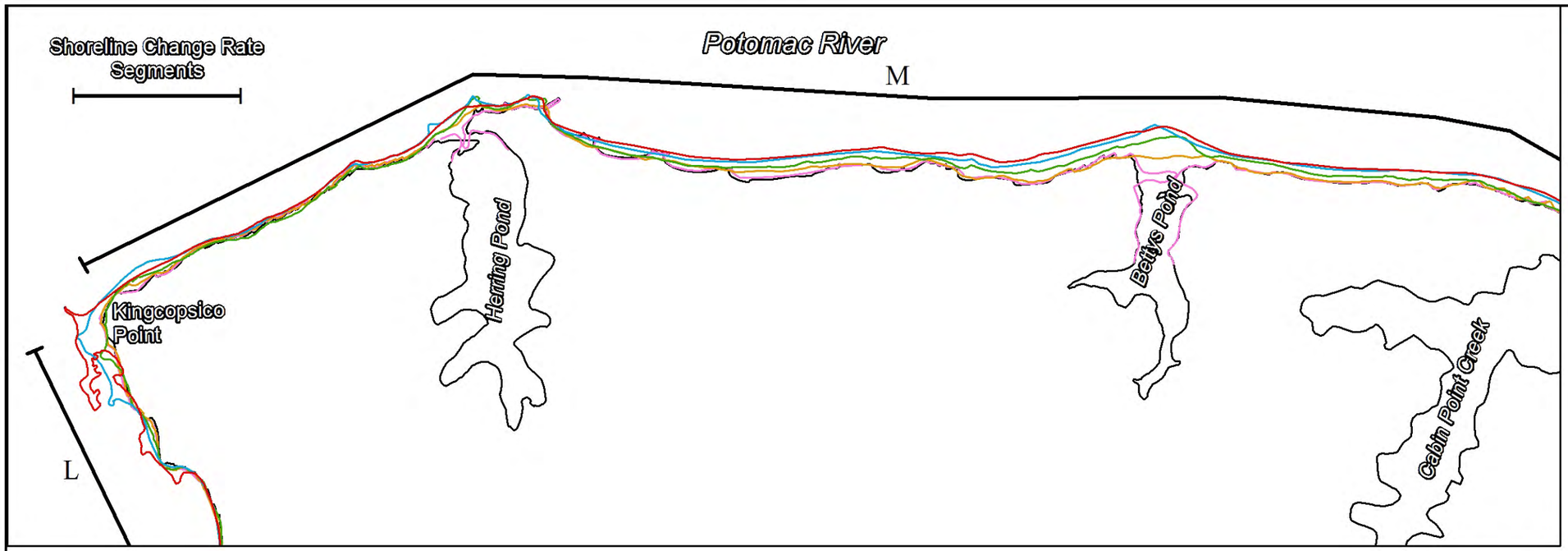
- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County Virginia

Plate 23



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
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- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
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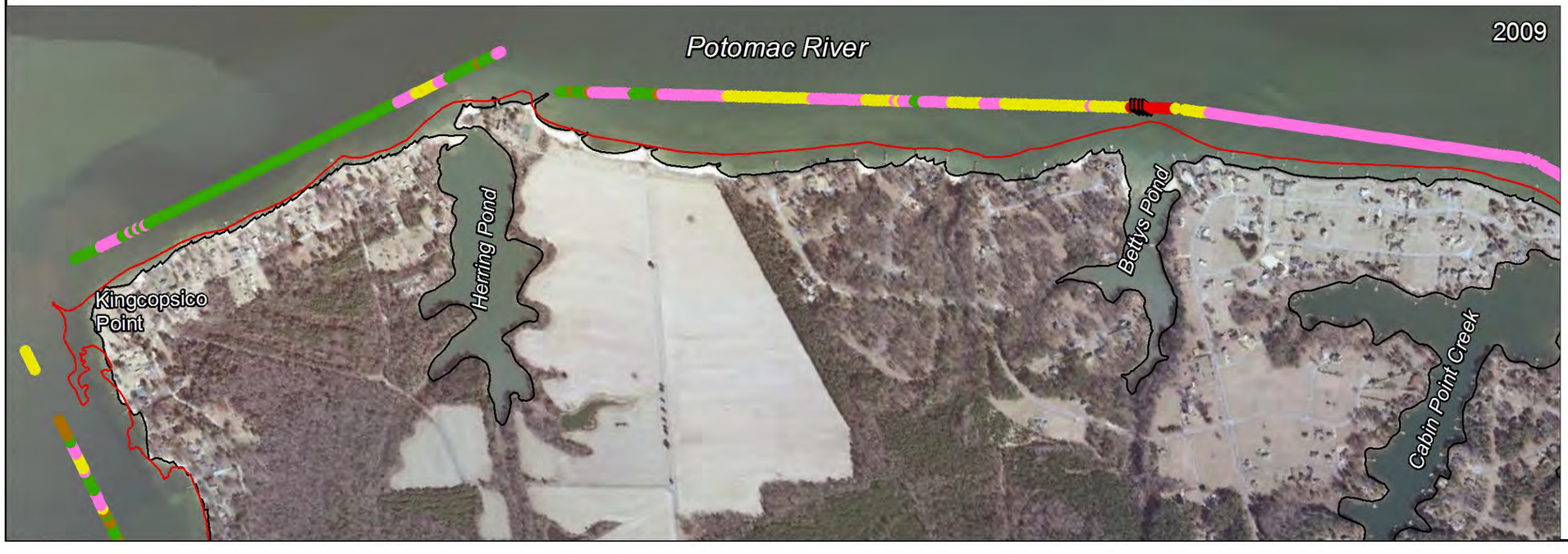


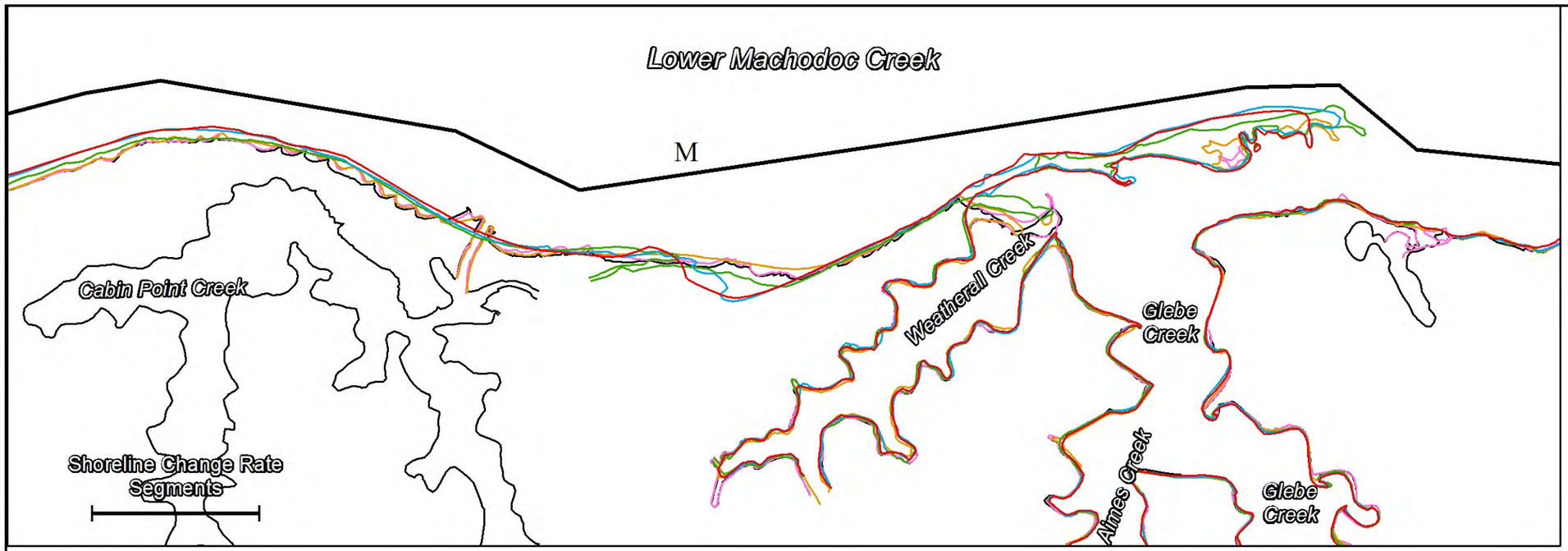
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 24



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
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- High Erosion: -5 to -10 (ft/yr)
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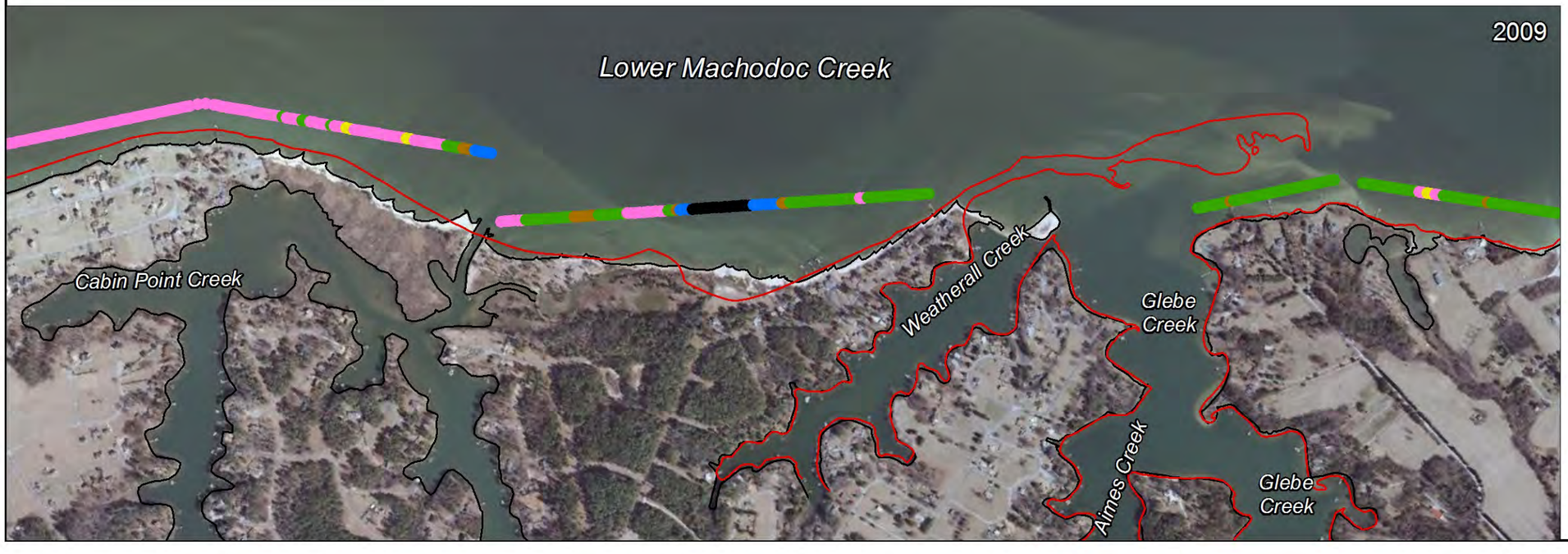


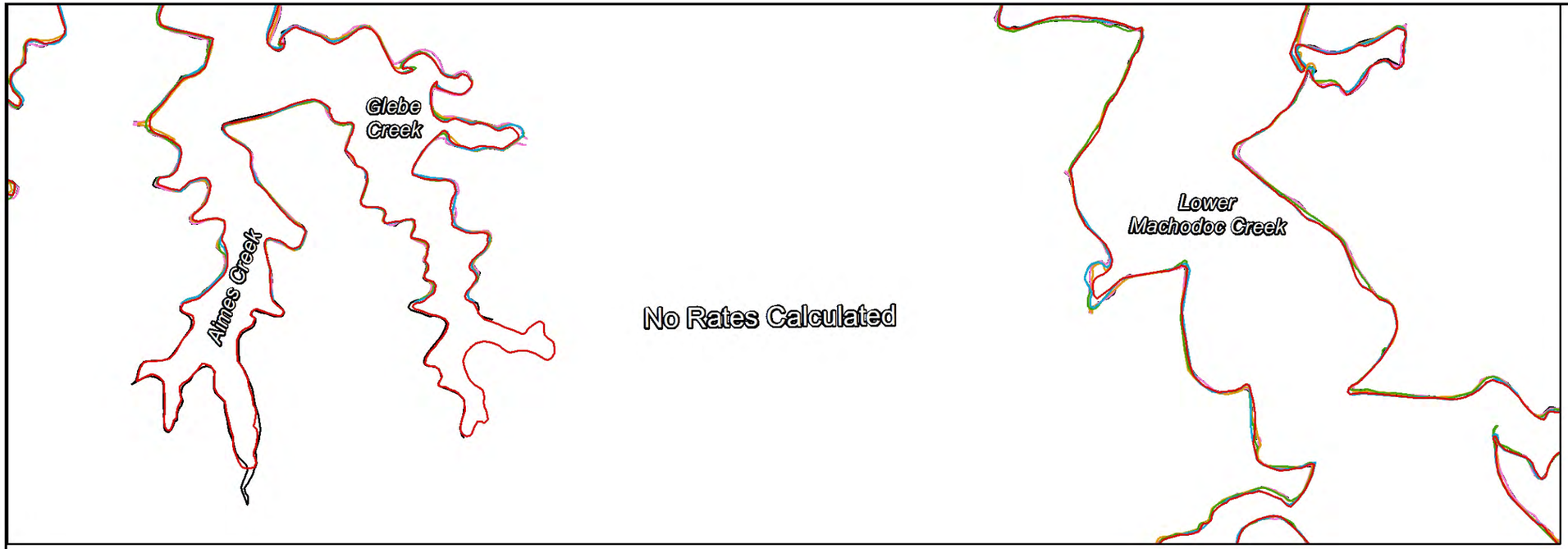
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 25



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
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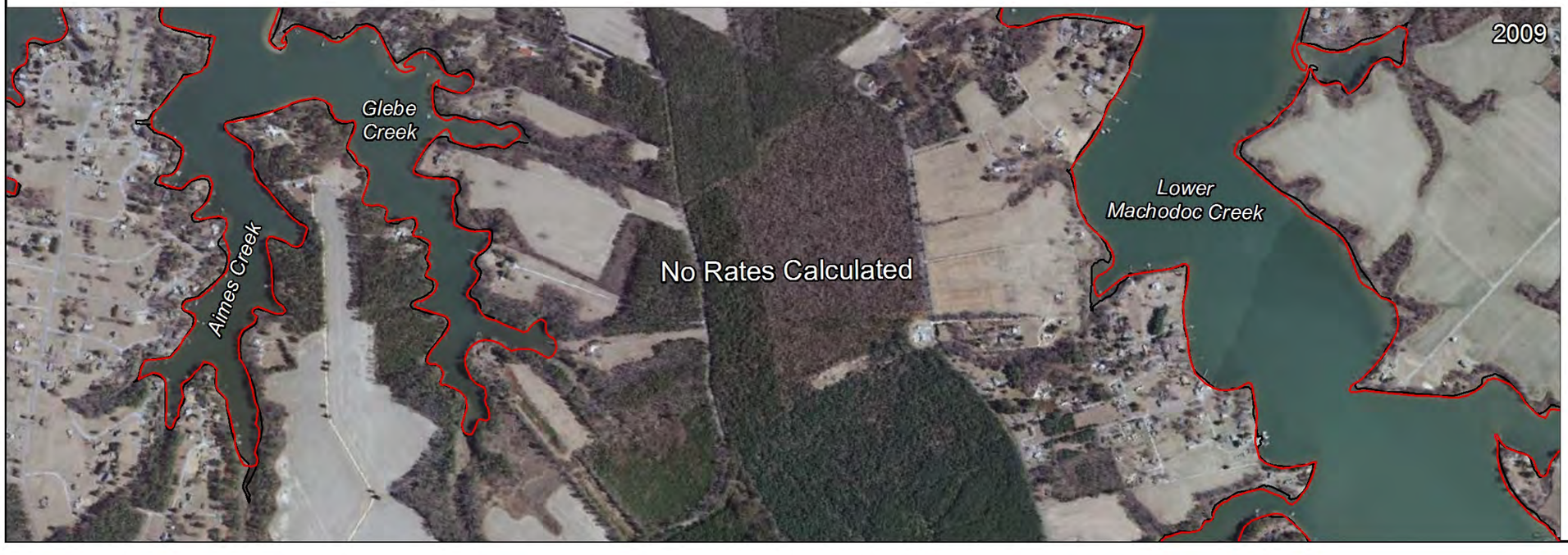


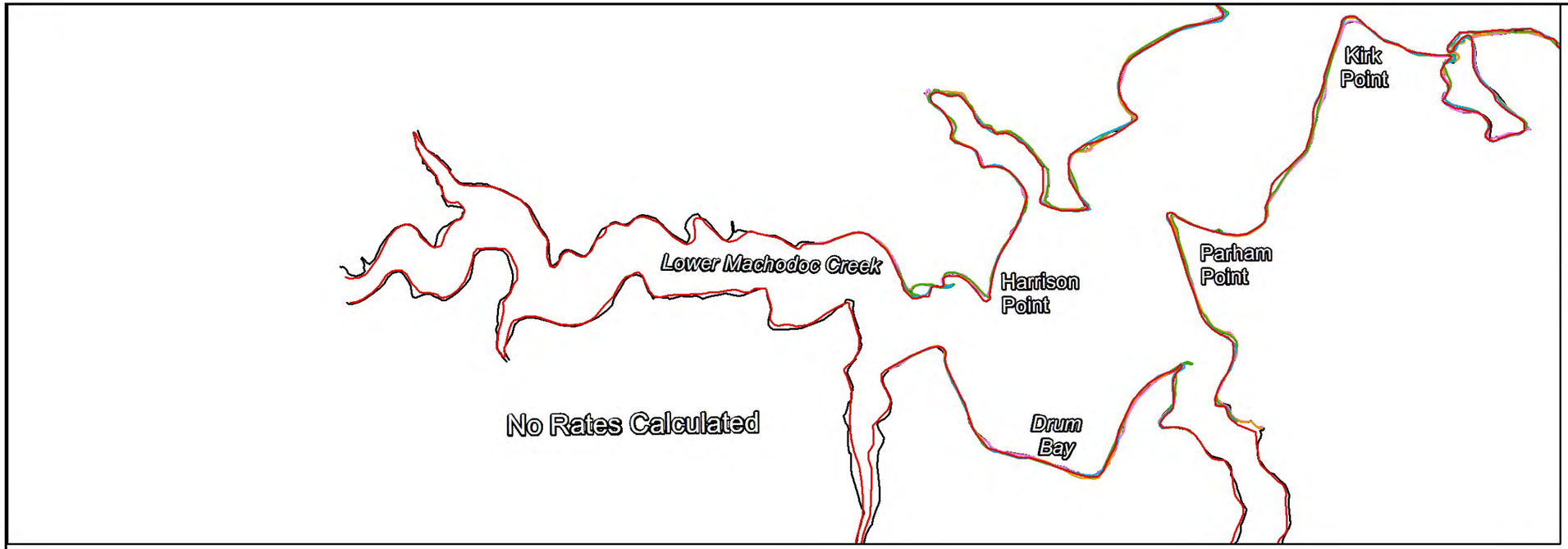
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 26



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
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- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
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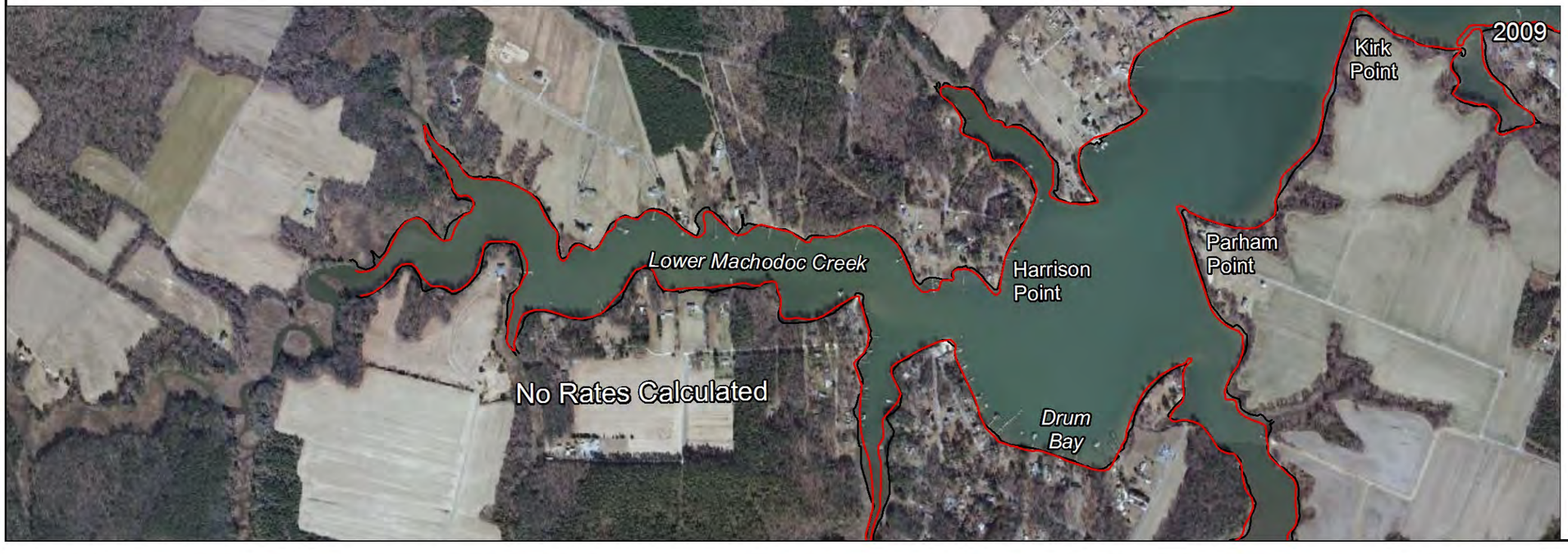
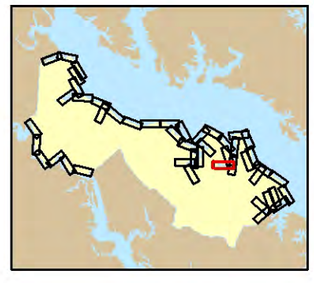




Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Shoreline Change Rate Segments

Kirk Point

Cherry Orchard Point

Lower Machodoc Creek

Church Point

Cupola Point

Hester Cove

M

Westmoreland County Virginia

Plate 27

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

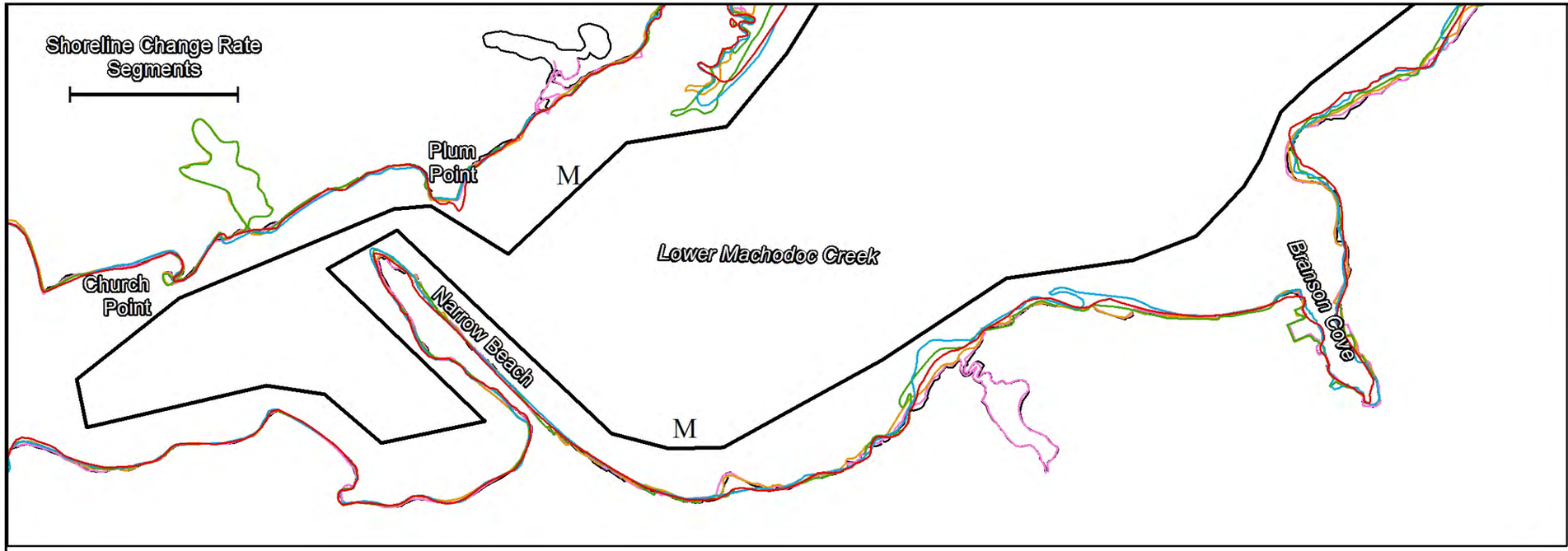
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 28



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

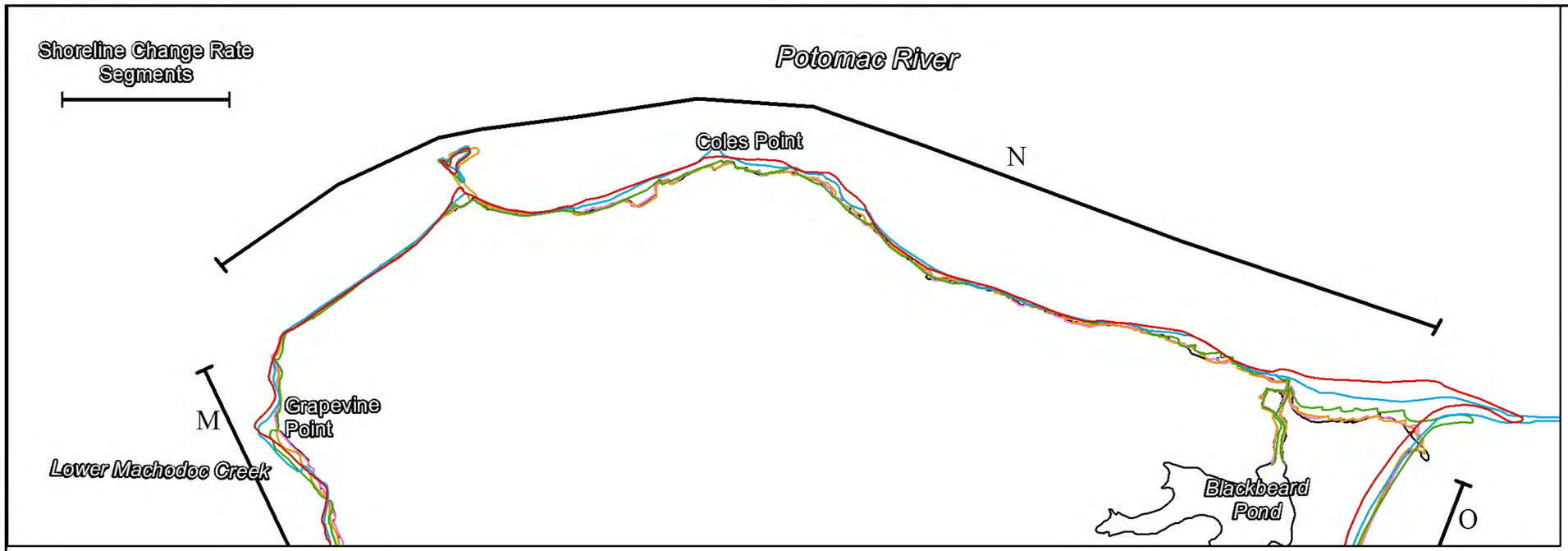
Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



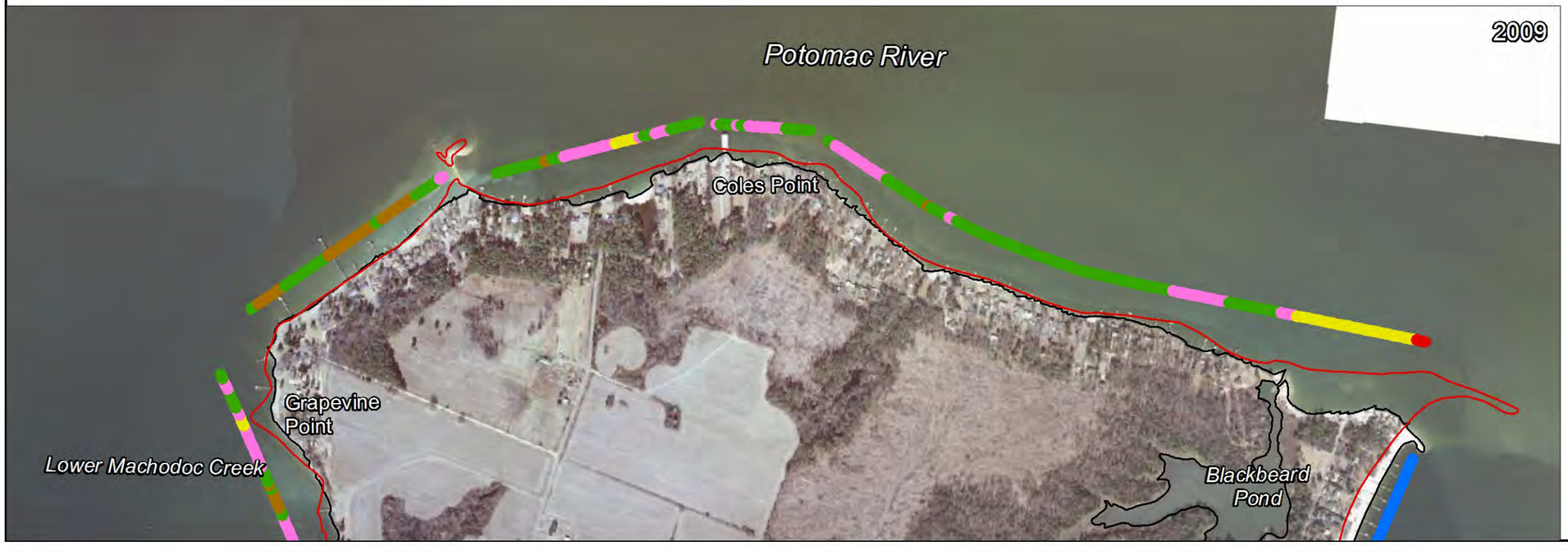
Westmoreland County Virginia

Plate 29

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

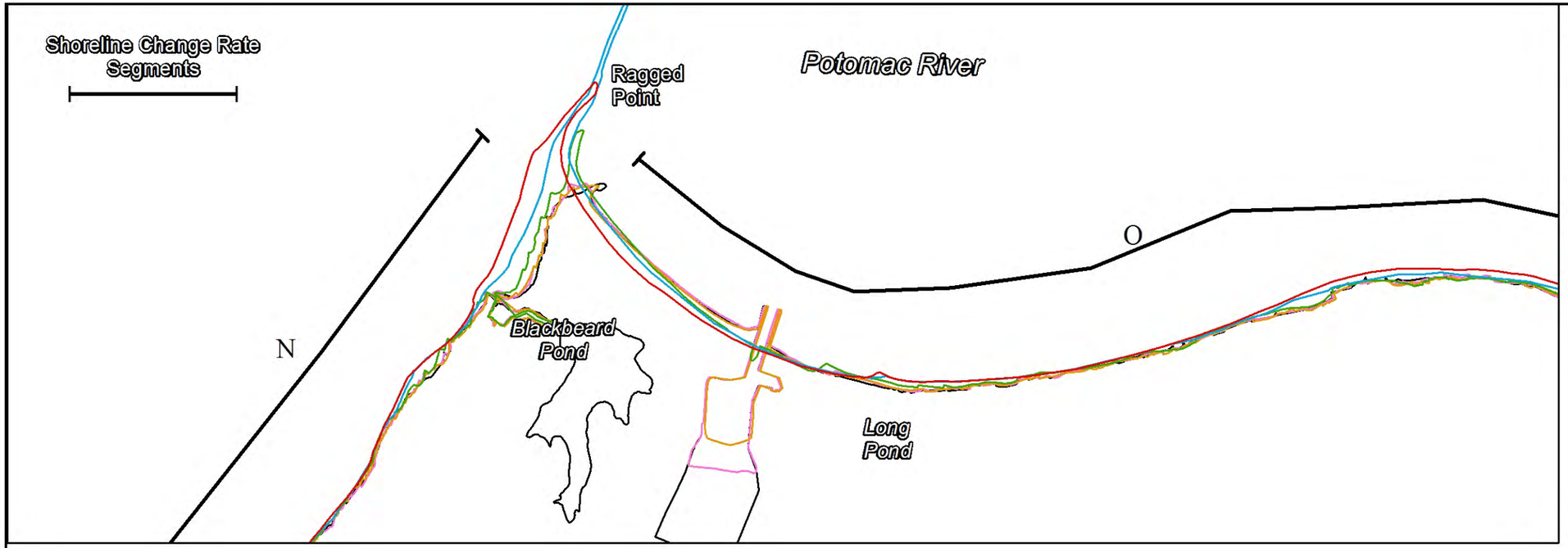
- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet



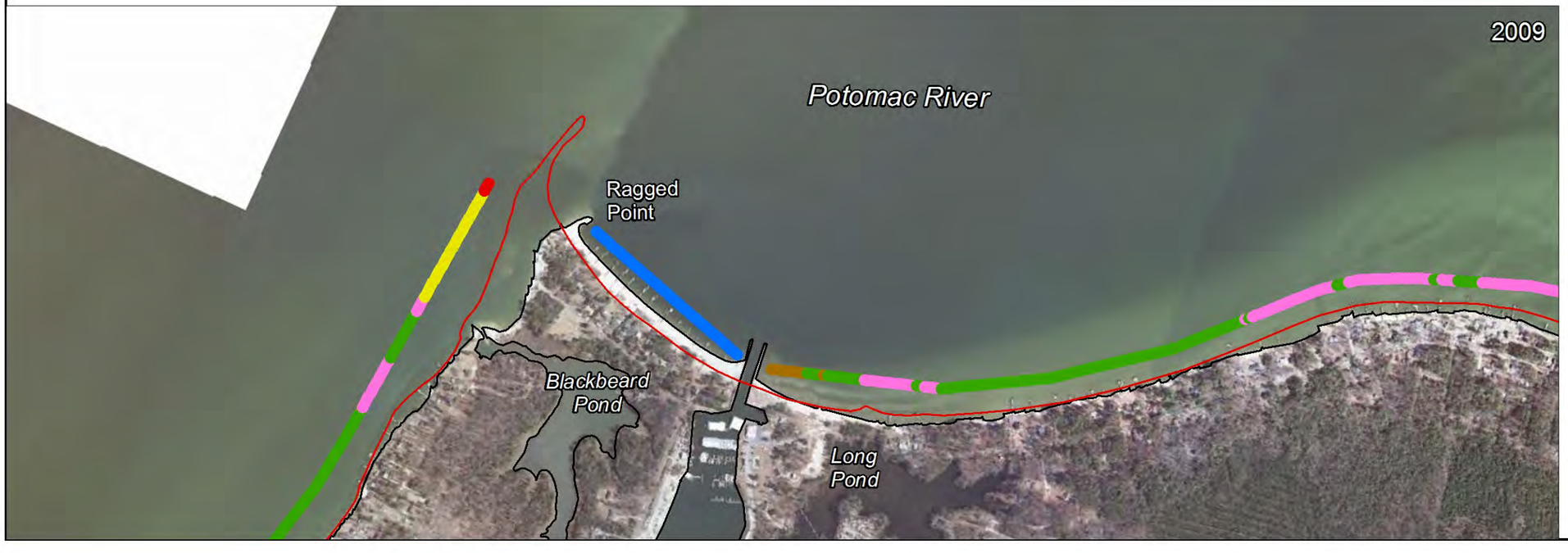
Westmoreland County Virginia

Plate 30

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



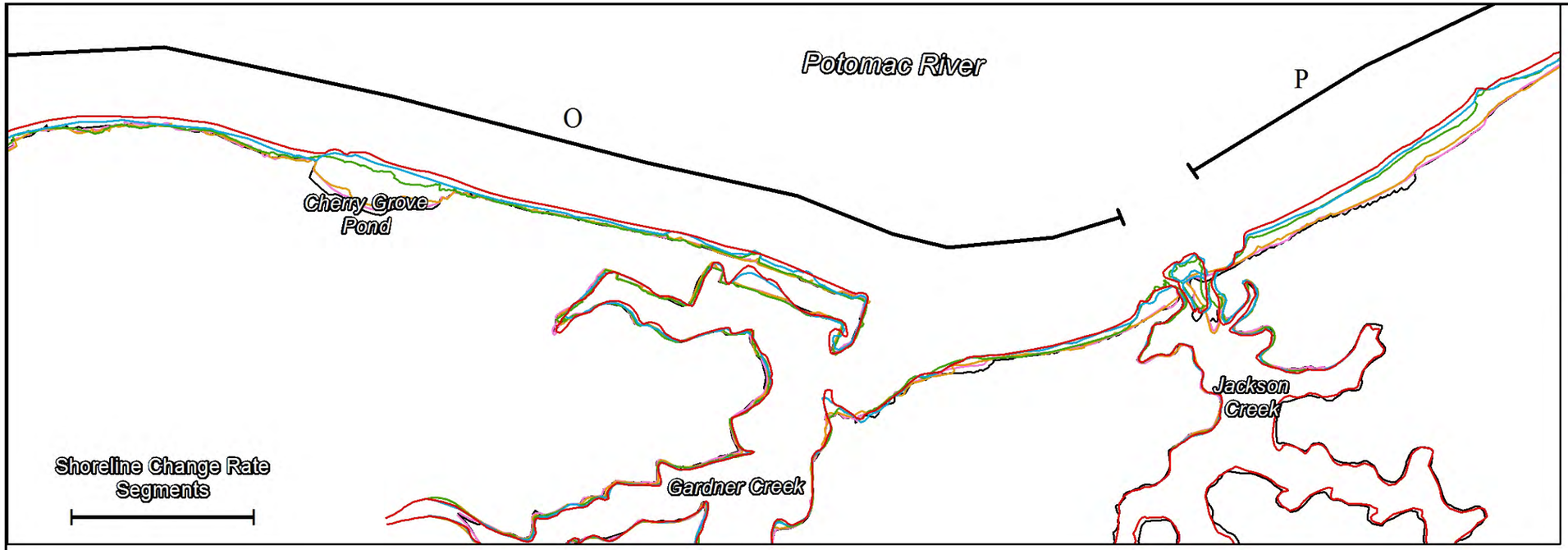
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 31



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

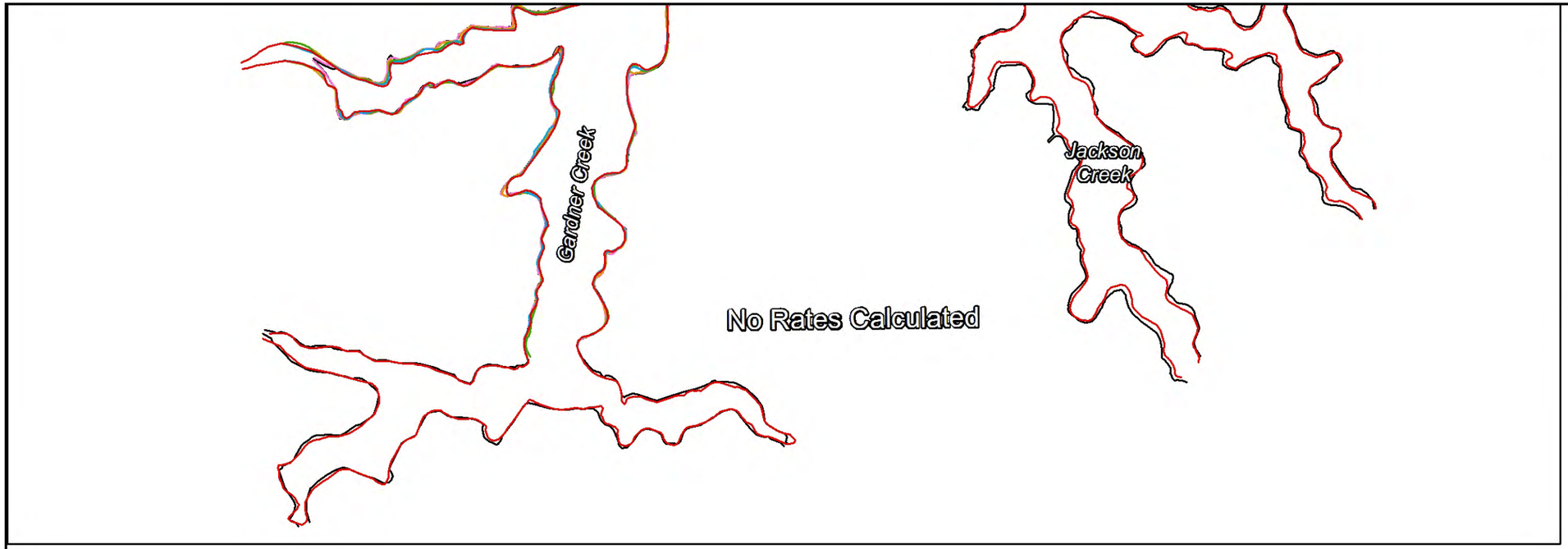
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

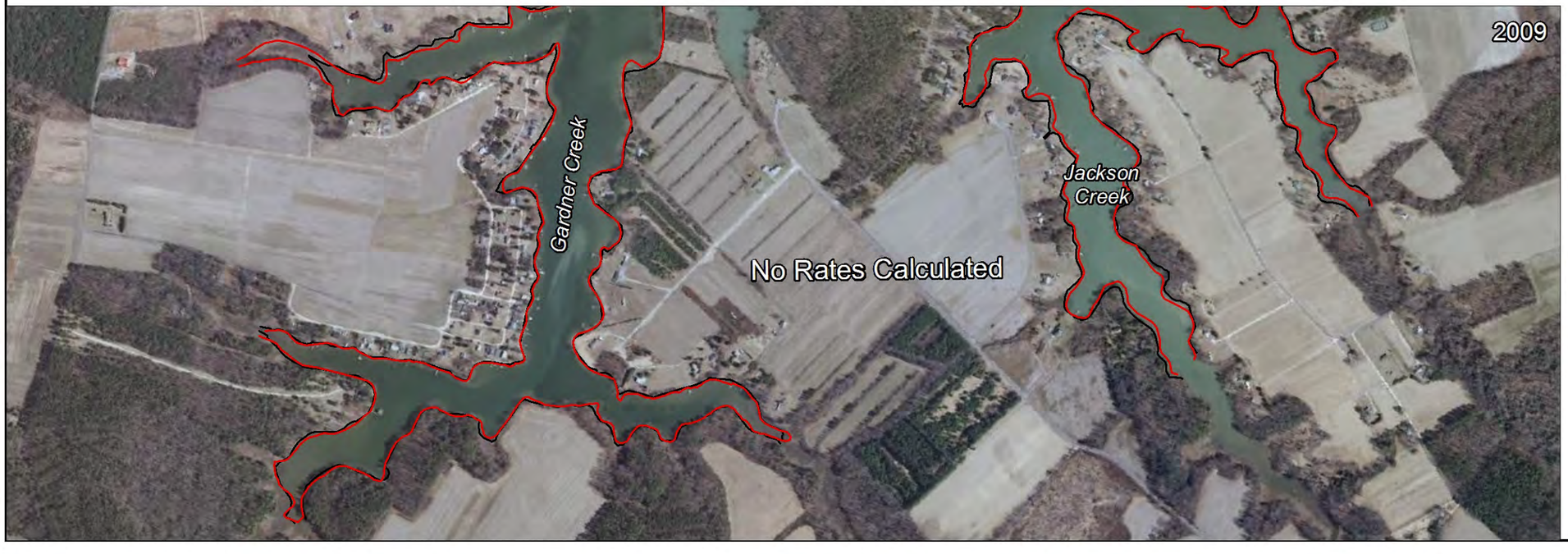
Plate 32



1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

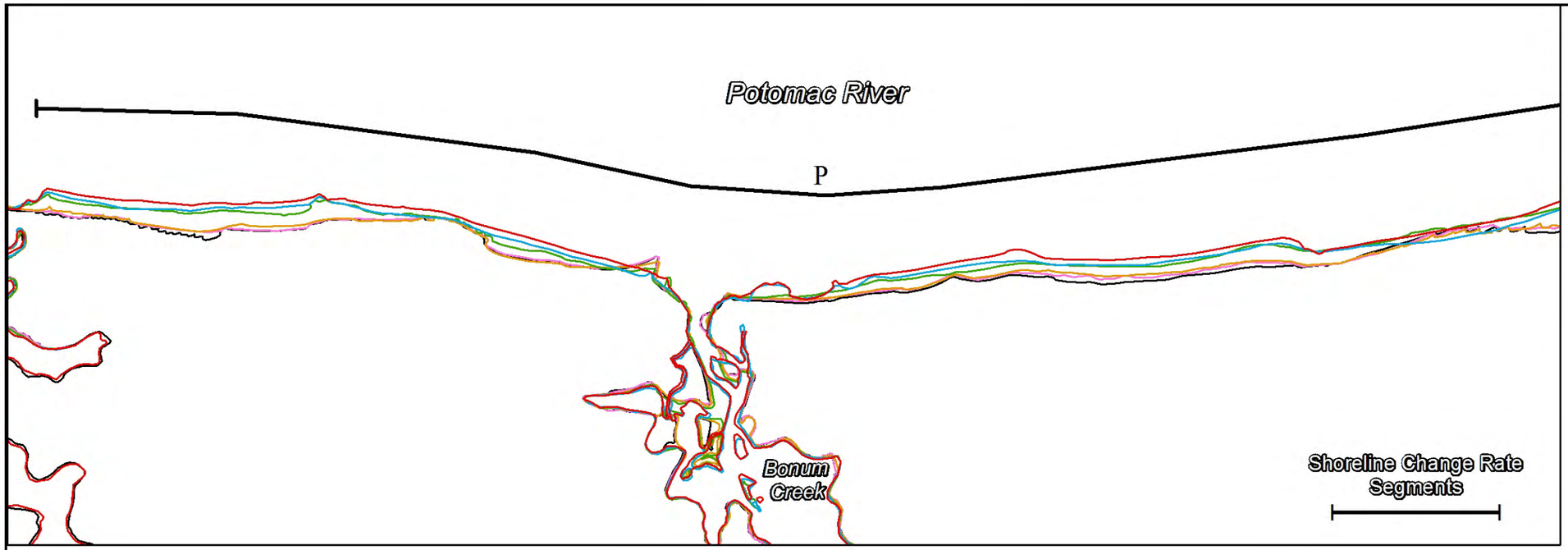


Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County Virginia

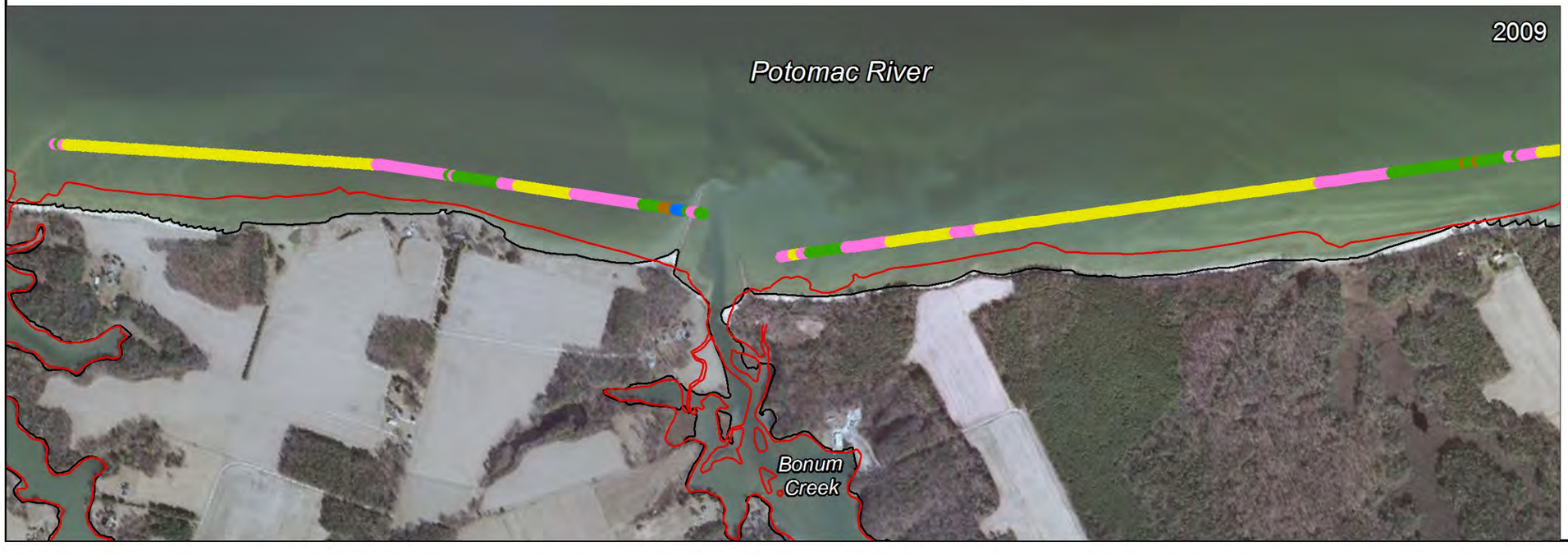
Plate 33



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Shoreline Change Rate Segments

Bonum Creek

P

Potomac River

Westmoreland County Virginia

Plate 34

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

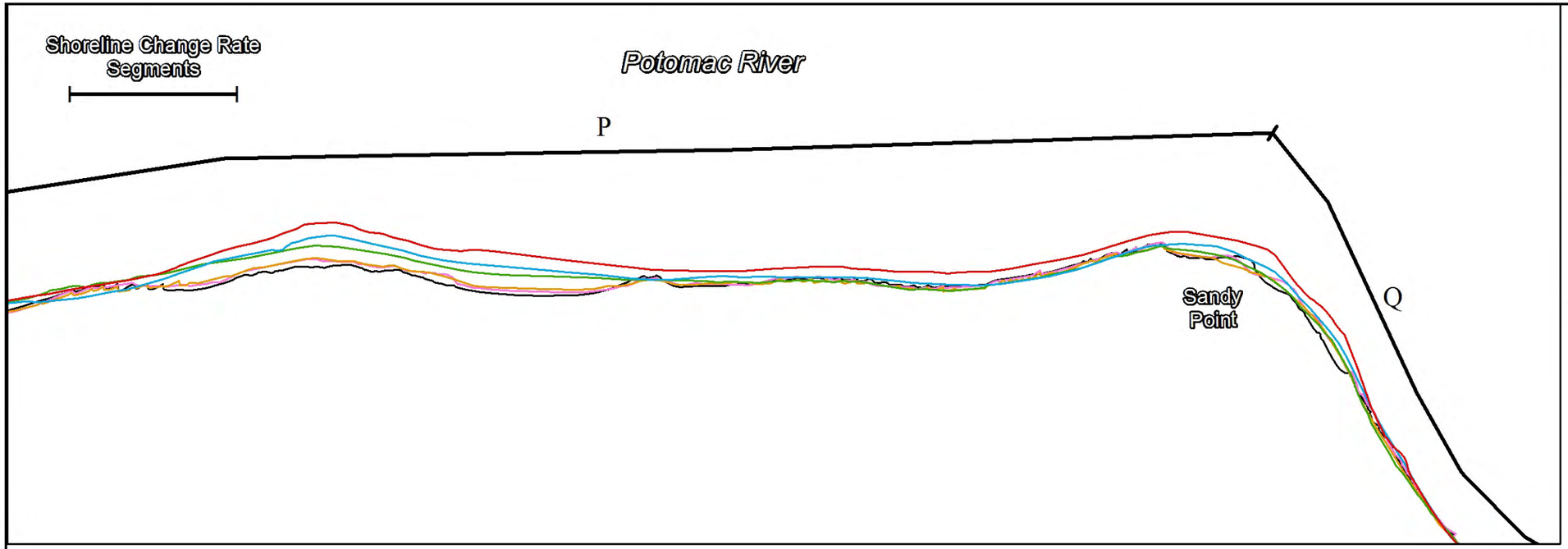
Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



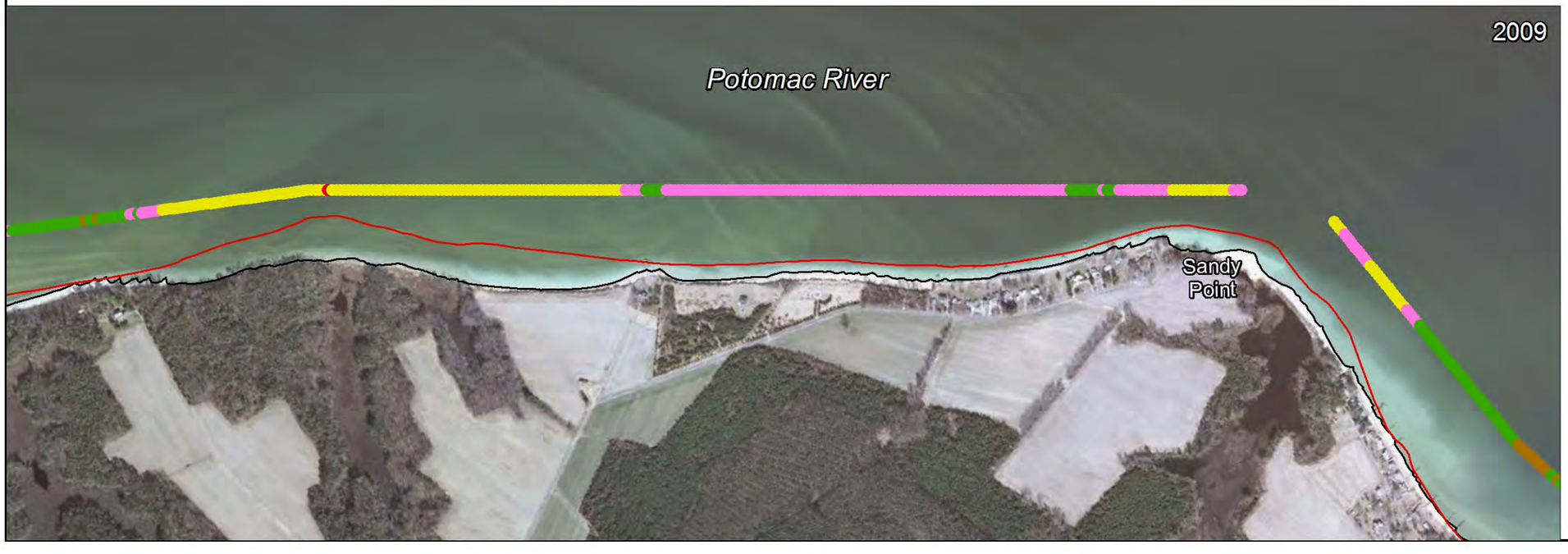
Westmoreland County Virginia

Plate 35

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



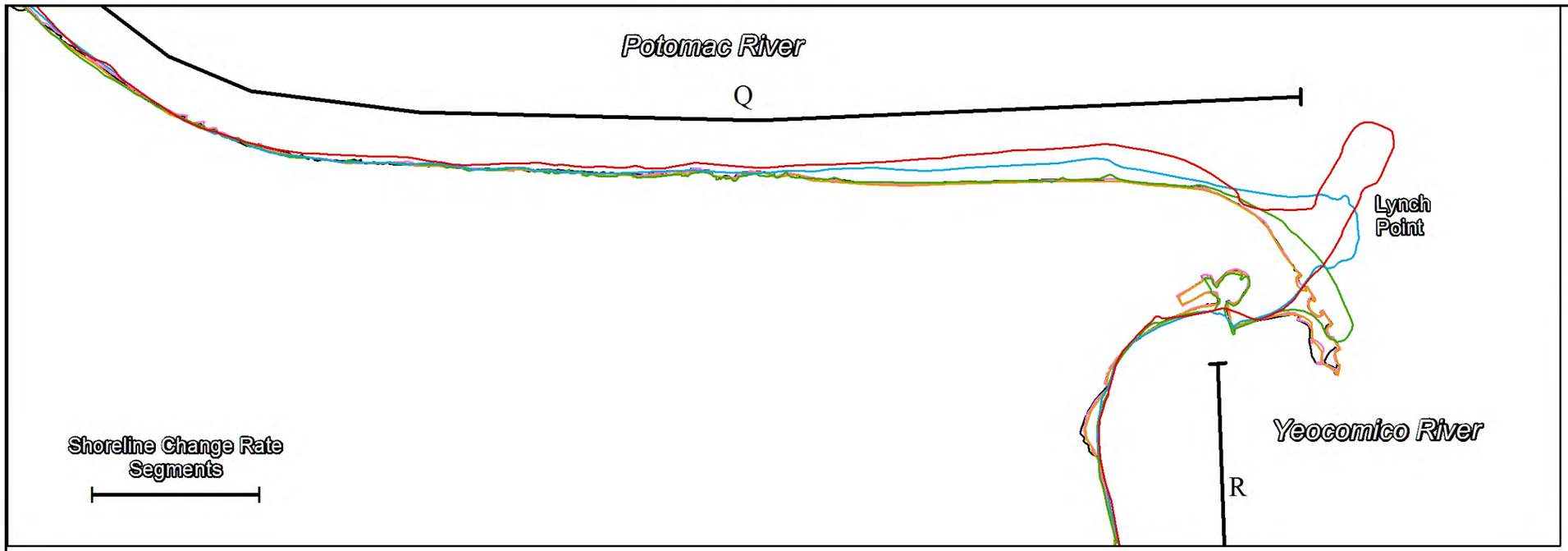
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

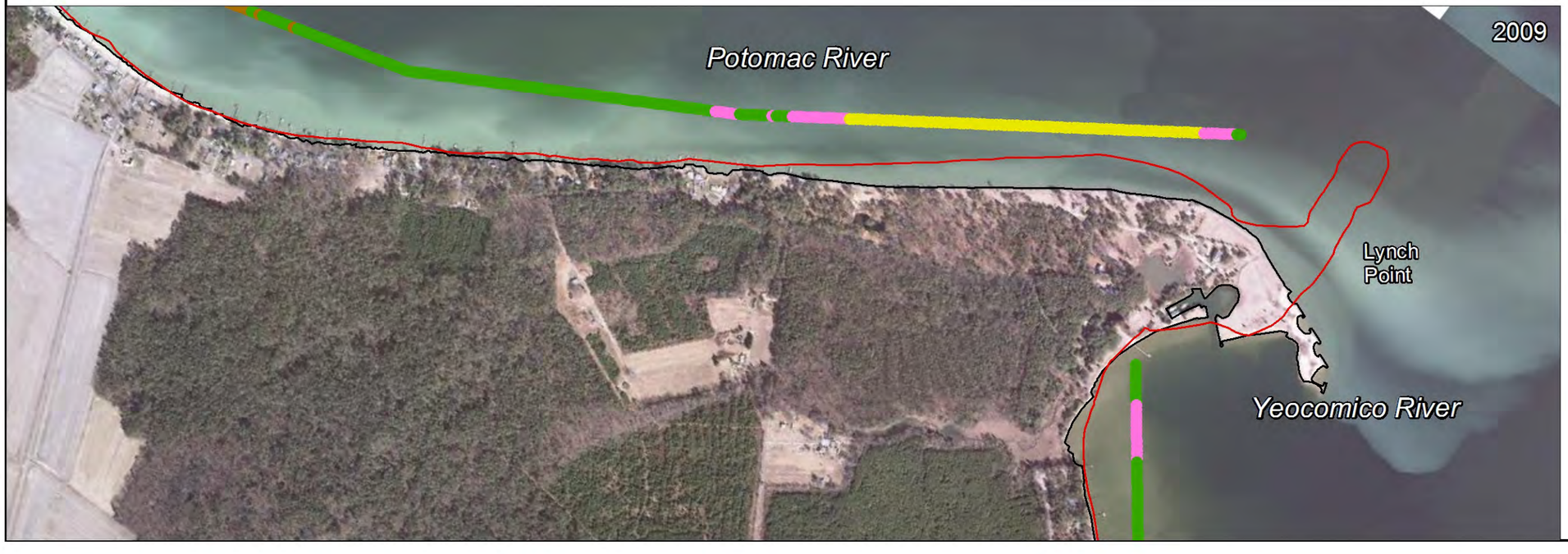
Plate 36



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



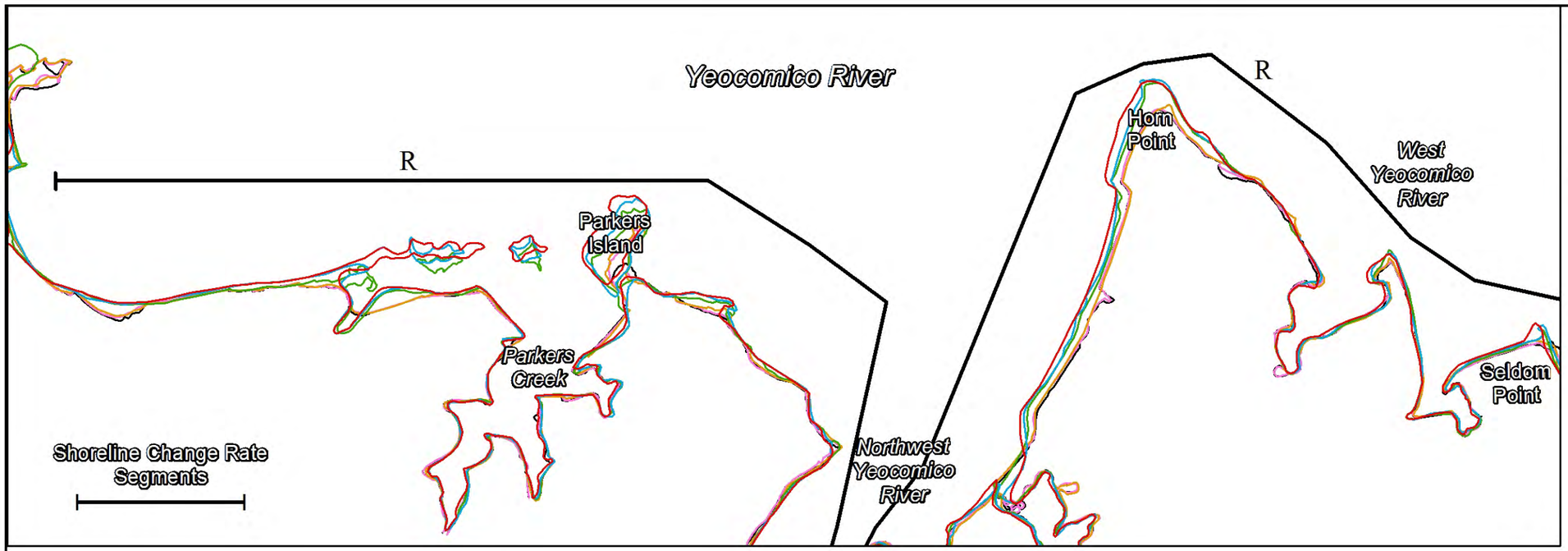
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

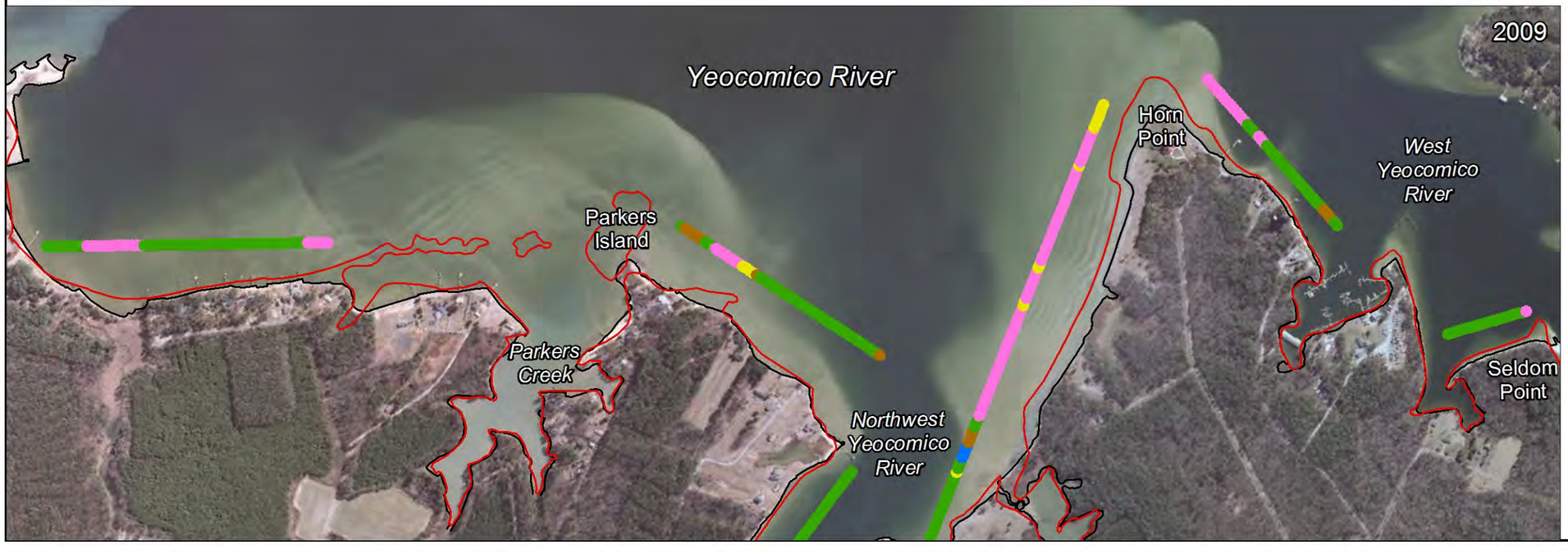
Plate 37



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 38

Shoreline Change Rate Segments

Shannon Branch

Northwest Yeocomico River

White Point Creek

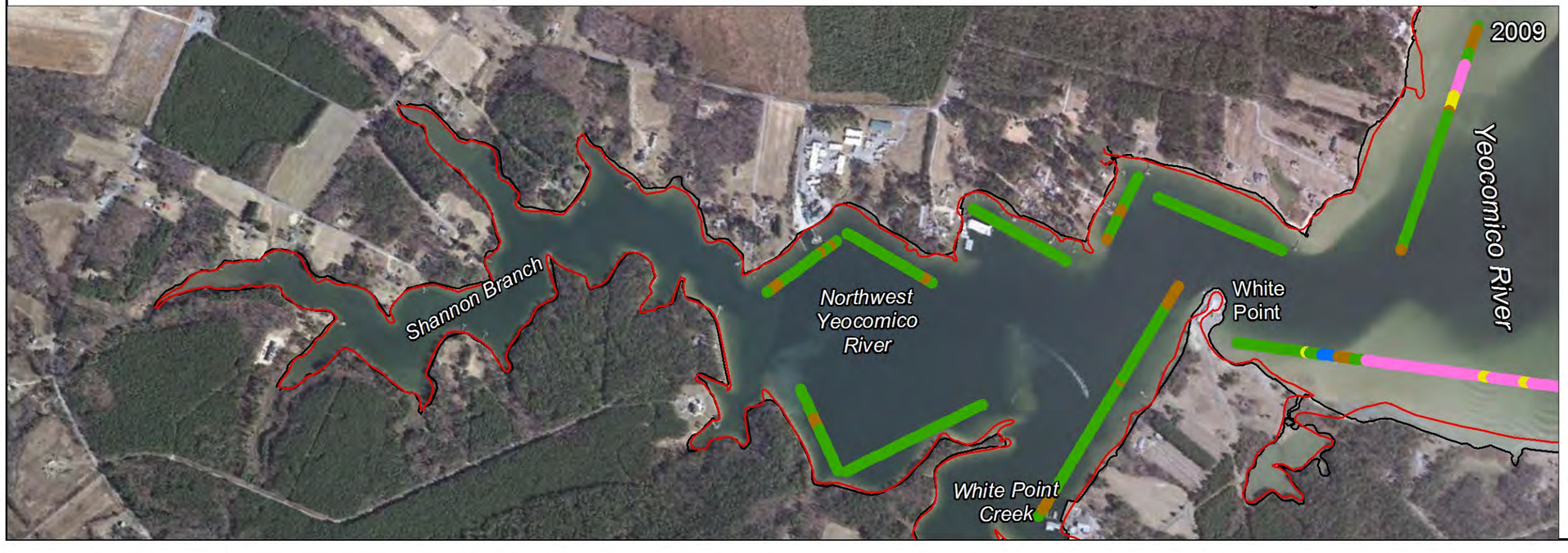
White Point

Yeocomico River

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Shoreline Change Rate Segments

White Point Creek

West Yeocomico River

Seldom Point

R

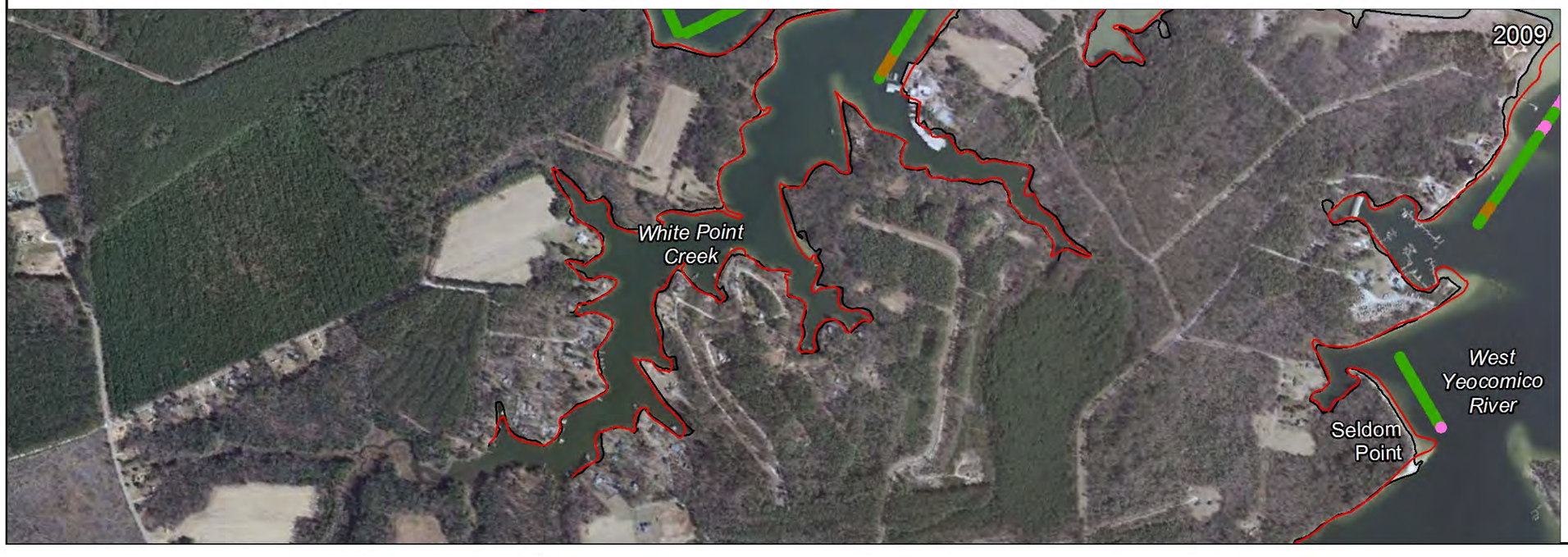
Westmoreland County Virginia

Plate 39

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



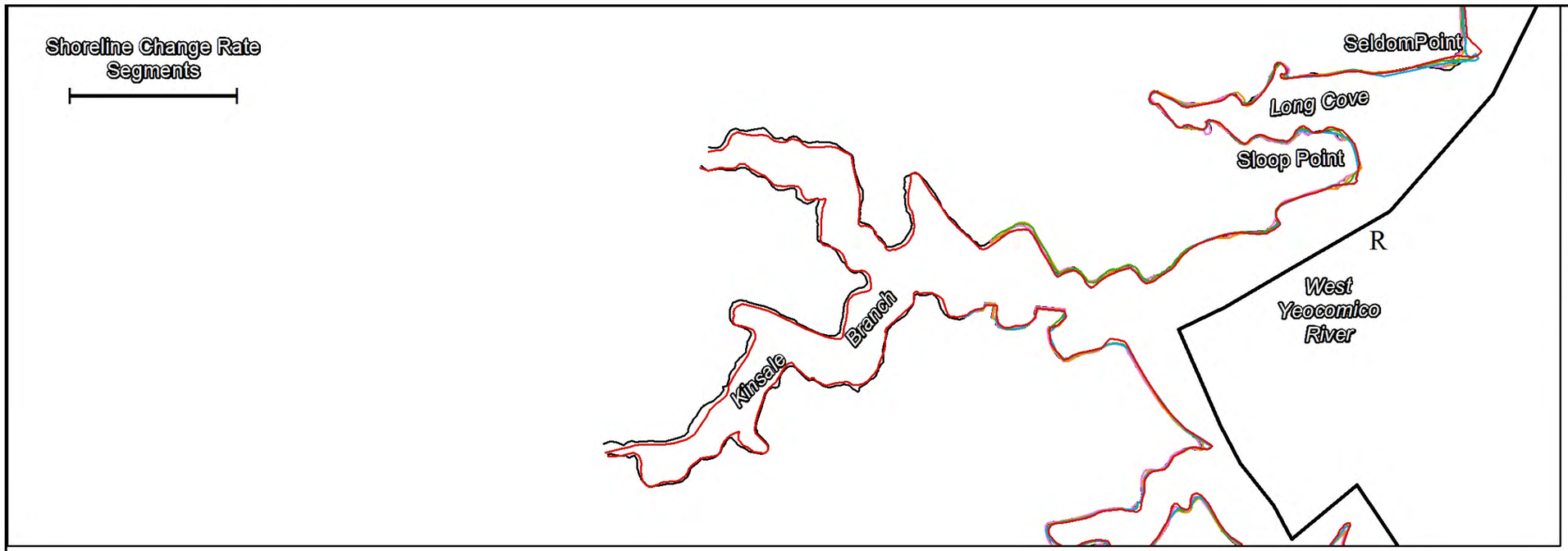
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

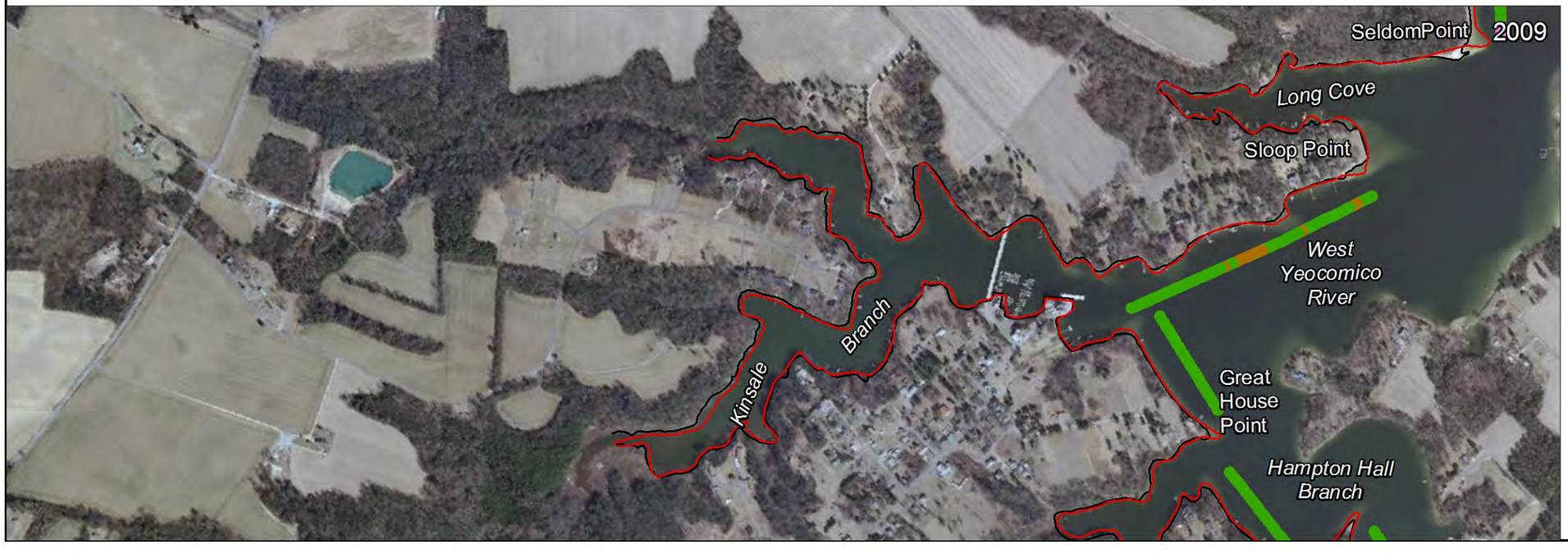
Plate 40



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Shoreline Change Rate Segments

Great House Point

Sloop Point

Long Cove

Seldom Point

West Yeocomico River

Hampton Hall Branch

R

R

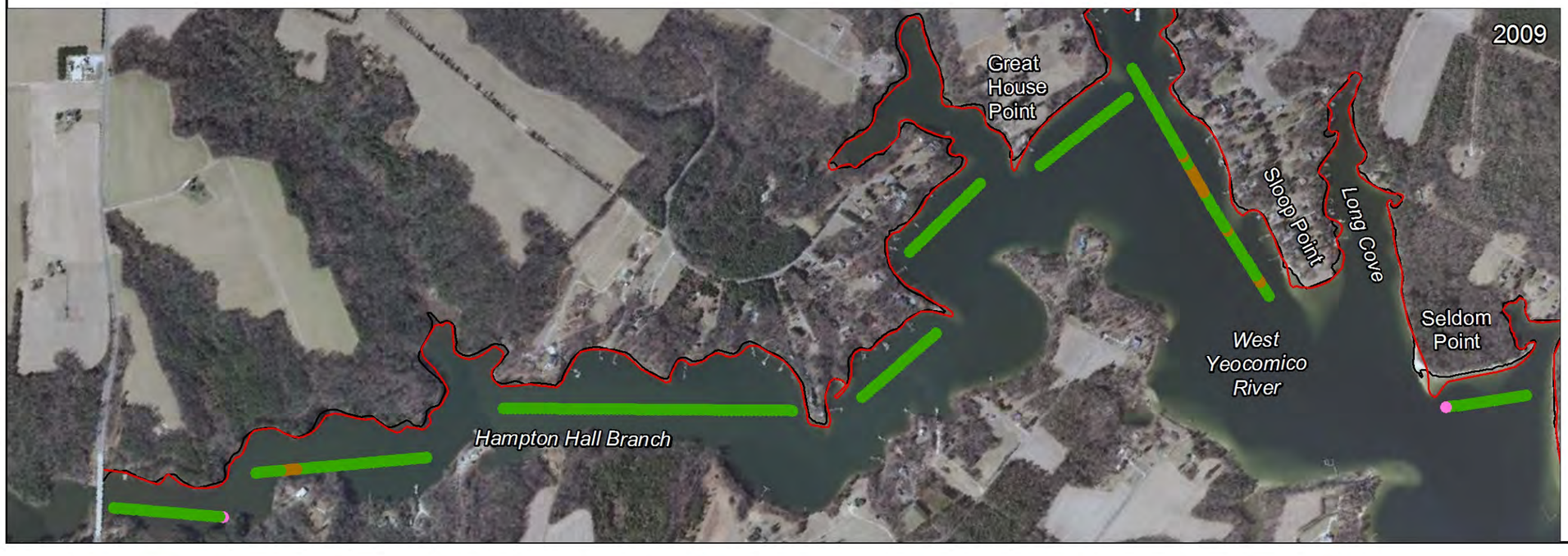
Westmoreland County Virginia

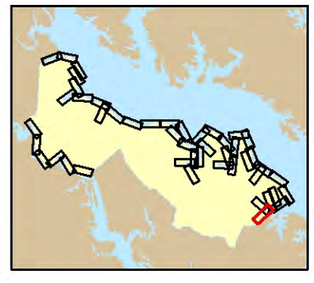
Plate 41

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)





Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Shoreline Change Rate Segments

Peedee Creek

Westmoreland County

Richmond County

S

Rappahannock River

Westmoreland County Virginia

Plate 42

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

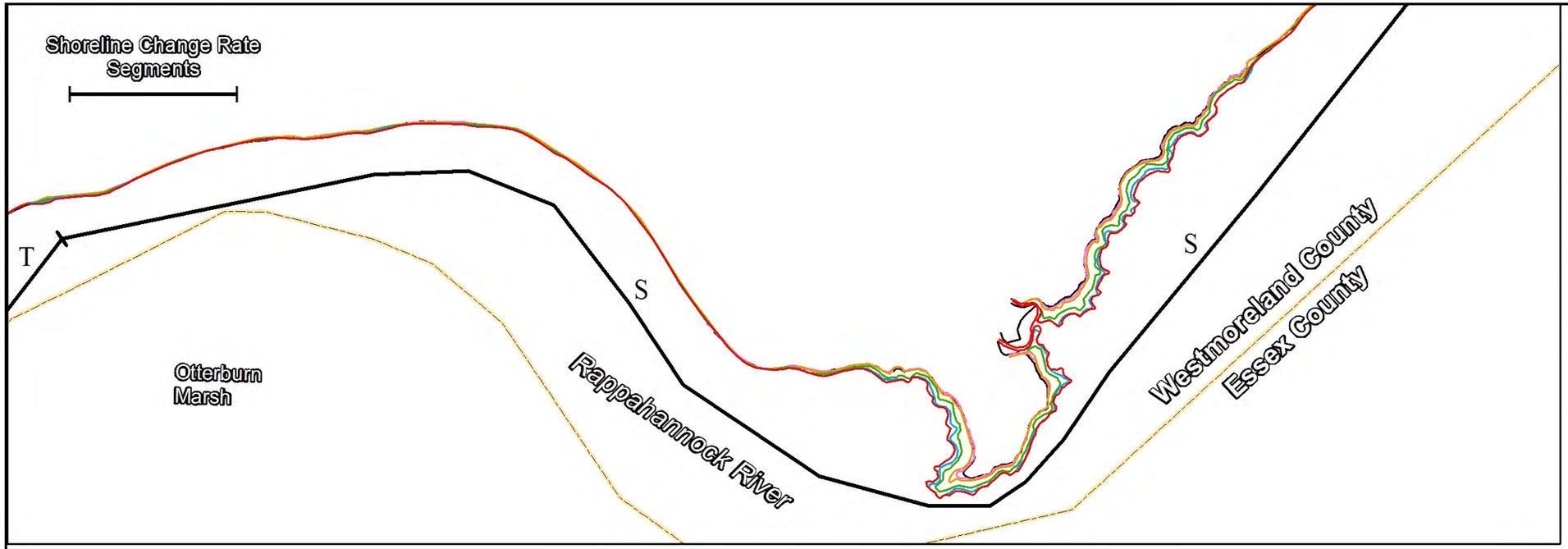
Shoreline Studies Program VIMS

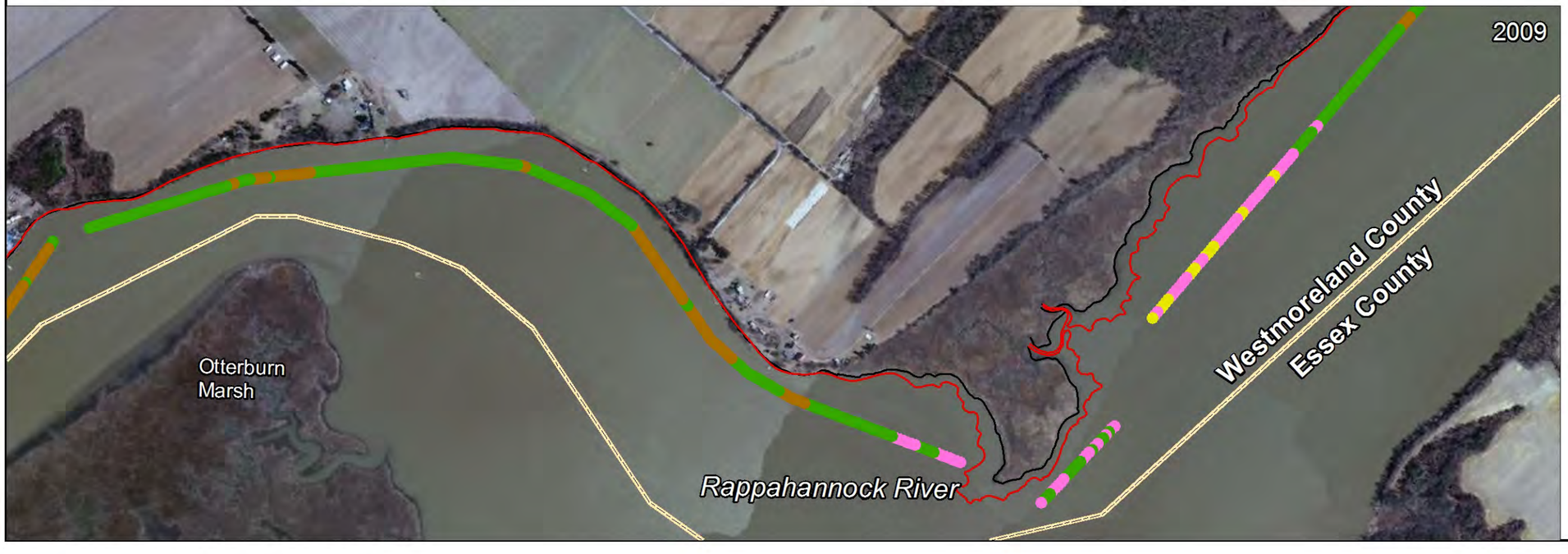
1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 43





1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

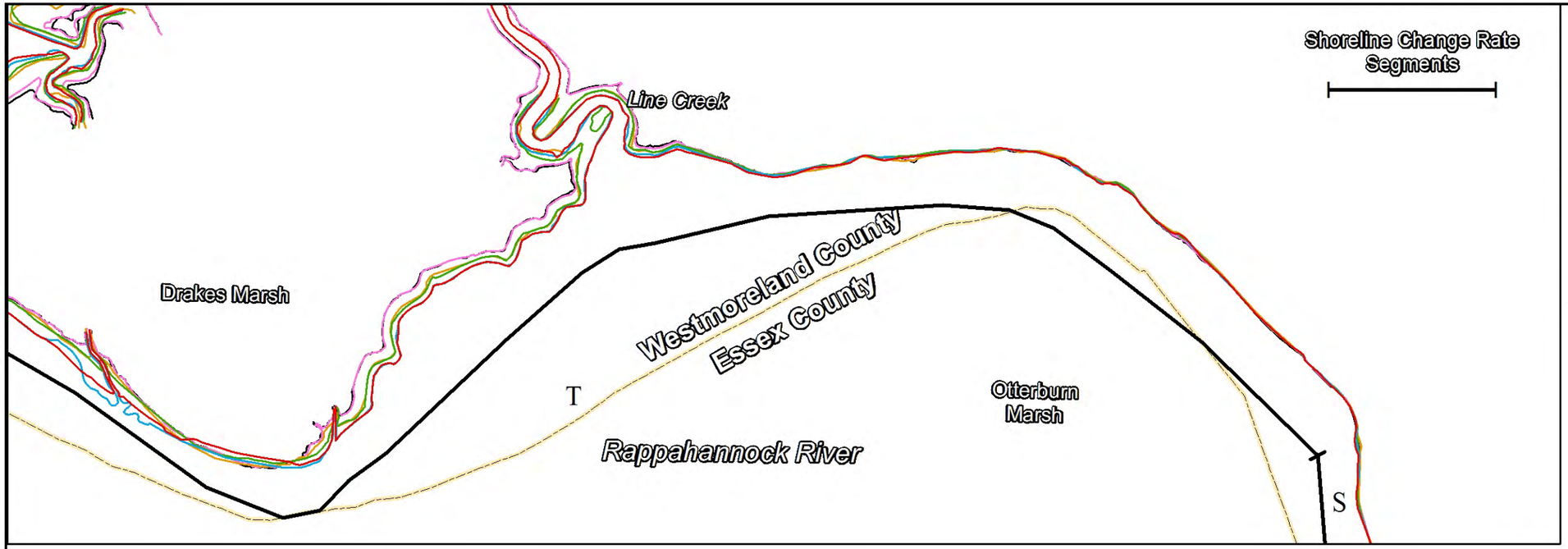
- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County
Virginia

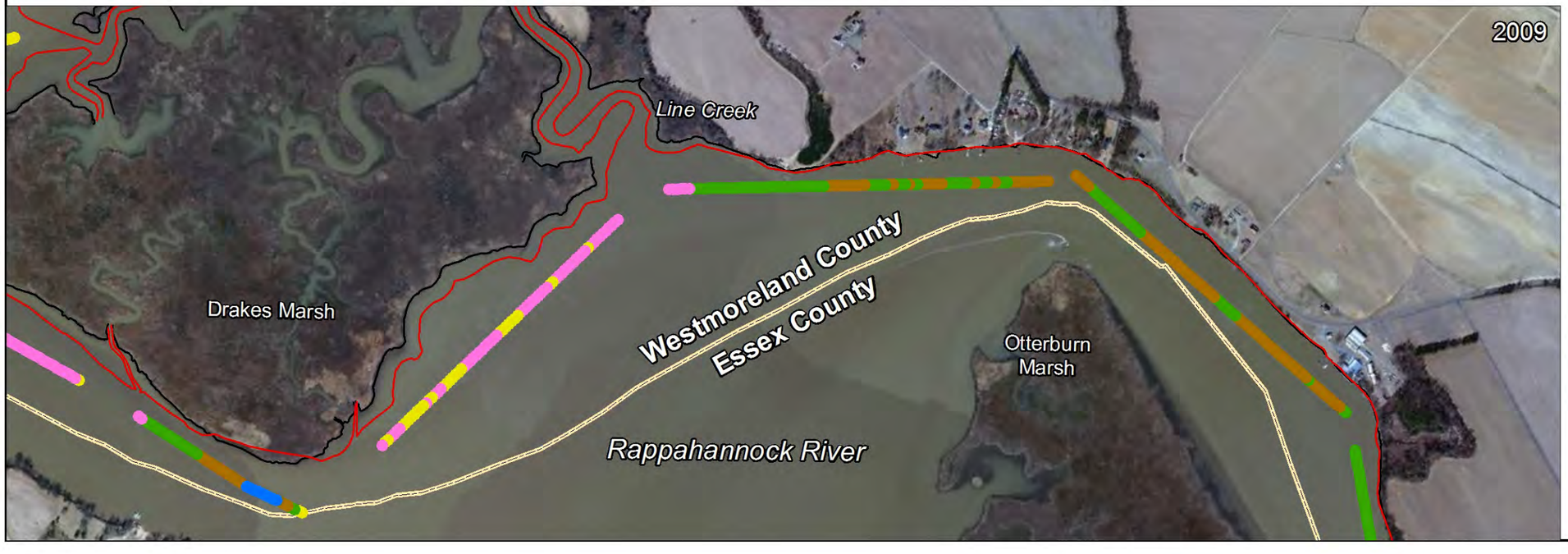
Plate 44



1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Shoreline Change Rate Segments

U

T

Blind Point

Westmoreland County

Essex County

Rappahannock River

Drakes Marsh

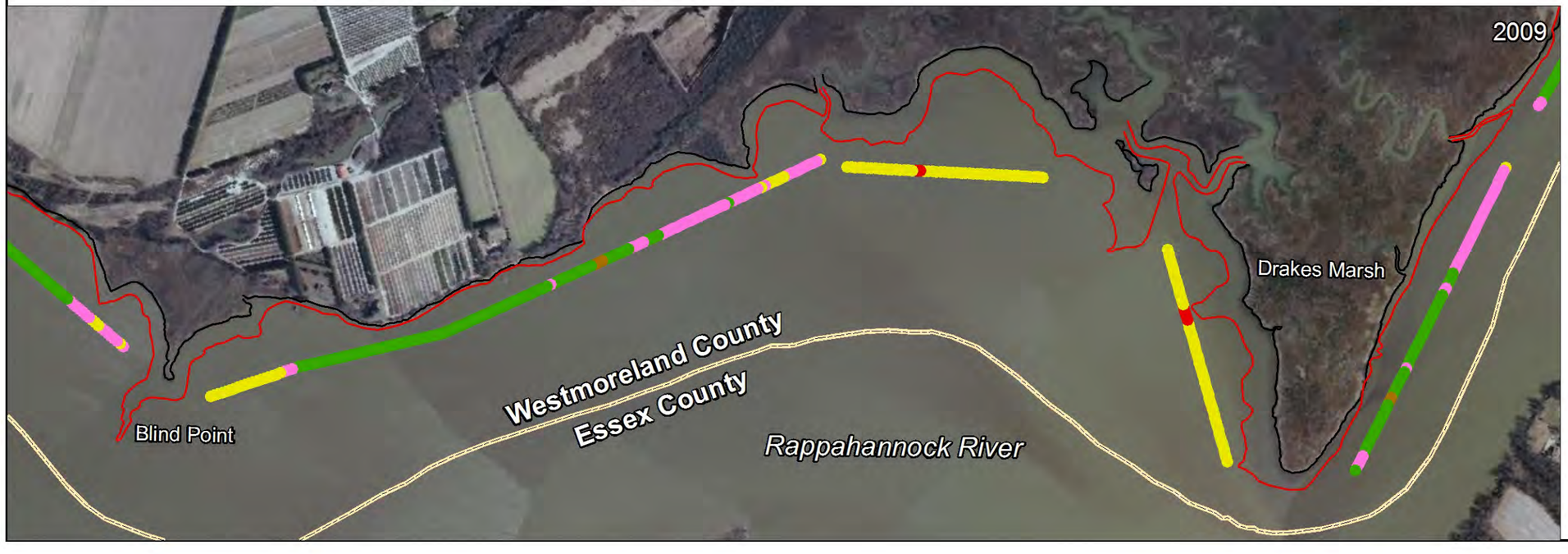
Westmoreland County Virginia

Plate 45

1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

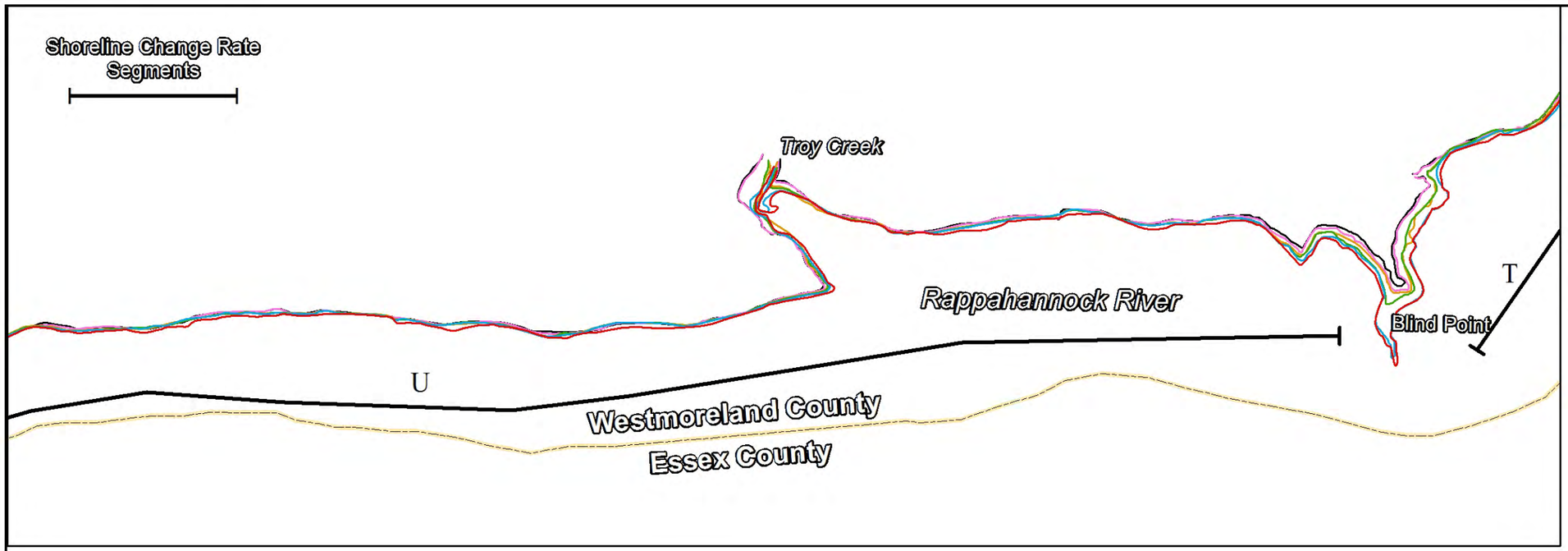
- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)



Shoreline Studies Program VIMS

1,000 0 1,000

Feet



Westmoreland County Virginia

Plate 46

1937 Shoreline
1953 Shoreline
1969 Shoreline
1994 Shoreline
2002 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

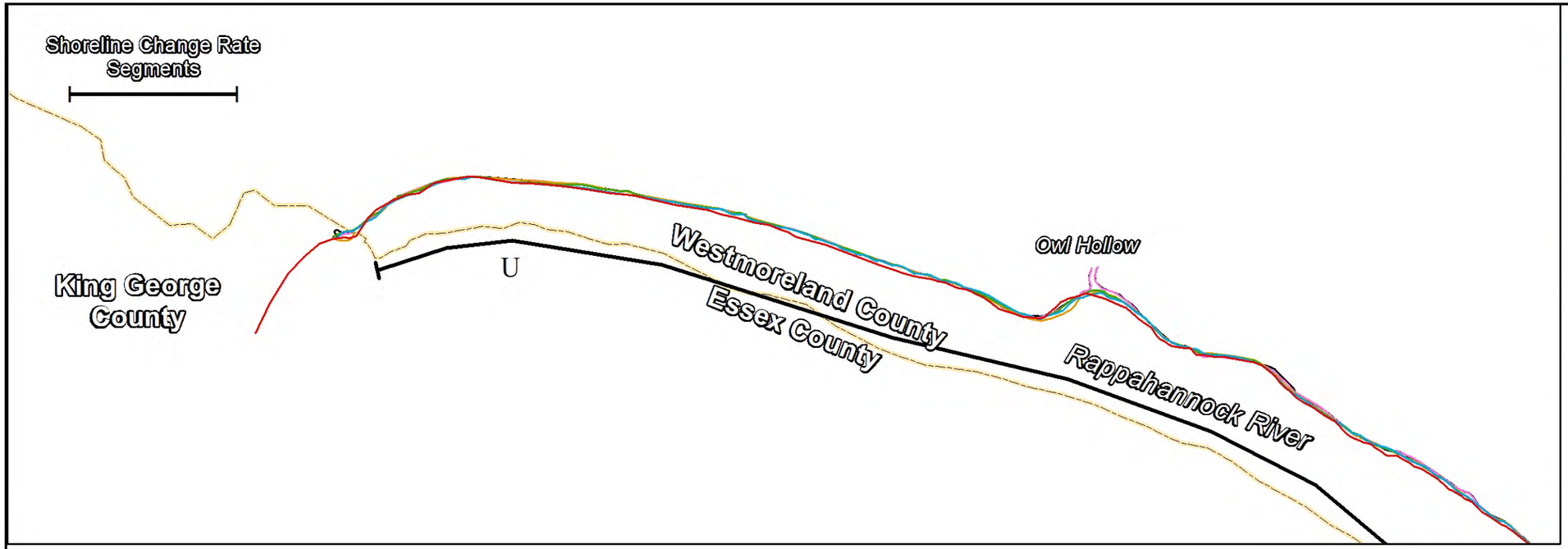
Shoreline Studies Program VIMS

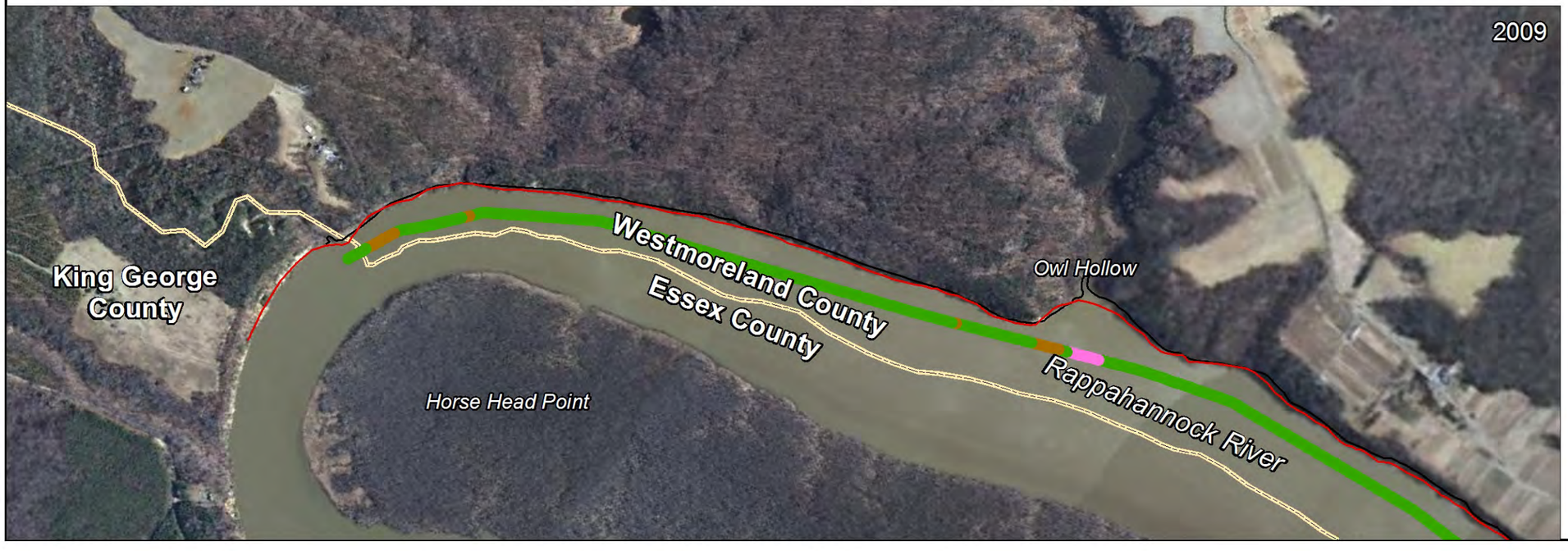
1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 47





1937 Shoreline
1994 Shoreline
1953 Shoreline
2002 Shoreline
1969 Shoreline
2009 Shoreline

Shoreline Rates of Change

- Medium Accretion: +5 to +2 (ft/yr)
- Low Accretion: +2 to +1 (ft/yr)
- Very Low Accretion: +1 to 0 (ft/yr)
- Very Low Erosion: 0 to -1 (ft/yr)
- Low Erosion: -1 to -2 (ft/yr)
- Medium Erosion: -2 to -5 (ft/yr)
- High Erosion: -5 to -10 (ft/yr)
- Very High Erosion: < -25 (ft/yr)

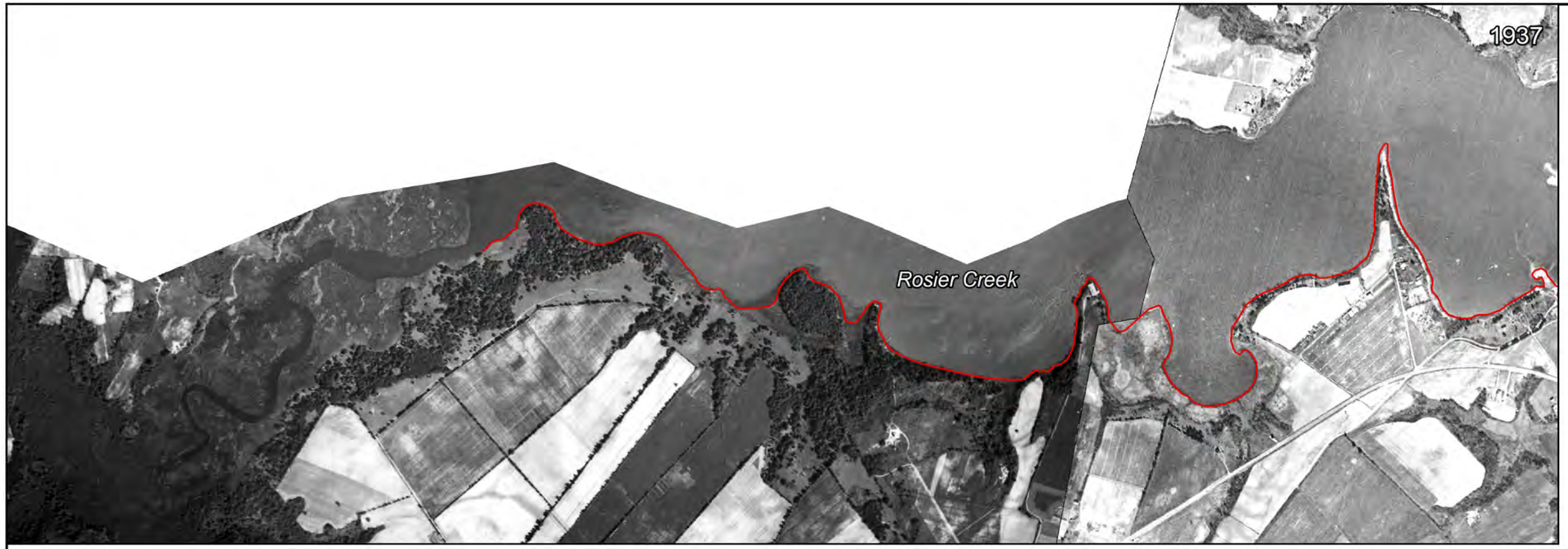
Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Appendix B

Historical Shoreline Photo Maps

Note: The location labels on the plates come from U.S. Geological Survey topographic maps, Google Earth, and other map sources and may not be accurate for the historical or even more recent images. They are for reference only.



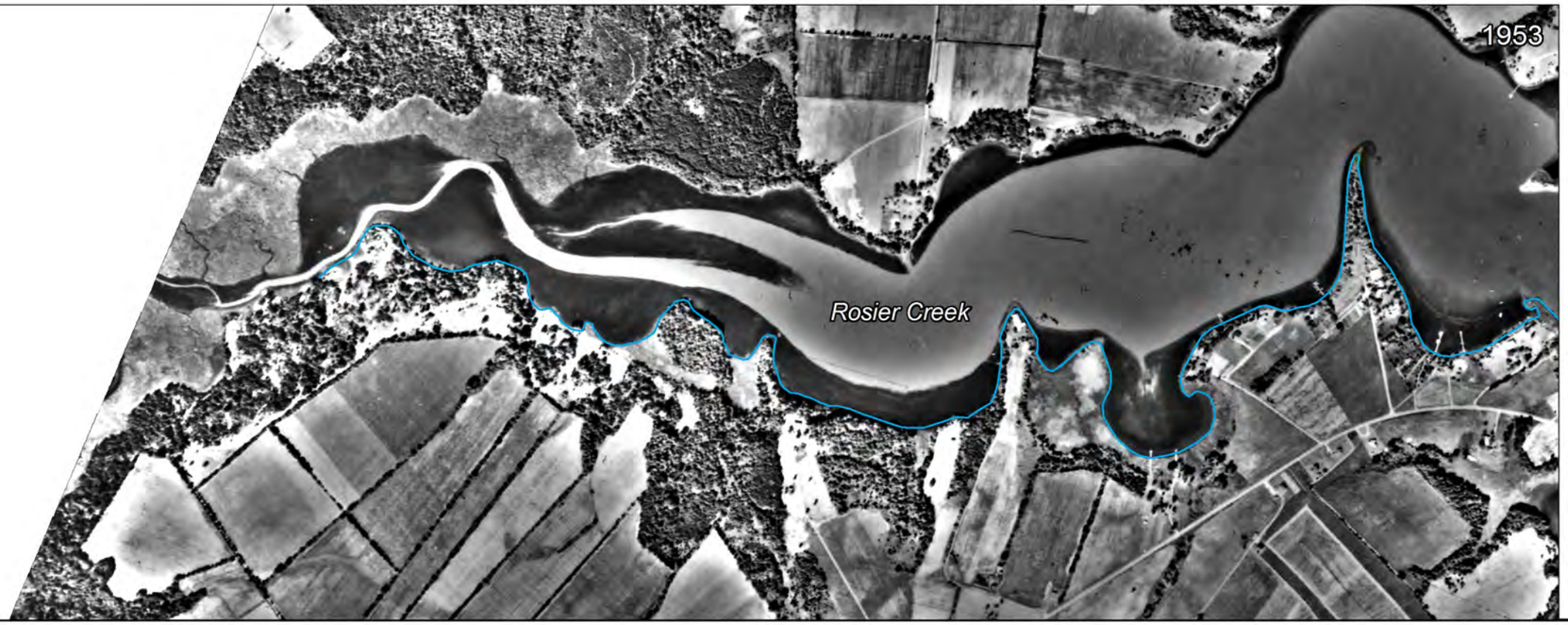
Westmoreland County
Virginia

Plate 1

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

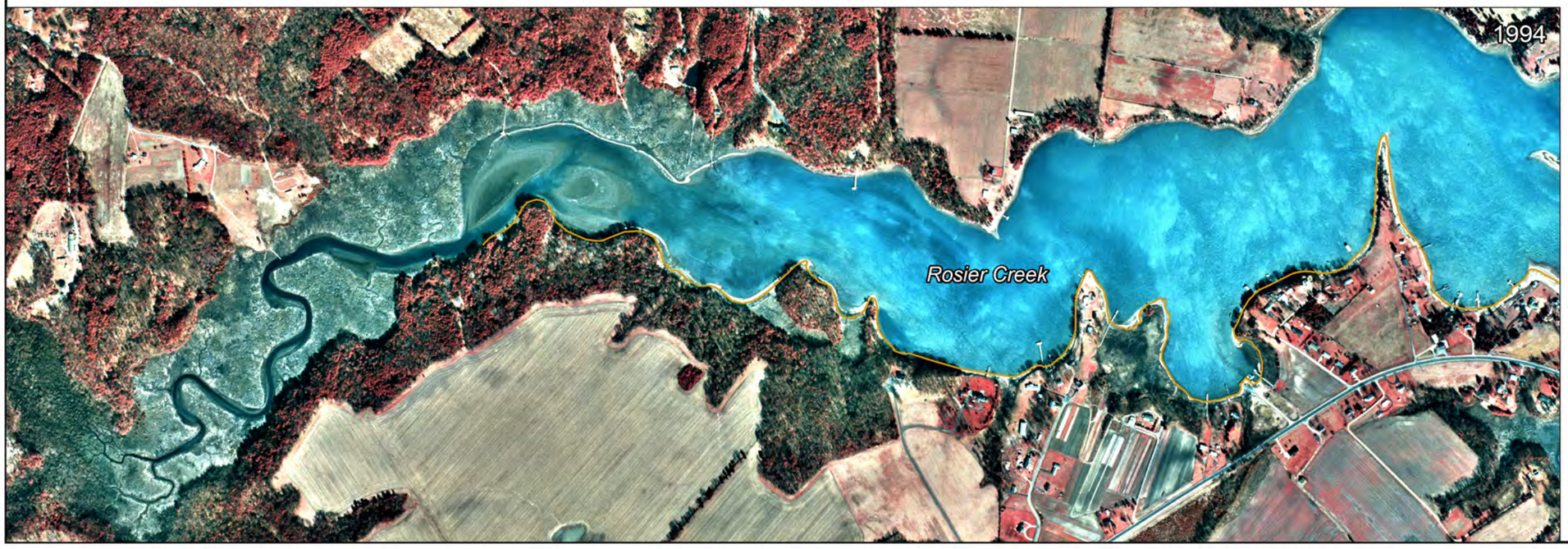
Westmoreland County
Virginia

Plate 1

Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

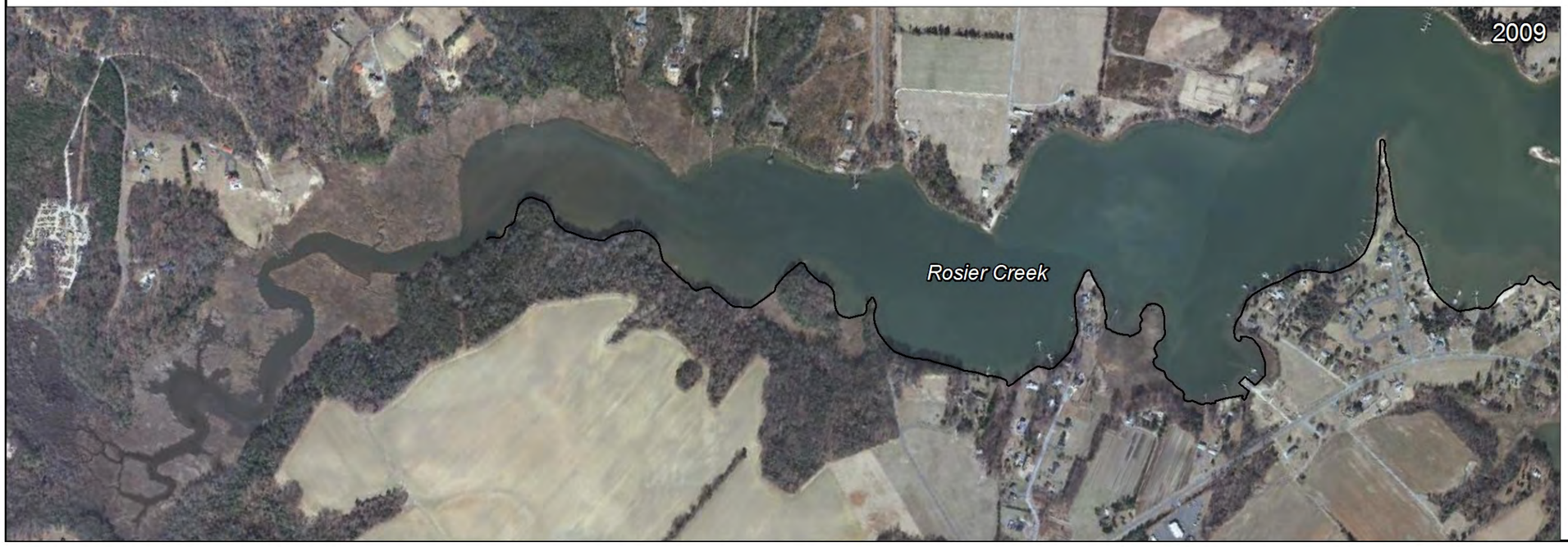
Westmoreland County Virginia

Plate 1

Legend

2002 Shoreline

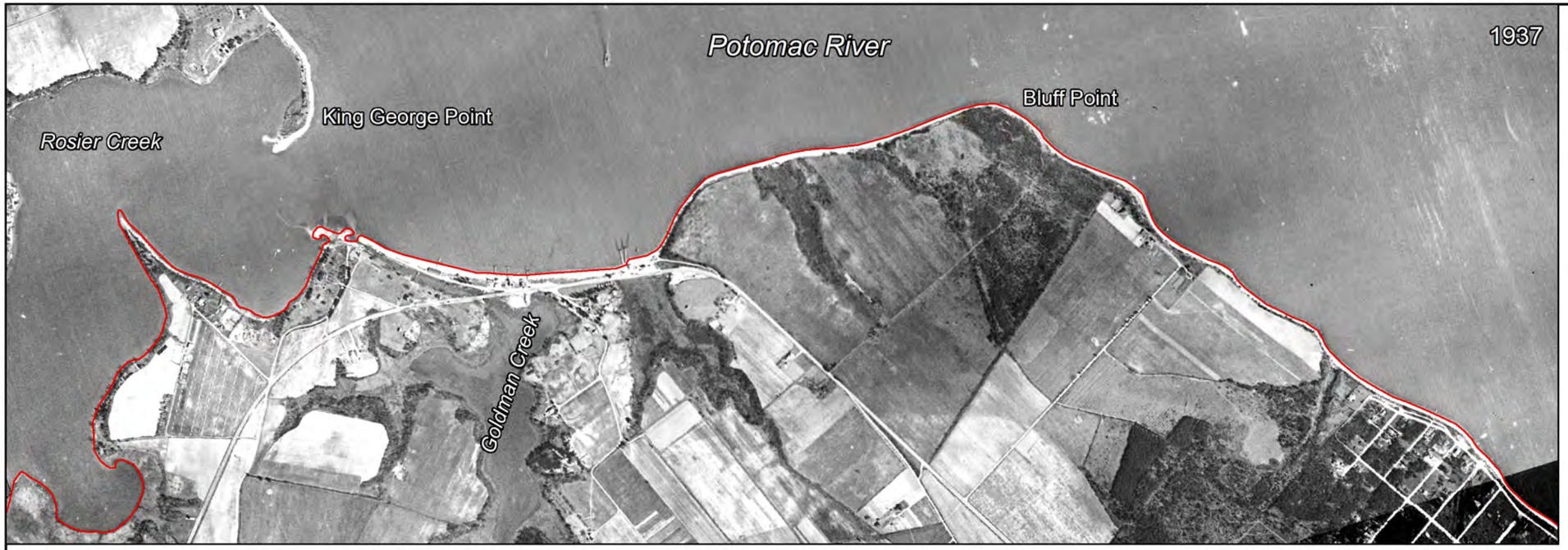
2009 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

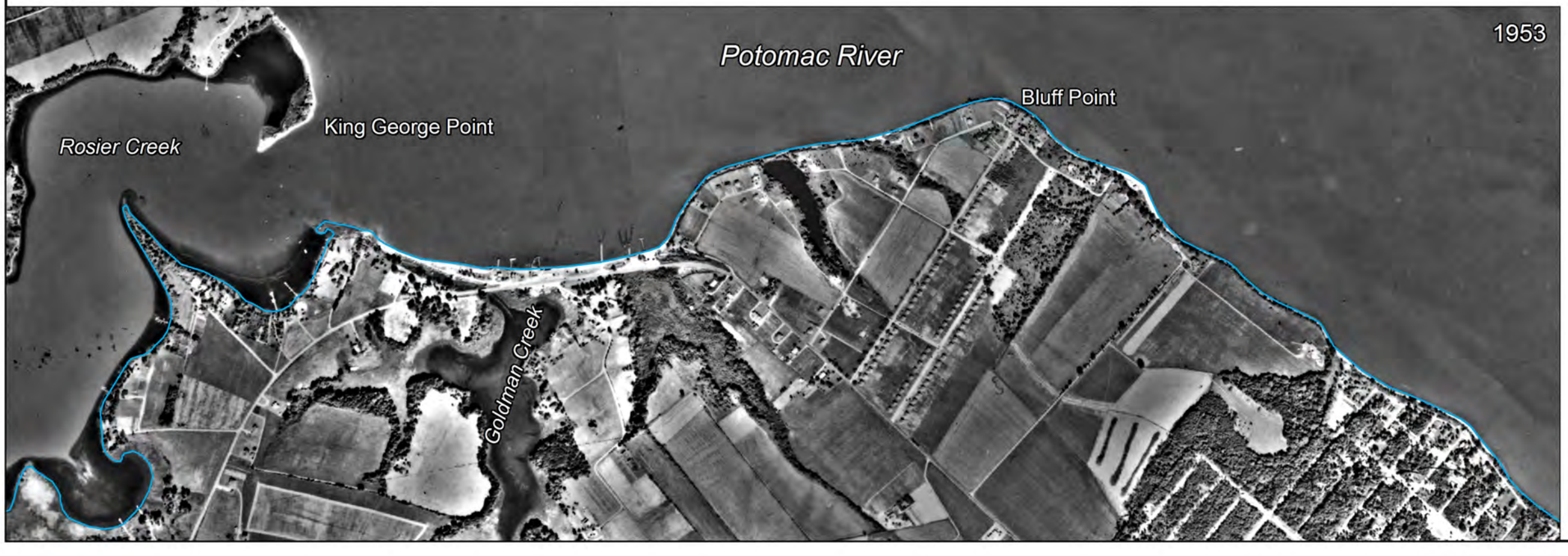


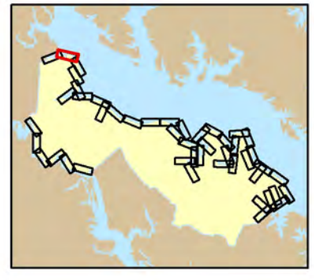
Westmoreland County Virginia

Plate 2

Legend

- 1937 Shoreline
- 1953 Shoreline

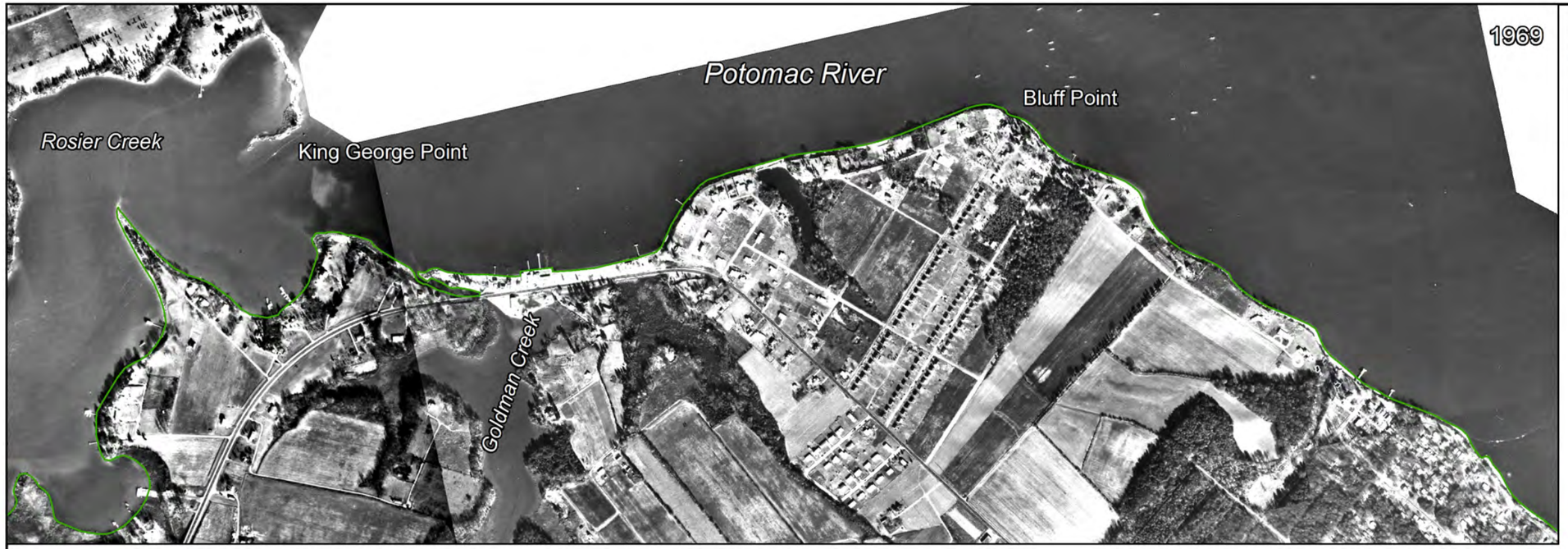




Shoreline Studies Program VIMS

1,000 0 1,000

Feet



Westmoreland County Virginia

Plate 2

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

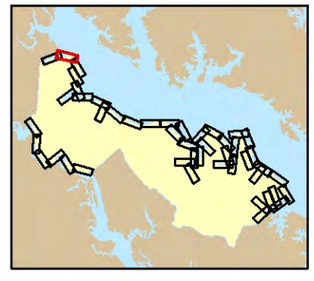
Westmoreland County Virginia

Plate 2

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 3

Legend

1937 Shoreline

1953 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

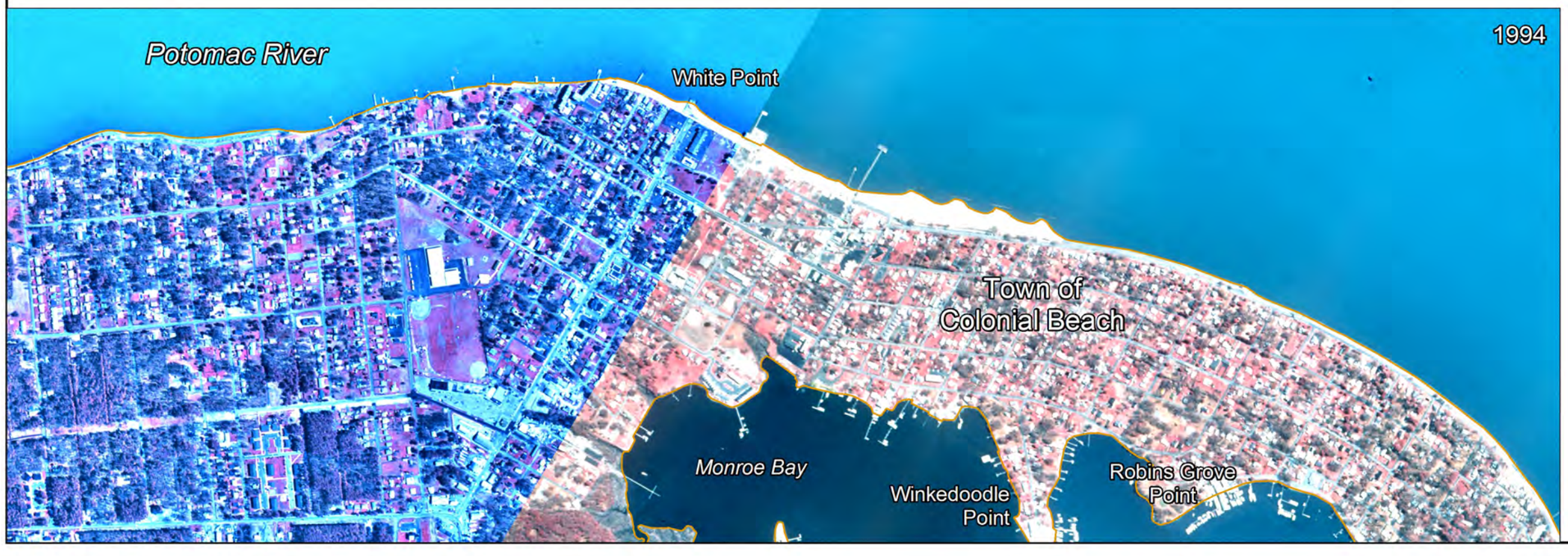
Westmoreland County
Virginia

Plate 3

Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

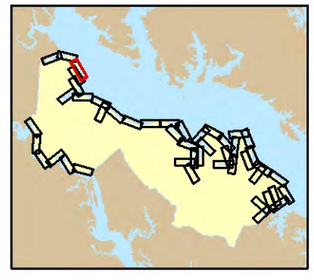
Westmoreland County
Virginia

Plate 3

Legend

2002 Shoreline

2009 Shoreline



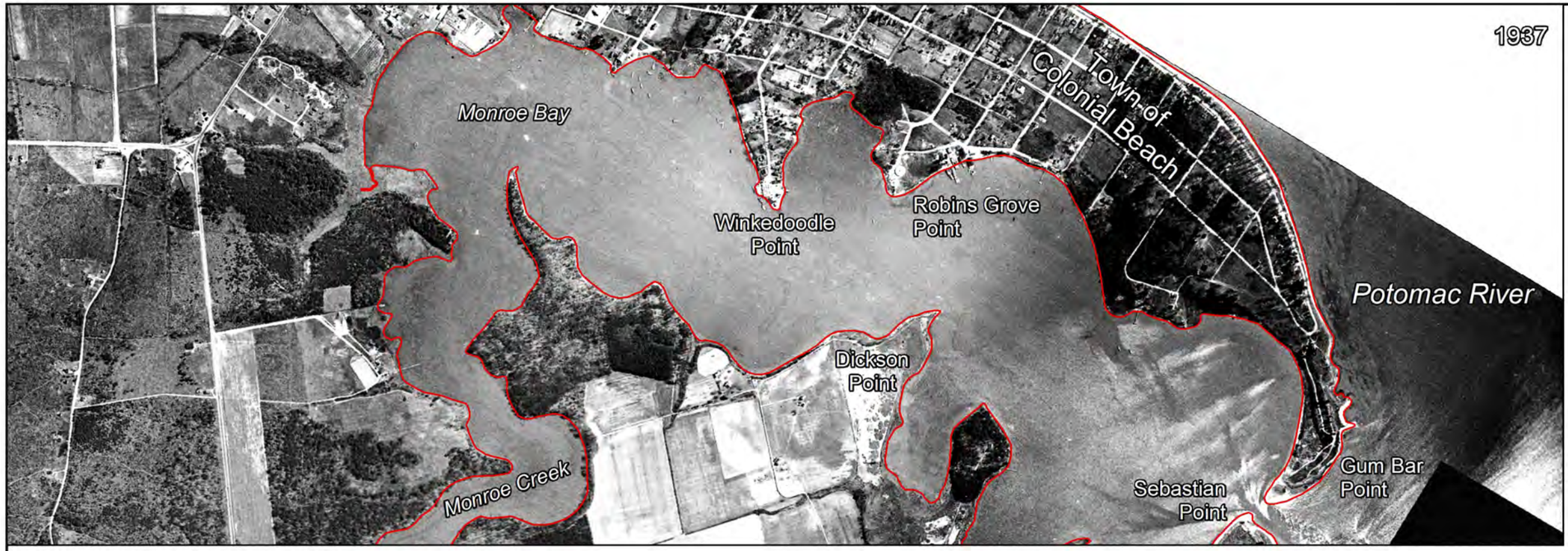
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

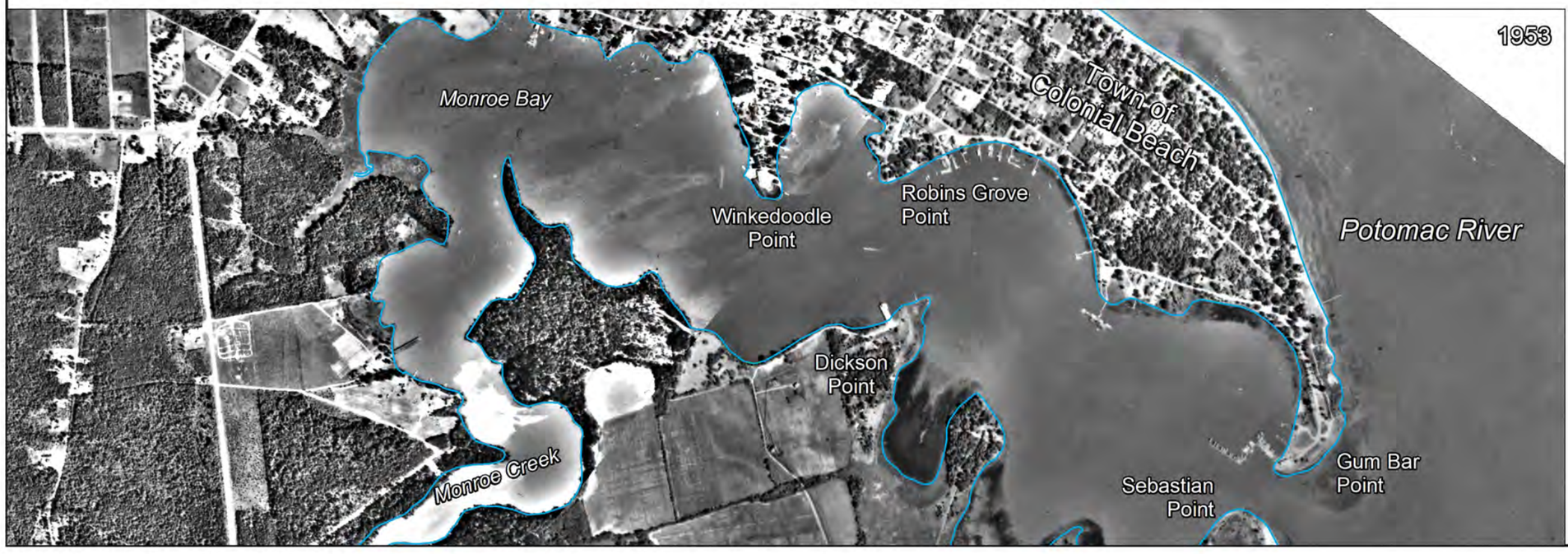
Westmoreland County
Virginia

Plate 4



Legend

- 1937 Shoreline
- 1953 Shoreline



Shoreline Studies Program, VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 4

Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

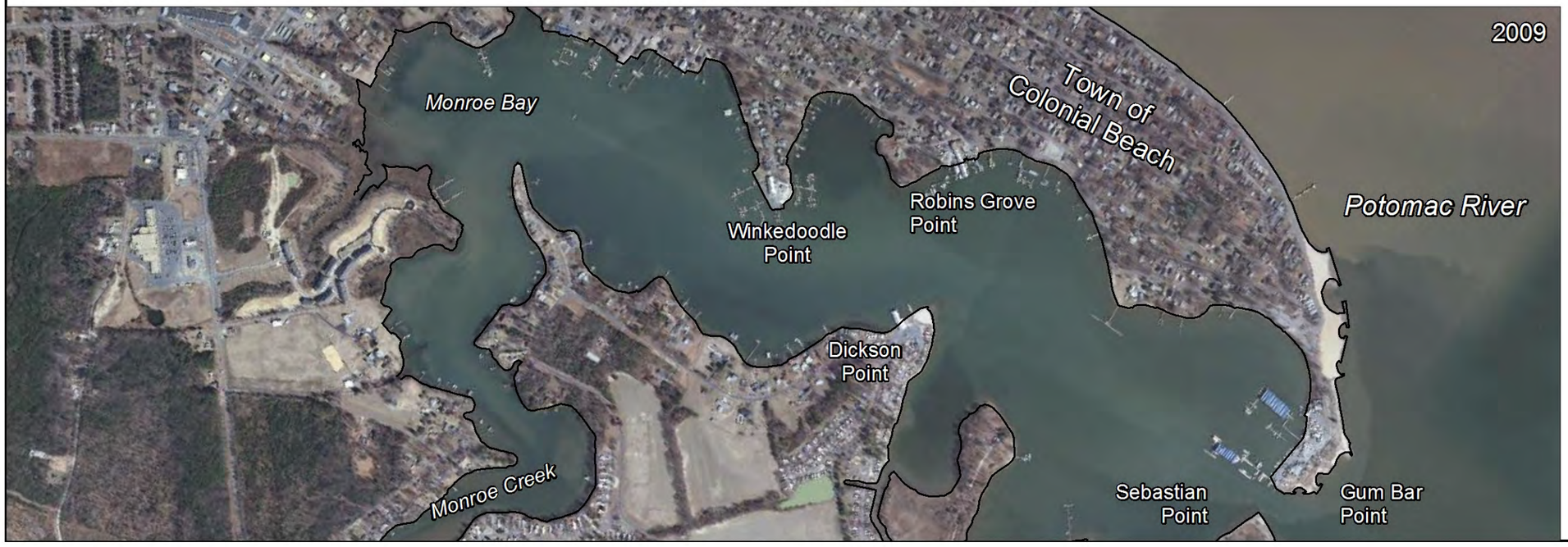
Westmoreland County Virginia

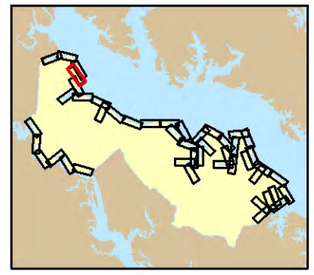
Plate 4

Legend

2002 Shoreline

2009 Shoreline





Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 5

Legend

- 1937 Shoreline
- 1953 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 5

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 5

Legend

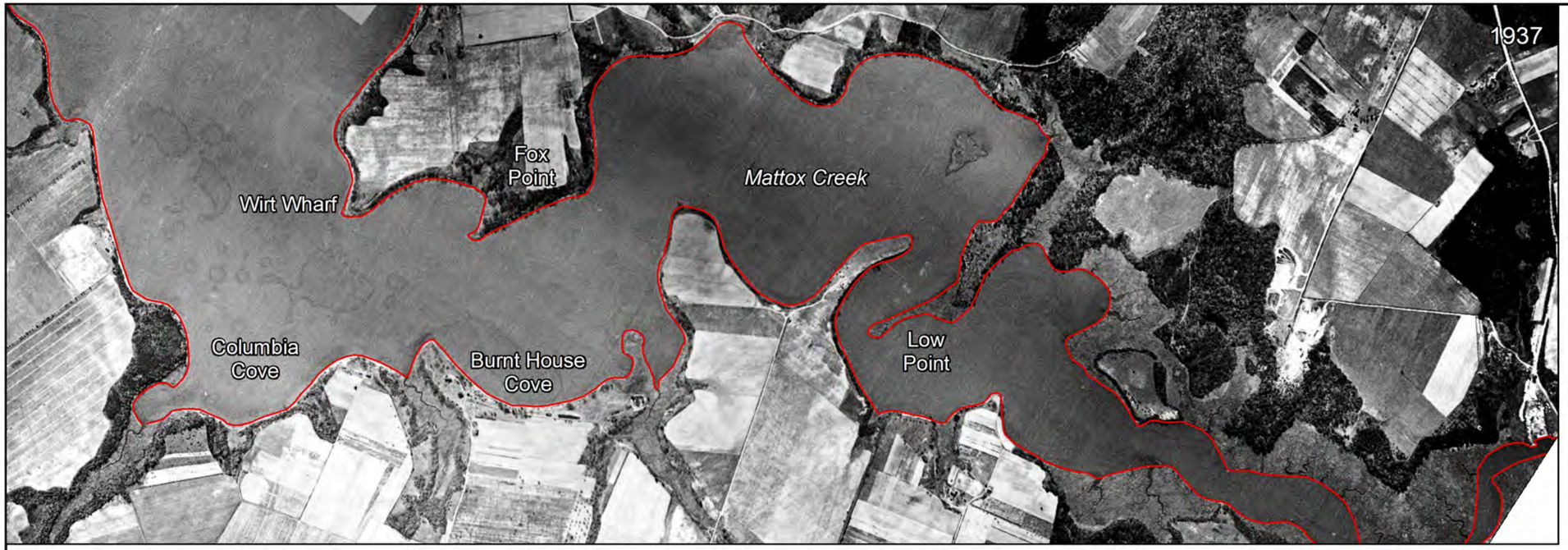
2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



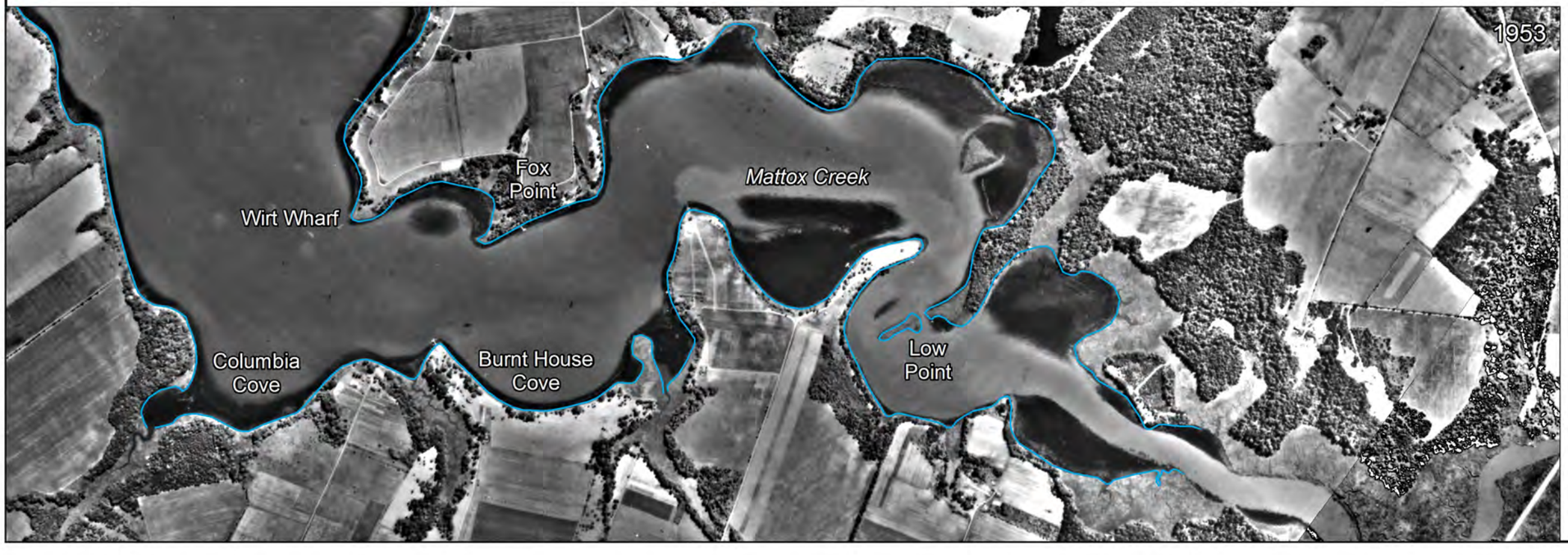
Westmoreland County
Virginia

Plate 6

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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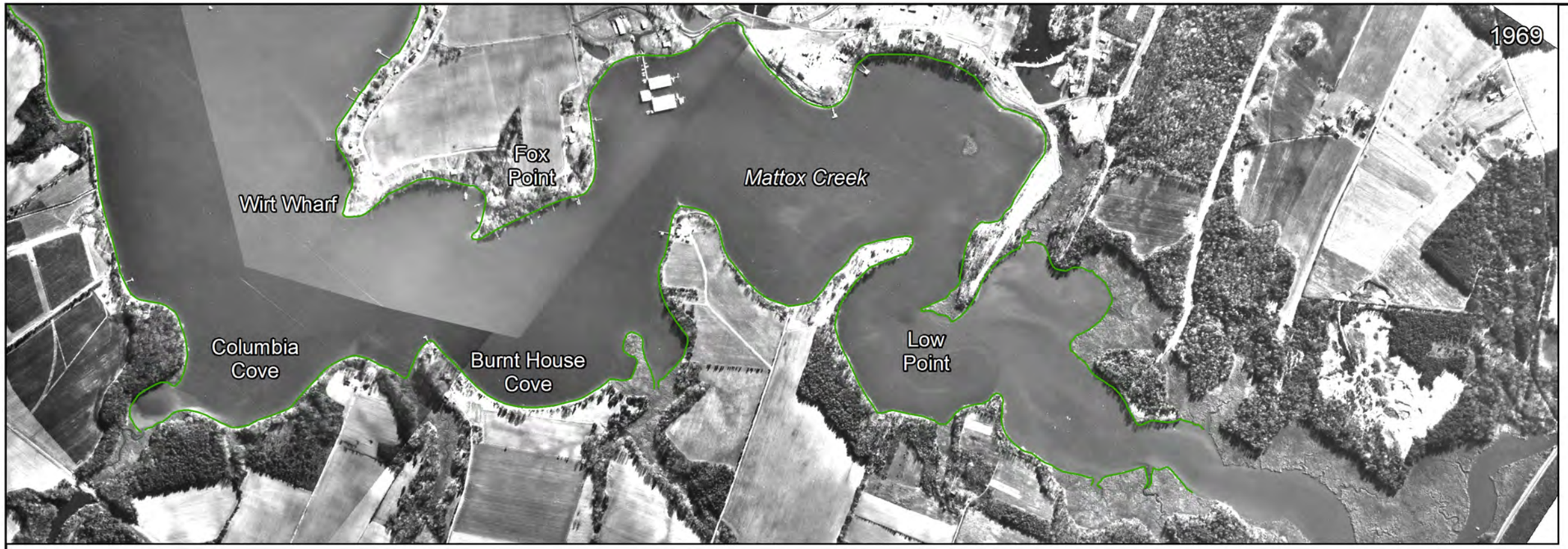
Feet



Westmoreland County
Virginia

Plate 6

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 6

Legend

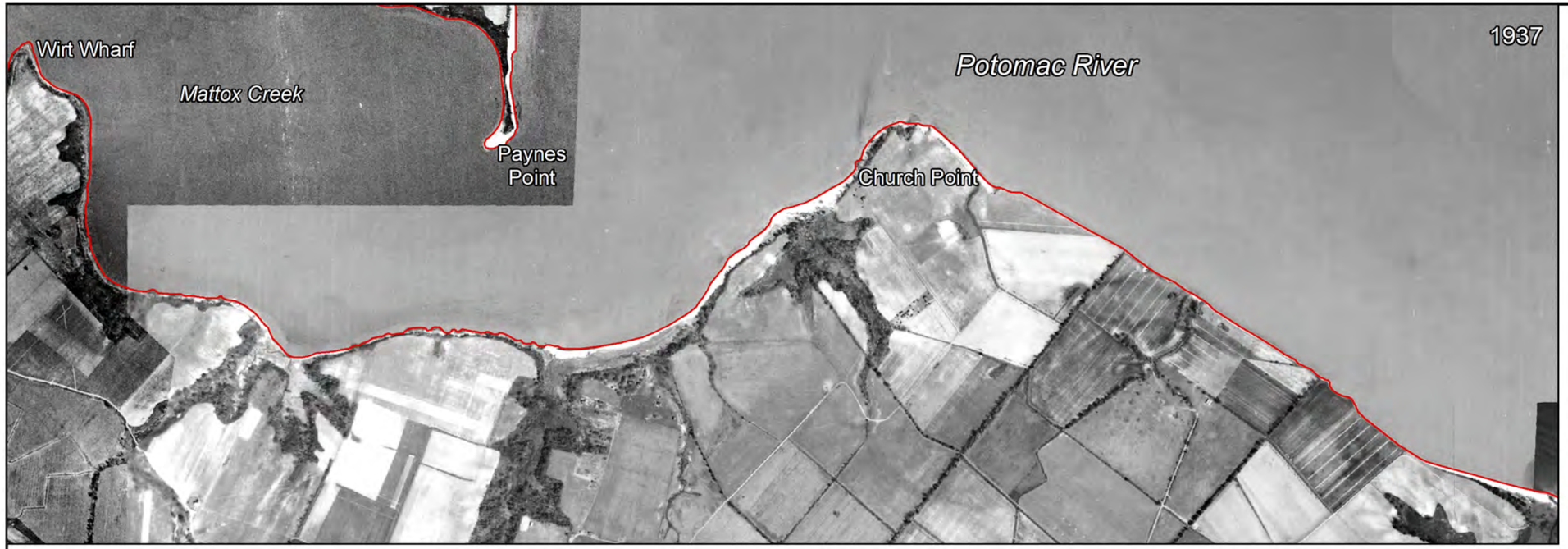
2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

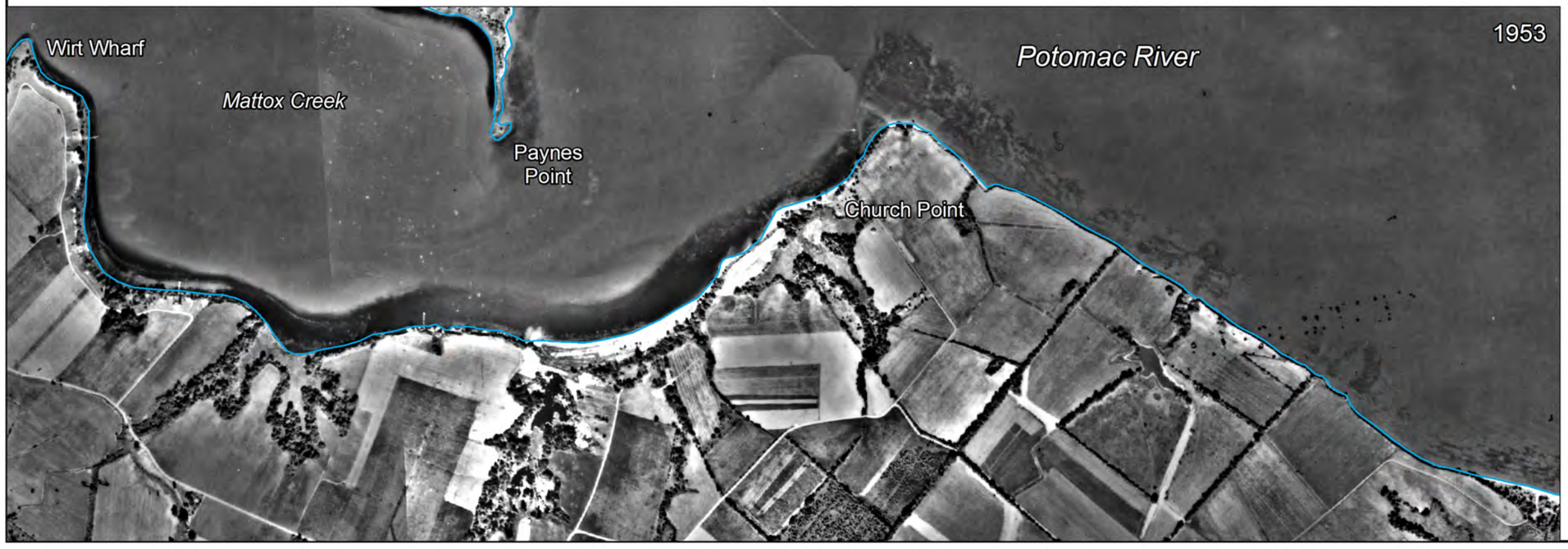


Westmoreland County Virginia

Plate 7

Legend

- 1937 Shoreline
- 1953 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 7

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 7

Legend

2002 Shoreline

2009 Shoreline

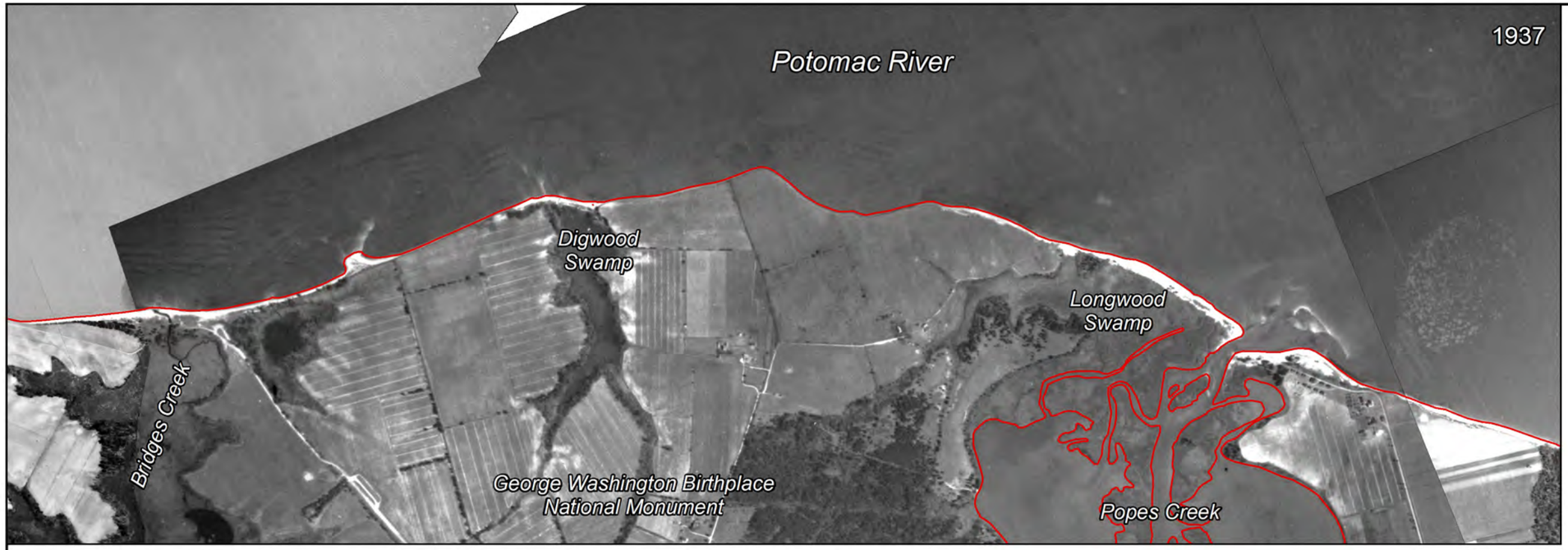
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

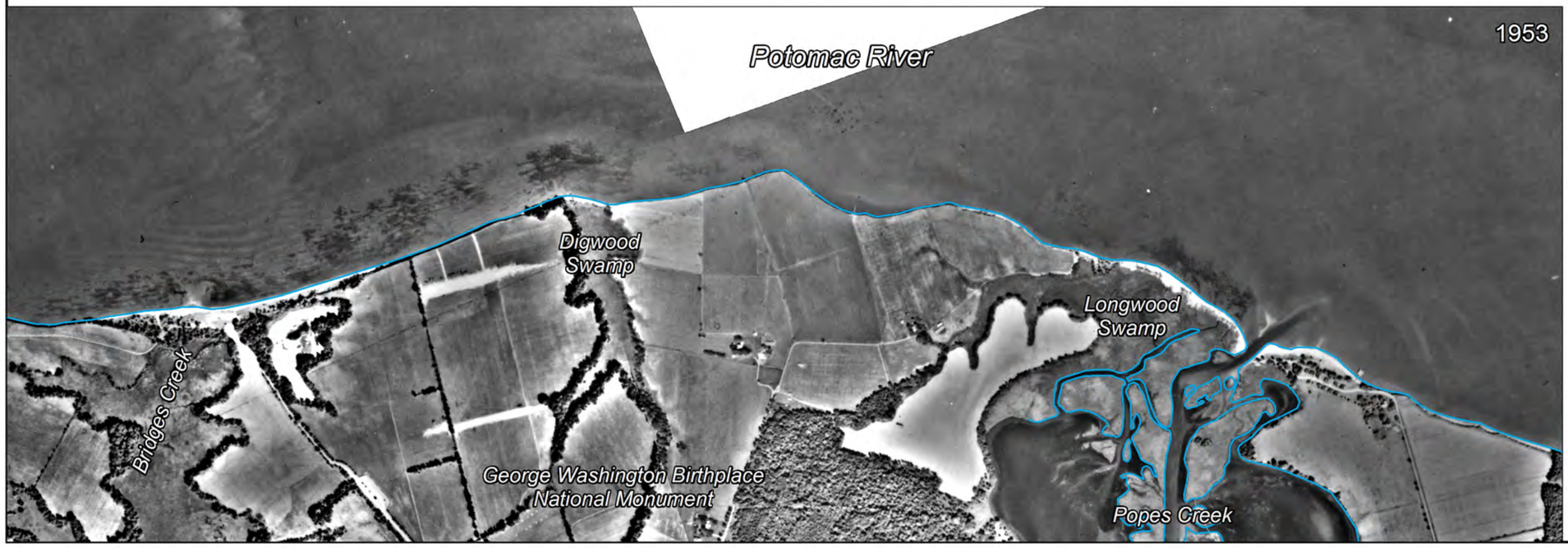
Plate 8



Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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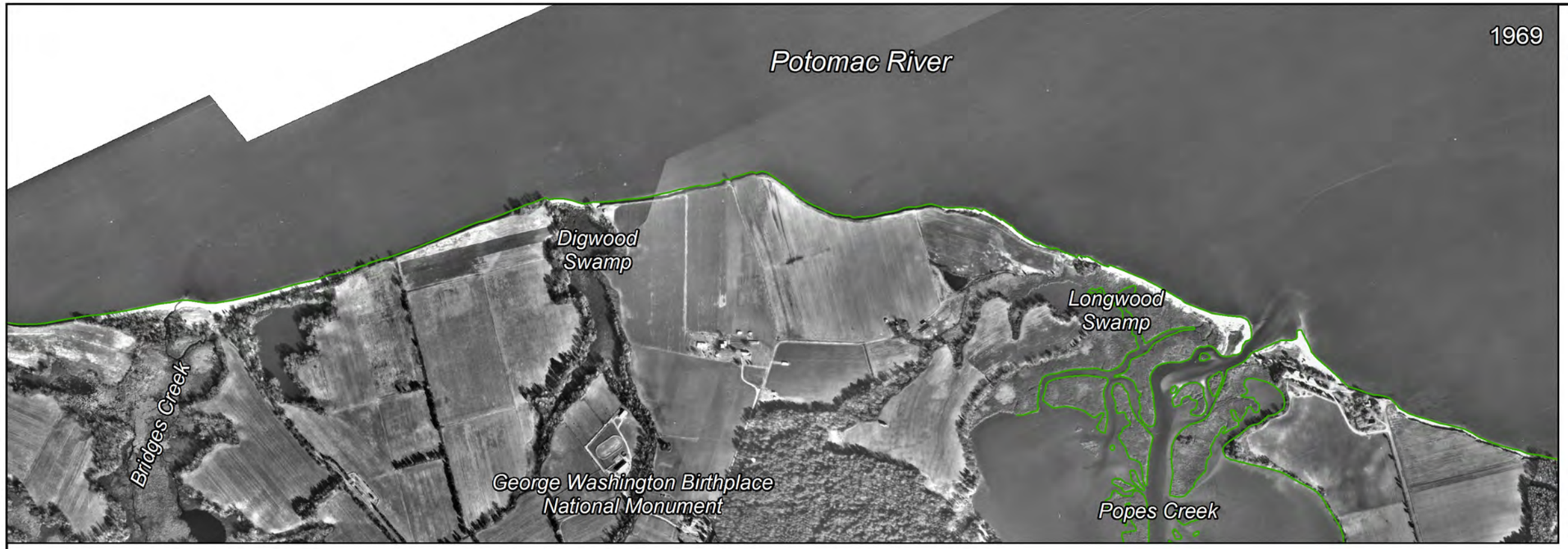


Westmoreland County Virginia

Plate 8

Legend

1969 Shoreline

1994 Shoreline

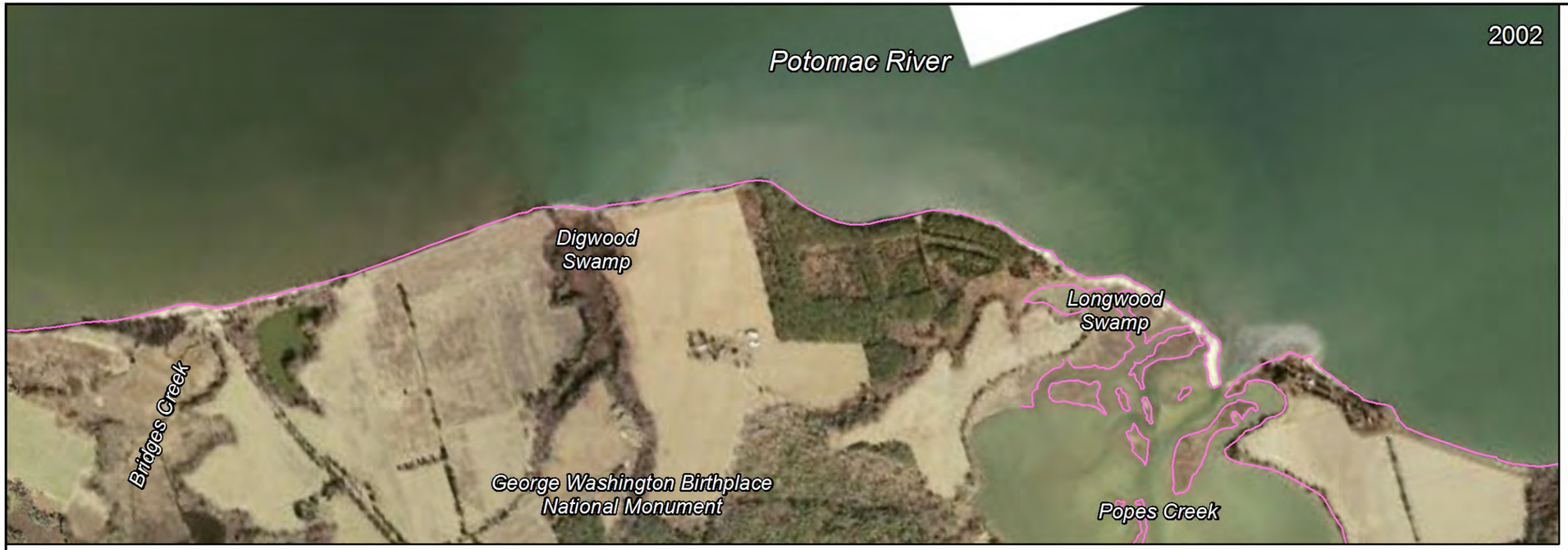
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

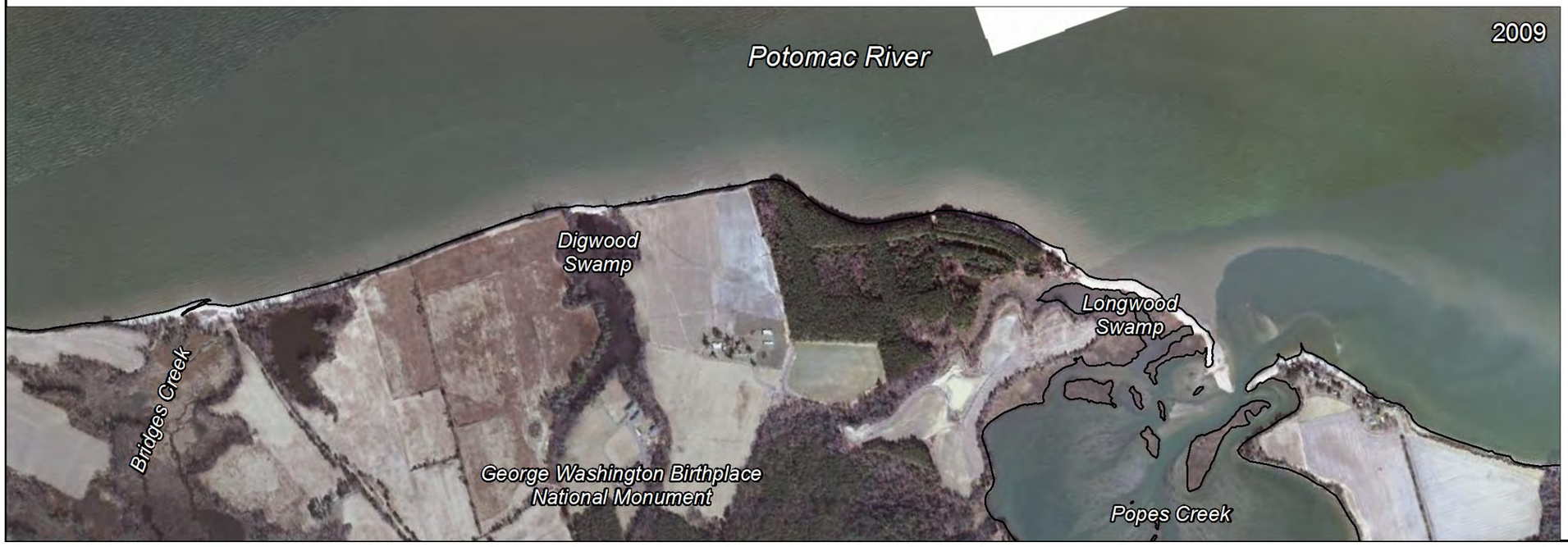
Plate 8

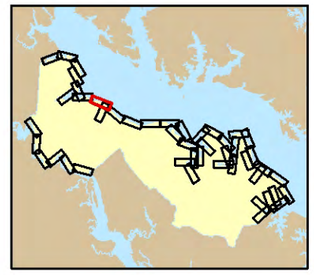


Legend

2002 Shoreline

2009 Shoreline





Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 9

Legend

- 1937 Shoreline
- 1953 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 9

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 9

Legend

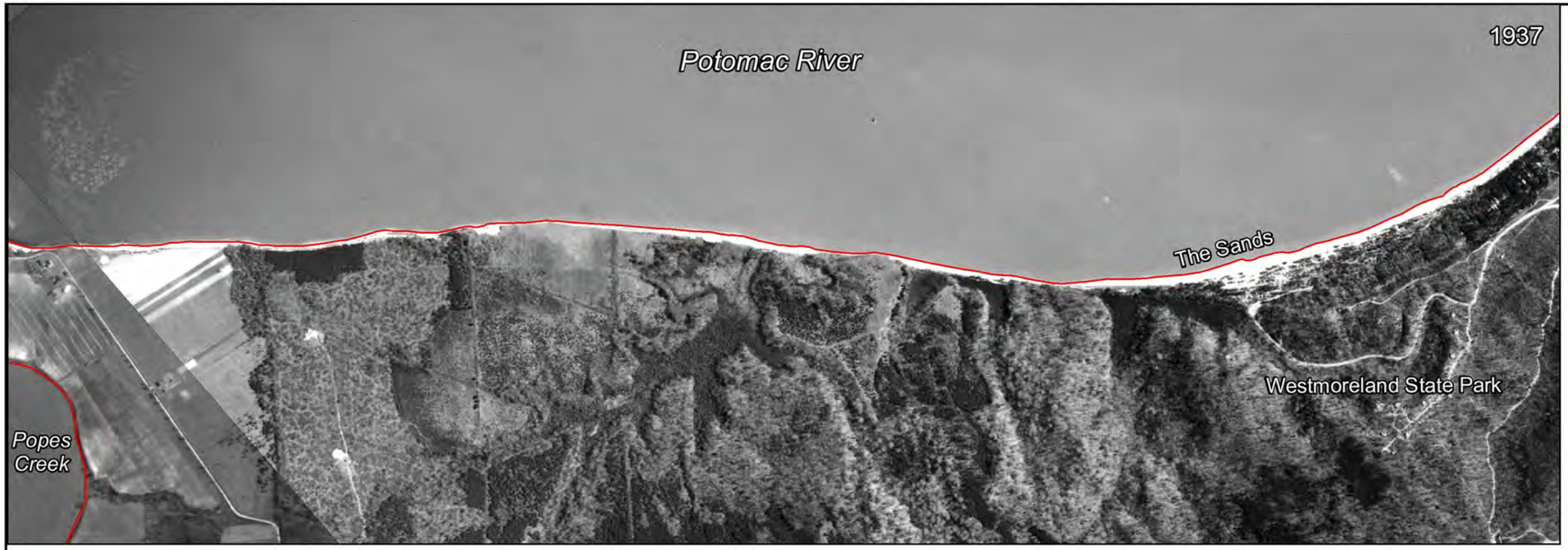
2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



Westmoreland County
Virginia

Plate 10

Legend

1937 Shoreline

1953 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 10

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

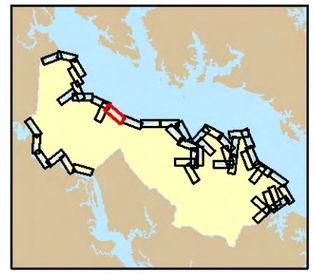
Westmoreland County Virginia

Plate 10

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 11

Legend

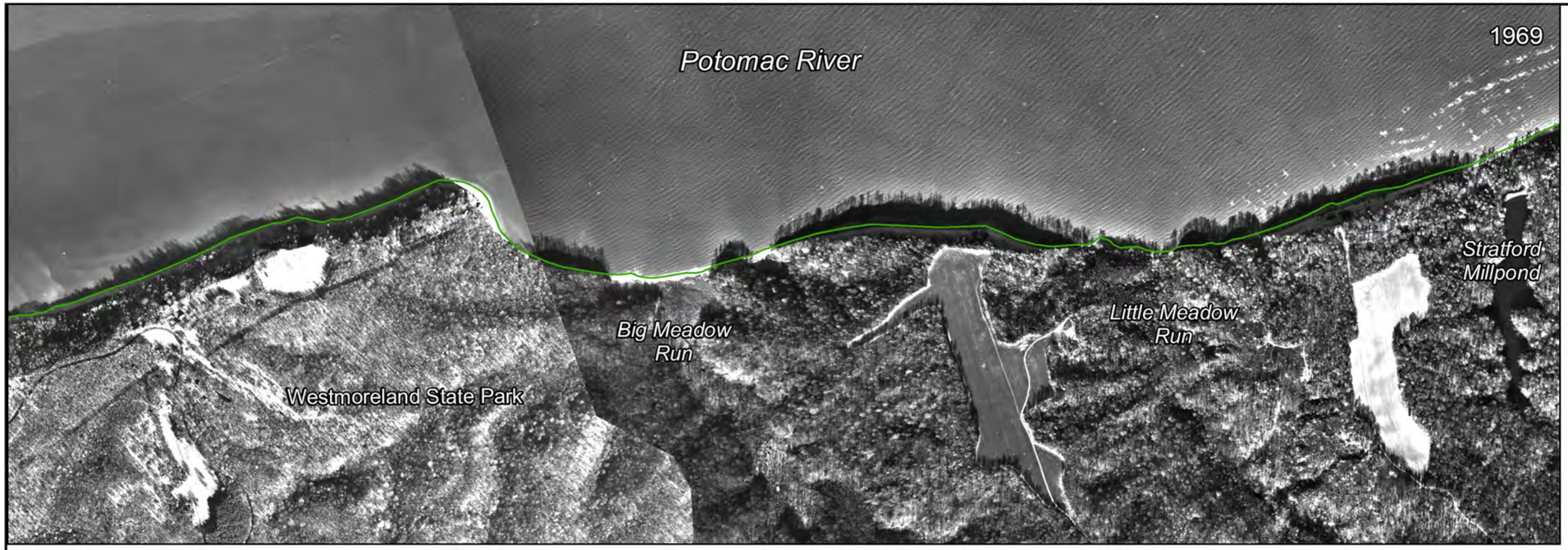
1937 Shoreline

1953 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



Westmoreland County Virginia

Plate 11

Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

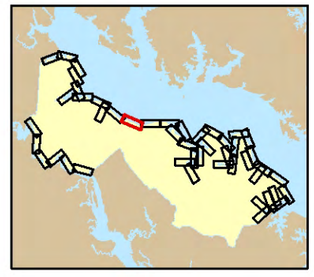
Westmoreland County Virginia

Plate 11

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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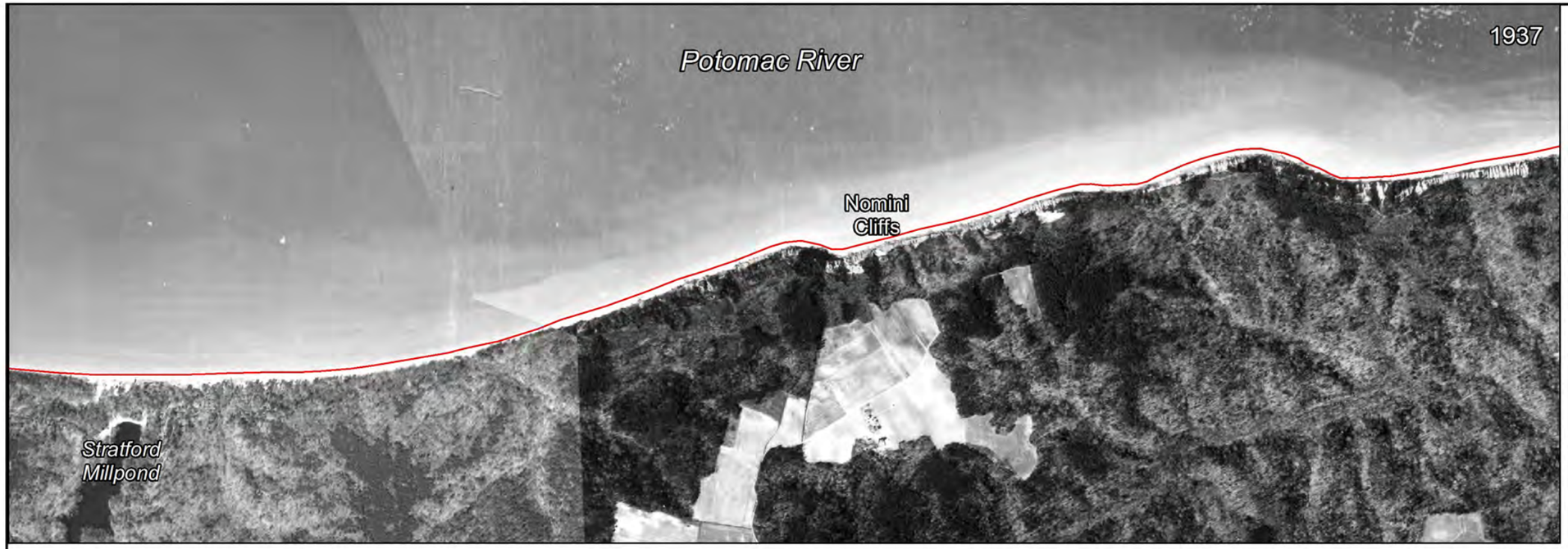


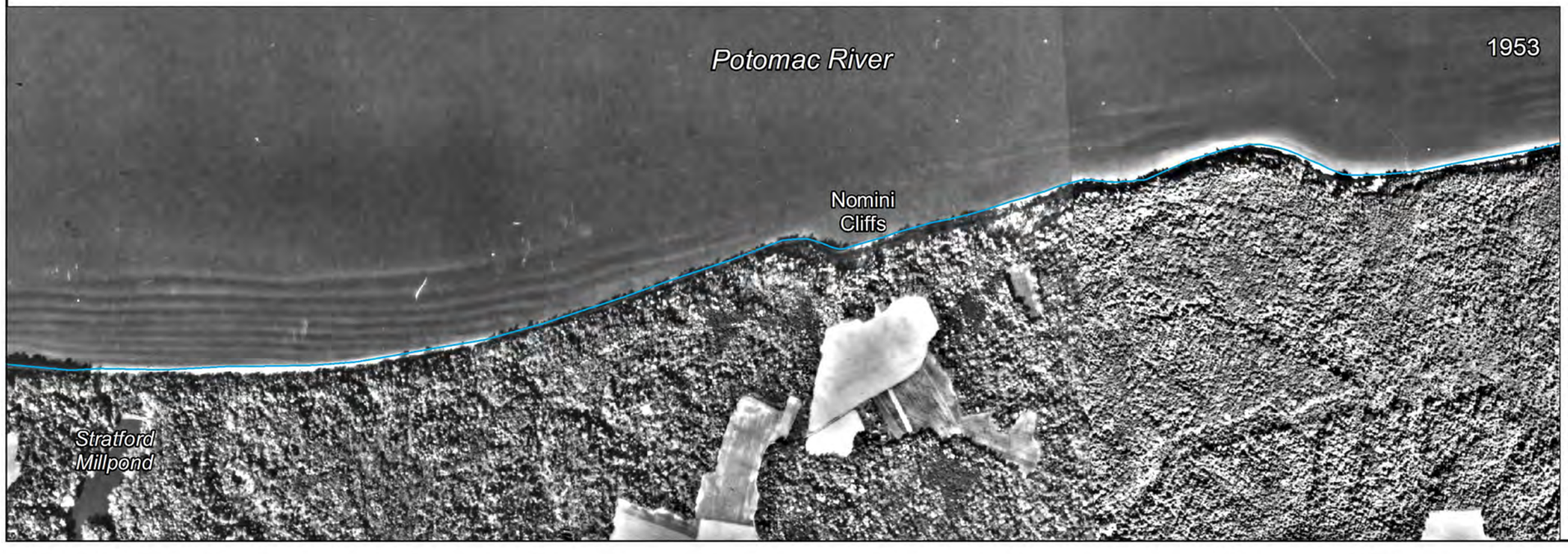
Westmoreland County
Virginia

Plate 12

Legend

1937 Shoreline

1953 Shoreline

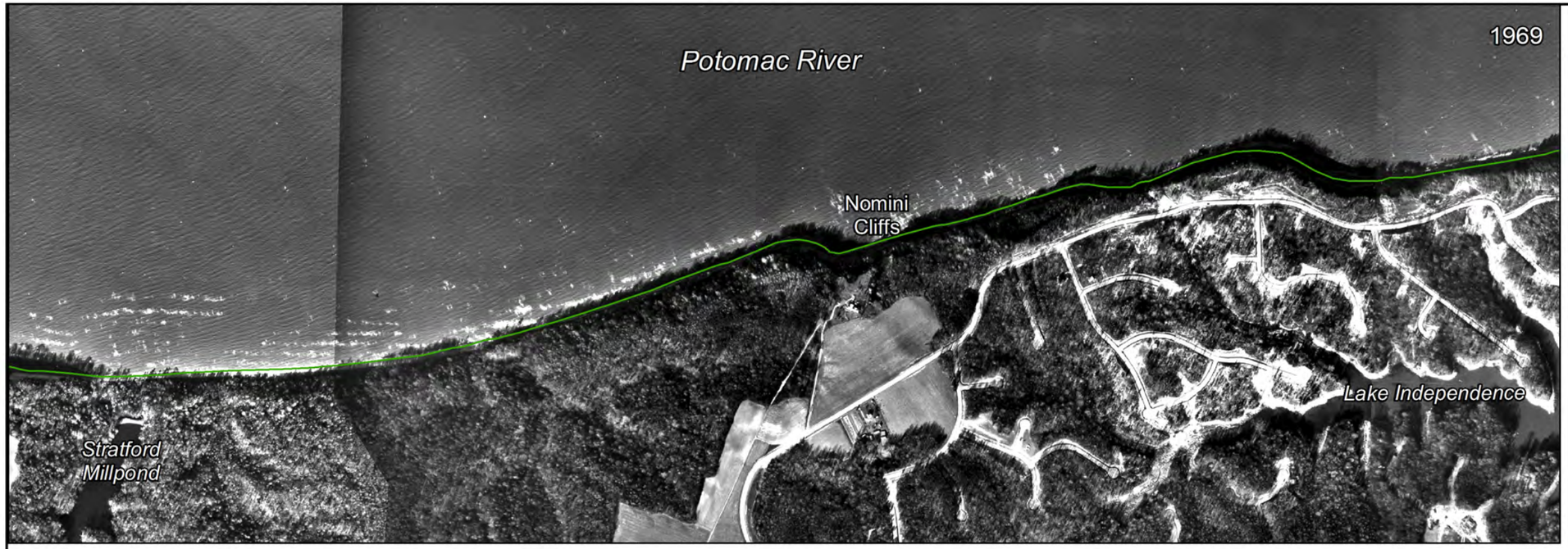


Shoreline Studies Program
VIMS

N

1,000 0 1,000

Feet



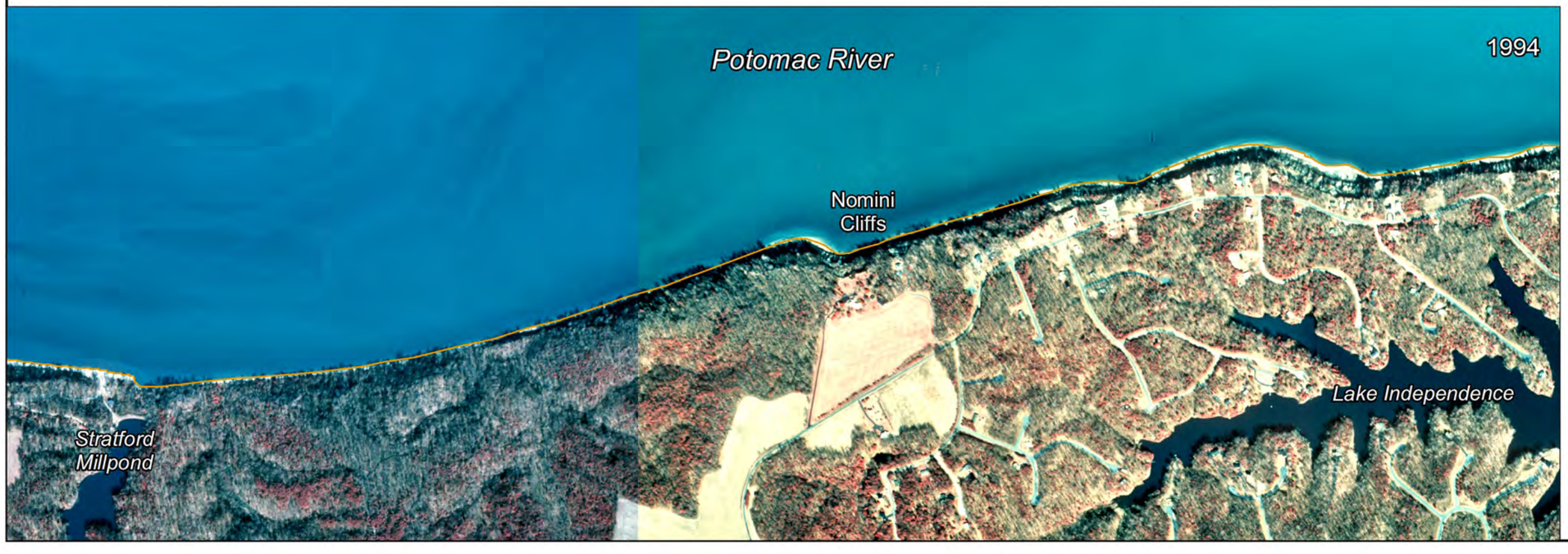
Westmoreland County
Virginia

Plate 12

Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program
VIMS

N

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 12

Legend

2002 Shoreline

2009 Shoreline

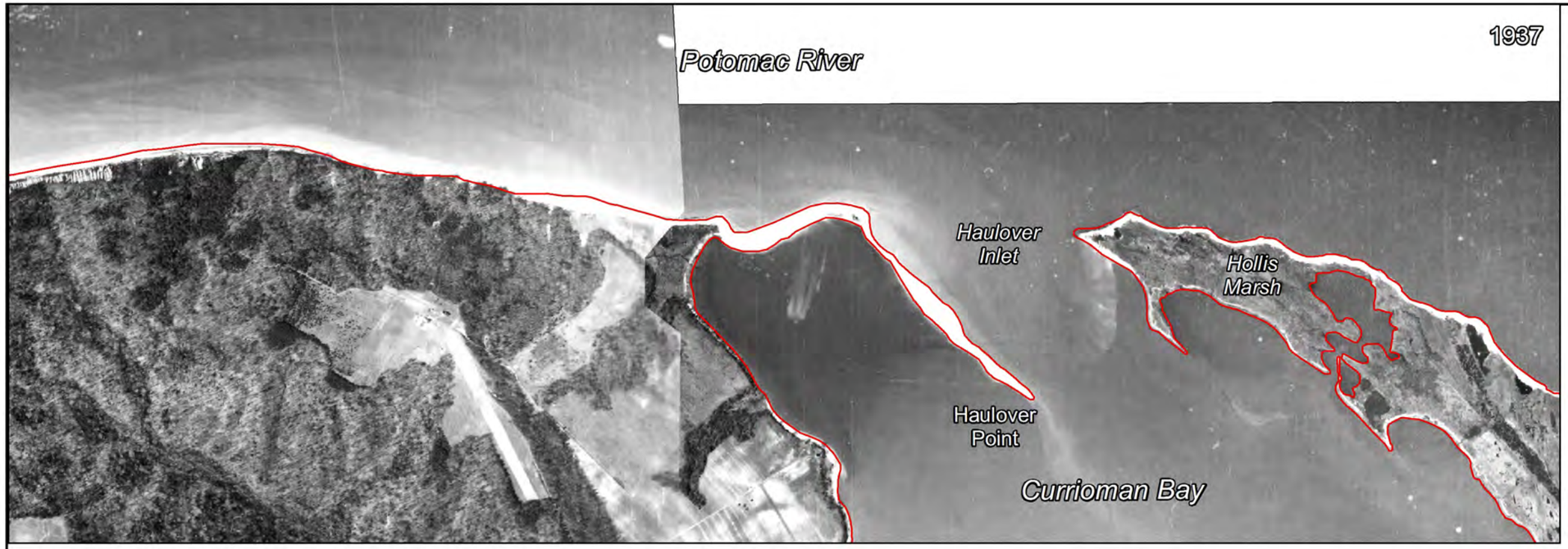
Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

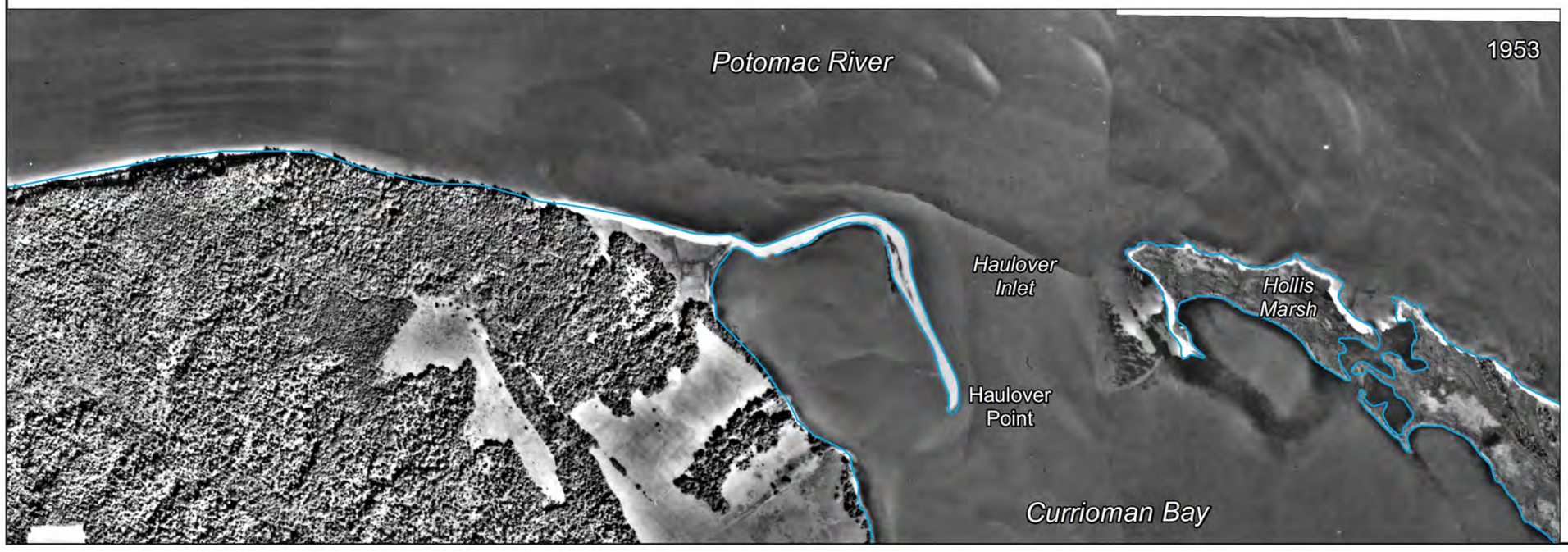
Plate 13



Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

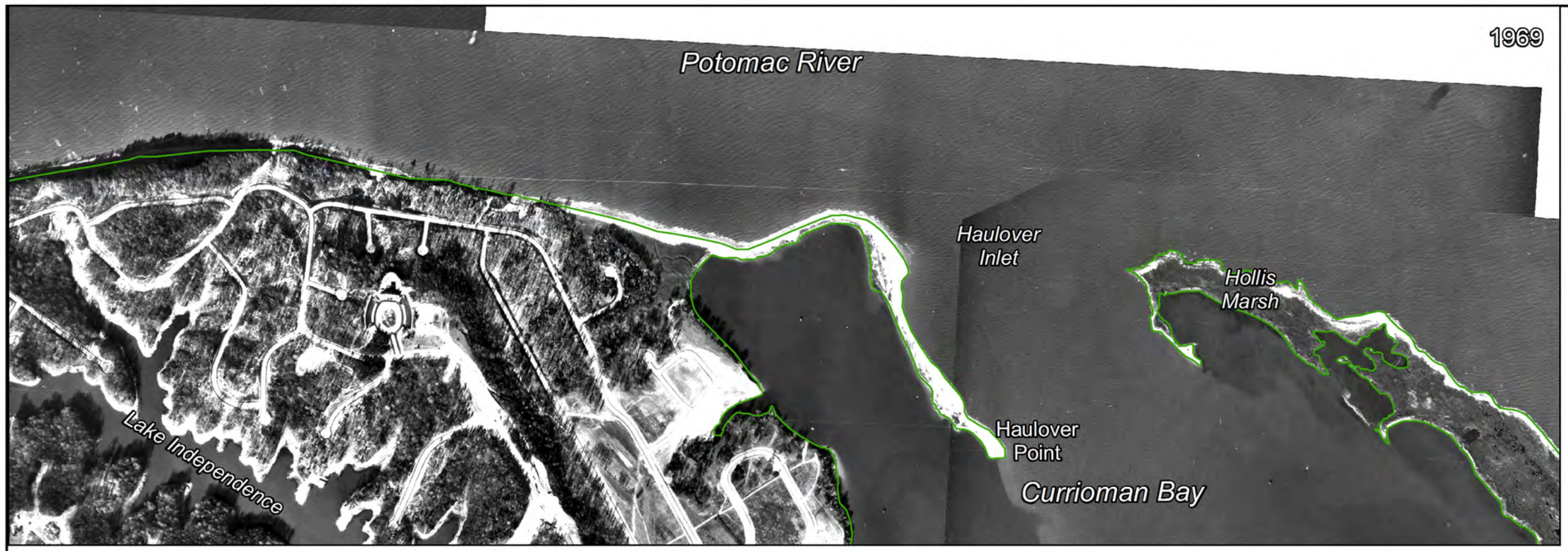
N

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 13



Legend

1969 Shoreline

1994 Shoreline

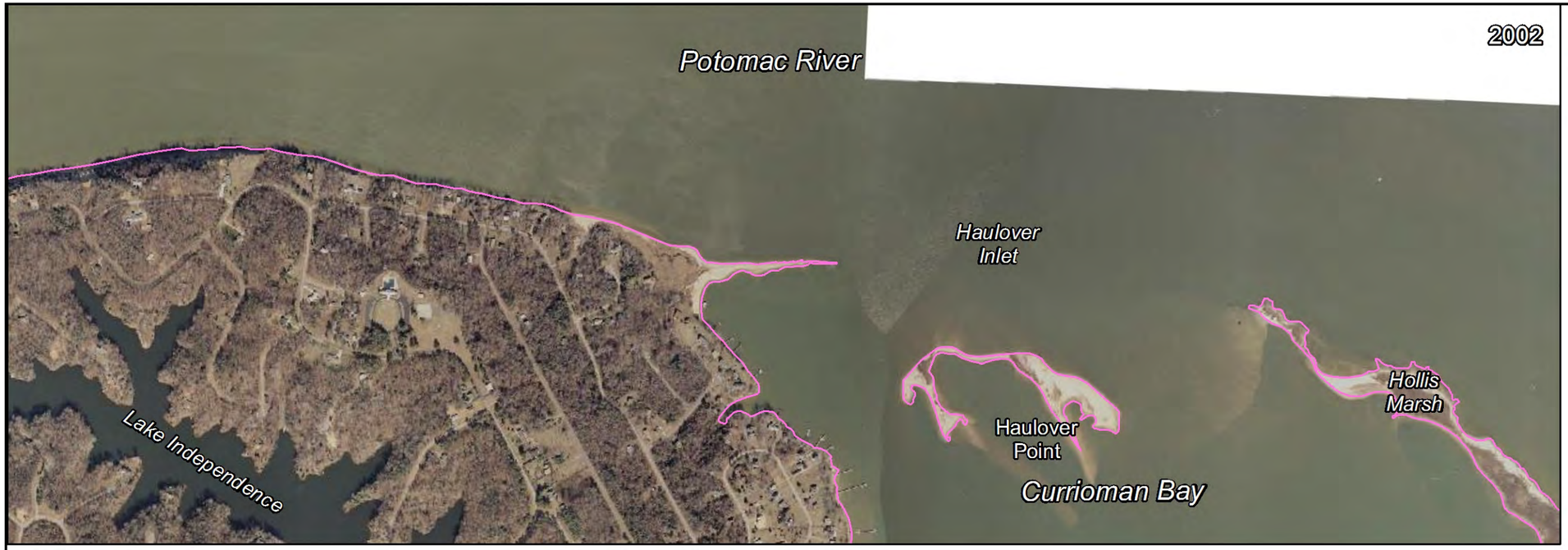
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

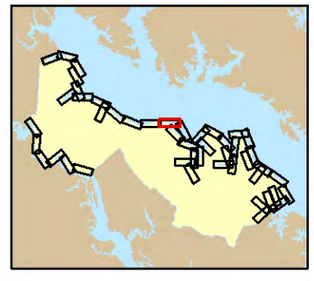
Plate 13



Legend

2002 Shoreline

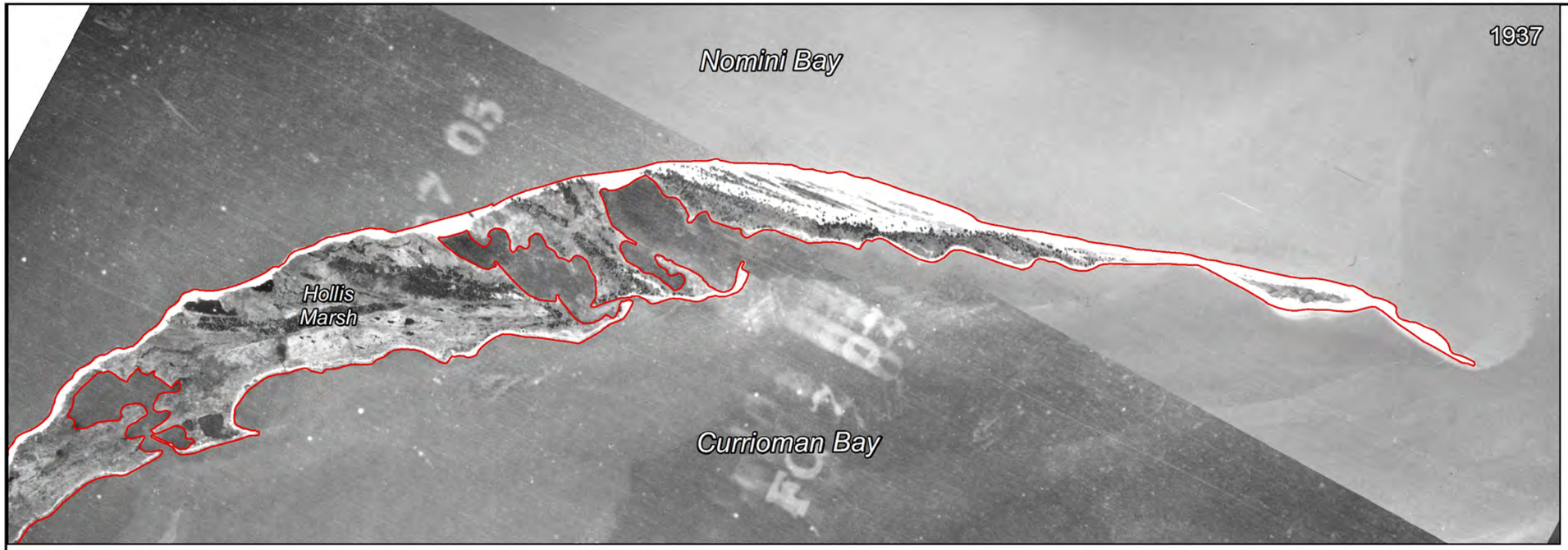
2009 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet



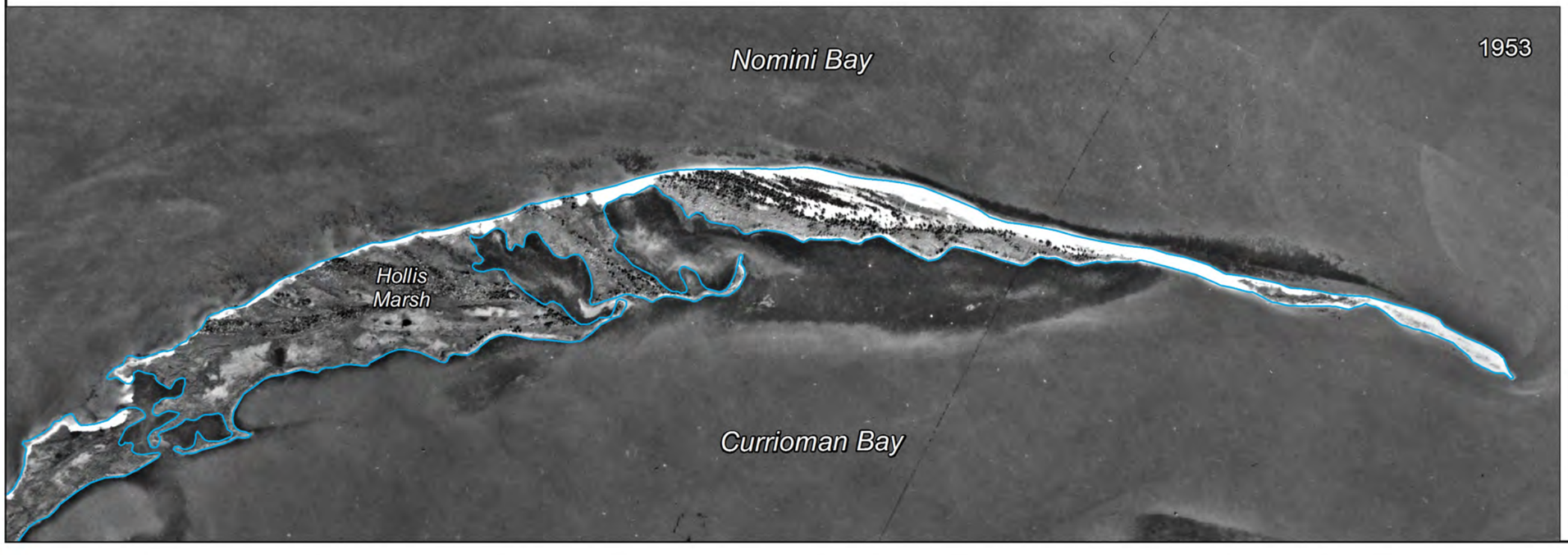
Westmoreland County
Virginia

Plate 14

Legend

1937 Shoreline

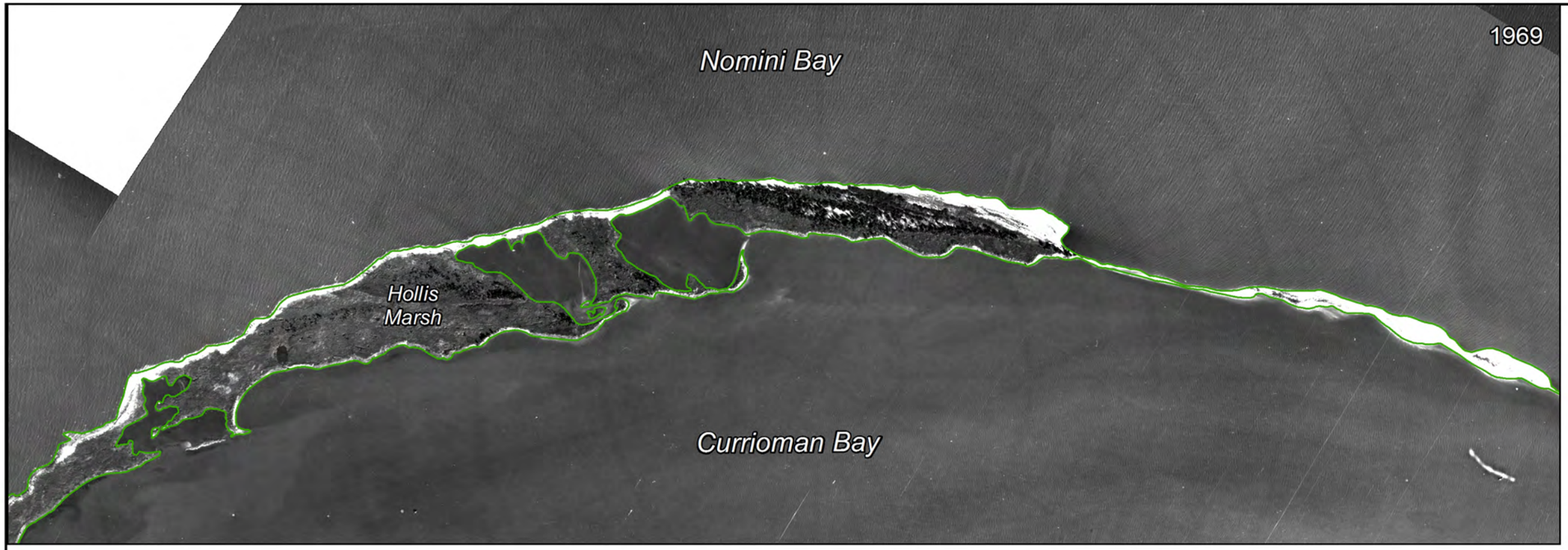
1953 Shoreline



Shoreline Studies Program
VIMS

1,000 0 1,000

Feet



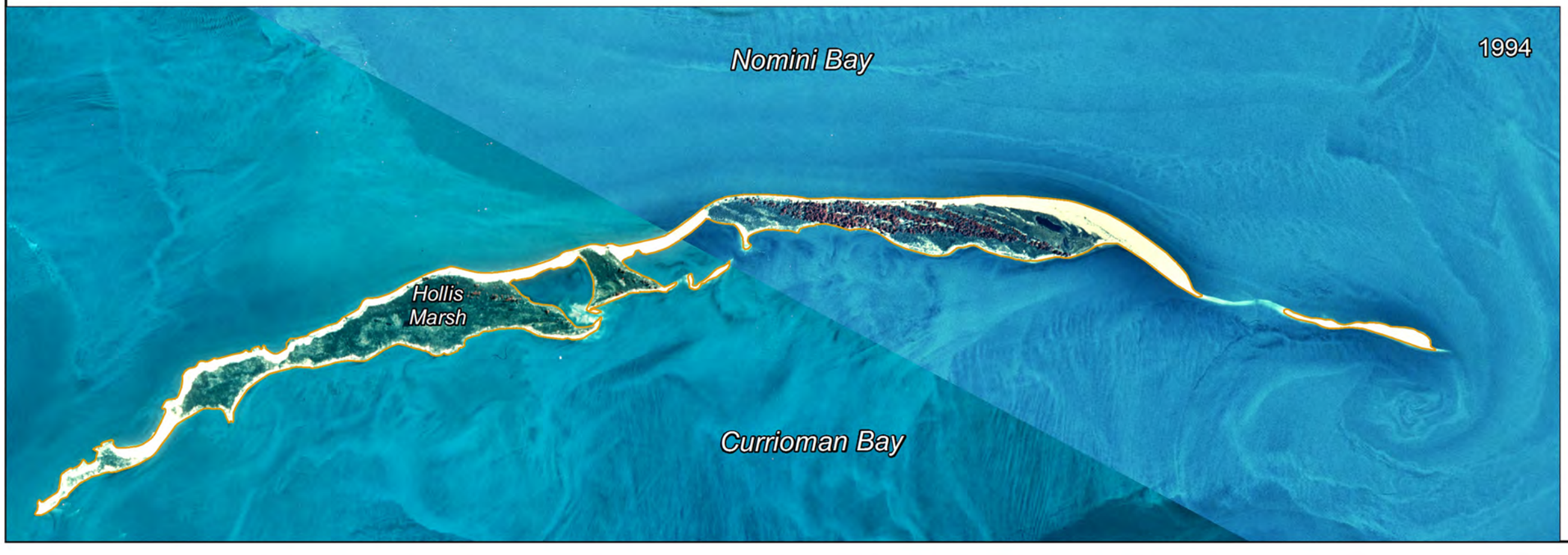
Westmoreland County
Virginia

Plate 14

Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program
VIMS

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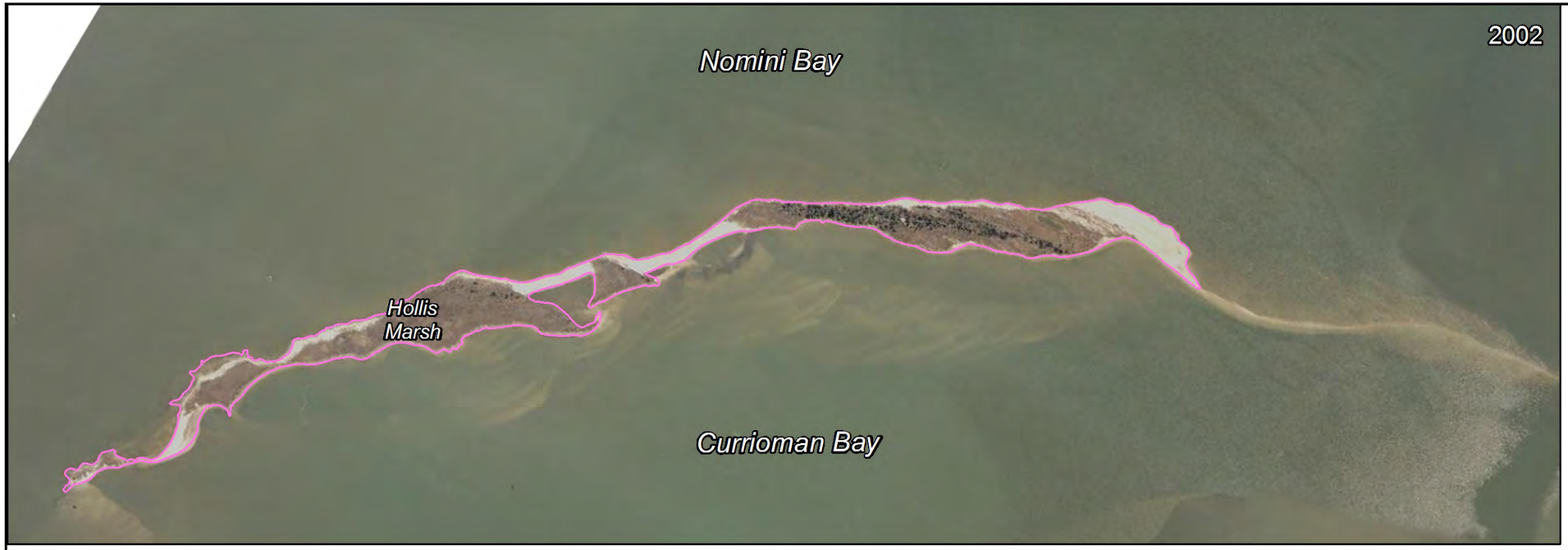
Feet



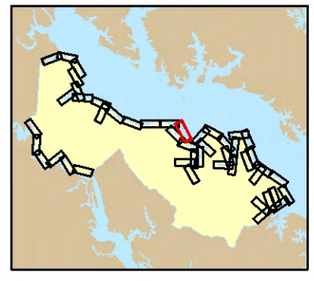
Westmoreland County
Virginia

Plate 14

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program
VIMS

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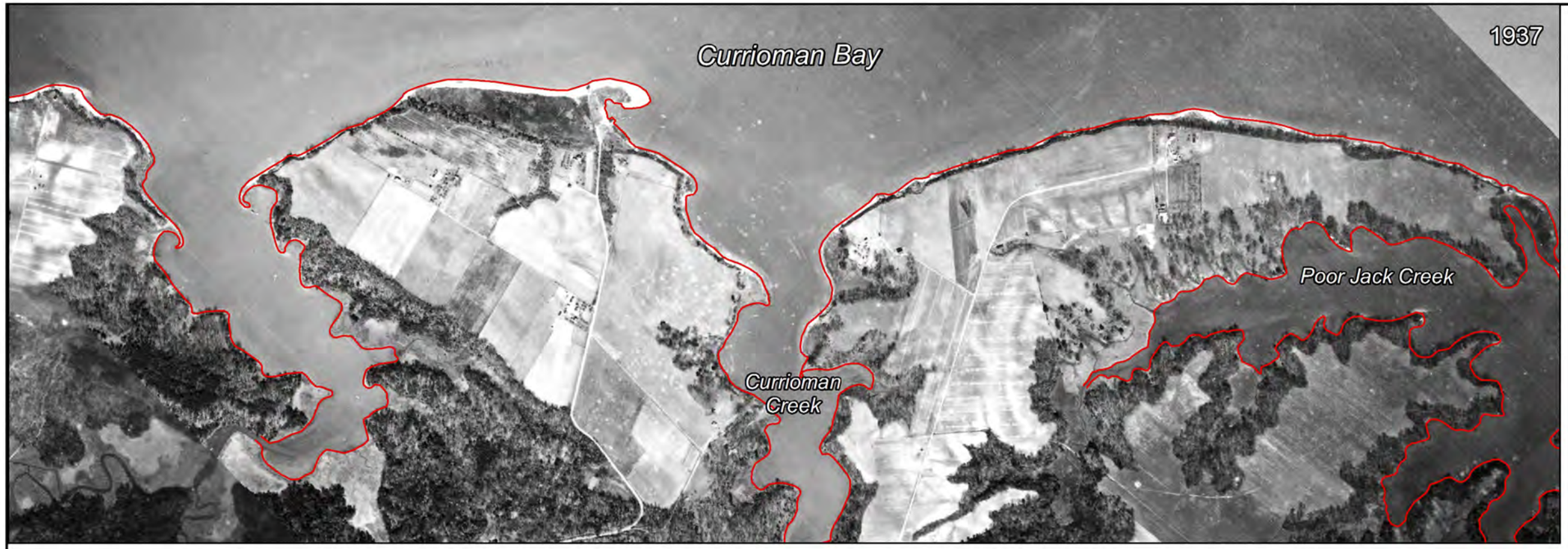
Feet

Westmoreland County
Virginia

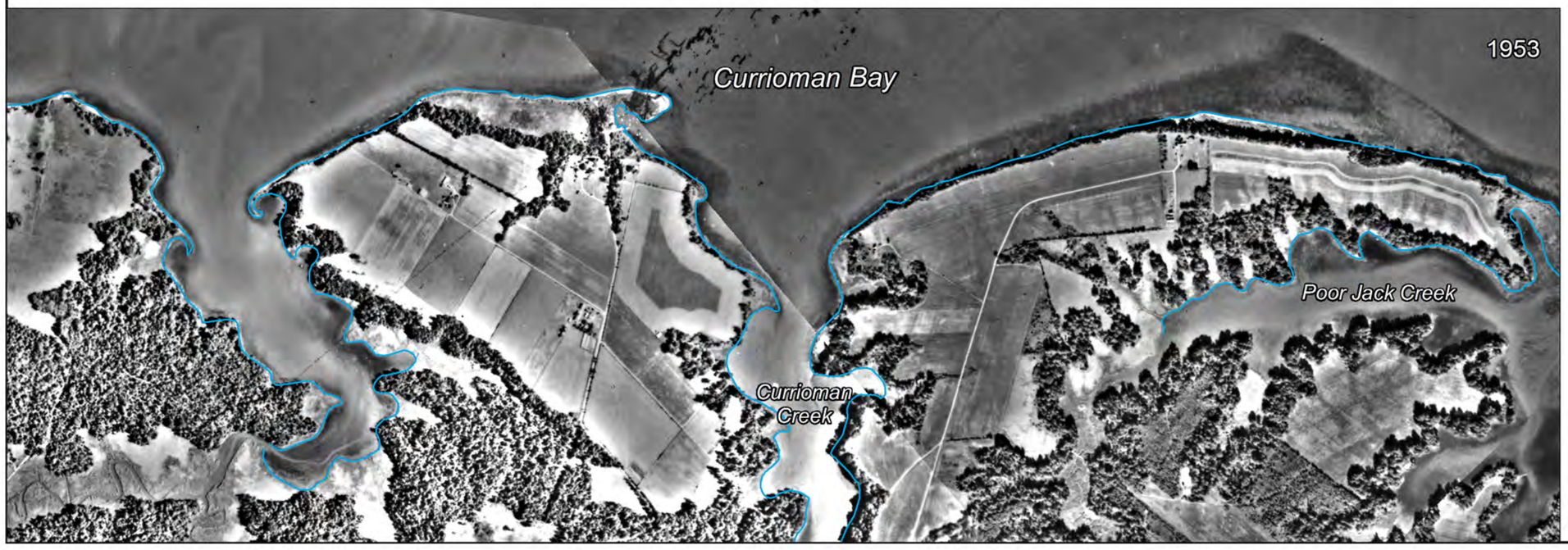
Plate 15



Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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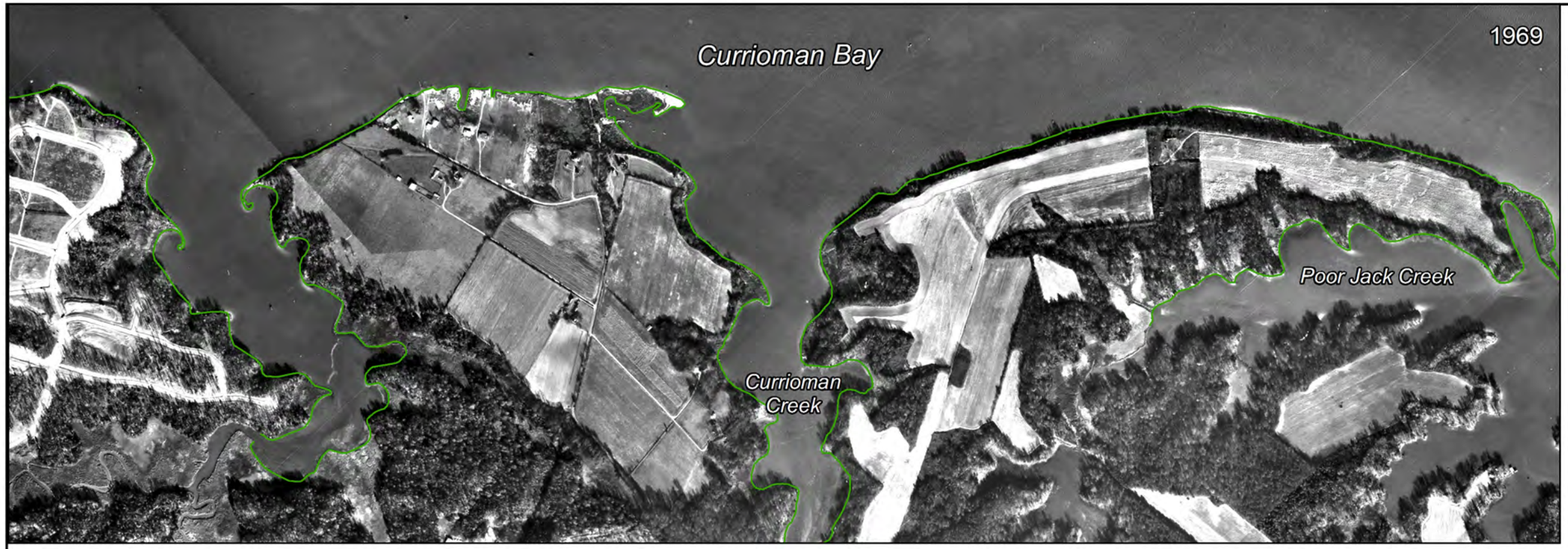


Westmoreland County
Virginia

Plate 15

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

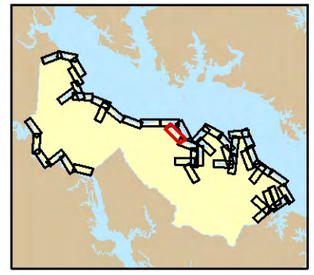
Westmoreland County
Virginia

Plate 15

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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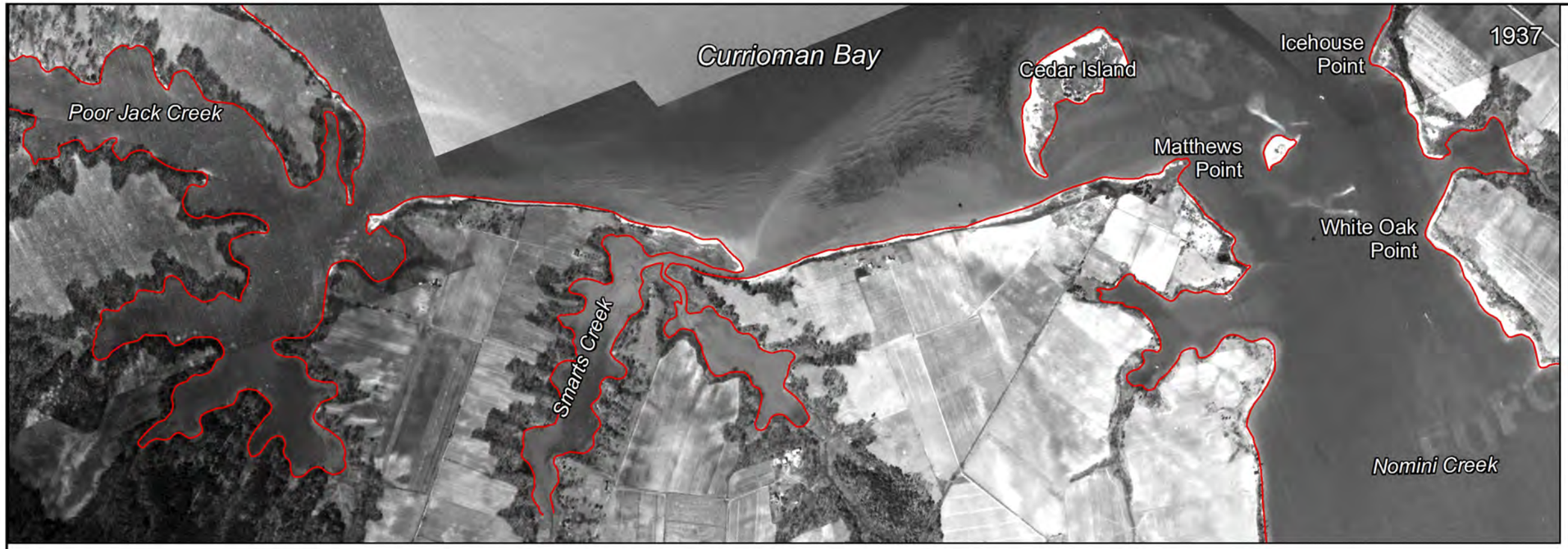
Feet

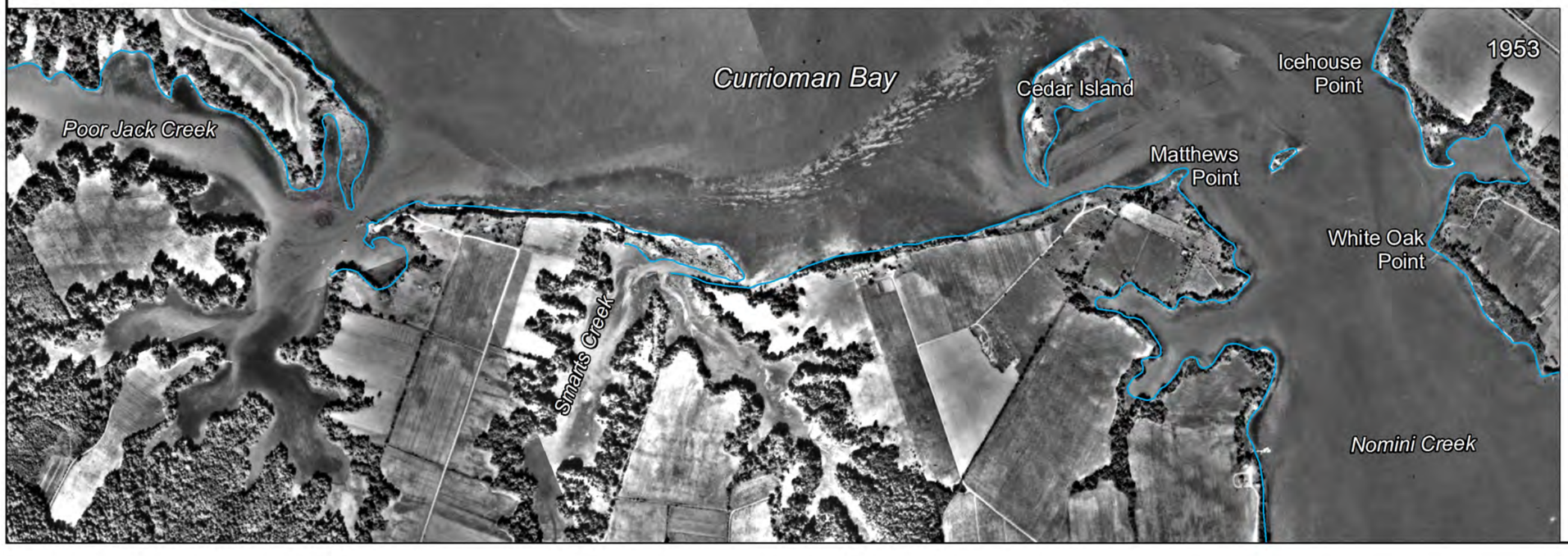


Westmoreland County Virginia

Plate 16

Legend

- 1937 Shoreline
- 1953 Shoreline



Shoreline Studies Program VIMS

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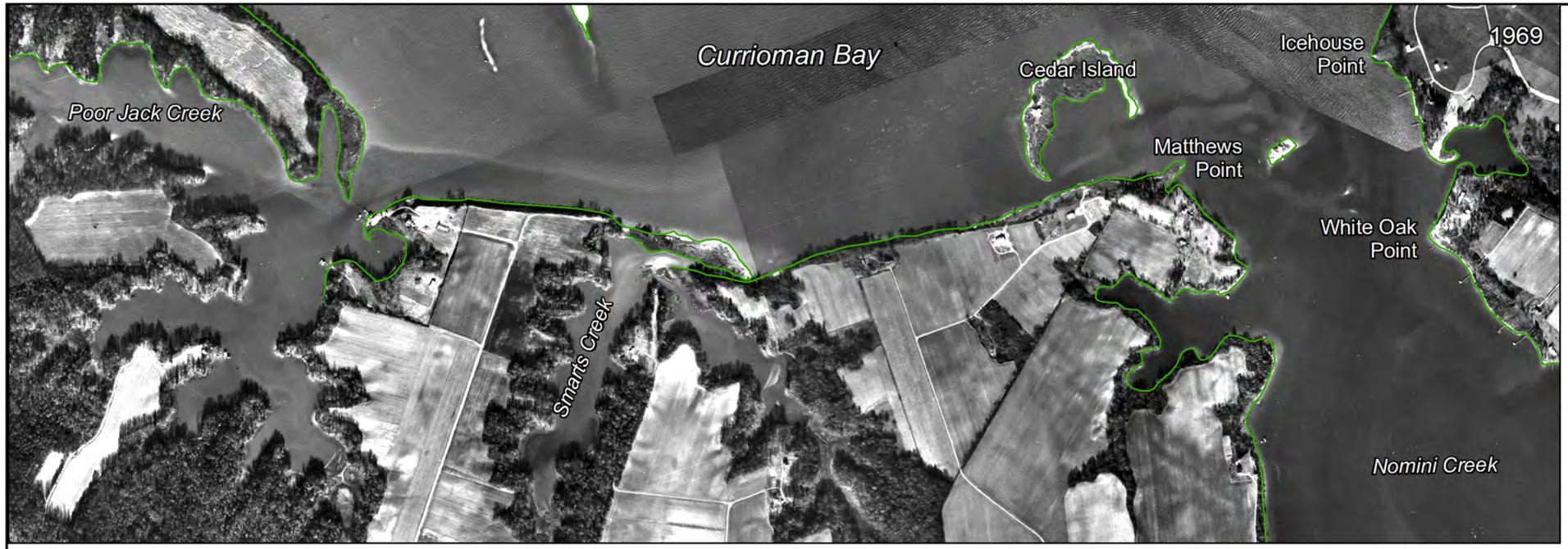


Westmoreland County Virginia

Plate 16

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 16

Legend

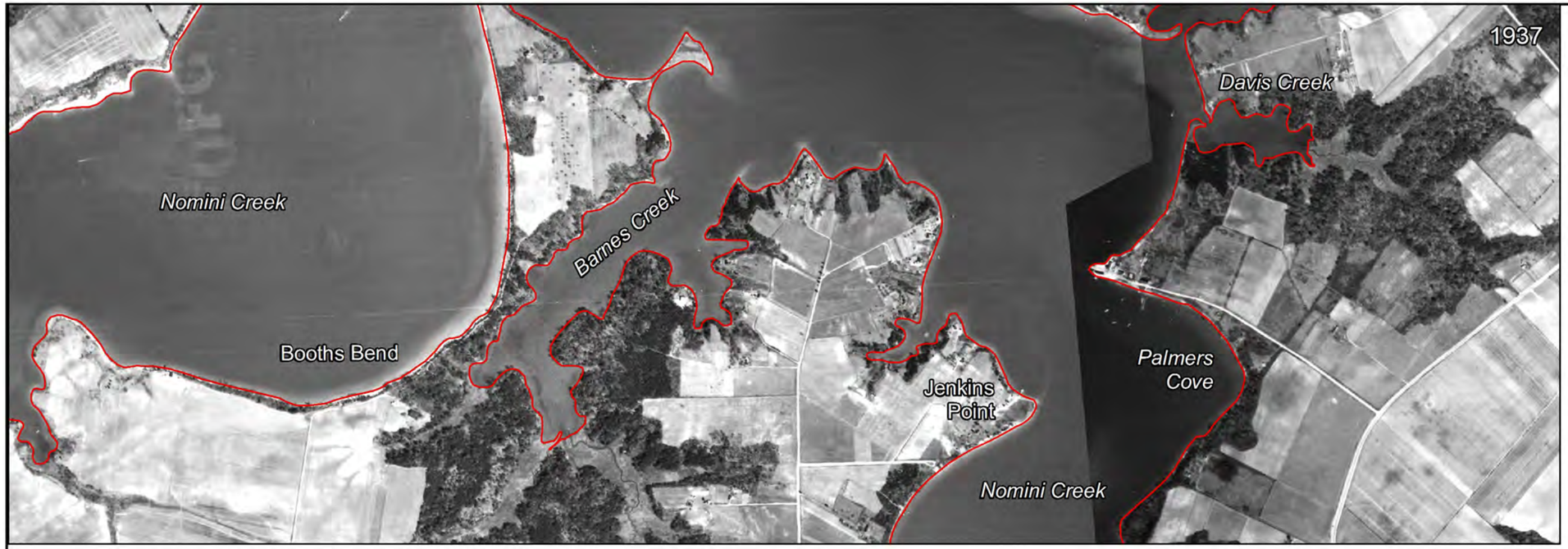
1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



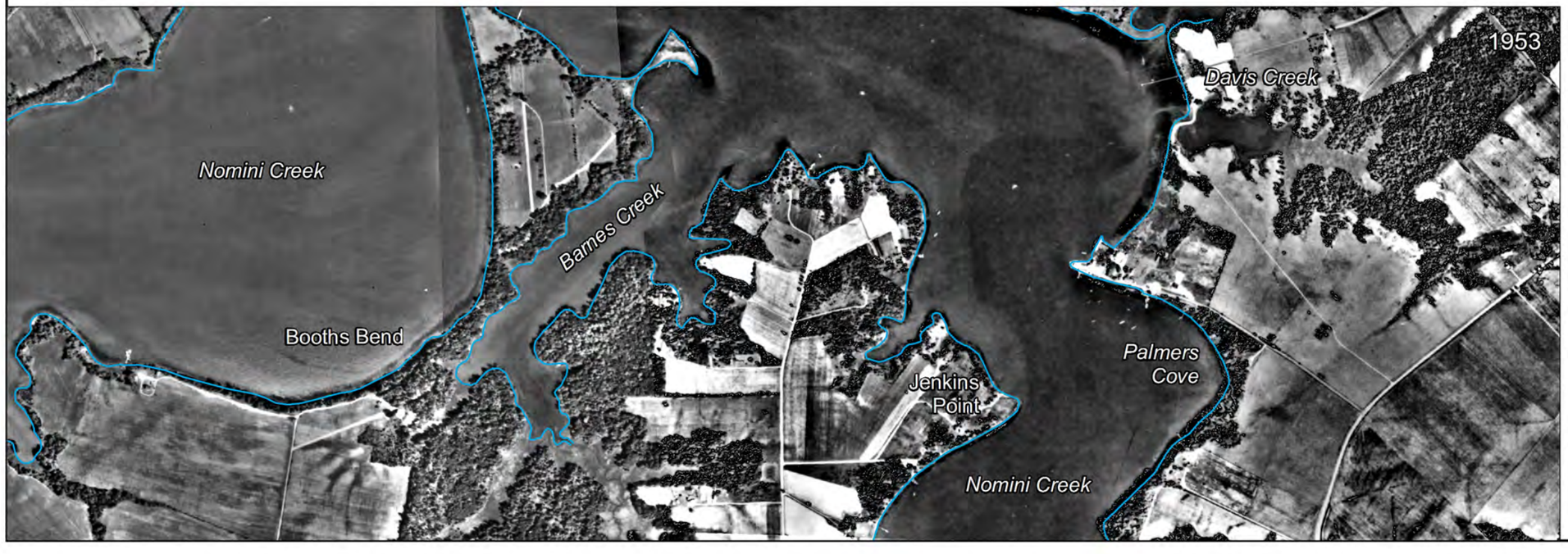
Westmoreland County Virginia

Plate 17

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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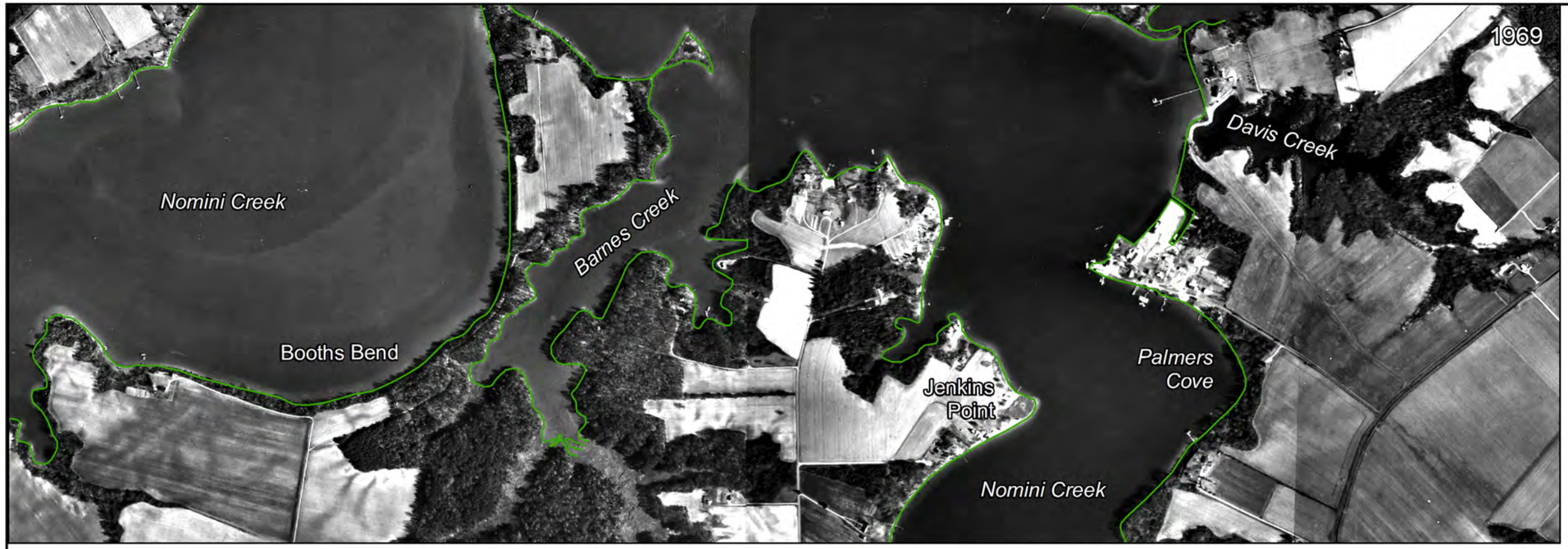


Westmoreland County Virginia

Plate 17

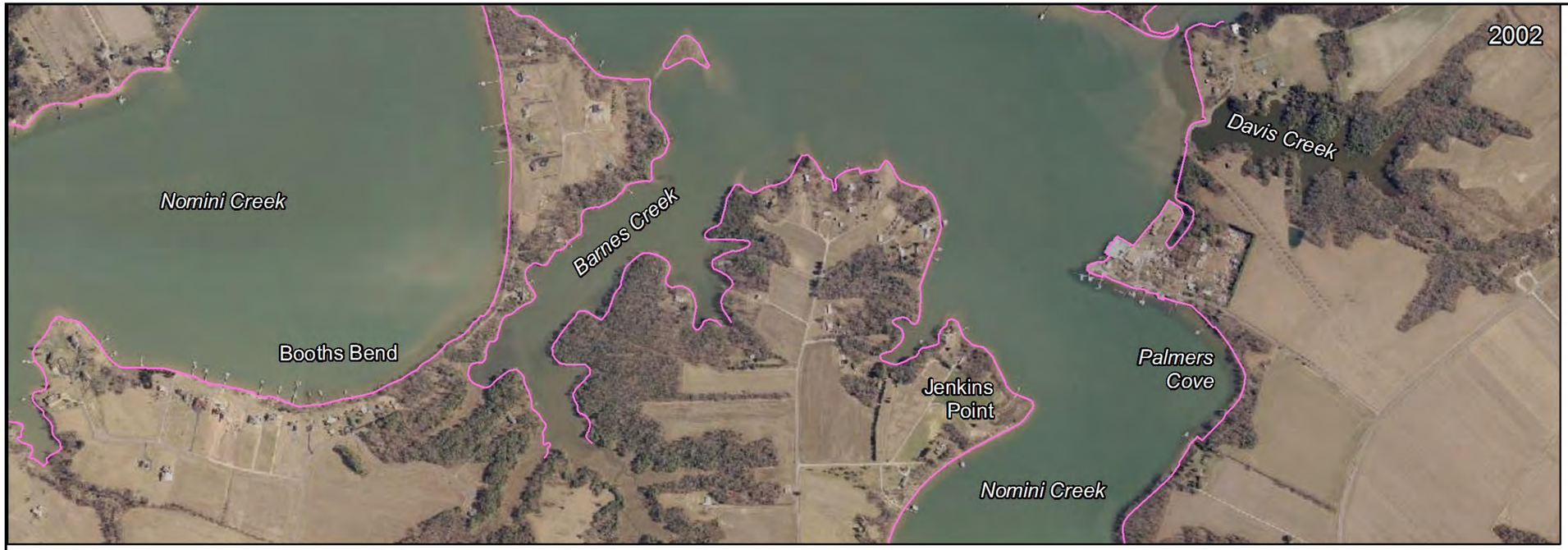
Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



Westmoreland County Virginia

Plate 17

Legend

2002 Shoreline

2009 Shoreline

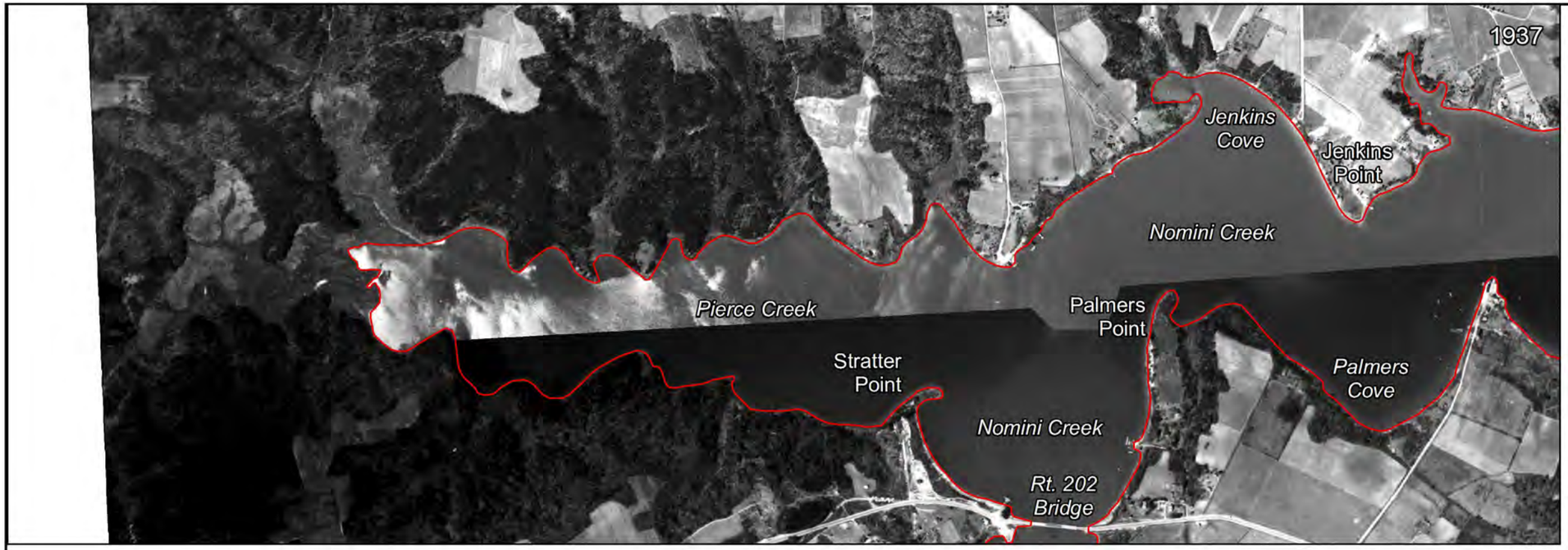
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

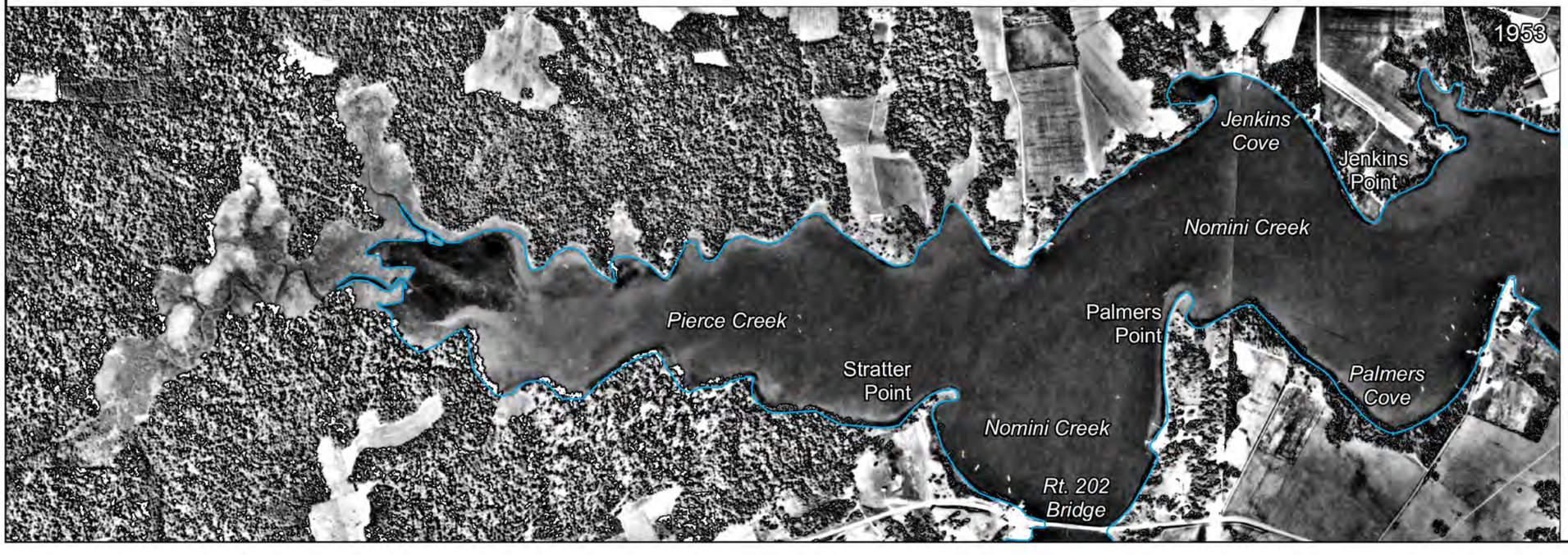
Westmoreland County Virginia

Plate 18



Legend

- 1937 Shoreline
- 1953 Shoreline



Shoreline Studies Program VIMS

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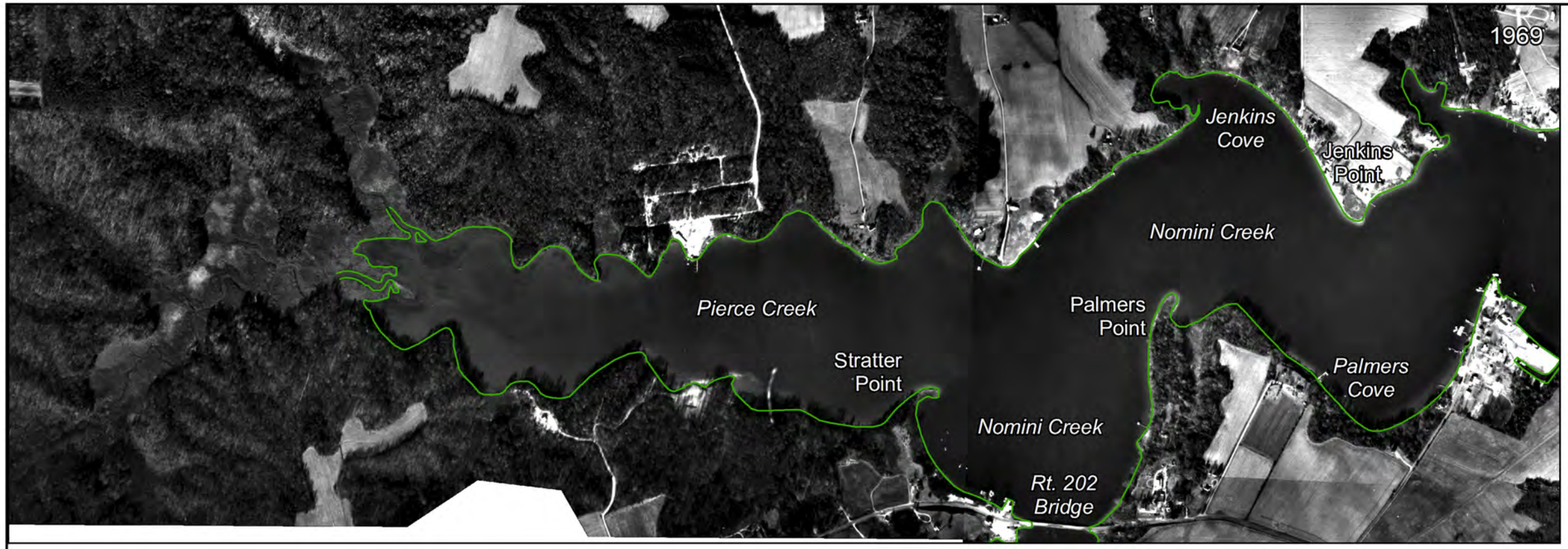
Feet

Westmoreland County
Virginia

Plate 18



Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program VIMS

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Feet

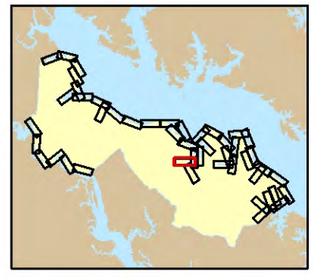
Westmoreland County Virginia

Plate 18

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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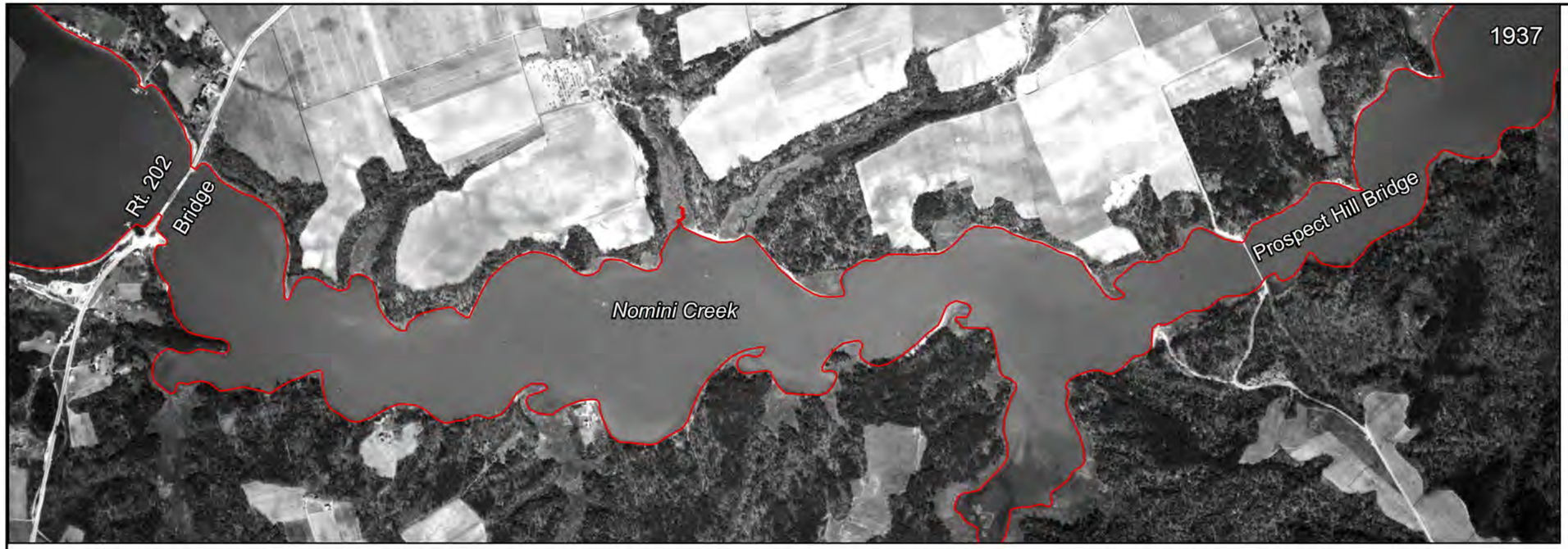


Westmoreland County
Virginia

Plate 19

Legend

1937 Shoreline

1953 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 19

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 19

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

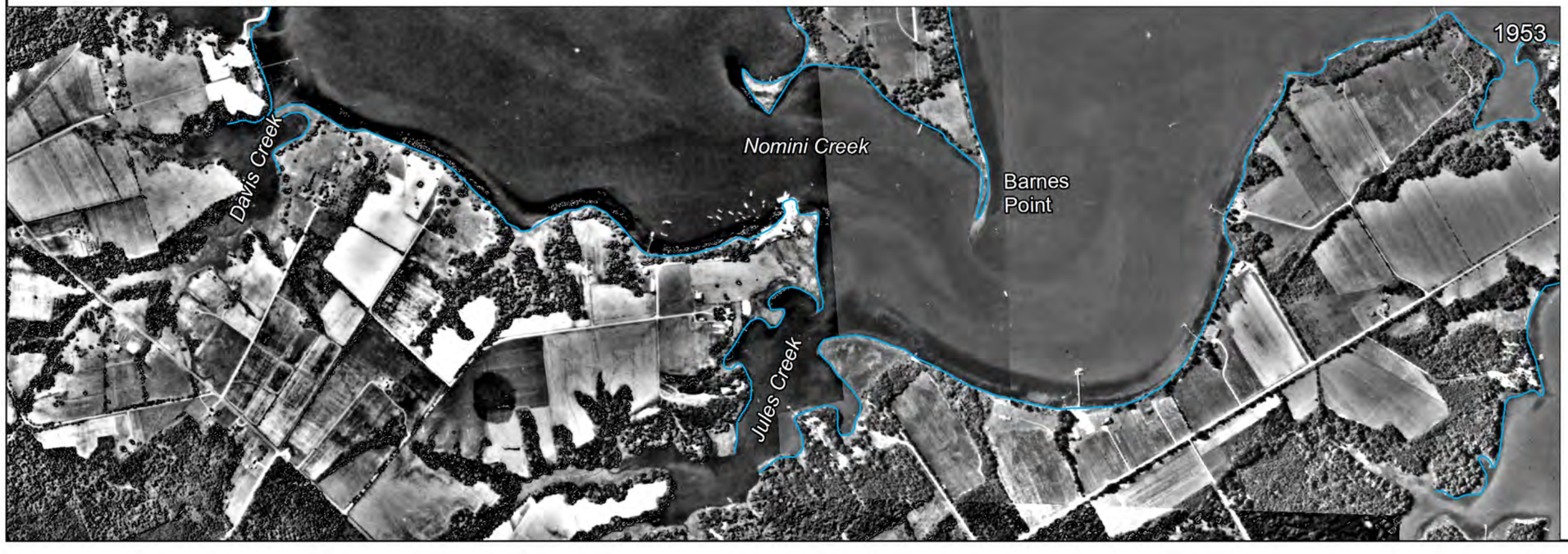
Westmoreland County
Virginia

Plate 20

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program
VIMS

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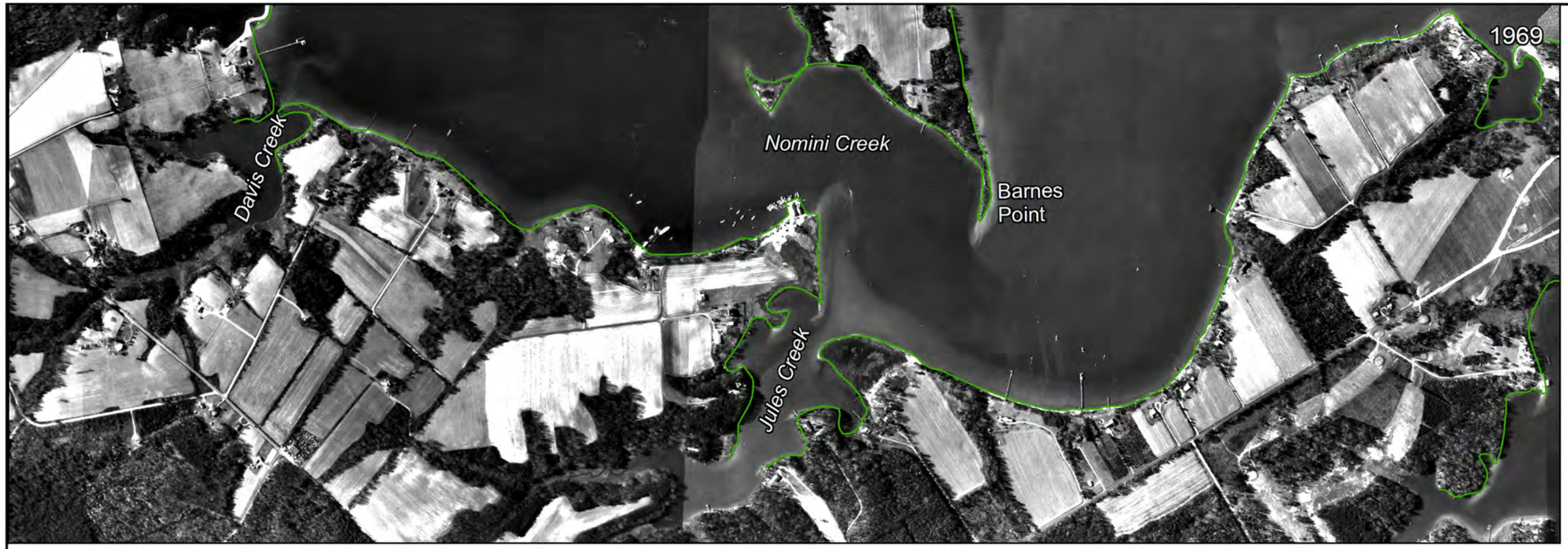

Westmoreland County
Virginia

Plate 20

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

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Feet

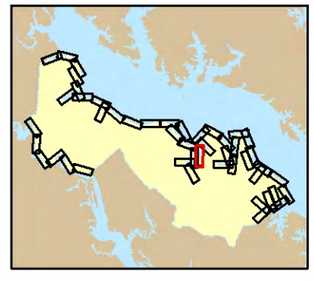
Westmoreland County
Virginia

Plate 20

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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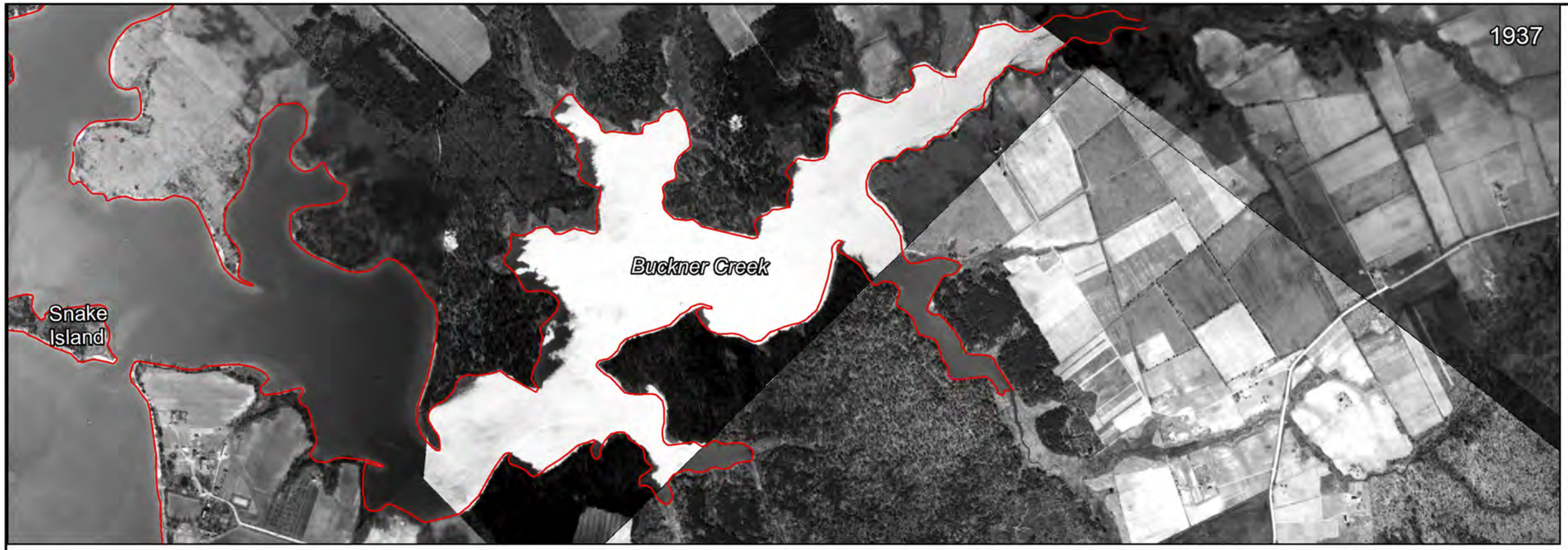


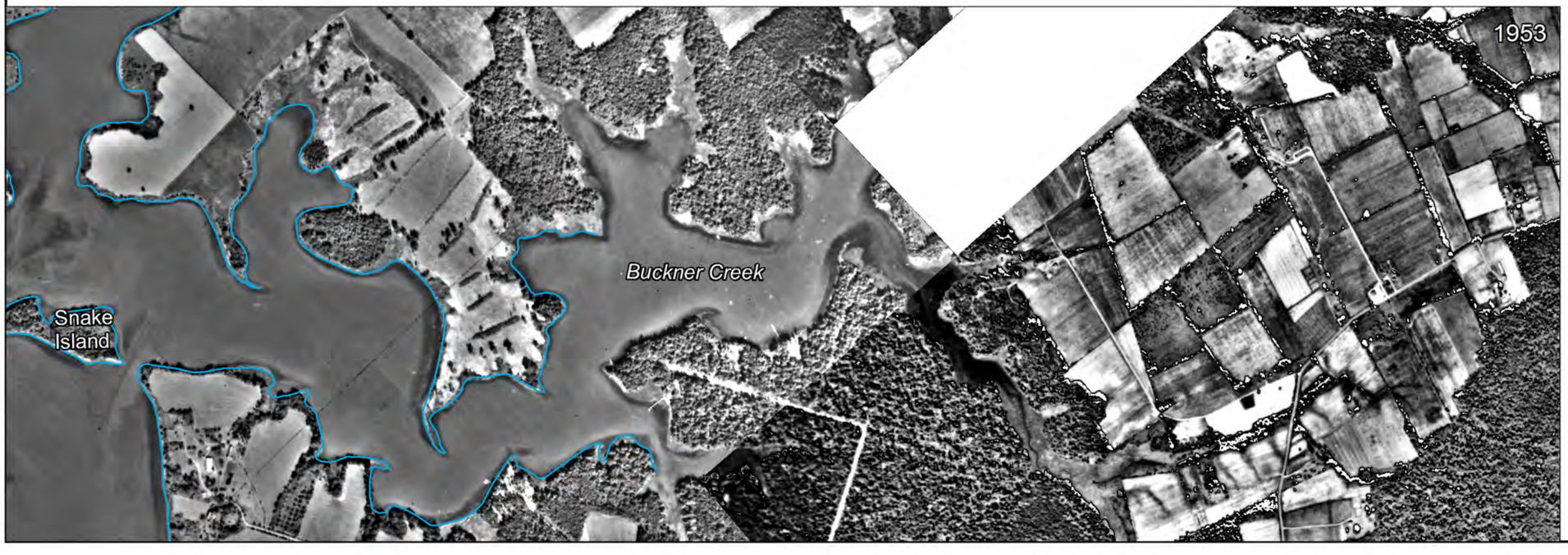
Westmoreland County
Virginia

Plate 21

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program
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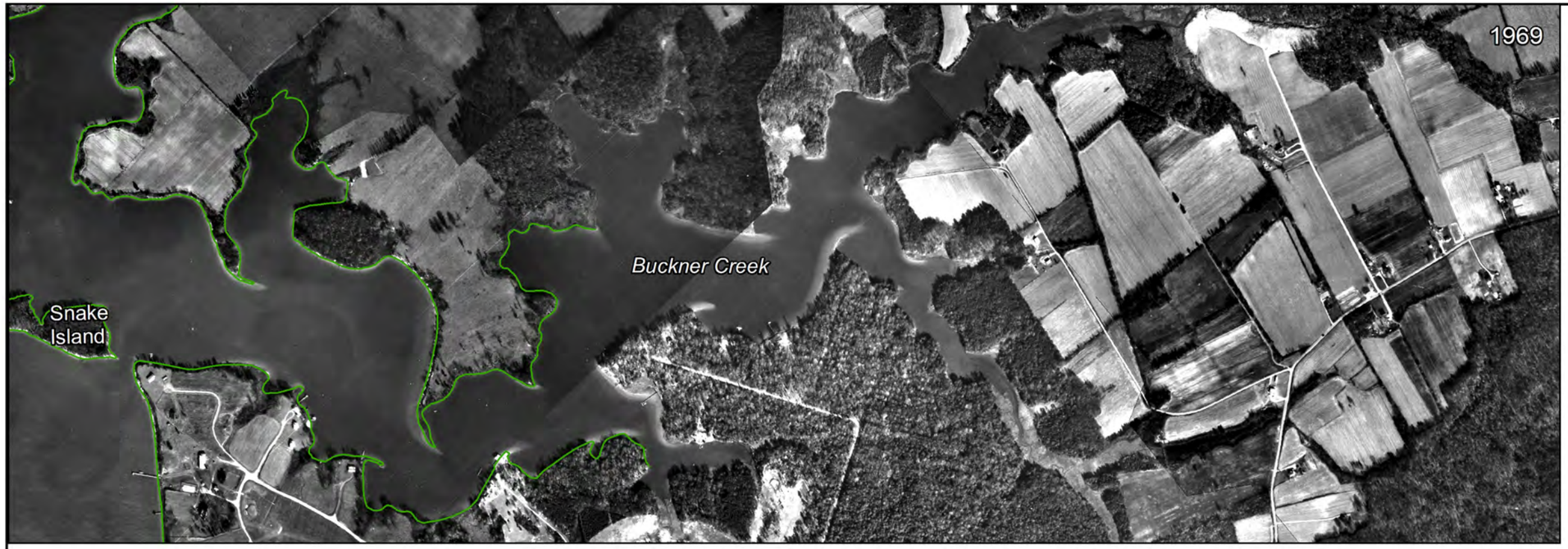


Westmoreland County
Virginia

Plate 21

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 21

Legend

2002 Shoreline

2009 Shoreline

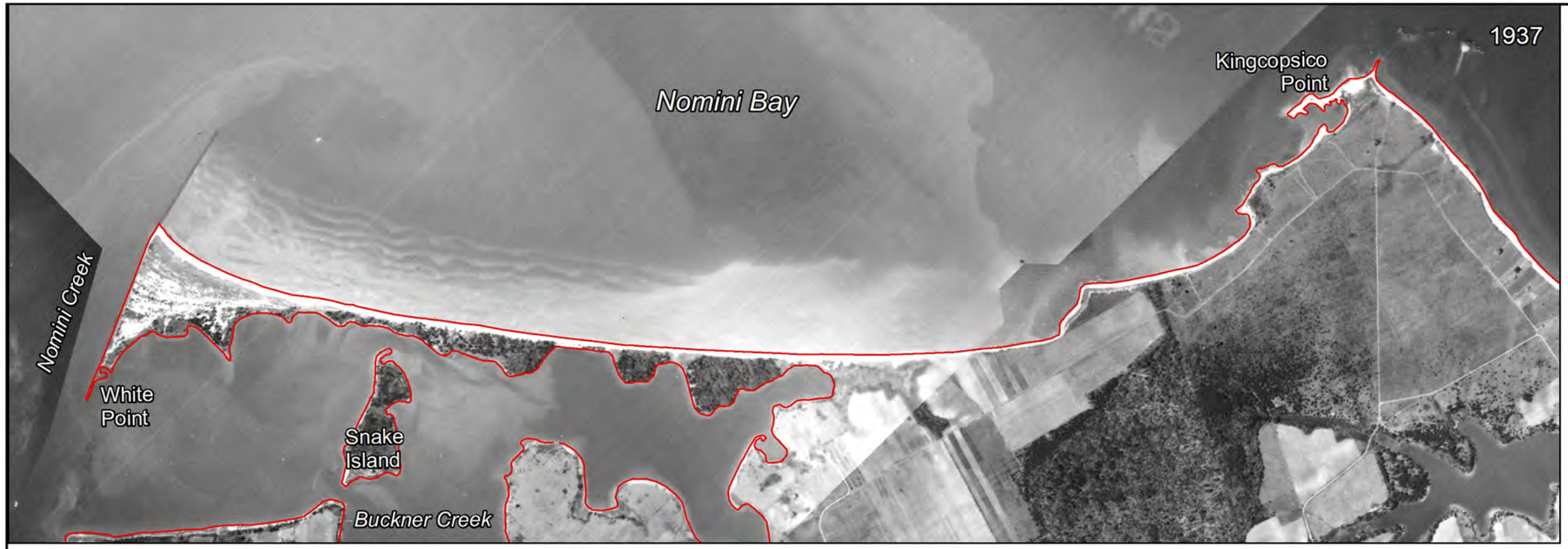
Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

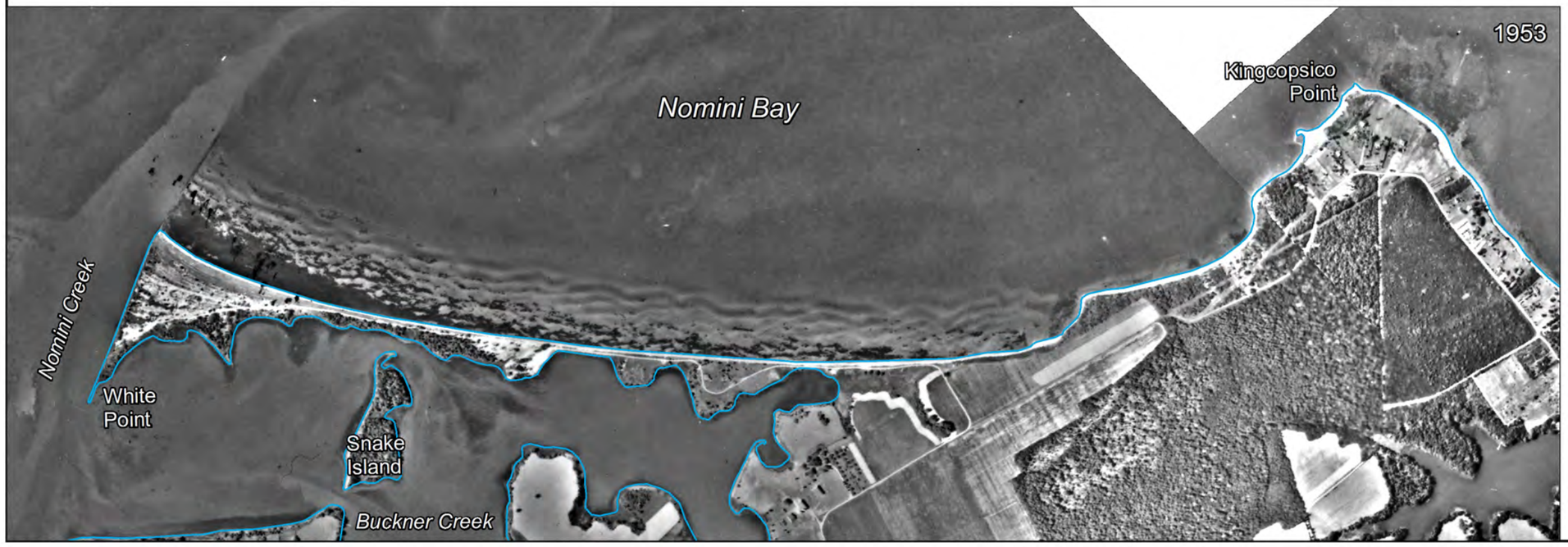
Plate 22



Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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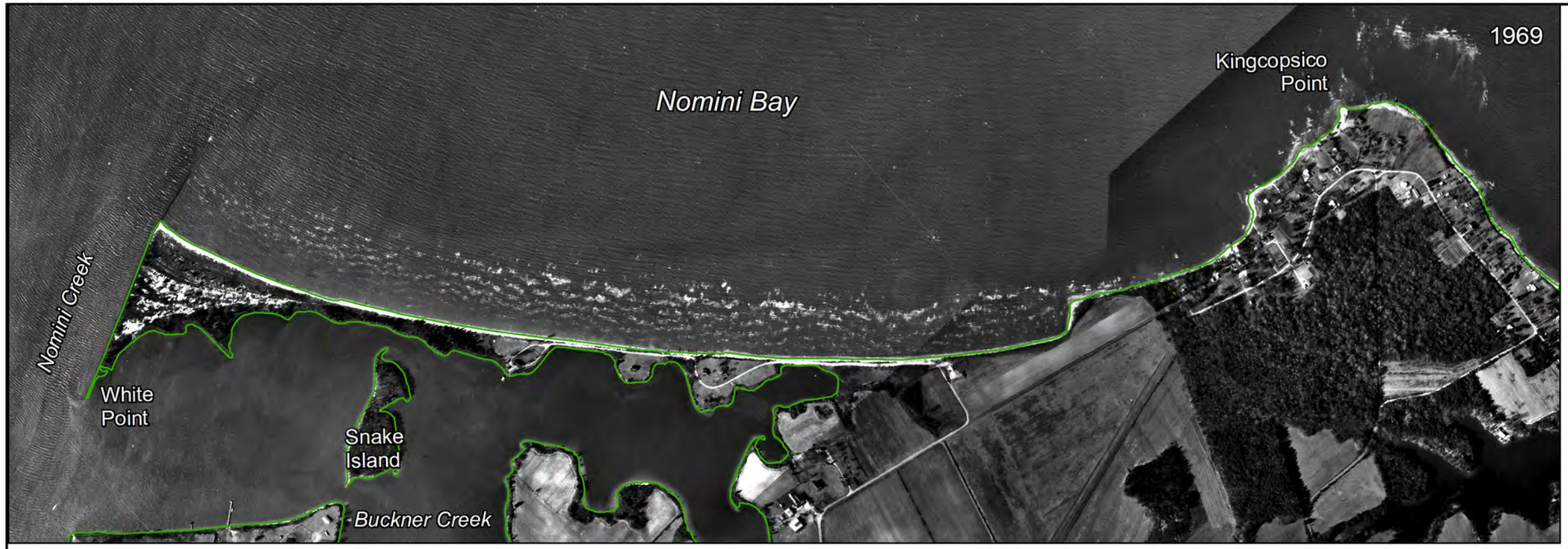

Westmoreland County Virginia

Plate 22

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

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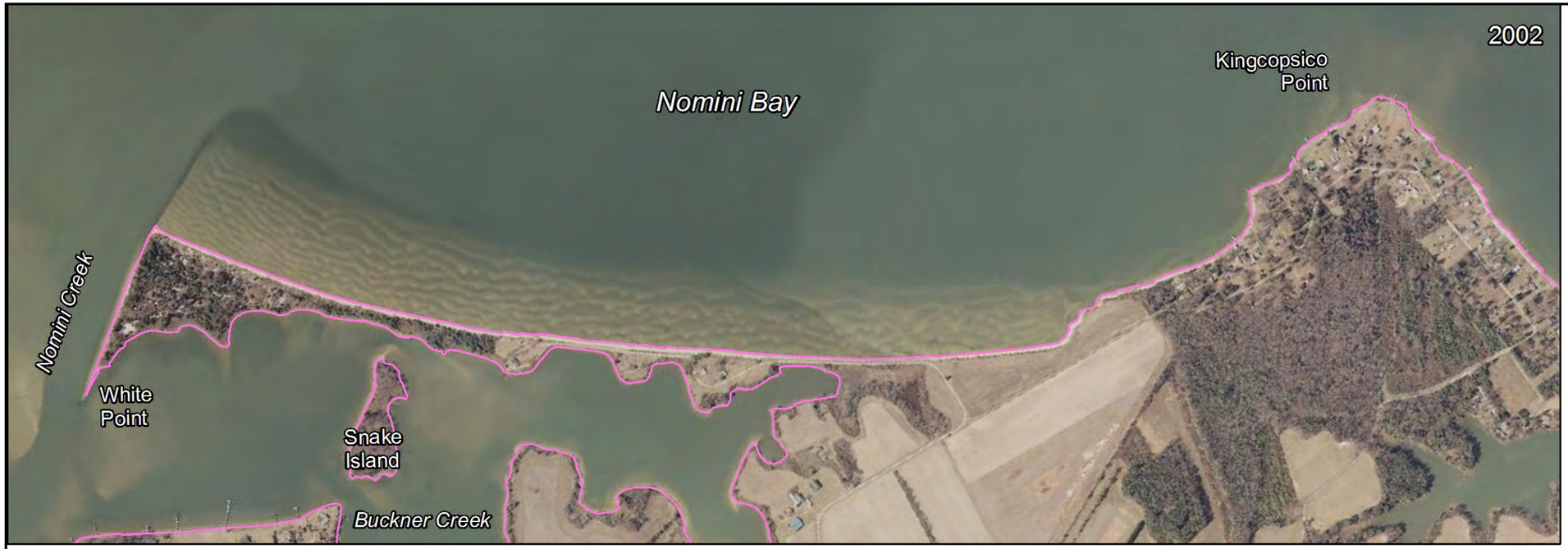
Feet



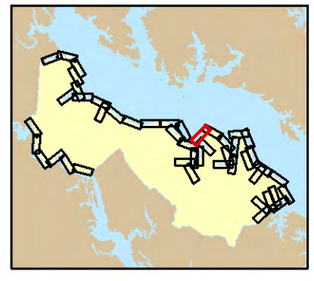
Westmoreland County Virginia

Plate 22

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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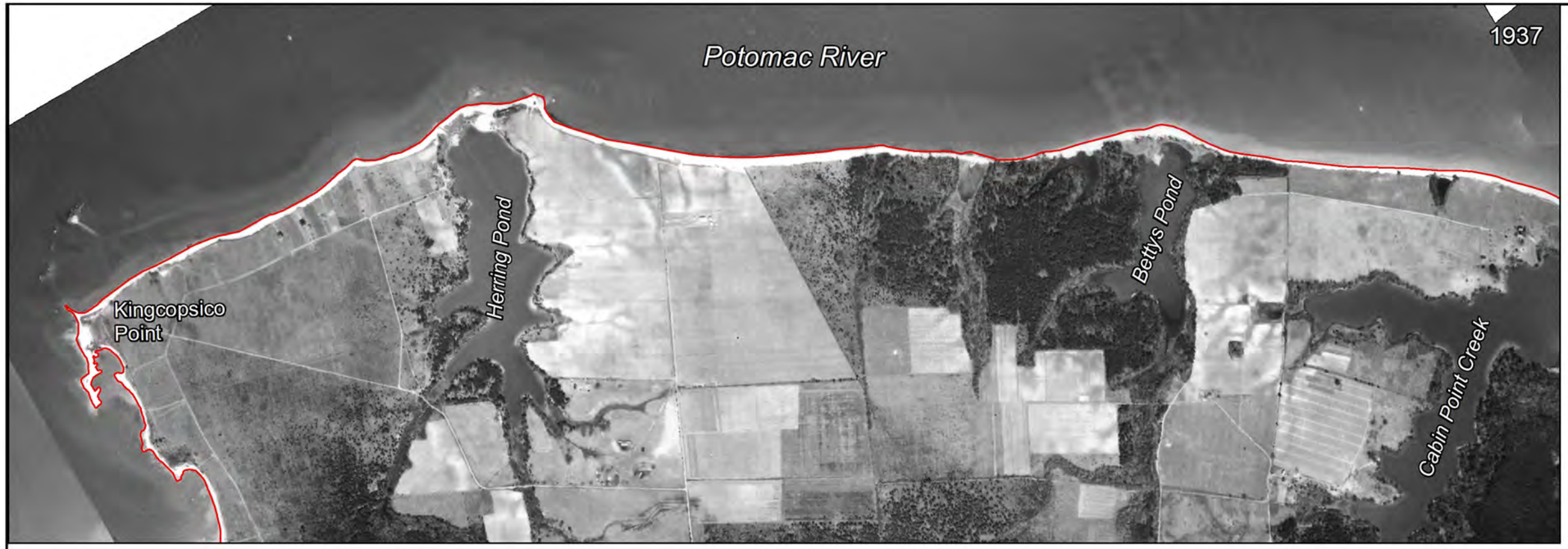


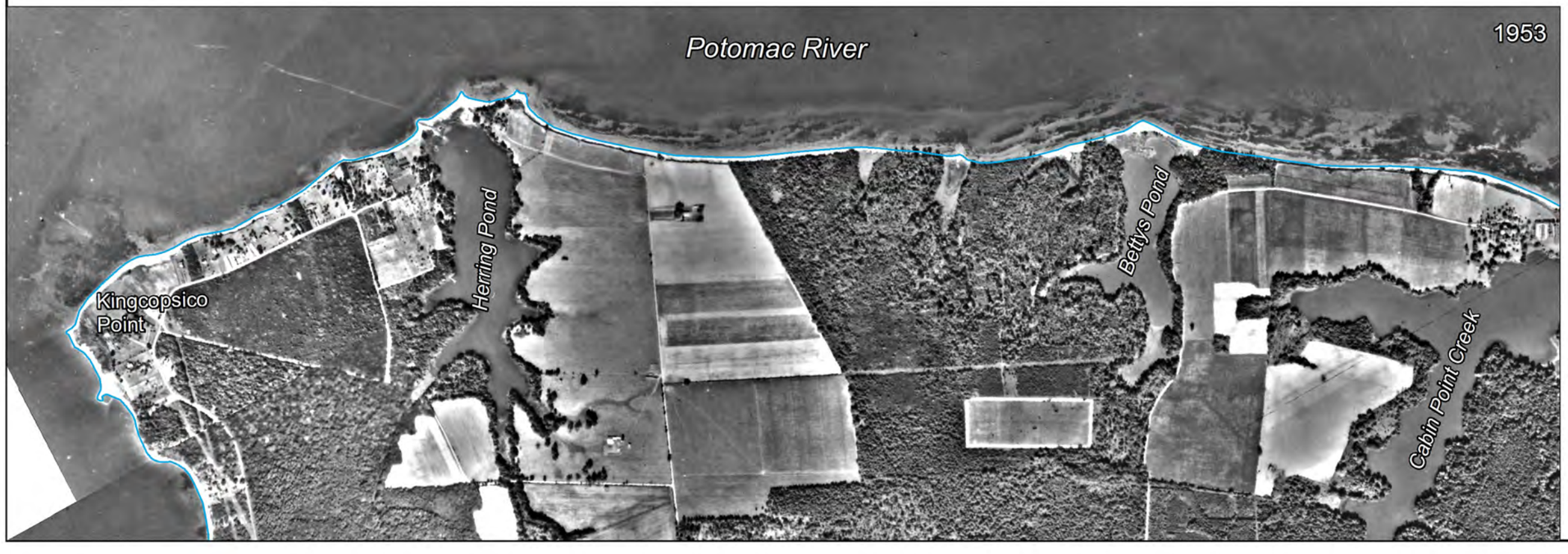
Westmoreland County Virginia

Plate 23

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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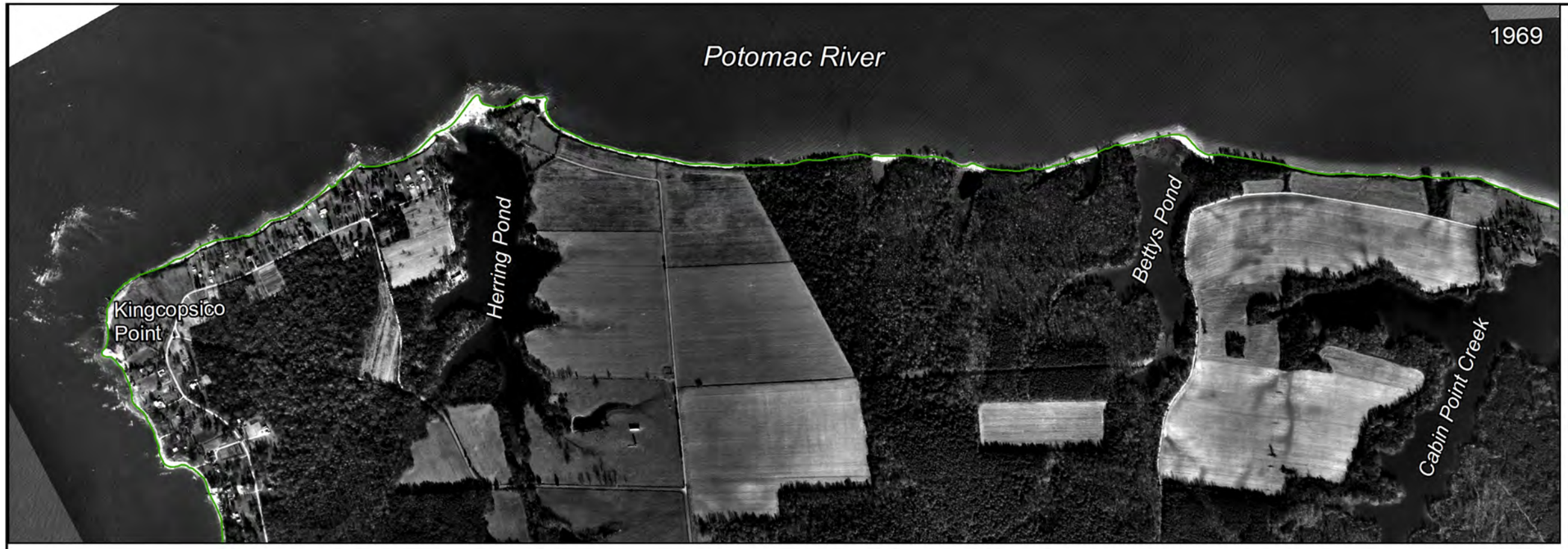
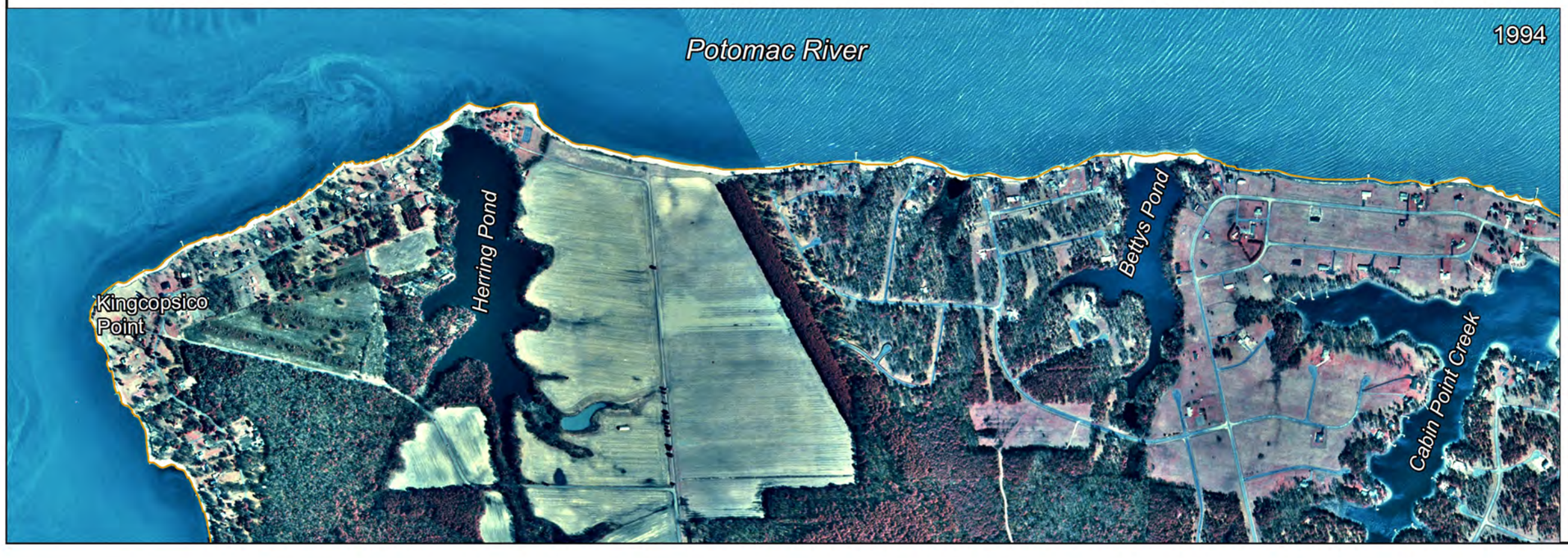


Westmoreland County Virginia

Plate 23

Legend

- 1969 Shoreline
- 1994 Shoreline



Shoreline Studies Program VIMS

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Feet

Westmoreland County Virginia

Plate 23

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

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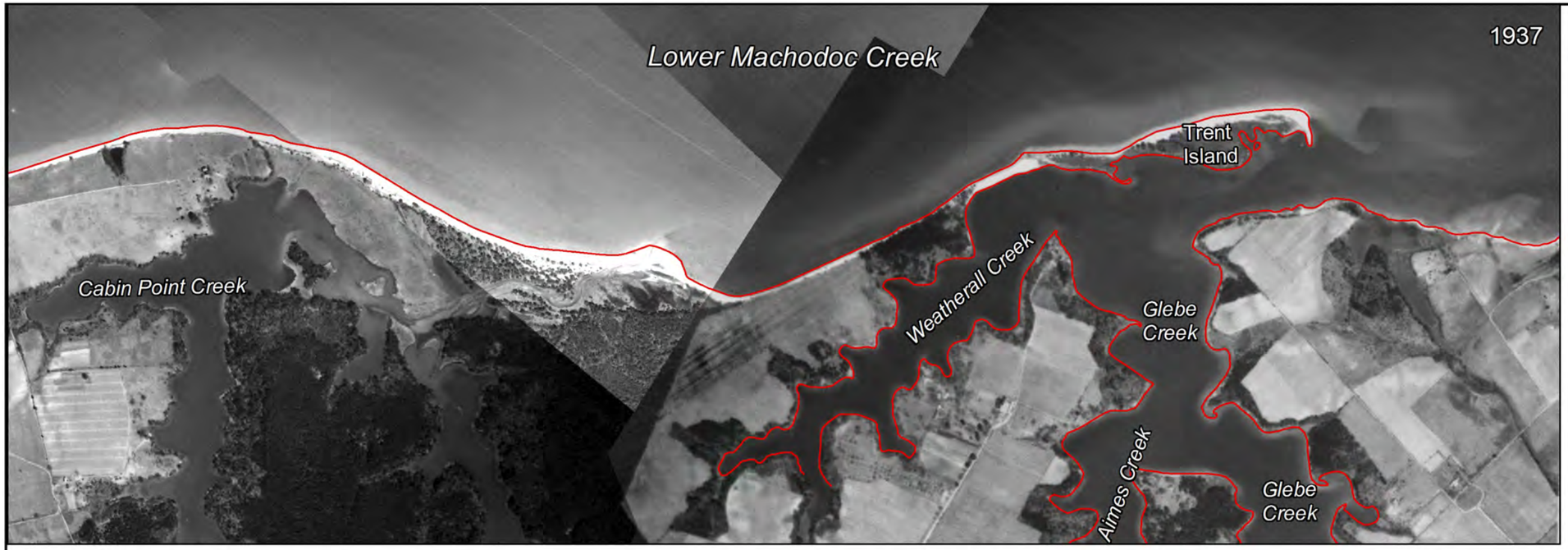
Feet

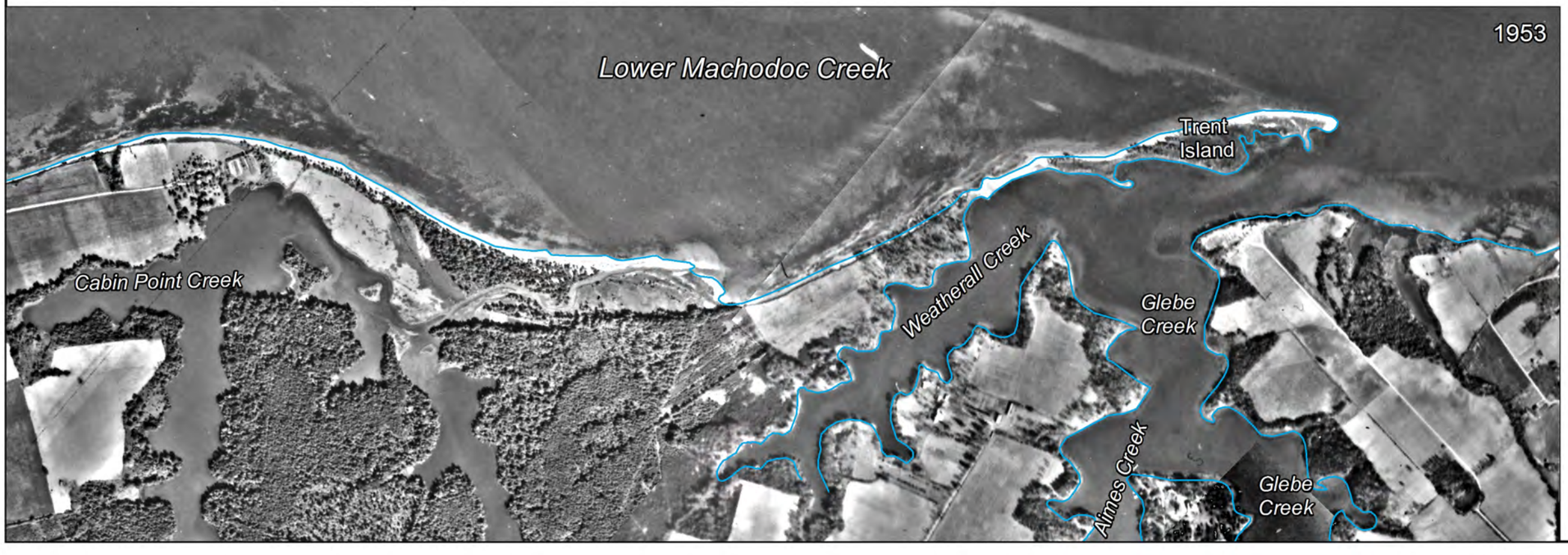


Westmoreland County Virginia

Plate 24

Legend

- 1937 Shoreline
- 1953 Shoreline



Shoreline Studies Program VIMS

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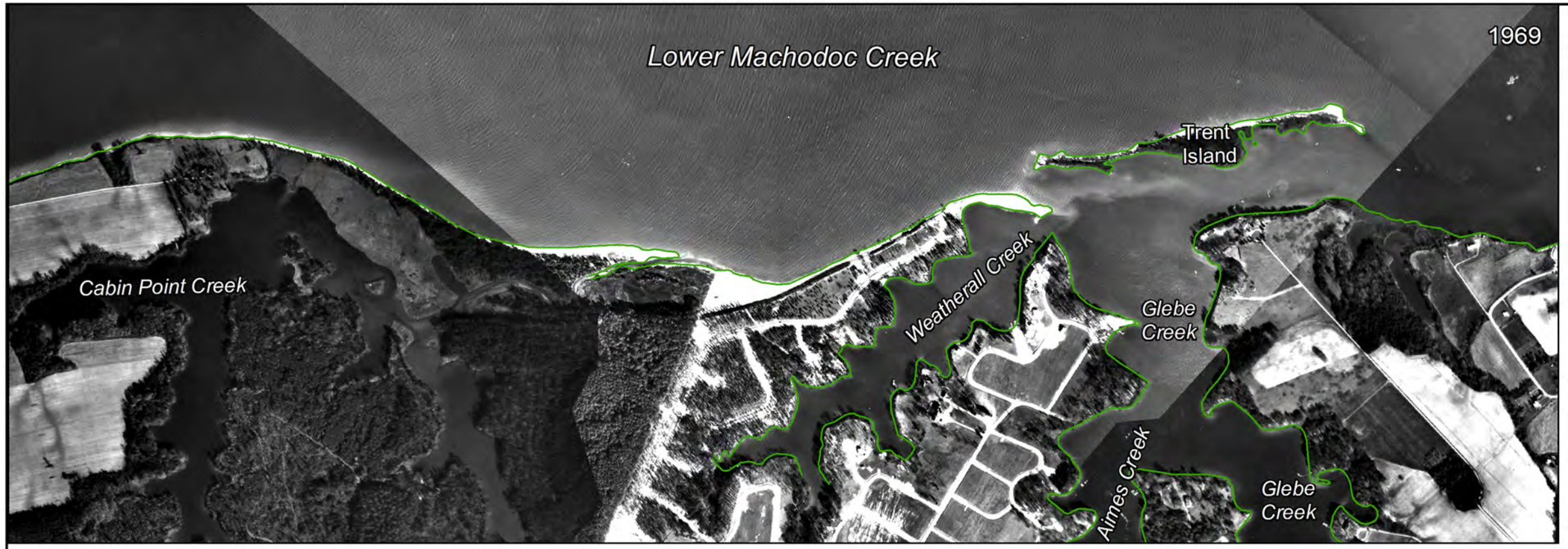

Westmoreland County Virginia

Plate 24

Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program VIMS

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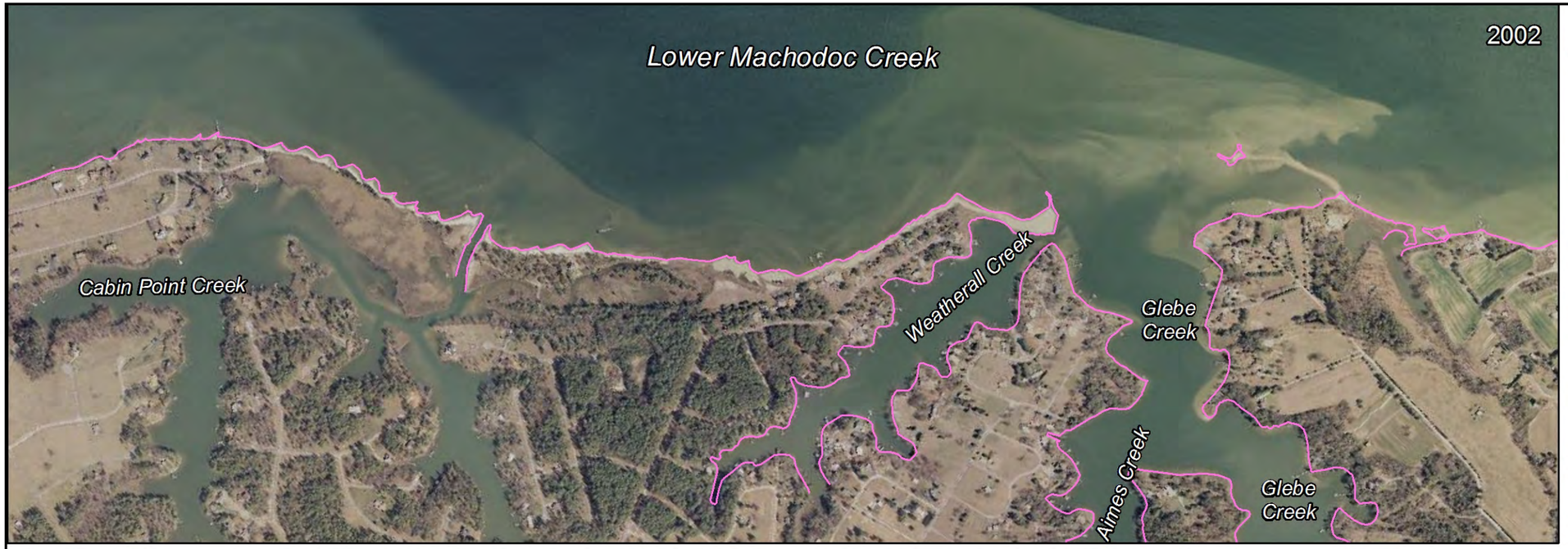
Feet



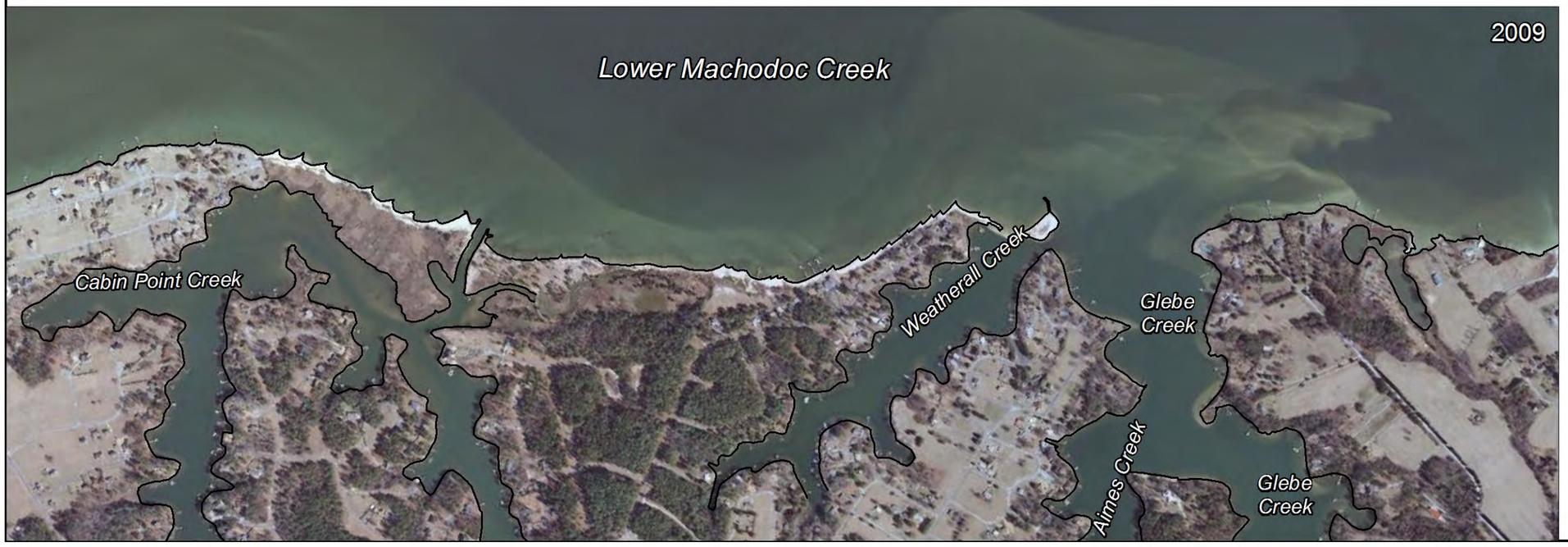
Westmoreland County Virginia

Plate 24

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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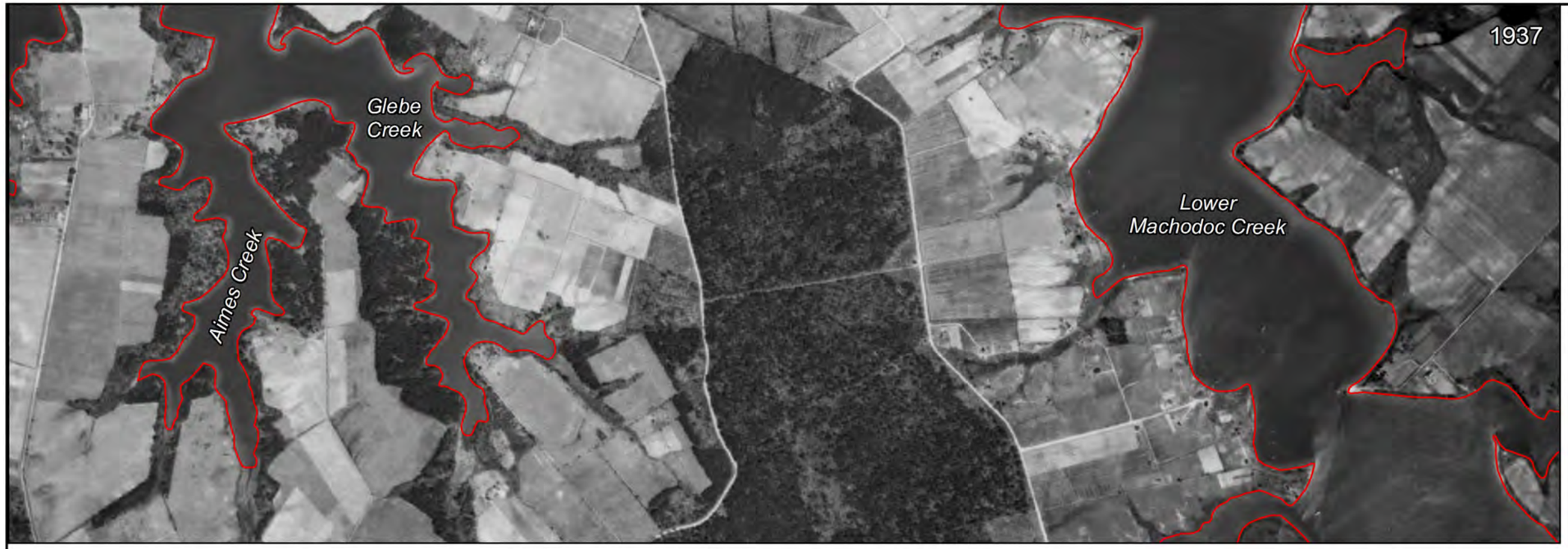
Feet



Westmoreland County Virginia

Plate 25

Legend

1937 Shoreline

1953 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

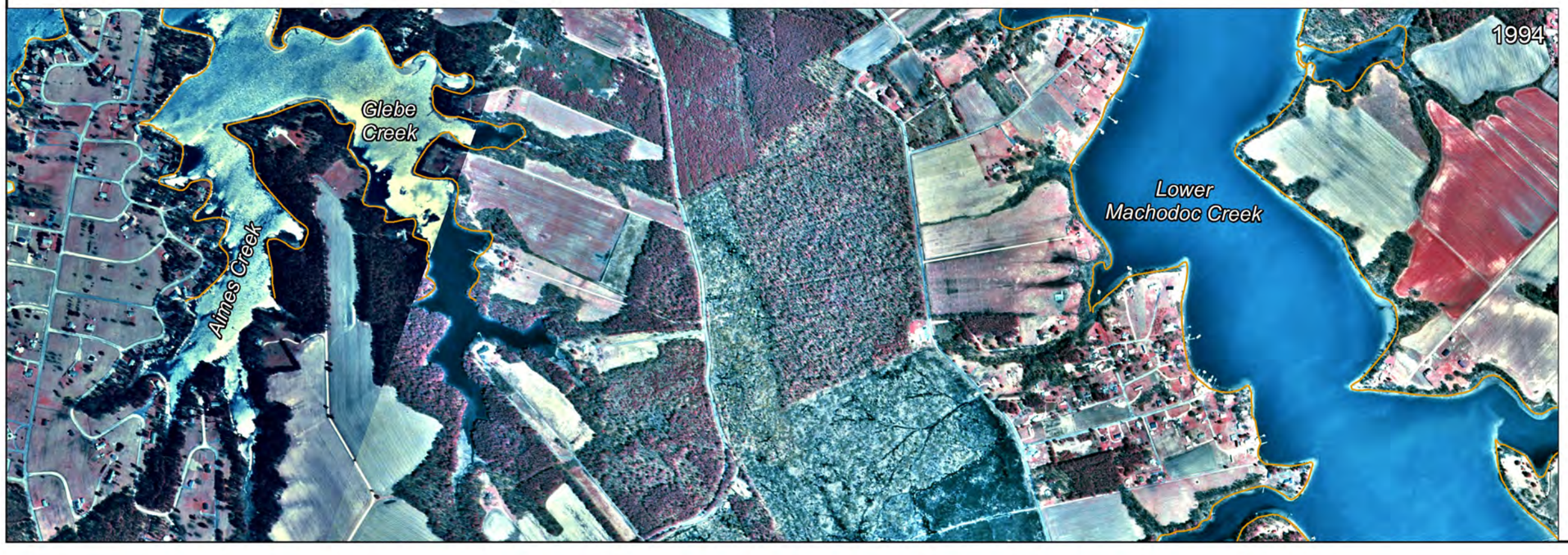
Westmoreland County Virginia

Plate 25

Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program
VIMS

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Feet

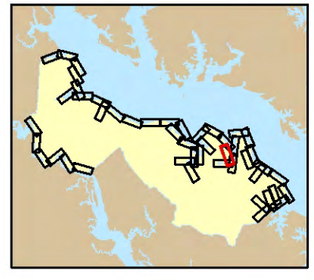
Westmoreland County
Virginia

Plate 25

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program
VIMS

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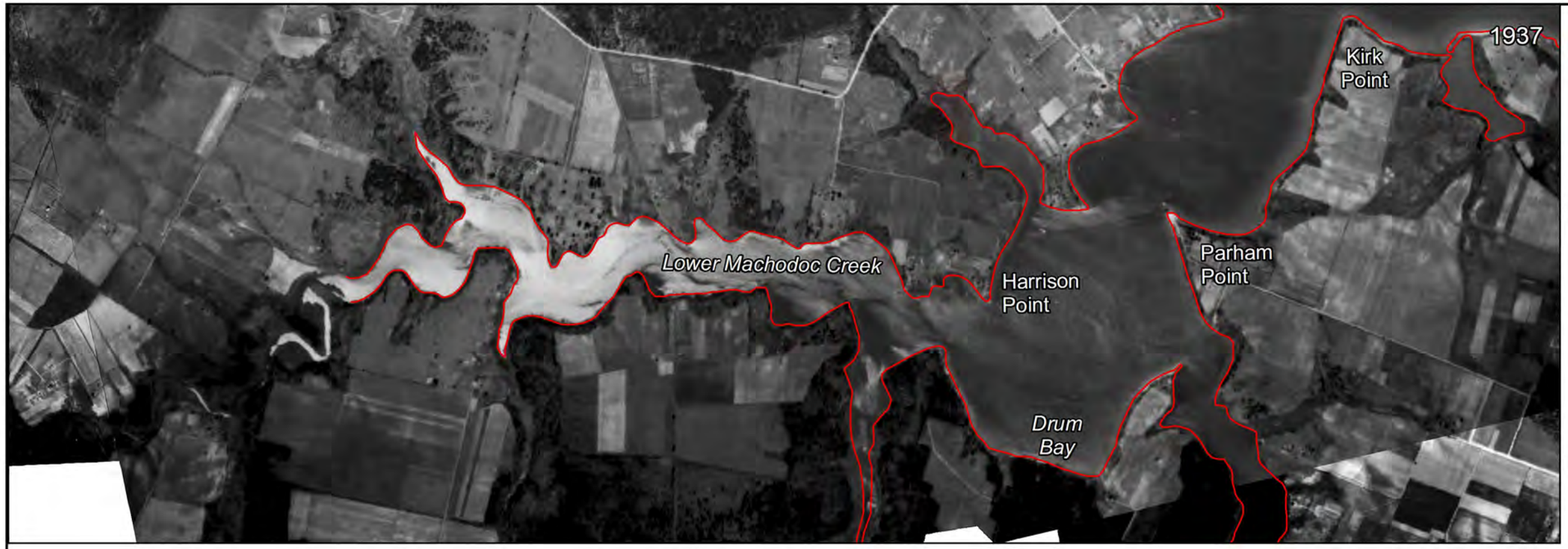
Feet



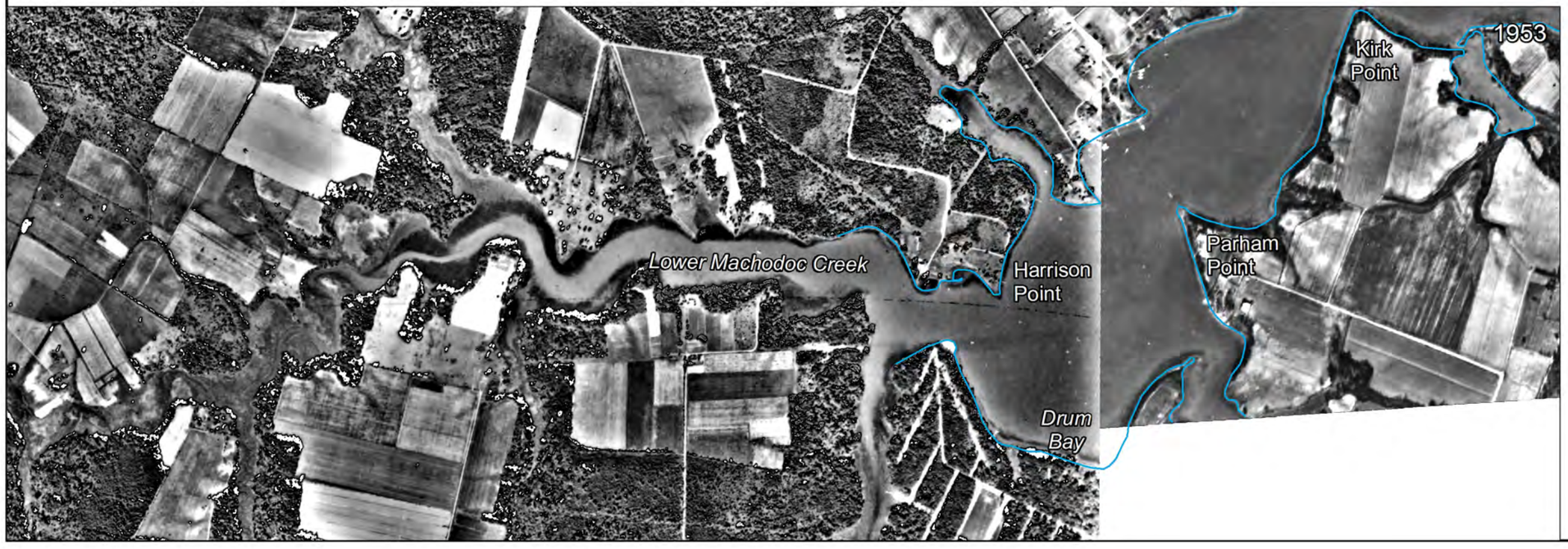
Westmoreland County Virginia

Plate 26

Legend

1937 Shoreline

1953 Shoreline



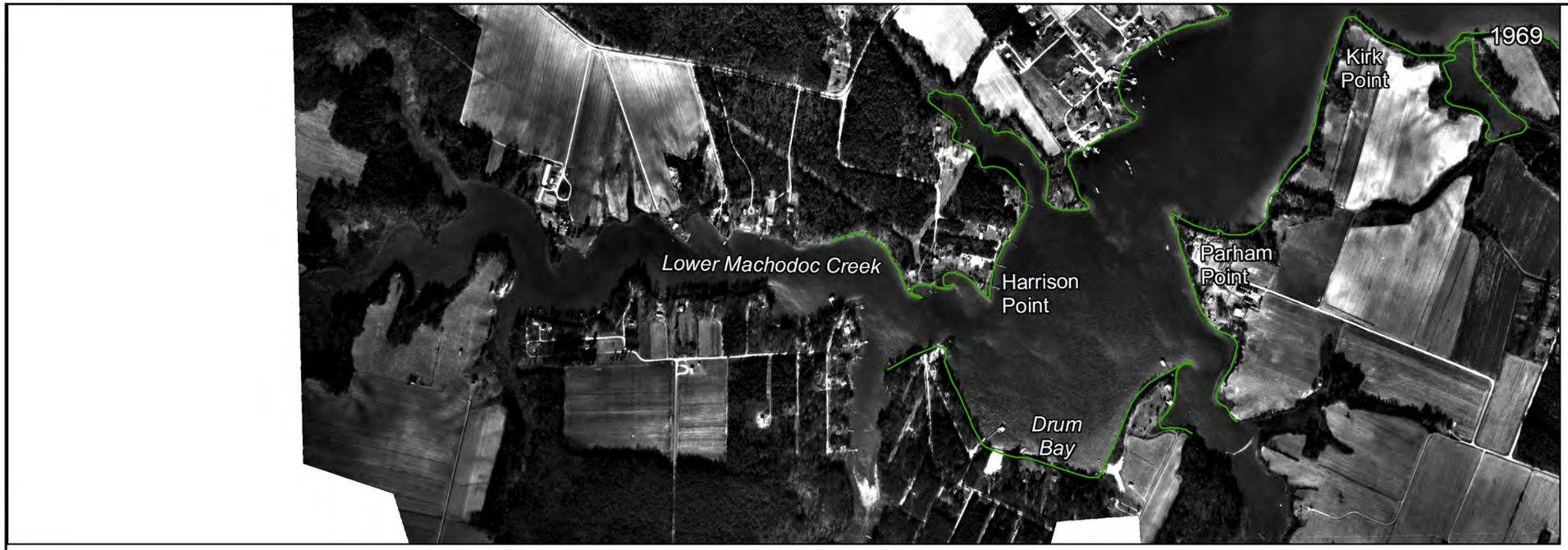
Shoreline Studies Program, VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 26



Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program
VIMS

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1,000 0 1,000

Feet

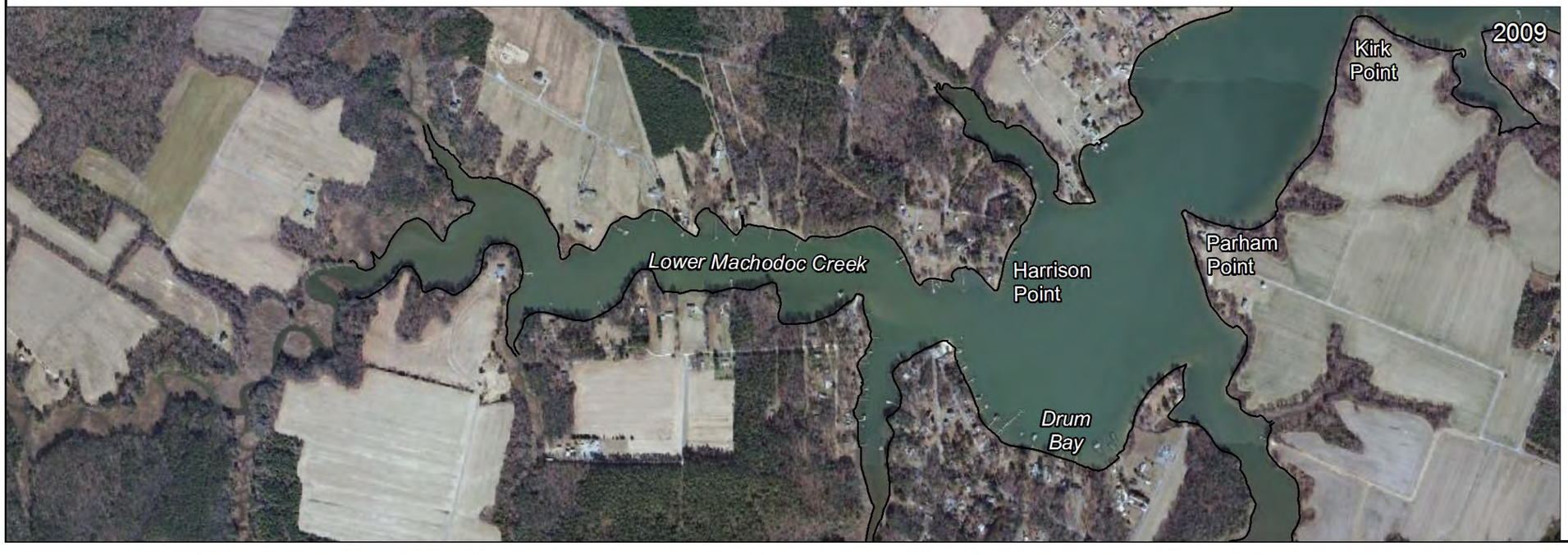
Westmoreland County Virginia

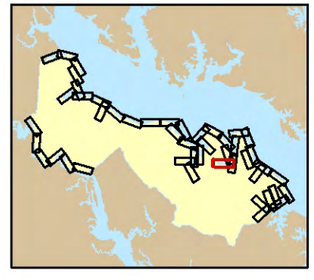
Plate 26

Legend

2002 Shoreline

2009 Shoreline





Shoreline Studies Program VIMS

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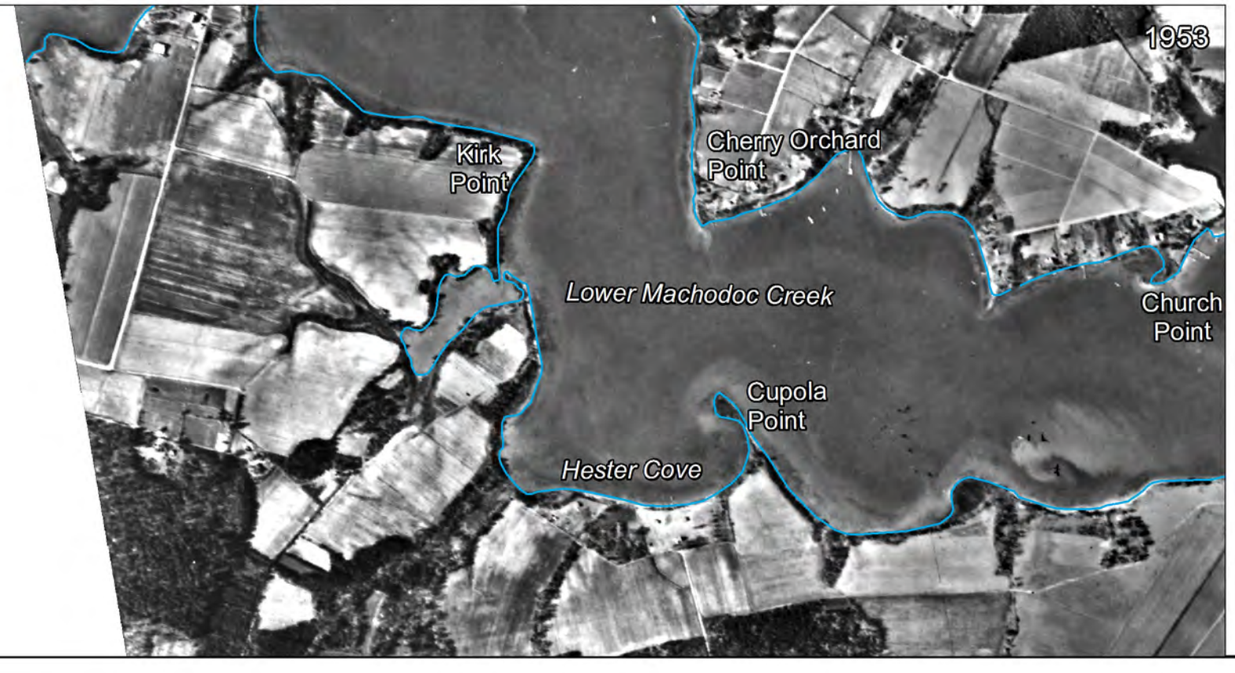
Feet

Westmoreland County
Virginia

Plate 27

Legend

- 1937 Shoreline
- 1953 Shoreline



Shoreline Studies Program VIMS

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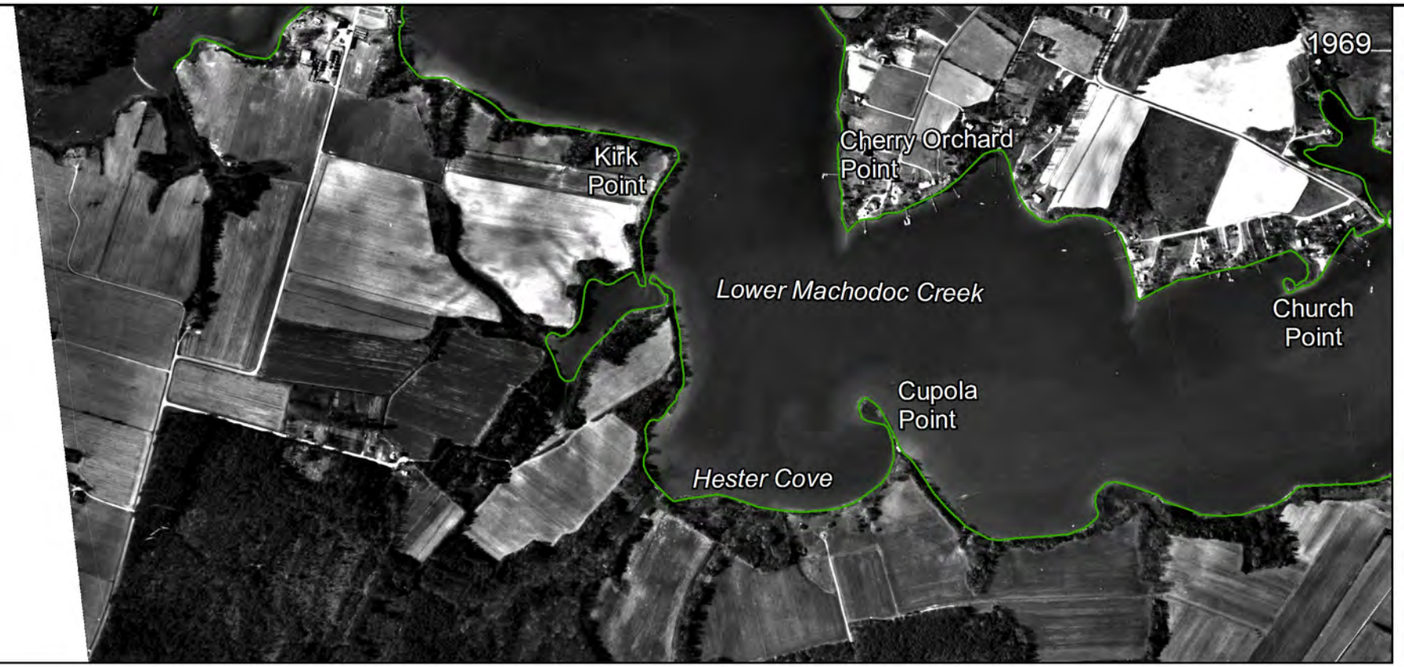
Feet

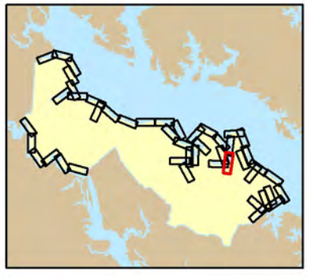
Westmoreland County
Virginia

Plate 27



Legend

- 1969 Shoreline
- 1994 Shoreline



Shoreline Studies Program
VIMS

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Feet

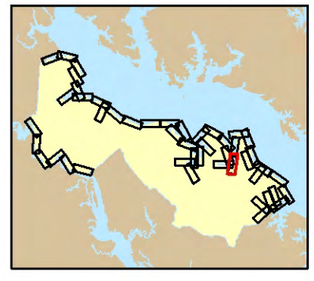
Westmoreland County Virginia

Plate 27

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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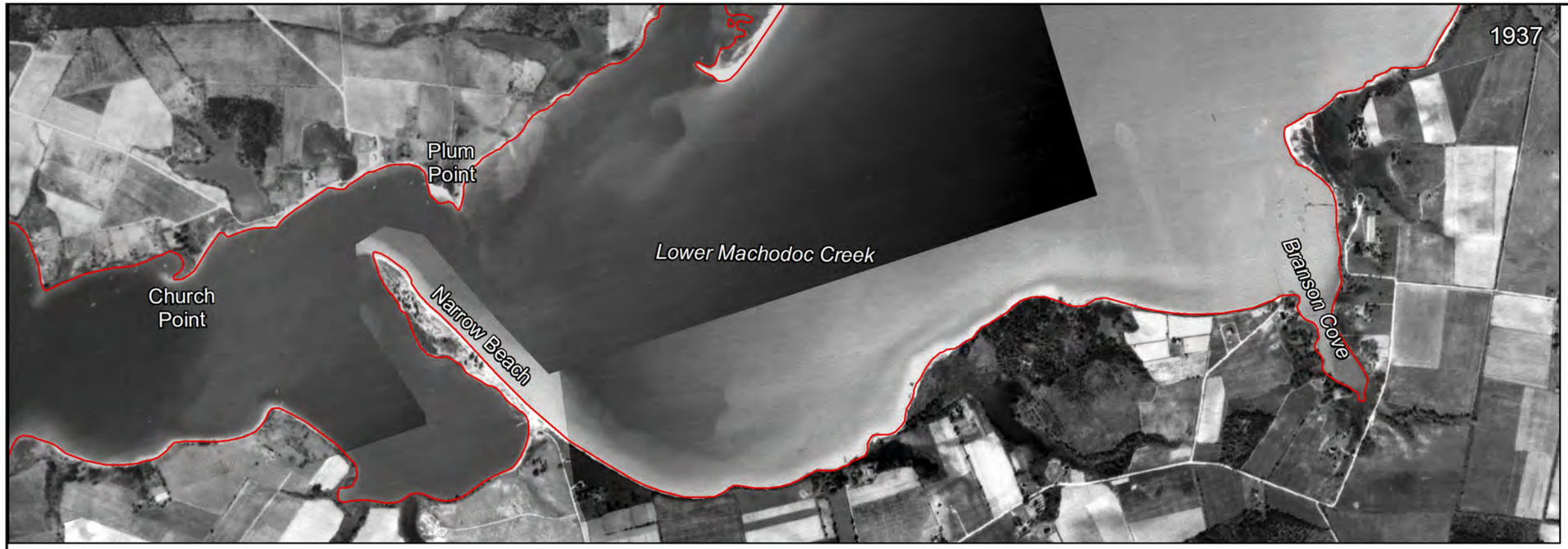
Feet

Westmoreland County
Virginia

Plate 28



Legend

- 1937 Shoreline
- 1953 Shoreline

Shoreline Studies Program VIMS

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Feet

Westmoreland County Virginia

Plate 28

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

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Feet

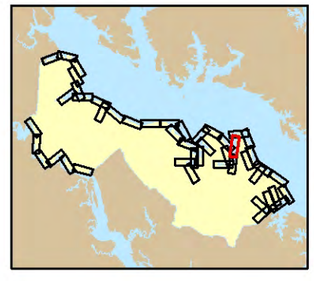
Westmoreland County Virginia

Plate 28

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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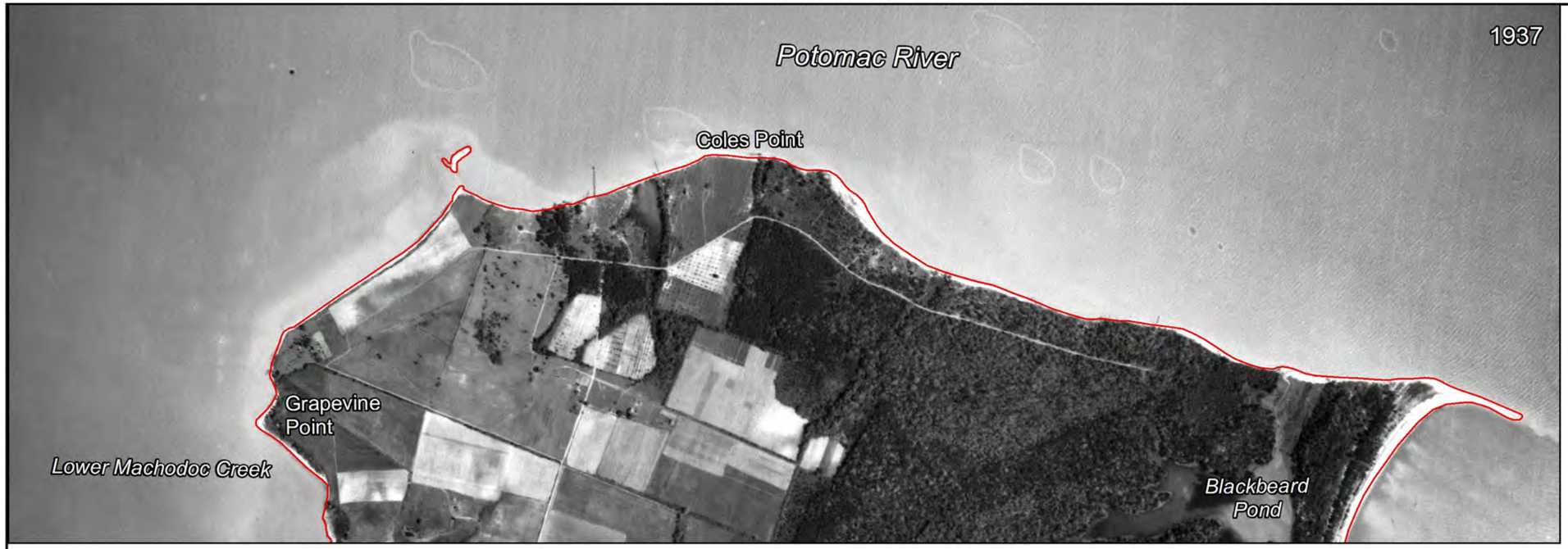
Feet



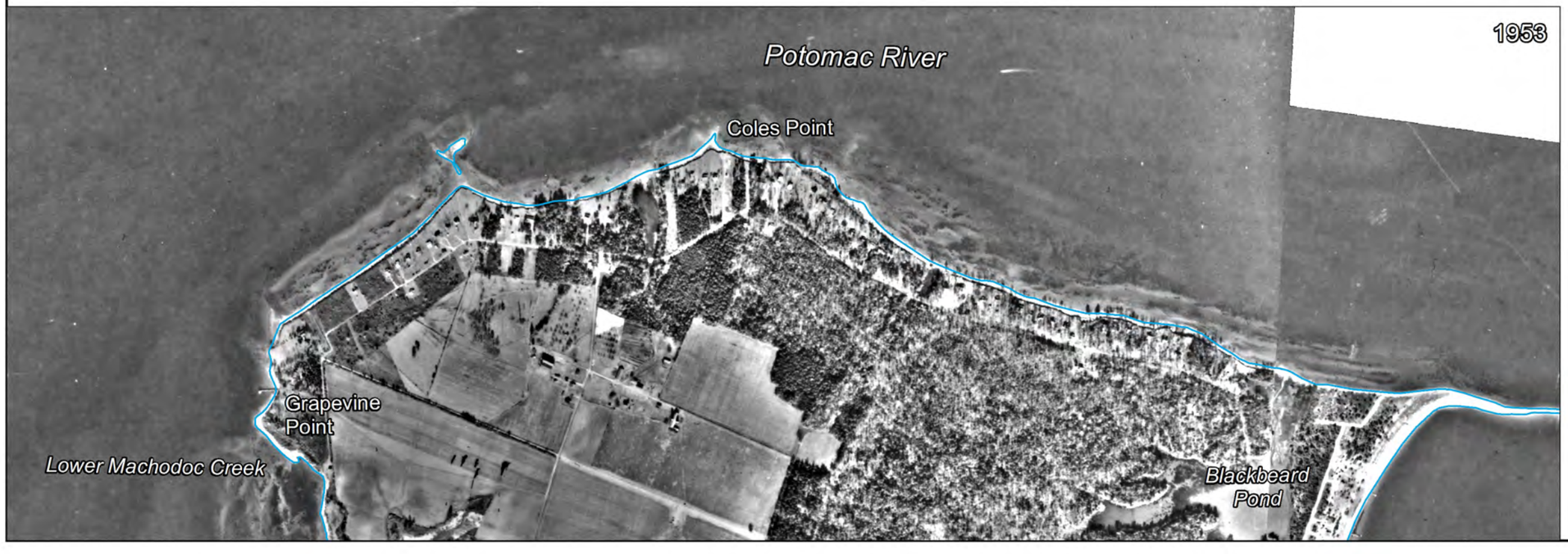
Westmoreland County
Virginia

Plate 29

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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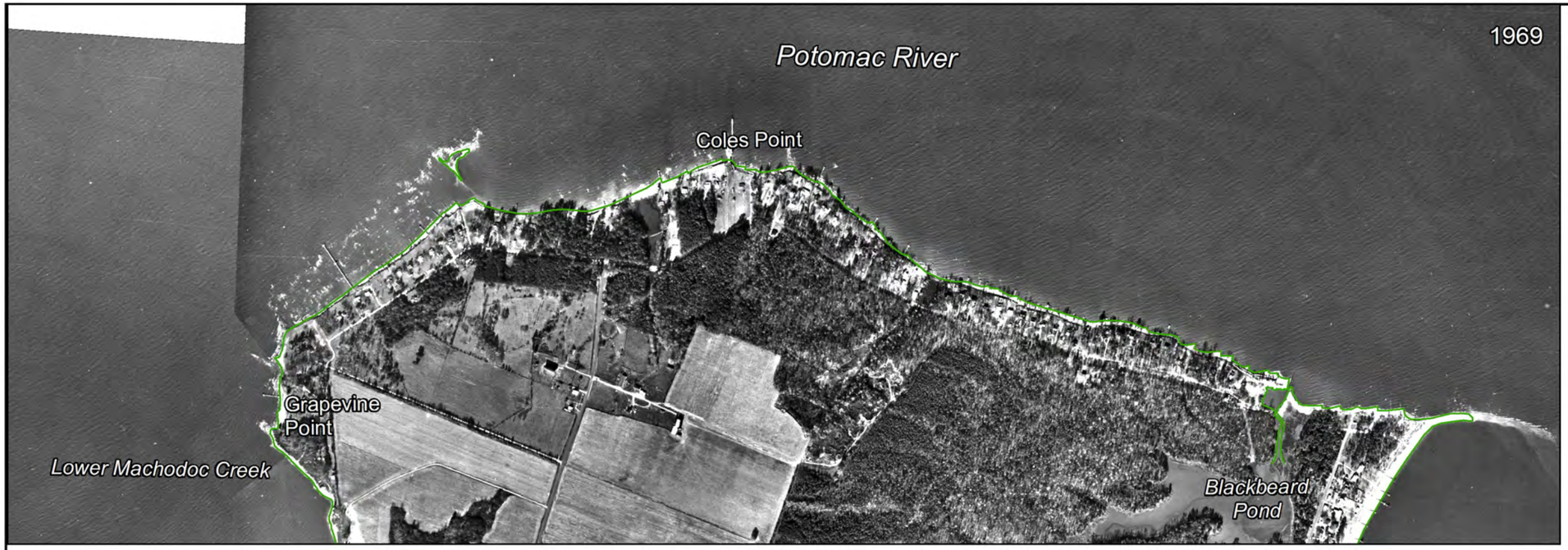
Feet

Westmoreland County
Virginia

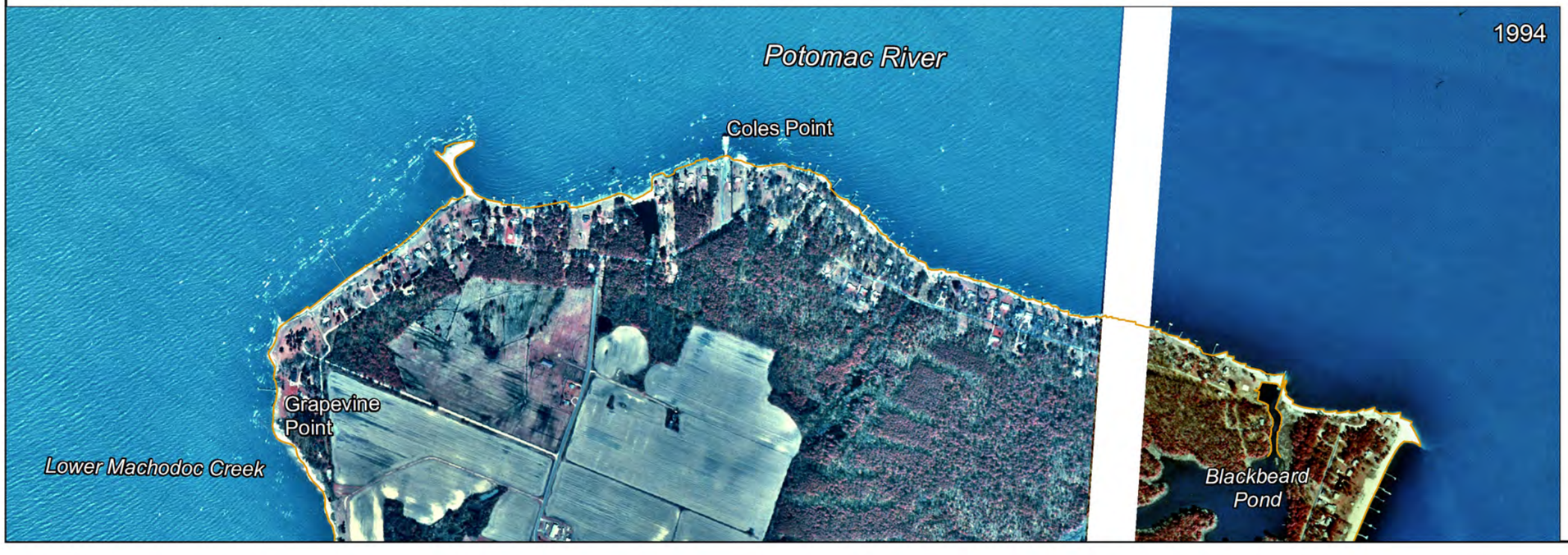
Plate 29



Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program
VIMS

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Feet

Westmoreland County
Virginia

Plate 29

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

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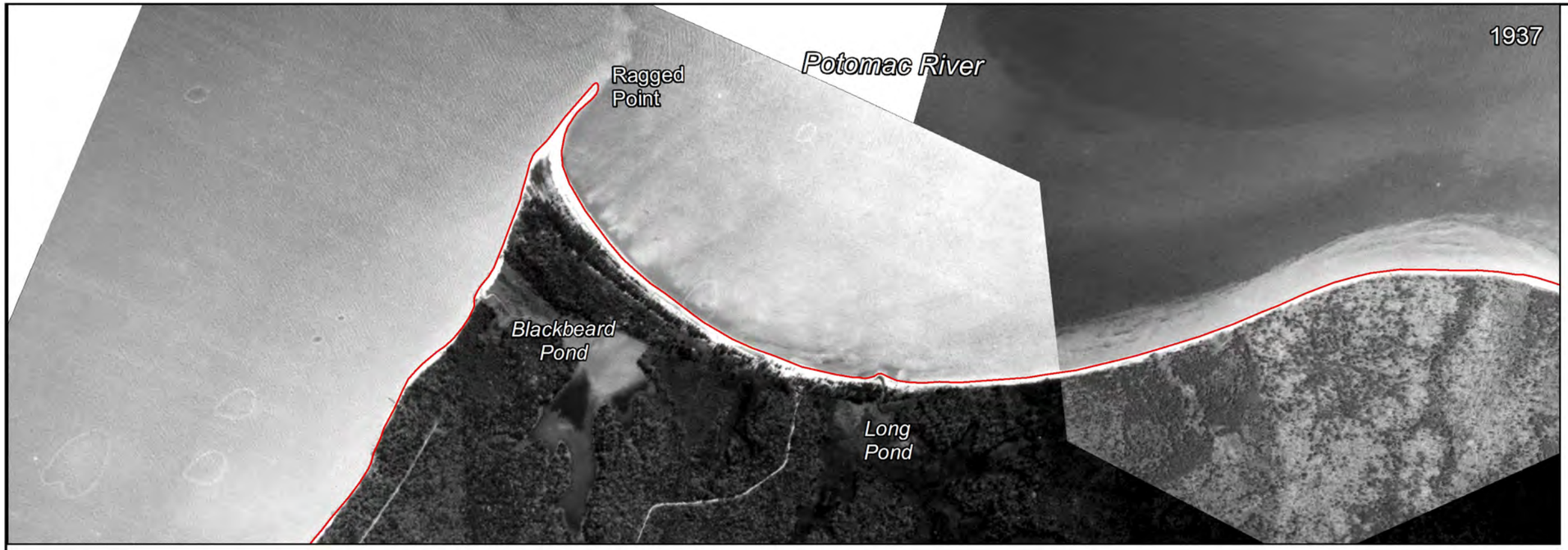
Feet

Westmoreland County
Virginia

Plate 30



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1937 Shoreline

1953 Shoreline

Shoreline Studies Program VIMS

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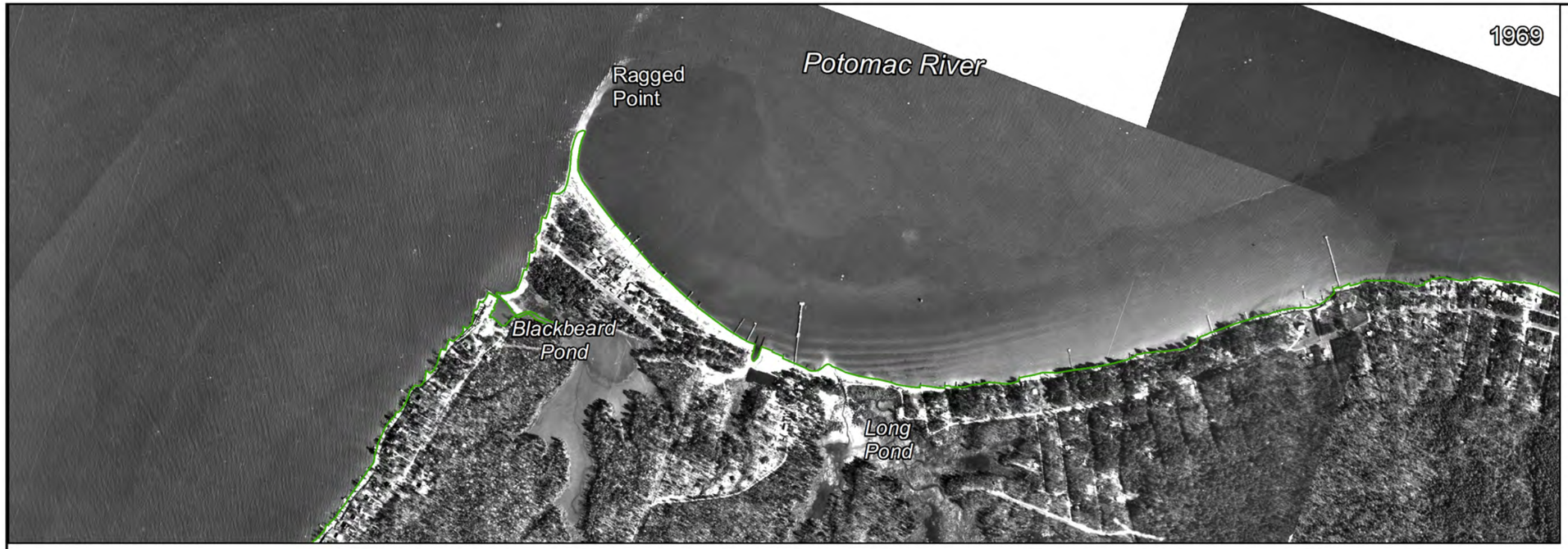
Feet



Westmoreland County Virginia

Plate 30

Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 30

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

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Feet

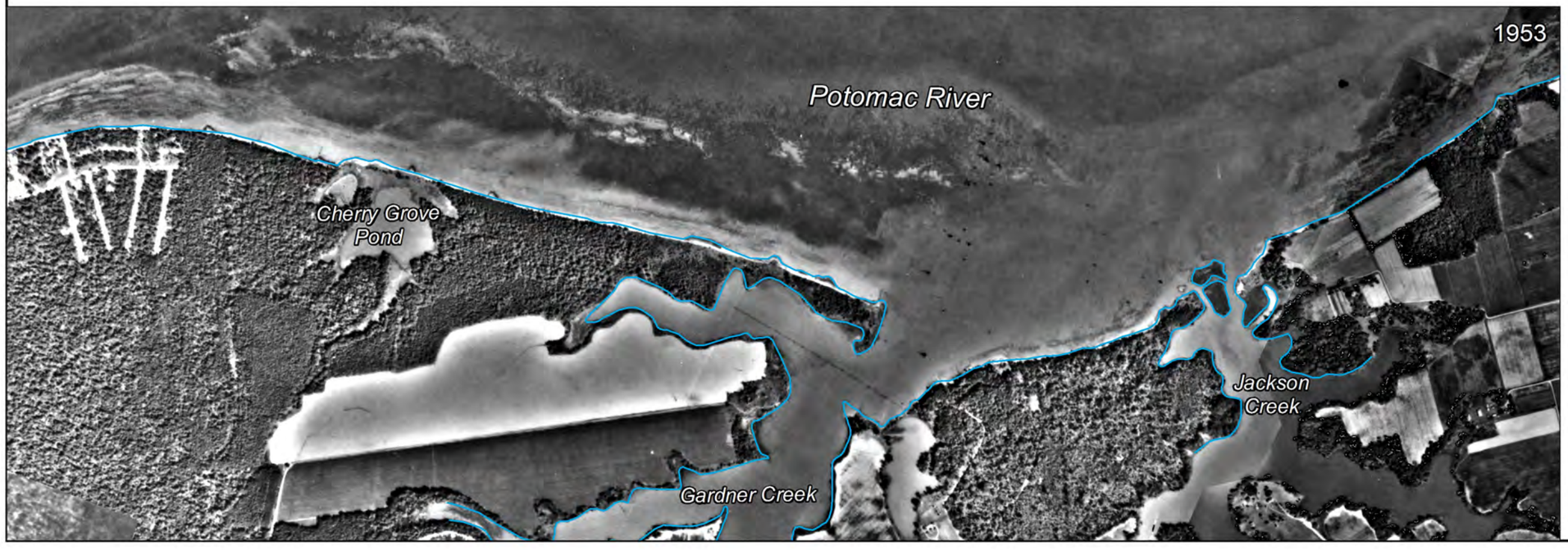
Westmoreland County
Virginia

Plate 31

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program
VIMS

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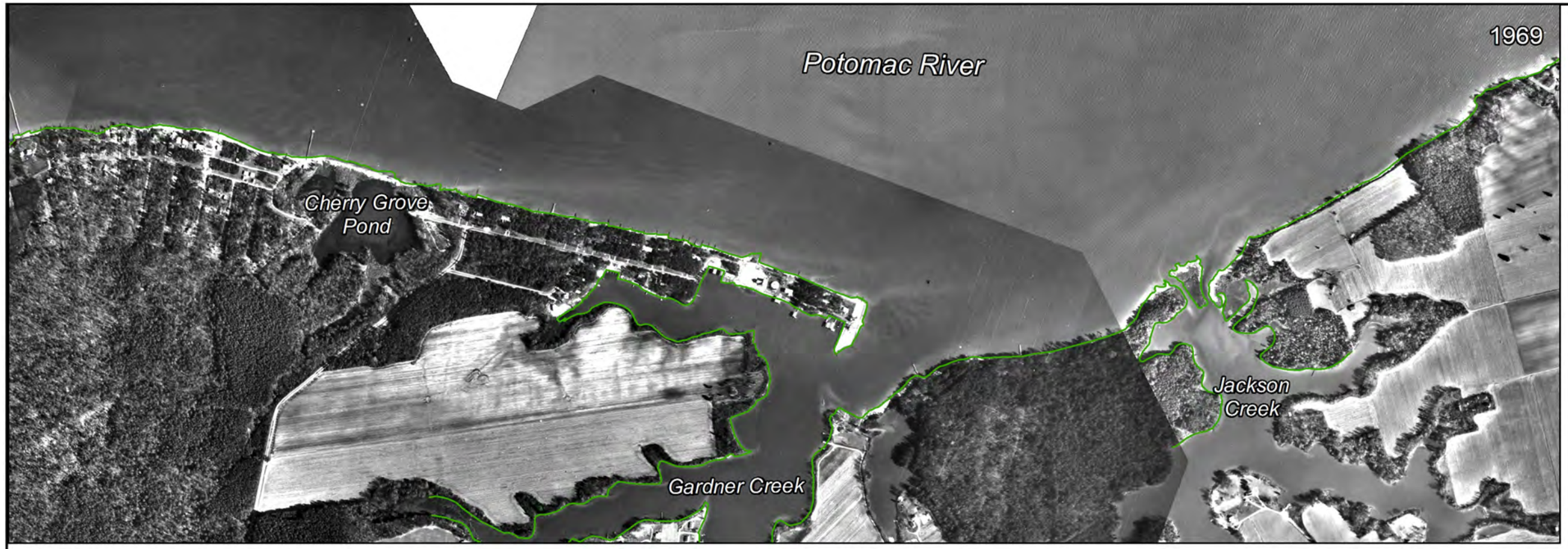
Feet



Westmoreland County Virginia

Plate 31

Legend

- 1969 Shoreline
- 1994 Shoreline

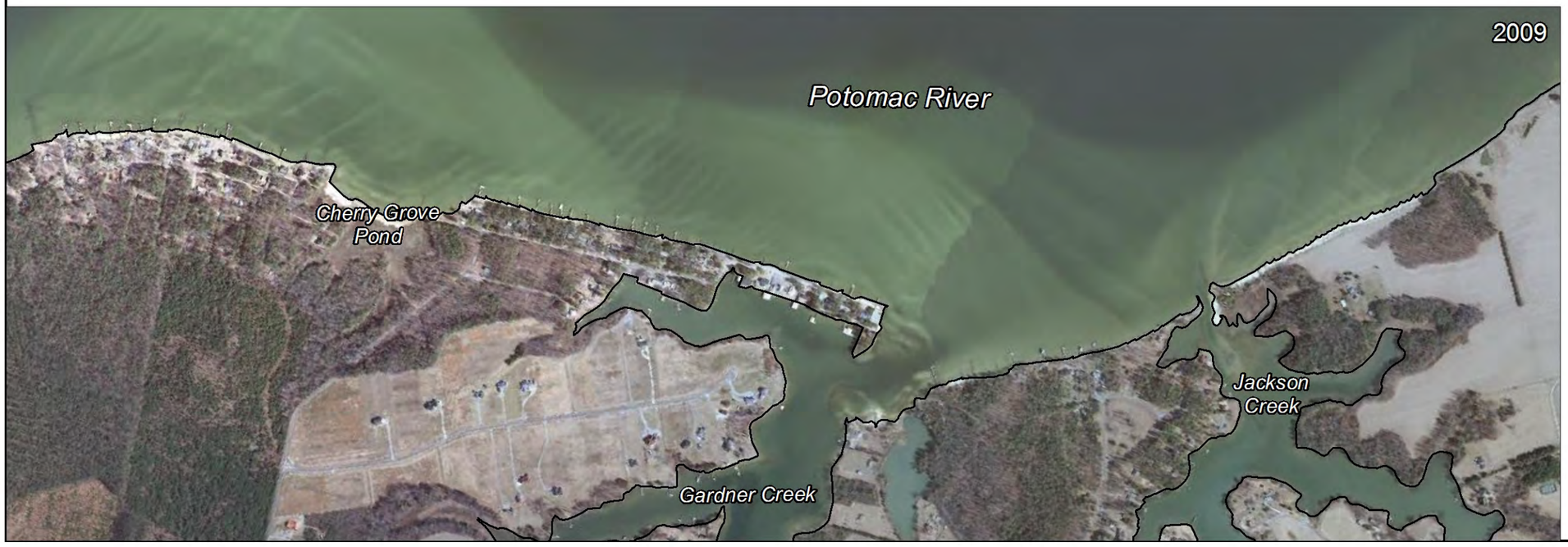
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 31



Legend

- 2002 Shoreline
- 2009 Shoreline

Shoreline Studies Program
VIMS

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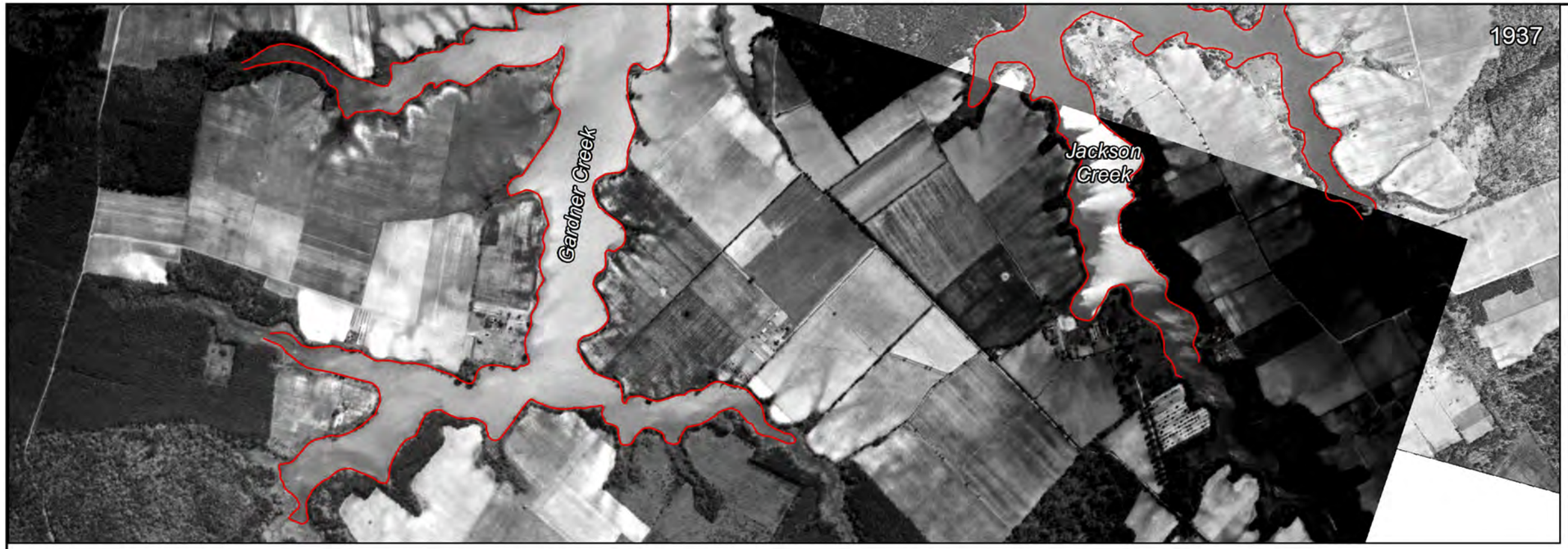
Feet



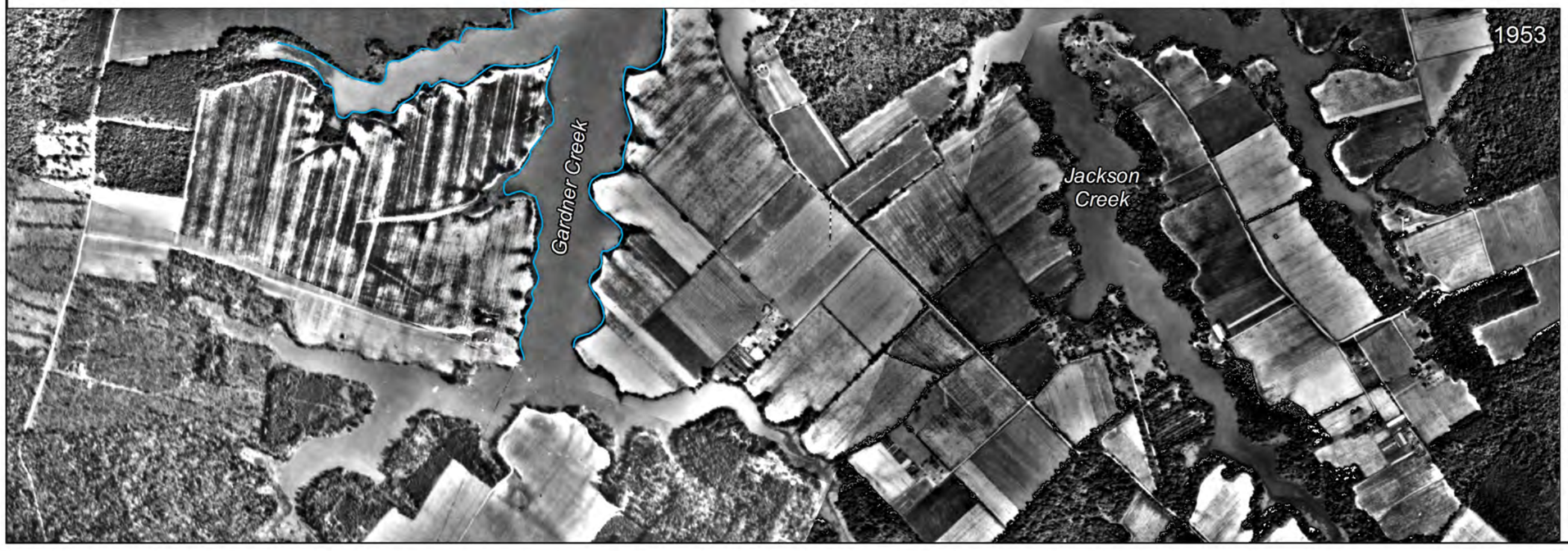
Westmoreland County Virginia

Plate 32

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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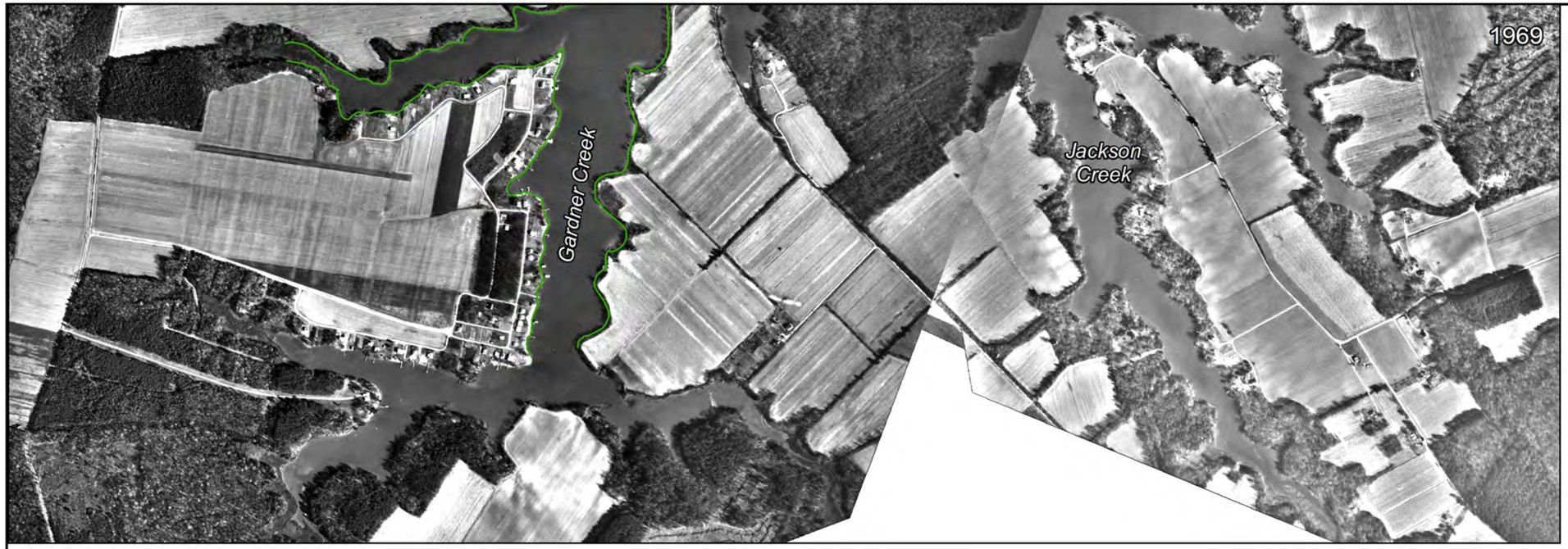
Feet



Westmoreland County Virginia

Plate 32

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

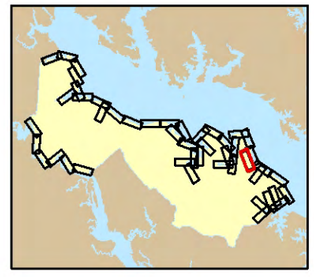
Westmoreland County Virginia

Plate 32

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

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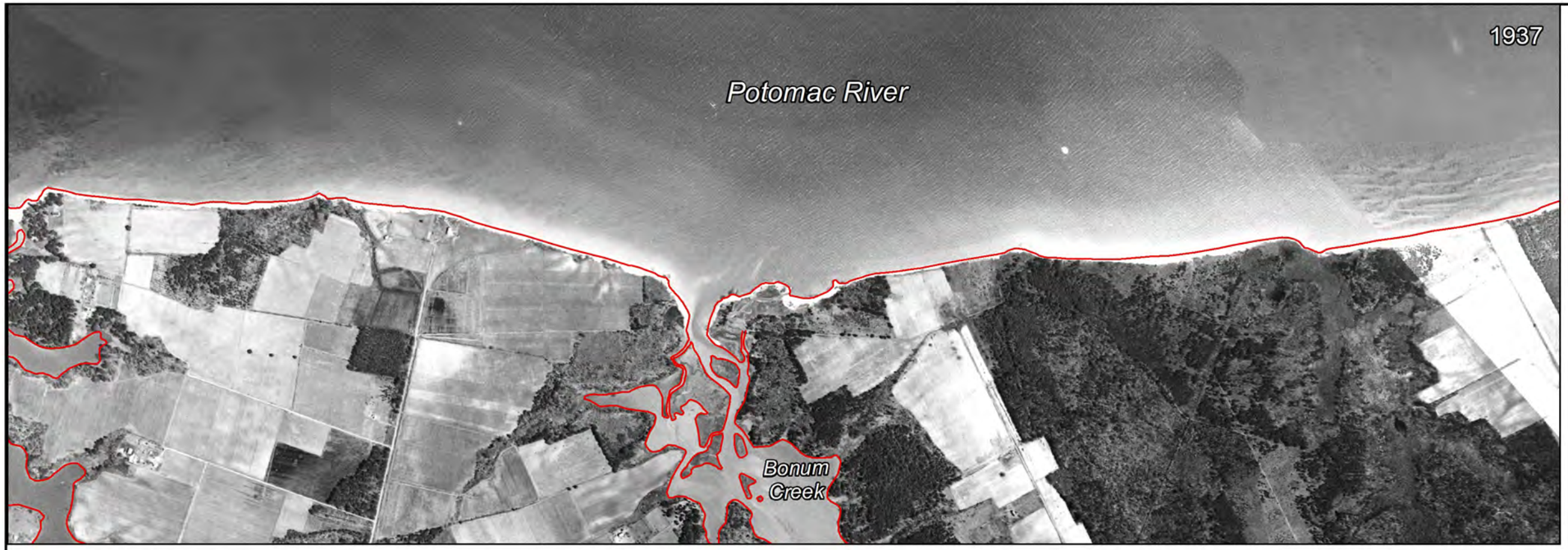
Feet

Westmoreland County
Virginia

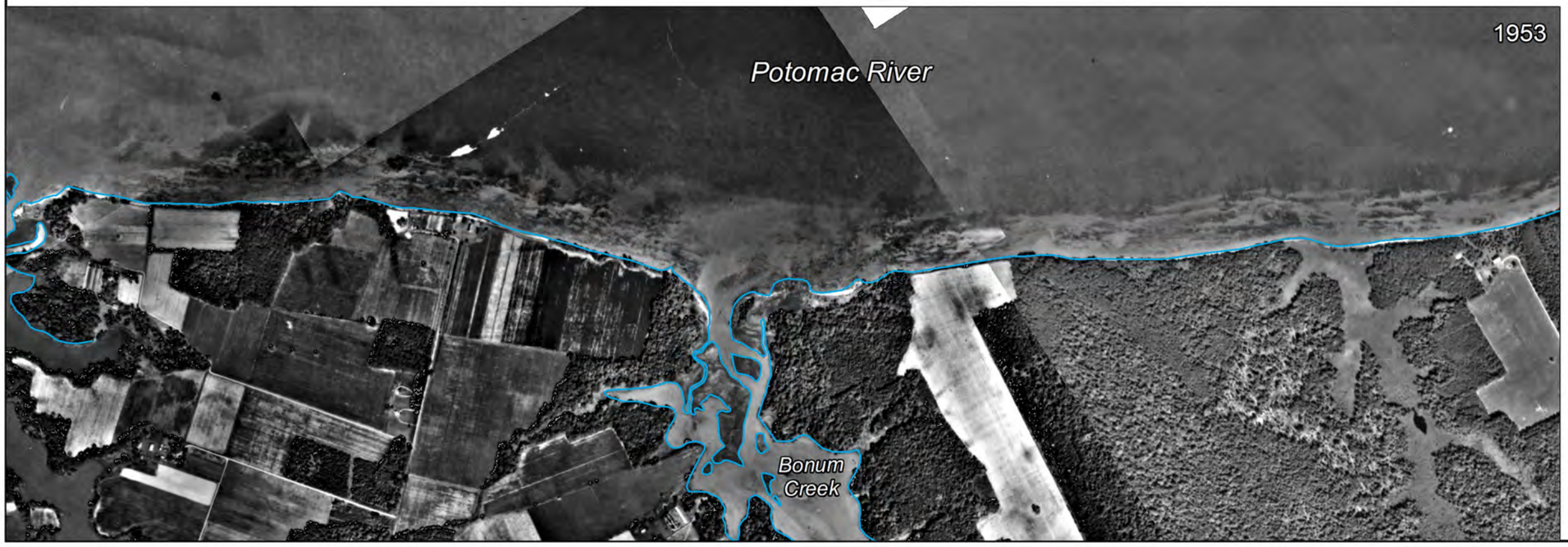
Plate 33



Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program
VIMS

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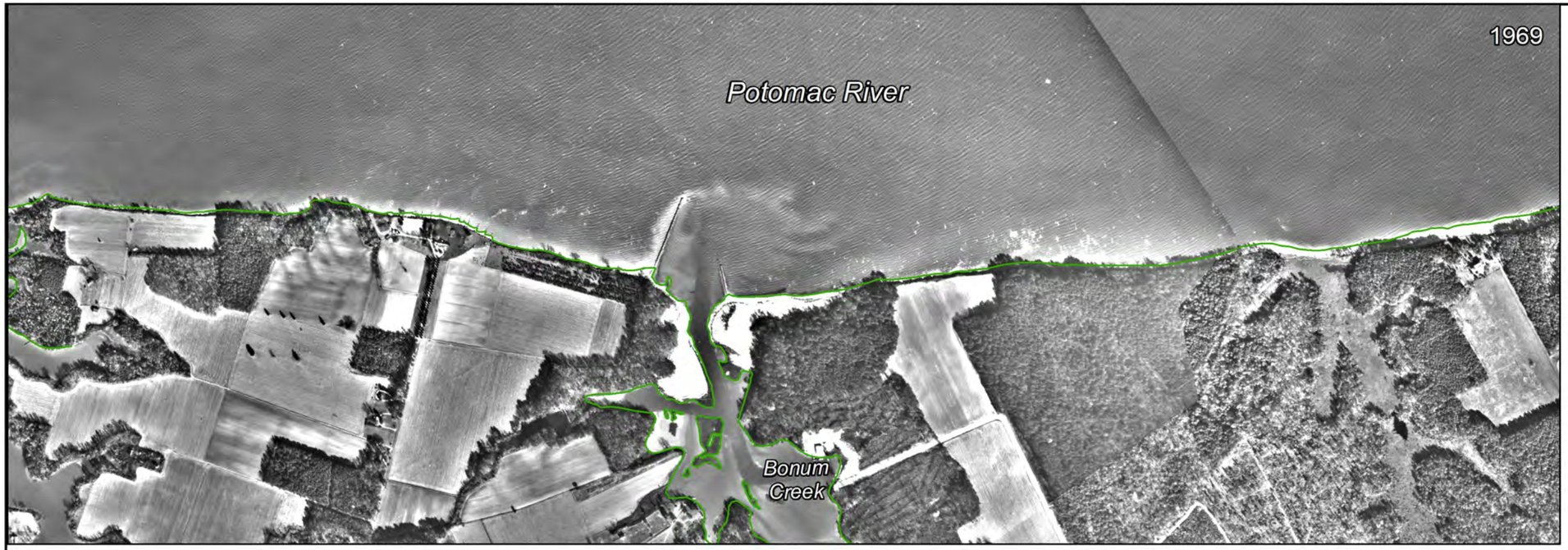
Feet



Westmoreland County
Virginia

Plate 33

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

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Feet

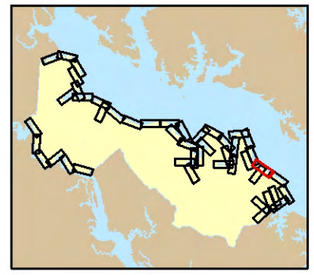
Westmoreland County
Virginia

Plate 33

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program
VIMS

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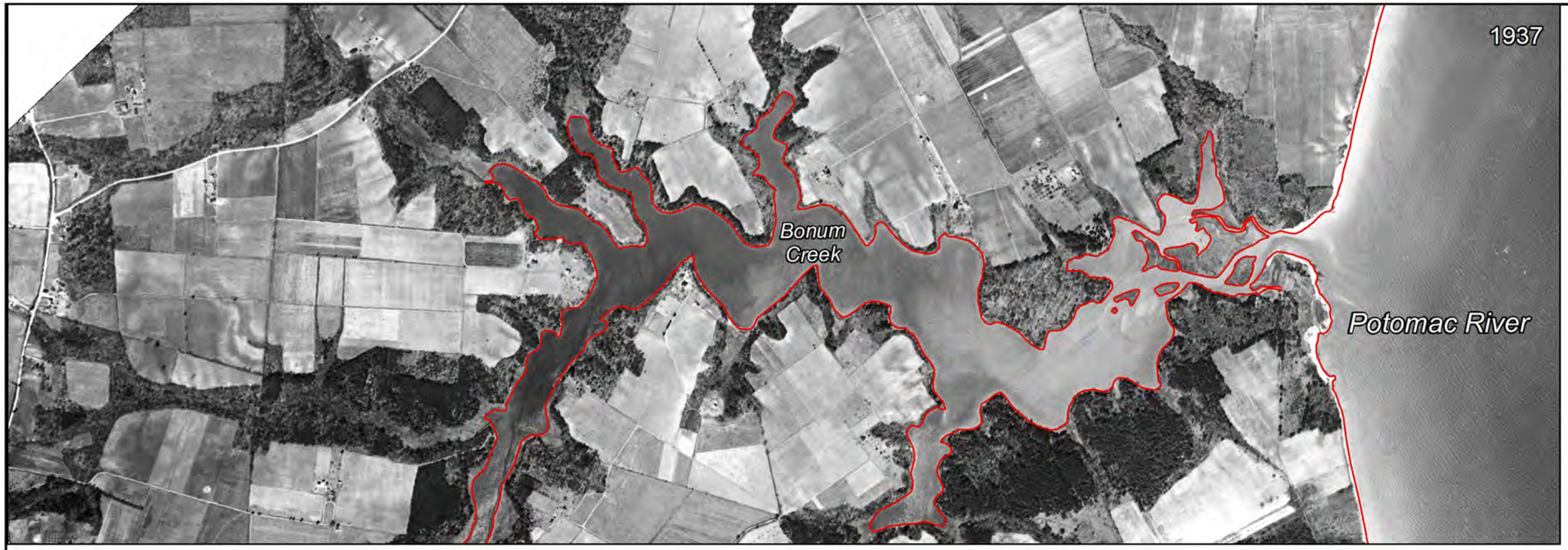
Feet



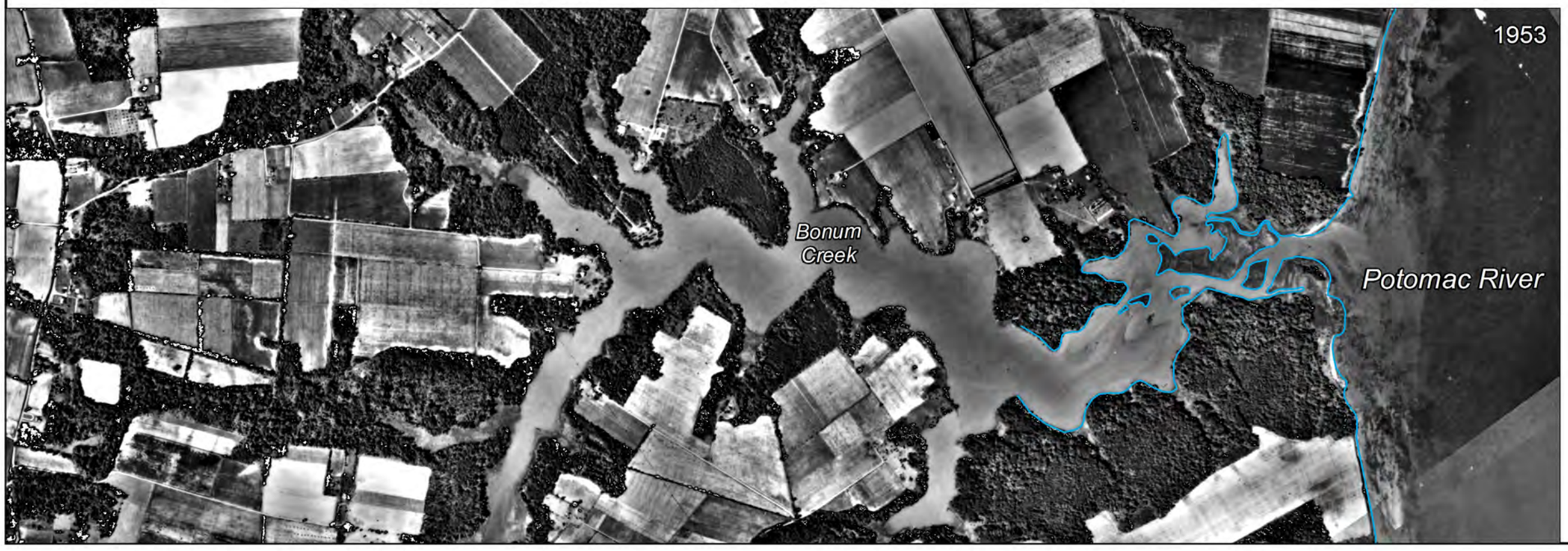
Westmoreland County
Virginia

Plate 34

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program
VIMS

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Feet

Westmoreland County
Virginia

Plate 34

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

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Feet

Westmoreland County
Virginia

Plate 34

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

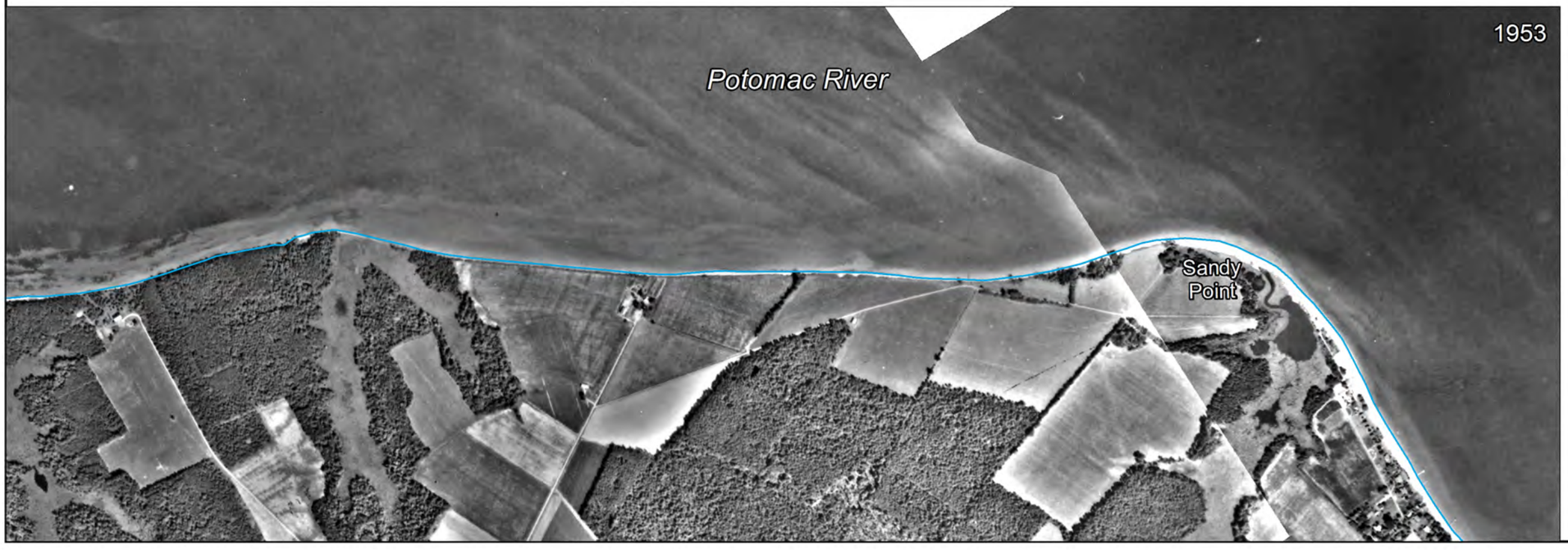
Westmoreland County
Virginia

Plate 35

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program
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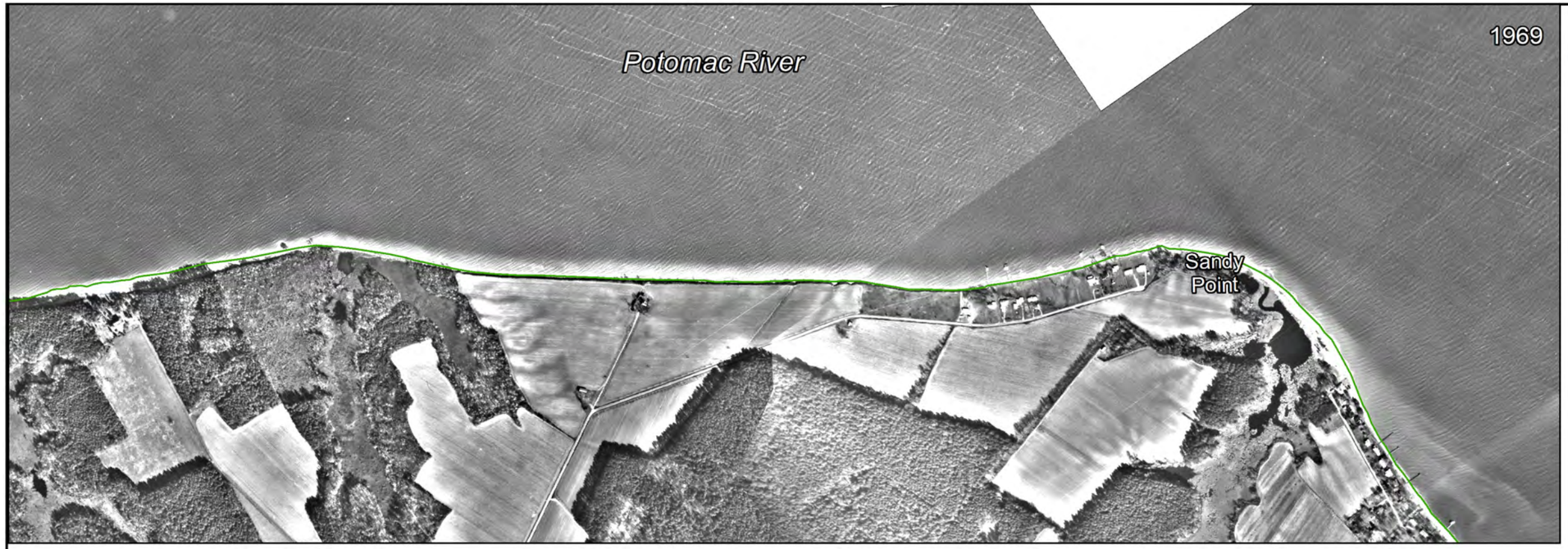


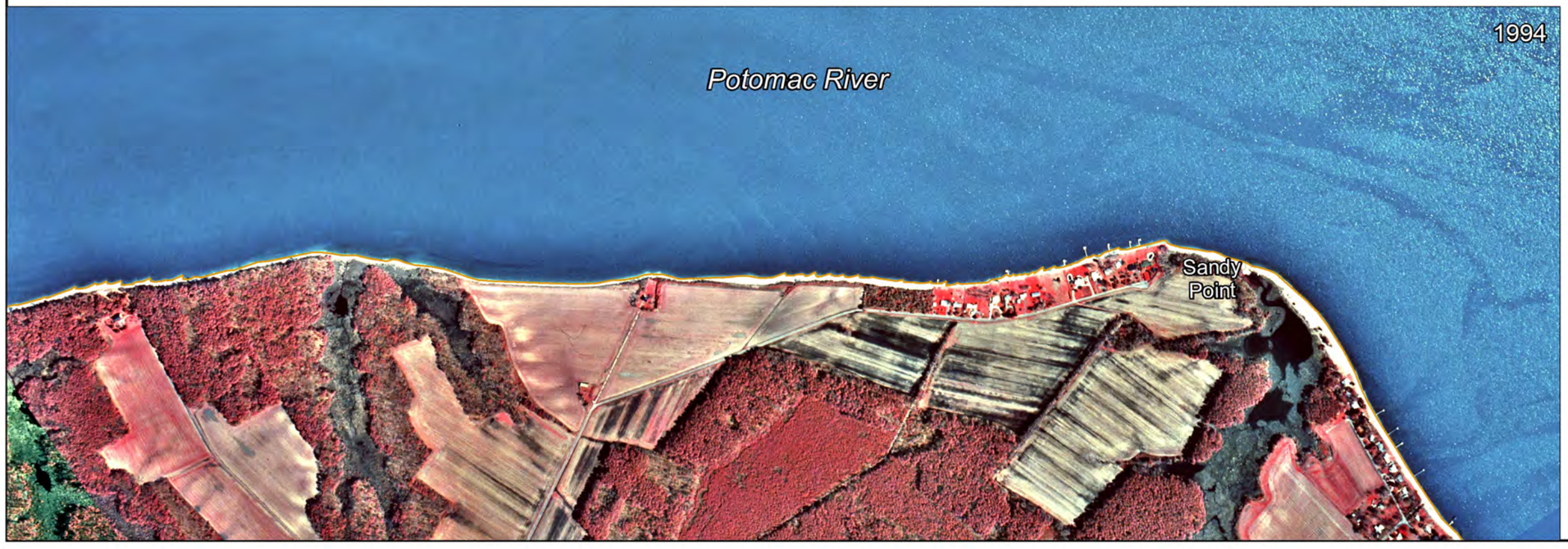
Westmoreland County
Virginia

Plate 35

Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program
VIMS

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Feet

Westmoreland County
Virginia

Plate 35

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program
VIMS

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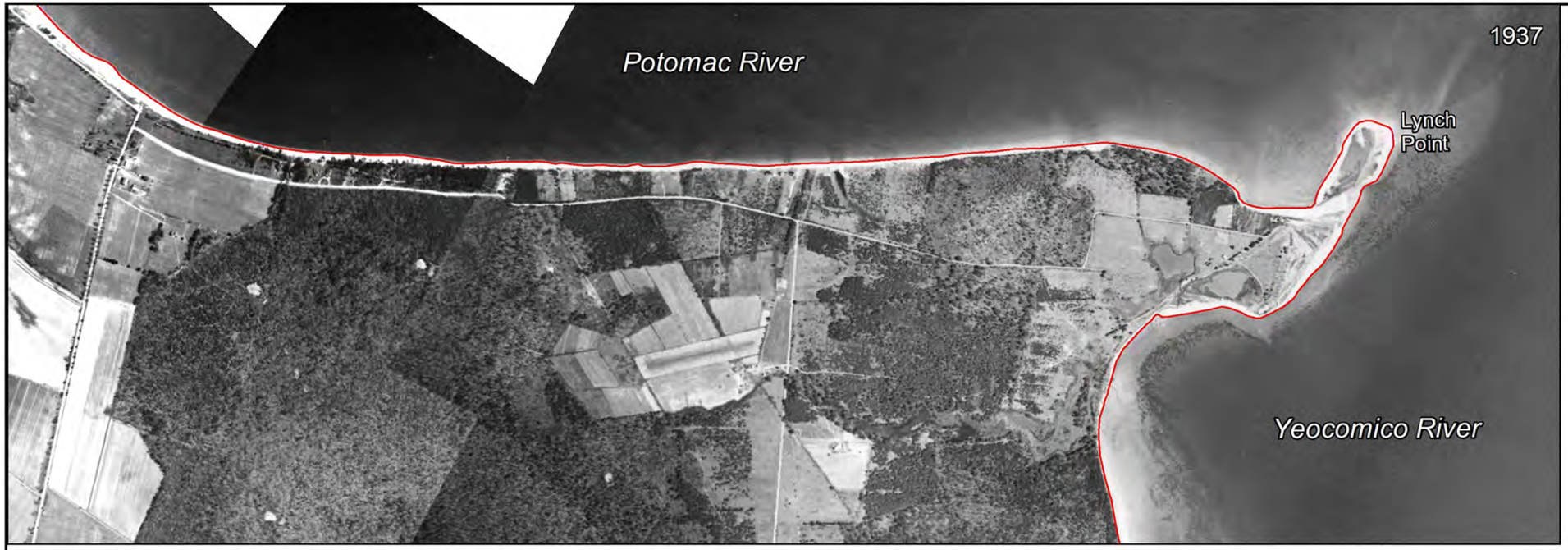
Feet

Westmoreland County
Virginia

Plate 36



Legend

- 1937 Shoreline
- 1953 Shoreline

Shoreline Studies Program
VIMS

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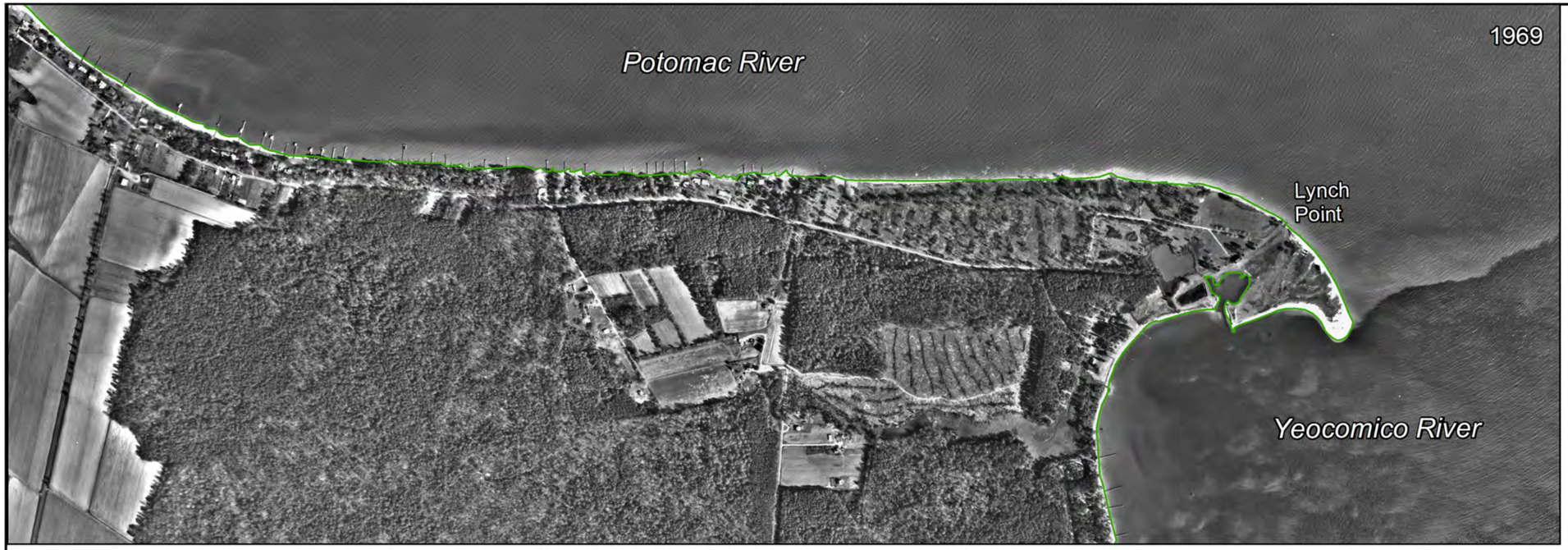
Feet



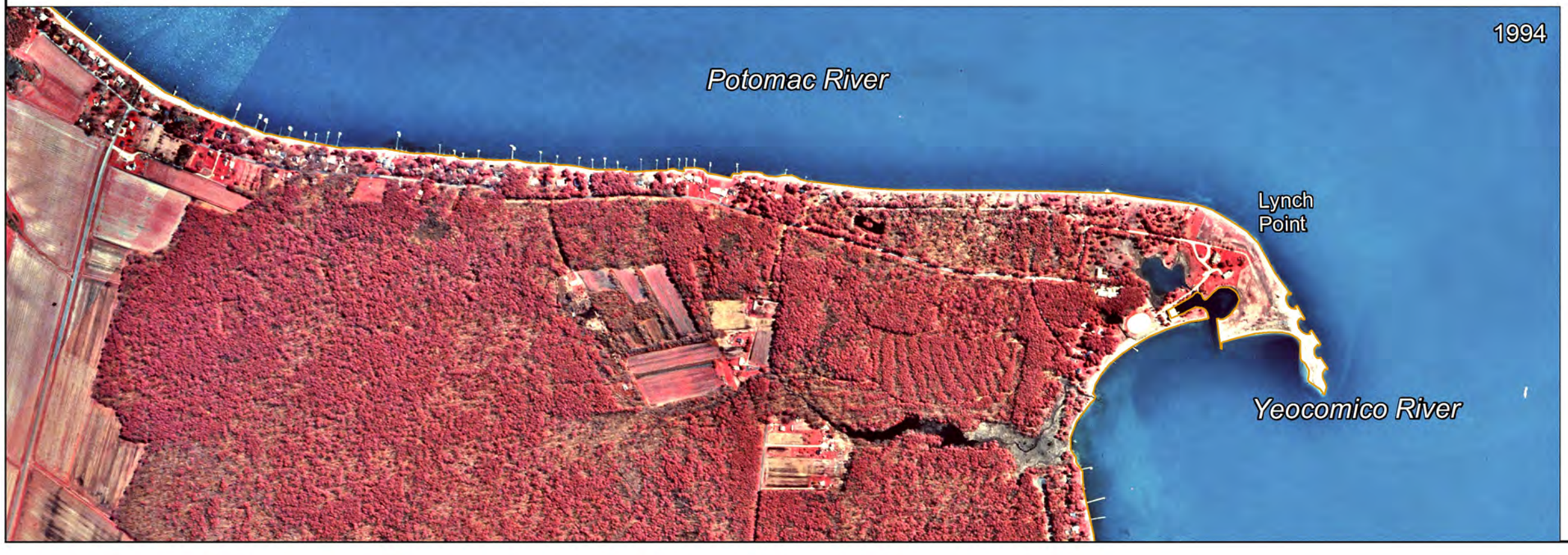
Westmoreland County
Virginia

Plate 36

Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program
VIMS

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Feet

Westmoreland County
Virginia

Plate 36

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program
VIMS

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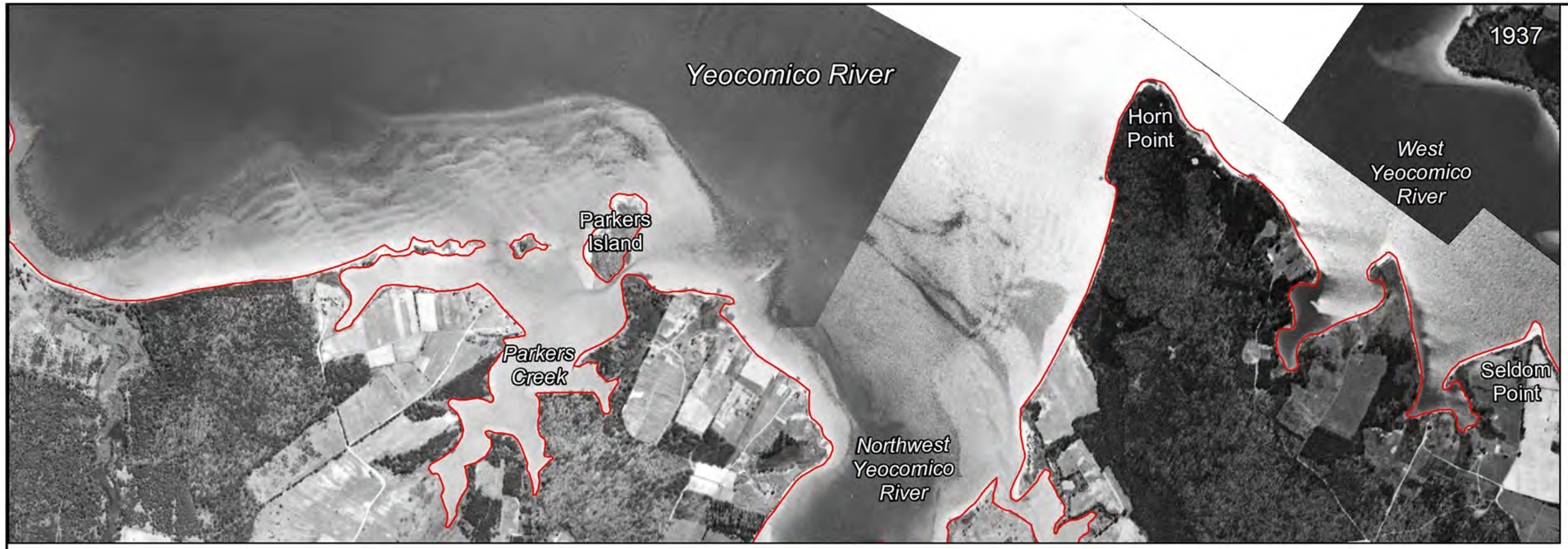
Feet

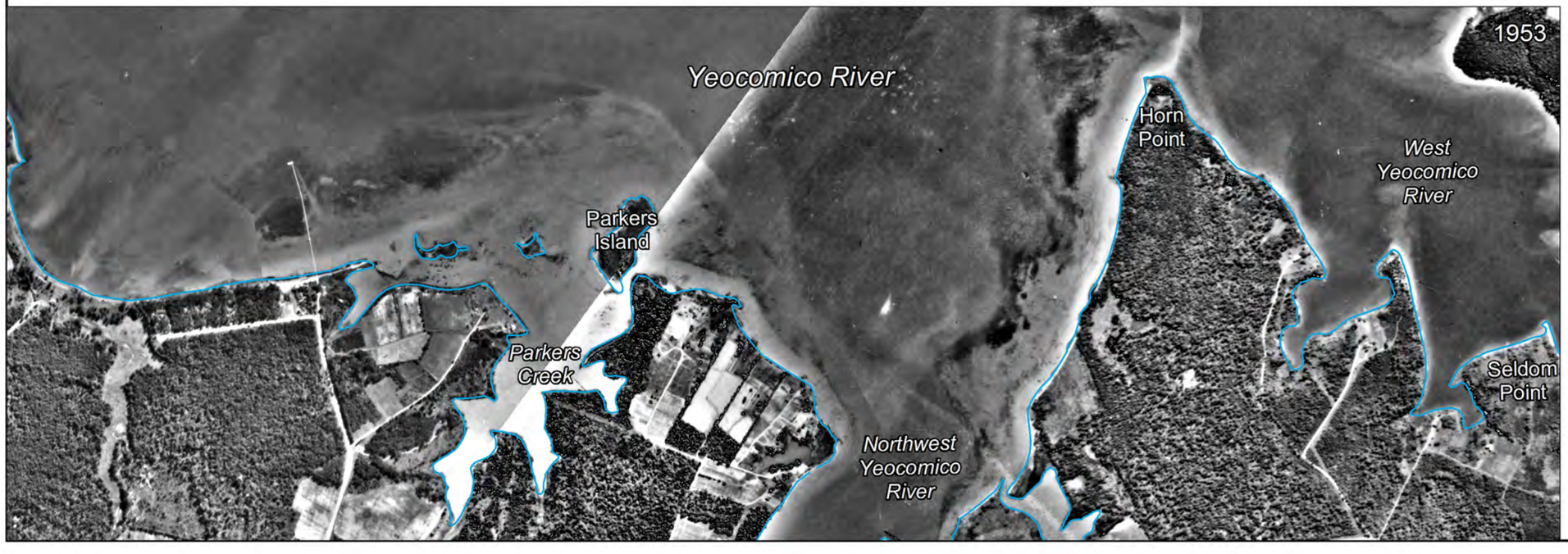
Westmoreland County
Virginia

Plate 37



Legend

- 1937 Shoreline
- 1953 Shoreline



Shoreline Studies Program VIMS

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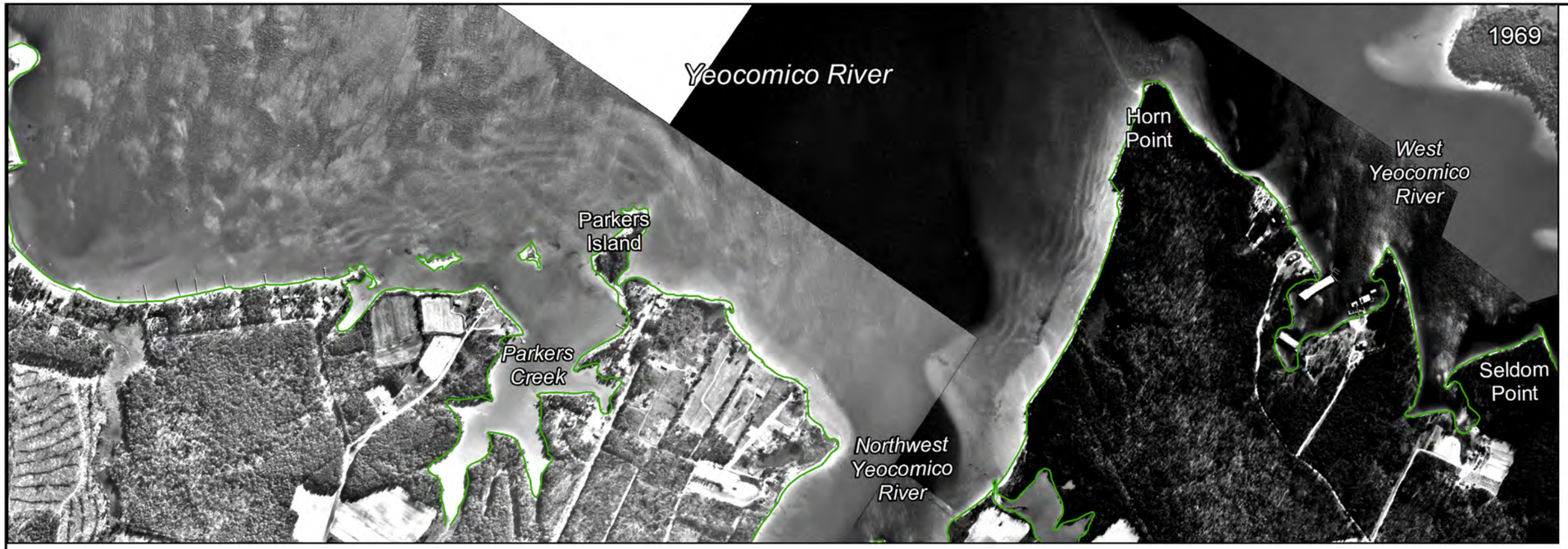
Feet



Westmoreland County Virginia

Plate 37

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 37

Legend

- 2002 Shoreline
- 2009 Shoreline

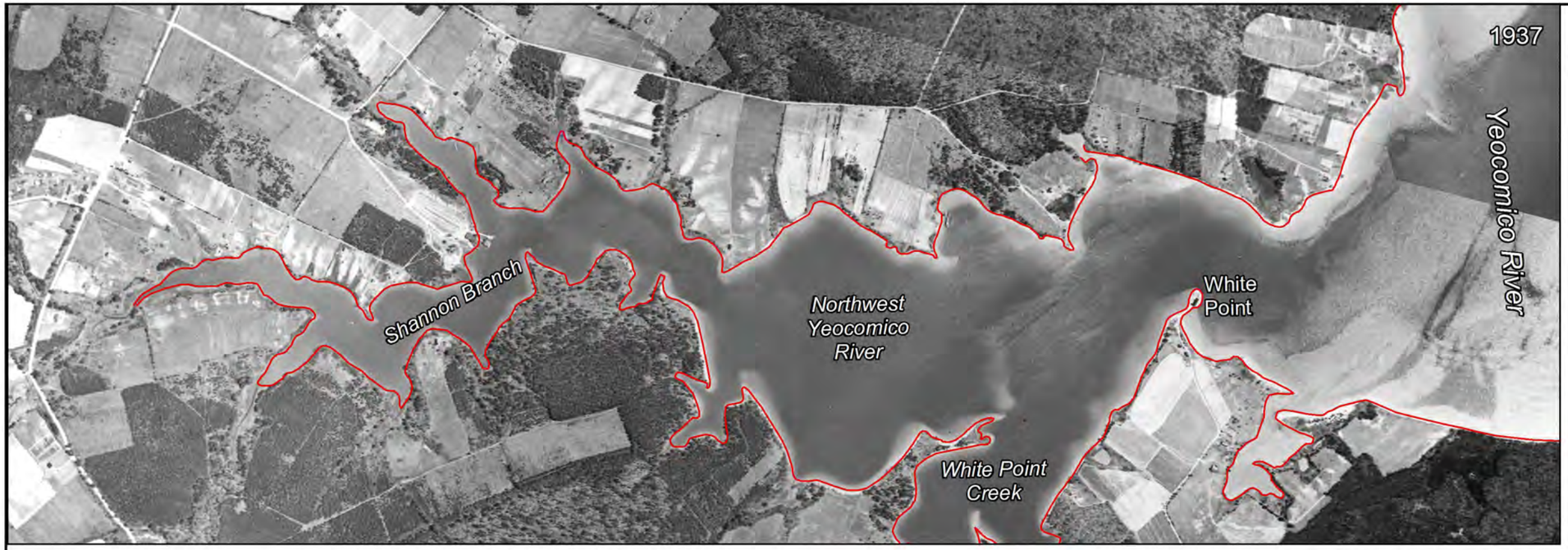
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

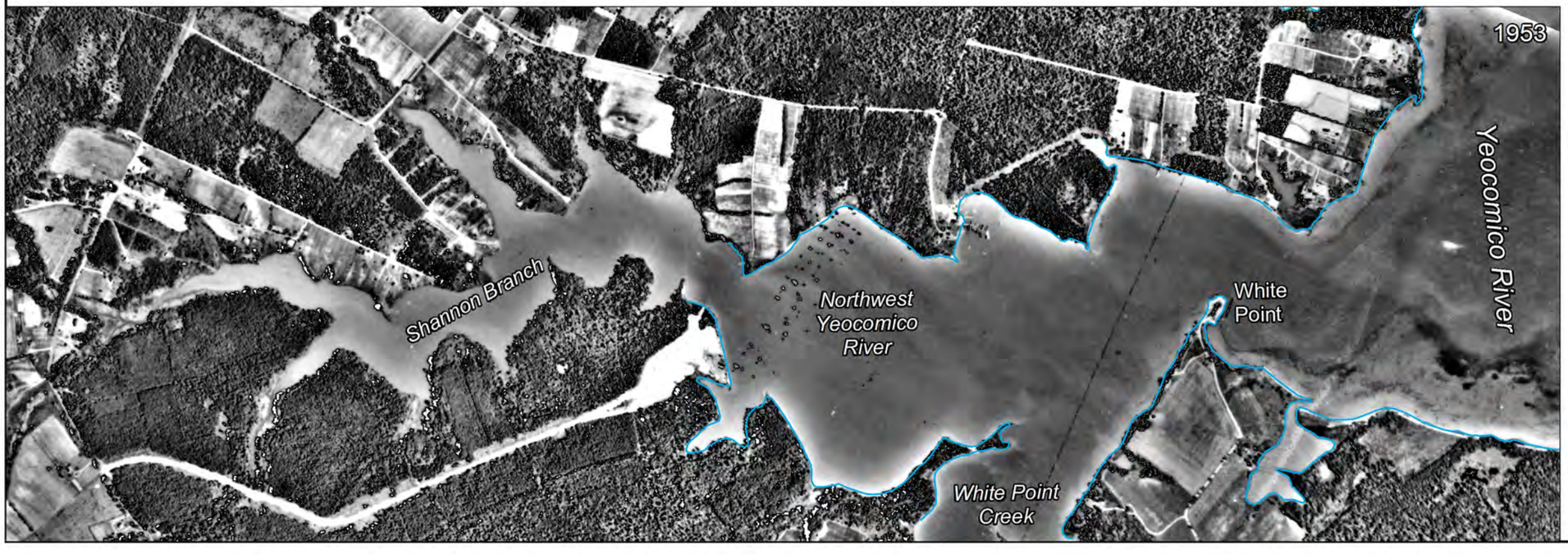
Plate 38



Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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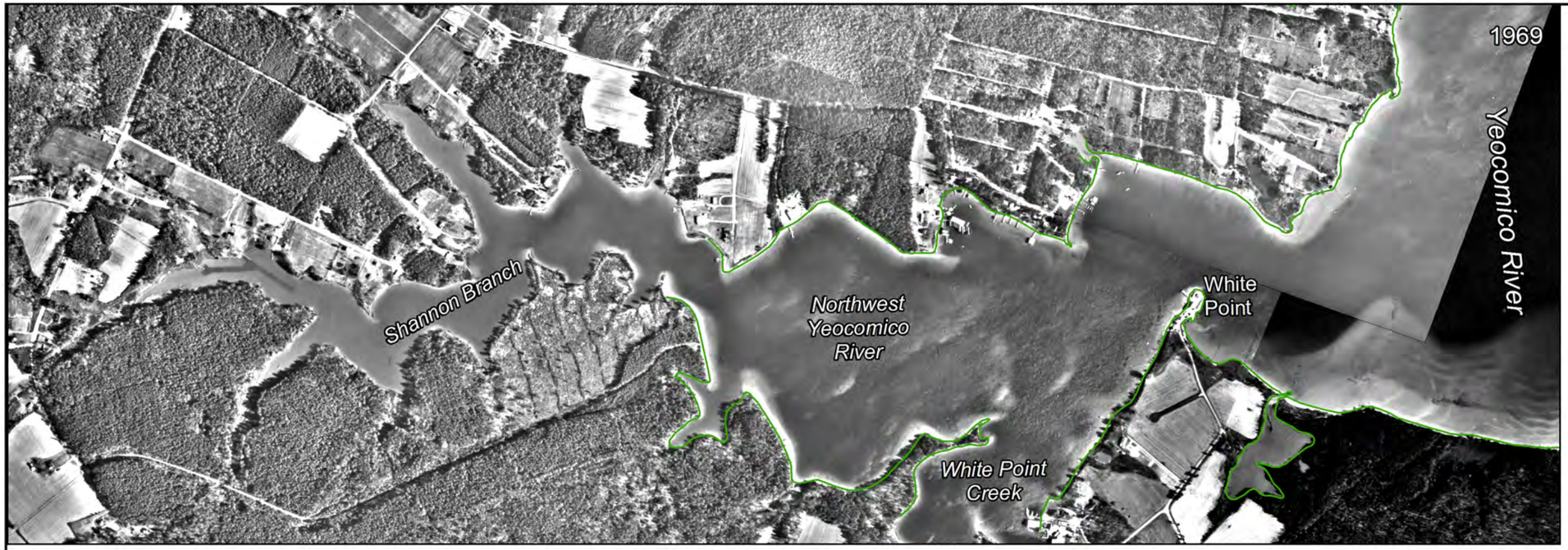
Feet

Westmoreland County
Virginia

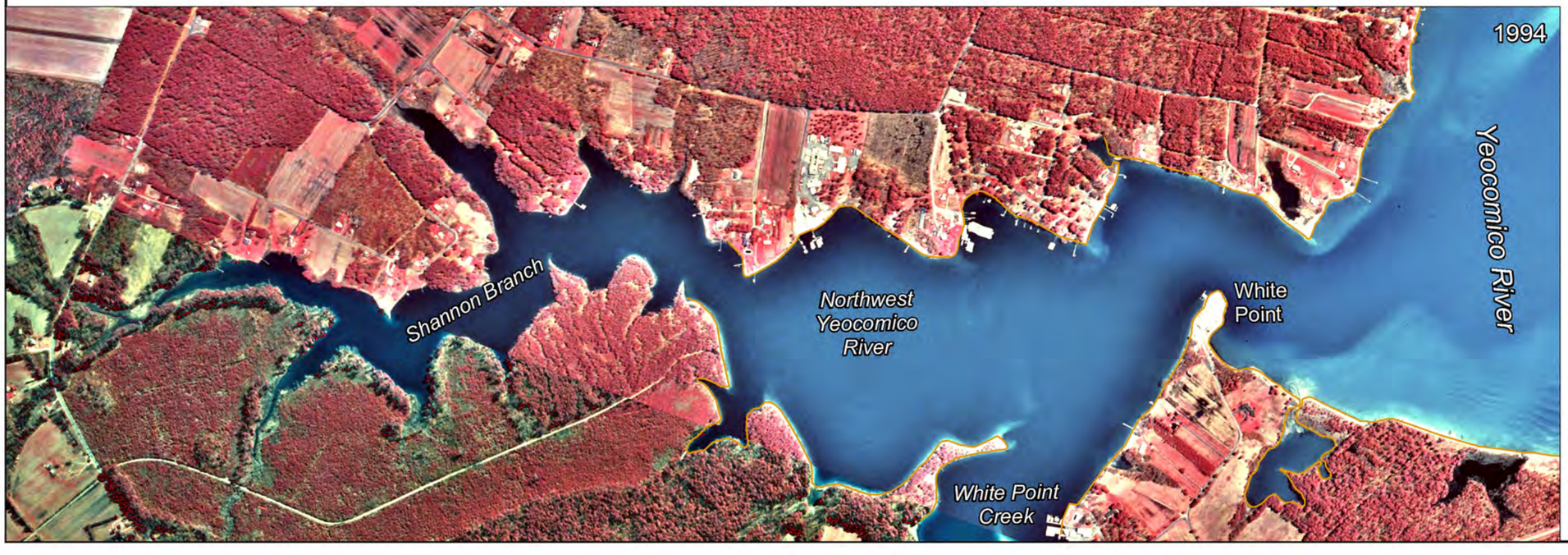
Plate 38



Legend

1969 Shoreline

1994 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 38

Legend

- 2002 Shoreline
- 2009 Shoreline

Shoreline Studies Program VIMS

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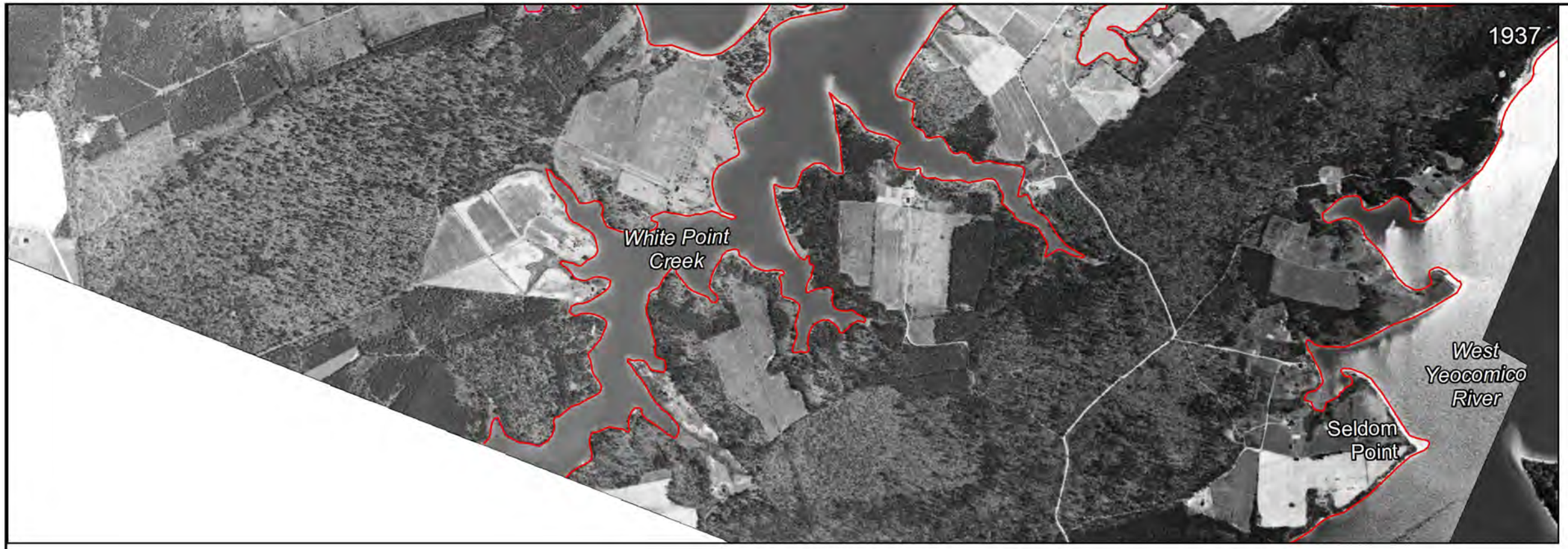
Feet



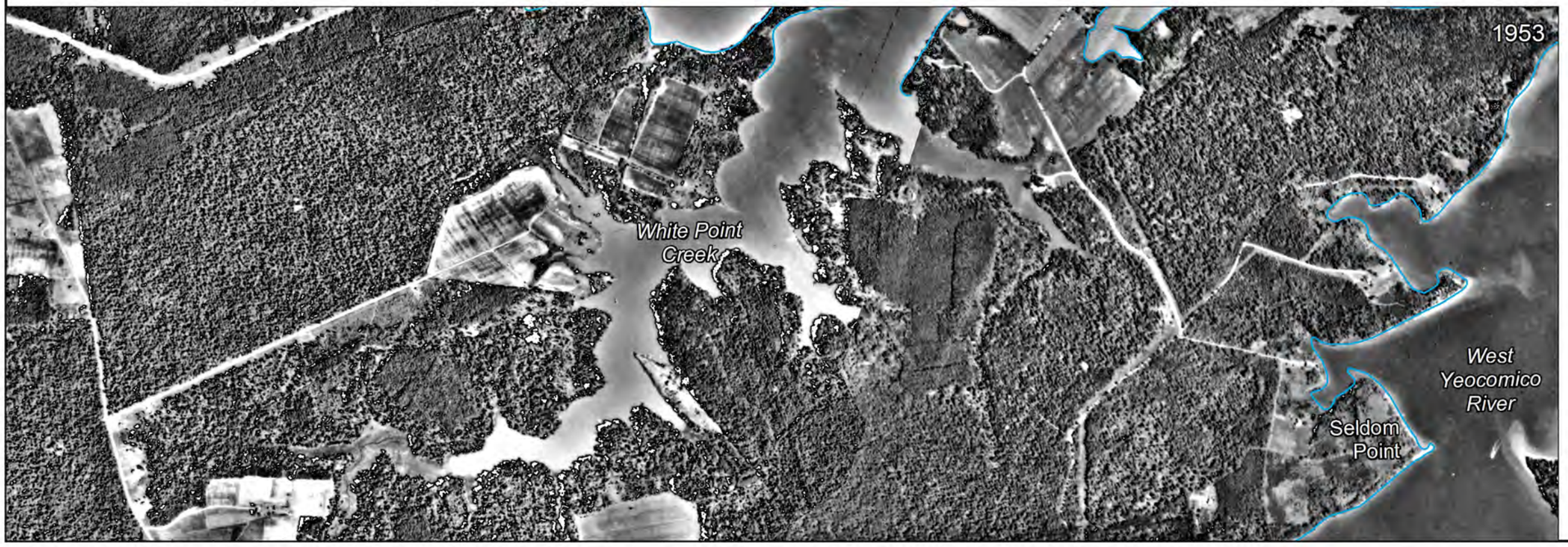
Westmoreland County Virginia

Plate 39

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

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Feet

Westmoreland County Virginia

Plate 39

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 39

Legend

2002 Shoreline

2009 Shoreline

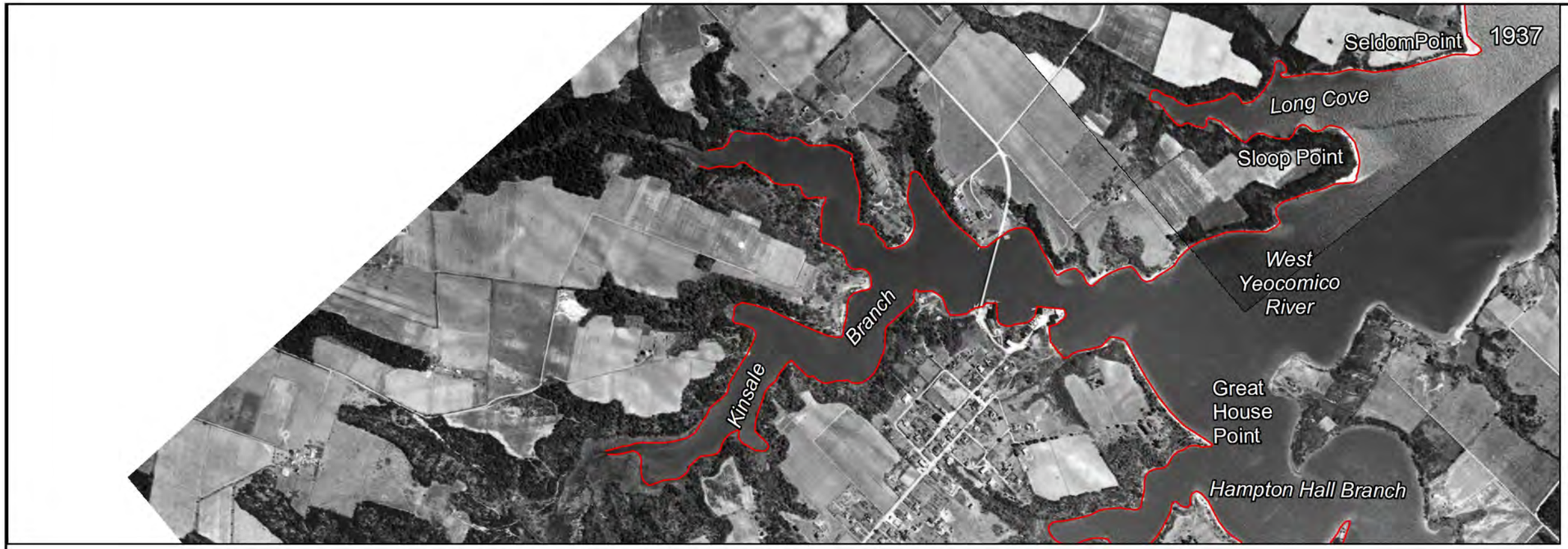
Shoreline Studies Program VIMS

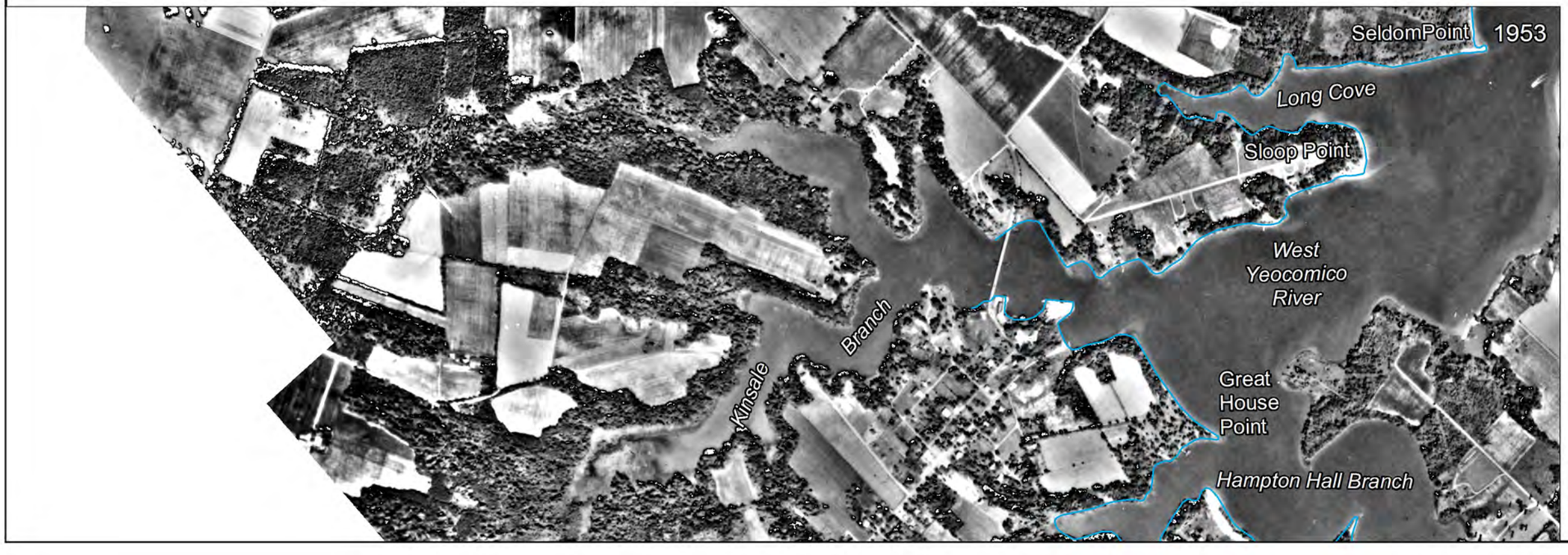
1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 40





Legend

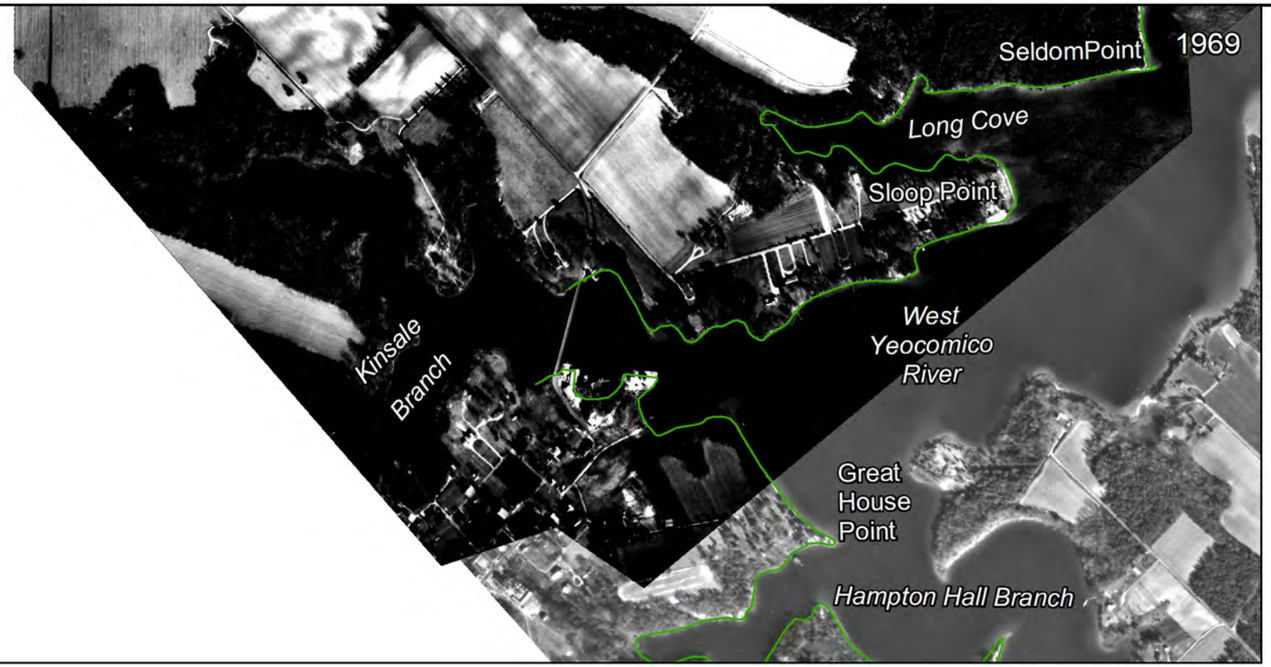
1937 Shoreline

1953 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000

Feet



Westmoreland County
Virginia

Plate 40

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 40

Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 41

Legend

- 1937 Shoreline
- 1953 Shoreline

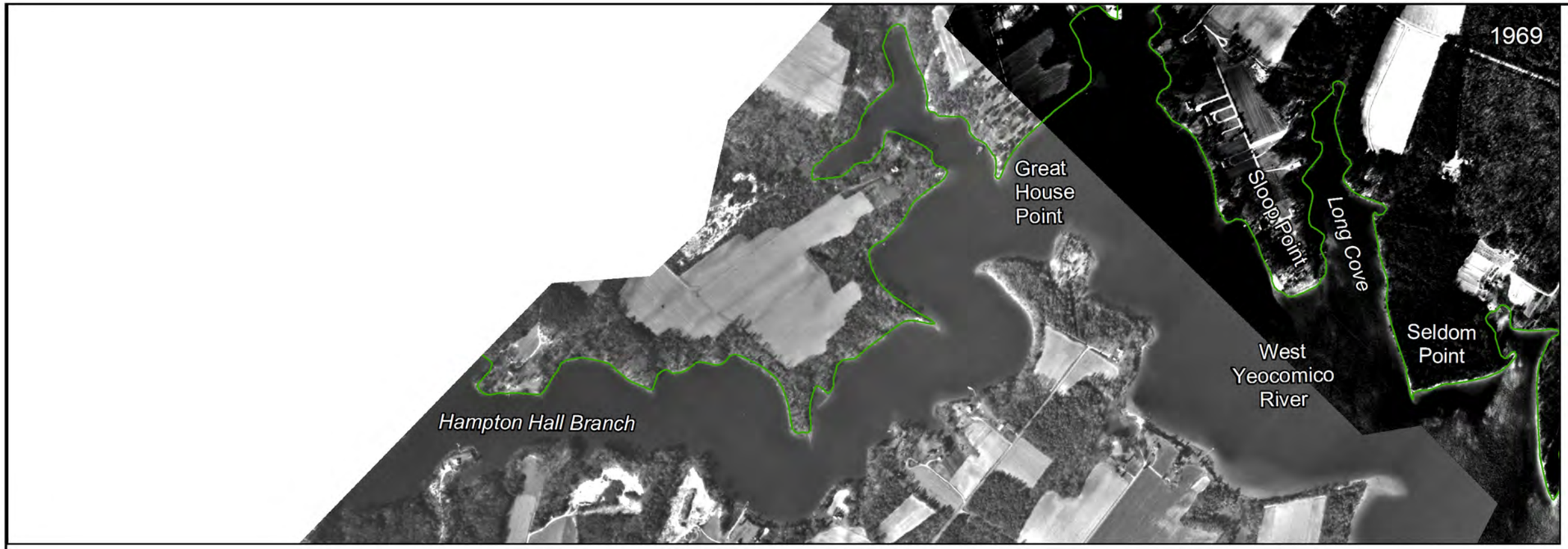
Shoreline Studies Program, VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 41



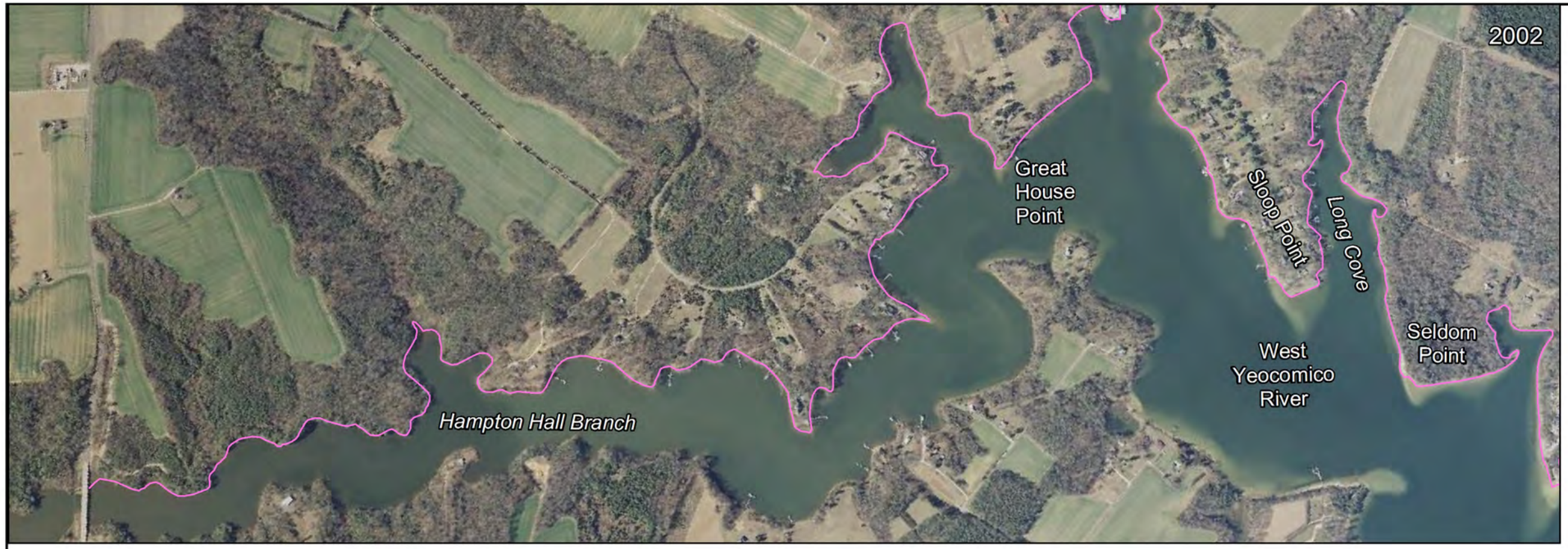
Legend

- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet



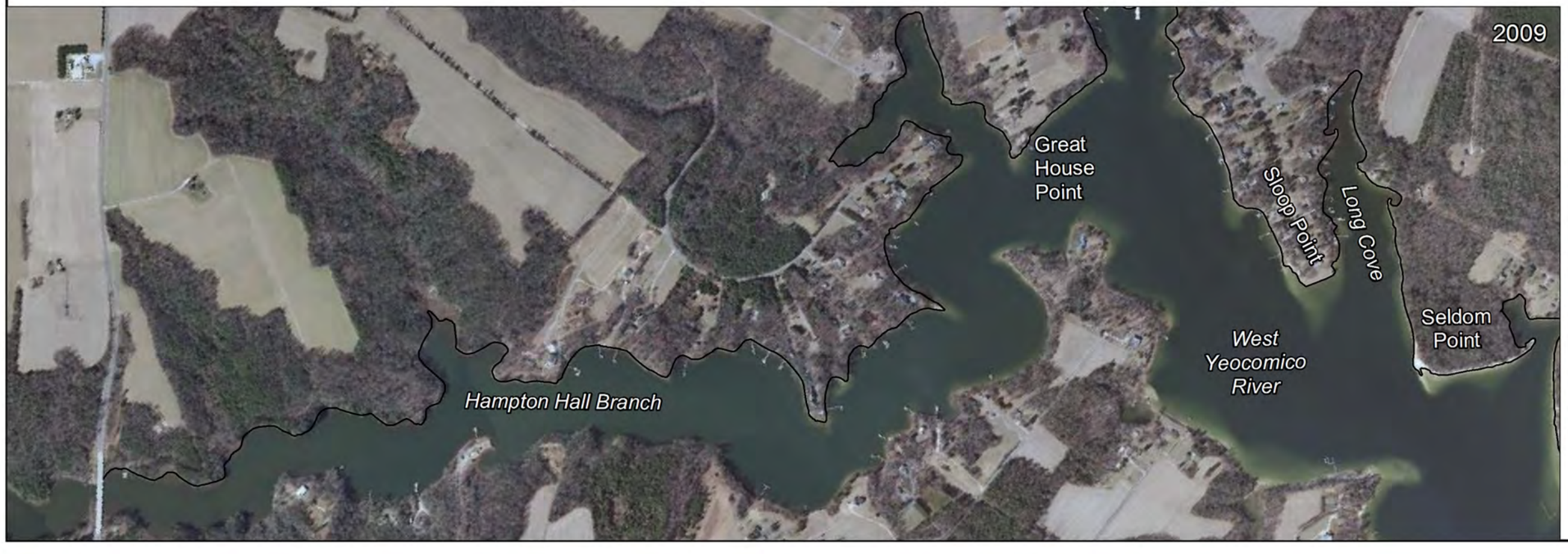
Westmoreland County
Virginia

Plate 41

Legend

2002 Shoreline

2009 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County Virginia

Plate 42

Legend

1937 Shoreline

1953 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet

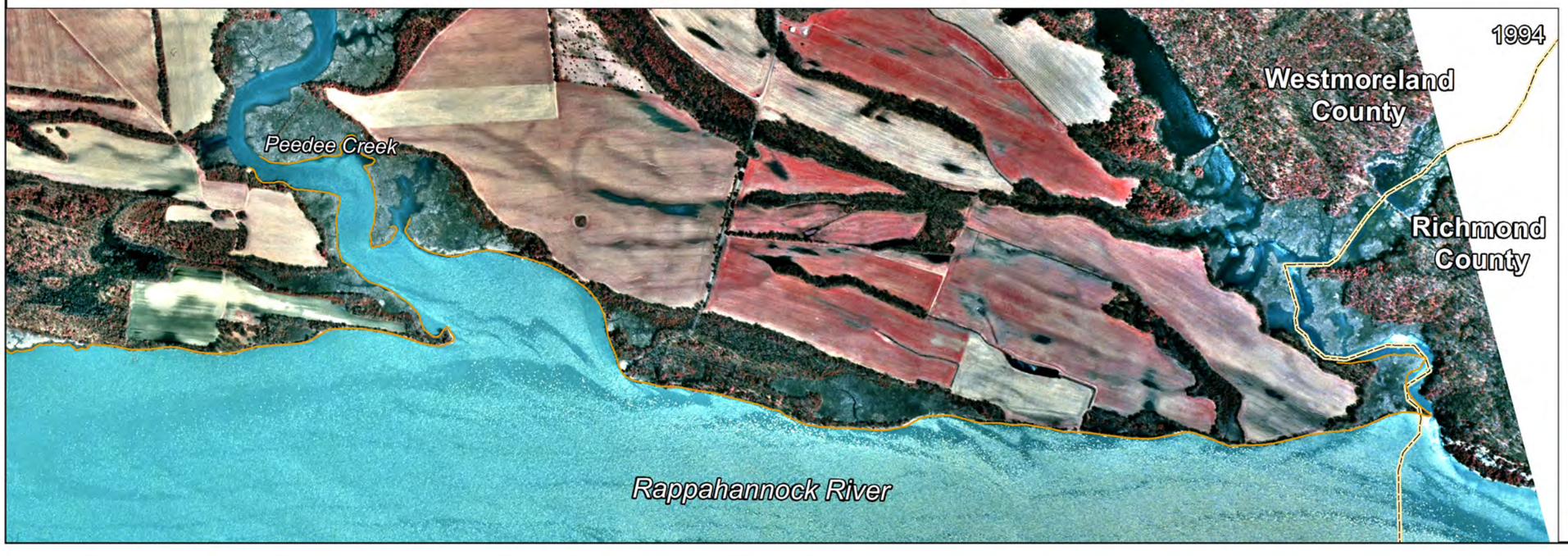
Westmoreland County Virginia

Plate 42

Legend

1937 Shoreline

1953 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet

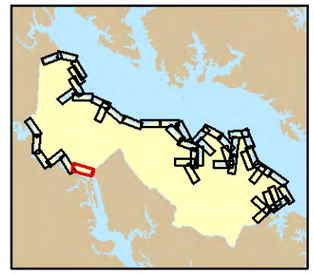
Westmoreland County Virginia

Plate 42

Legend

2002 Shoreline

2009 Shoreline



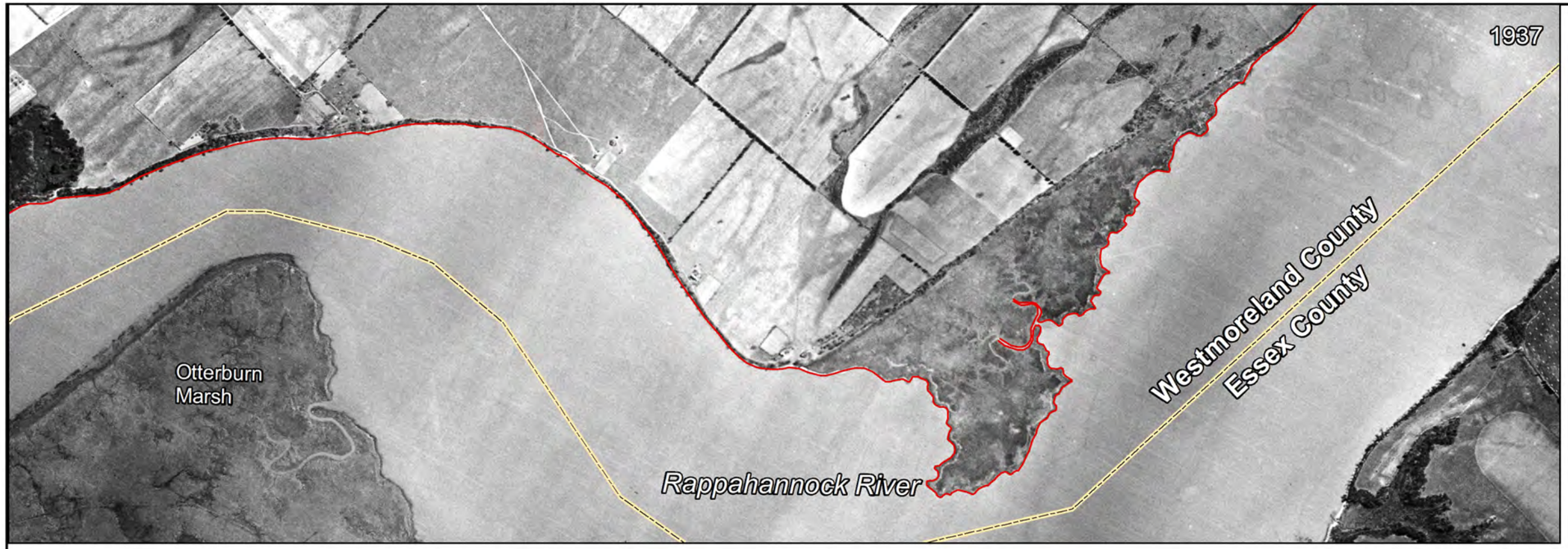
Shoreline Studies Program VIMS

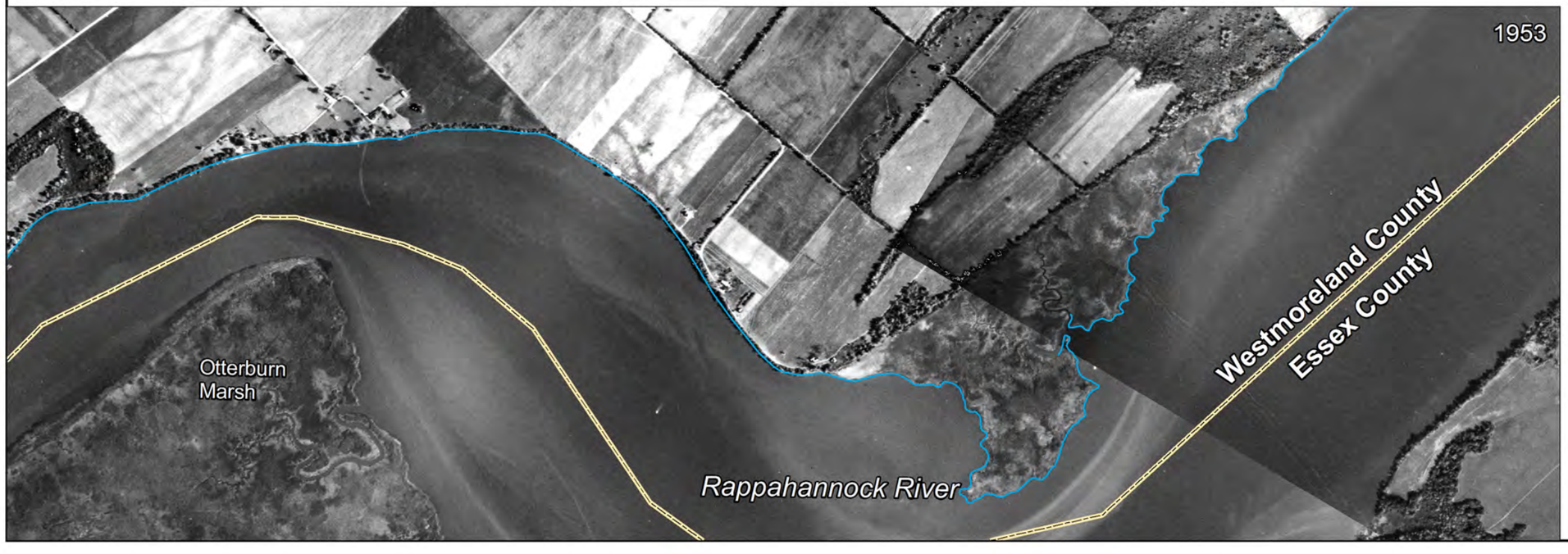
1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 43





Legend

1937 Shoreline

1953 Shoreline

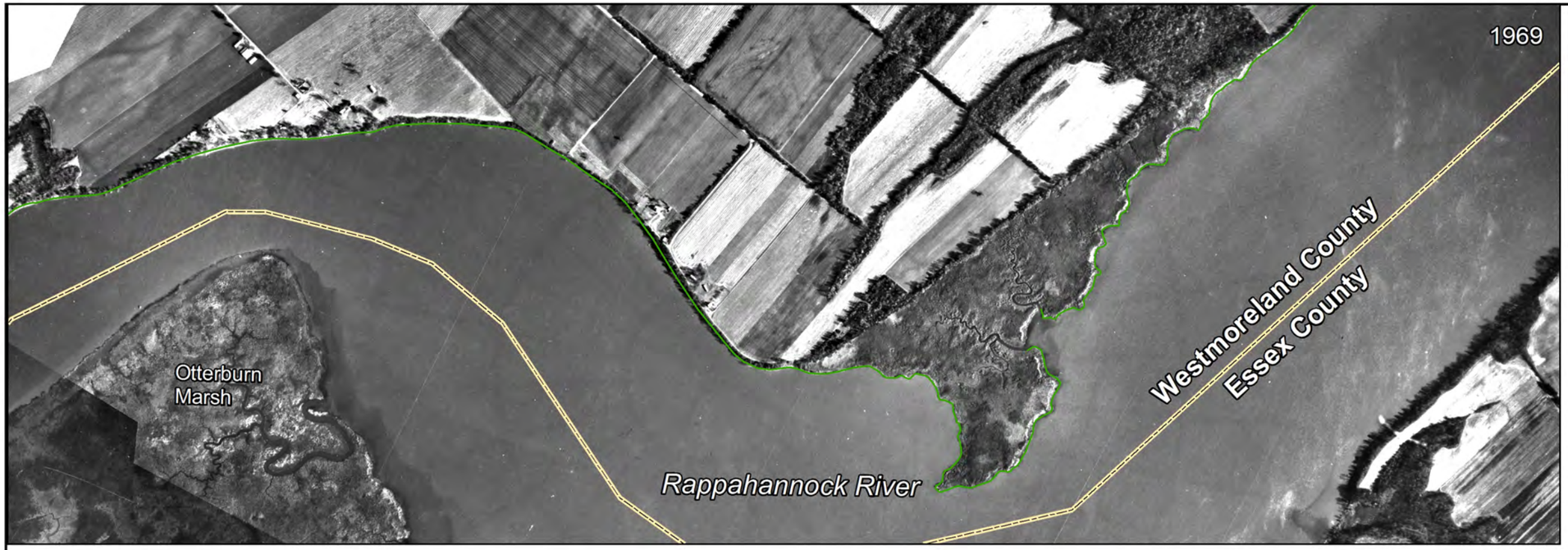
Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 43



Legend

1969 Shoreline

1994 Shoreline

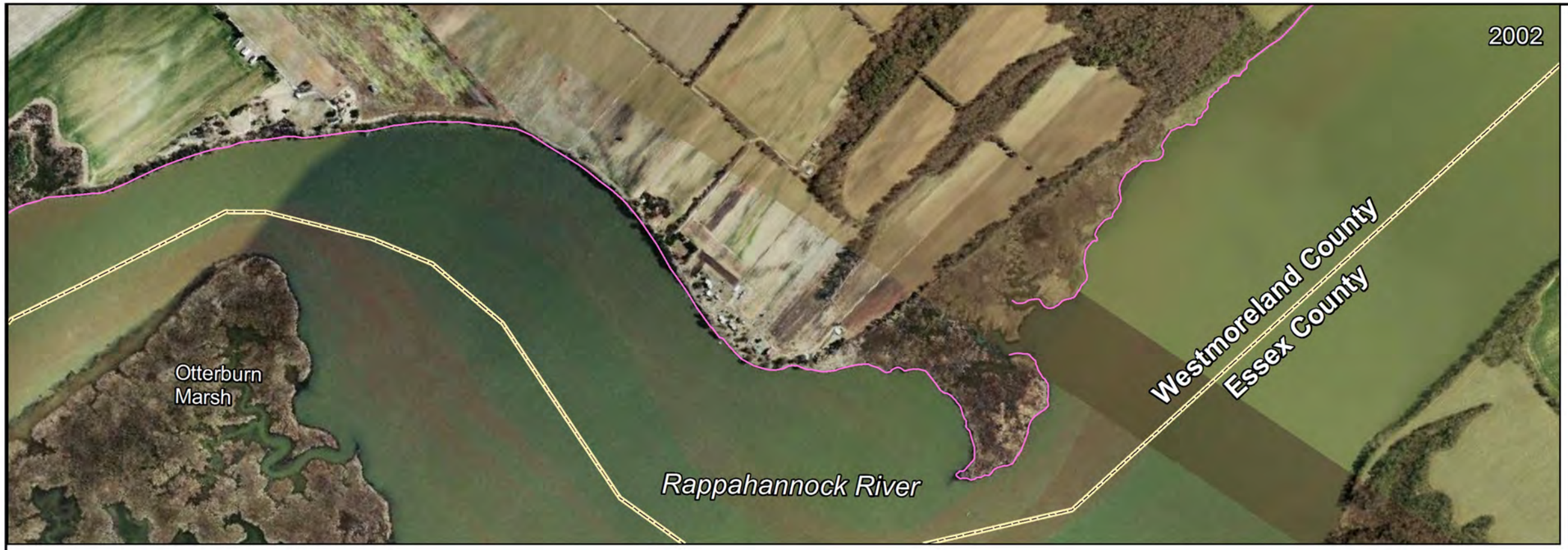
Shoreline Studies Program
VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 43



Legend

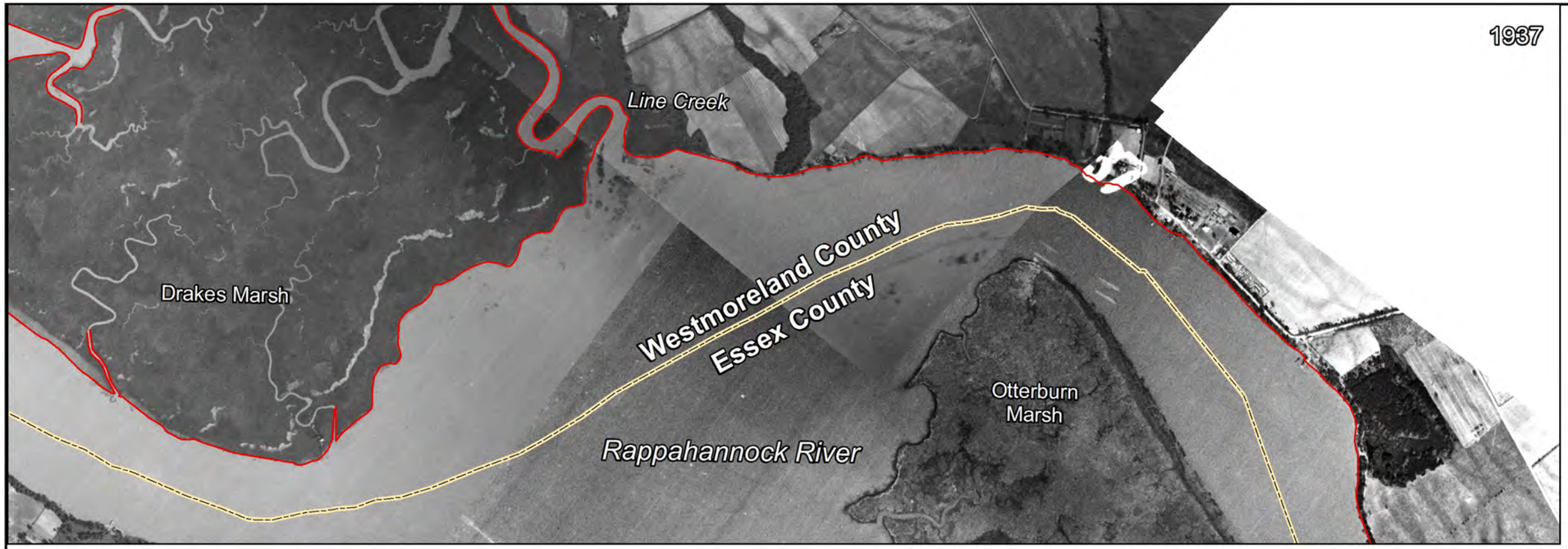
- 2002 Shoreline
- 2009 Shoreline

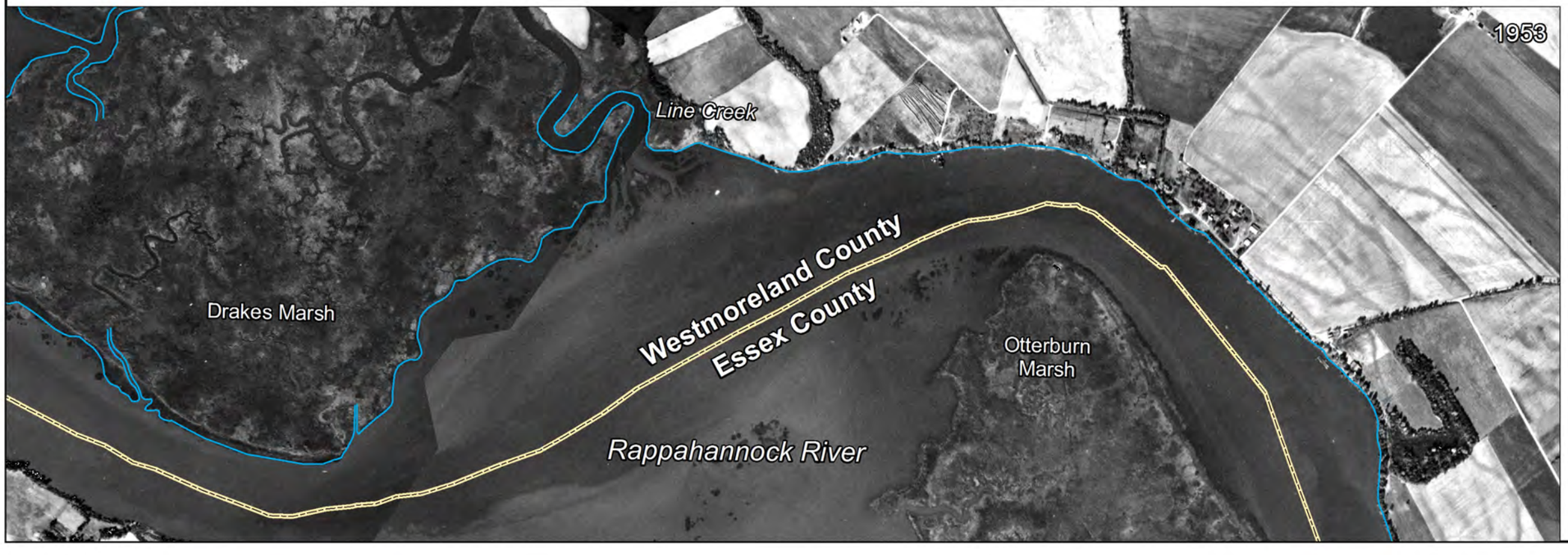
Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County
Virginia

Plate 44



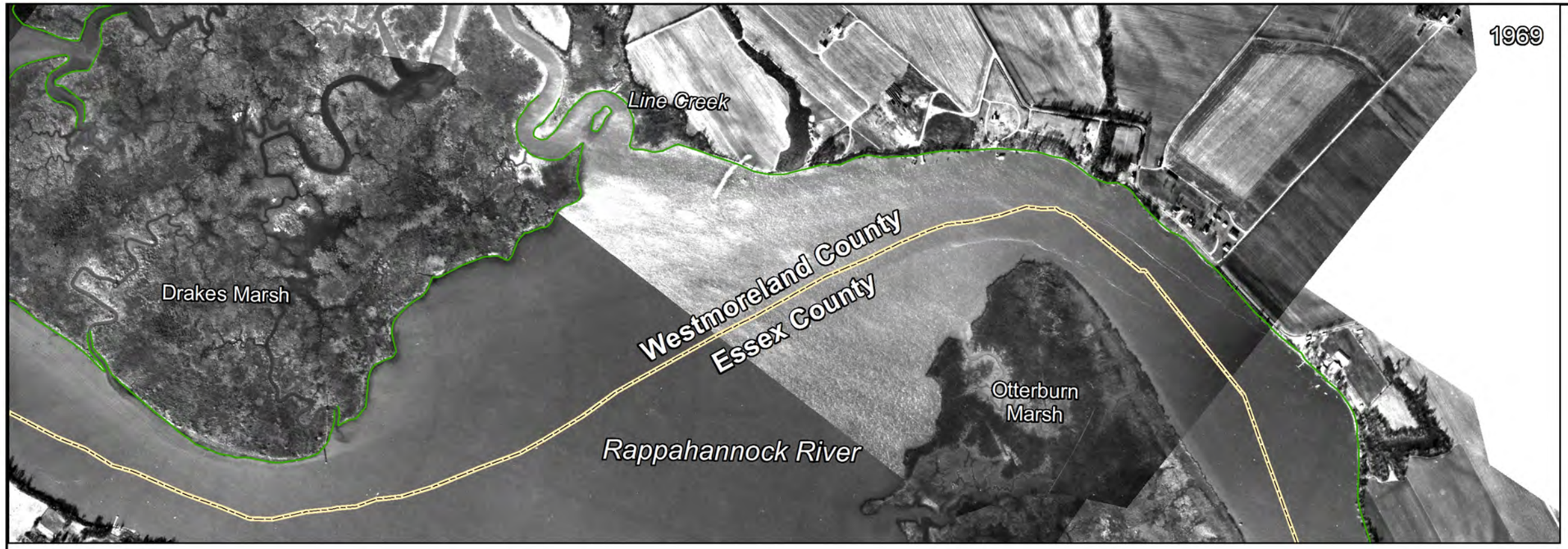


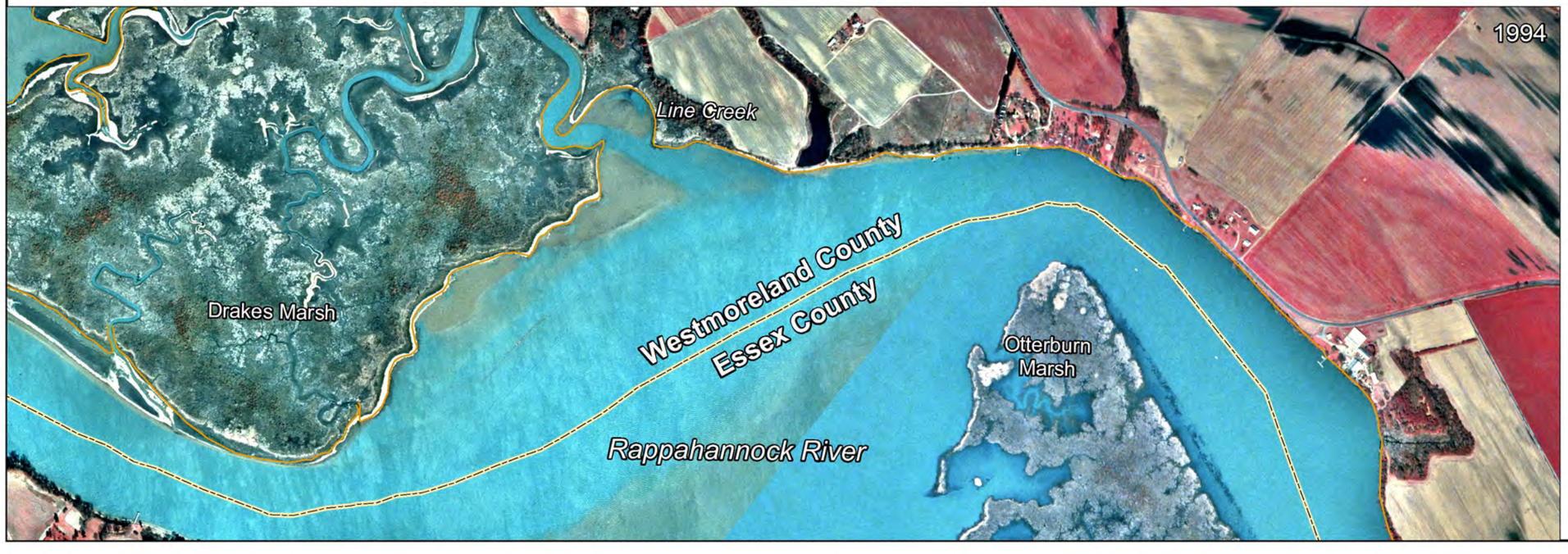
Legend

- 1937 Shoreline
- 1953 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet





Westmoreland County
Virginia

Plate 44

Legend

1969 Shoreline

1994 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County
Virginia

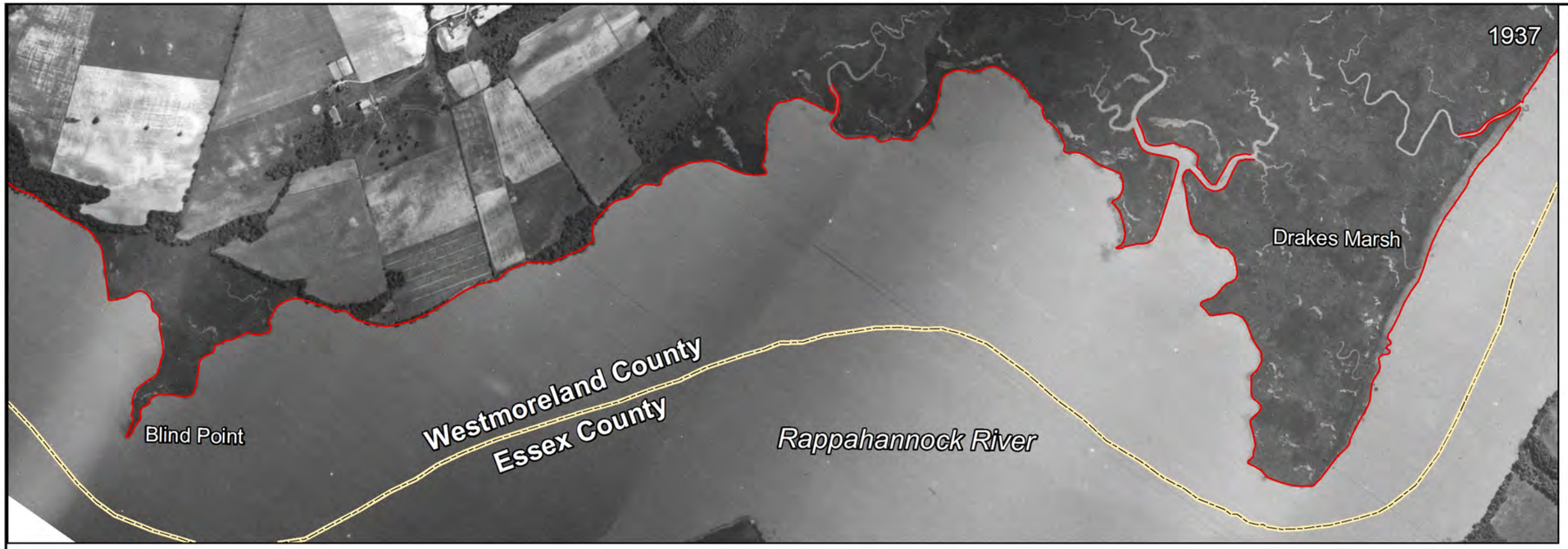
Plate 44

Legend

- 2002 Shoreline
- 2009 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet



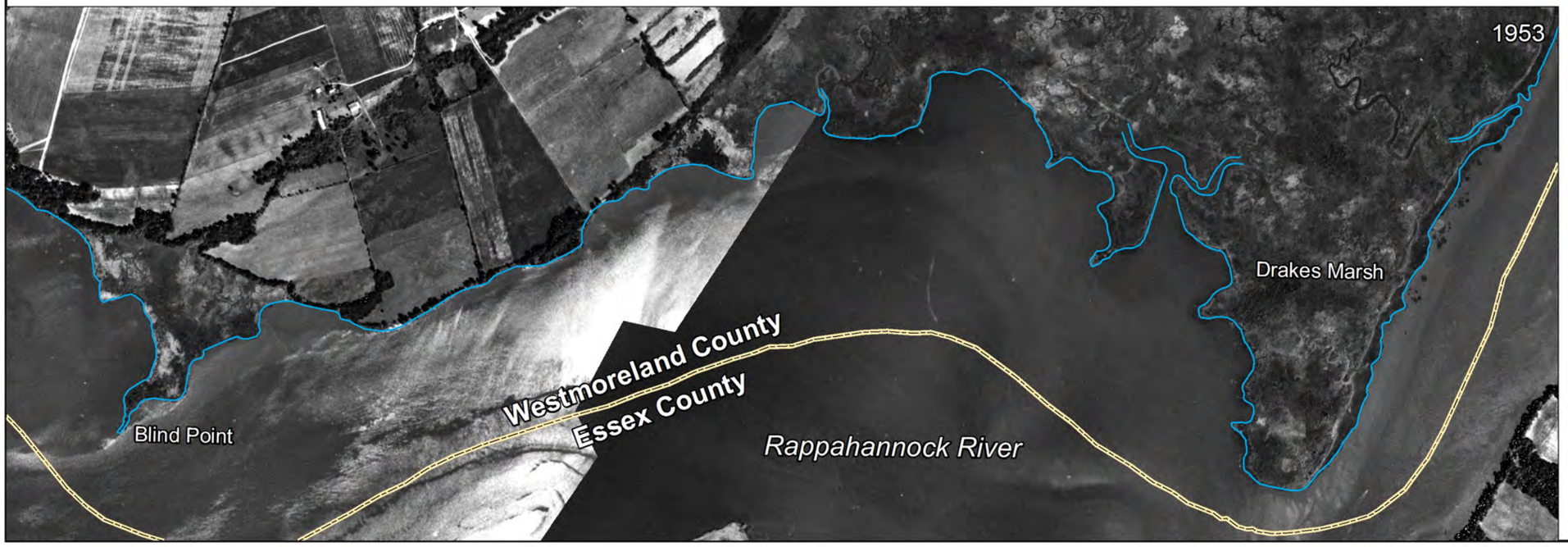
Westmoreland County Virginia

Plate 45

Legend

1937 Shoreline

1953 Shoreline



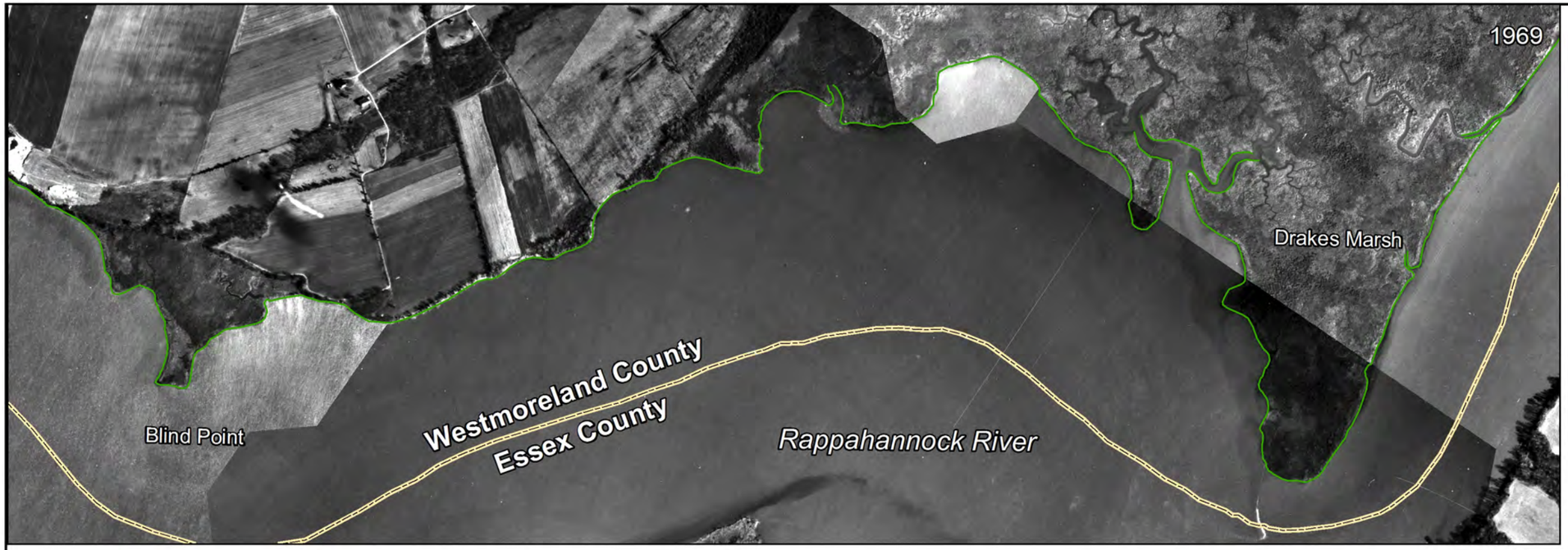
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

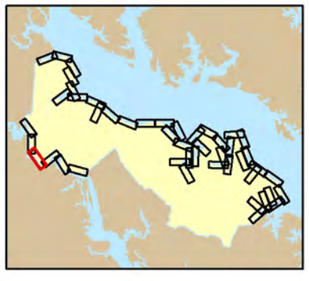
Plate 45



Legend

1969 Shoreline

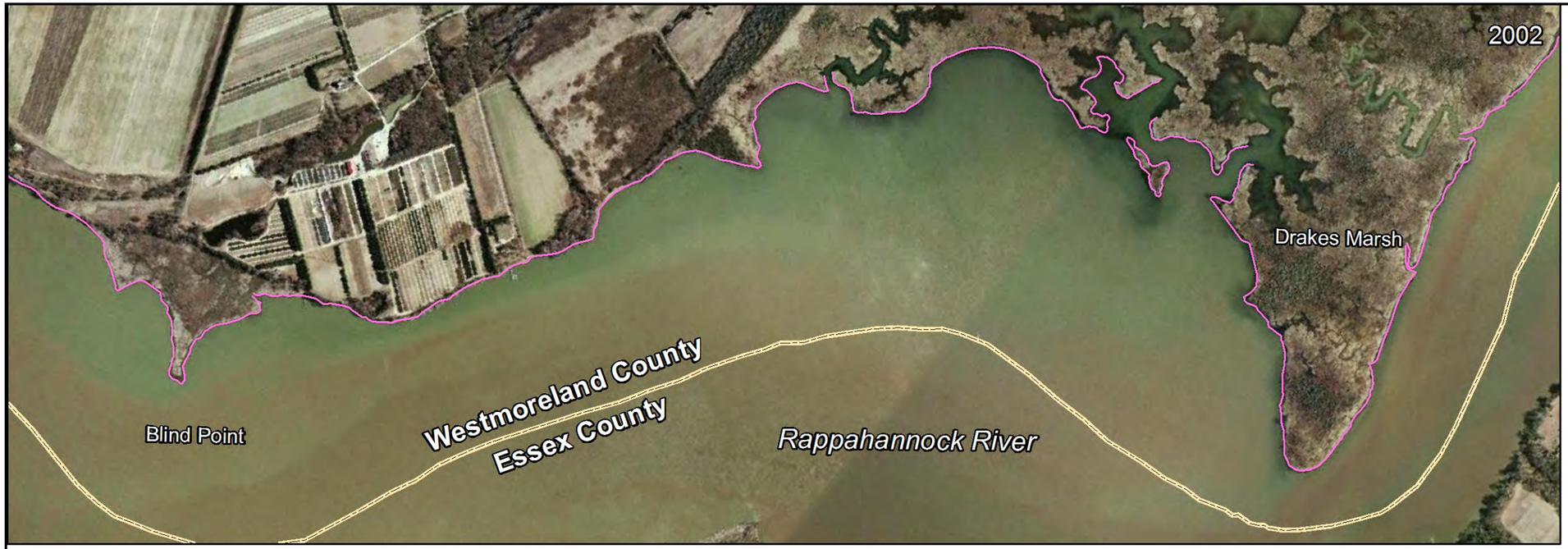
1994 Shoreline



Shoreline Studies Program VIMS

1,000 0 1,000

Feet



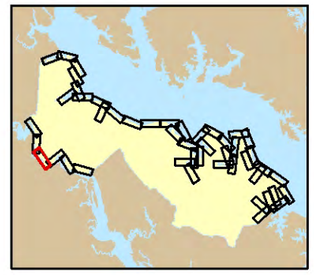
Westmoreland County Virginia

Plate 45

Legend

2002 Shoreline

2009 Shoreline



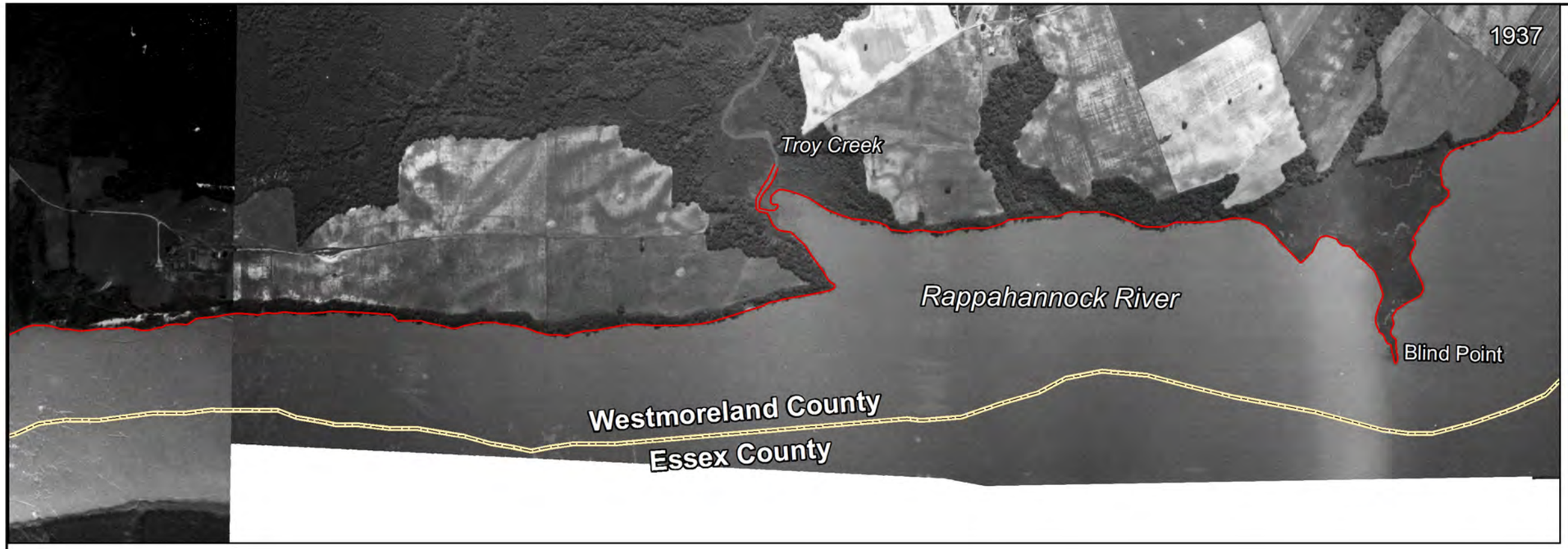
Shoreline Studies Program VIMS

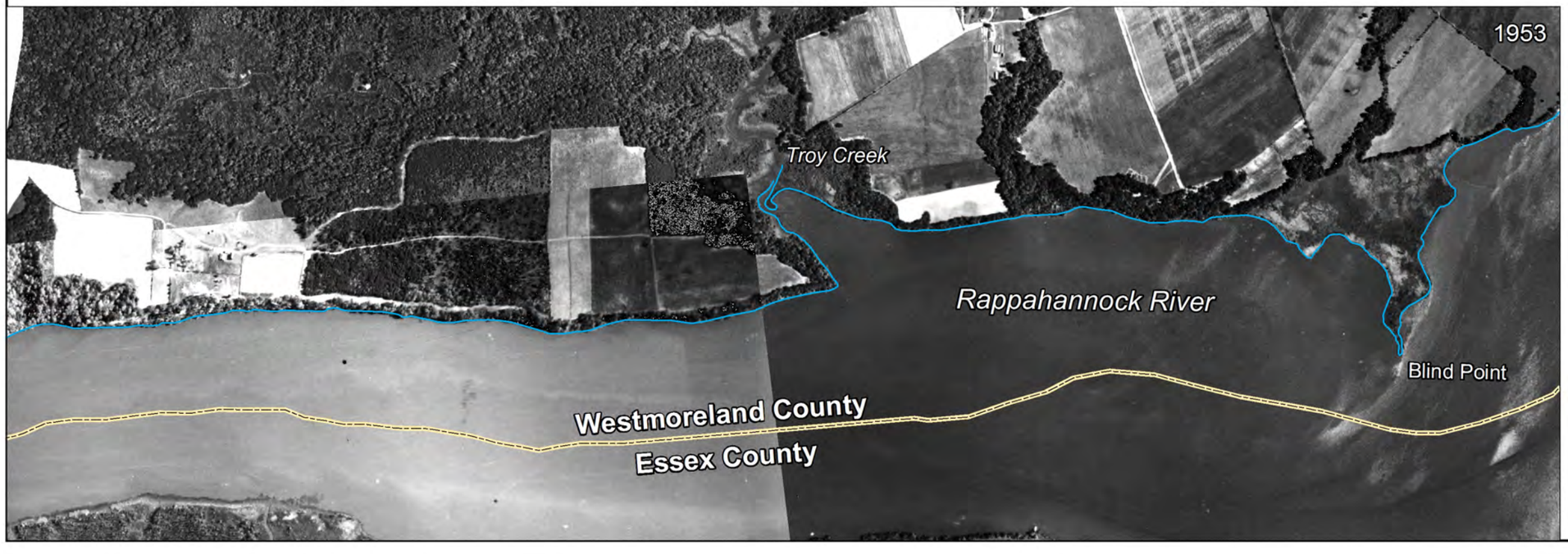
1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 46





Legend

1937 Shoreline

1953 Shoreline

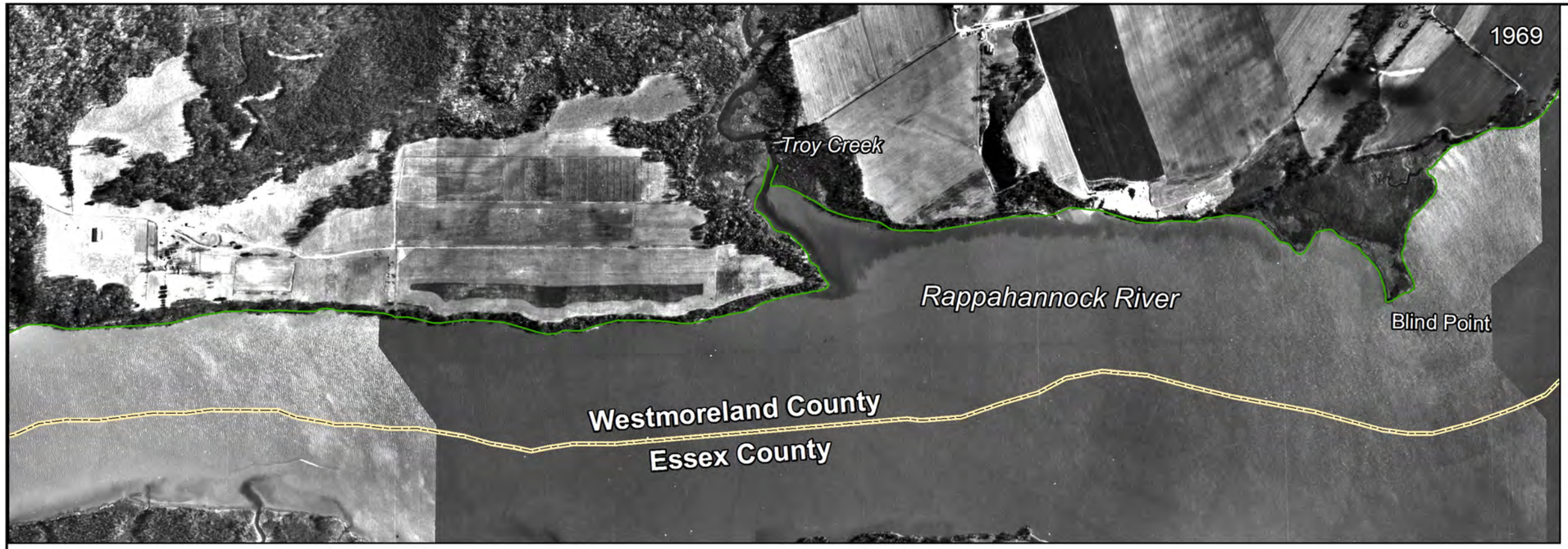
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

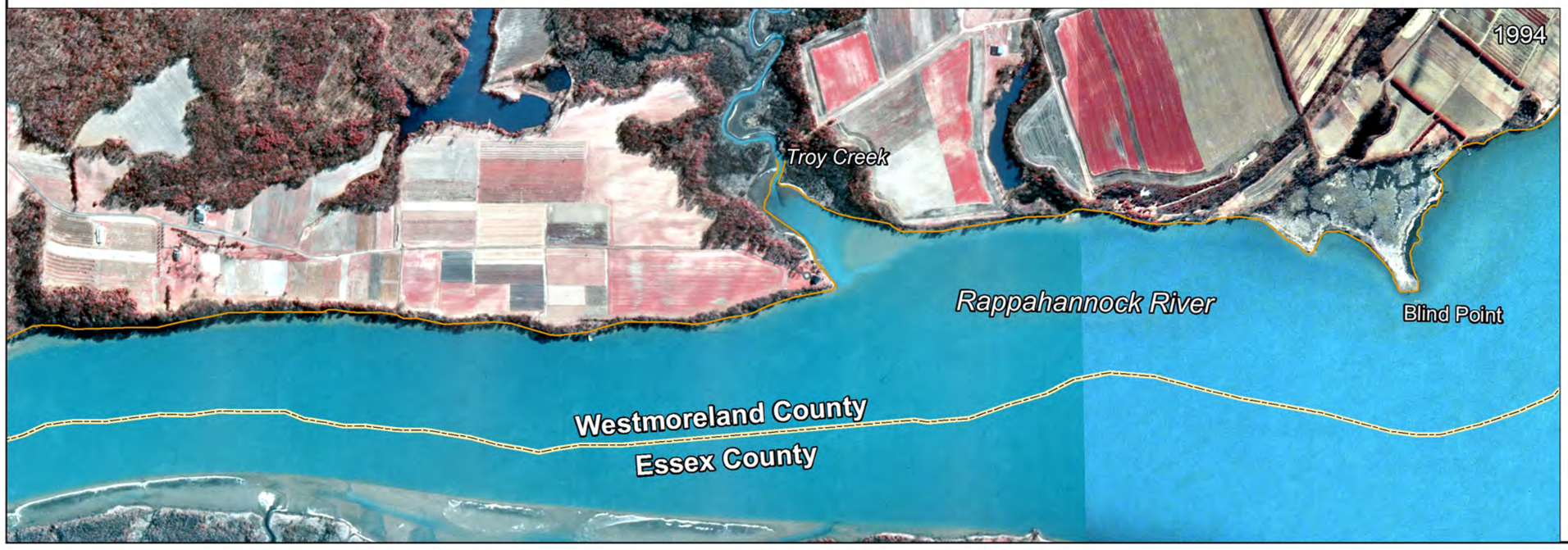
Westmoreland County
Virginia

Plate 46



Legend

- 1969 Shoreline
- 1994 Shoreline



Shoreline Studies Program
VIMS

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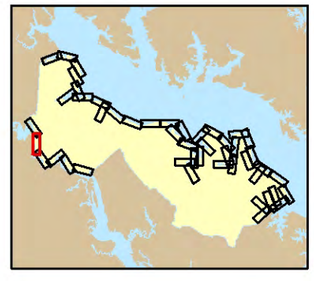
Feet

Westmoreland County
Virginia

Plate 46

Legend

- 2002 Shoreline
- 2009 Shoreline



Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

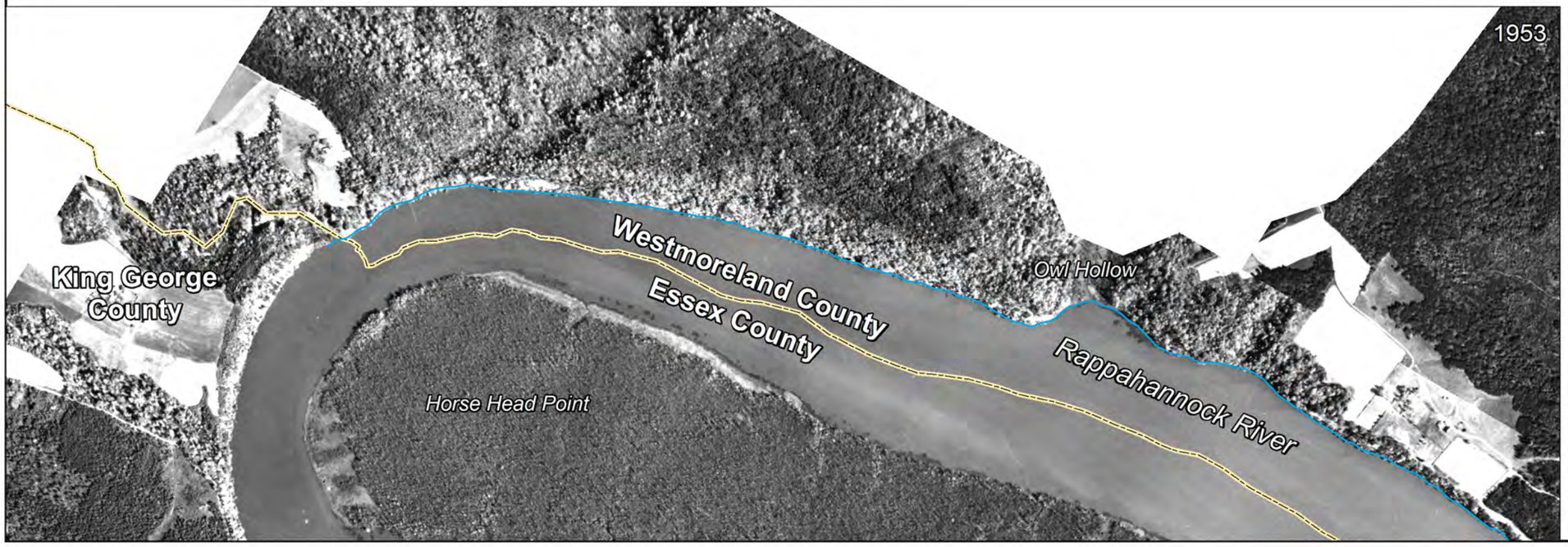
Westmoreland County
Virginia

Plate 47

Legend

1937 Shoreline

1953 Shoreline



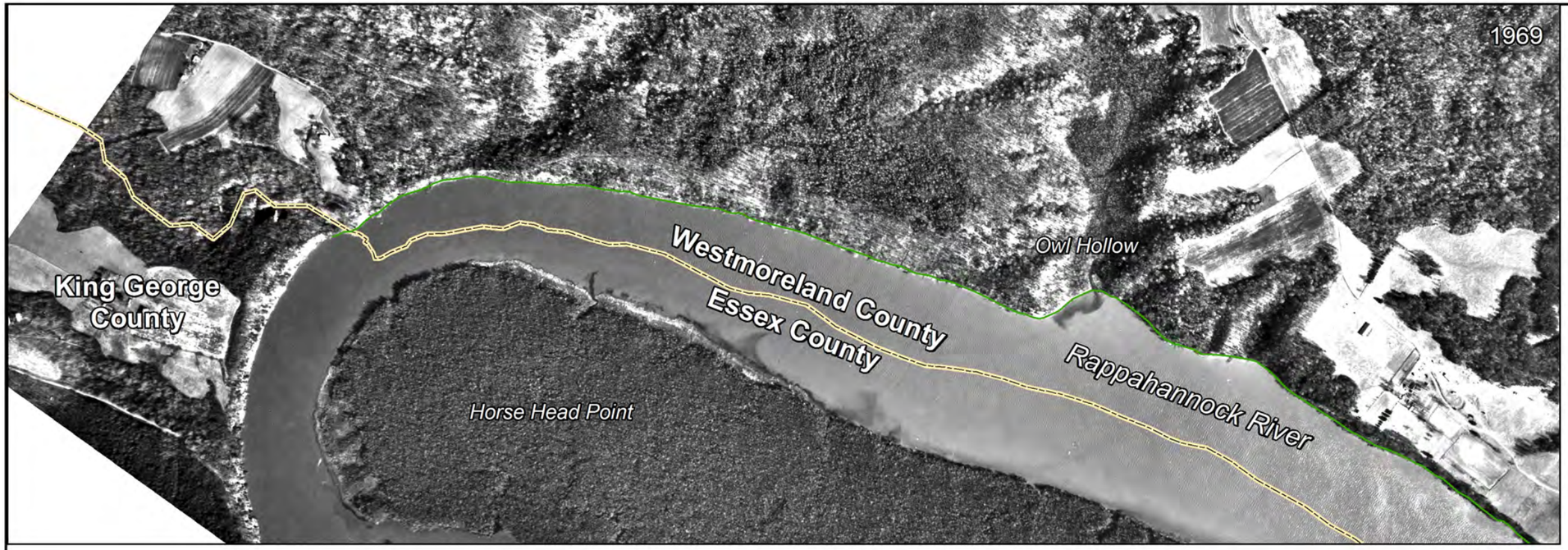
Shoreline Studies Program VIMS

1,000 0 1,000

Feet

Westmoreland County
Virginia

Plate 47



Legend

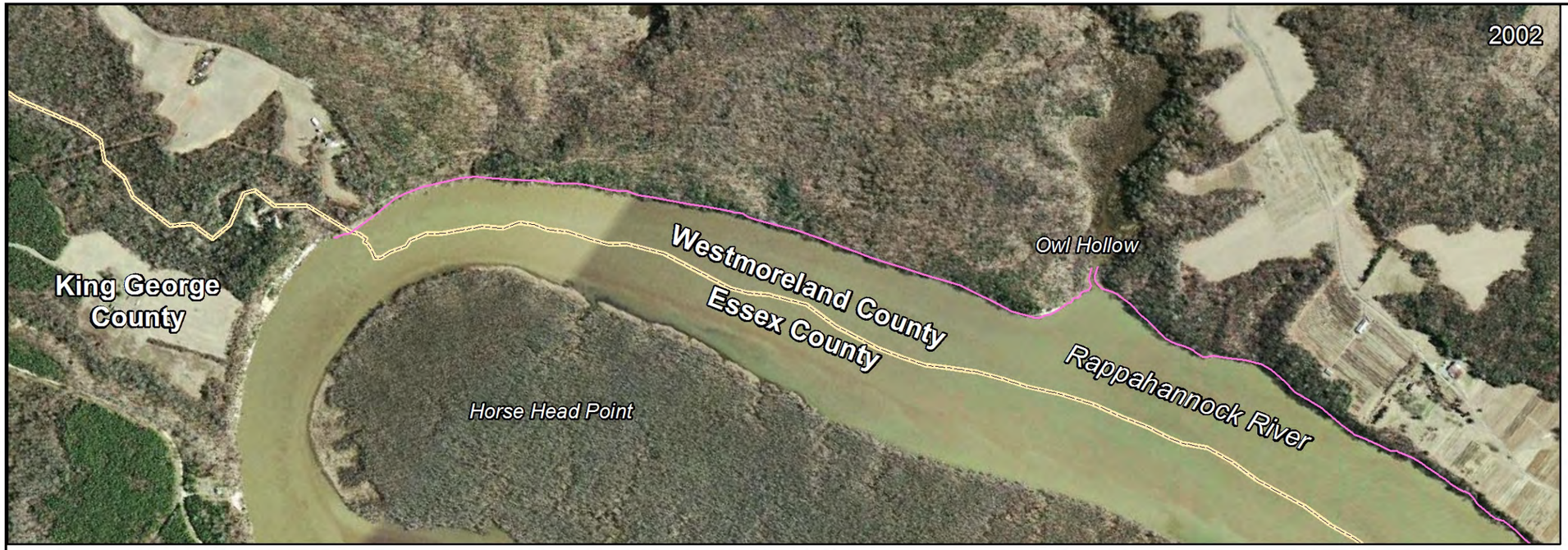
- 1969 Shoreline
- 1994 Shoreline

Shoreline Studies Program
VIMS

1,000 0 1,000
Feet

Westmoreland County
Virginia

Plate 47



Legend

2002 Shoreline

2009 Shoreline

Shoreline Studies Program VIMS

1,000 0 1,000

Feet