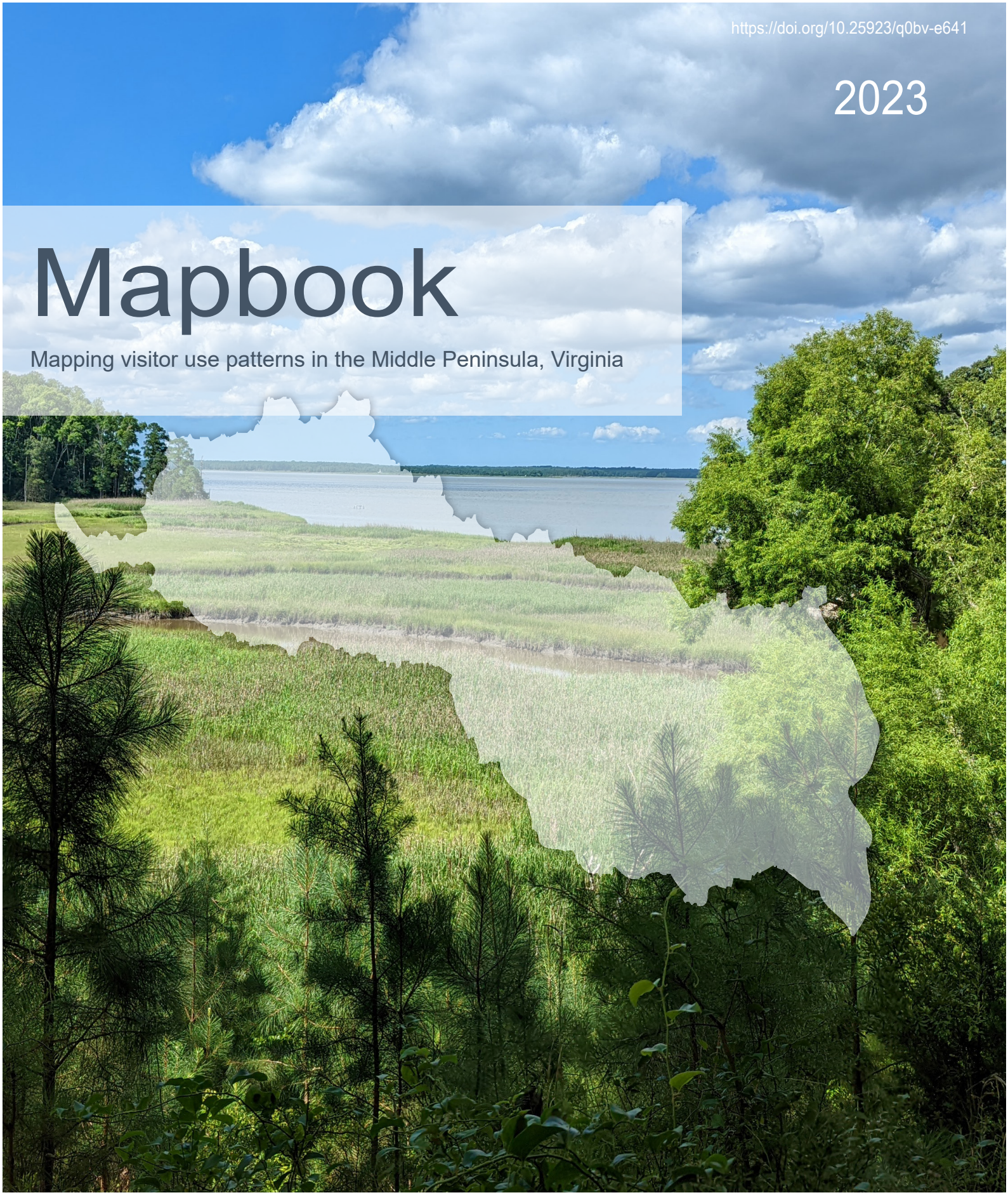
https://doi.org/10.25923/q0bv-e641

2023

Mapbook

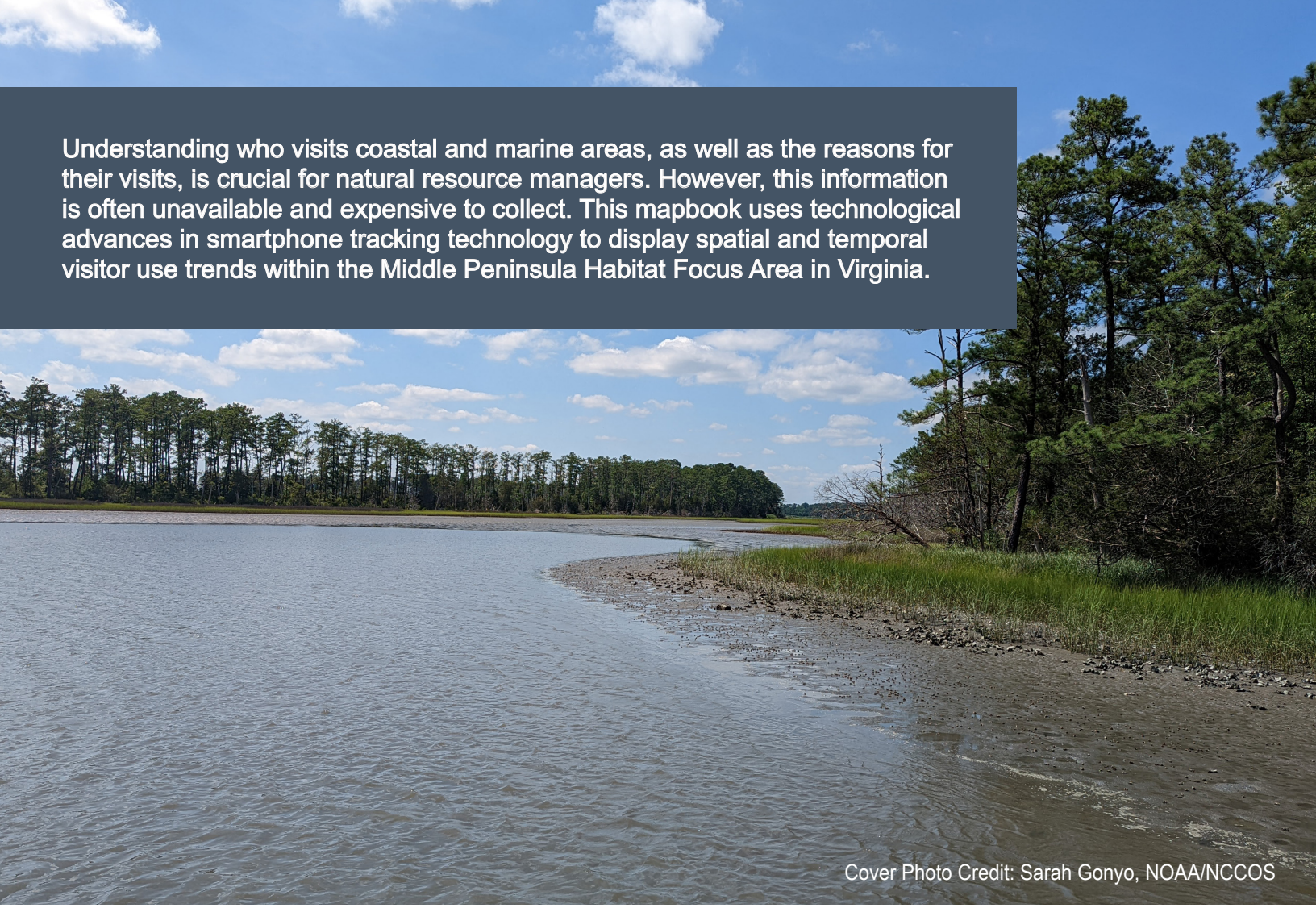
Mapping visitor use patterns in the Middle Peninsula, Virginia



NCCOS NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

SCIENCE SERVING COASTAL COMMUNITIES

Understanding who visits coastal and marine areas, as well as the reasons for their visits, is crucial for natural resource managers. However, this information is often unavailable and expensive to collect. This mapbook uses technological advances in smartphone tracking technology to display spatial and temporal visitor use trends within the Middle Peninsula Habitat Focus Area in Virginia.



Cover Photo Credit: Sarah Gonyo, NOAA/NCCOS

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[1] CSS, Inc., under contract to NOAA/National Ocean Service/National Centers for Coastal Ocean Science
[2] NOAA/National Ocean Service/National Centers for Coastal Ocean Science

Acknowledgments
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Photo Credit: Seann Regan, NOAA/NCCOS

1 OVERVIEW OF THE MIDDLE PENINSULA HABITAT FOCUS AREA

NOAA has selected the Middle Peninsula in Virginia as a Habitat Focus Area (HFA). HFAs are targeted places that allow NOAA to focus programs and investments and build partnerships. The Middle Peninsula of Virginia encompasses the tidal sections of the York River, the Piankatank River, and Mobjack Bay. The area is renowned for its diverse range of recreational opportunities, maritime industries, and profound historical significance dating back to indigenous and colonial eras. The waterways in the region are home to submerged aquatic vegetation, which plays a pivotal role in supporting vital commercial and recreational fisheries, including bluefish, summer flounder, and black sea bass, as well as the endangered Atlantic sturgeon. Although oyster reefs have experienced significant depletion from their historical abundance, concerted efforts are underway to restore them in rivers across the region.

The Middle Peninsula Habitat Focus Area (MPHFA) region includes the tidal watershed of the York River, Piankatank River, and Mobjack Bay in Virginia and faces significant challenges from climate change. Recognizing the need for habitat conservation in this area, NOAA is collaborating with federal, state, local, and NGO partners to restore habitats for important fish and shellfish species to improve the resiliency of coastal communities. Figure 1 shows an overall index map of the MPHFA followed by a series of maps corresponding to index grids A1–D6.

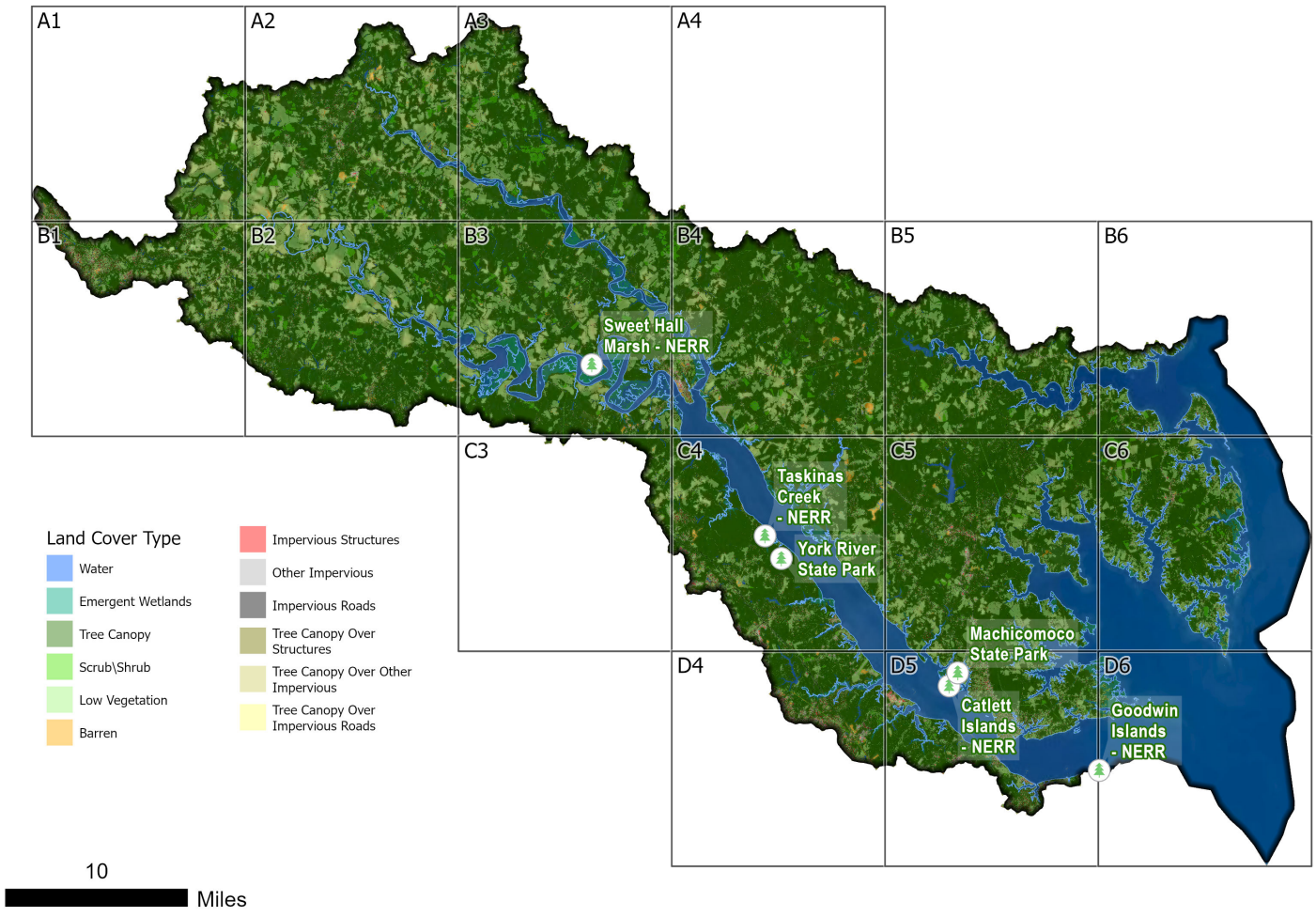
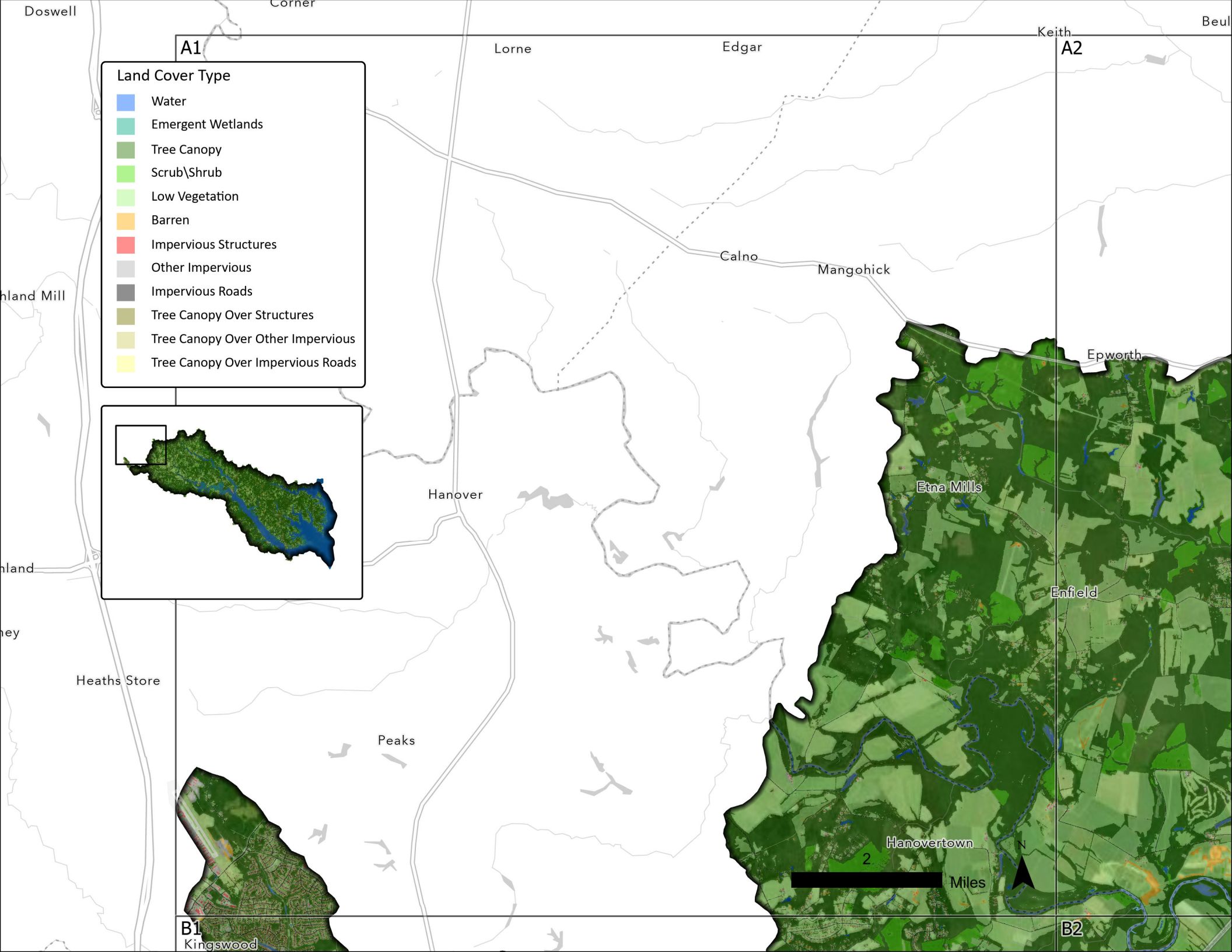
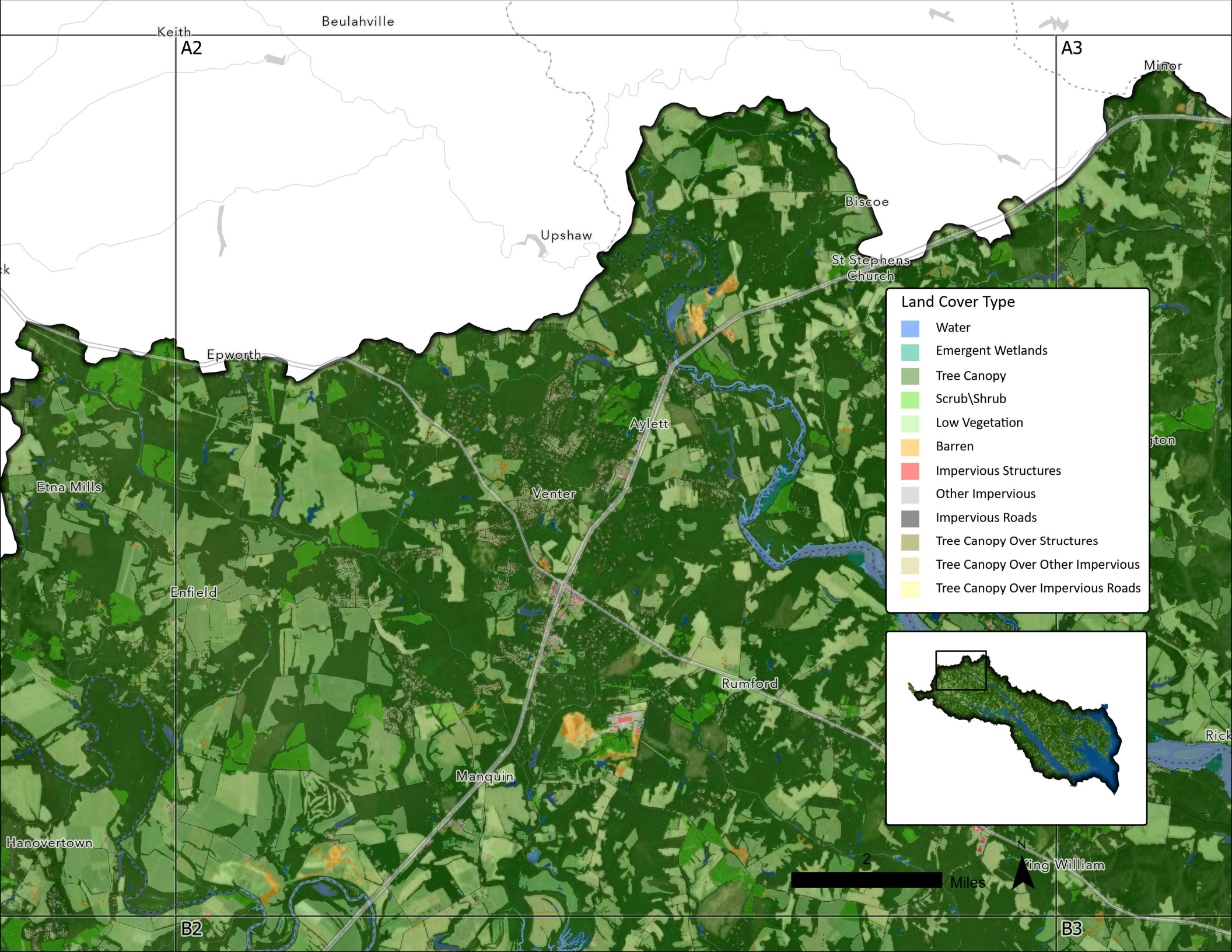
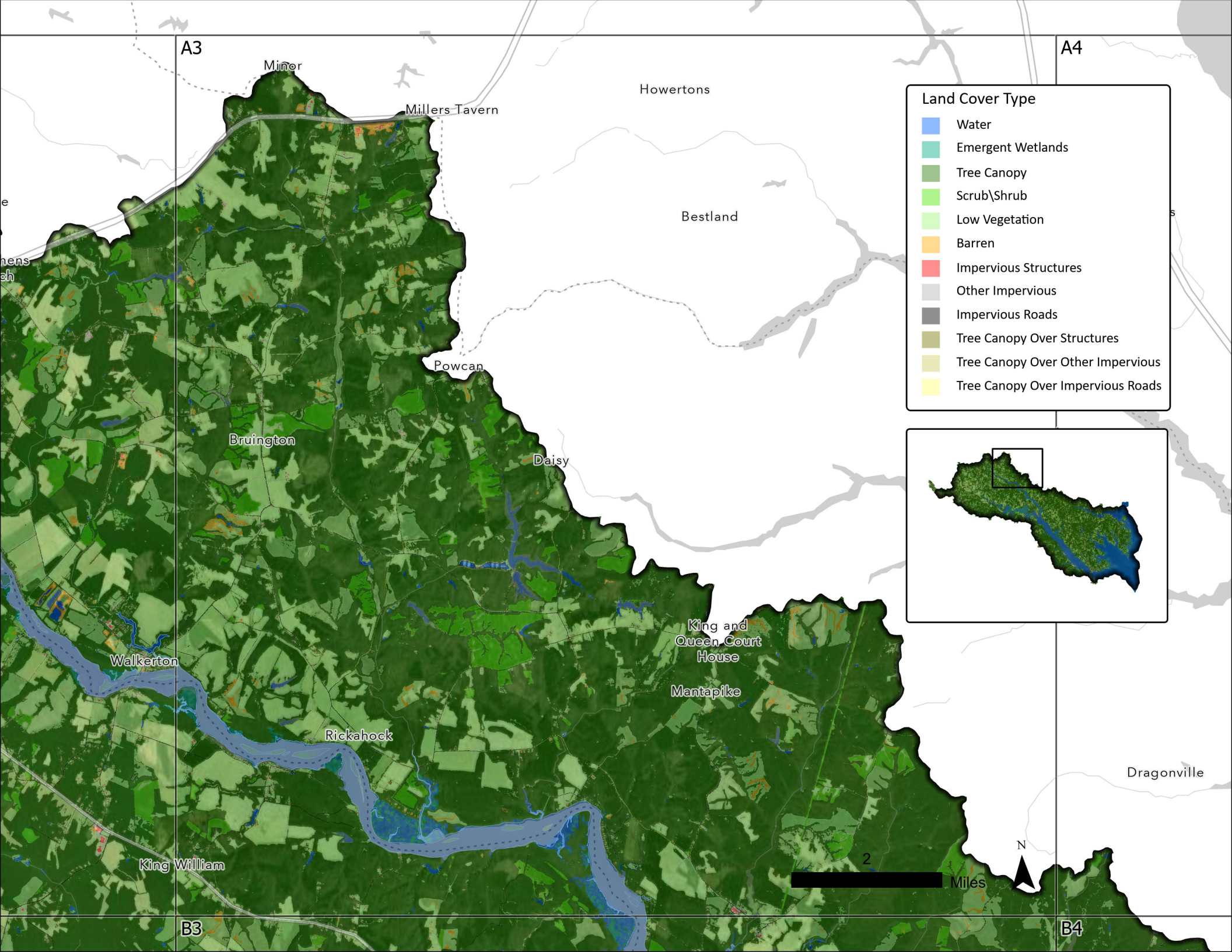


Figure 1. Map of land cover and land use in the Middle Peninsula Habitat Focus Area (Source: Chesapeake Bay Program Office [CBPO], 2022).


Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
A1
A2
B1
B2
Doswell
Corner
Lorne
Edgar
Keith
Beul
Calno
Mangohick
Epworth
Etna Mills
Enfield
Hanover
Heaths Store
Peaks
Hanovertown
Kingswood
2
Miles
N


Keith
Beulahville
A2
A3
Minor
Biscoe
Upshaw
St Stephens Church
Epworth
Aylett
Etna Mills
Venter
Enfield
Rumford
Manquin
Hanovertown
B2
B3
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
2
Miles
N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B3
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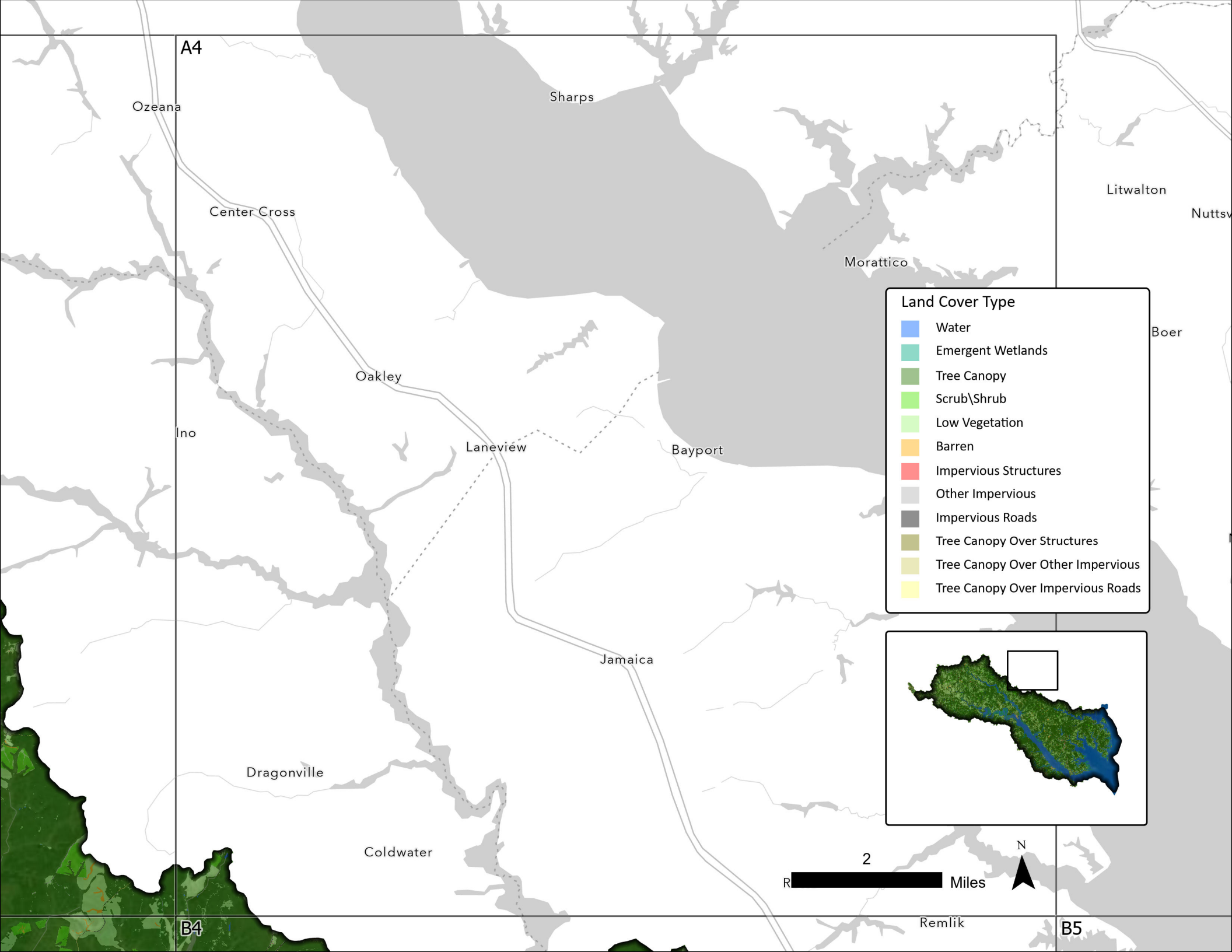
Howertons
Bestland
Powcan
Bruington
Daisy
King and Queen Court House
Mantapike
Walkerton
Rickahock
King William
Dragonville
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
N
2
Miles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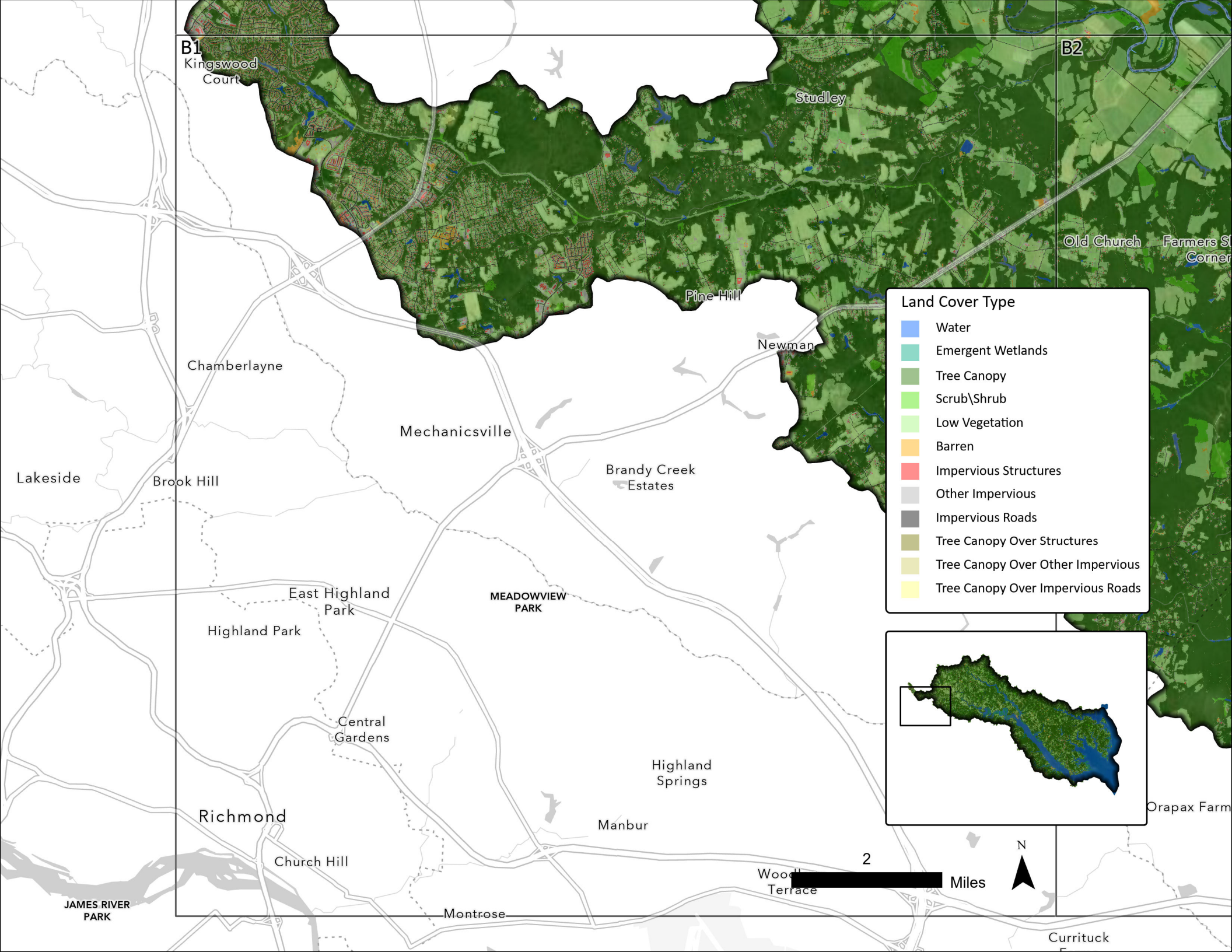
Sharps
Litwalton
Center Cross
Morattico
Boer
Oakley
Ino
Laneview
Bayport
Jamaica
Dragonville
Coldwater
Remlik
B4
B5
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
N
2
Miles


B1
B2
Kingswood Court
Studley
Old Church
Pine Hill
Newman
Chamberlayne
Mechanicsville
Lakeside
Brook Hill
Brandy Creek Estates
East Highland Park
MEADOWVIEW PARK
Highland Park
Central Gardens
Highland Springs
Richmond
Manbur
Church Hill
Terrace
JAMES RIVER PARK
Montrose
Orapax Farm
Currituck
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
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Tree Canopy Over Other Impervious
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2
Miles
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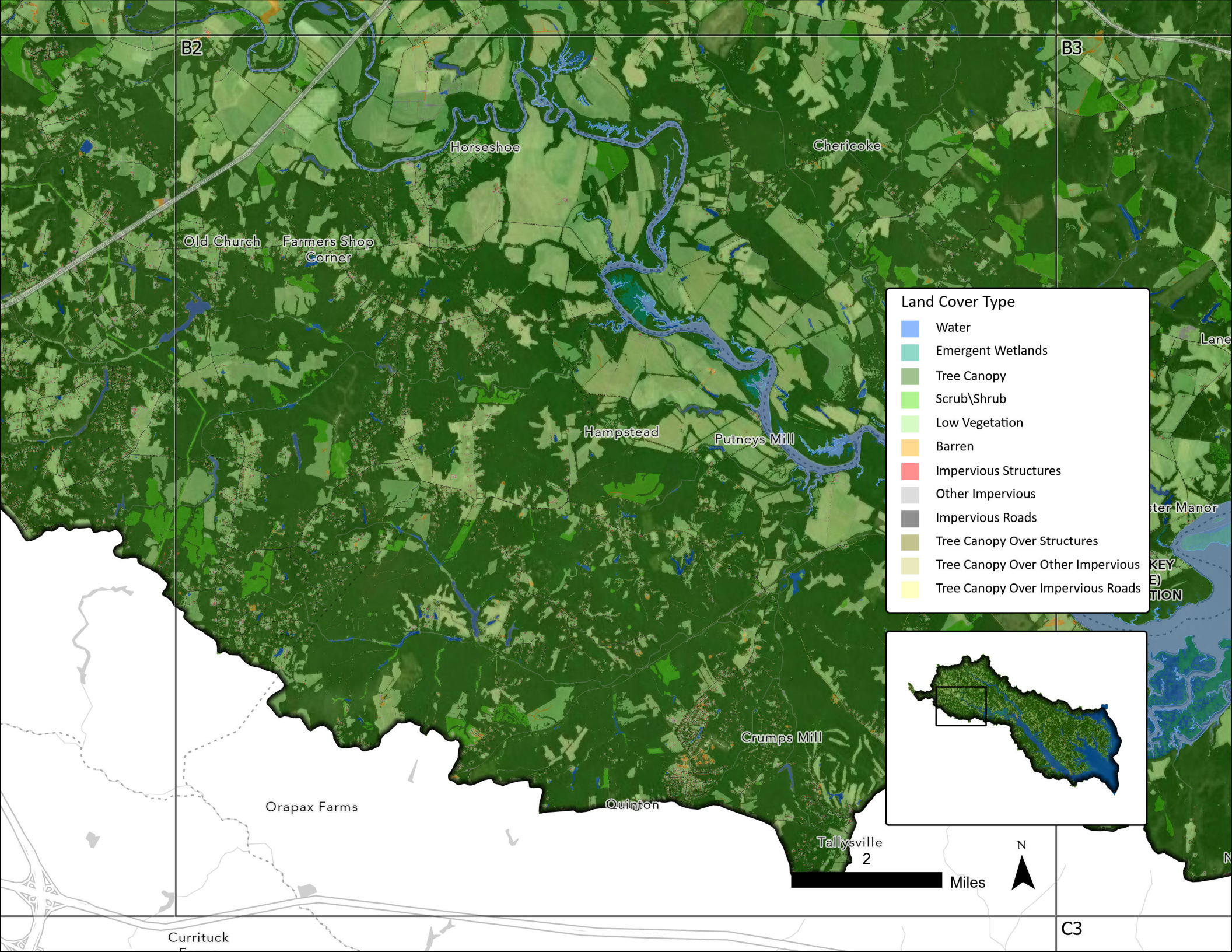
B2
B3
C3
Horseshoe
Chericoke
Old Church
Farmers Shop Corner
Hampstead
Putneys Mill
Crumps Mill
Orapax Farms
Quinton
Tallysville
Currituck
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
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Impervious Roads
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Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
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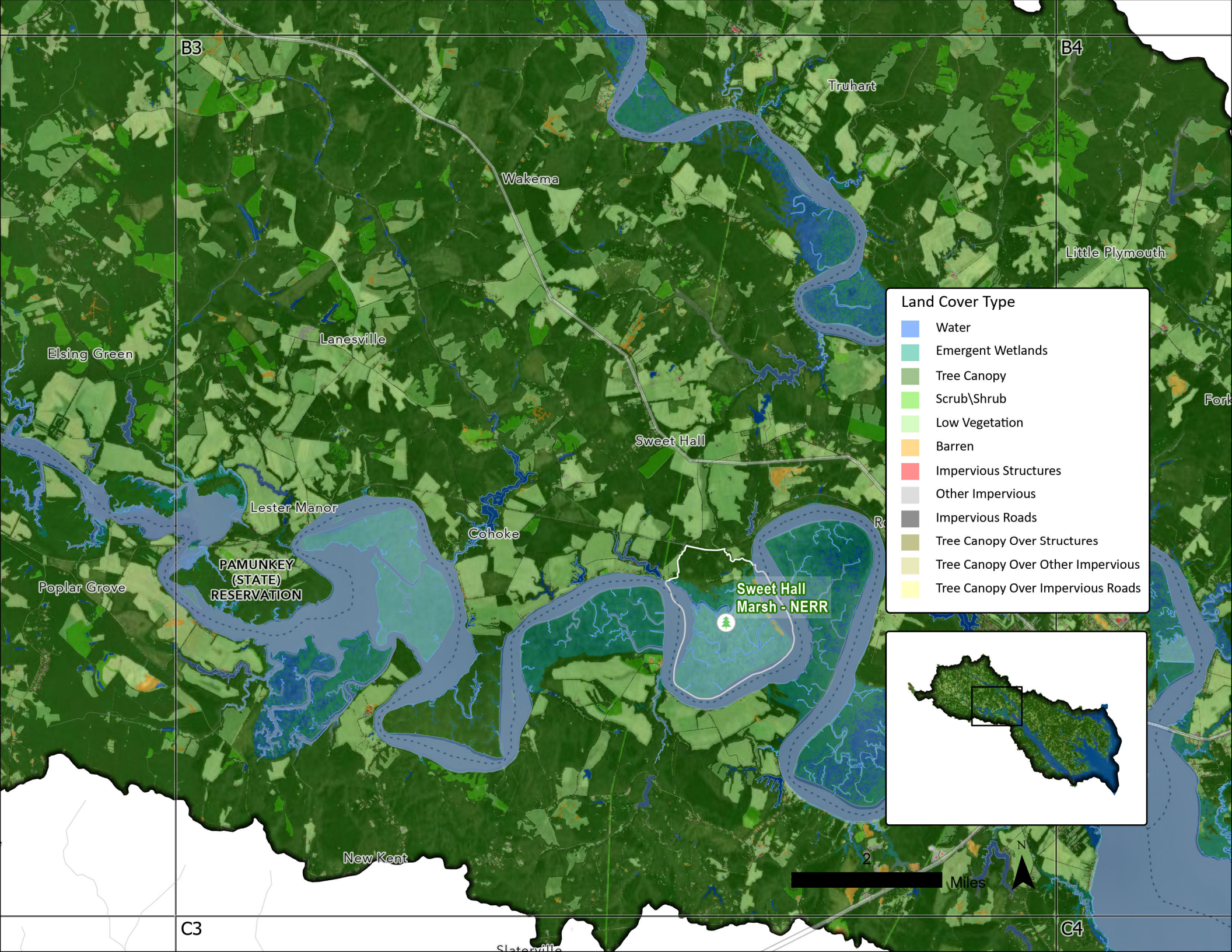
B3
B4
C3
C4
Truhart
Wakema
Little Plymouth
Lanesville
Elsing Green
Sweet Hall
Lester Manor
Cohoke
PAMUNKEY
(STATE)
RESERVATION
Poplar Grove
Sweet Hall
Marsh - NERR
New Kent
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
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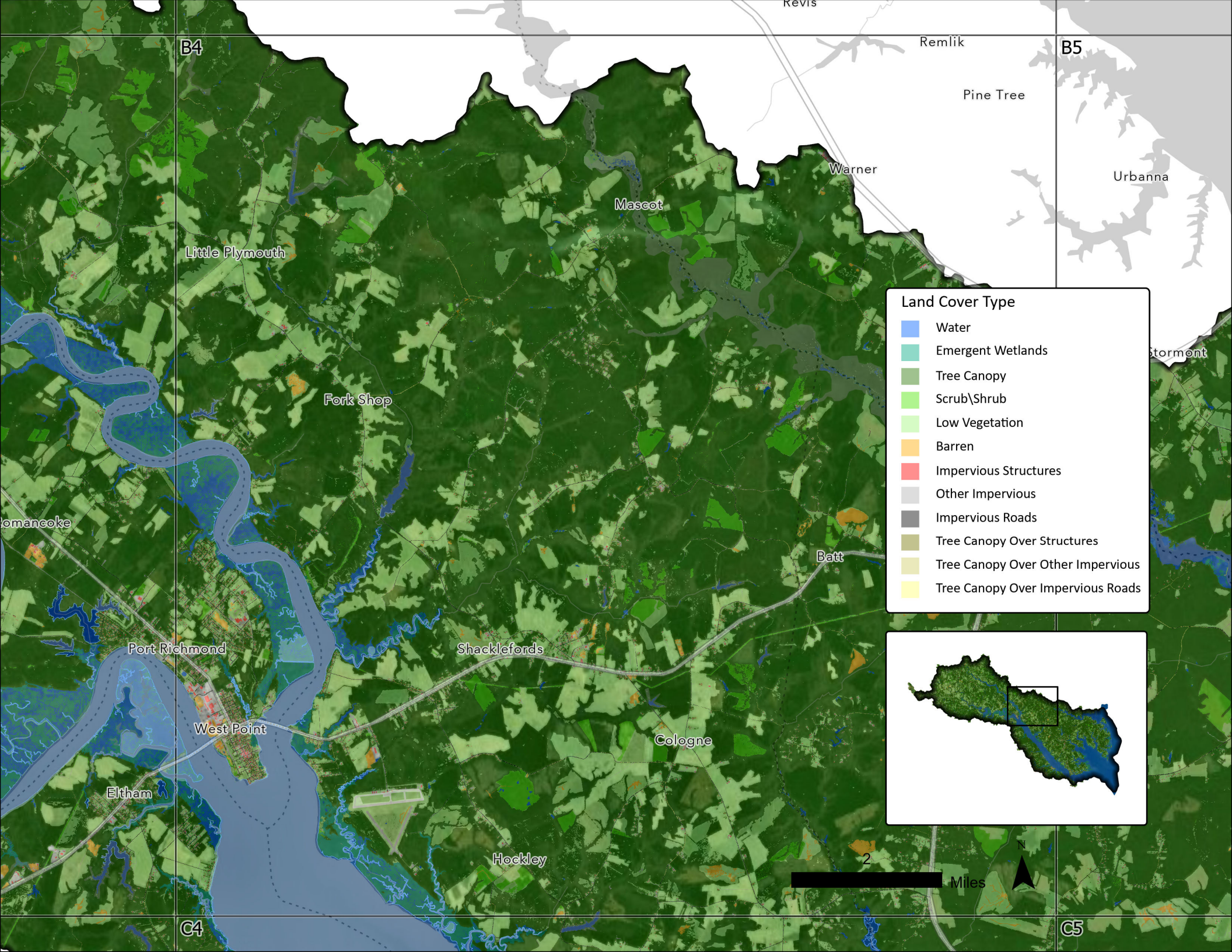
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Remlik
Pine Tree
Warner
Urbanna
Mascot
Little Plymouth
Fork Shop
Batt
Port Richmond
Shacklefords
West Point
Cologne
Eltham
Hockley
B4
B5
C4
C5
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
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Tree Canopy Over Impervious Roads
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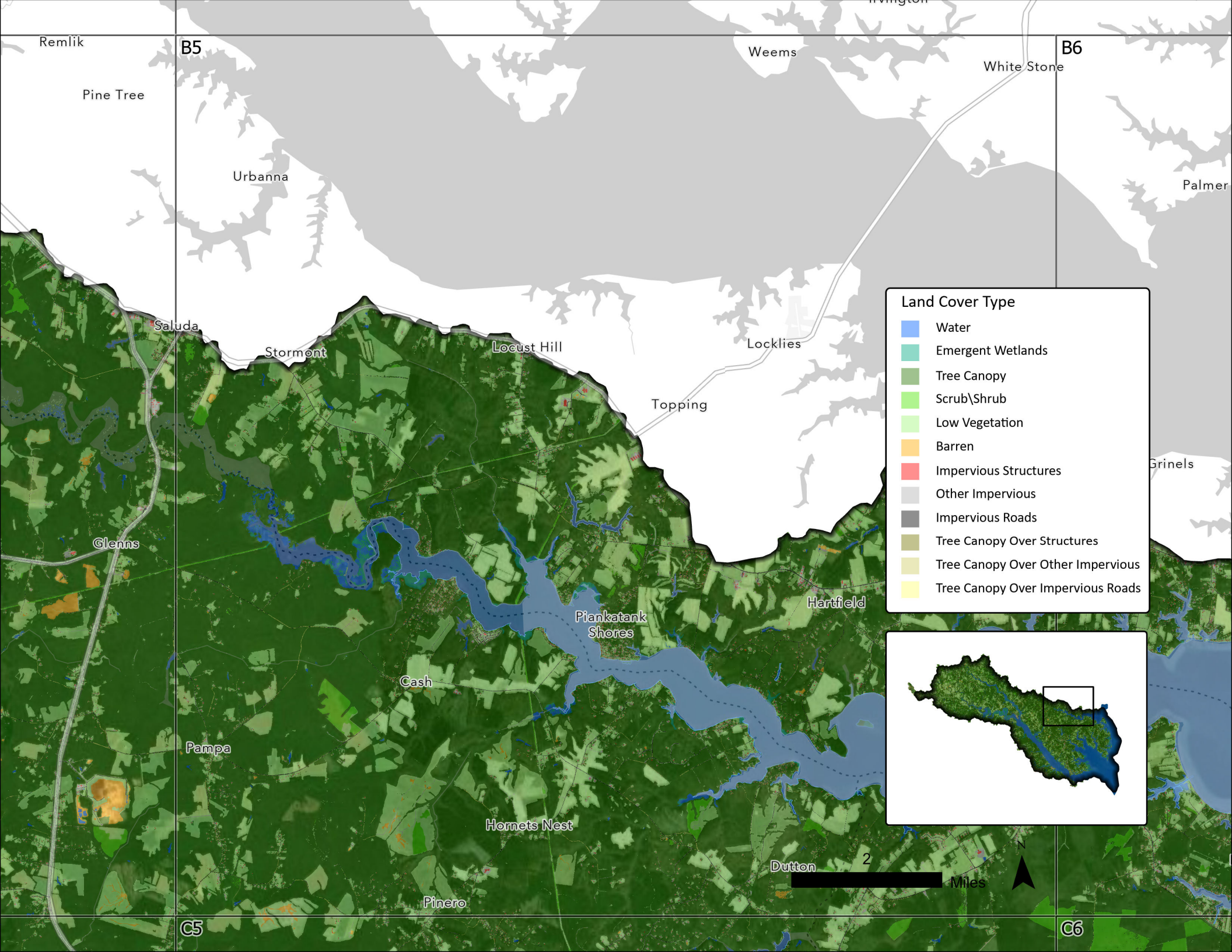
Remlik
B5
Weems
White Stone
B6
Pine Tree
Urbanna
Palmer
Saluda
Stormont
Locust Hill
Locklies
Topping
Grinels
Glenns
Hartfield
Piankatank Shores
Cash
Pampa
Hornets Nest
Dutton
Pinero
C5
C6
Land Cover Type
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Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
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Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
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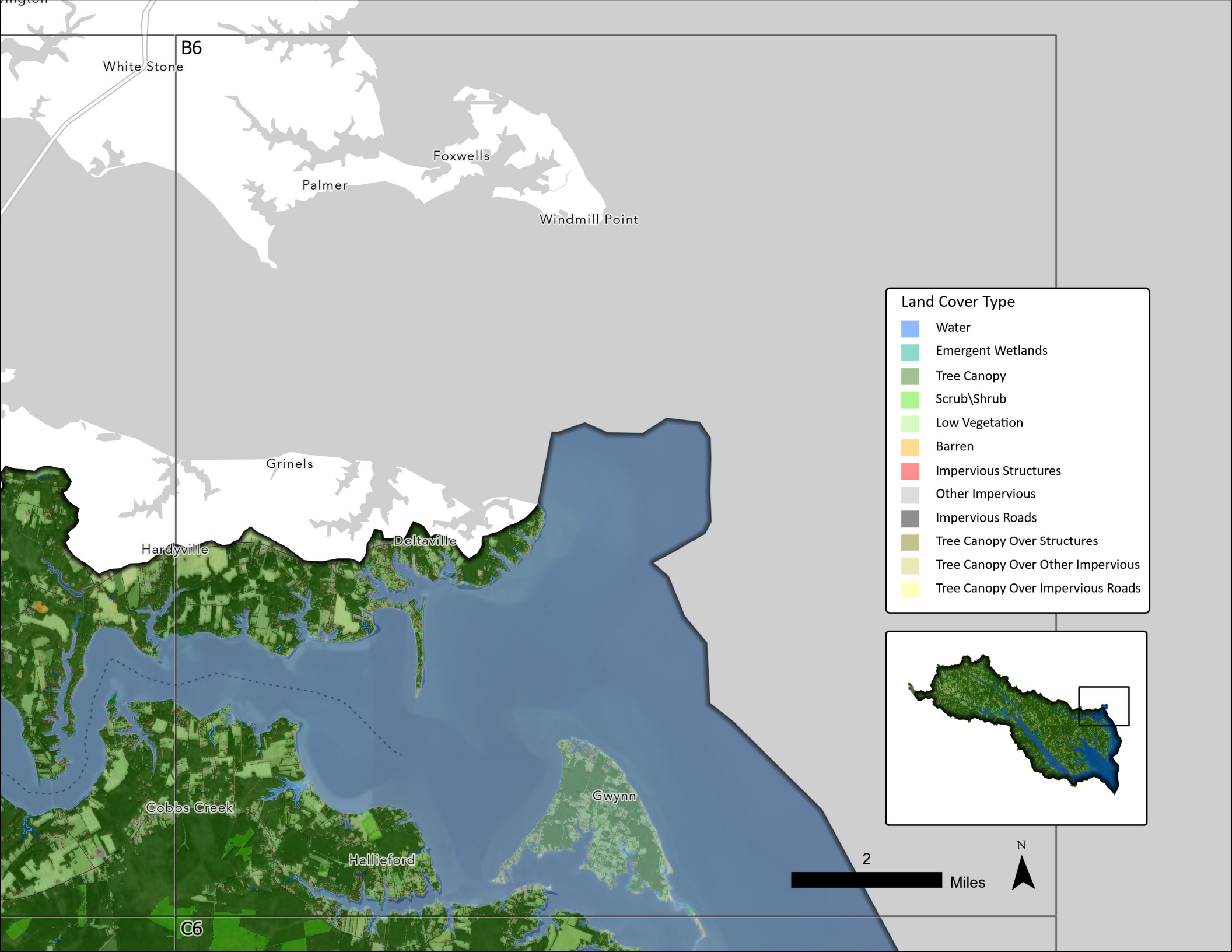
Miles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White Stone
Foxwells
Palmer
Windmill Point
Grinels
Hardyville
Deltaville
Cobbs Creek
Gwynn
Hallieford
C6
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
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Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
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Miles
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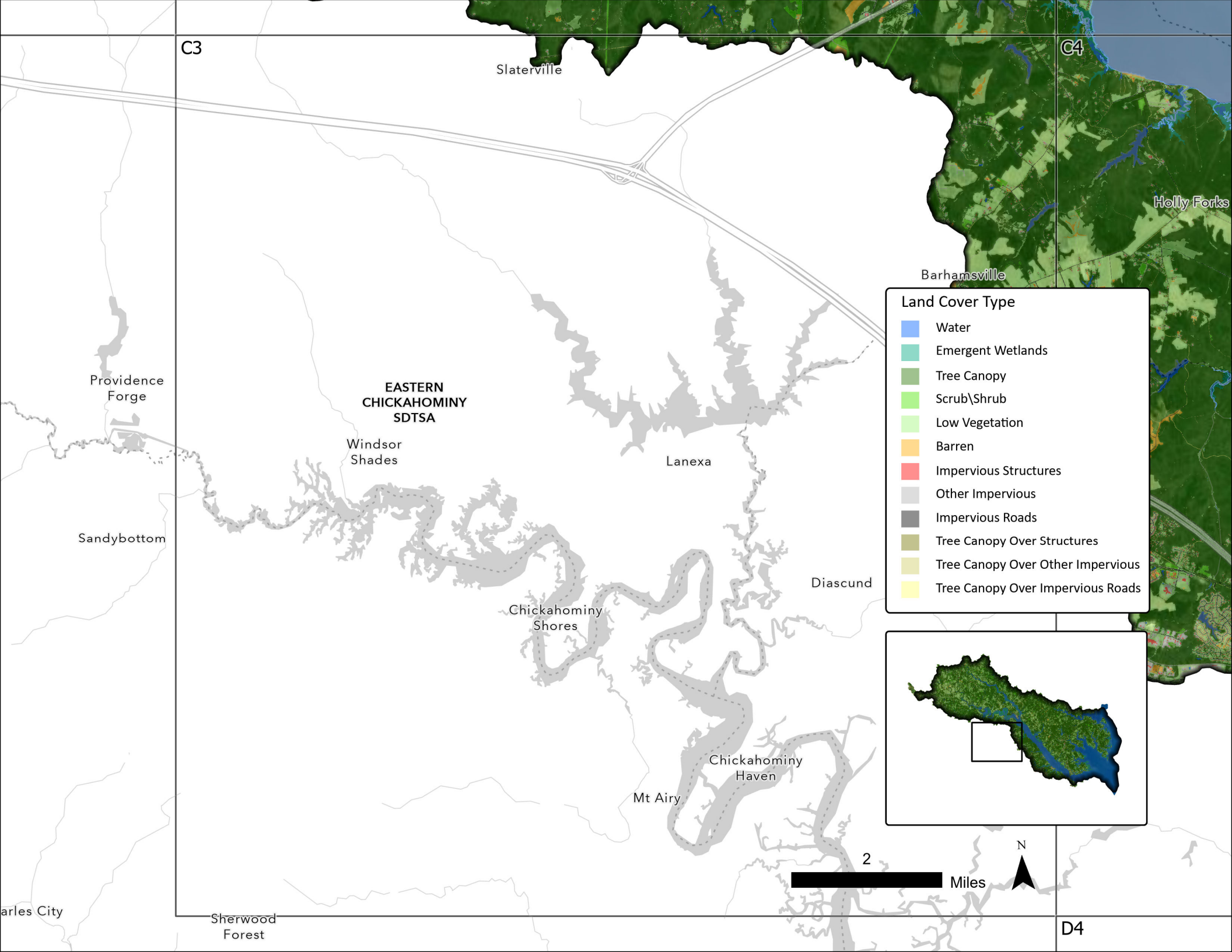
C3
C4
D4
Slaterville
Holly Forks
Barhamsville
Providence Forge
EASTERN CHICKAHOMINY SDTSA
Windsor Shades
Lanexa
Sandybottom
Diascund
Chickahominy Shores
Chickahominy Haven
Mt Airy
Sherwood Forest
arles City
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
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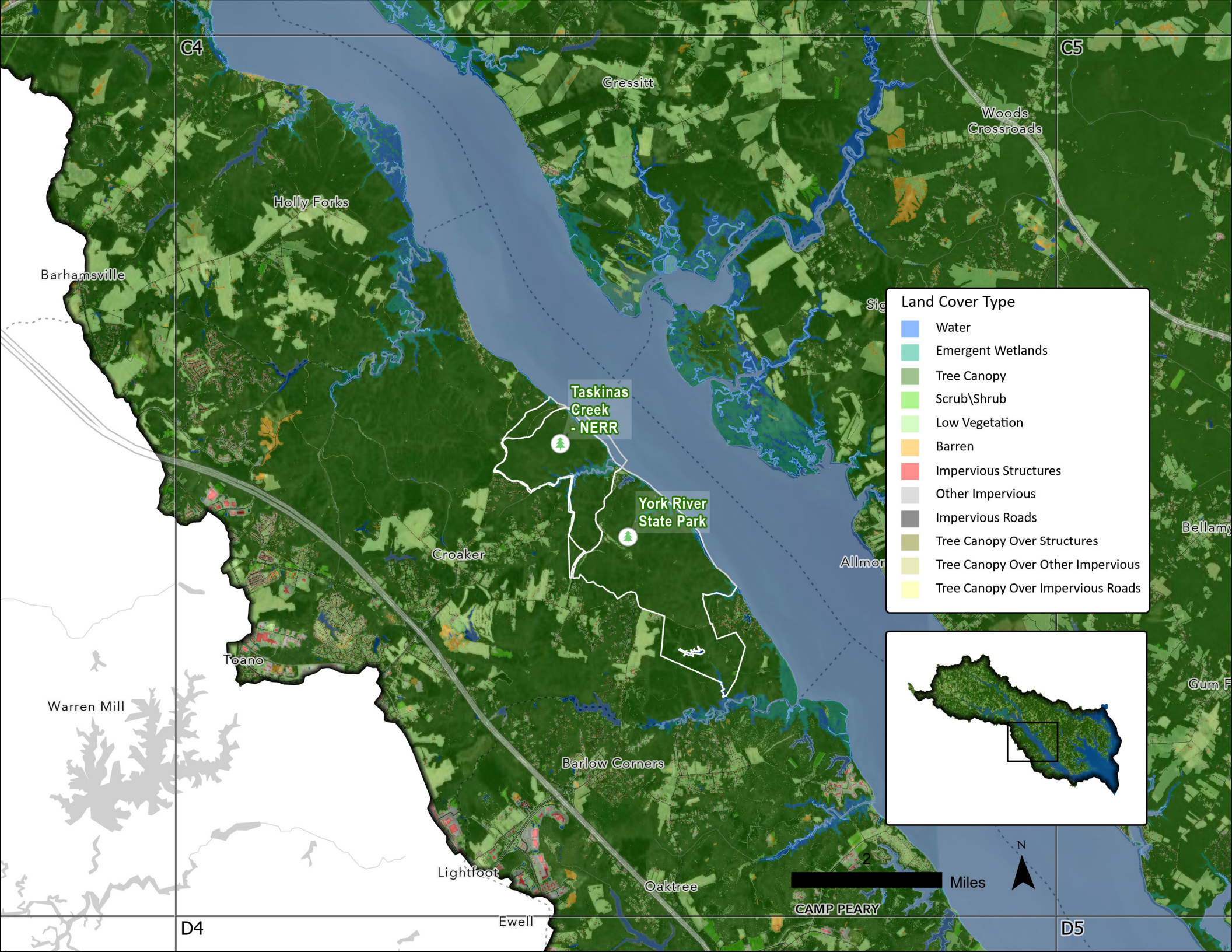
C4
C5
D4
D5
Gressitt
Woods Crossroads
Holly Forks
Barhamsville
Taskinas Creek - NERR
York River State Park
Croaker
Toano
Warren Mill
Barlow Corners
Lightfoot
Oaktree
Ewell
CAMP PEARY
Bellamy
Gum F
Land Cover Type
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Emergent Wetlands
Tree Canopy
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Impervious Structures
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Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
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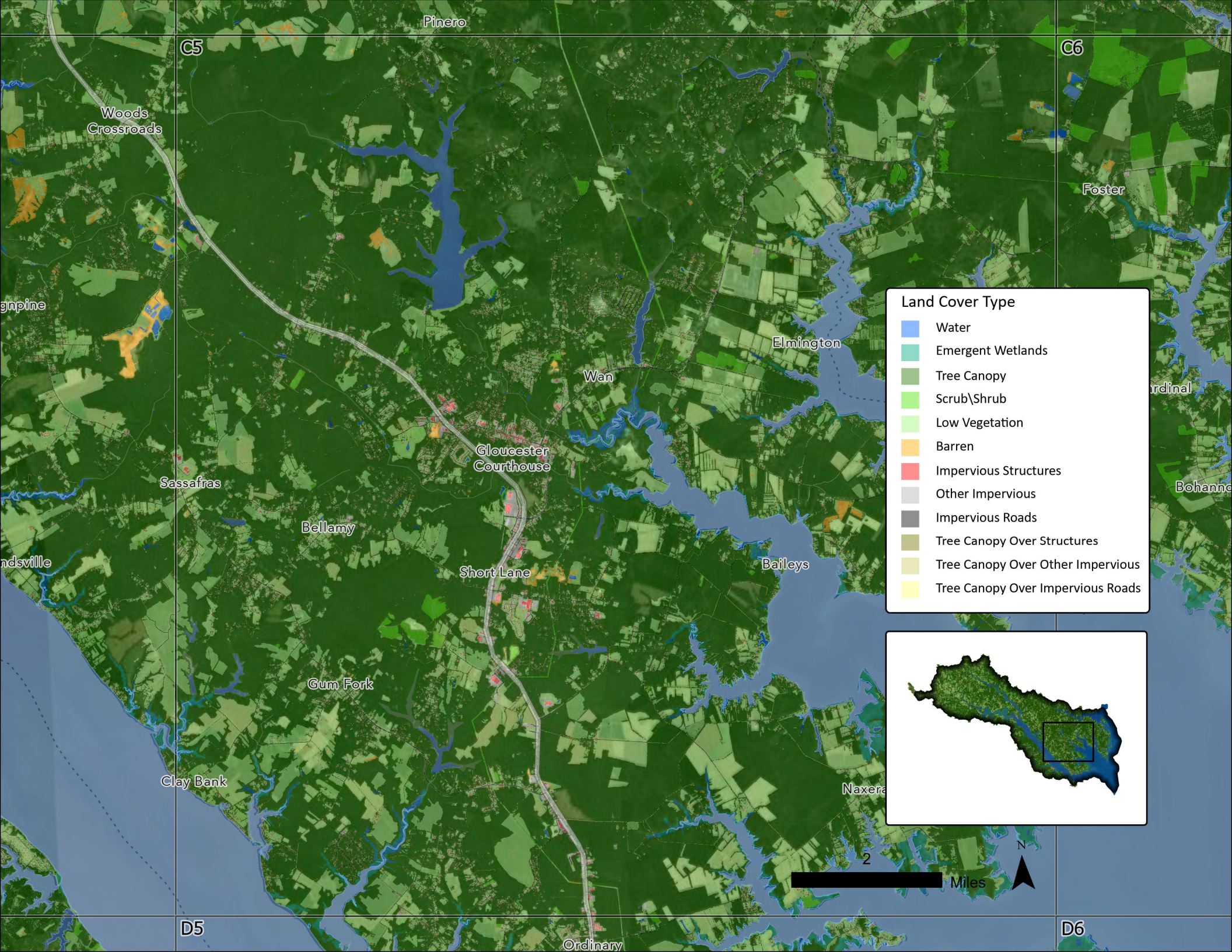
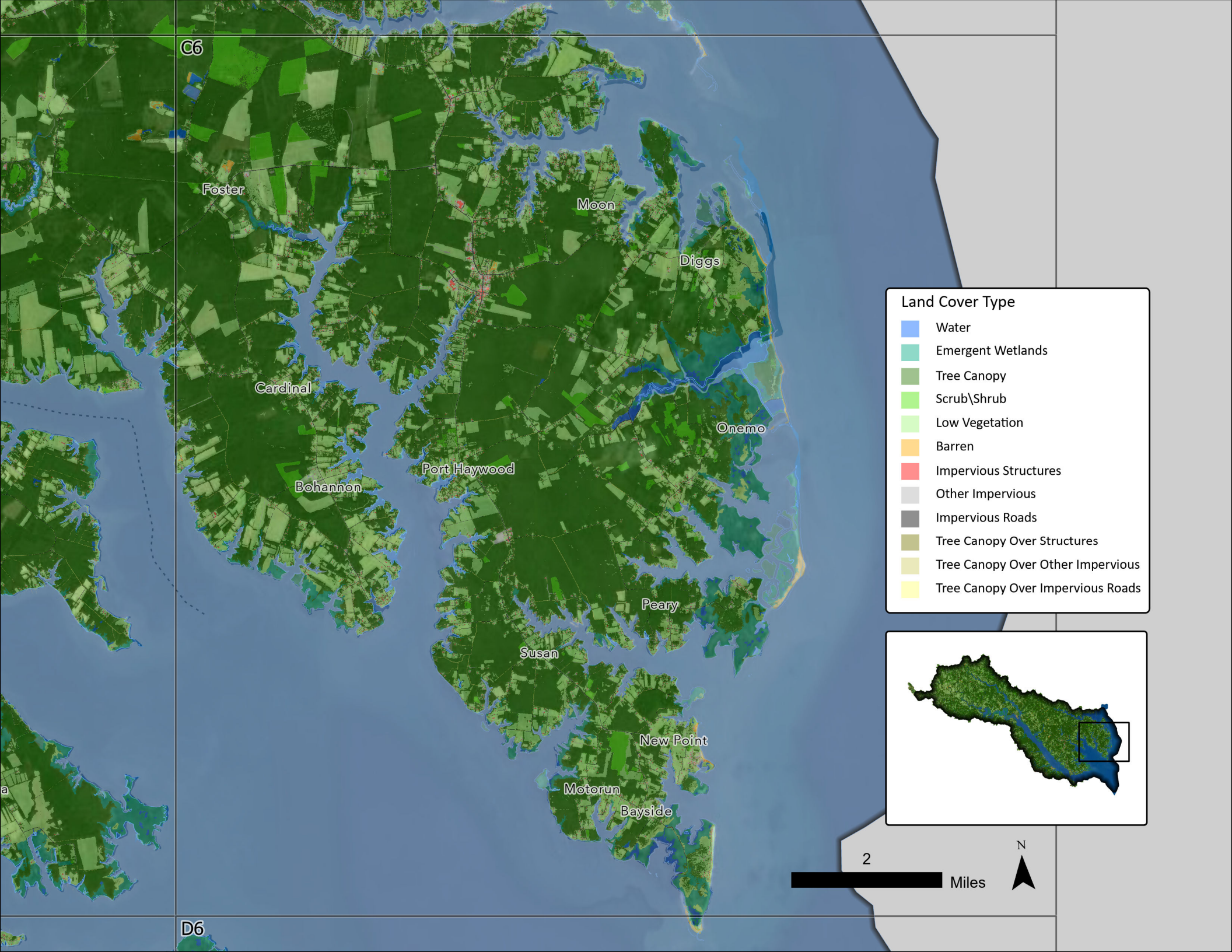

Pinero
C5
C6
Woods Crossroads
Foster
Elmington
Wan
Gloucester Courthouse
Sassafras
Bellamy
Short Lane
Baileys
Gum Fork
Clay Bank
Naxera
Ordinary
D5
D6
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
N
2
Miles


C6
D6
Foster
Moon
Diggs
Cardinal
Onemo
Port Haywood
Bohannon
Peary
Susan
New Point
Motorun
Bayside
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
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Miles
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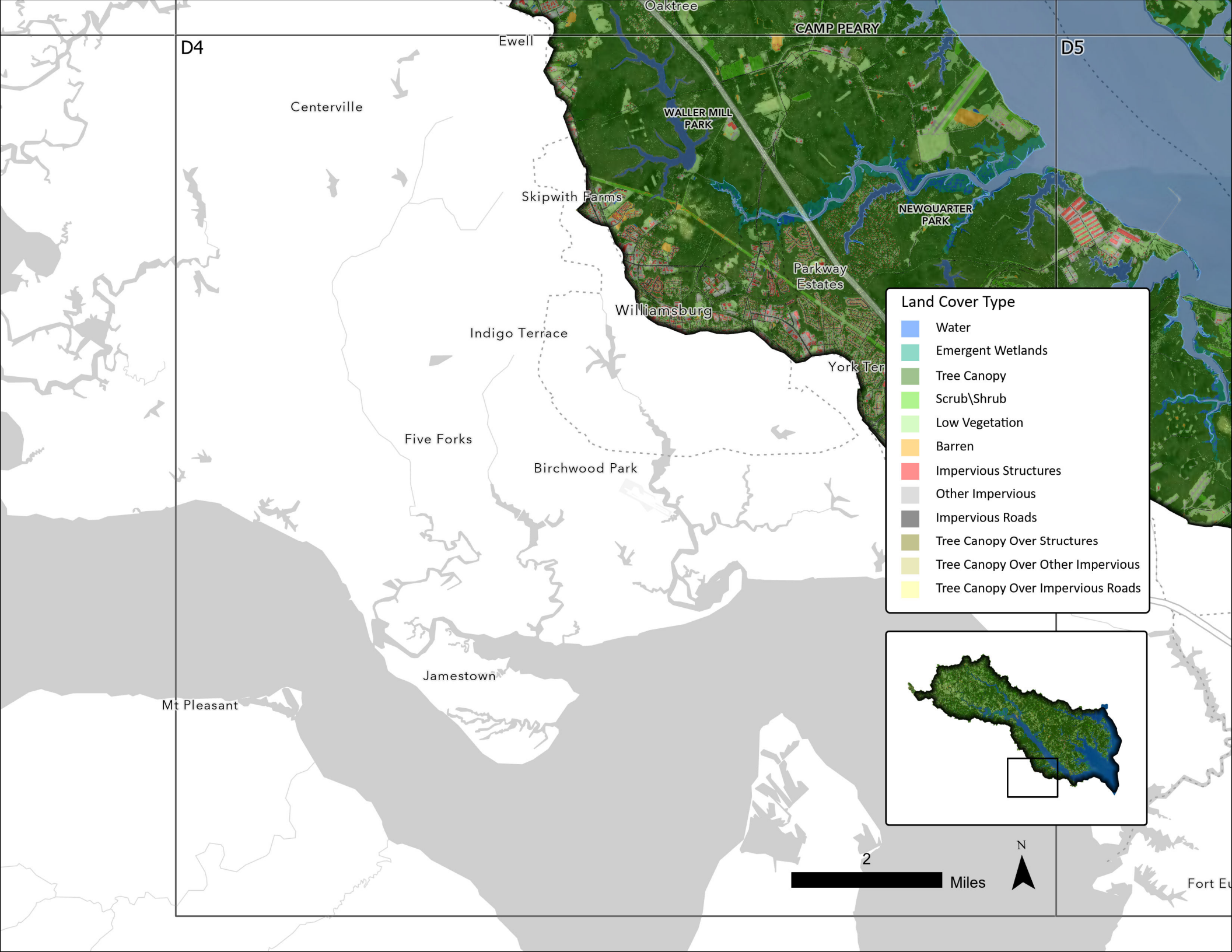
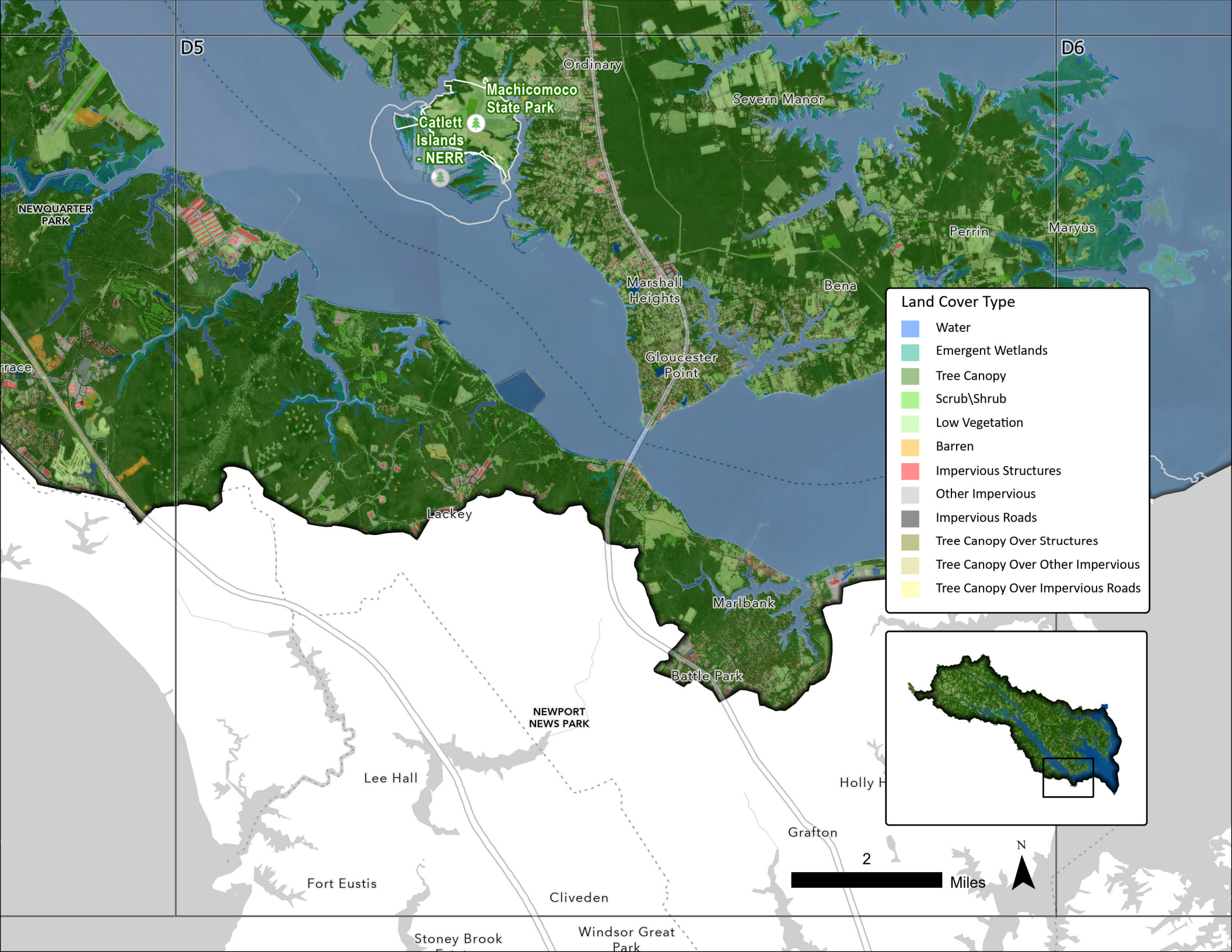

D4
D5
Oaktree
Ewell
CAMP PEARY
Centerville
WALLER MILL PARK
Skipwith Farms
NEWQUARTER PARK
Parkway Estates
Williamsburg
Indigo Terrace
York Ter
Five Forks
Birchwood Park
Jamestown
Mt Pleasant
Fort Eu
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
2
Miles
N


D5
D6
Ordinary
Machicomoco State Park
Catlett Islands - NERR
Severn Manor
NEWQUARTER PARK
Perrin
Maryus
Marshall Heights
Bena
Gloucester Point
Lackey
Marlbank
Battle Park
NEWPORT NEWS PARK
Lee Hall
Holly H
Grafton
Fort Eustis
Cliveden
Stoney Brook
Windsor Great Park
Land Cover Type
Water
Emergent Wetlands
Tree Canopy
Scrub\Shrub
Low Vegetation
Barren
Impervious Structures
Other Impervious
Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
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Miles
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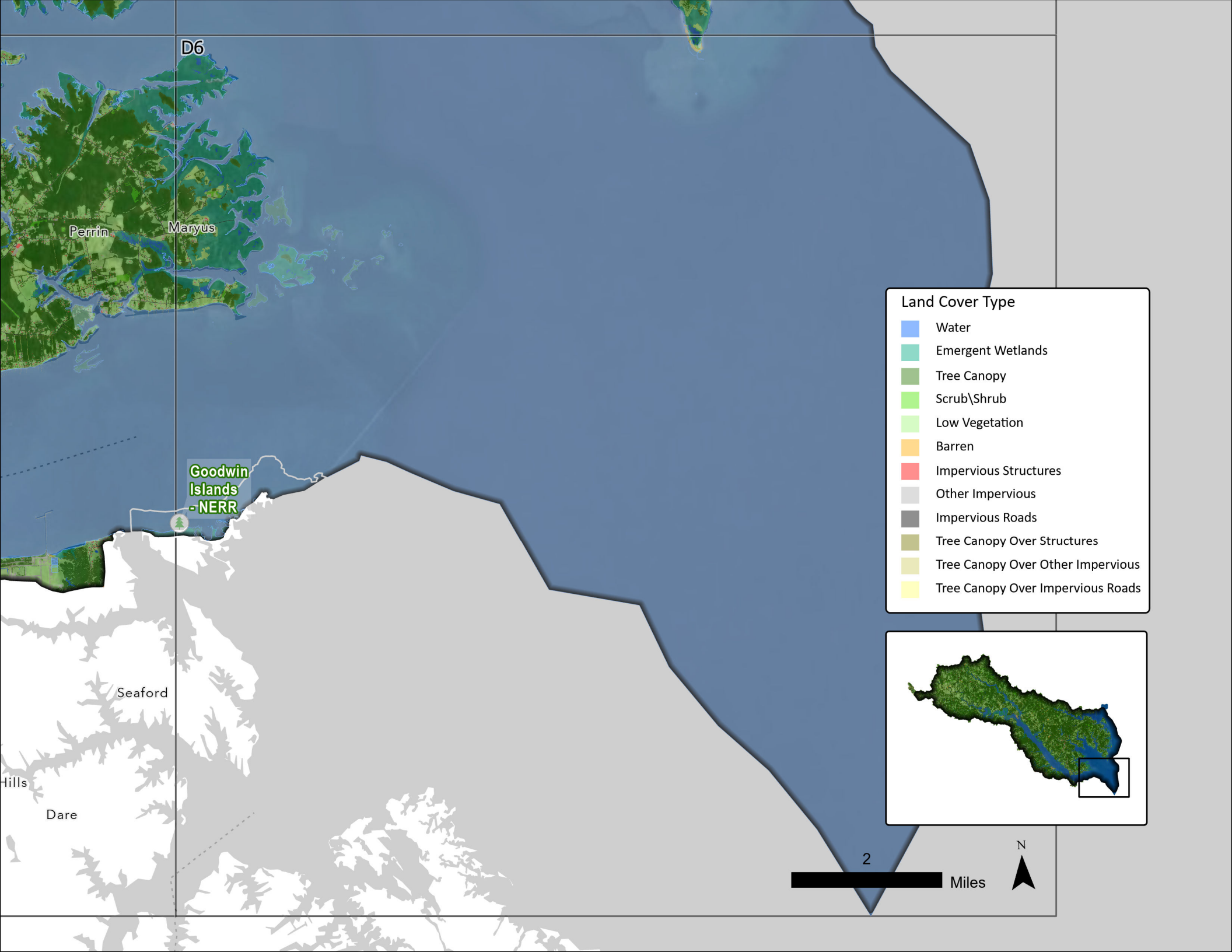
D6
Perrin
Maryus
Goodwin
Islands
- NERR
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Dare
Land Cover Type
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Tree Canopy
Scrub\Shrub
Low Vegetation
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Impervious Roads
Tree Canopy Over Structures
Tree Canopy Over Other Impervious
Tree Canopy Over Impervious Roads
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Miles
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2 HUMAN ACTIVITY IN THE MIDDLE PENINSULA HABITAT FOCUS AREA

Human mobility data (HMD) used in this study consist of georeferenced information from millions of smartphones and mobile apps, with opt-in consent from users. HMD can be provided by a variety of data firms, but the current project utilized data from Unacast (2022), which provided anonymous device data including information on the geolocation, date, time, and duration for each data record shown in the human mobility maps and charts. Unacast employs machine learning techniques to identify patterns in device activity based on where and when it occurs.

Data are allocated into the categories of “travel,” “area dwell,” and “potential area dwell.” These classifications are determined by analyzing the number of signals (pings) within a specific area (buffered up to 100 meters) over a set time interval. Due to the considerable amount of background noise in the data, particularly in the “travel” and “potential area dwell” categories, this study utilizes only the “area dwell” classification. This category signifies that a device remained in a specific area for an extended time or had a consecutive cluster of signals within a 150-meter radius. The dataset used in this study comprised over 4 million records for the designated area in 2022. It is important to identify some potential limitations of analysis from HMD. Of note, these data may be representative of only a subset of the population, exhibit potential temporal artifacts, and vary depending upon the device used (Android, iPhone, model, and so forth).

Over 13 million anonymized human mobility data records linked to over 500,000 unique devices were detected in 2022 within the MPHFA. Section two presents maps and charts of spatial and temporal trends observed in the HMD. Figure 2 shows HMD records detected during 2022 within the MPHFA as an overall index map of the region, which is followed by a series of maps corresponding to index grids A1–D6 and displaying pockets of high and low density throughout the region.

Photo Credit: Seann Regan, NOAA/NCCOS

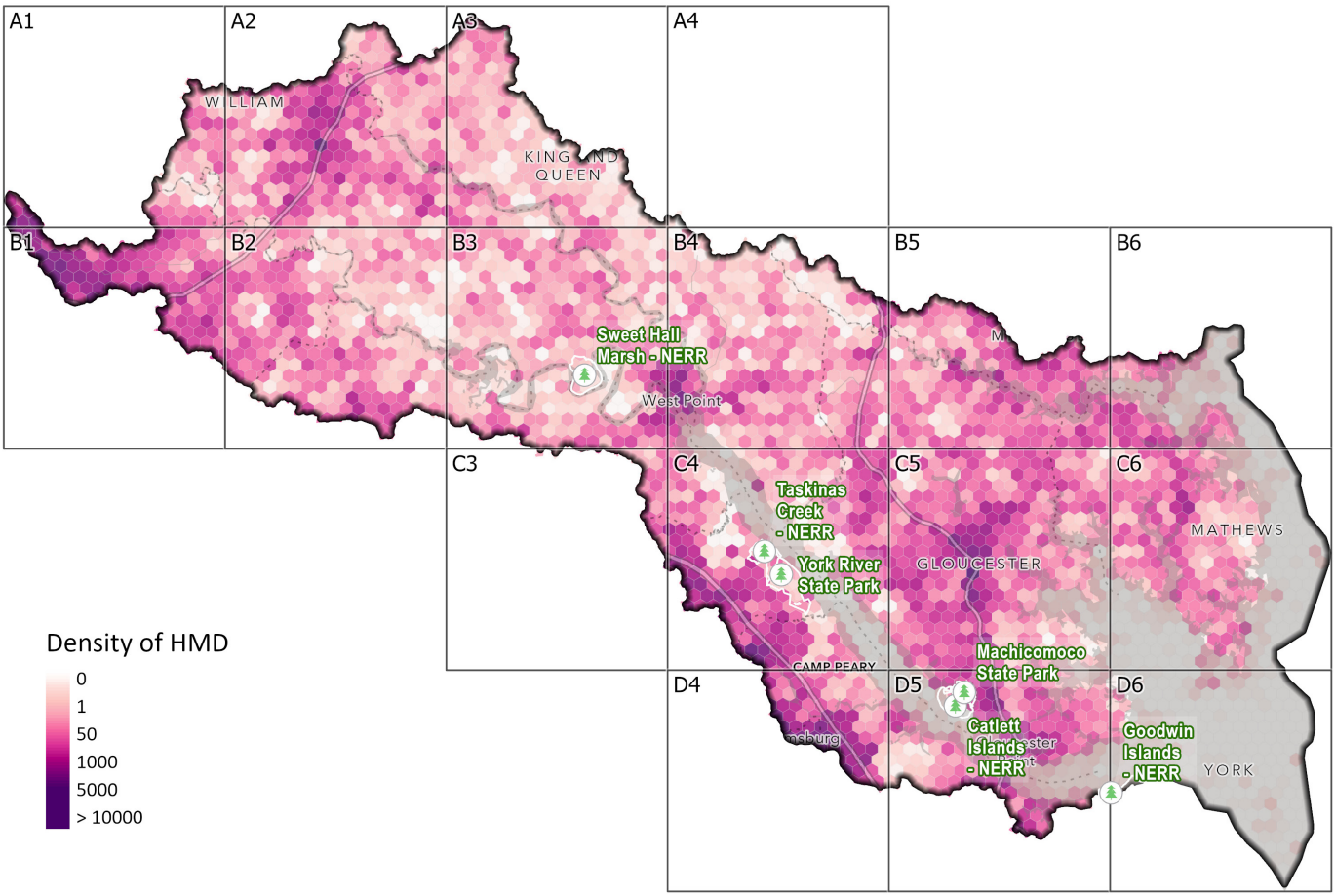
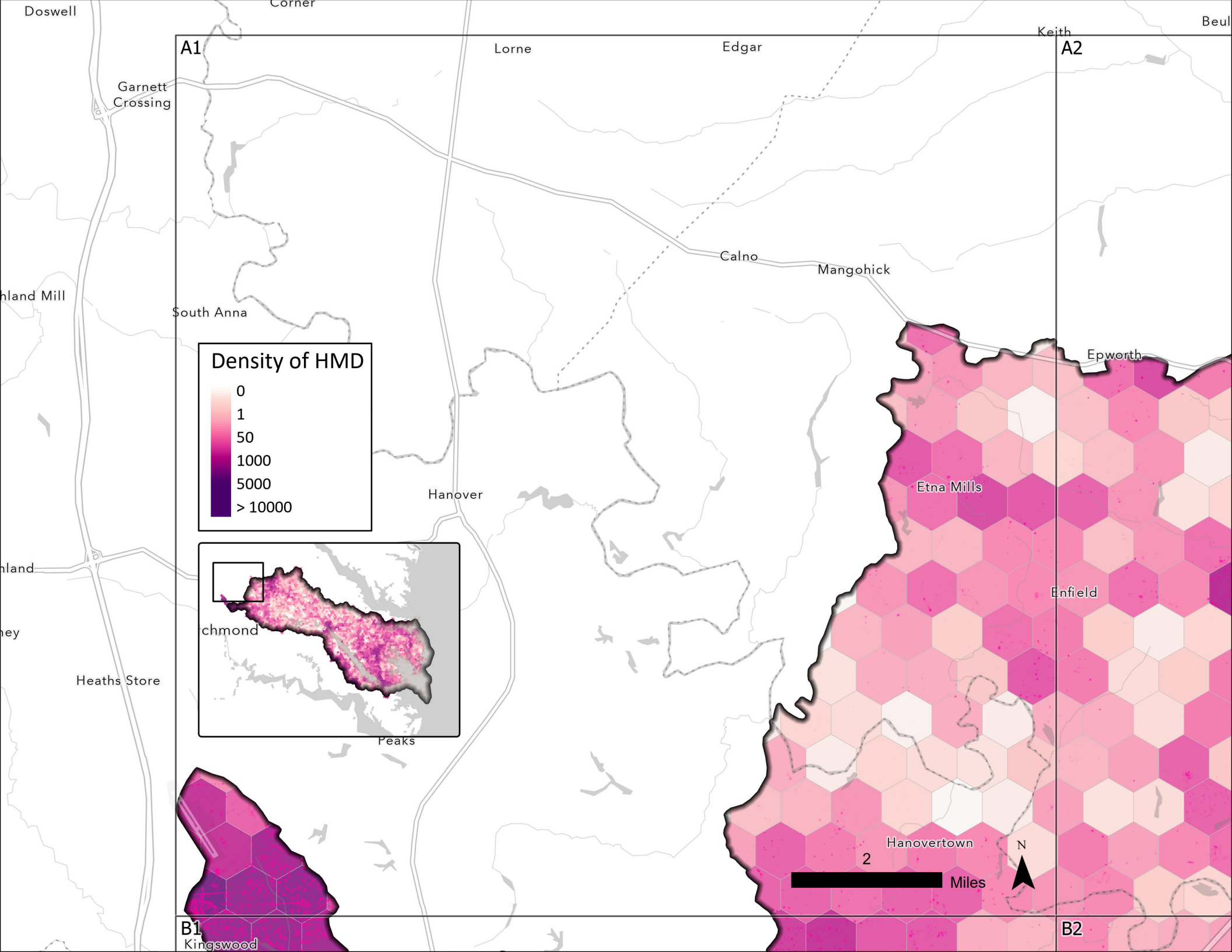
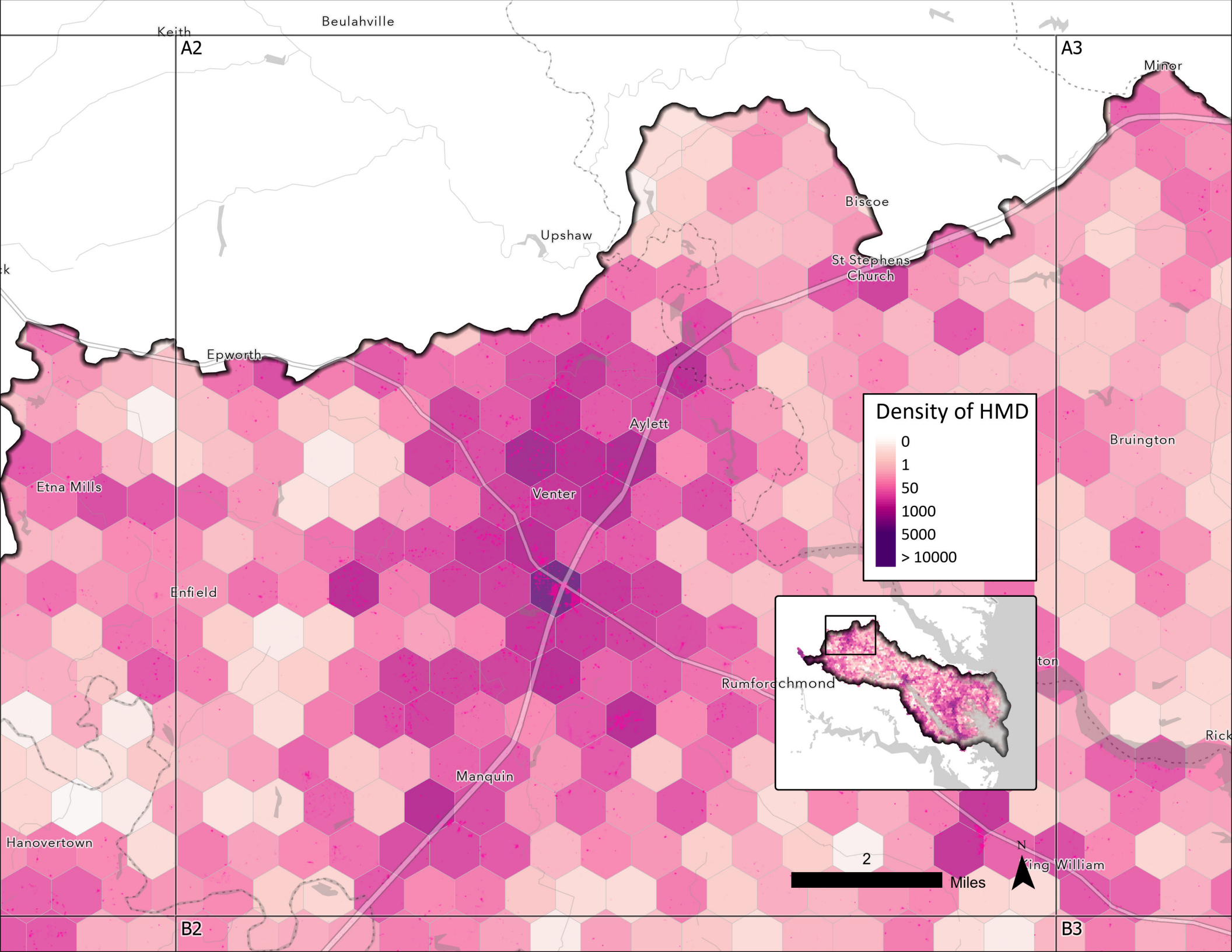


Figure 2. Map of human mobility data records summarized by count per 1-km^2 hexagon grid in the Middle Peninsula Habitat Focus Area in 2022, with a gridded index map overlay.


A1
A2
B1
B2
Doswell
Corner
Garnett
Crossing
Lorne
Edgar
Keith
Beul
Calno
Mangohick
South Anna
Hanover
Epworth
Etna Mills
Enfield
Hanovertown
Heaths Store
Peaks
Kingswood
Density of HMD
0
1
50
1000
5000
> 10000
2
Miles
N


Keith
Beulahville
A2
A3
Minor
Biscoe
Upshaw
St Stephens Church
Epworth
Aylett
Bruington
Etna Mills
Venter
Enfield
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Manquin
Hanovertown
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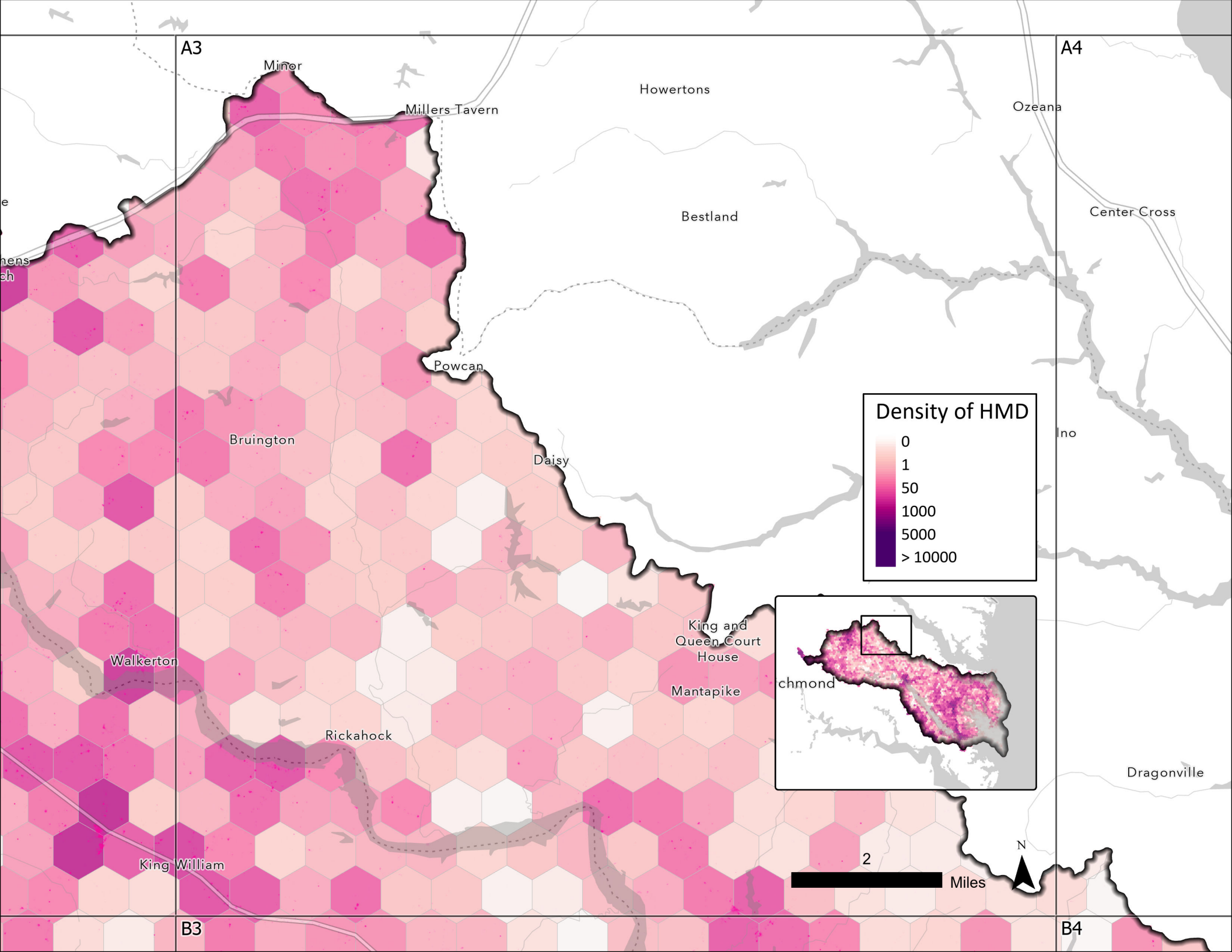
B2
B3


A3
A4
B3
B4
Minor
Millers Tavern
Howertons
Ozeana
Bestland
Center Cross
Powcan
Bruington
Daisy
Density of HMD
0
1
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1000
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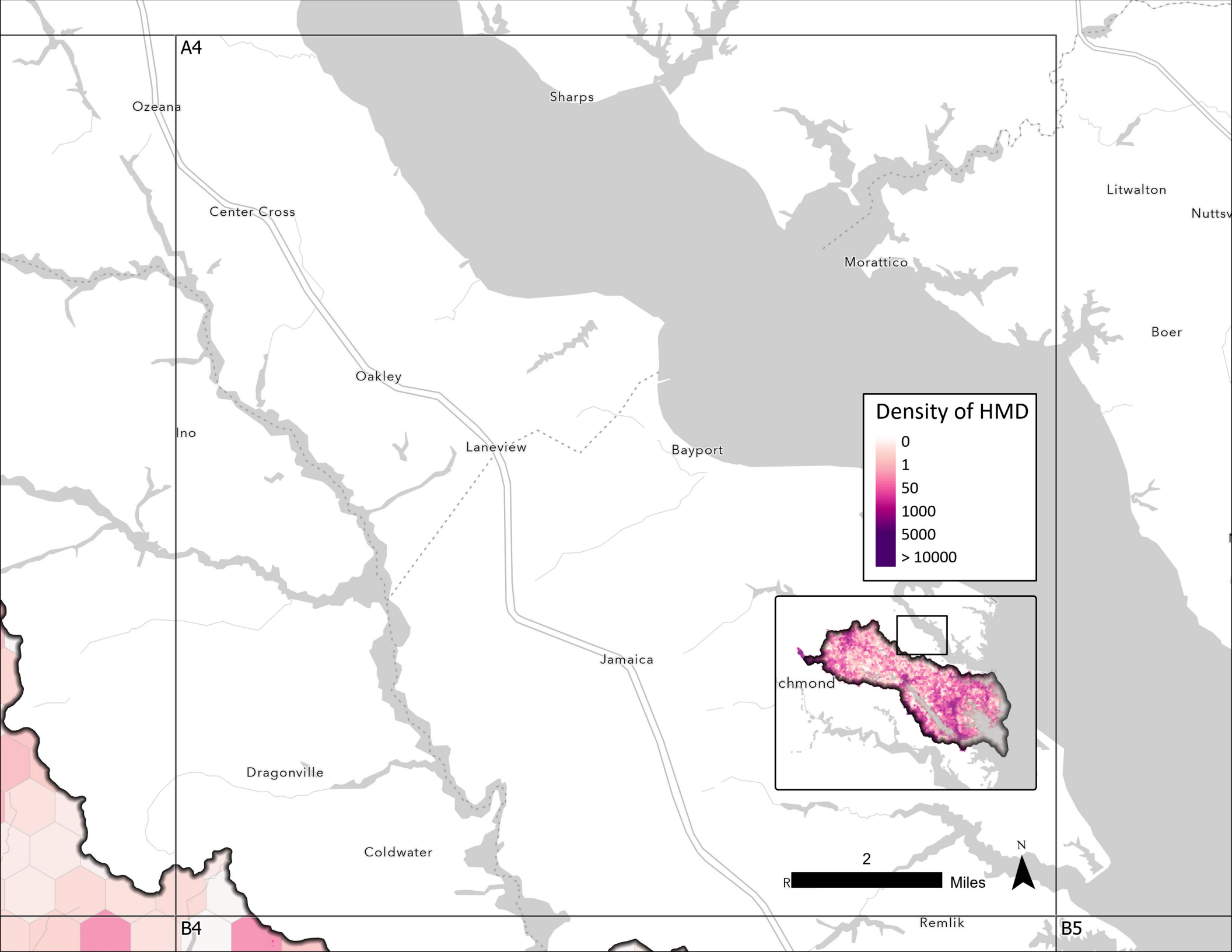
> 10000
King and
Queen Court
House
Walkerton
Mantapike
Rickahock
King William
Dragonville
2
Miles
N


A4
Ozeana
Sharps
Litwalton
Center Cross
Morattico
Boer
Oakley
Ino
Laneview
Bayport
Density of HMD
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1000
5000
> 10000
Jamaica
chmond
Dragonville
Coldwater
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Miles
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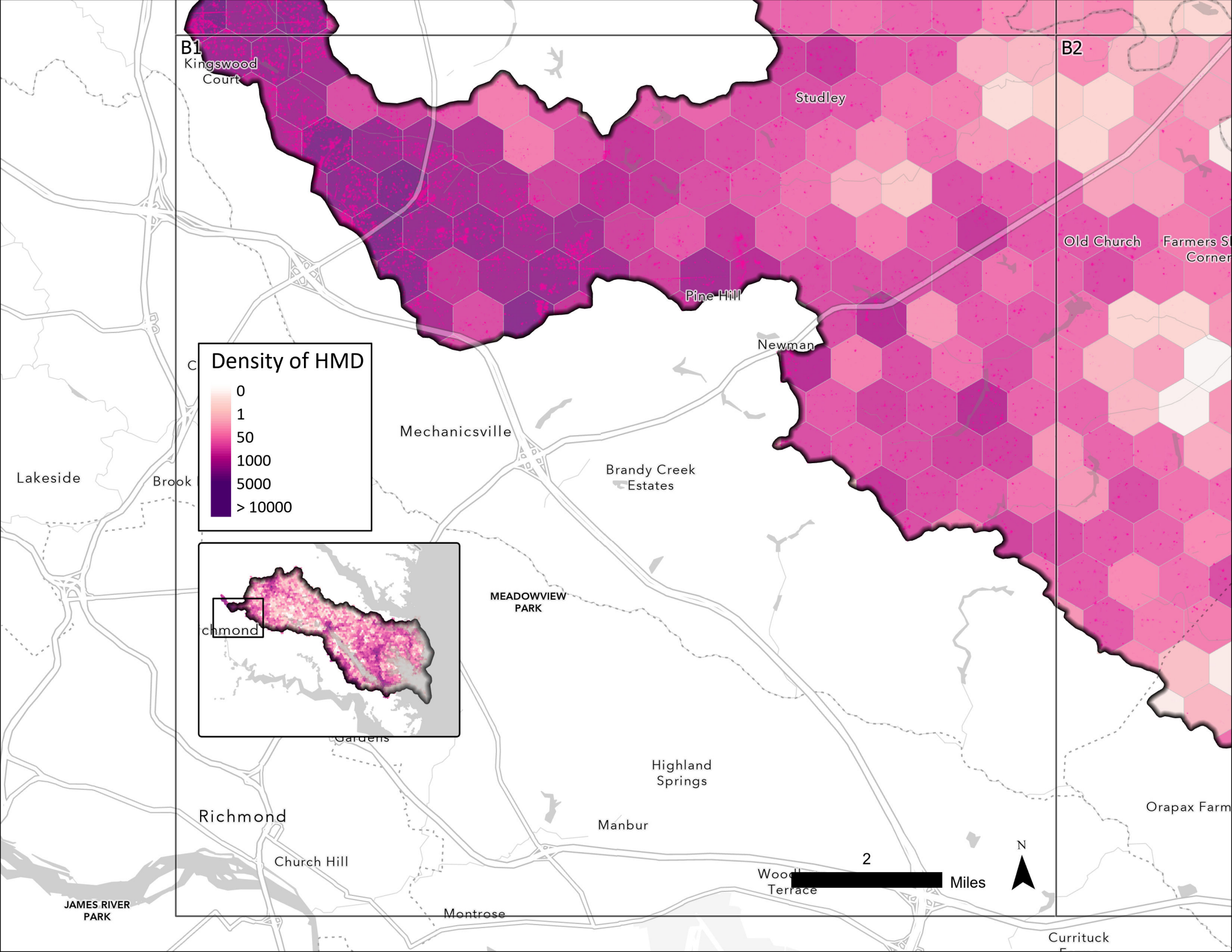
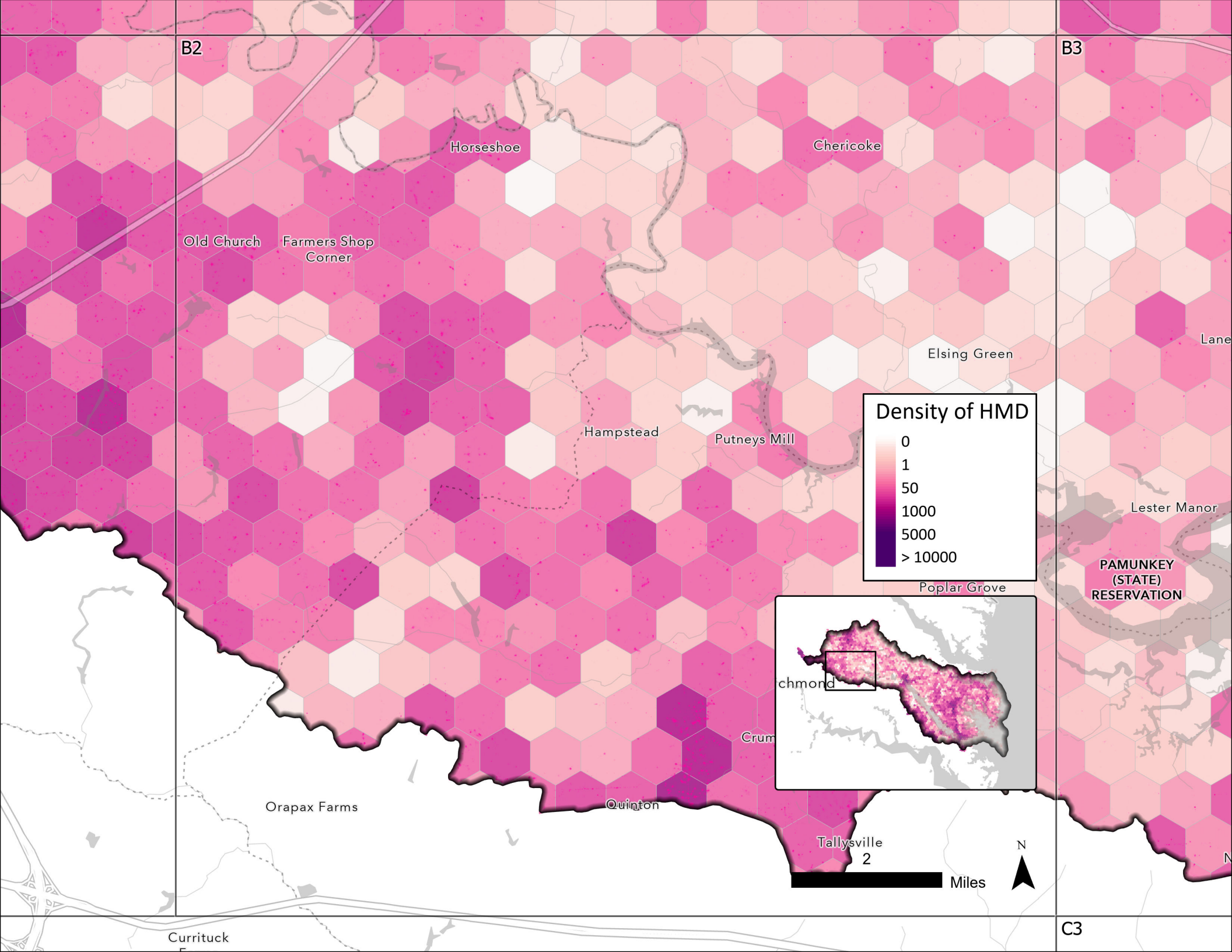
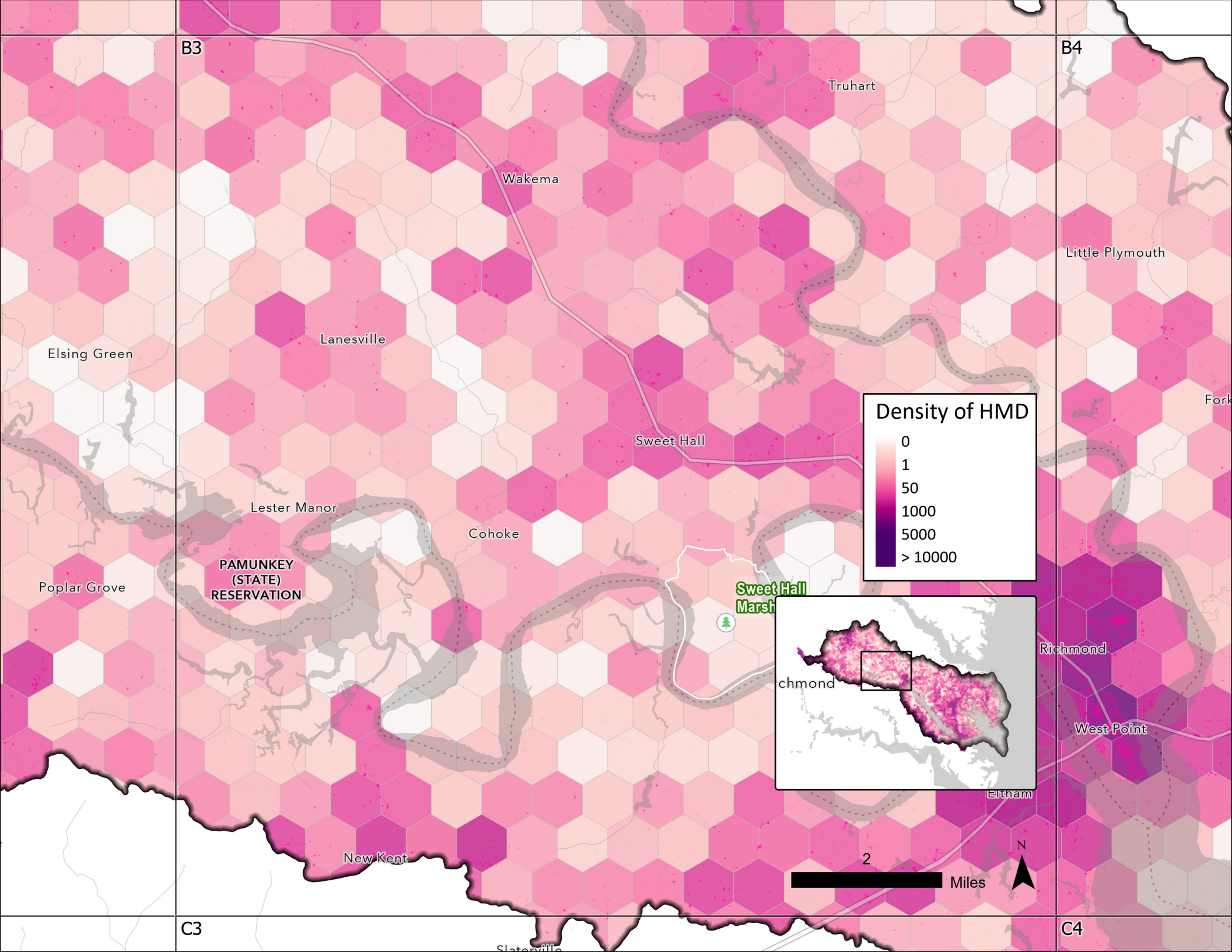
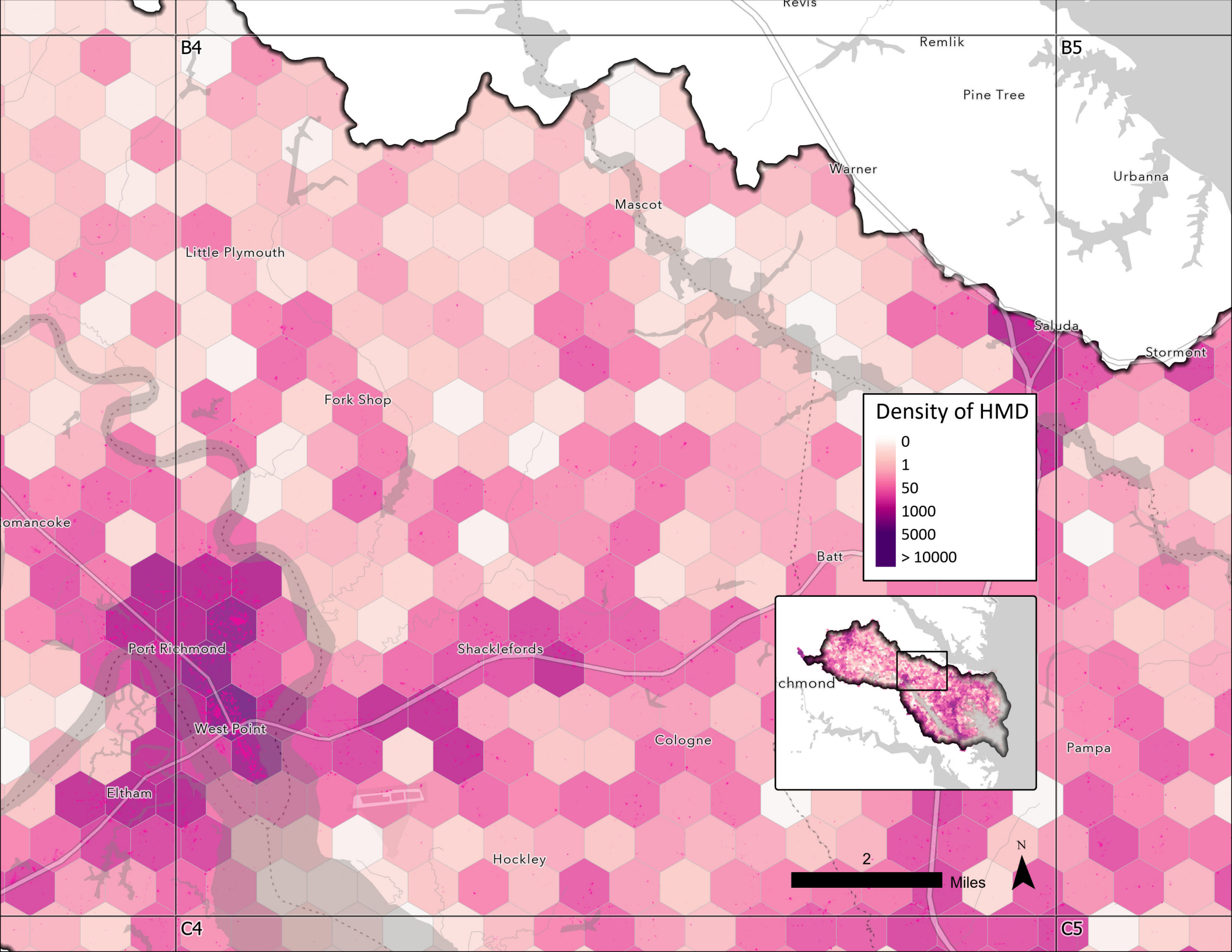
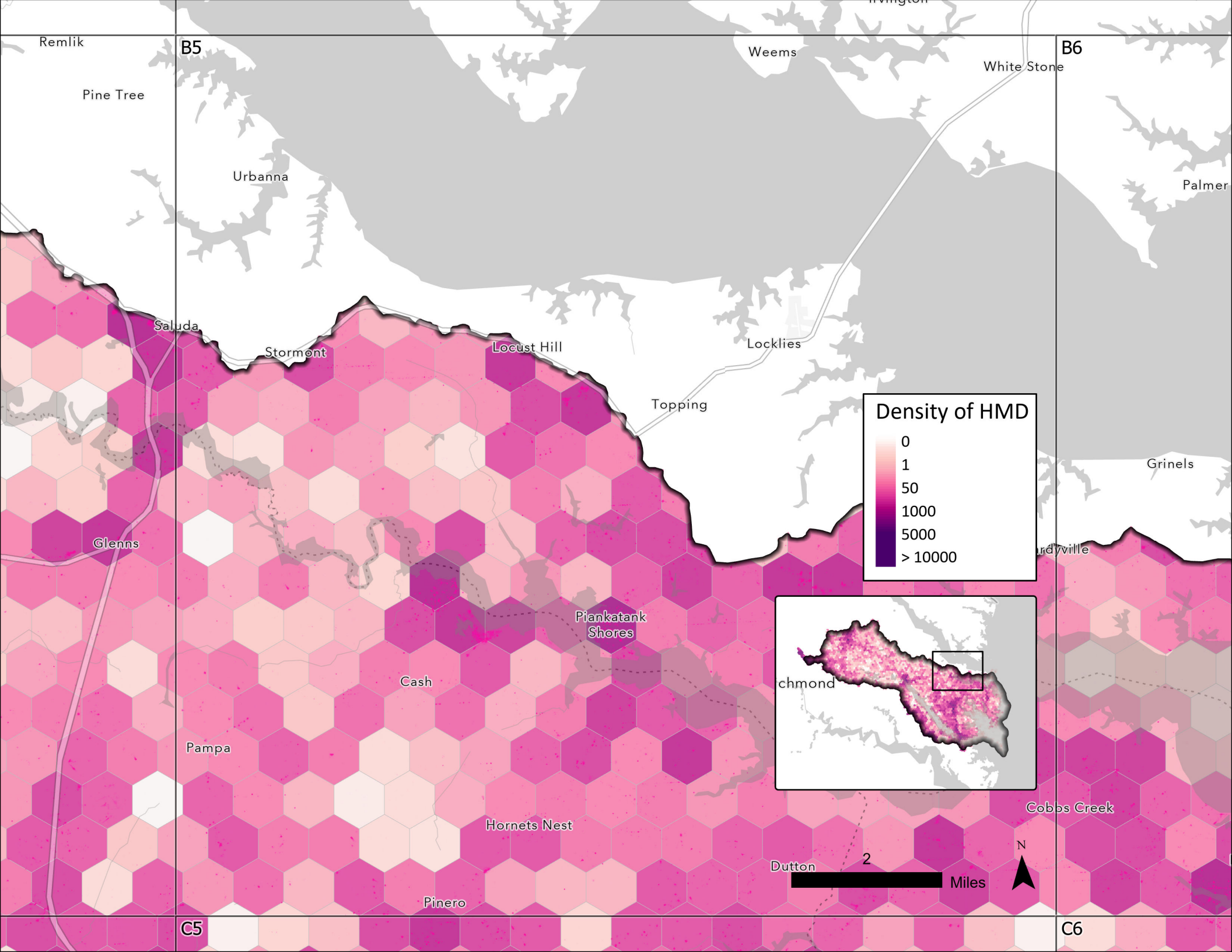
Remlik
B4
B5

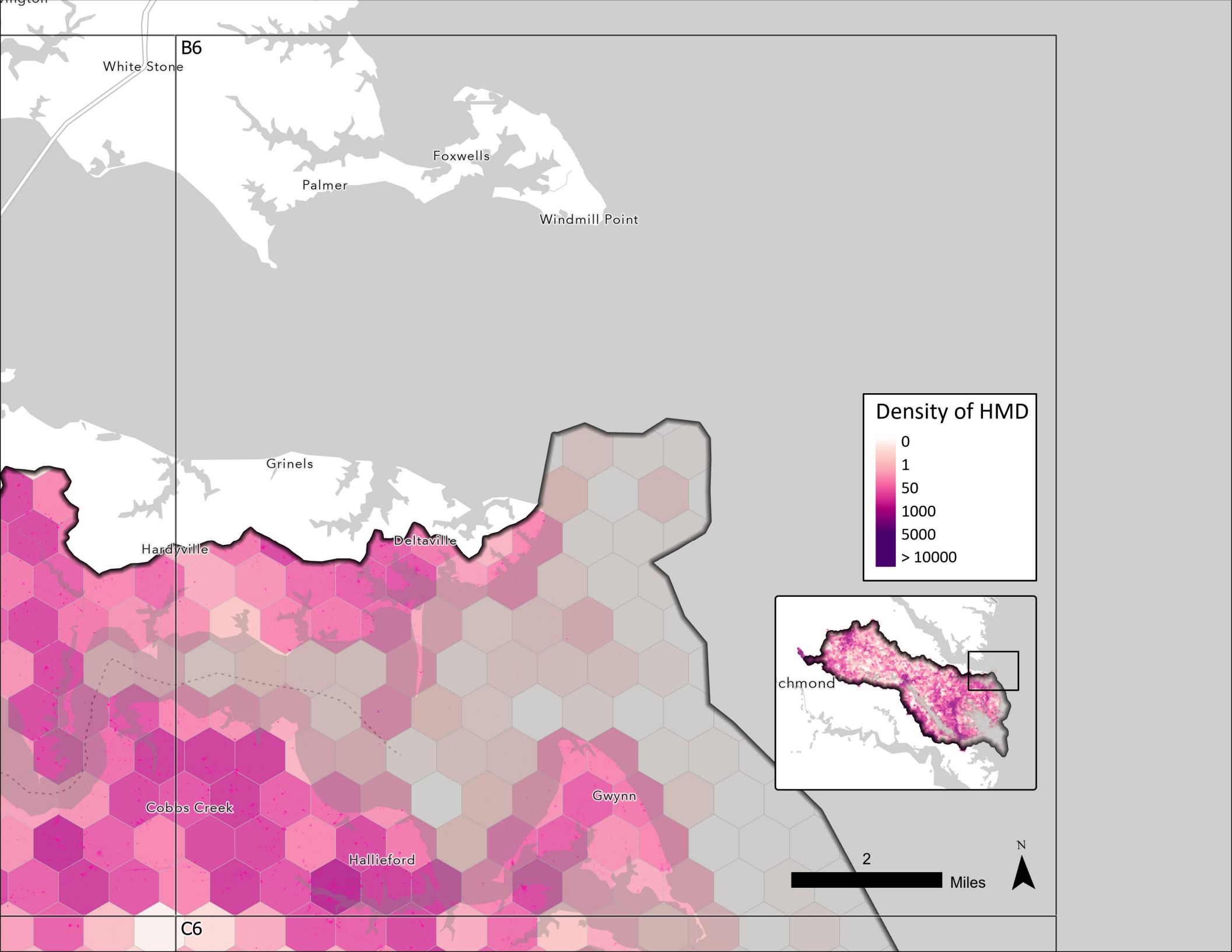

B1
B2
Kingswood Court
Studley
Old Church
Pine Hill
Newman
Density of HMD
0
1
50
1000
5000
> 10000
Mechanicsville
Lakeside
Brook
Brandy Creek Estates
MEADOWVIEW PARK
Highland Springs
Richmond
Manbur
Church Hill
Orapax Farm
Terrace
JAMES RIVER PARK
Montrose
Currituck
2
Miles
N

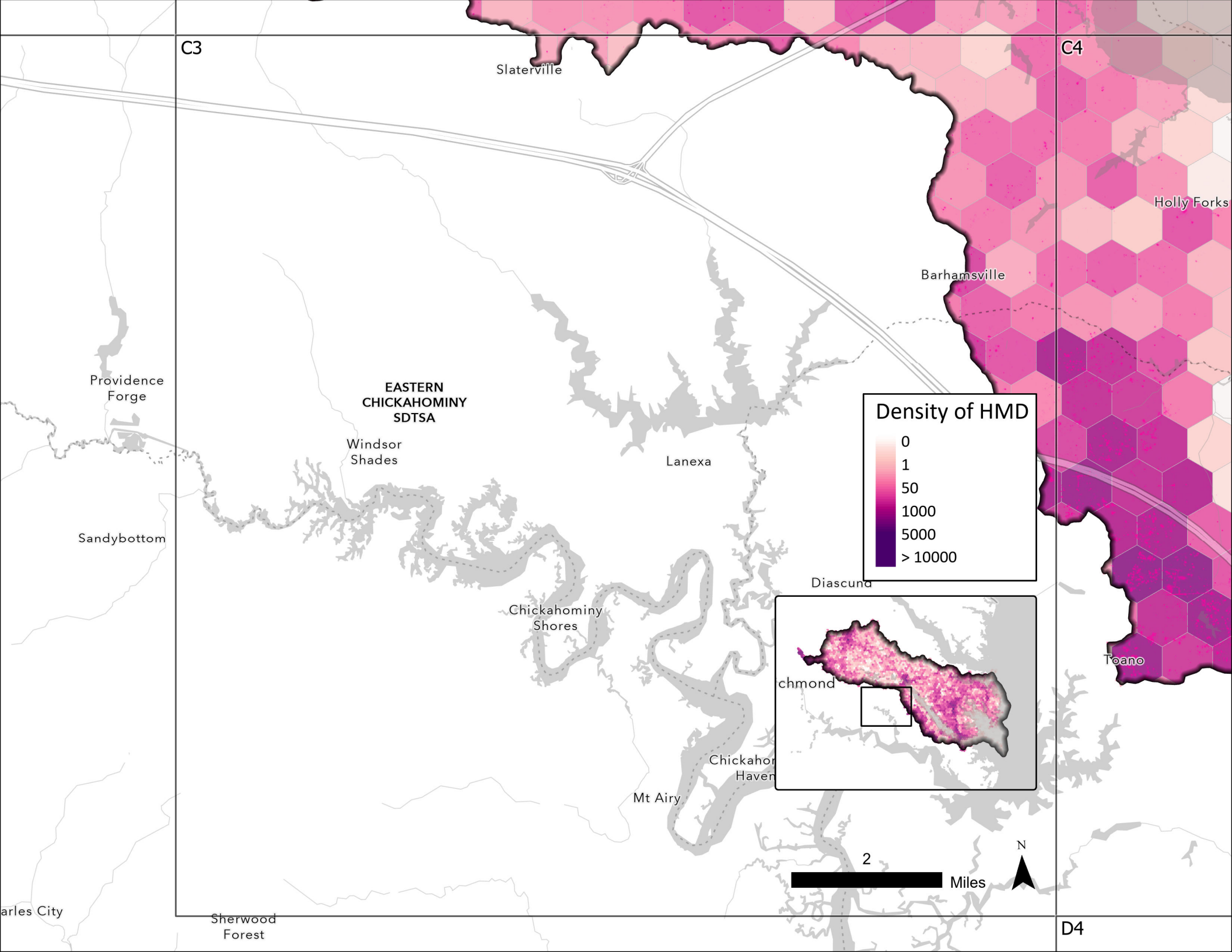

B2
B3
C3
Horseshoe
Chericoke
Old Church
Farmers Shop Corner
Elsing Green
Hampstead
Putneys Mill
Lester Manor
PAMUNKEY (STATE) RESERVATION
Poplar Grove
Density of HMD
0
1
50
1000
5000
> 10000
chmond
Crum
Orapax Farms
Quinton
Tallysville
2
Miles
N
Currituck

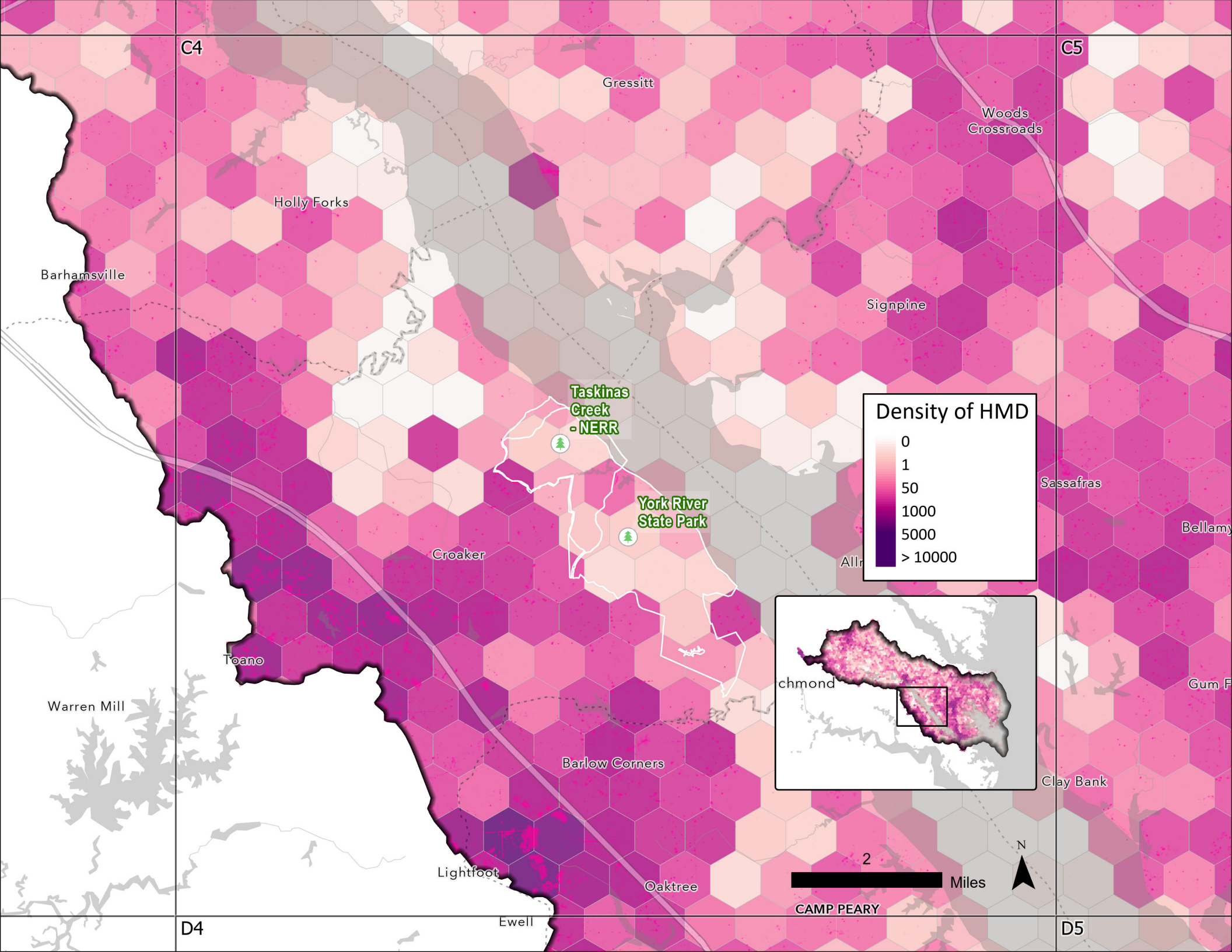

B3
B4
C3
C4
Truhart
Wakema
Little Plymouth
Lanesville
Elsing Green
Sweet Hall
Lester Manor
Cohoke
PAMUNKEY
(STATE)
RESERVATION
Poplar Grove
Sweet Hall
Marsh
Richmond
West Point
New Kent
Density of HMD
0
1
50
1000
5000
> 10000
2
Miles
N

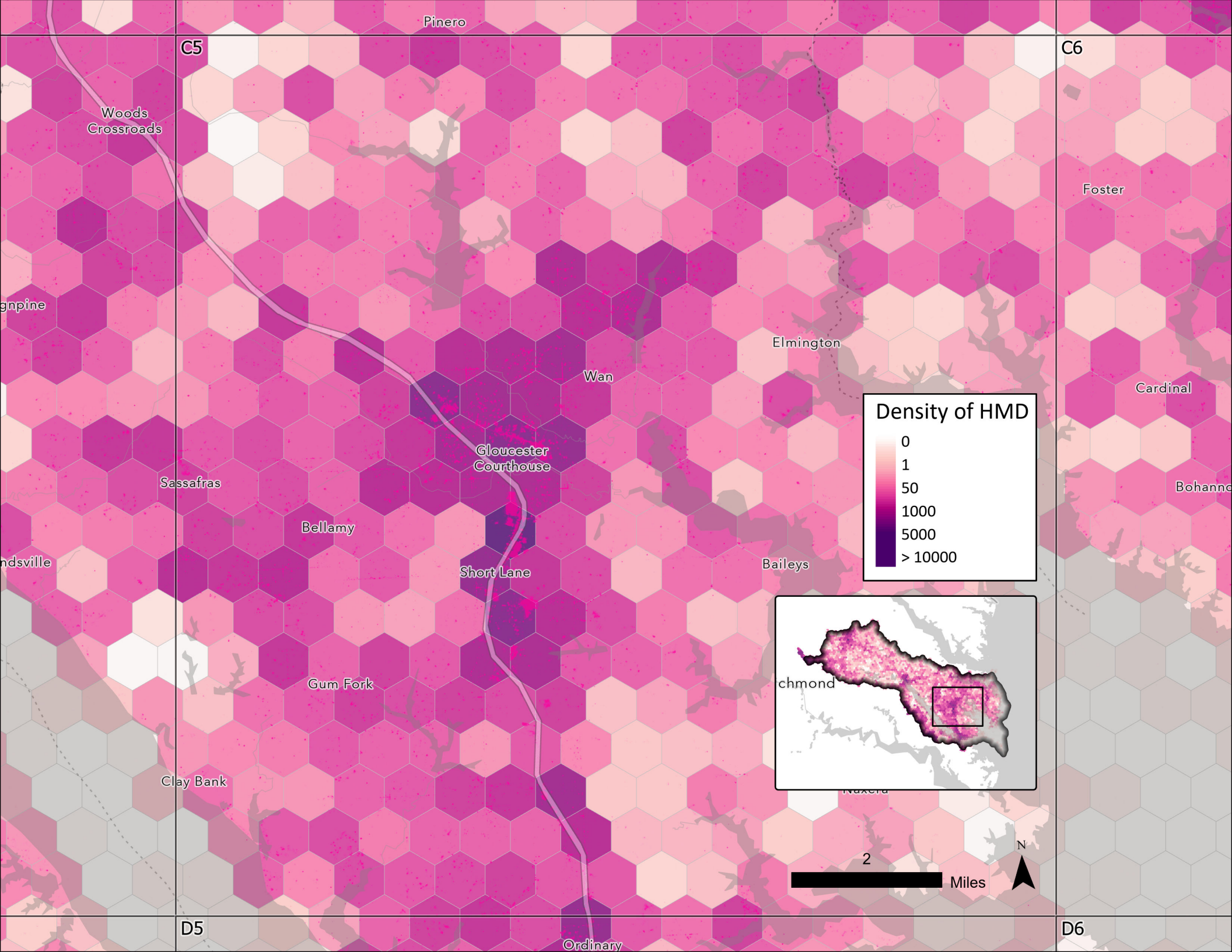

B4
B5
C4
C5
Revis
Remlik
Pine Tree
Warner
Urbanna
Mascot
Little Plymouth
Saluda
Stormont
Fork Shop
omancoke
Batt
Density of HMD
0
1
50
1000
5000
> 10000
Port Richmond
Shacklefords
chmond
West Point
Cologne
Pampa
Eltham
Hockley
2
Miles
N

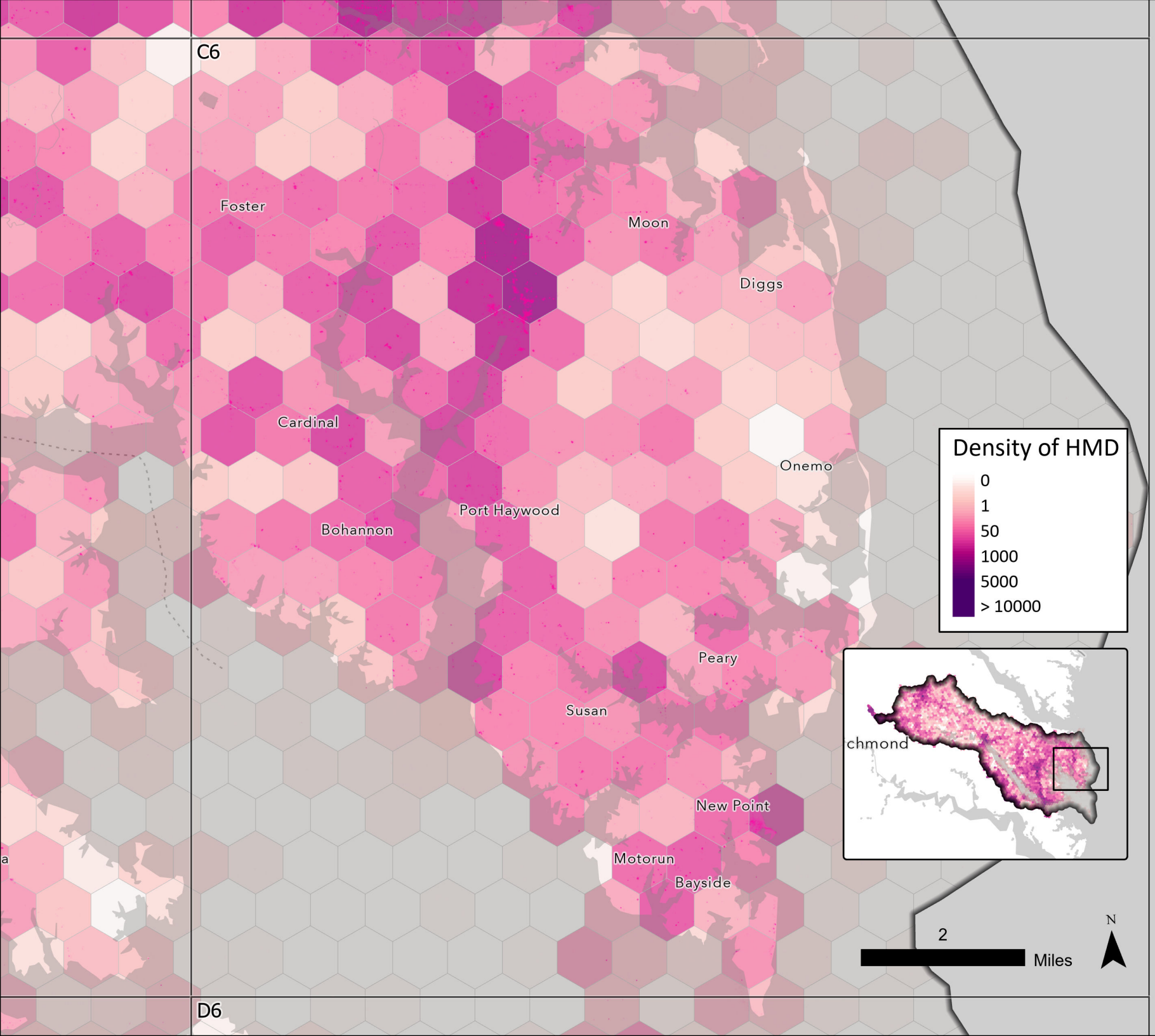

B5
B6
C5
C6
Remlik
Pine Tree
Urbanna
Weems
White Stone
Palmer
Saluda
Stormont
Locust Hill
Locklies
Topping
Grinels
Glenns
Piankatank Shores
Cash
Pampa
Hornets Nest
Pinero
Dutton
Cobbs Creek
chmond
Density of HMD
0
1
50
1000
5000
> 10000
2
Miles
N

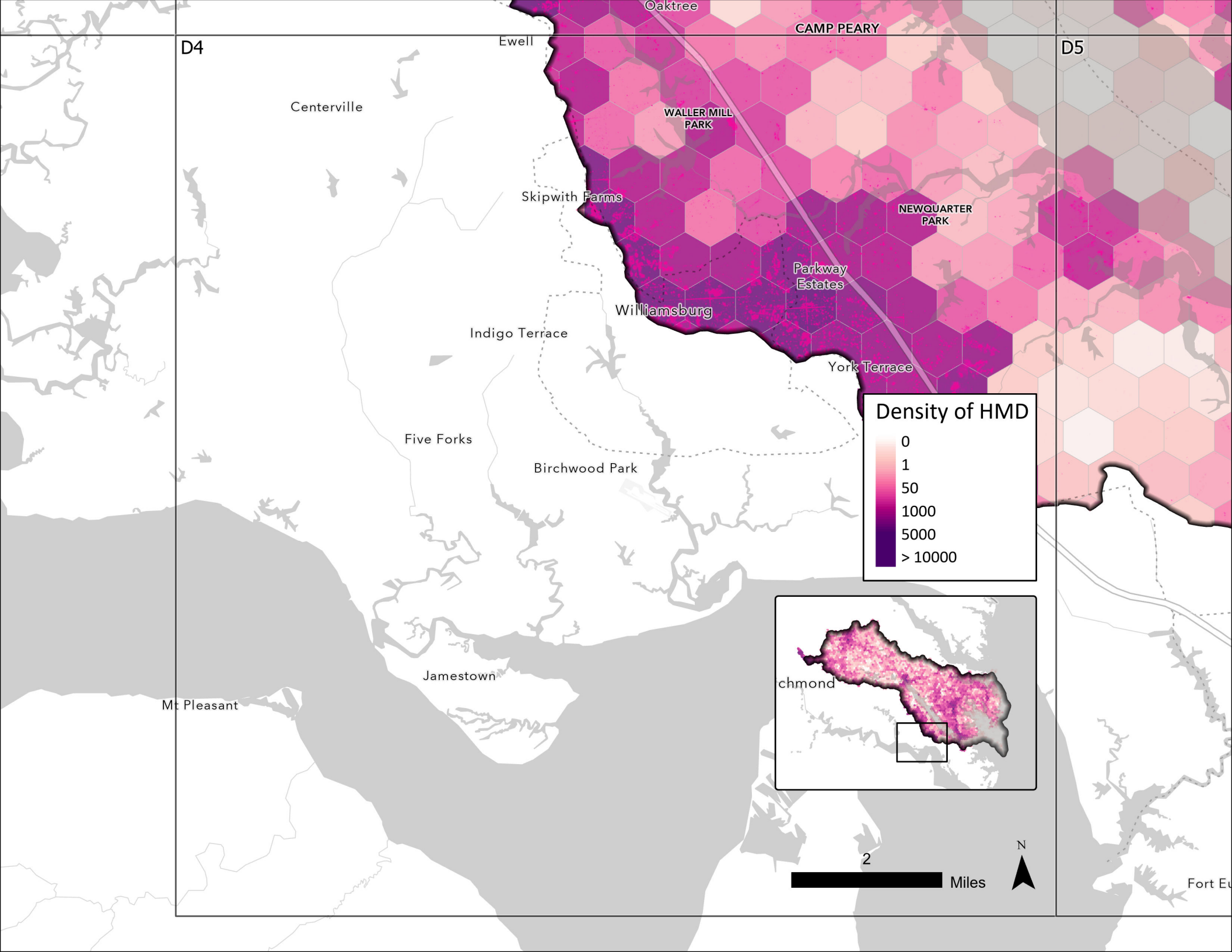

B6
White Stone
Foxwells
Palmer
Windmill Point
Grinels
Hardyville
Deltaville
Density of HMD
0
1
50
1000
5000
> 10000
chmond
Gwynn
Cobbs Creek
Hallieford
2
Miles
N
C6

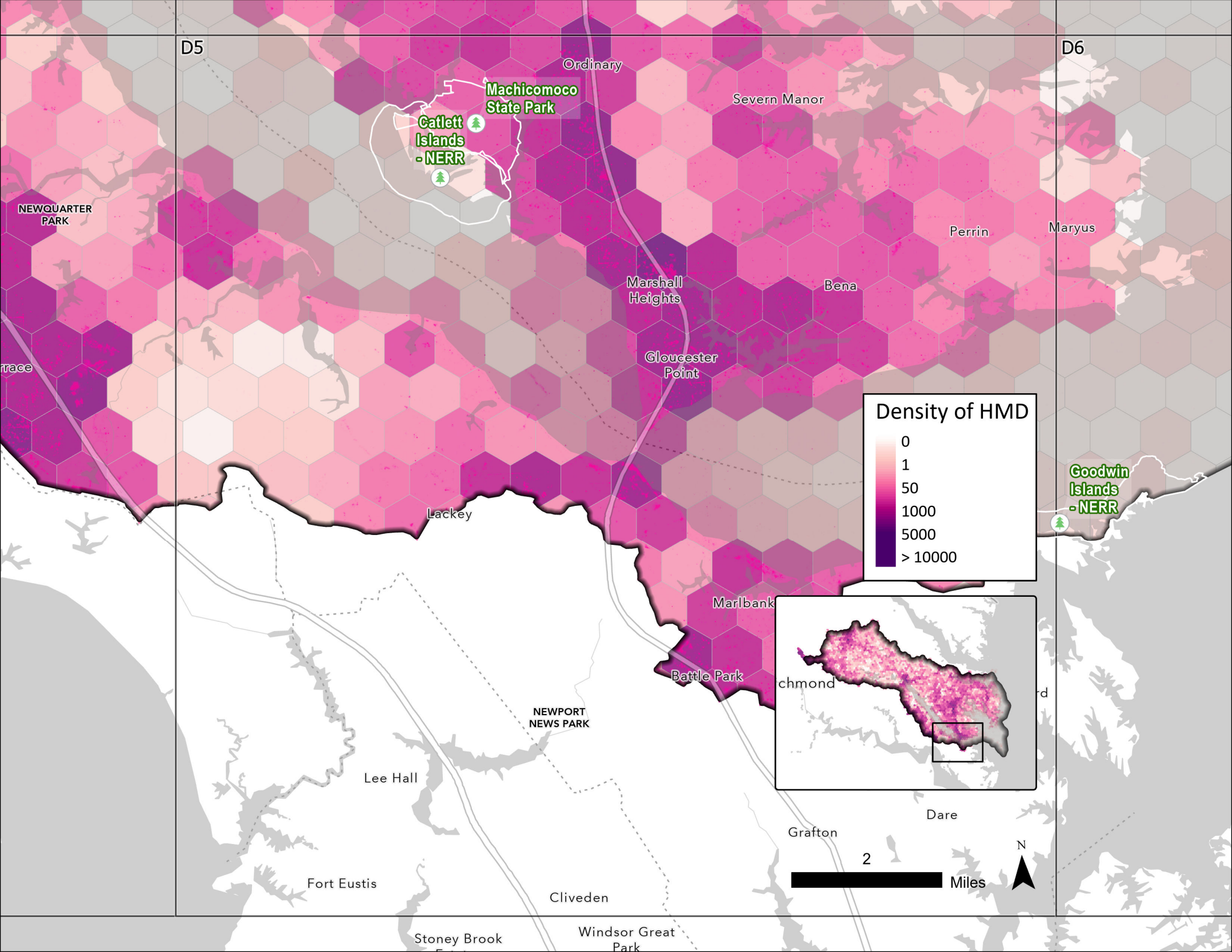

C3
C4
D4
Slaterville
Holly Forks
Barhamsville
Providence Forge
EASTERN CHICKAHOMINY SDTSA
Windsor Shades
Lanexa
Sandybottom
Diascund
Chickahominy Shores
Toano
chmond
Chickahor
Haven
Mt Airy
arles City
Sherwood Forest
Density of HMD
0
1
50
1000
5000
> 10000
2
Miles
N

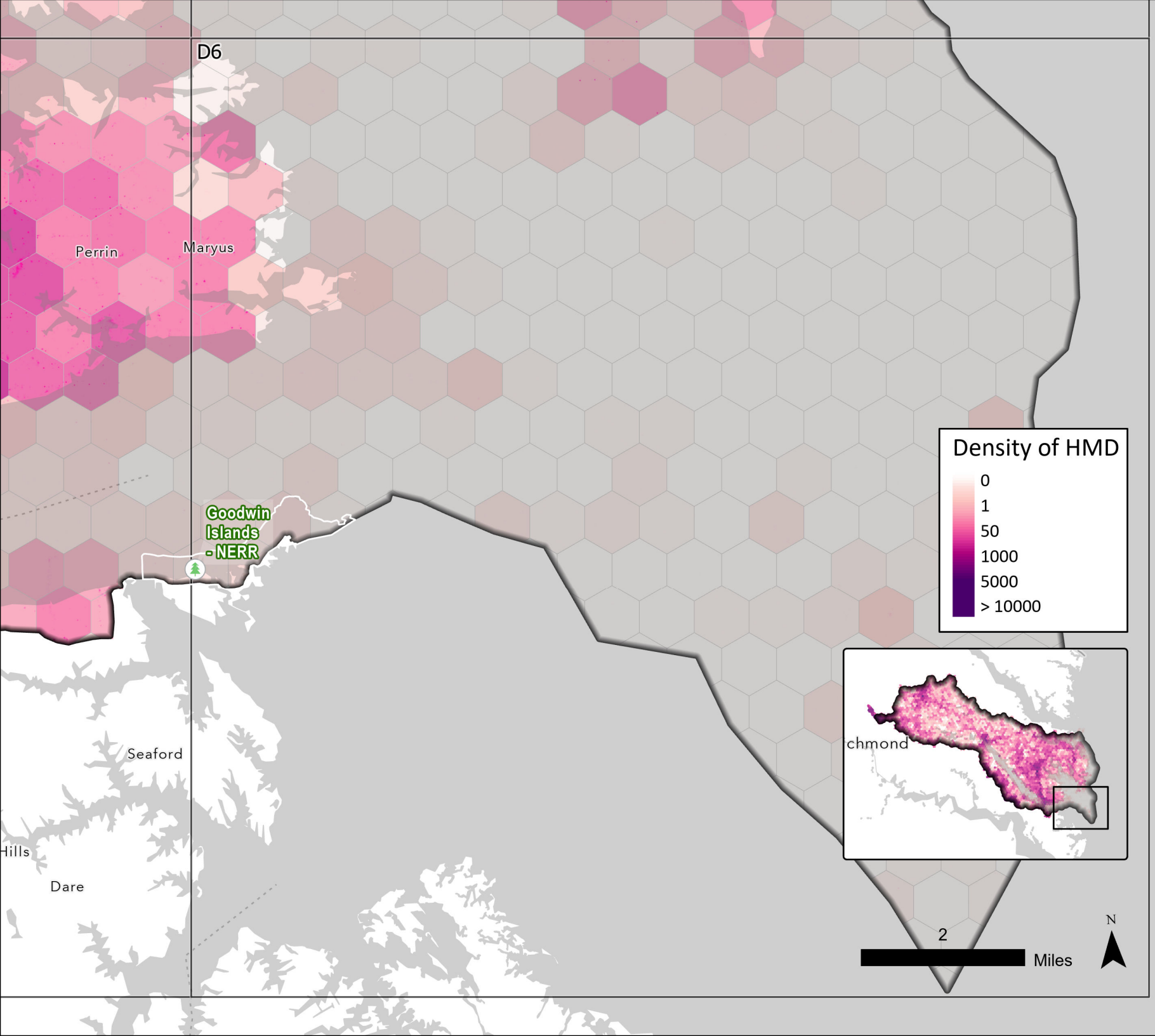

C4
C5
Gressitt
Woods Crossroads
Holly Forks
Barhamsville
Signpine
Taskinas Creek - NERR
York River State Park
Croaker
Sassafras
Bellamy
Toano
Warren Mill
Barlow Corners
Clay Bank
Lightfoot
Oaktree
Ewell
CAMP PEARY
D4
D5
Density of HMD
0
1
50
1000
5000
> 10000
2
Miles
N


C5
C6
D5
D6
Pinero
Woods Crossroads
Foster
Elmington
Wan
Cardinal
Gloucester Courthouse
Sassafras
Bellamy
Short Lane
Baileys
Gum Fork
Clay Bank
Ordinary
Density of HMD
0
1
50
1000
5000
> 10000
2
Miles
N


C6
Foster
Moon
Diggs
Cardinal
Onemo
Port Haywood
Bohannon
Peary
Susan
New Point
Motorun
Bayside
Density of HMD
0
1
50
1000
5000
> 10000
chmond
2
Miles
N
D6


D4
D5
Oaktree
Ewell
CAMP PEARY
Centerville
WALLER MILL PARK
Skipwith Farms
NEWQUARTER PARK
Parkway Estates
Williamsburg
Indigo Terrace
York Terrace
Five Forks
Birchwood Park
Jamestown
Mt Pleasant
chmond
Fort Eu
Density of HMD
0
1
50
1000
5000
> 10000
2
Miles
N


D5
D6
Ordinary
Machicomoco State Park
Catlett Islands - NERR
Severn Manor
NEWQUARTER PARK
Perrin
Maryus
Marshall Heights
Bena
Gloucester Point
Density of HMD
0
1
50
1000
5000
> 10000
Goodwin Islands - NERR
Lackey
Marlbank
Battle Park
chmond
NEWPORT NEWS PARK
Lee Hall
Dare
Grafton
2
Miles
N
Fort Eustis
Cliveden
Stoney Brook
Windsor Great Park


D6
Perrin
Maryus
Goodwin
Islands
- NERR
Seaford
Dare
Density of HMD
0
1
50
1000
5000
> 10000
chmond
2
Miles
N

Figures 3, 4, and 5 depict temporal trends in the number of HMD records, devices detected, and device-hours. Record counts are not uniform across all devices and represent varying levels of duration spent within the study area. The unit of device-hours captures this element of duration, or time spent, in the study area and is calculated by multiplying the number of unique devices by the duration of device activity.

The temporal trends in the MPHFA across the year 2022 suggest that most visitation appears to have occurred in October and during afternoon hours. According to the measure of device-hours, most devices appear to be present in the MPHFA for longer durations in the afternoon hours of October. April was the least active month according to all measures (records, devices, and device-hours).

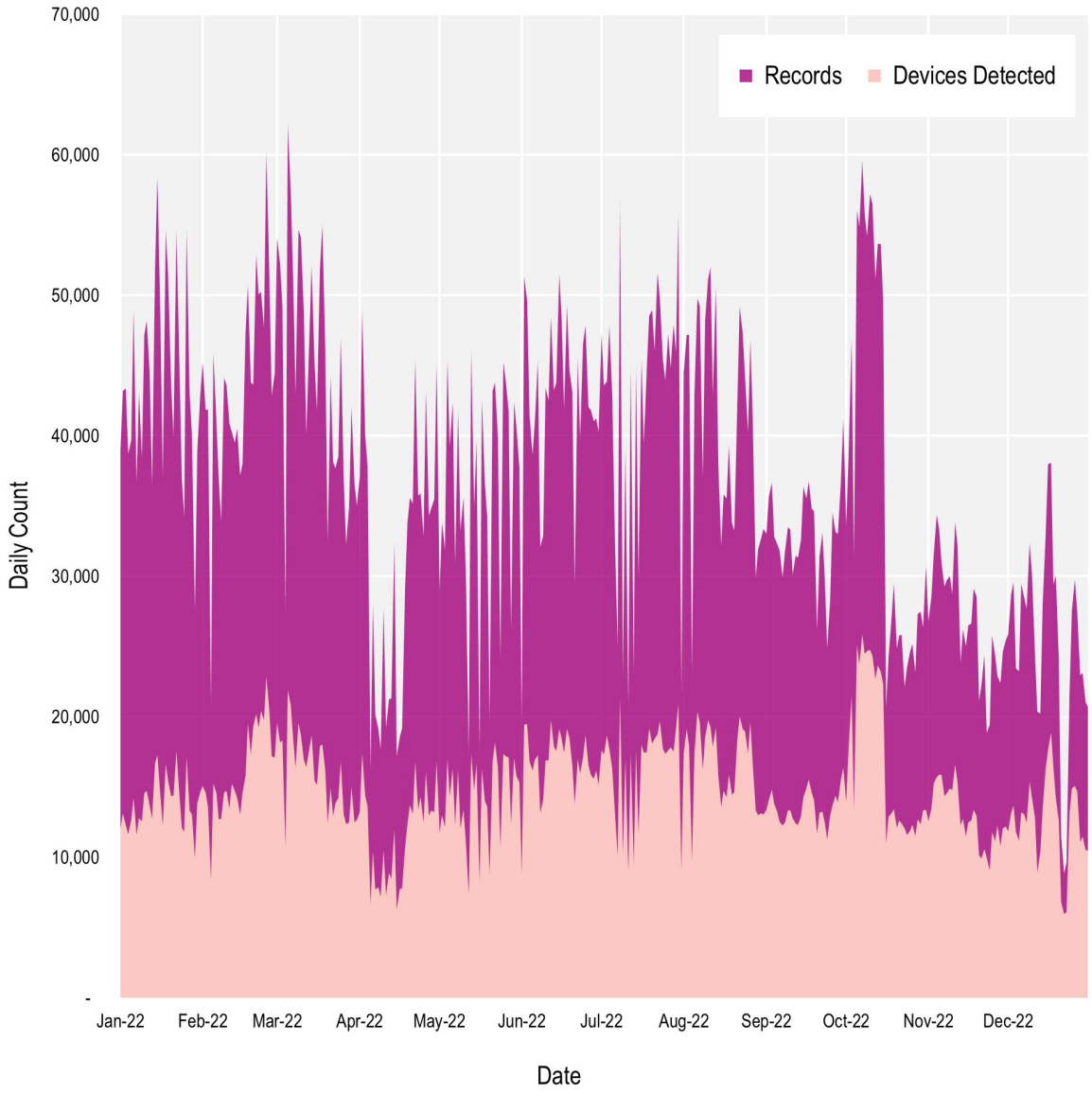


Figure 3. Number of records and unique devices detected per month in the Middle Peninsula Habitat Focus Area in 2022.

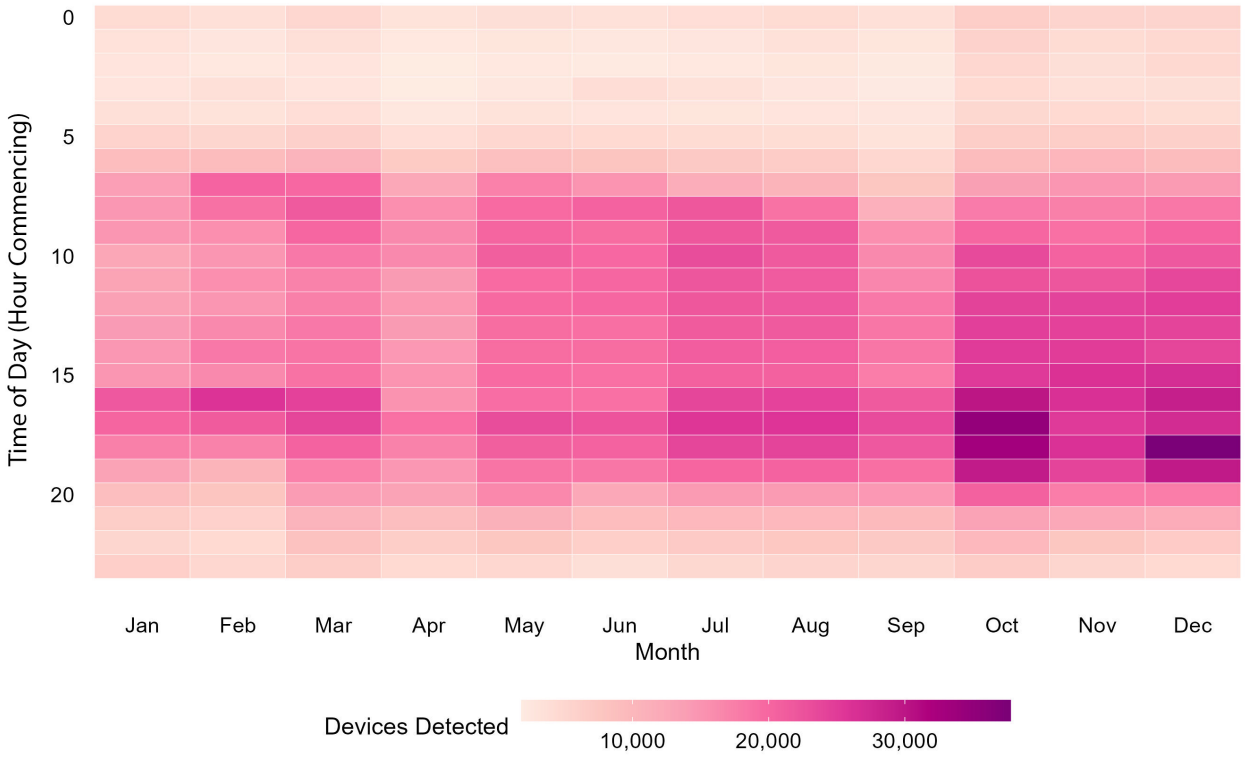


Figure 4. Number of unique devices per month and time of day in the Middle Peninsula Habitat Focus Area in 2022.

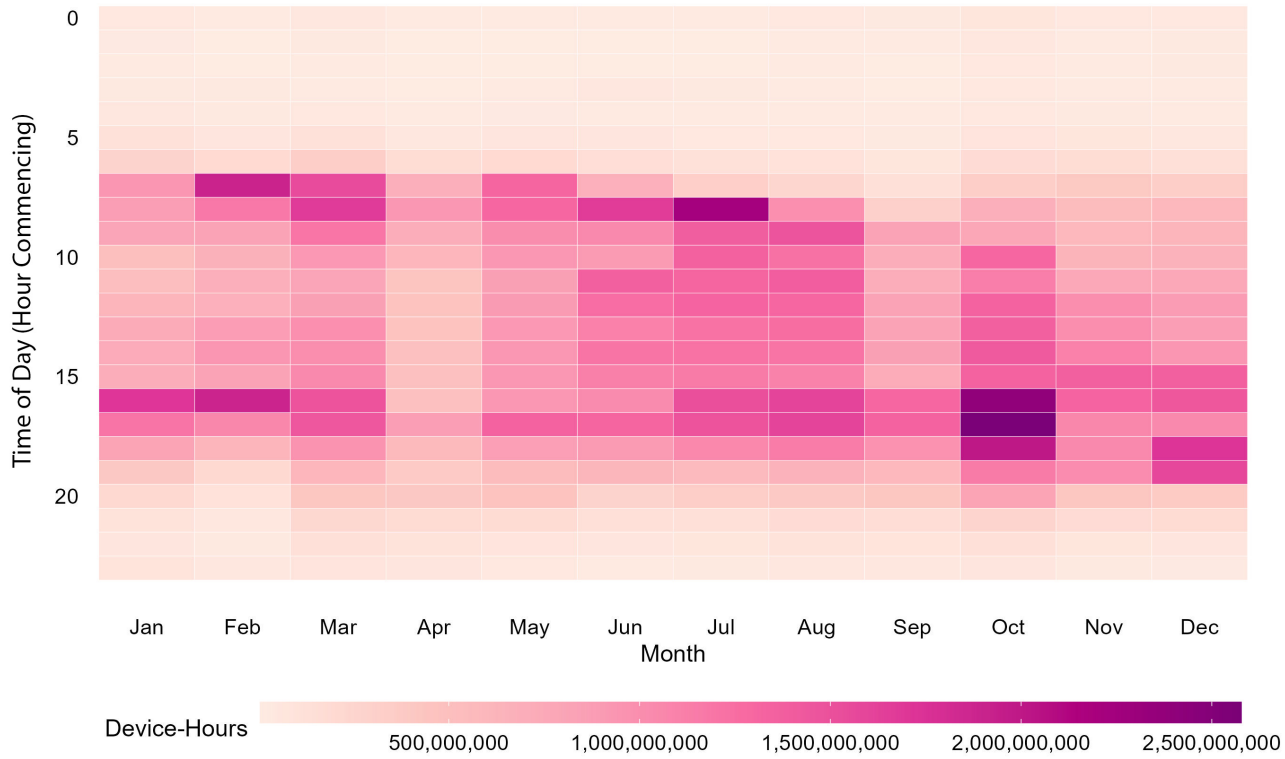


Figure 5. Total device-hours per month and time of day in the Middle Peninsula Habitat Focus Area in 2022. Device-hours are the number of unique devices multiplied by the duration (hours) of device activity.

3 HUMAN ACTIVITY ALONG THE YORK RIVER

In 2022, just over 500,000 HMD records linked to nearly 50,000 unique devices were detected within the York River and a 500-meter buffer surrounding it (Unacast, 2022). The 500-meter buffer surrounding the York River was selected to better understand ecosystem services provided adjacent to, not just on, the water of the York River region. The six parks and National Estuarine Research Reserves (NERRs) within the study area are also displayed: Sweet Hall Marsh NERR, Taskinas Creek NERR, York River State Park, Catlett Island NERR, Machicomoco State Park, and Goodwin Islands NERR.

Figure 6 shows the waterways of the York River in Virginia, near the mouth of the Chesapeake Bay. A higher density of human mobility data is seen in two popular fishing spots: Coleman Memorial Bridge (in the southwest) and the West Point area where the York River meets the Pamunkey and Mattaponi Rivers (near the center of the map).

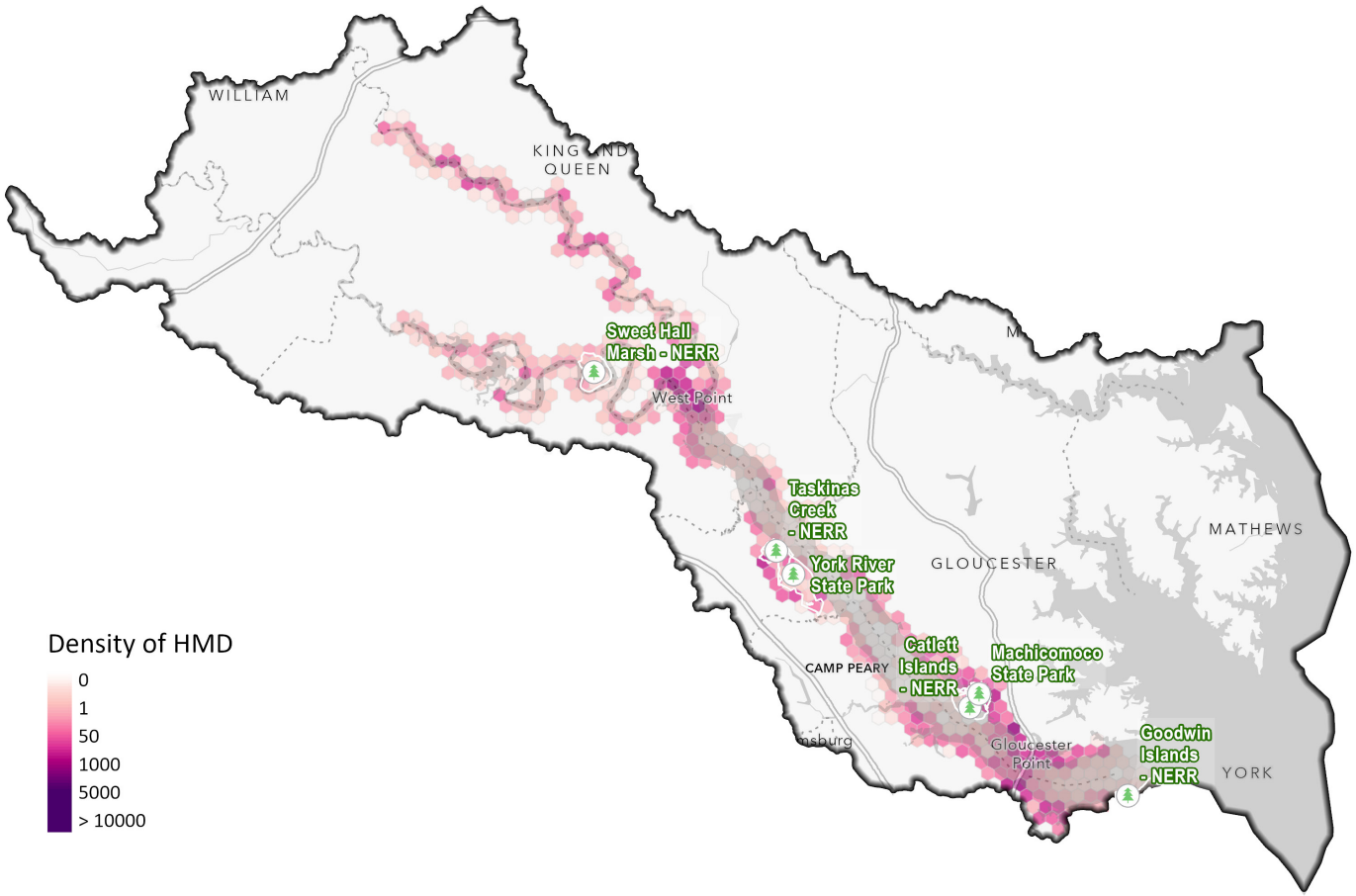


Figure 6. Map of human mobility data records summarized by count per 1 km^2 hexagon grid within a 500-meter buffer of the York River in 2022.

Figures 7, 8, and 9 show the temporal trends in the number of HMD records, devices detected, and device-hours within the York River 500-meter buffered area. The temporal trends in the York River buffered area across the year 2022 suggest that most visitation occurred in the summer months, with high visitation also in the afternoon hours in October through December. According to the measure of device-hours, most devices appear to be present in the York River 500-meter buffered area for longer durations in the afternoon hours of October. April was again the least active month according to all measures (records, devices, and device-hours).

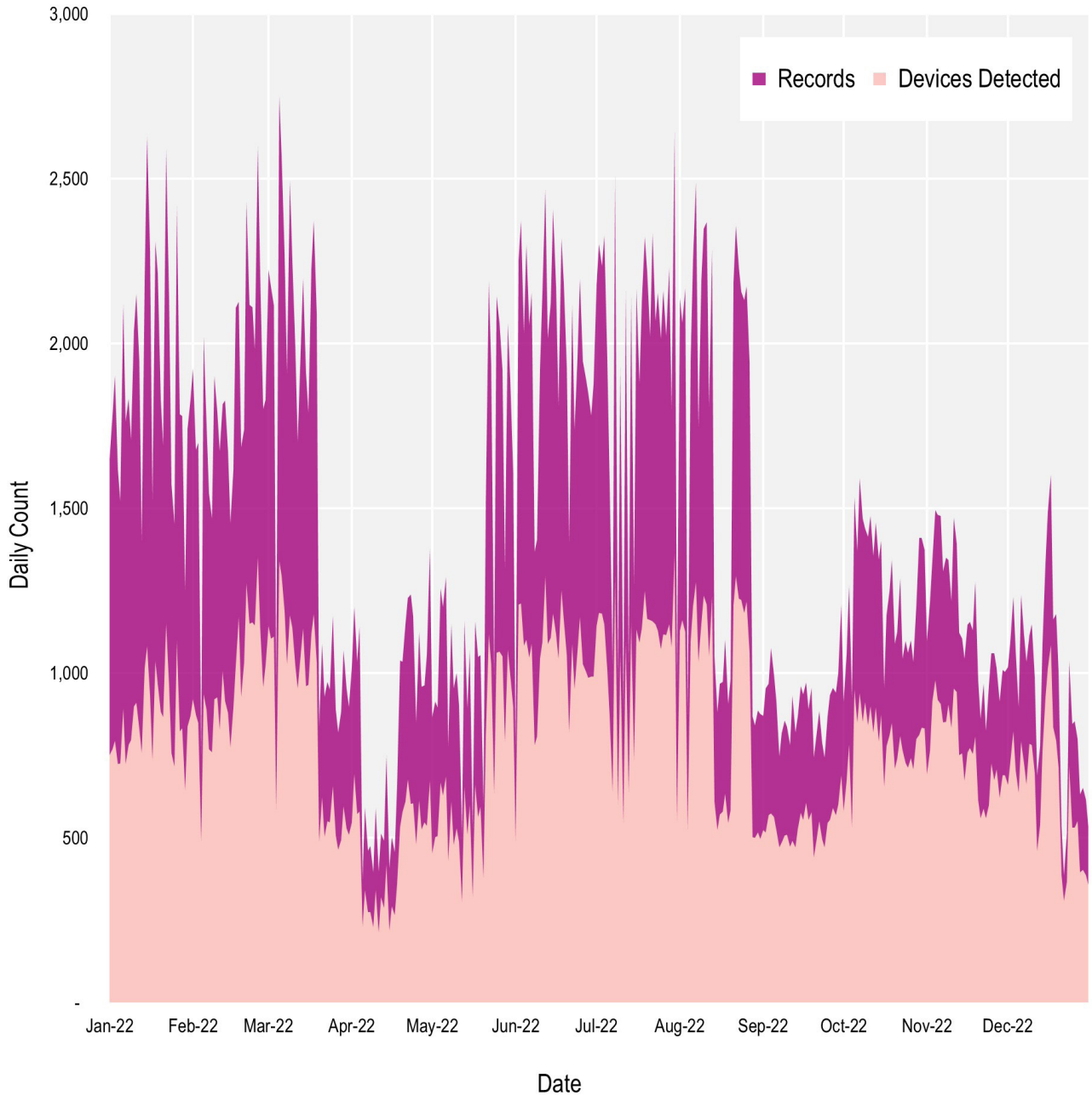


Figure 7. Number of records and unique devices detected per month in the York River 500-meter buffered area in 2022.

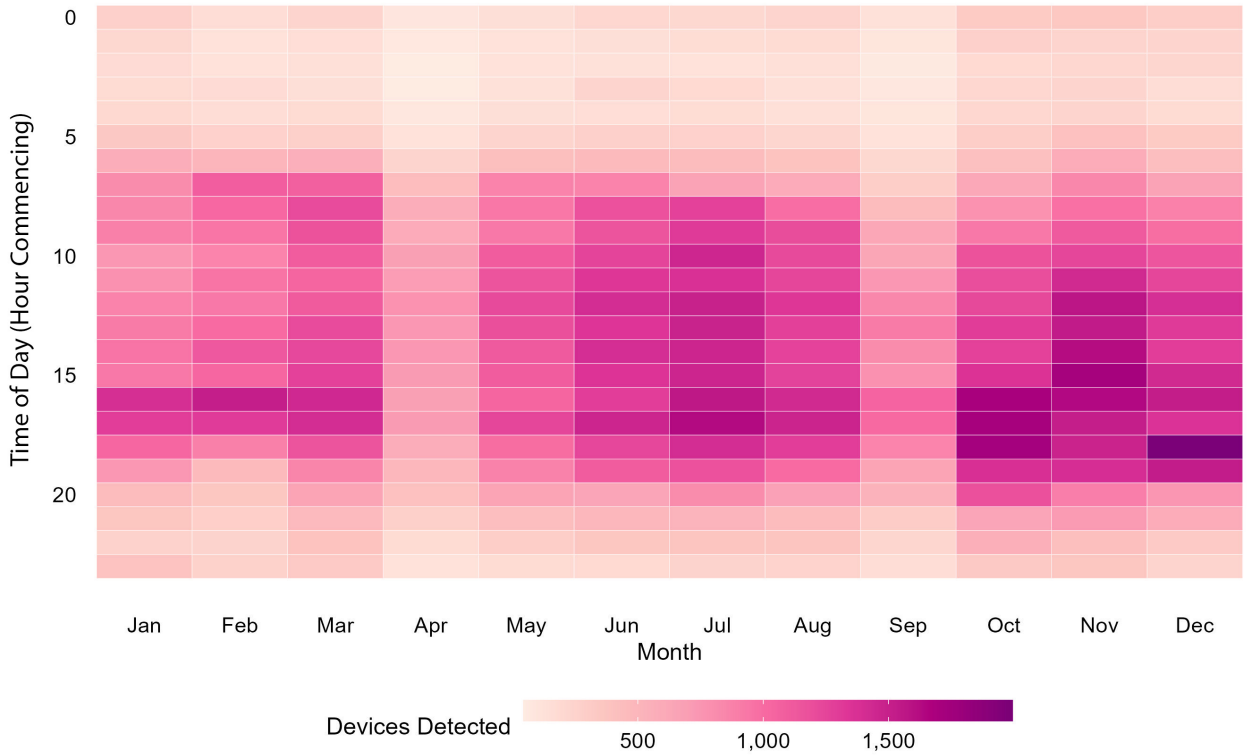


Figure 8. Number of unique devices per month and time of day in the York River 500-meter buffered area in 2022.

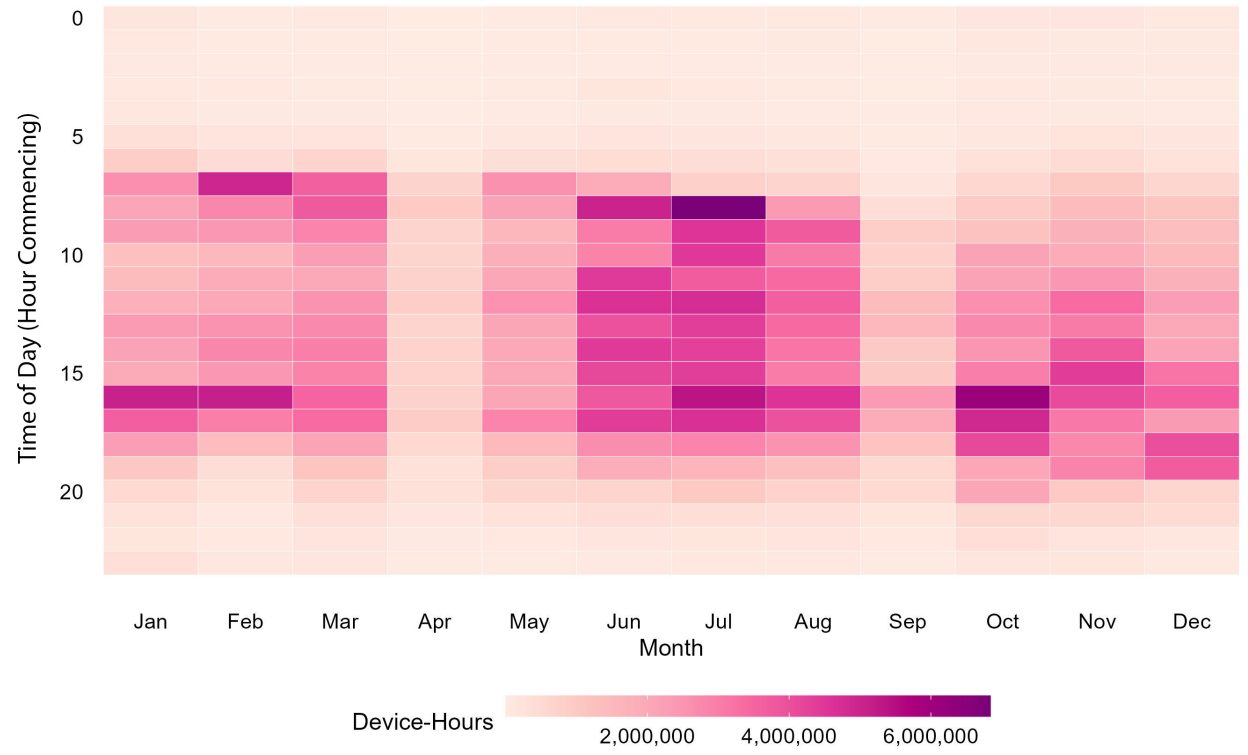
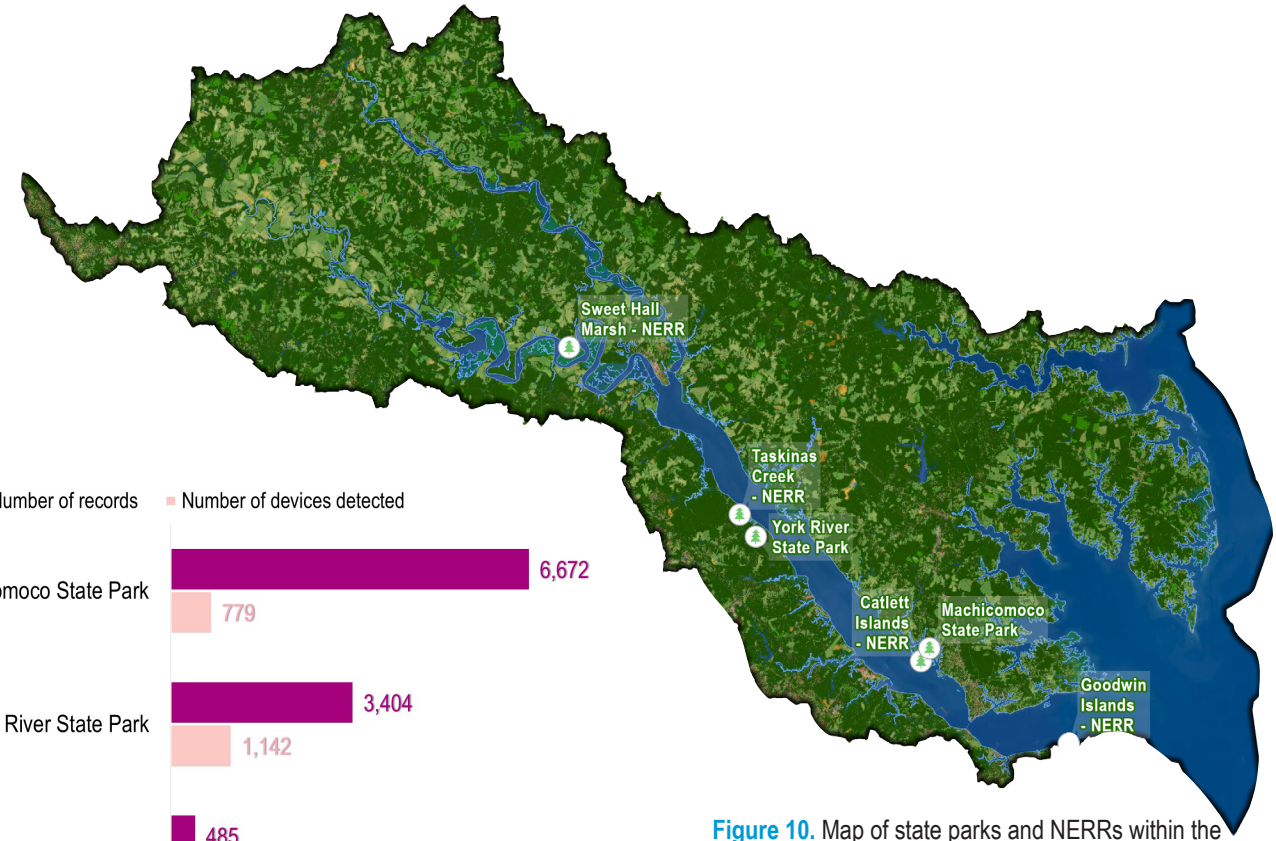


Figure 9. Total device-hours per month and time of day in the York River 500-meter buffered area in 2022. Device-hours are the number of unique devices multiplied by the duration (hours) of device activity.

4 HUMAN ACTIVITY IN PARK AREAS

HMD for 2022 was analyzed for six park and reserve areas within the MPHFA boundary: Machicomoco State Park, York River State Park, Taskinas Creek NERR, Catlett Islands NERR, Sweet Hall Marsh NERR, and Goodwin Islands NERR.



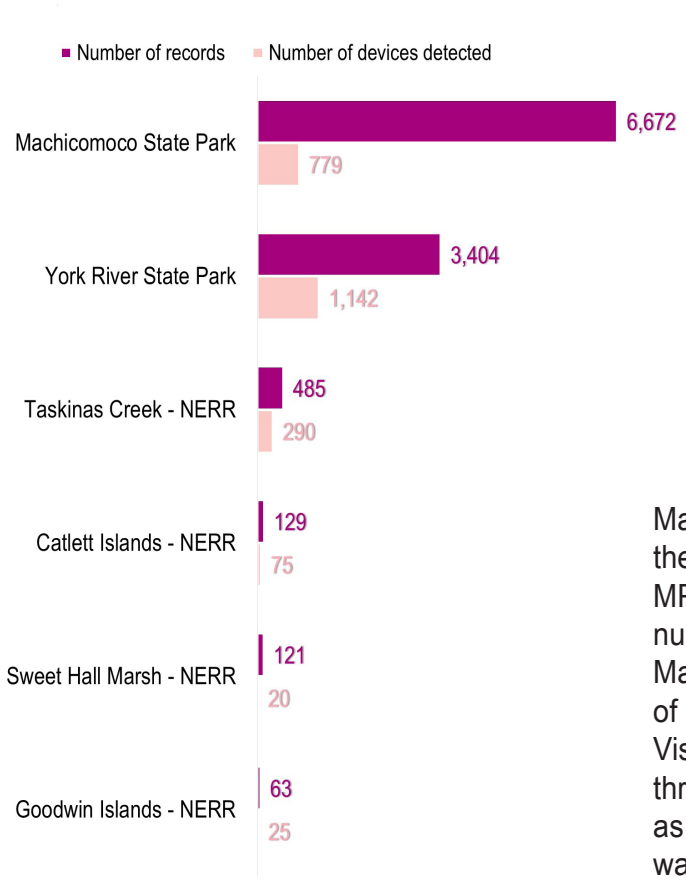


Figure 10. Map of state parks and NERRs within the MPHFA included in the analysis.

Machicomoco State Park and York River State Park were the most visited of the six parks and NERRs within the MPHFA. While York River State Park had the greatest number of unique visitors, visitors spent more time at Machicomoco State Park, as indicated by the number of records in dark magenta in the bar charts to the left. Visitation hot spots in parks (Figures 11 and 15) and NERRs throughout the HFA seem to align with park amenities, such as parking, trailheads, visitor and interpretive centers, and water access (e.g., boat ramps, fishing piers, beaches) although more research is needed to fully quantify these relationships.

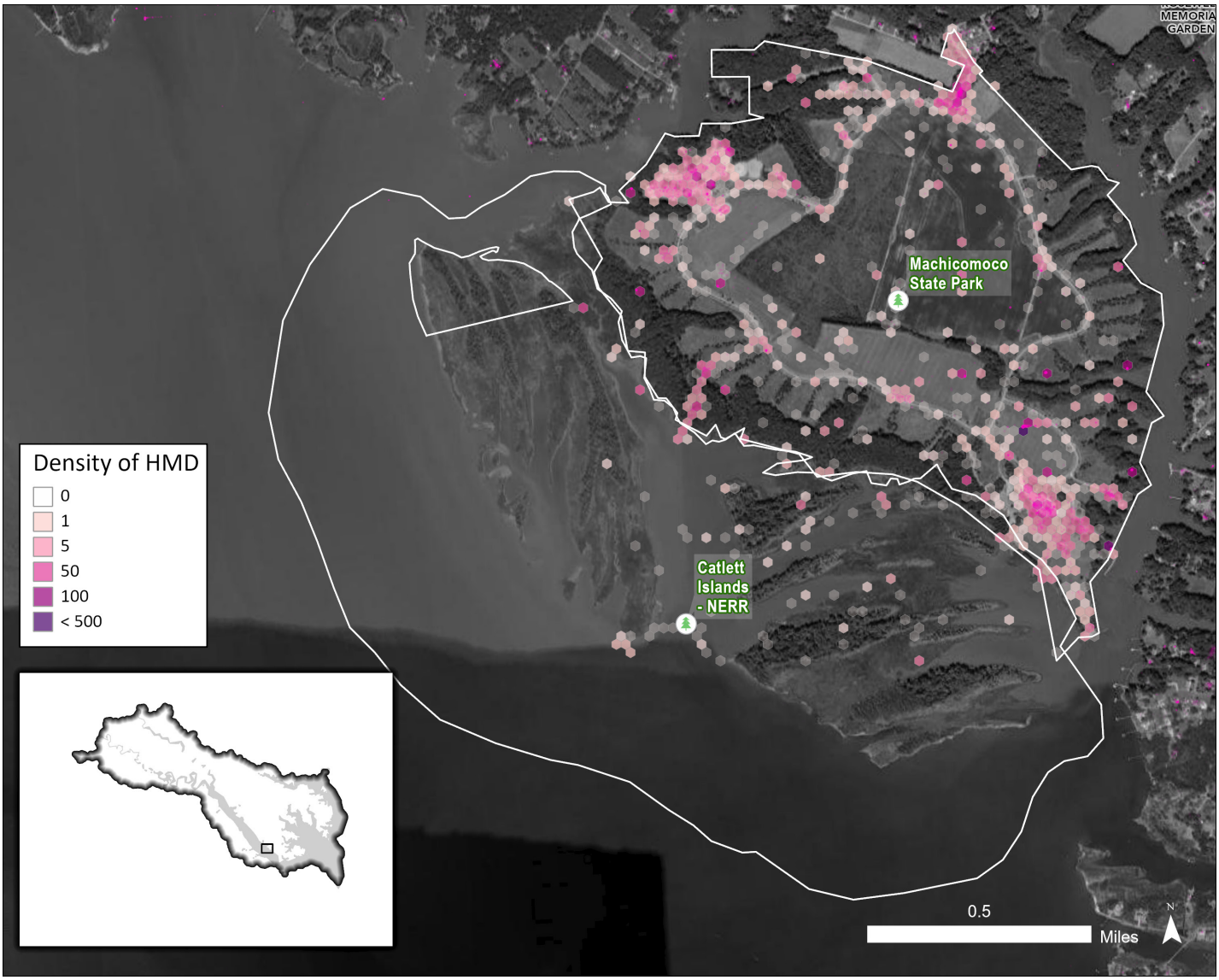


Figure 11. Map of human mobility data records summarized by count per 1,000-m^2 hexagon grid in Machicomoco State Park and the neighboring Catlett Island NERR in 2022.

Figures 12, 13, and 14 show temporal trends in 2022 HMD for Machicomoco State Park. Figures 16, 17, and 18 show temporal trends in the neighboring Catlett Islands NERR. These data suggest that most activity (based on device-hours) occurred in the morning hours of July, but the highest number of unique devices present occurred in the midday hours of November. April, May, and September were the least active months according to all measures (records, devices, and device-hours).

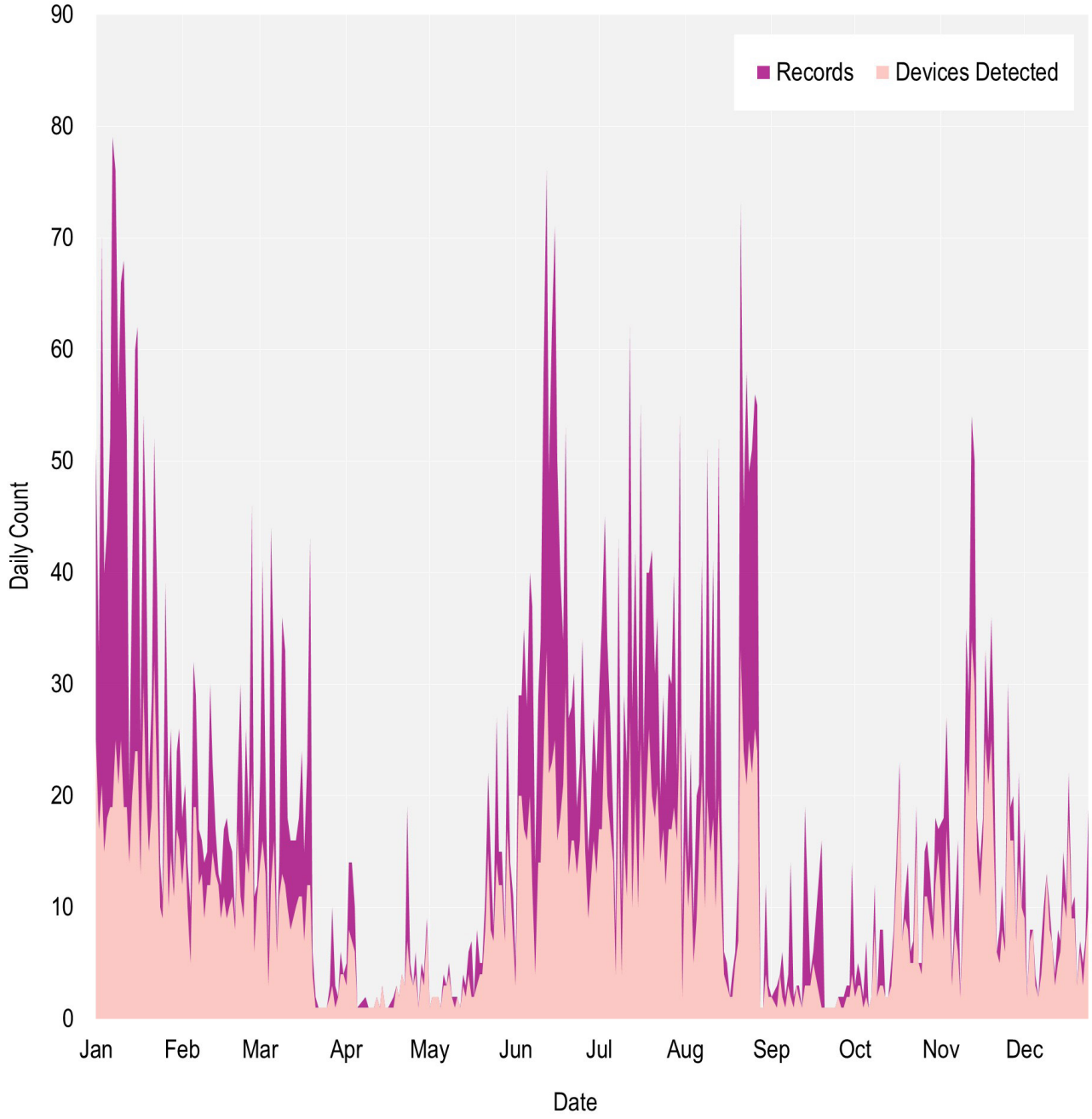


Figure 12. Number of records and unique devices detected per month in Machicomoco State Park and Catlett Islands NERR in 2022.

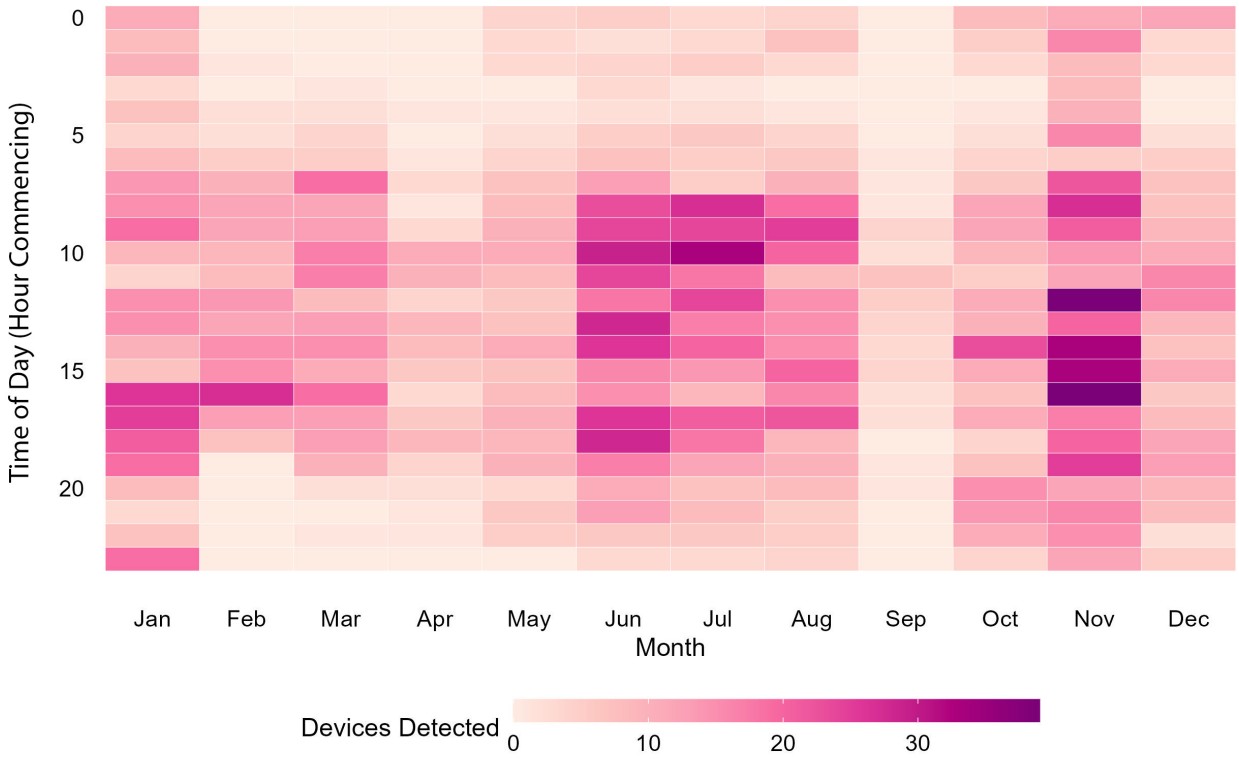


Figure 13. Number of unique devices per month and time of day in Machicomoco State Park and Catlett Islands NERR in 2022.

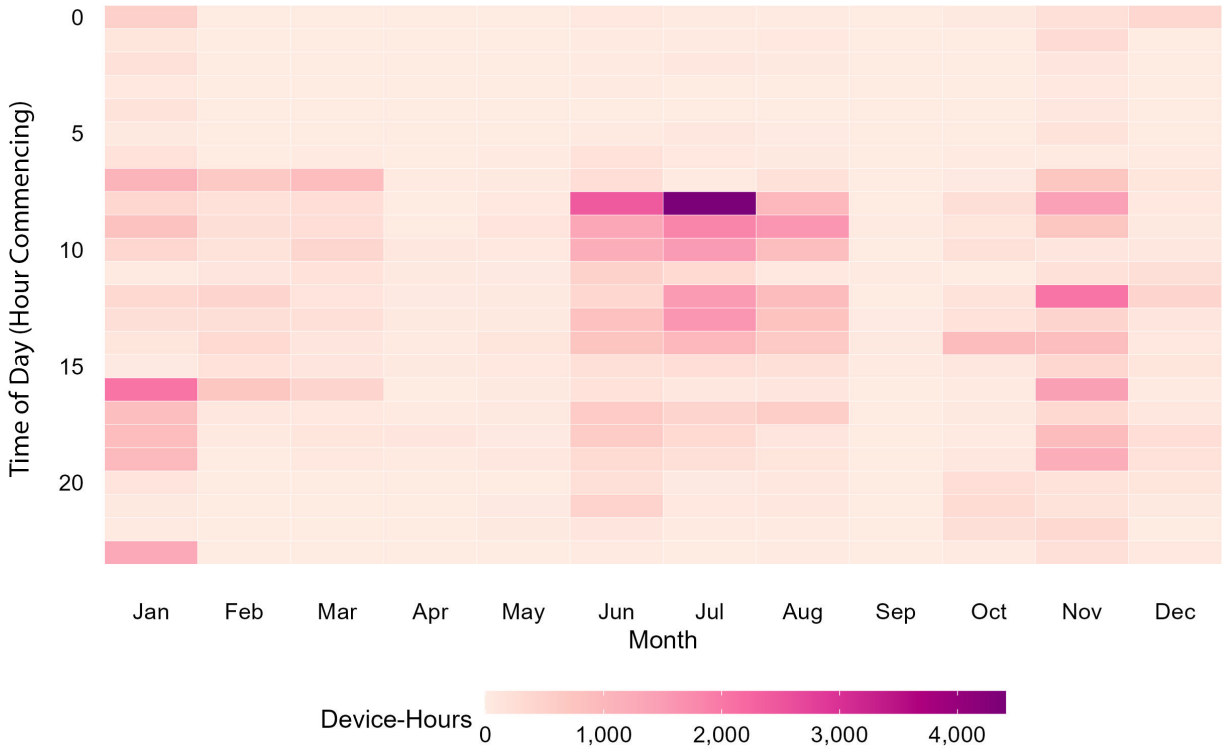


Figure 14. Total device-hours per month and time of day in Machicomoco State Park and Catlett Islands NERR in 2022. Device-hours are the number of unique devices multiplied by the duration (hours) of device activity.

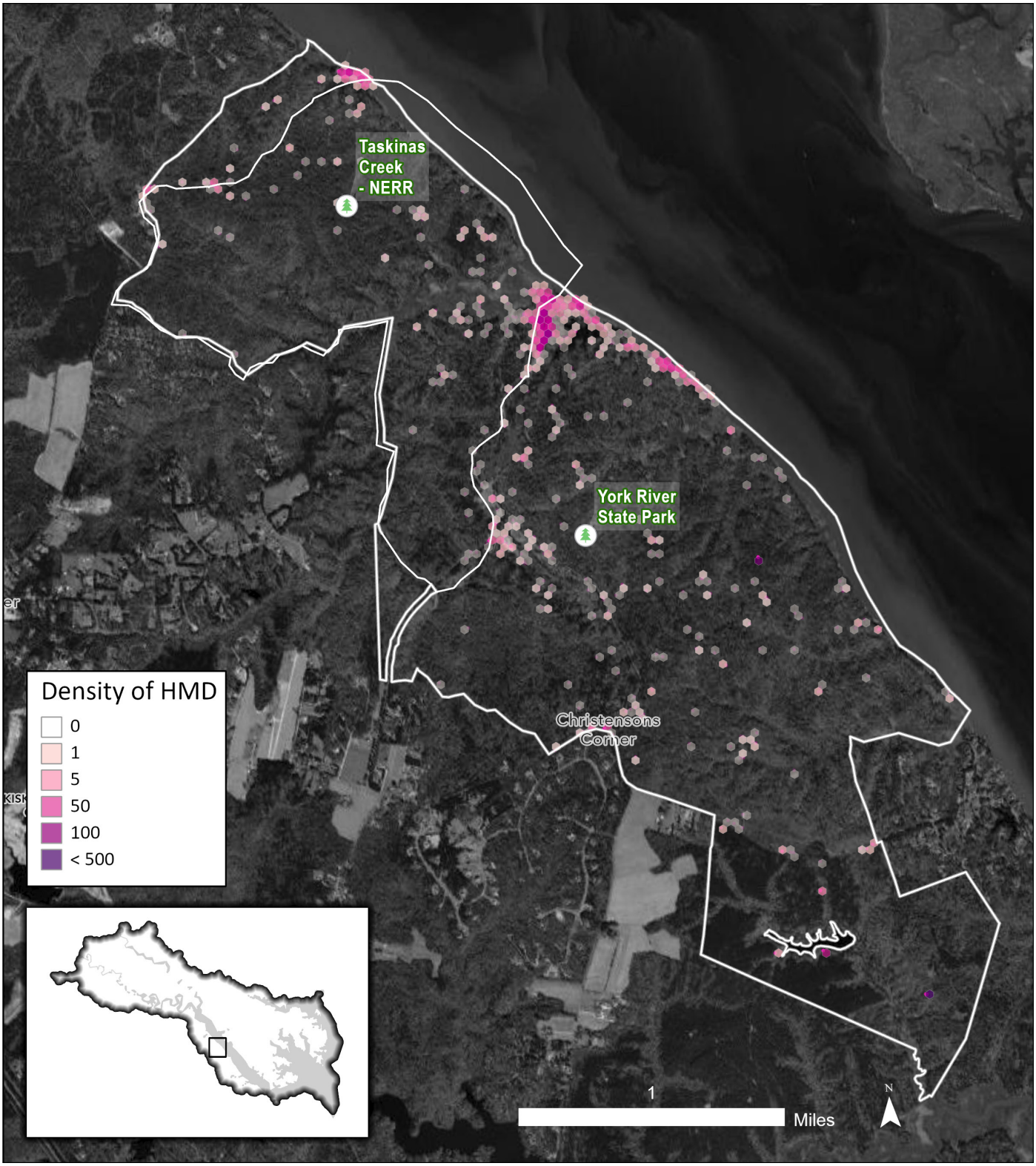


Figure 15. Map of human mobility data records summarized by count per 1,000-m^2 hexagon grid in York River State Park and neighboring Taskinas Creek NERR in 2022.

Temporal trends in 2022 HMD for York River State Park and the neighboring Taskinas Creek NERR suggest that, while more devices overall were detected here (compared to Machicomoco State Park), activity (based on device-hours) was not as high. This indicates that visits to this park were shorter in duration. The number of devices detected was fairly consistent throughout the year, with a peak in December. Higher activity based on device-hours occurred in the midday hours of May and June (Figure 18). April and September were the least active months according to all measures (records, devices, and device-hours).

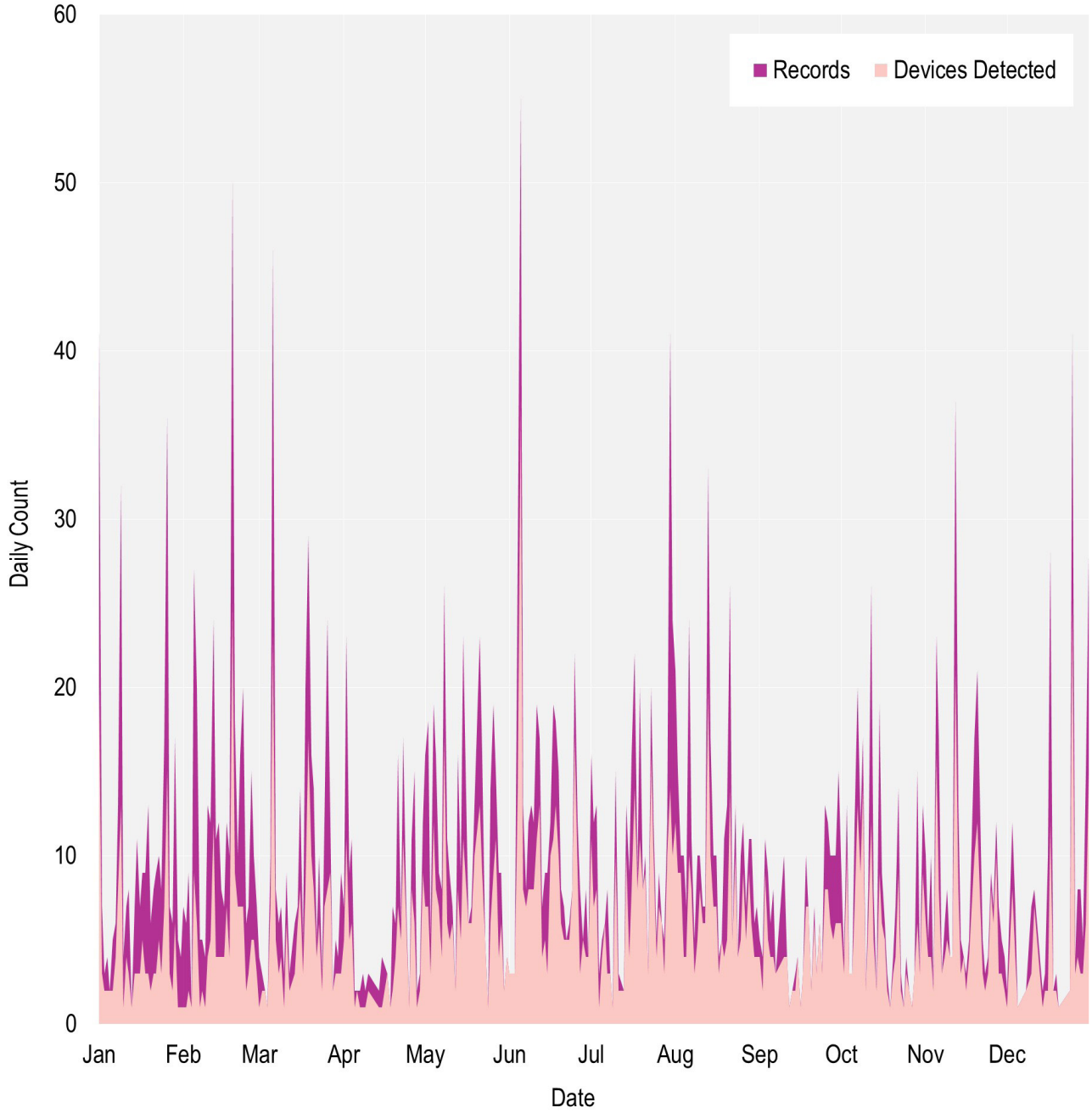


Figure 16. Number of records and unique devices detected per month in York River State Park and Taskinas Creek NERR in 2022.

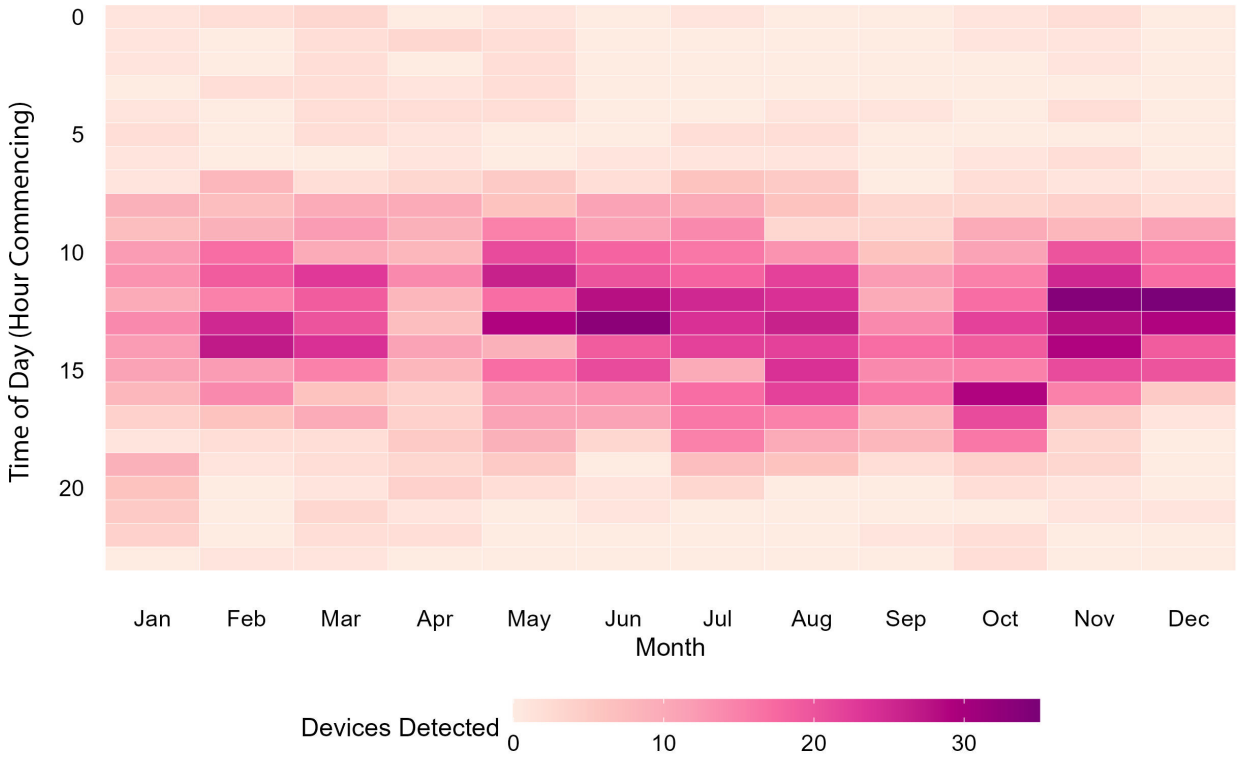


Figure 17. Number of unique devices per month and time of day in York River State Park and Taskinas Creek NERR in 2022.

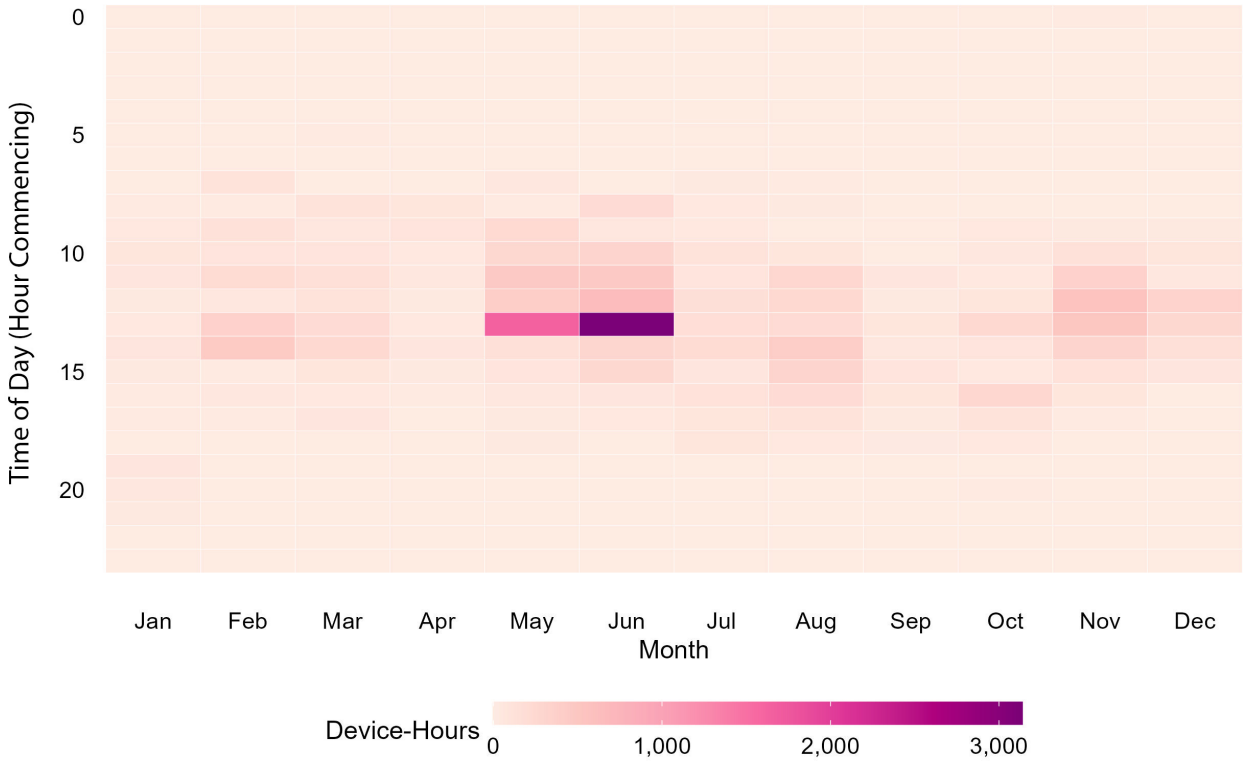


Figure 18. Total device-hours per month and time of day in York River State Park and Taskinas Creek NERR in 2022. Device-hours are the number of unique devices multiplied by the duration (hours) of device activity.

Mapping visitor use in the Middle Peninsula, VA

For more information, please see the project page:

https://coastalscience.noaa.gov/project/using-anonymous-cell-phone-data-to-characterize-visitor-use-patterns-in-the-middle-peninsula-virginia/

NOAA National Ocean Service
National Centers for Coastal Ocean Science
Marine Spatial Ecology Division, Biogeography Branch
Silver Spring, MD 20910
USA