

## Coastal Habitats Status and Trends

This document contains information on coastal habitats composition as well as expected habitat shifts with climate change for Chesapeake Bay Segments in Virginia

\*Note: For some Chesapeake Bay Segments, habitat composition estimates do not include headwater habitats. Therefore, in some cases reported habitat quantity may be underestimated.

\**Developed* riparian lands include the following land uses

- Residential
- Commercial
- Military
- Educational (schools)
- Paved
- Bare
- Industrial
- Timbered

\*Shoreline hardening or armoring includes the following alterations

- Bulkhead (aka seawall)
- Dilapidated bulkhead
- Marina
- Riprap revetment
- Wharf
- Miscellaneous/unconventional /debris- e.g. broken concrete rubble

### Data sources:

Tidal Marshes - Tidal Marsh Inventory (TMI)

Shoreline condition & Riparian land use - VIMS-CCRM Shoreline Inventory

Beaches - VIMS-CCRM Shoreline Inventory & VIMS Shoreline Studies Survey

Submerged Aquatic Vegetation - VIMS SAV monitoring Program

Shallow Water - VIMS-CCRM Seamless 3-d topographic/bathymetric elevation surface

Imagery - Virginia Base Mapping Program (VBMP, Preliminary Imagery 2009)

**Potomac River**

POTTF - Upper Potomac River

POTOH- Middle Potomac River

POTMH - Lower Potomac River

**Pocomoke River**

POCOH - Upper Pocomoke River

POCMH - Lower Pocomoke River

York River and Tributaries

MPNTF - Upper Mattaponi River

MPNOH - Lower Mattaponi River

PMKTF - Upper Pamunkey River

PMKOH - Lower Pamunkey River

YRKMH - Middle York River

YRKPH - Lower York River

**James River and Tributaries**

JMSTF - Upper James River

CHKOH - Chickahominy River

JMSOH - Upper James River

JMSMH - Middle James River

JMSPH - Lower James River

**Rappahannock River**

RPPTF - Upper Rappahannock River

RPPOH - Middle Rappahannock River

RPPMH - Lower Rappahannock River

**Chesapeake Bay**

CB5MH - Upper Western Chesapeake Bay

**TANMH - Tangier Island**

CB6PH - Chesapeake Bay Western Shore

CB7PH - Chesapeake Bay Eastern Shore

CB8PH - Chesapeake Bay Near Mouth

**Corrotoman River**

CRRMH - Corrotoman River

**Southern Chesapeake Bay Rivers**

ELIPH - Elizabeth River

LAFMH - Laffayette River

LYNPH - Lynnhaven River

**Piankatank River**

PIAMH - Piankatank River

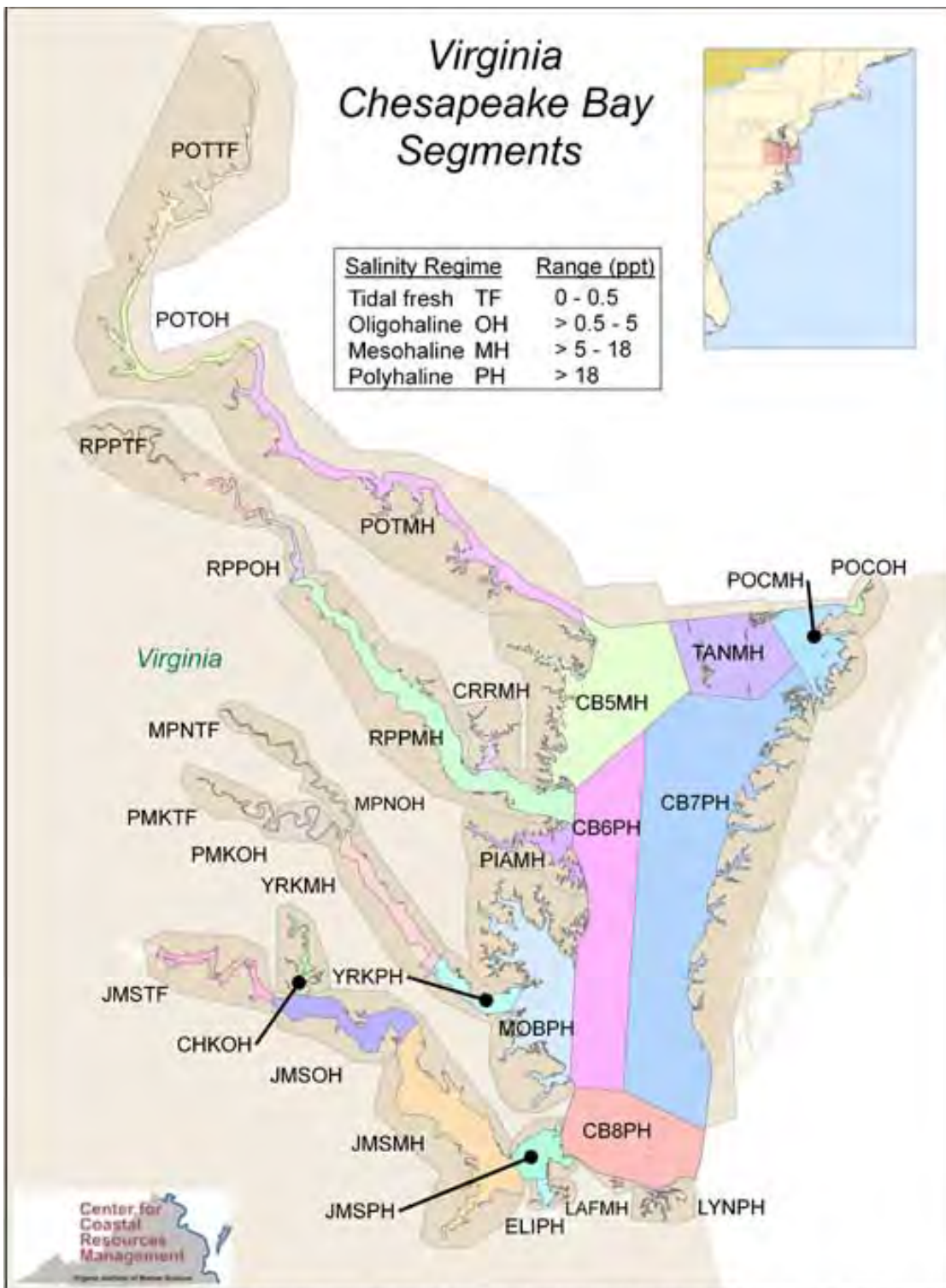
**Mobjack Bay**

MOBPH - Mobjack Bay

# Virginia Chesapeake Bay Segments

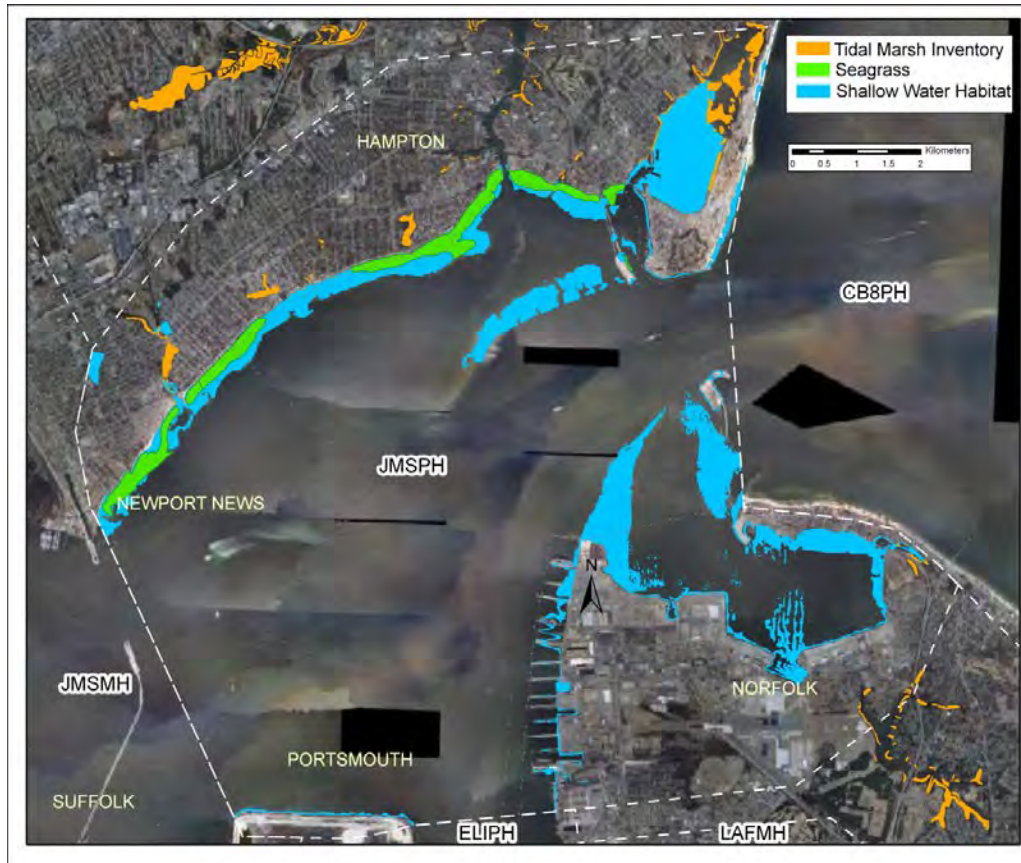


Salinity Regime	Range (ppt)
Tidal fresh TF	0 - 0.5
Oligohaline OH	> 0.5 - 5
Mesohaline MH	> 5 - 18
Polyhaline PH	> 18



\*Chesapeake Bay Program Segments modified by CCRM to be inclusive of riparian lands for climate change modeling  
 Last two letters in Segment label indicate the salinity regime (e.g. TF = Tidal Fresh)

## Lower James River–Polyhaline (JMSPH)



### CURRENT COASTAL HABITAT COMPOSITION

- **0.8 km<sup>2</sup>** Tidal wetlands
- **1.5 km<sup>2</sup>** Submerged Aquatic Vegetation
- **9.8 km<sup>2</sup>** Shallow Water
- **4.4 km** Beaches

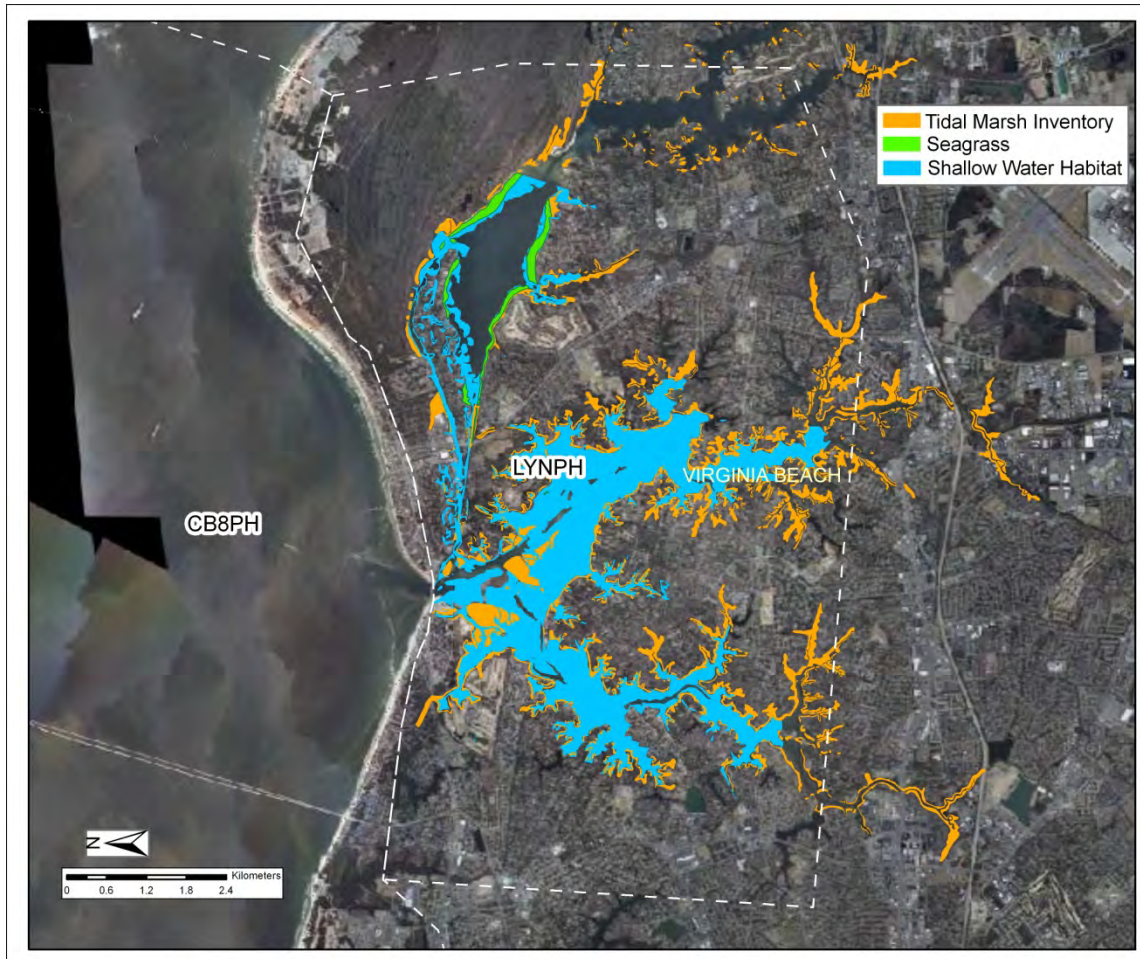
The Lower James River (polyhaline) segment includes the mouth of the river and is located in the Cities of Newport News, Norfolk, Portsmouth and Hampton. Of the shoreline surveyed, riparian lands are highly developed (75%, mostly commercial) and the shoreline extremely altered (52% armored, excluding military wharfs). Inventories have not been completed for Hampton. These four cities have high average annual rates of permitted shoreline hardening ranging on average from 0.2-1.1 km/yr hardened (0.1 to 0.4% of the shoreline).

### COASTAL HABITATS SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Lynnhaven River–Polyhaline (LYNPH)



### CURRENT COASTAL HABITAT COMPOSITION

- **5.2 km<sup>2</sup>** Tidal wetlands
- **0.4 km<sup>2</sup>** Submerged Aquatic Vegetation
- **11.2 km<sup>2</sup>** Shallow Water
- **2.0 km** Beaches

Lynnhaven River is located in Virginia Beach a region with highly developed riparian lands (74%). The segment includes Eastern Branch and Western Branch of the river, and Lynnhaven, Broad, and Linkhorn Bays. Shoreline conditions within this segment include 46 km of hardened structure (28% of shoreline altered). Virginia Beach has a high average annual rate of permitted shoreline hardening of 3.6 km/yr (0.3% of the shoreline).

### COASTAL HABITATS SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Elizabeth River–Polyhaline (ELIPH)



### CURRENT COASTAL HABITAT COMPOSITION

- **0.3 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **3.2 km<sup>2</sup>** Shallow Water
- **0.3 km** Beaches

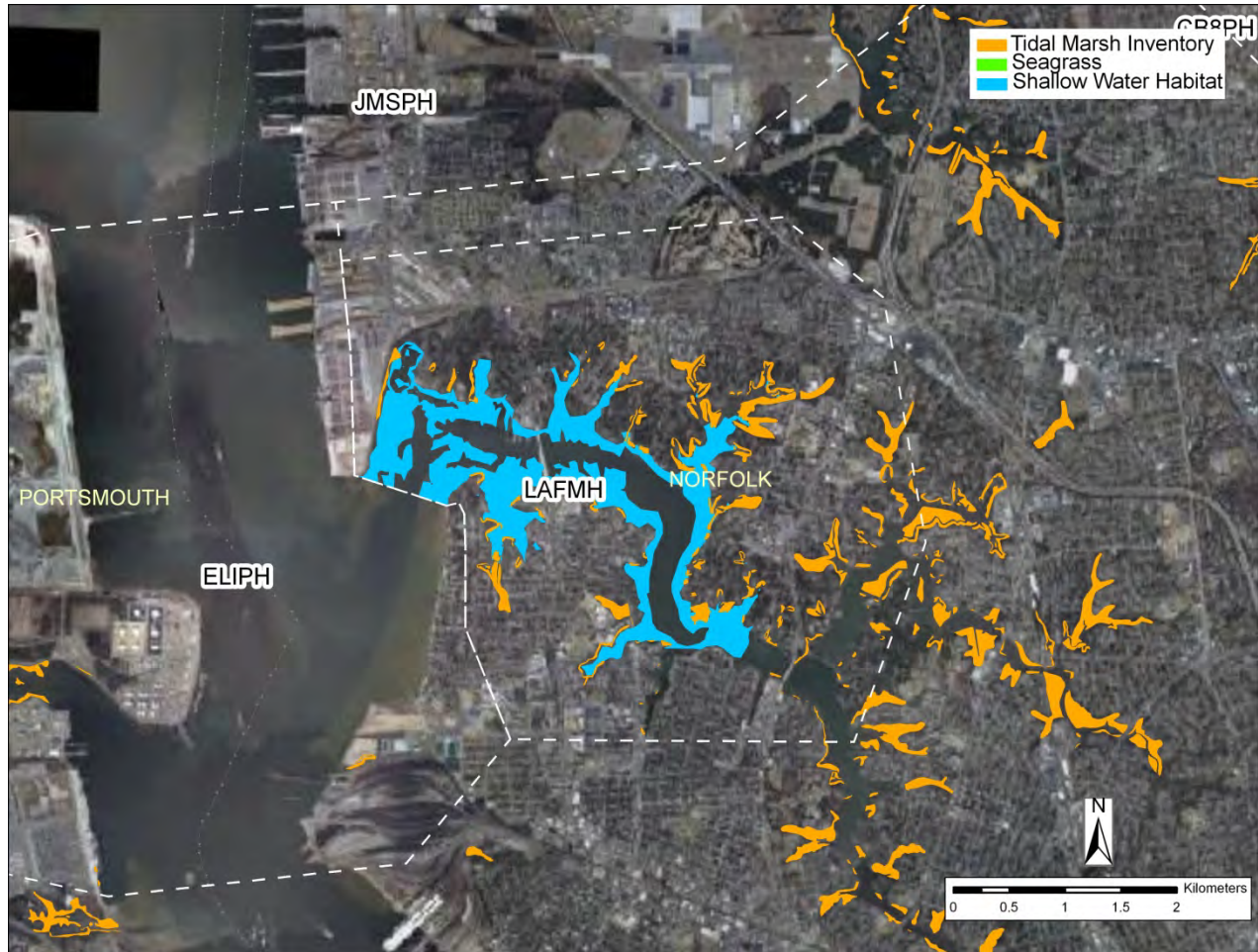
Mainstem Elizabeth River, located in the Cities Norfolk and Portsmouth, is a highly developed harbor with military and industrial use, including the US Army Disposal Area at Craney Island. The segment has approximately 61% developed riparian lands and 18 km of hardened structure (69% of shoreline altered). Portsmouth and Norfolk have moderate-high average annual rates of permitted shoreline hardening ranging from 0.2-1.1 km/yr (0.2-0.4% of the shoreline).

### COASTAL HABITATS SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Laffayette River–Mesohaline (LAFMH)



### CURRENT COASTAL HABITAT COMPOSITION

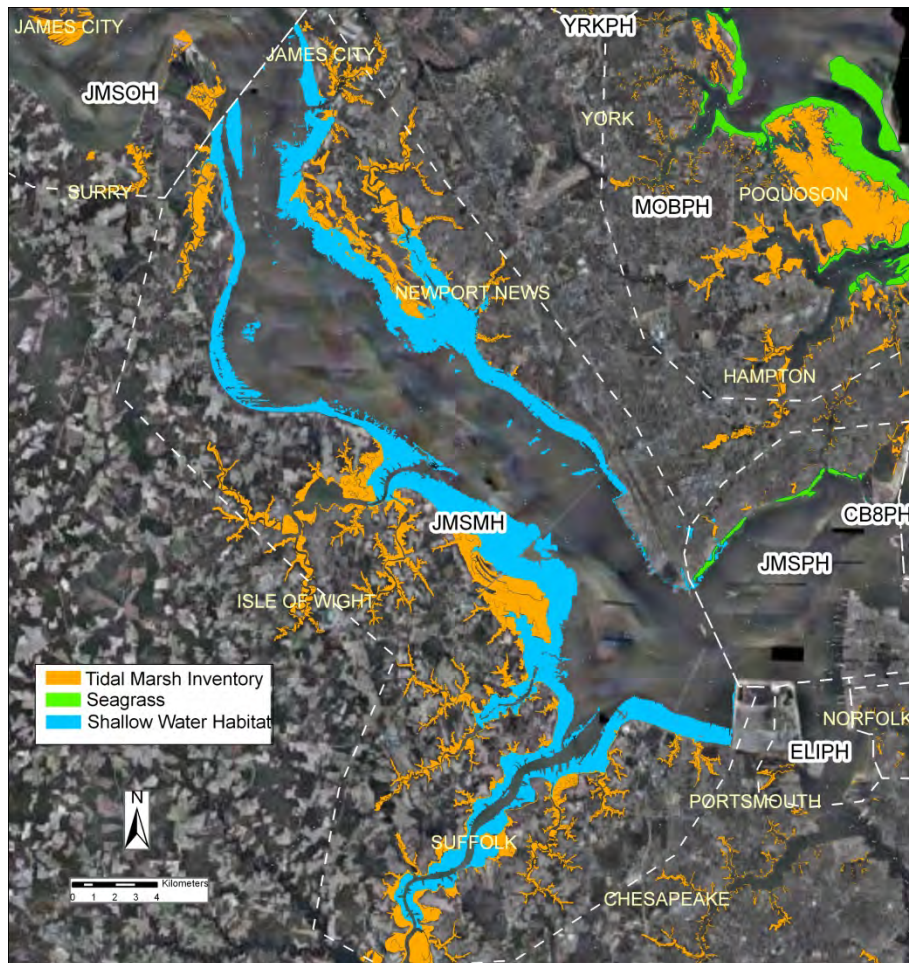
- **0.9 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **2.1 km<sup>2</sup>** Shallow Water
- **1.4 km** Beaches

The Lafayette River empties into the Elizabeth River and is entirely located in the City of Norfolk. The segment has 78% of riparian lands developed and 28 km of hardened structure (45% of shoreline altered). Norfolk has a high average annual rate of permitted shoreline hardening of 1.1 km/yr (0.4% of the shoreline).

### COASTAL HABITATS SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Middle James River–Mesohaline (JMSMH)



### CURRENT COASTAL HABITAT COMPOSITION

- **57.4 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **94.2 km<sup>2</sup>** Shallow Water
- **47.4 km** Beaches

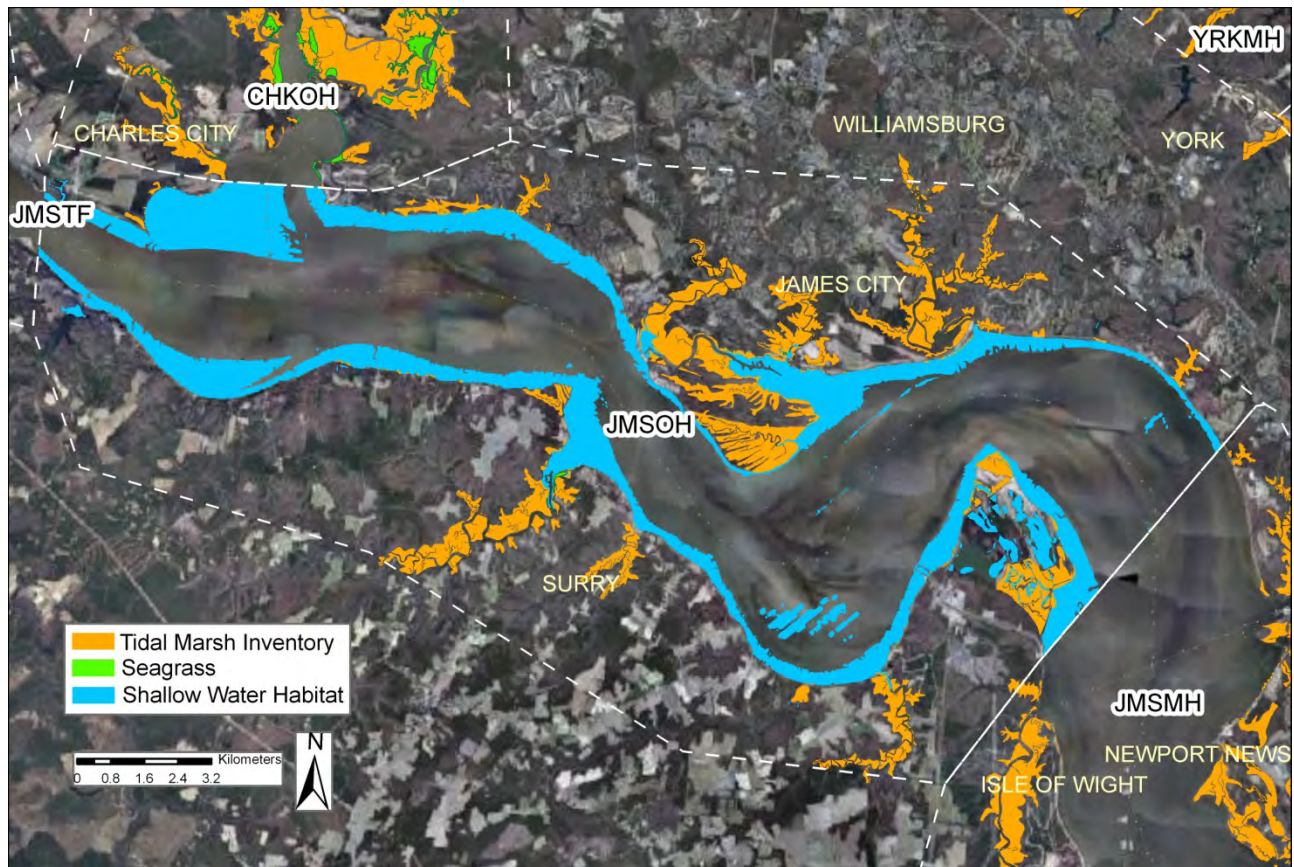
The Middle James River is located in Isle of Wight, Suffolk Counties and City of Newport News. This segment extends from the James River Bridge to just south of Hog Island near the Surry Nuclear Power Plant and includes the Warwick, Pagan, and Nanesmond rivers. Much of the surveyed shoreline (427 km) is undeveloped (27% developed riparian lands & 11% hardened shoreline). However, the northern shore along Newport News has a high average annual rate of permitted shoreline hardening of 1.1 km/yr (0.4% of the shoreline), and the southern shore (Suffolk and Isle of Wight) have moderate rates of 0.2-0.3 km/yr (0.1% of the shoreline).

### COASTAL HABITATS SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Upper James River–Oligohaline (JMSOH)



### CURRENT COASTAL HABITAT COMPOSITION

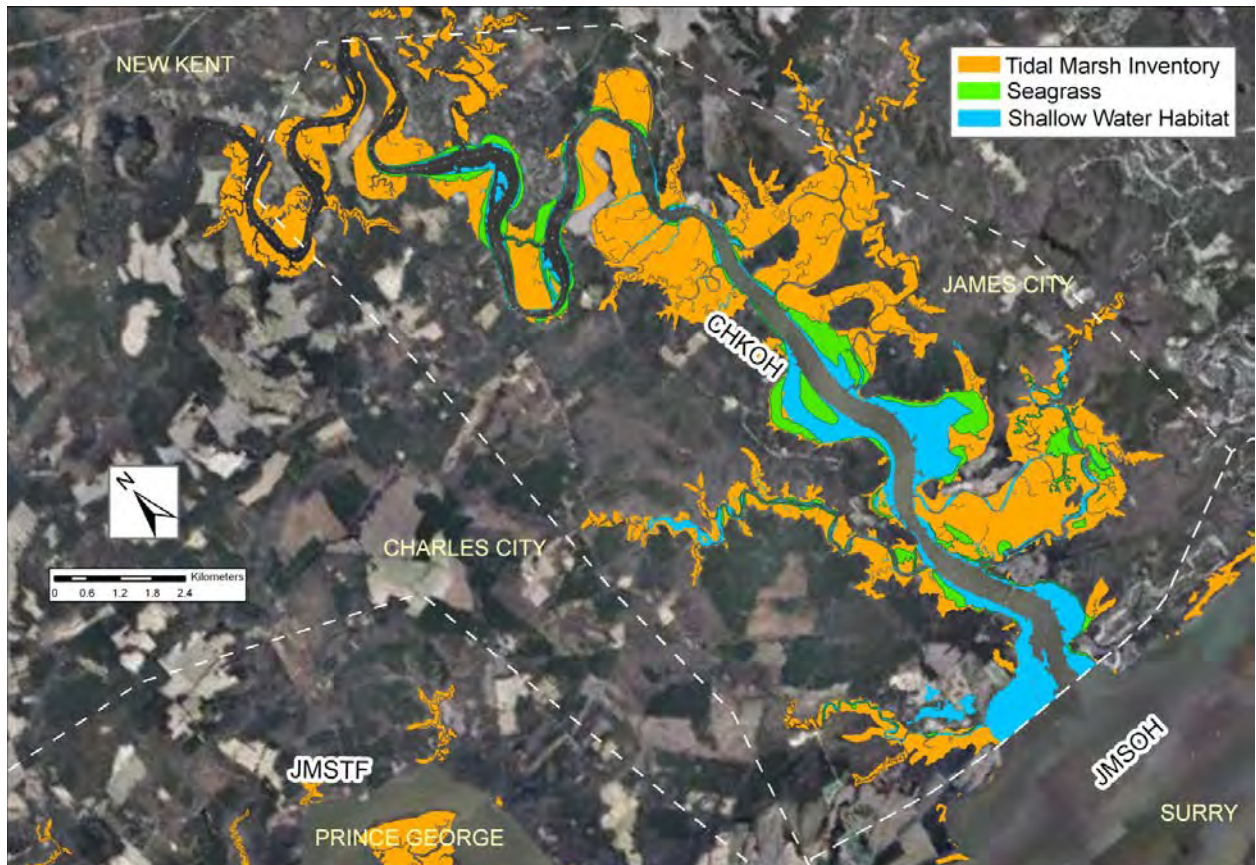
- **16.1 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **36.3 km<sup>2</sup>** Shallow Water
- **36.4 km** Beaches

The Upper James River (oligohaline) is located in James City and Surry Counties extending slightly upriver of the mouth of the Chickahominy River. Much of the surveyed shoreline (61km) is undeveloped (22% developed riparian lands and 23% hardened shoreline). The northern Shore along James City County has a moderate average annual rate of permitted shoreline hardening of 0.5 km/yr (0.1% of the shoreline), and the southern shore (Surry) has a similar rate of 0.1 km/yr (0.08 % of the shoreline).

### COASTAL HABITATS SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Chickahominy River–Oligohaline (CHKOH)



### CURRENT COASTAL HABITAT COMPOSITION

- **27.2 km<sup>2</sup>** Tidal wetlands
- **4.3 km<sup>2</sup>** Submerged Aquatic Vegetation
- **14.5 km<sup>2</sup>** Shallow Water
- **No Data** Beaches

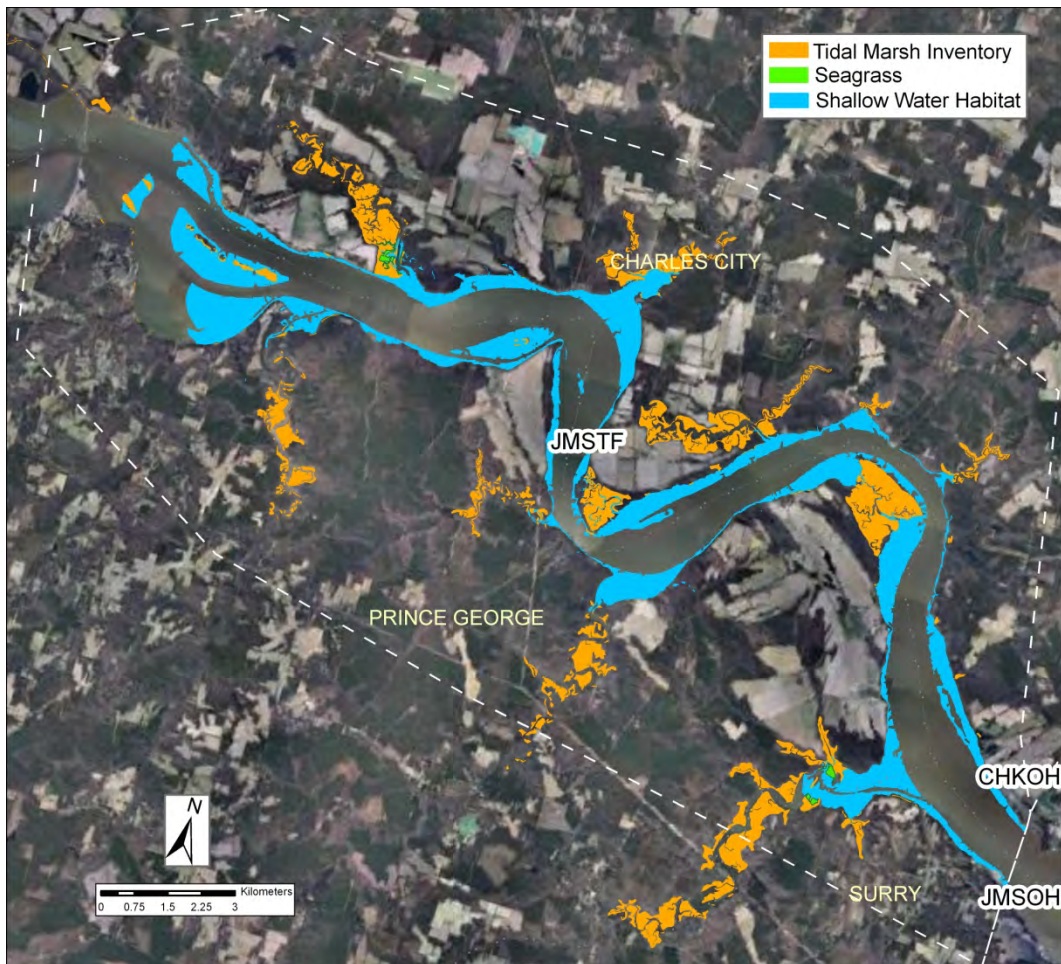
The Chickahominy River is located in James City and Charles City Counties. To date, only the upper reaches of the river have been inventoried (33km) and much of the shoreline is undeveloped (31% developed riparian lands and 12% hardened shoreline). The eastern shore along James City County has a moderate average annual rate of permitted shoreline hardening of 0.5 km/yr (0.11% of the shoreline), while the western shore (Charles City) has a low rate of 0.2 km/yr (0.05 % of the shoreline).

### COASTAL HABITATS SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## James River–Tidal Fresh (JMSTF)



### CURRENT COASTAL HABITAT COMPOSITION

- **16.1 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **36.3 km<sup>2</sup>** Shallow Water
- **36.4 km** Beaches

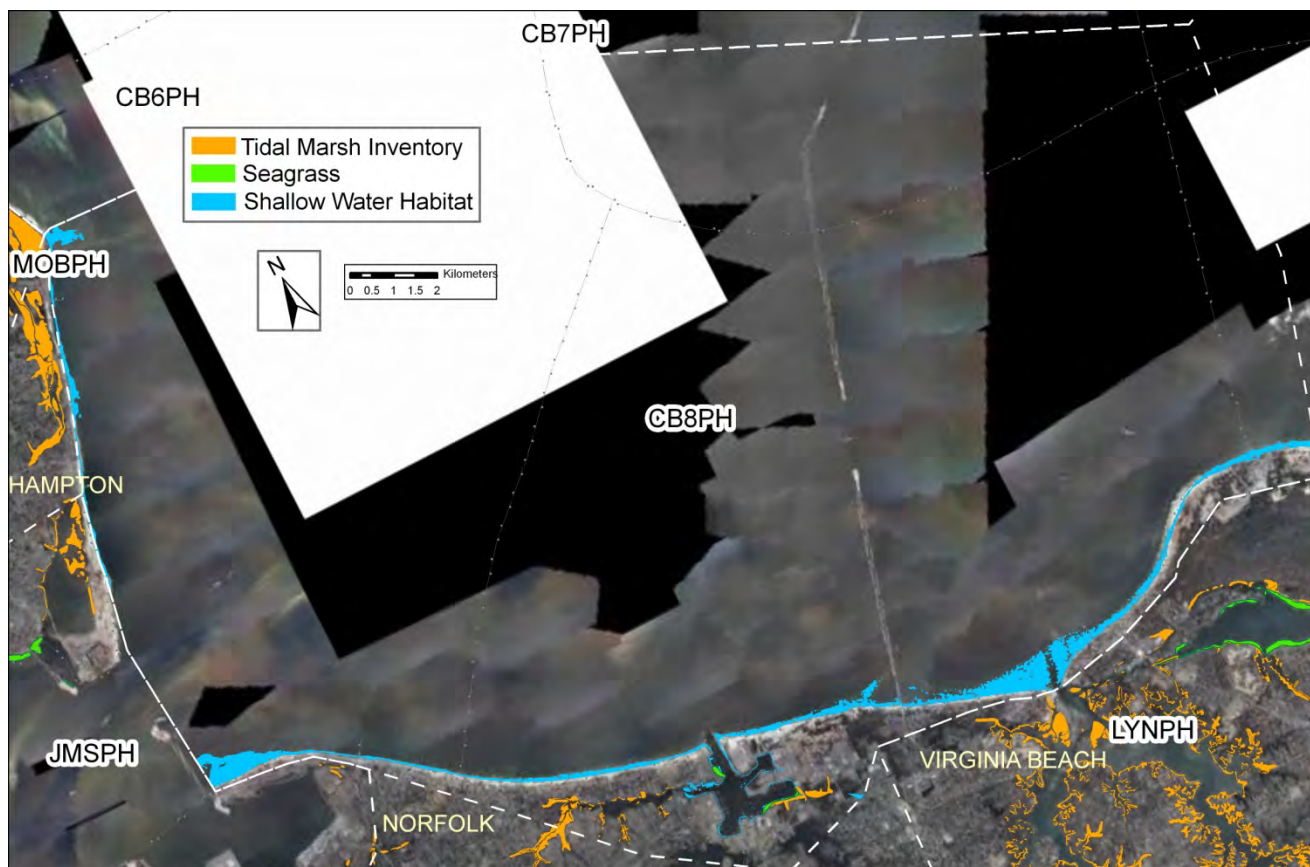
The lower tidal freshwater James River segment is located in Charles City, Prince George and Surry Counties extending upriver to the mouth of the Appomattox River. To date, shoreline inventories have not been completed in these counties. Both shores have low-moderate average annual rates of permitted shoreline hardening ranging from 0.1-0.2 km/yr (0.04-0.08% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Chesapeake Bay Near Mouth–Polyhaline (CB8PH)



### CURRENT COASTAL HABITAT COMPOSITION

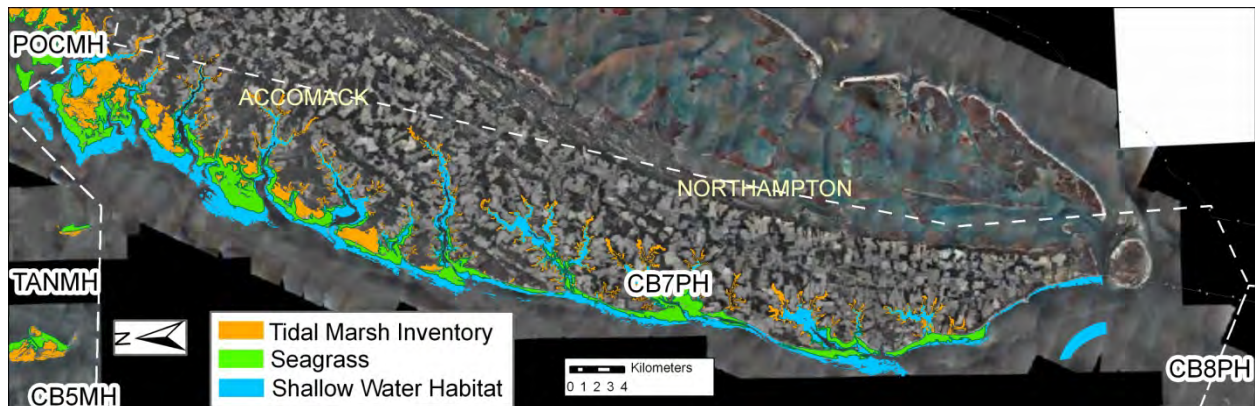
- **0.7 km<sup>2</sup>** Tidal wetlands
- **0.1 km<sup>2</sup>** Submerged Aquatic Vegetation
- **79.8 km<sup>2</sup>** Shallow Water
- **12.7 km** Beaches

The Lower Chesapeake Bay adjoins Norfolk, Virginia Beach and Hampton, all highly developed cities. To date, riparian lands inventoried are 68% developed with 24% of shorelines hardened (41 km total surveyed). These three cities have high average annual rates of permitted shoreline hardening ranging on average from 0.6-3.6 km/yr hardened (0.3-0.4% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Chesapeake Bay Eastern Shore–Polyhaline (CB7PH)



### CURRENT COASTAL HABITAT COMPOSITION

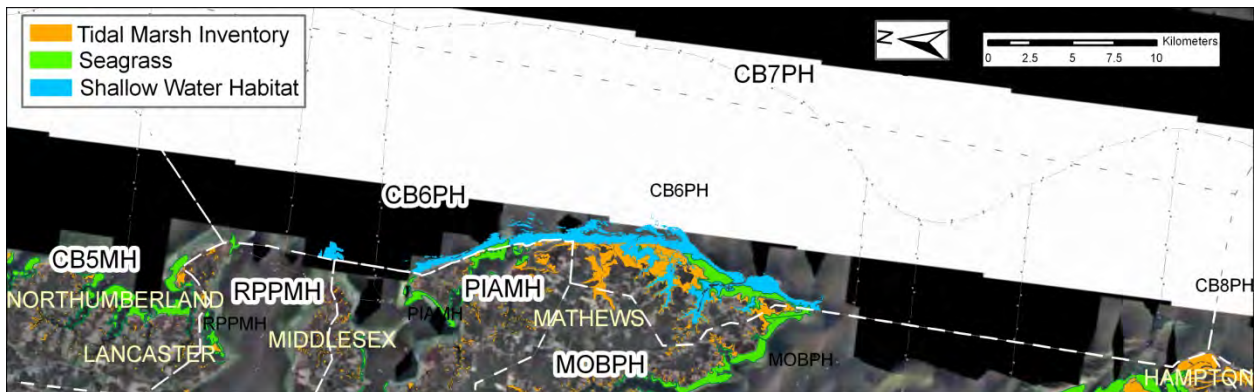
- **45.4 km<sup>2</sup>** Tidal wetlands
- **52.9 km<sup>2</sup>** Submerged Aquatic Vegetation
- **140.7 km<sup>2</sup>** Shallow Water
- **67.7 km** Beaches

Virginia's Eastern Shore of Chesapeake Bay is a low development region located in Accomack and Northampton Counties. Shorelines were inventoried in Accomack County which consists of 12% developed riparian lands (80 km), 5% agriculture (35 km), and 3% hardened shoreline (18 km of shoreline altered). Both counties have low average annual rates of permitted shoreline hardening ranging from 0.9-1.3 km/yr (0.04-0.05% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Chesapeake Bay Western Shore–Polyhaline (CB6PH)



### CURRENT COASTAL HABITAT COMPOSITION

- **9.8 km<sup>2</sup>** Tidal wetlands
- **4.3 km<sup>2</sup>** Submerged Aquatic Vegetation
- **25.0 km<sup>2</sup>** Shallow Water
- **17.2 km** Beaches

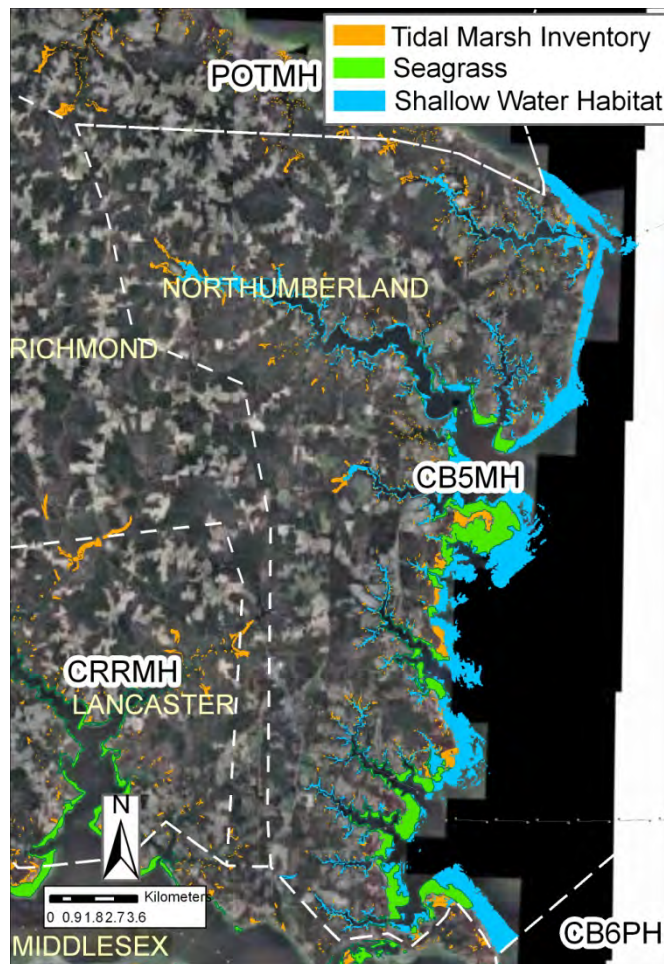
Virginia's Western Shore of Chesapeake Bay is located on the edges of Mathews, Middlesex, Lancaster and Northumberland Counties. Much of the surveyed shoreline (152 km) is undeveloped (23% developed riparian lands and 4% hardened shoreline). Across the counties, however, high average annual rates of permitted shoreline hardening exist (ranging from 1.5-5.0 km/yr (0.3-0.8% of the shoreline)).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Upper Western Chesapeake Bay–Mesohaline (CB5MH)



### CURRENT COASTAL HABITAT COMPOSITION

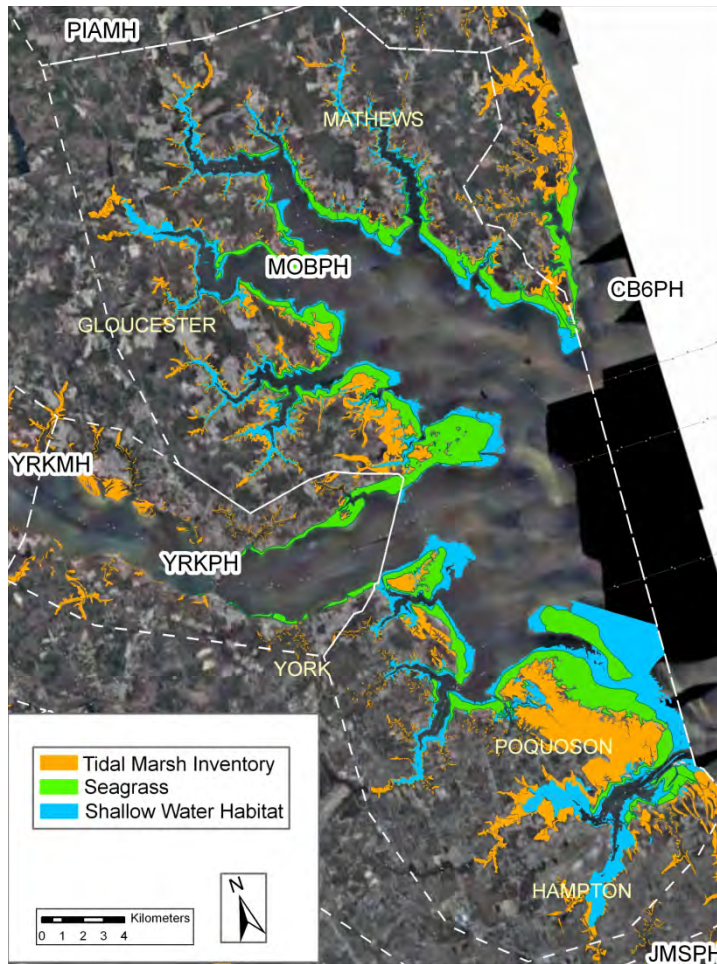
- **7.4 km<sup>2</sup>** Tidal wetlands
- **13.8 km<sup>2</sup>** Submerged Aquatic Vegetation
- **54.4 km<sup>2</sup>** Shallow Water
- **112.0 km** Beaches

The Upper Western Shore of the Mainstem Chesapeake Bay is located in Northumberland and Lancaster Counties, with moderately developed riparian lands (37% developed & 6% agriculture) and 16% shoreline armoring (112 km of shoreline altered). Both counties have high average annual rates of permitted shoreline hardening ranging from 3.5-5.0 km/yr (0.7-0.8% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Mobjack Bay–Polyhaline (MOBPH)



### CURRENT COASTAL HABITAT COMPOSITION

- **6.5 km<sup>2</sup>** Tidal wetlands
- **4.4 km<sup>2</sup>** Submerged Aquatic Vegetation
- **19.9 km<sup>2</sup>** Shallow Water
- **22.7 km** Beaches

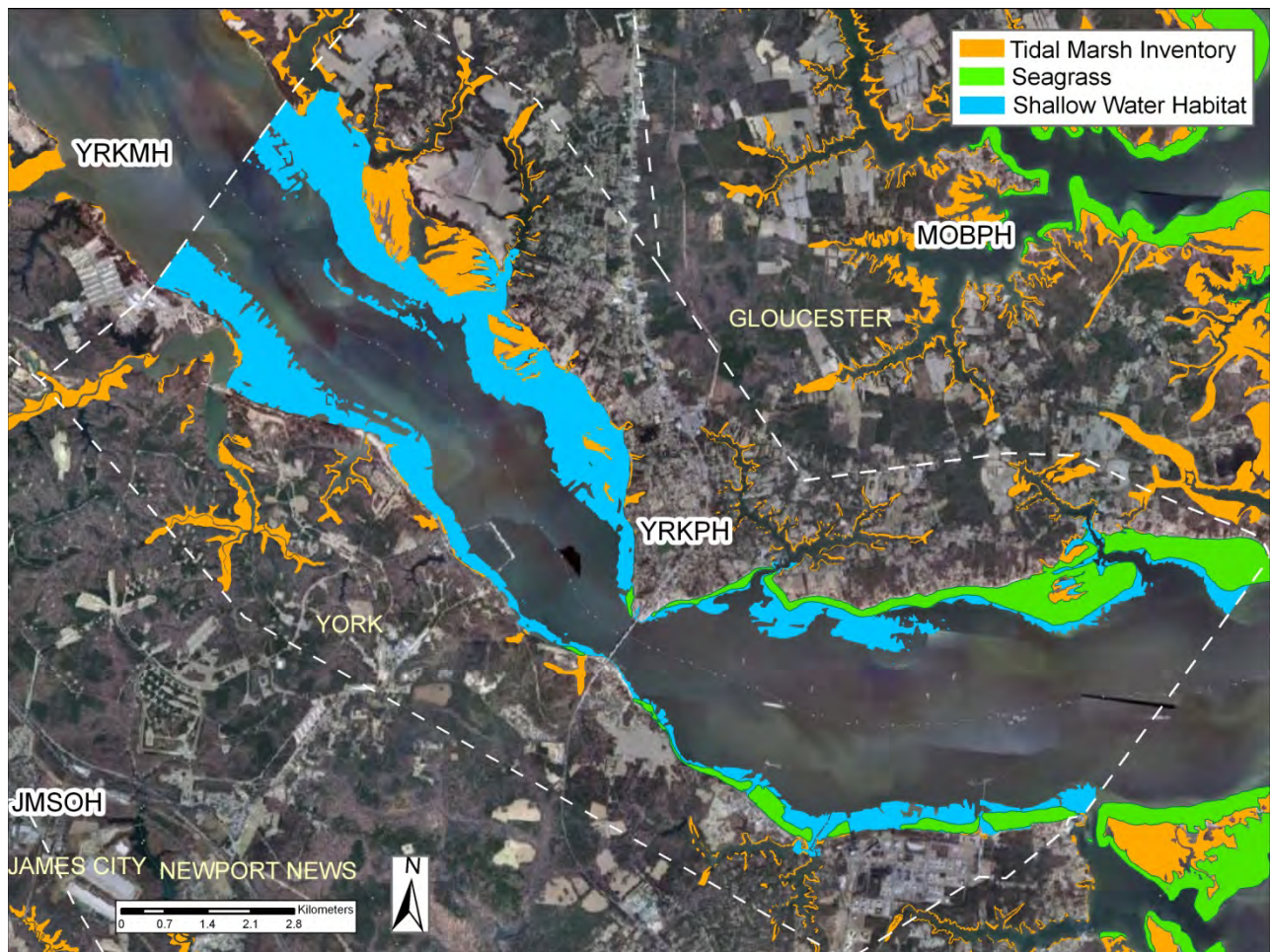
The Mobjack Bay and surrounds are located in Gloucester, Mathews, York, Poquoson and Hampton Counties. The segment includes East, North, Ware, Severn, Poquoson, and Back rivers, Guinea Marshes, Goodwin Islands, and the mouth of the York River. Much of the surveyed shoreline (913 km) is undeveloped (25% developed riparian lands and 6% hardened shoreline). All counties have moderate-high average annual rates of permitted shoreline hardening ranging from 0.4-1.5 km/yr (0.2-0.3% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Lower York River–Polyhaline (YRKPH)



### CURRENT COASTAL HABITAT COMPOSITION

- **6.5 km<sup>2</sup>** Tidal wetlands
- **4.4 km<sup>2</sup>** Submerged Aquatic Vegetation
- **19.9 km<sup>2</sup>** Shallow Water
- **22.7 km** Beaches

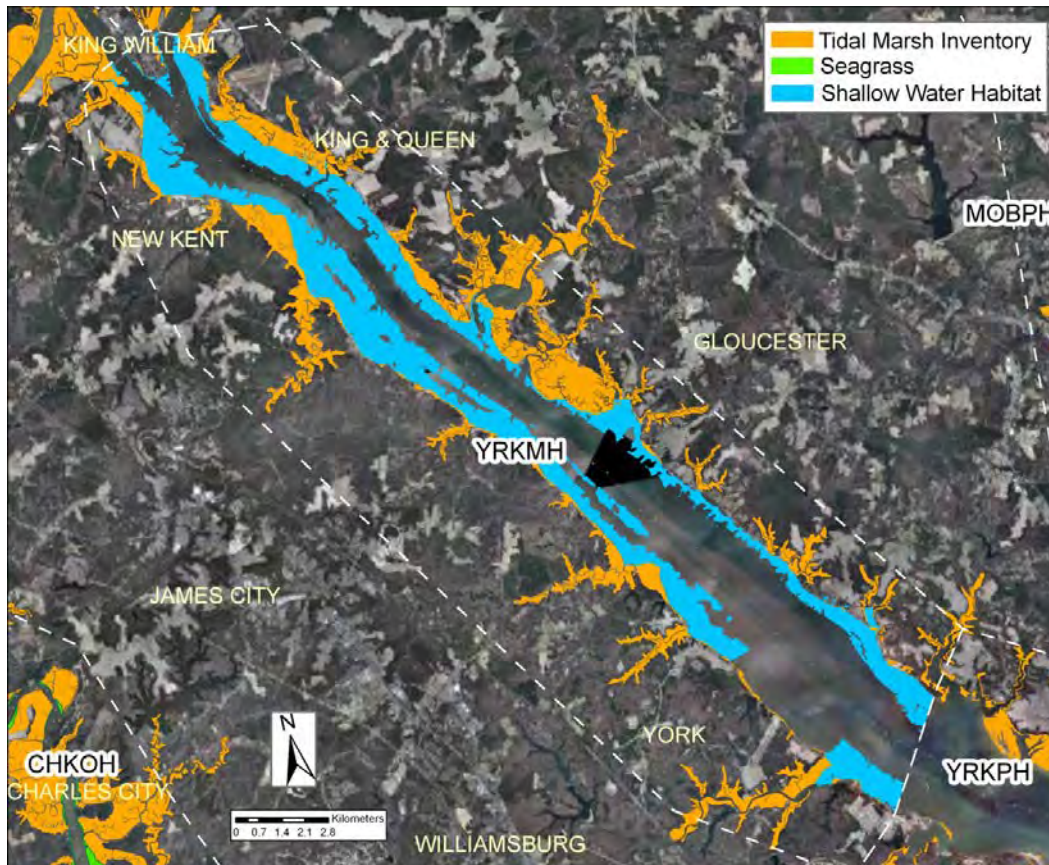
The Lower York River segment is located in York and Gloucester Counties and extends from the river mouth to slightly upriver of Cheatham Annex. Much of the shoreline is developed (45% developed riparian lands (mostly residential), and 28% hardened shoreline). Both counties have moderate-high average annual rates of permitted shoreline hardening ranging from 0.9-1.3 km/yr (0.2-0.3% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Middle York River–Mesohaline (YRKMH)



### CURRENT COASTAL HABITAT COMPOSITION

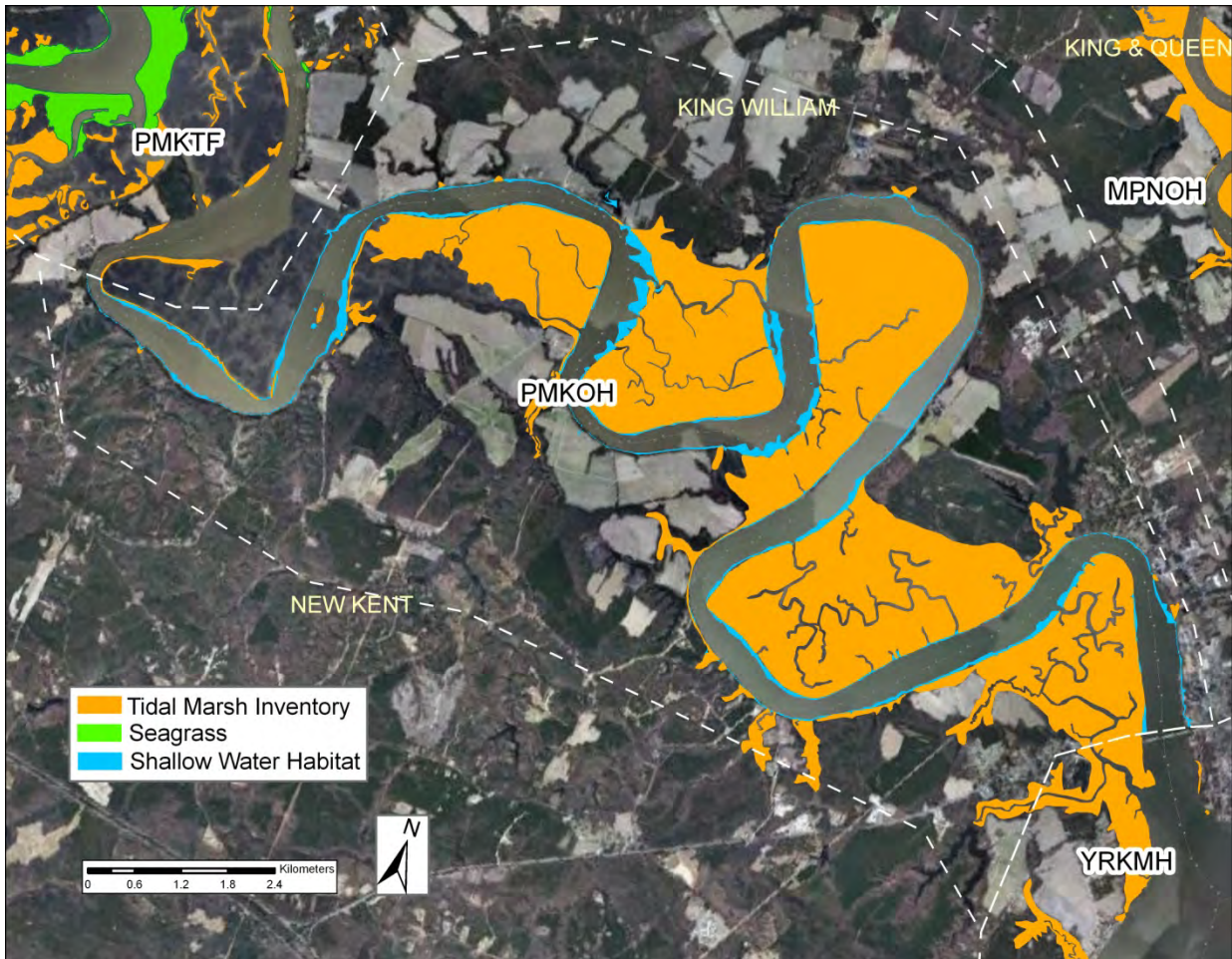
- **30.1 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **36.8 km<sup>2</sup>** Shallow Water
- **16.8 km** Beaches

The Middle York River is located in York, Gloucester, James City, King & Queen, and New Kent Counties. The segment extends from the polyhaline waters above Cheatham Annex to the mouths of the Pamunkey and Mattaponi Rivers (West Point). Much of the shoreline is undeveloped (12% developed riparian lands (mostly residential), and 5% hardened shoreline). As one moves upriver to less populated regions, average annual rates of permitted shoreline hardening decrease. York, Gloucester and James City Counties have moderate-high rates ranging from 0.5-1.3 km/yr (0.1-0.3% of the shoreline), and New Kent and King and Queen have low rates ranging from 0.1-0.2 km/yr (0.04-0.05% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Lower Pamunkey River–Oligohaline (PMKOH)



### CURRENT COASTAL HABITAT COMPOSITION

- **21.8 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **2.4 km<sup>2</sup>** Shallow Water
- **2.8 km** Beaches

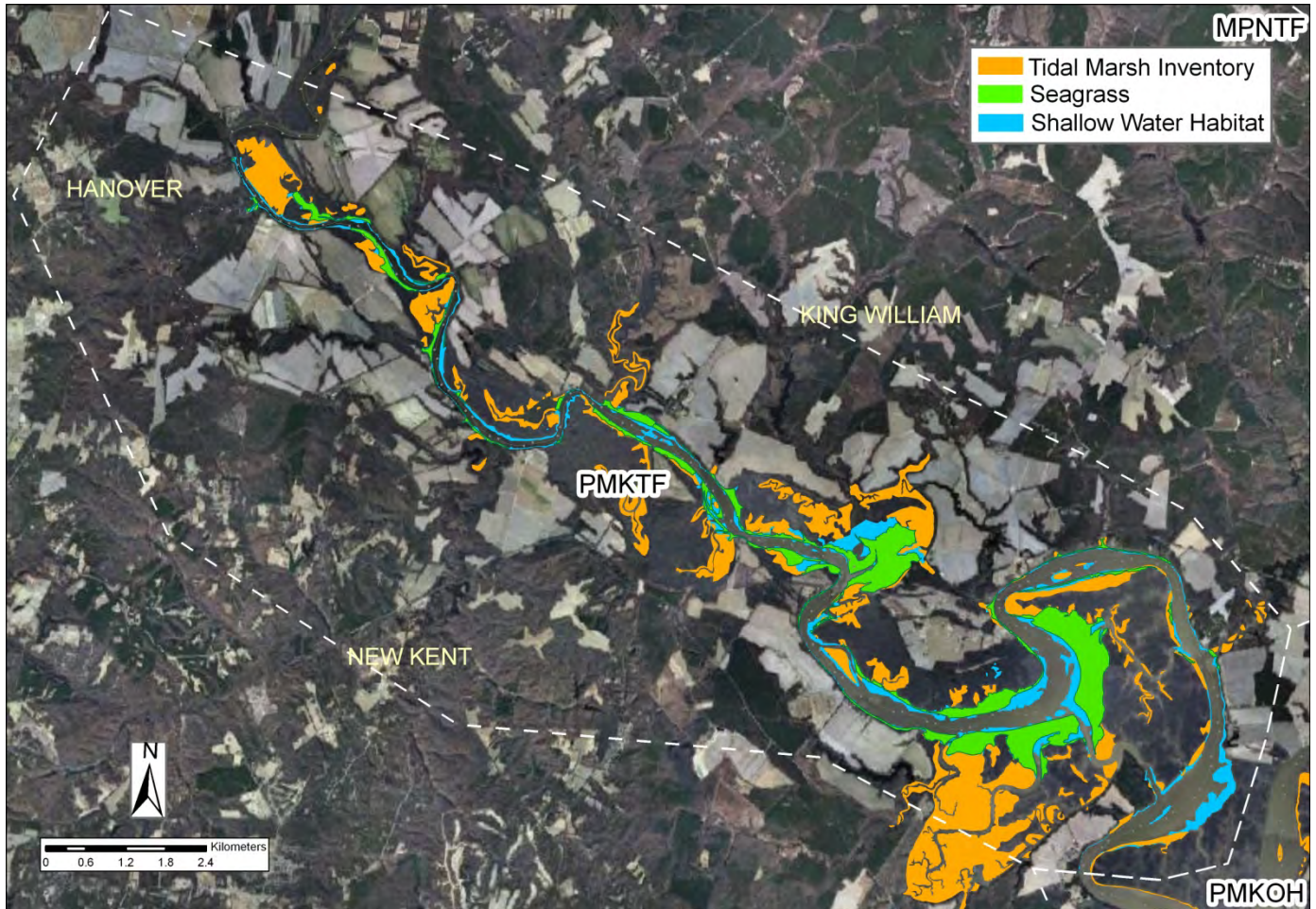
The Lower Pamunkey River is located in King & Queen and New Kent Counties extending from the river mouth (West Point) to Cohoke Marsh. The majority of the shoreline is undeveloped (8.6% developed riparian lands (predominantly residential), 4.4% agriculture, and 2.9% hardened shoreline). Both counties have low average annual rates of permitted shoreline hardening ranging from 0.1-0.2 km/yr (0.04-0.05% of the shoreline)

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Upper Pamunkey River–Tidal Fresh (PMKTF)



### CURRENT COASTAL HABITAT COMPOSITION

- **7.5 km<sup>2</sup>** Tidal wetlands
- **3.6 km<sup>2</sup>** Submerged Aquatic Vegetation
- **5.6 km<sup>2</sup>** Shallow Water
- **2.4 km** Beaches

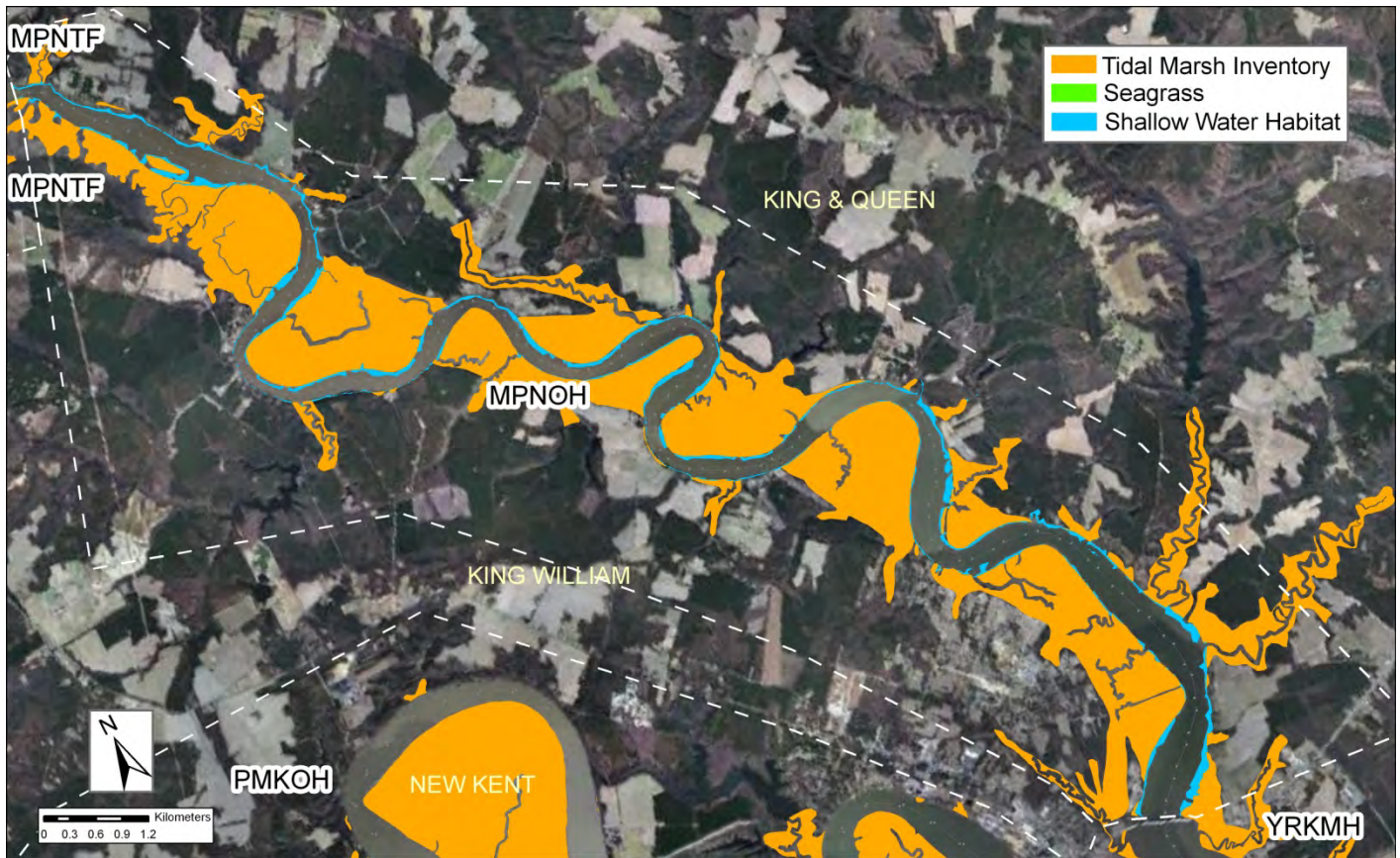
The Upper Pamunkey River is located in King William and New Kent Counties, extending upriver from Cohoke Marsh to Totopotomoy Creek. The majority of the shoreline is undeveloped (5.2% developed riparian lands (predominantly residential), 4.2% agriculture, and 1.8% hardened shoreline). Both counties have low average annual rates of permitted shoreline hardening of 0.2 km/yr (0.04-0.05% of the shoreline)

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Lower Mattaponi River–Oligohaline (MPNOH)



### CURRENT COASTAL HABITAT COMPOSITION

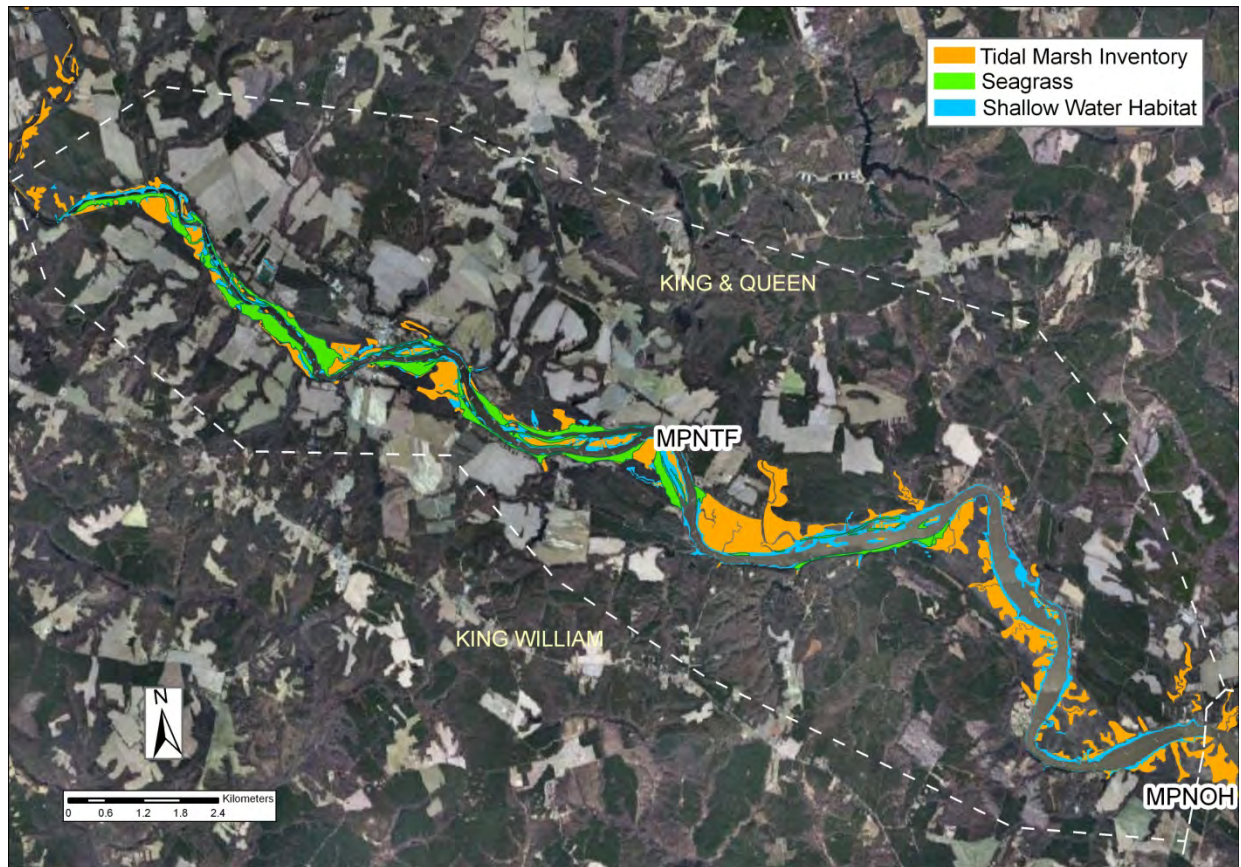
- **14.7 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **1.9 km<sup>2</sup>** Shallow Water
- **0.0 km** Beaches

The Lower Mattaponi River is located in King & Queen and King William Counties and extends from West Point to Courthouse Landing. Much of the shoreline is undeveloped (18% developed riparian lands and 3% hardened shoreline). Both counties have low average annual rates of permitted shoreline hardening ranging from 0.1-0.2 km/yr (0.04% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Upper Mattaponi River–Tidal Fresh (MPNTF)



### CURRENT COASTAL HABITAT COMPOSITION

- **5.1 km<sup>2</sup>** Tidal wetlands
- **1.9 km<sup>2</sup>** Submerged Aquatic Vegetation
- **3.5 km<sup>2</sup>** Shallow Water
- **0.2 km** Beaches

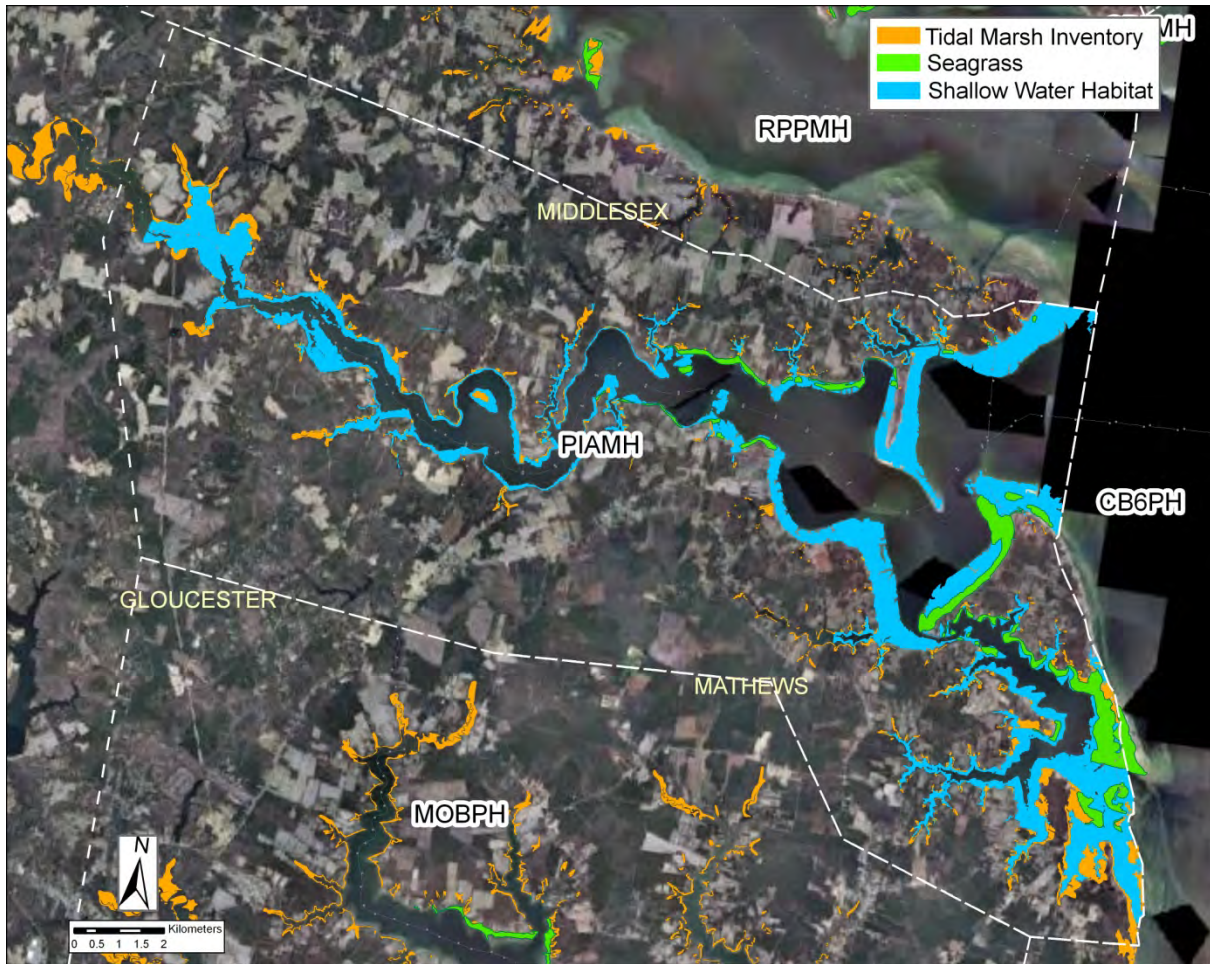
The Upper Mattaponi River is located in King & Queen and King William Counties and extends from Courthouse Landing to Aylett. Much of the shoreline is undeveloped (22% developed riparian lands and 3% hardened shoreline). Both counties have low average annual rates of permitted shoreline hardening ranging from 0.1-0.2 km/yr (0.04% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Piankatank River–Mesohaline (PIAMH)



### CURRENT COASTAL HABITAT COMPOSITION

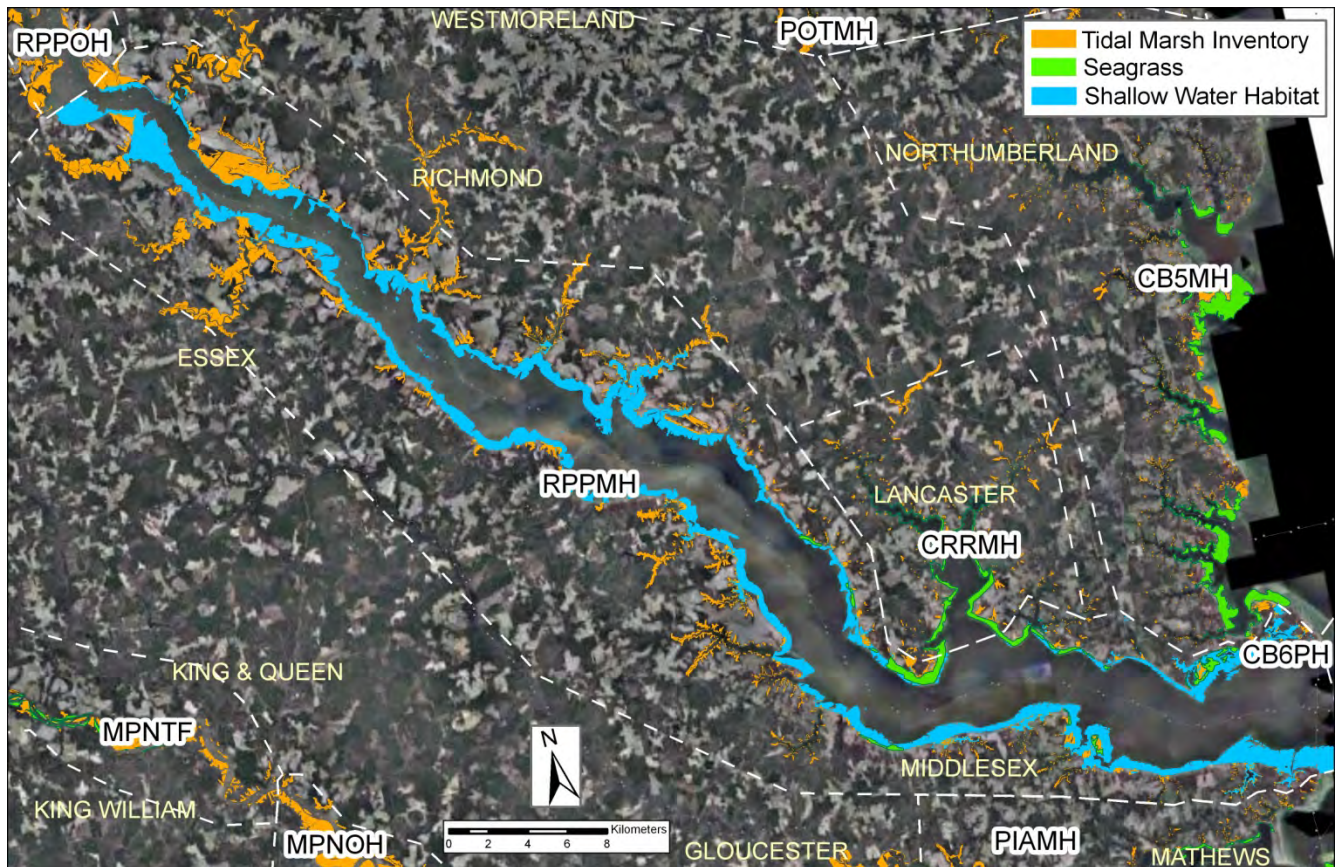
- **5.0 km<sup>2</sup>** Tidal wetlands
- **3.8 km<sup>2</sup>** Submerged Aquatic Vegetation
- **26.7 km<sup>2</sup>** Shallow Water
- **41.5 km** Beaches

The Piankatank River is located in Mathews, Gloucester and Middlesex Counties and is predominantly residential in character. Much of the shoreline is developed (52% developed riparian lands and 20% hardened shoreline). All counties have moderate-high average annual rates of permitted shoreline hardening ranging from 1.3-1.7 km/yr (0.2-0.5% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Lower Rappahannock River–Mesohaline (RPPMH)



### CURRENT COASTAL HABITAT COMPOSITION

- **36.6 km<sup>2</sup>** Tidal wetlands
- **4.5 km<sup>2</sup>** Submerged Aquatic Vegetation
- **84.4 km<sup>2</sup>** Shallow Water
- **140.4 km** Beaches

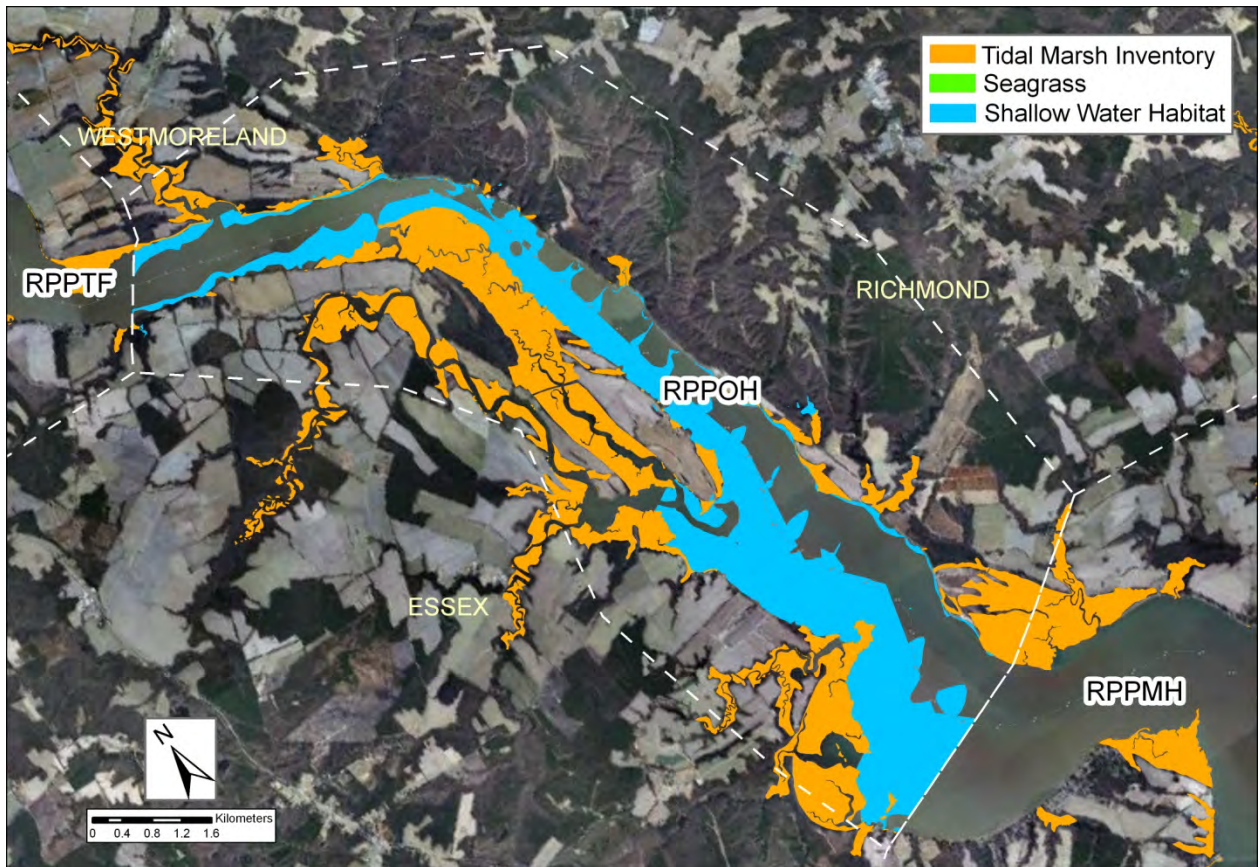
The Lower Rappahannock River is located in Middlesex, Lancaster, Richmond, and Essex Counties and extends from the mouth to approximately Jenkins Landings. Much of the riparian lands are undeveloped (22% developed and 4% agriculture riparian lands), however approximately 12% of the shoreline has been armored. All counties have moderate-high average annual rates of permitted shoreline hardening ranging from 0.3-3.5 km/yr (0.1-0.8% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Middle Rappahannock River–Oligohaline (RPPOH)



### CURRENT COASTAL HABITAT COMPOSITION

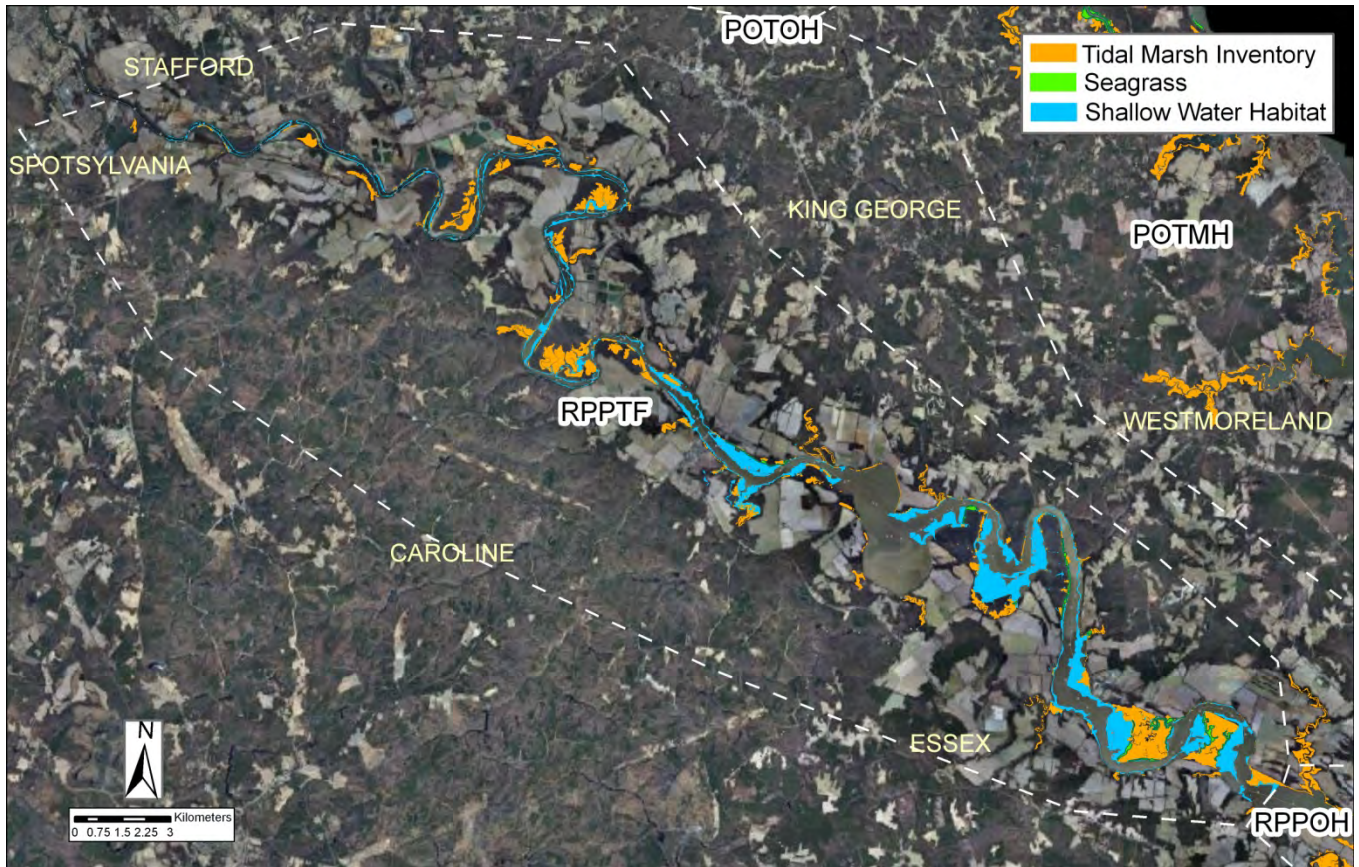
- **10.5 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **9.7 km<sup>2</sup>** Shallow Water
- **9.5 km** Beaches

The Middle Rappahannock River (oligohaline) is located in Essex, Richmond, and Westmoreland Counties and extends from the mesohaline segment approximately to Peedee Creek. Much of the shoreline is currently undeveloped (4% developed riparian lands, 5% agriculture, and 0.4% hardened shoreline). However, across counties, moderate-high average annual rates of permitted shoreline hardening exist ranging from 0.3-2.0 km/yr (0.3-0.5% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Upper Rappahannock River–Tidal Fresh (RPPTF)



### CURRENT COASTAL HABITAT COMPOSITION

- **9.5 km<sup>2</sup>** Tidal wetlands
- **0.6 km<sup>2</sup>** Submerged Aquatic Vegetation
- **12.4 km<sup>2</sup>** Shallow Water
- **5.9 km** Beaches

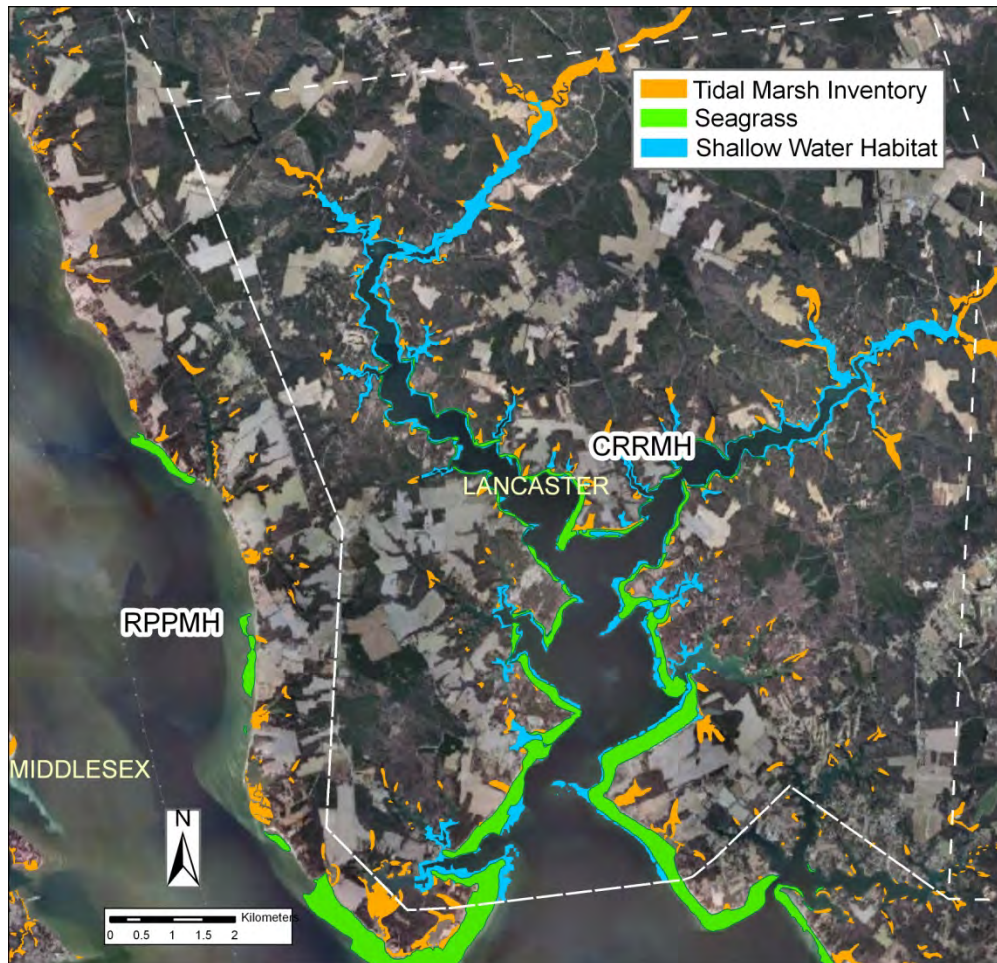
The Upper Tidal Fresh Rappahannock River is located in Essex, Westmoreland, King George, Stafford, Spotsylvania and Caroline Counties and extends upriver to Fredericksburg, Virginia. Much of the shoreline is undeveloped (5% developed, 6.5% agricultural riparian lands and 0.7% hardened shoreline). Overall, Essex, King George and Westmoreland counties have moderate-high average annual rates of permitted shoreline hardening ranging from 0.3-2.0 km/yr (0.1-0.5% of the shoreline), while Caroline County has low rates of 0.1 km/yr (0.2% of the shoreline)..

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Corrotoman River–Mesohaline (CRRMH)



### CURRENT COASTAL HABITAT COMPOSITION

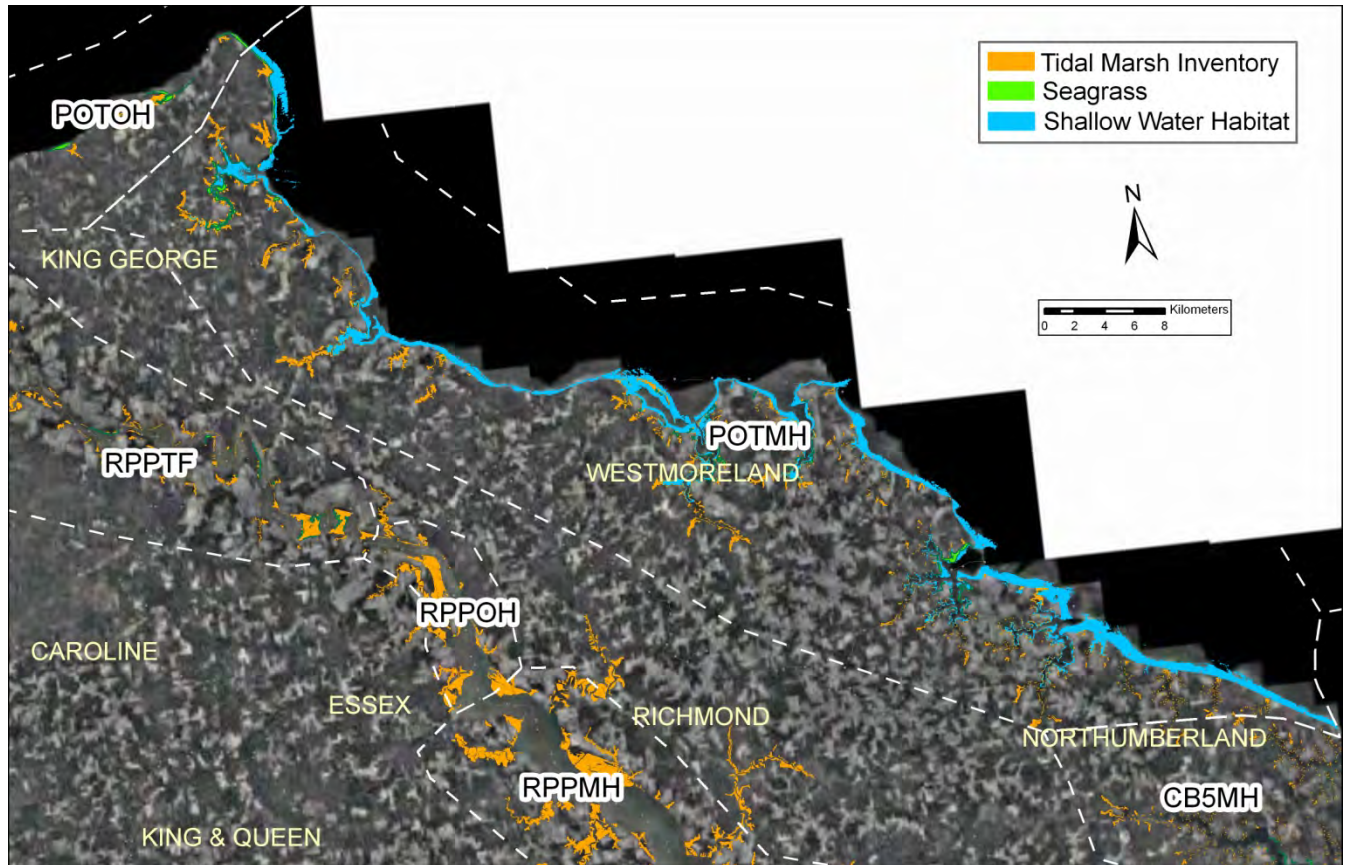
- **3.3 km<sup>2</sup>** Tidal wetlands
- **3.4 km<sup>2</sup>** Submerged Aquatic Vegetation
- **7.5 km<sup>2</sup>** Shallow Water
- **24.7 km** Beaches

The Corrotoman River, a tributary of the Rappahannock River, is located in Lancaster County. Riparian lands are 34% developed (predominantly residential) with 23% of shorelines hardened. Lancaster County has a high average annual rates of permitted shoreline hardening of 3.5 km/yr (0.8% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Lower Potomac River–Mesohaline (POTMH)



### CURRENT COASTAL HABITAT COMPOSITION

- **19.1 km<sup>2</sup>** Tidal wetlands
- **3.7 km<sup>2</sup>** Submerged Aquatic Vegetation
- **63.6 km<sup>2</sup>** Shallow Water
- **103.2 km** Beaches

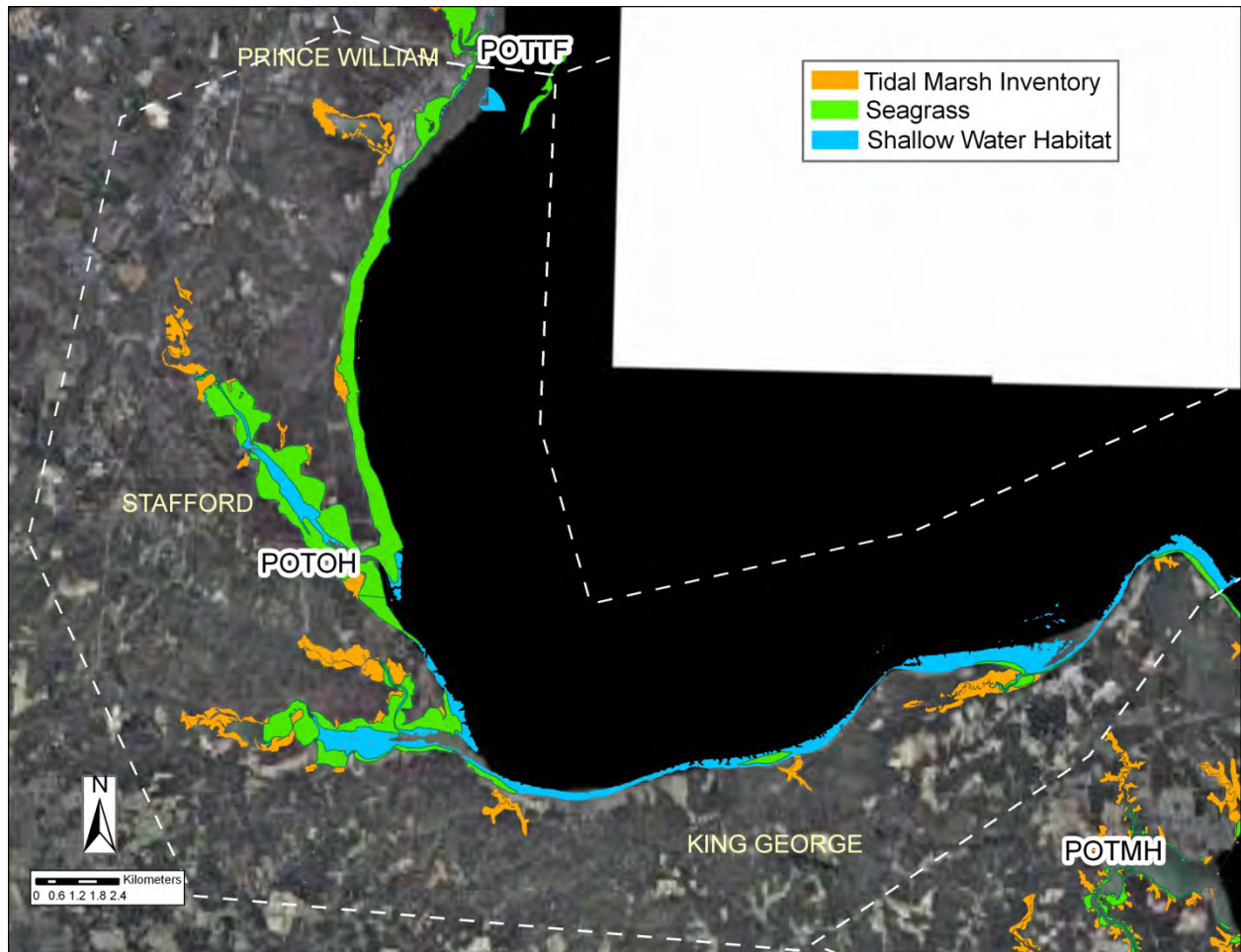
Virginia's Lower Potomac River is located in Northumberland, Westmoreland and King George counties, and extends from the mouth of the river to Popes Creek. Much of the shoreline is developed (43% developed riparian lands and 17% hardened shoreline). All counties have moderate-high average annual rates of permitted shoreline hardening ranging from 0.4-5.0 km/yr (0.4-0.7% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Middle Potomac River–Oligohaline (POTOH)



### CURRENT COASTAL HABITAT COMPOSITION

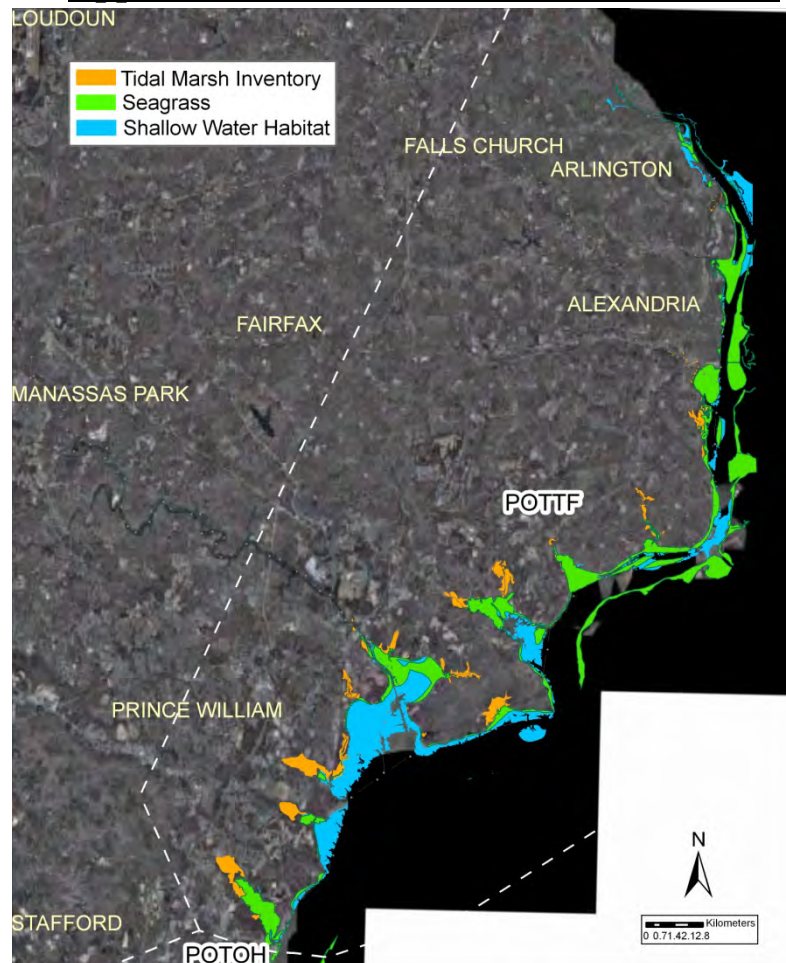
- **8.0 km<sup>2</sup>** Tidal wetlands
- **18.7 km<sup>2</sup>** Submerged Aquatic Vegetation
- **26.9 km<sup>2</sup>** Shallow Water
- **32.6 km** Beaches

Virginia's Middle Potomac River is located in King George, Stafford and Prince William Counties and extends approximately to Quantico Pier. Much of the shoreline is developed (35% developed riparian lands and 23% hardened shoreline). All counties have moderate average annual rates of permitted shoreline hardening ranging from 0.2-0.4 km/yr (0.2% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Upper Potomac River–Tidal Fresh (POTTF)



### CURRENT COASTAL HABITAT COMPOSITION

- **7.9 km<sup>2</sup>** Tidal wetlands
- **30.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **43.8 km<sup>2</sup>** Shallow Water
- **No data** Beaches

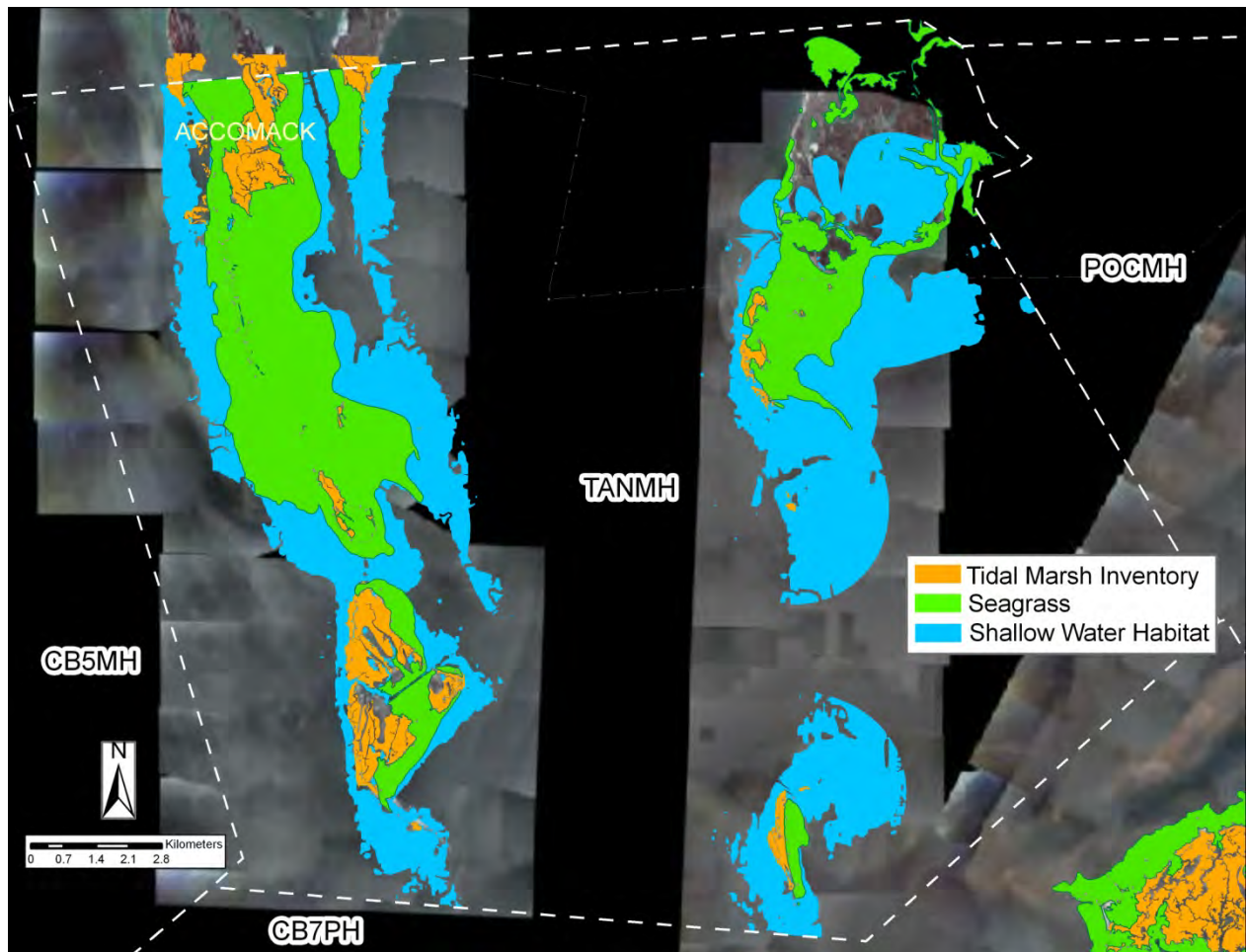
Virginia's Upper Tidal Potomac River is located in Fairfax, Prince William and Arlington counties and the City of Alexandria, a highly developed region. To date, shoreline inventories have not been completed in these counties. Counties have moderate-high average annual rates of permitted shoreline hardening ranging from 0.1-0.3 km/yr (0.2-3.0% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Tangier Island–Mesohaline (TANMH)



### CURRENT COASTAL HABITAT COMPOSITION

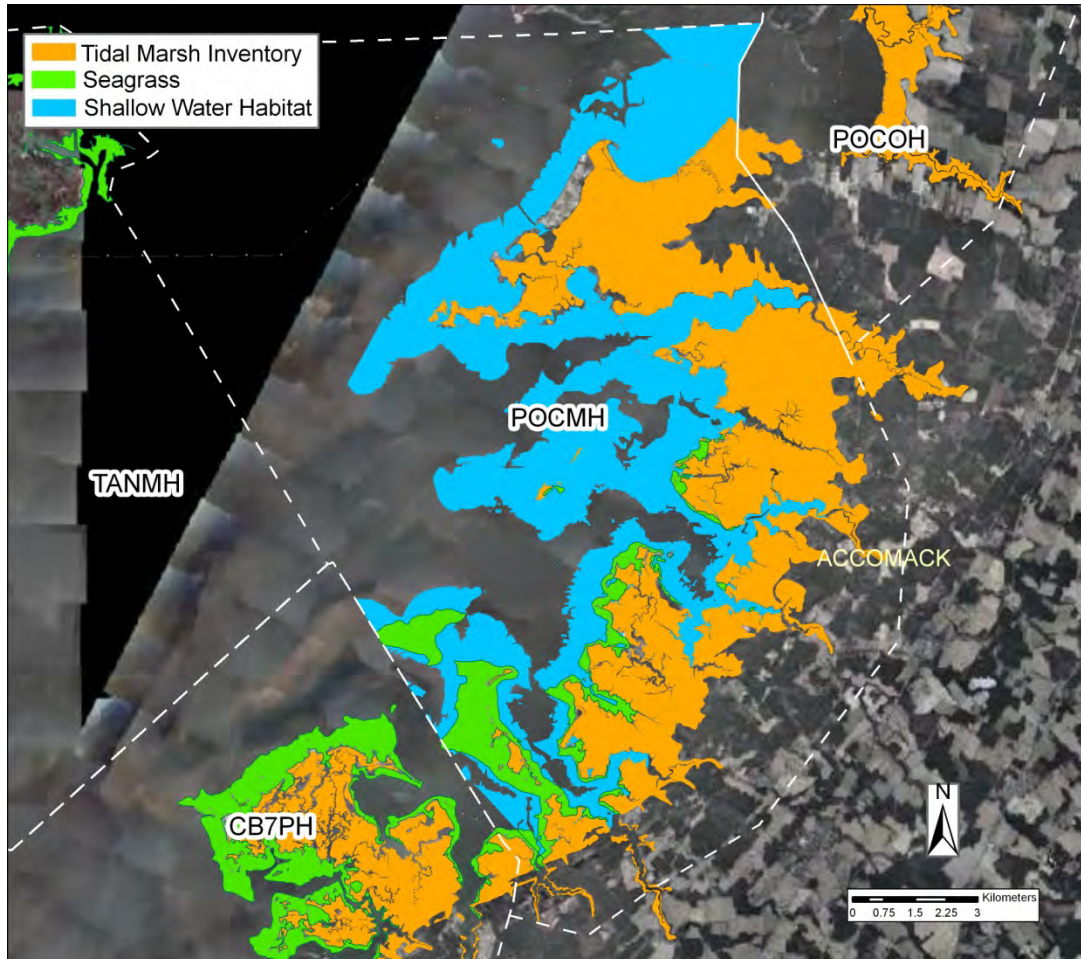
- **8.3 km<sup>2</sup>** Tidal wetlands
- **36.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **88.7 km<sup>2</sup>** Shallow Water
- **No Data** Beaches

Tangier Island is located in the upper region of Virginia's mainstem Chesapeake Bay within Accomack County. To date, shoreline inventories have not been completed in this region. Accomack County has a low average annual rate of permitted shoreline hardening of 1.3 km/yr (0.04% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation

## Lower Pocomoke River–Mesohaline (POCMH)



### CURRENT COASTAL HABITAT COMPOSITION

- **52.2 km<sup>2</sup>** Tidal wetlands
- **8.6 km<sup>2</sup>** Submerged Aquatic Vegetation
- **63.2 km<sup>2</sup>** Shallow Water
- **61.8 km** Beaches

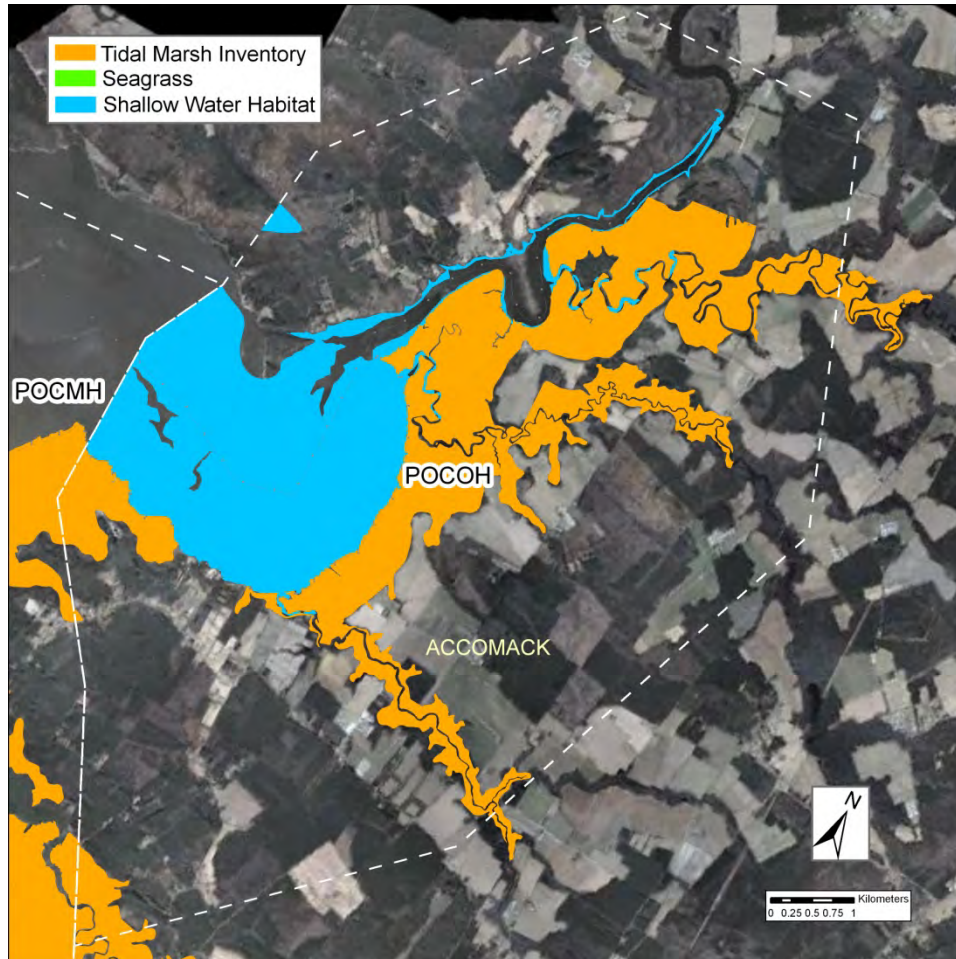
Virginia's Lower Pocomoke River is located in Accomack County. Much of the shoreline is undeveloped (18% developed riparian lands and 0.8% hardened shoreline). Accomack County has a low average annual rate of permitted shoreline hardening of 1.3 km/yr (0.04% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation



## Upper Pocomoke River–Oligohaline (POCOH)



### CURRENT COASTAL HABITAT COMPOSITION

- **24.9 km<sup>2</sup>** Tidal wetlands
- **0.0 km<sup>2</sup>** Submerged Aquatic Vegetation
- **9.7 km<sup>2</sup>** Shallow Water
- **2.8 km** Beaches

Virginia's Upper Pocomoke River is located in Accomack County. Much of the shoreline is undeveloped (3% developed, 11% agricultural riparian lands and 1.2% hardened shoreline). Accomack County has a low average annual rate of permitted shoreline hardening of 1.3 km/yr (0.04% of the shoreline).

### COASTAL HABITAT SHIFTS WITH CLIMATE CHANGE

- Tidal Wetlands
- Shallow Water Habitat
- Beaches
- Submerged Aquatic Vegetation