



Sea Level Rise and Changing Shorelines

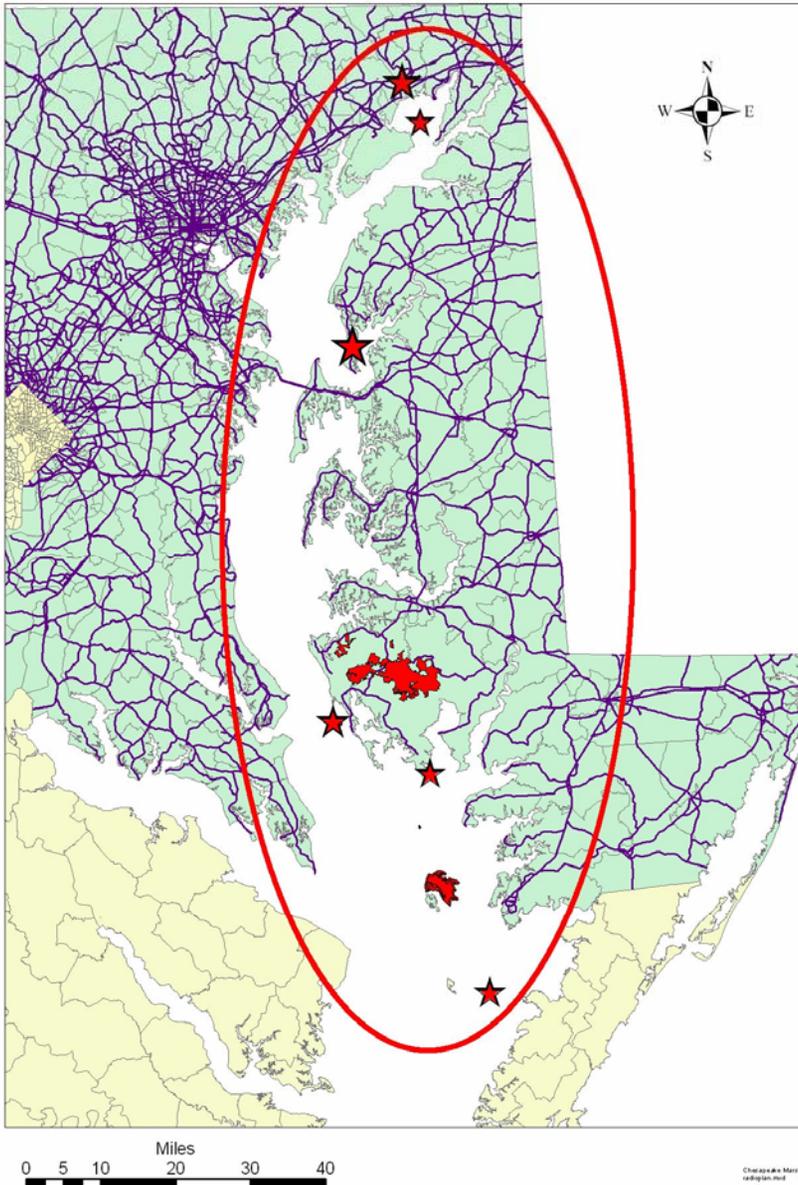
Curt Larsen and Inga Clark

U.S. Geological Survey

Reston, VA 20192

Chesapeake Marshlands National Wildlife Refuge Complex

Radio Plan Coverage Area

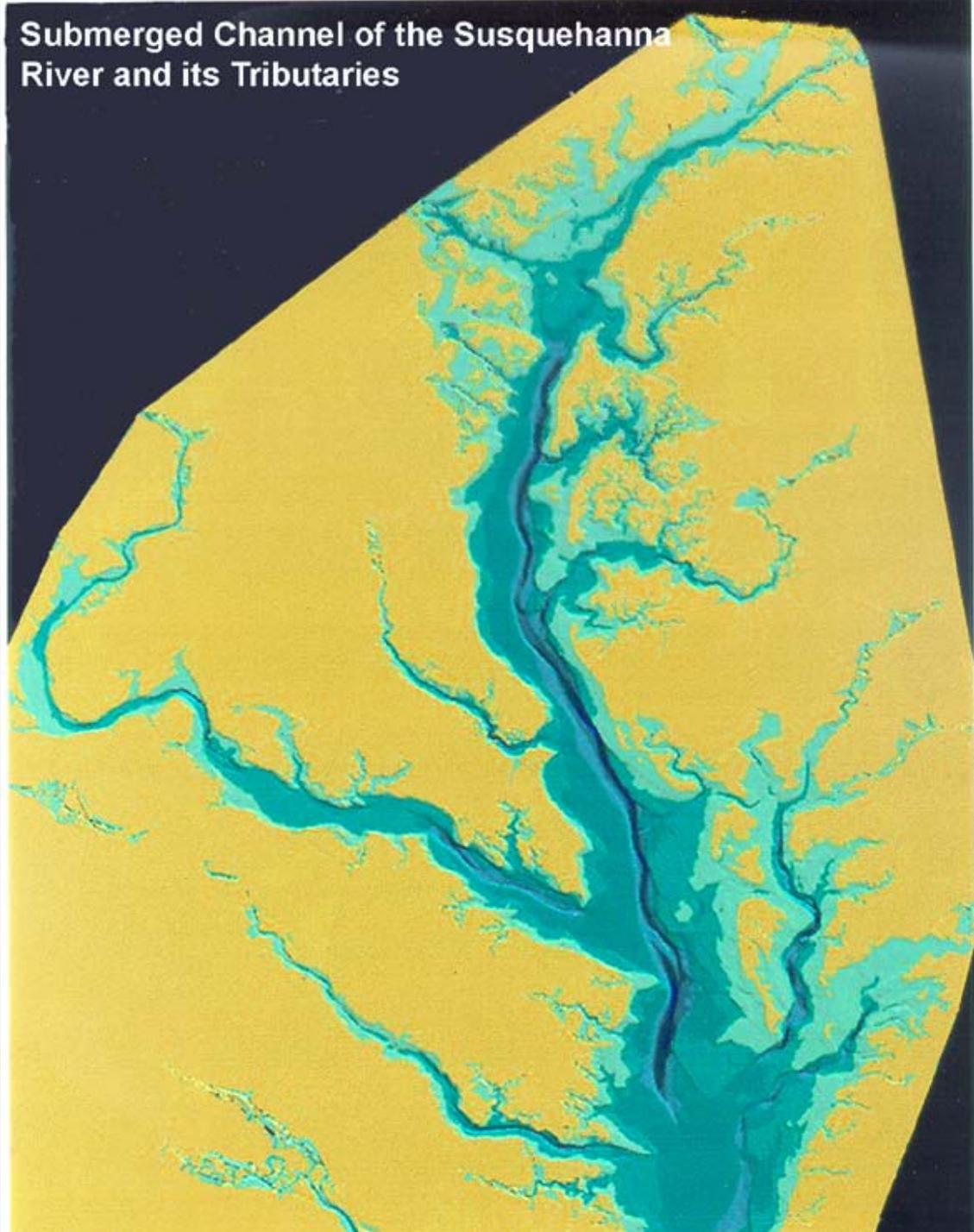


Blackwater NWR is part
of the Chesapeake
Marshlands
National Wildlife Refuge
Complex:

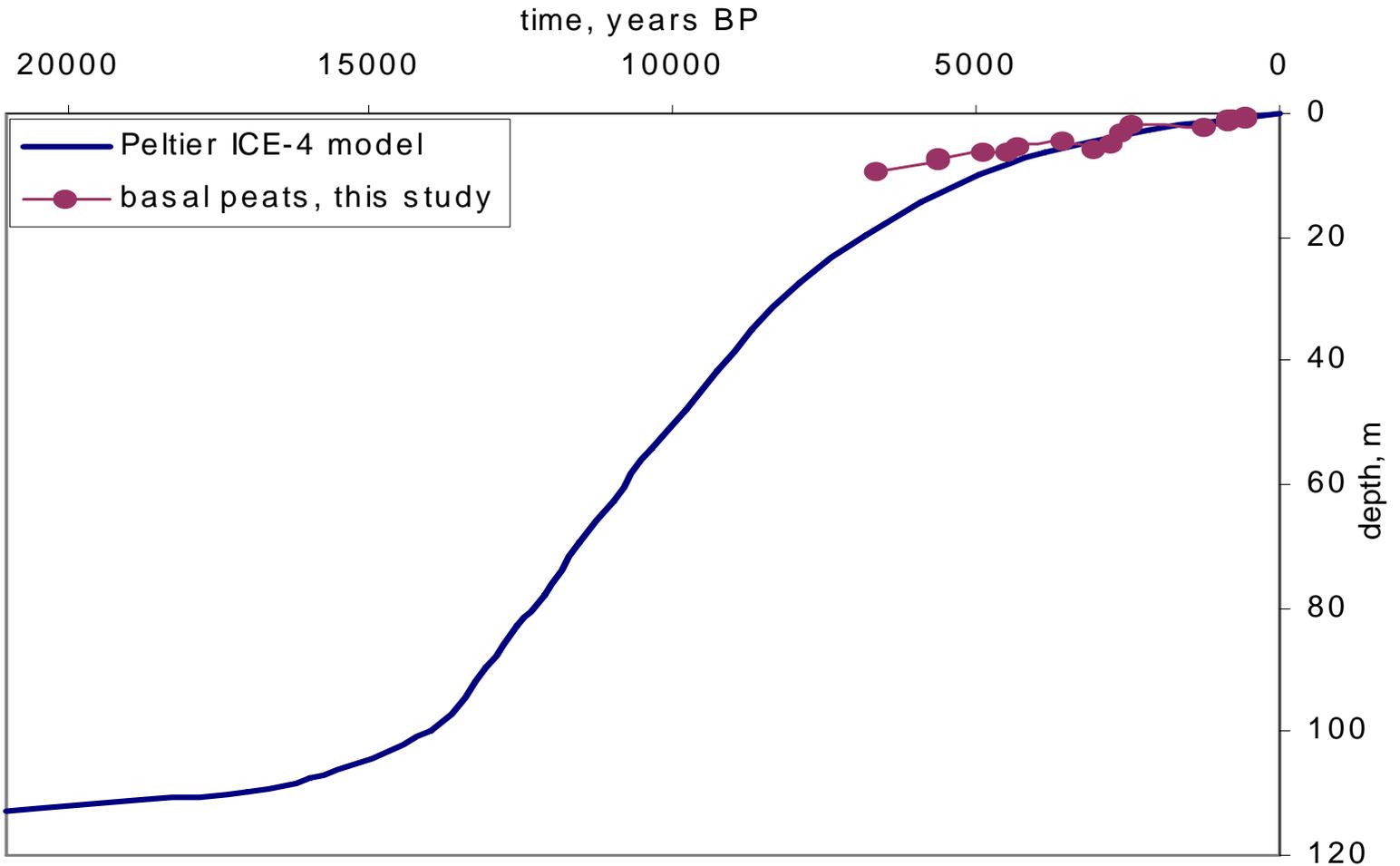
Blackwater NWR
Eastern Neck NWR
Martin NWR
Susquehanna NWR
Watts Island
Bishops Head Point
Spring Island
Barren Island



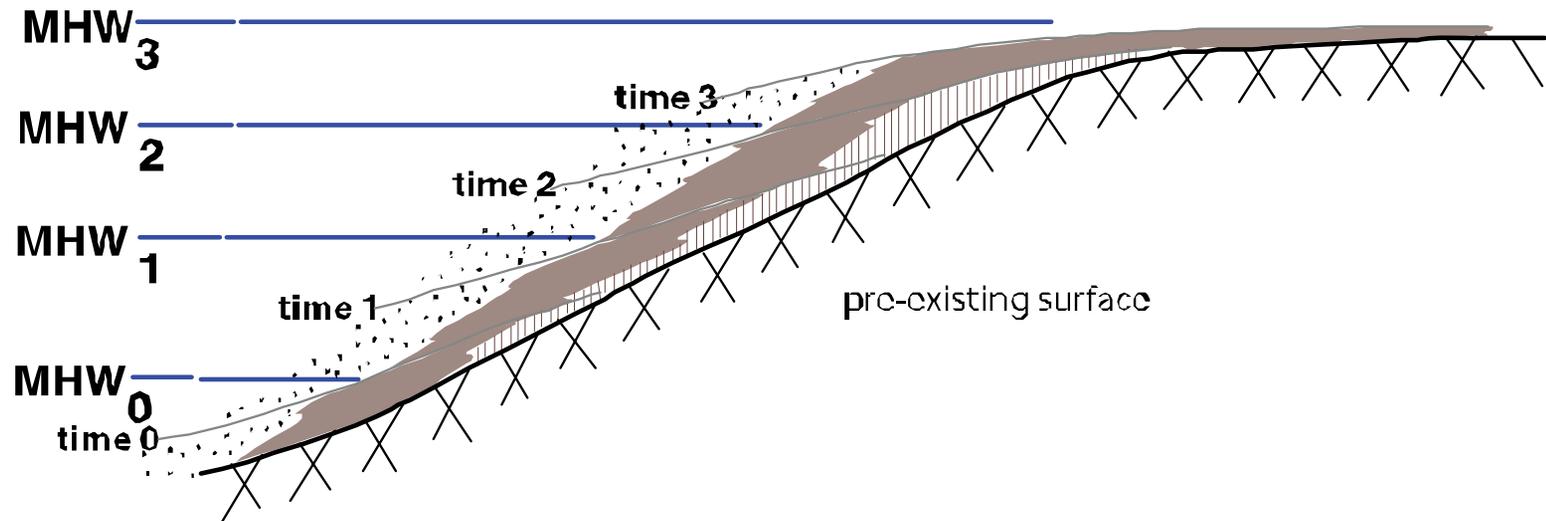
Submerged Channel of the Susquehanna River and its Tributaries



Relative sea level rise curve for Chesapeake Bay

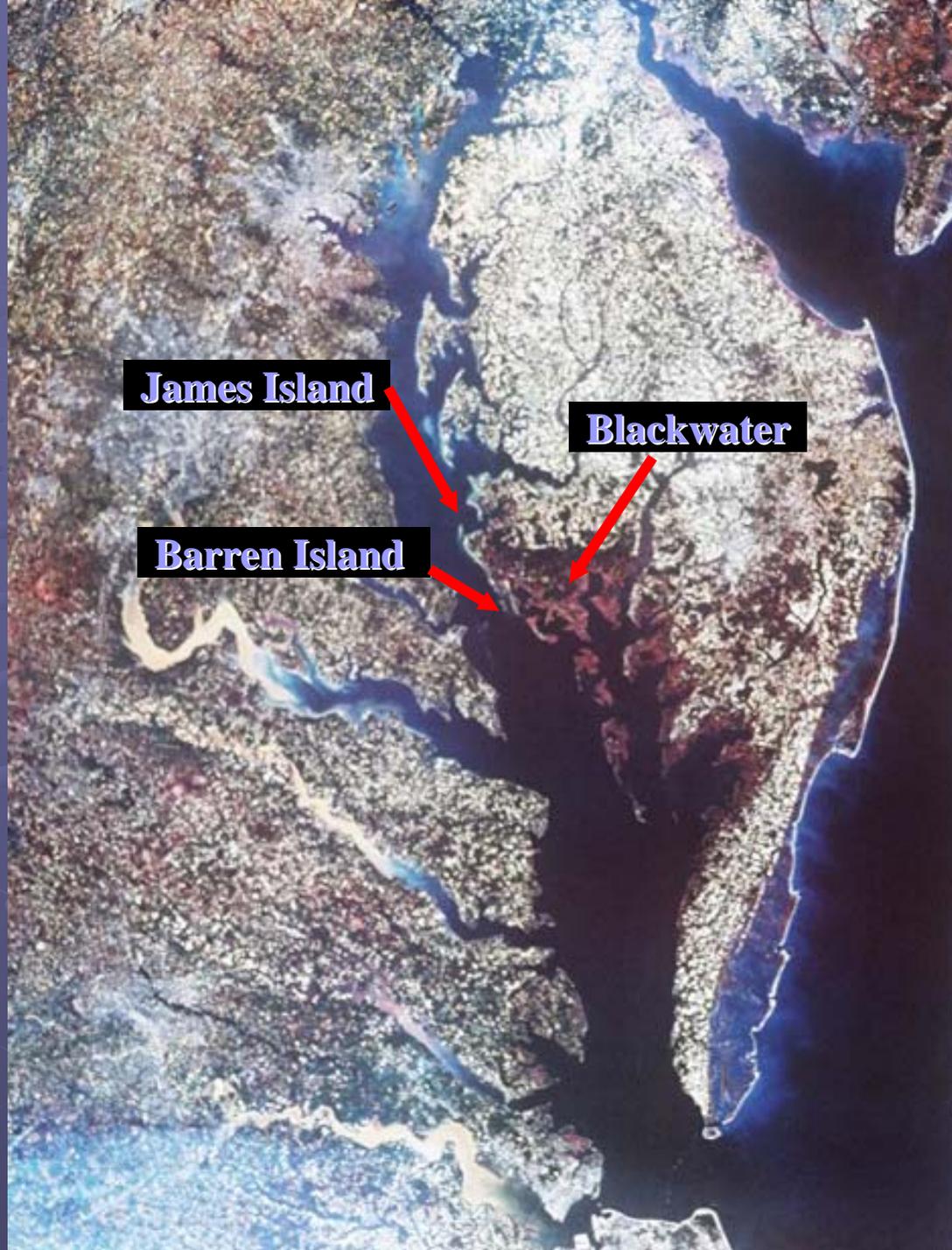


Maryland's Eastern Shore-salt marshes have developed as a function of topography. Low relief land areas gave rise to broad marshes.



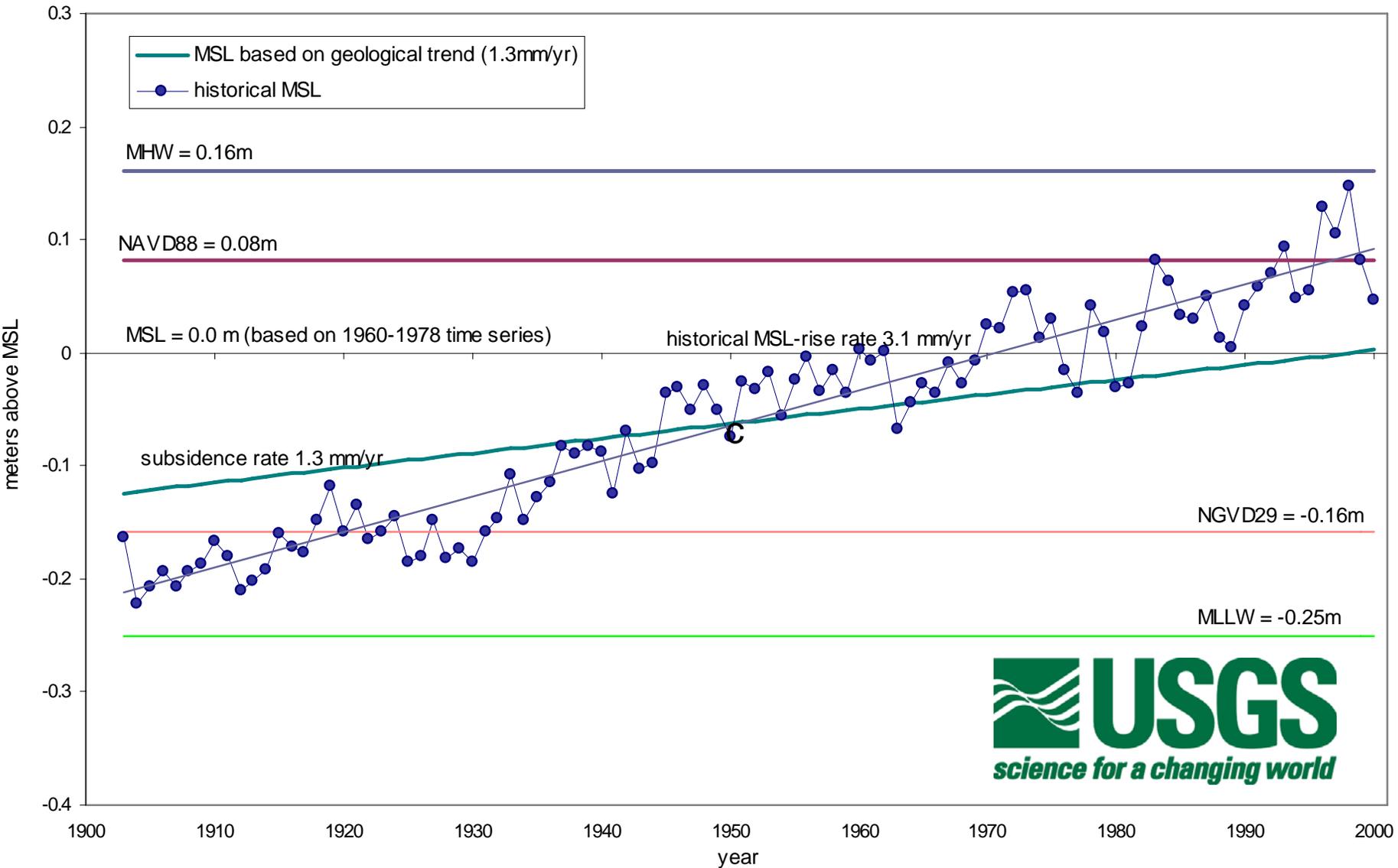
- ☐ sand
- ☐ low-marsh peat
- ☐ high-marsh peat

Remaining
marsh
shown
in red

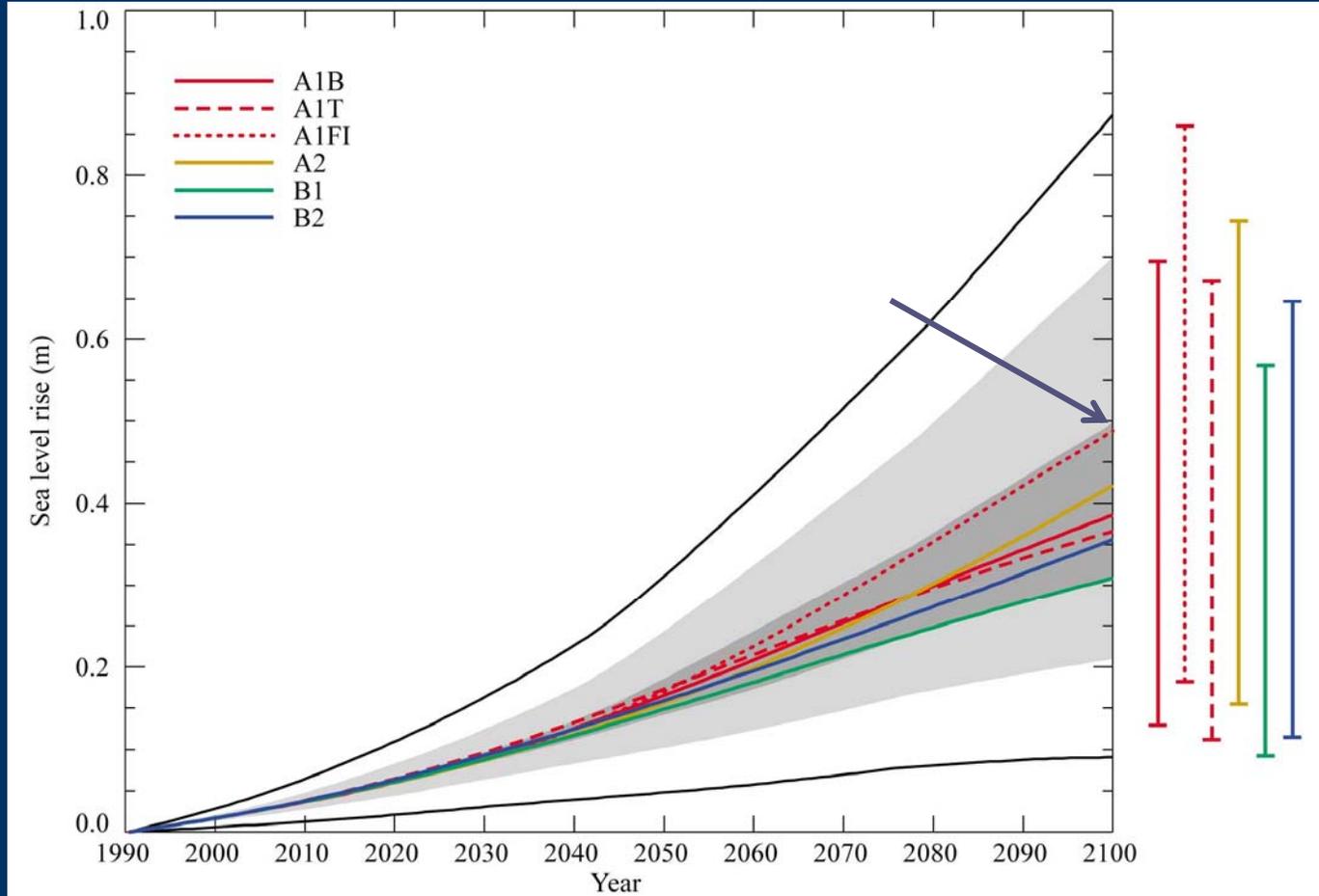




Relative mean sea level trend for Chesapeake Bay - geological trend vs historical values (relative to present MSL)

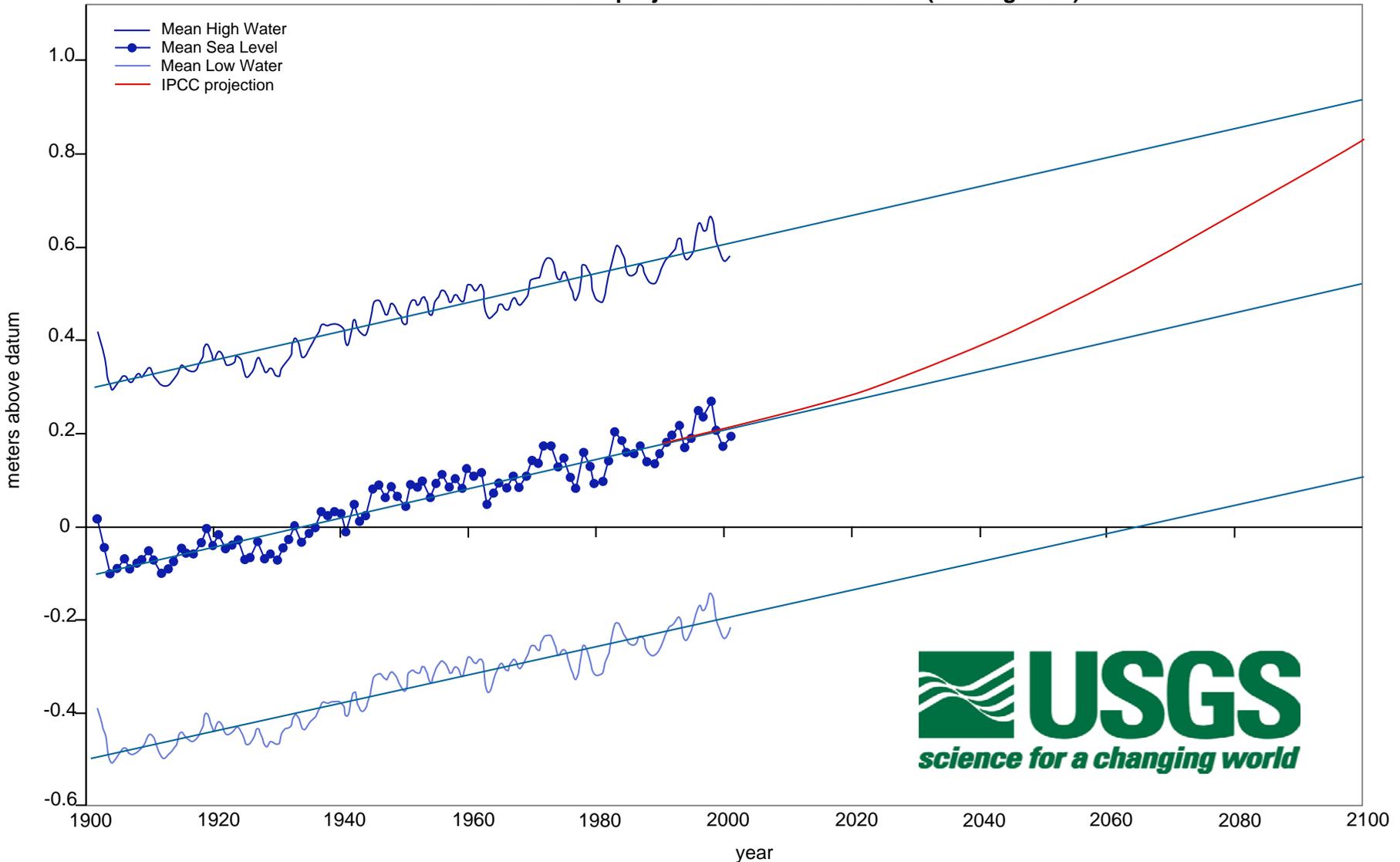


Motivation for sea-level rise research



Sea Level Scenario for IPCC 2001

Relative MSL trend for Fishing Bay / Blackwater NWR (approximation) compared to IPCC 2001 projections for sea level rise (starting 1990)

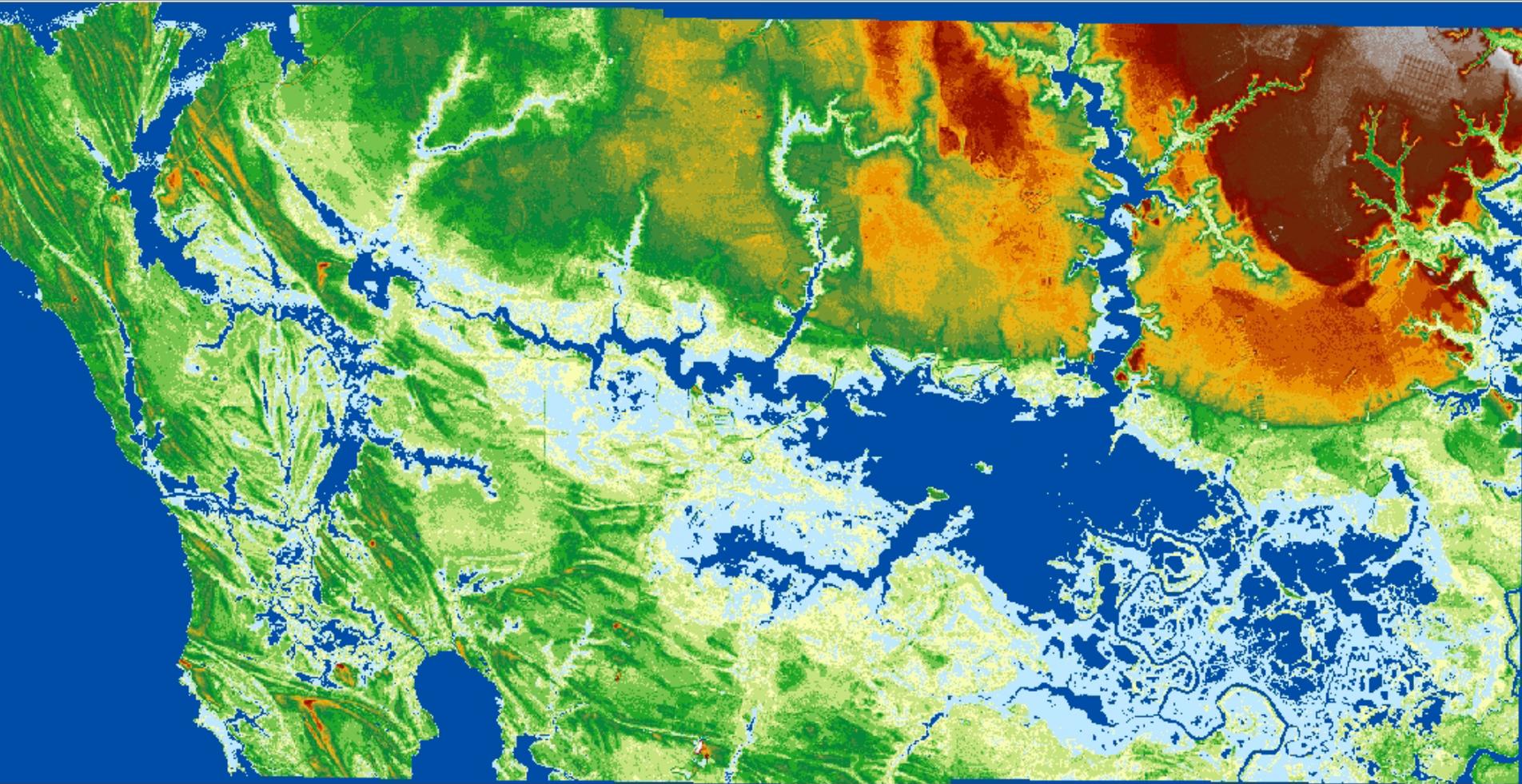


An aerial photograph of a wetland area, likely a National Wildlife Refuge. The image shows a complex network of waterways, including a prominent river in the lower-left quadrant. The land is divided into numerous irregular parcels, some of which are outlined in white. The vegetation is dense and green, interspersed with water bodies. The overall scene is a mix of natural wetland features and human-managed land parcels.

**BLACKWATER NATIONAL
WILDLIFE REFUGE**

HONGA RIVER

Blackwater National Wildlife Refuge Area, 2002

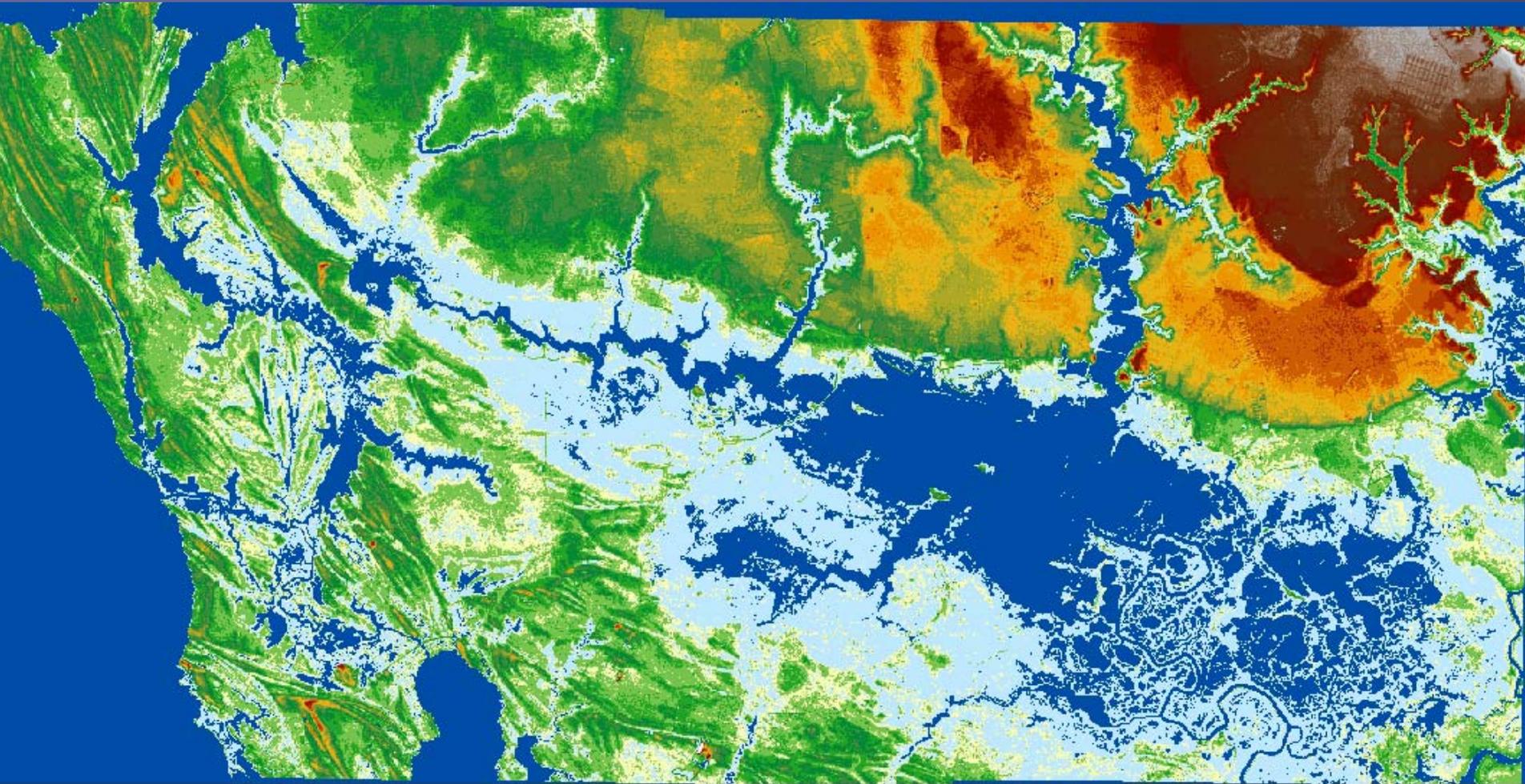


Open water

Intertidal marsh

High marsh

Blackwater National Wildlife Refuge Area, 2050 (3 mm/yr rise)

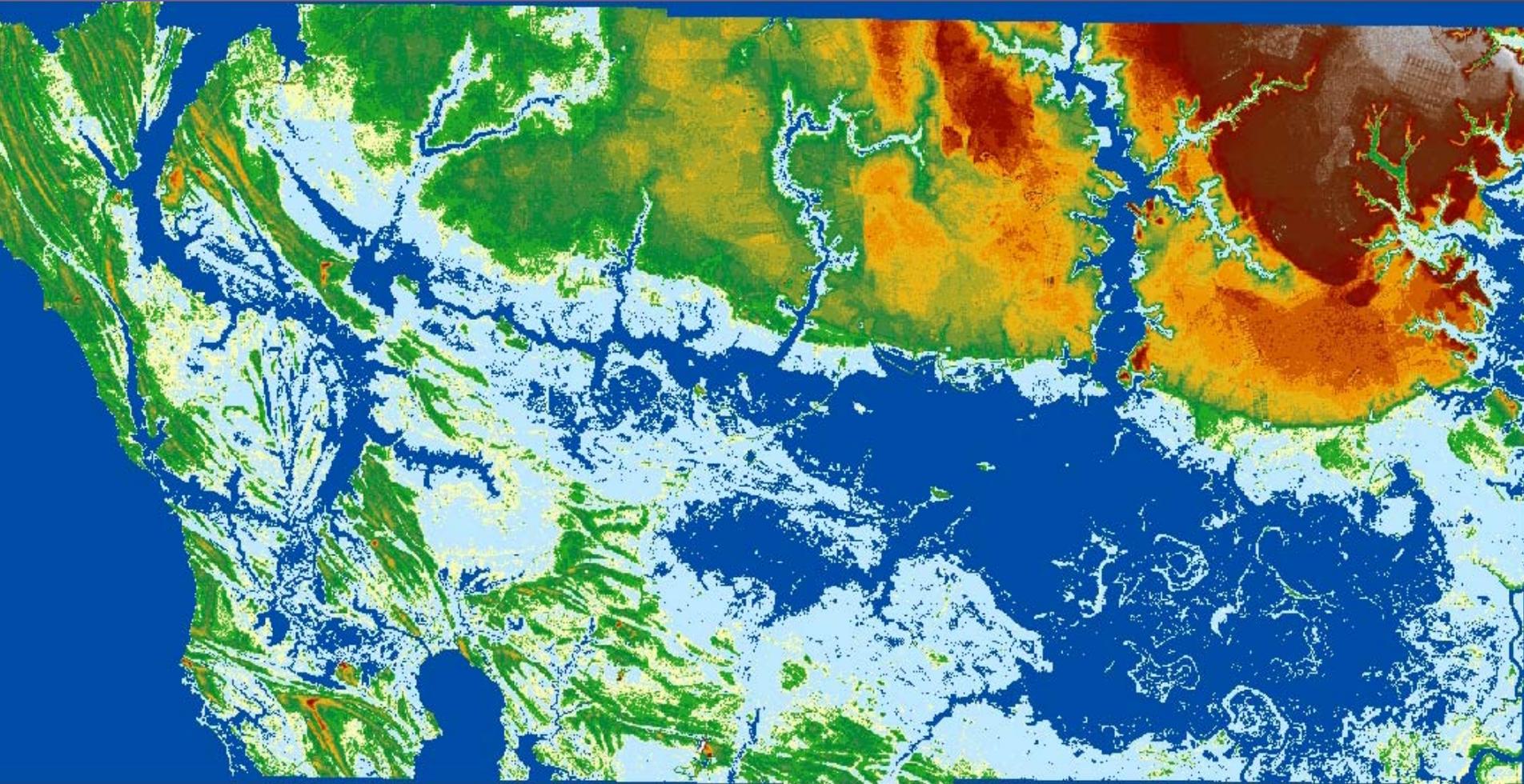


Open water

Intertidal marsh

High marsh

Blackwater National Wildlife Refuge Area, 2100 (3 mm/yr rise)

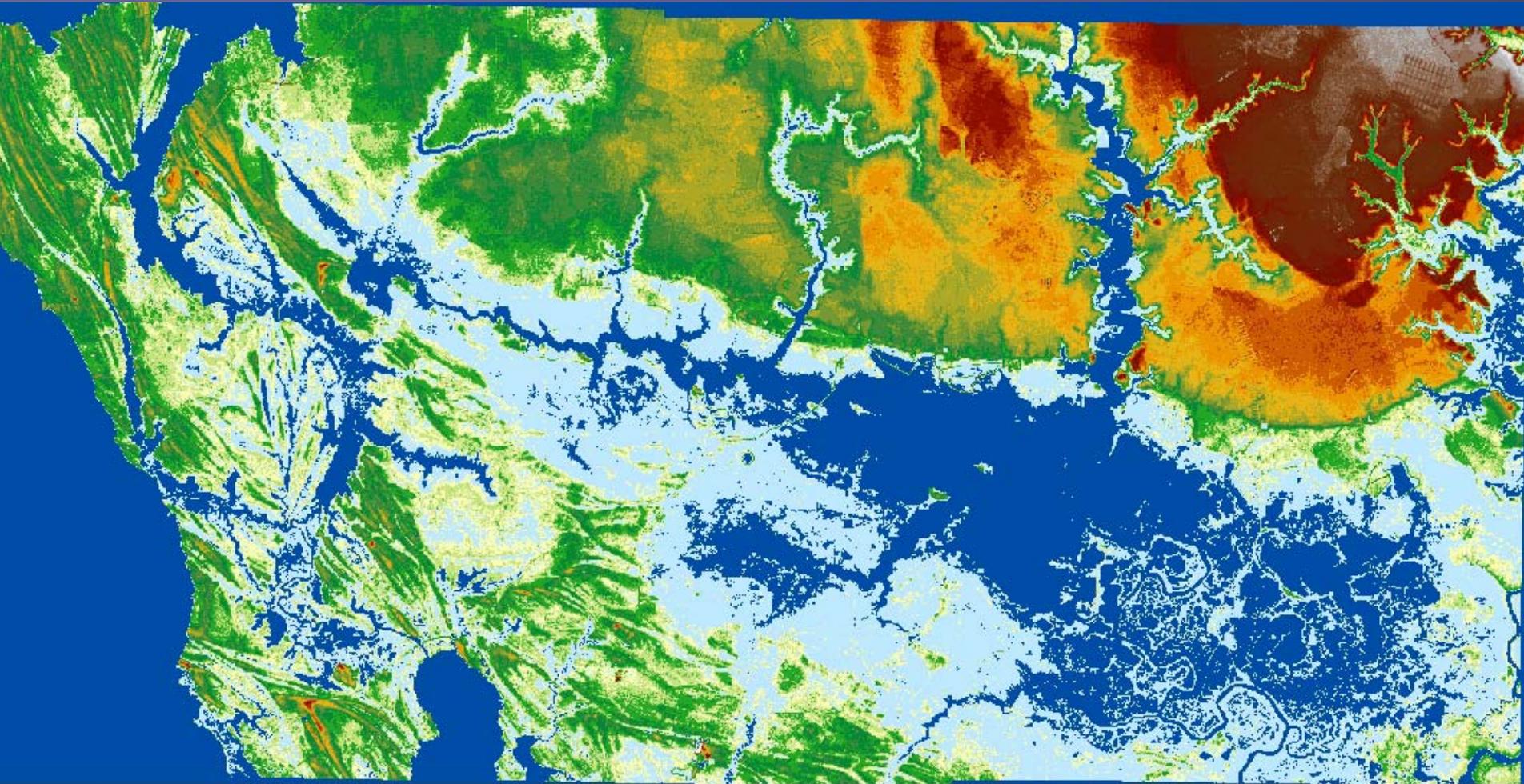


Open water

Intertidal marsh

High marsh

Blackwater National Wildlife Refuge Area, IPCC projection, average case scenario, 2050 (5 mm/yr rise)



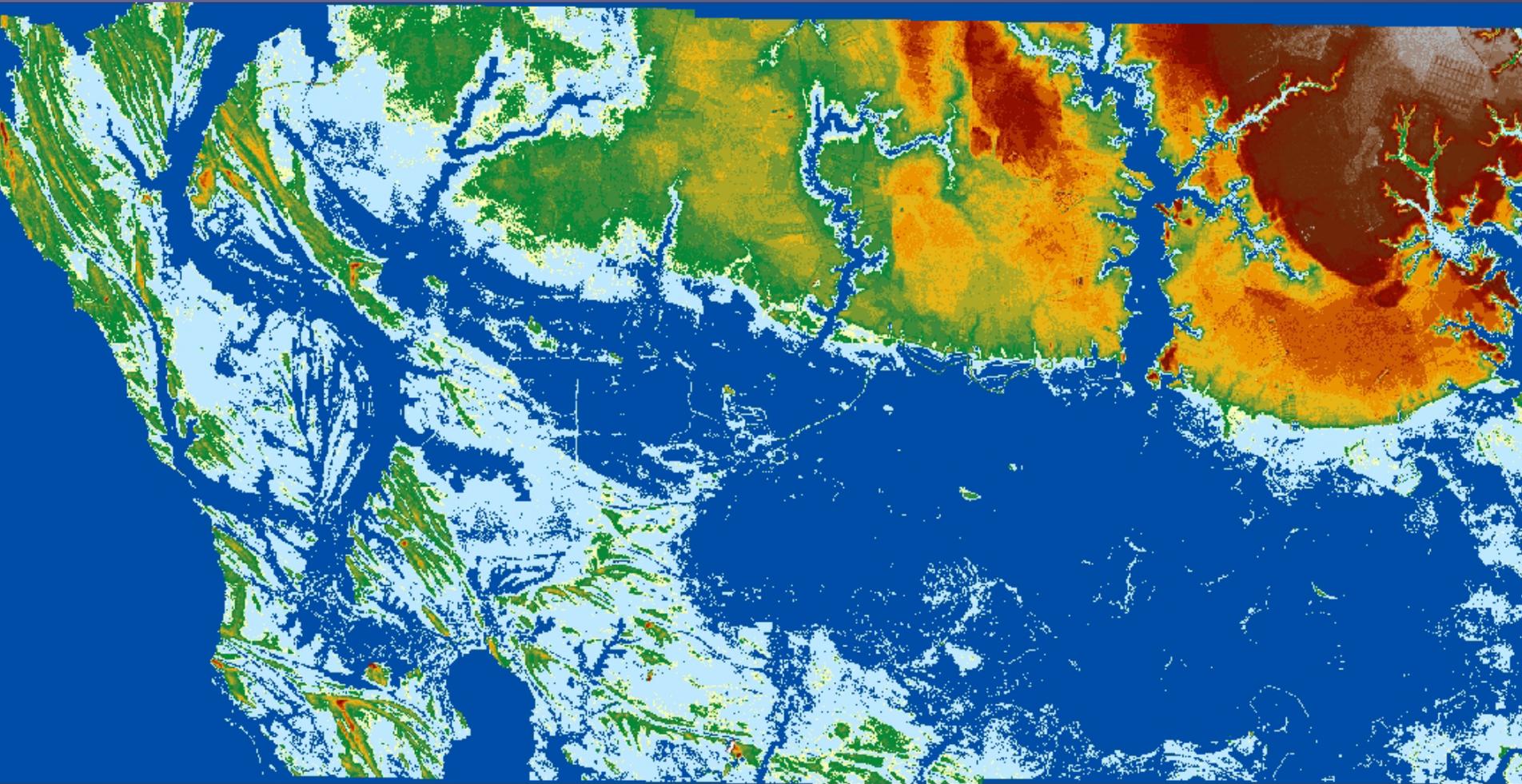
Open water

Intertidal marsh

High marsh

Blackwater National Wildlife Refuge Area, IPCC

projection, average case scenario, 2100 (6.2 mm/yr rise)



Open water

Intertidal marsh

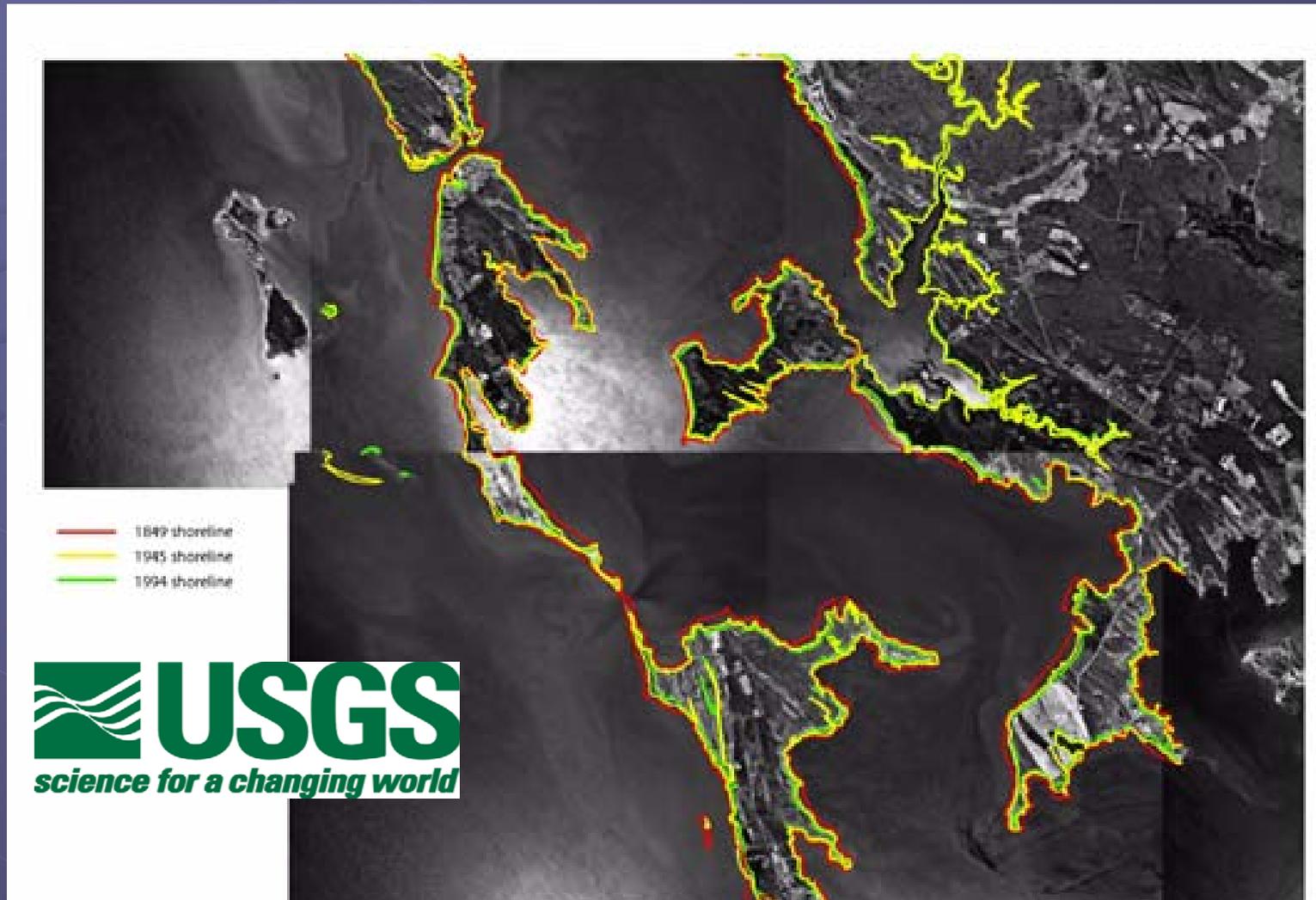
High marsh

Systems/Watershed Context



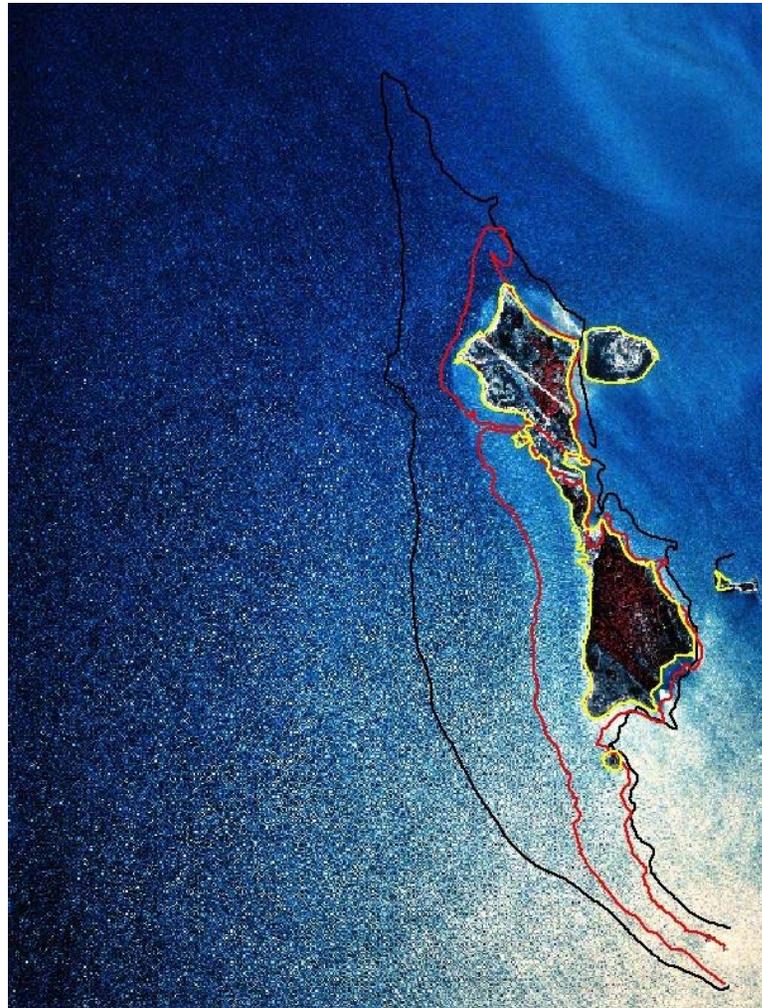
- Scarcity
- Connectivity
- Special Species Status

Hoopers Island Shoreline Change



BARREN ISLAND (1847-1994)

147 Years



**Barren Island protects
Hooper's Island**

839 acres (1847)

175 acres (1994)

664 acres lost

**Barren has lost 78% of its
Acreage since 1884.**

— 1847
— 1942

Date of photography 1994

JAMES ISLAND (1847 - 1994)

147 years

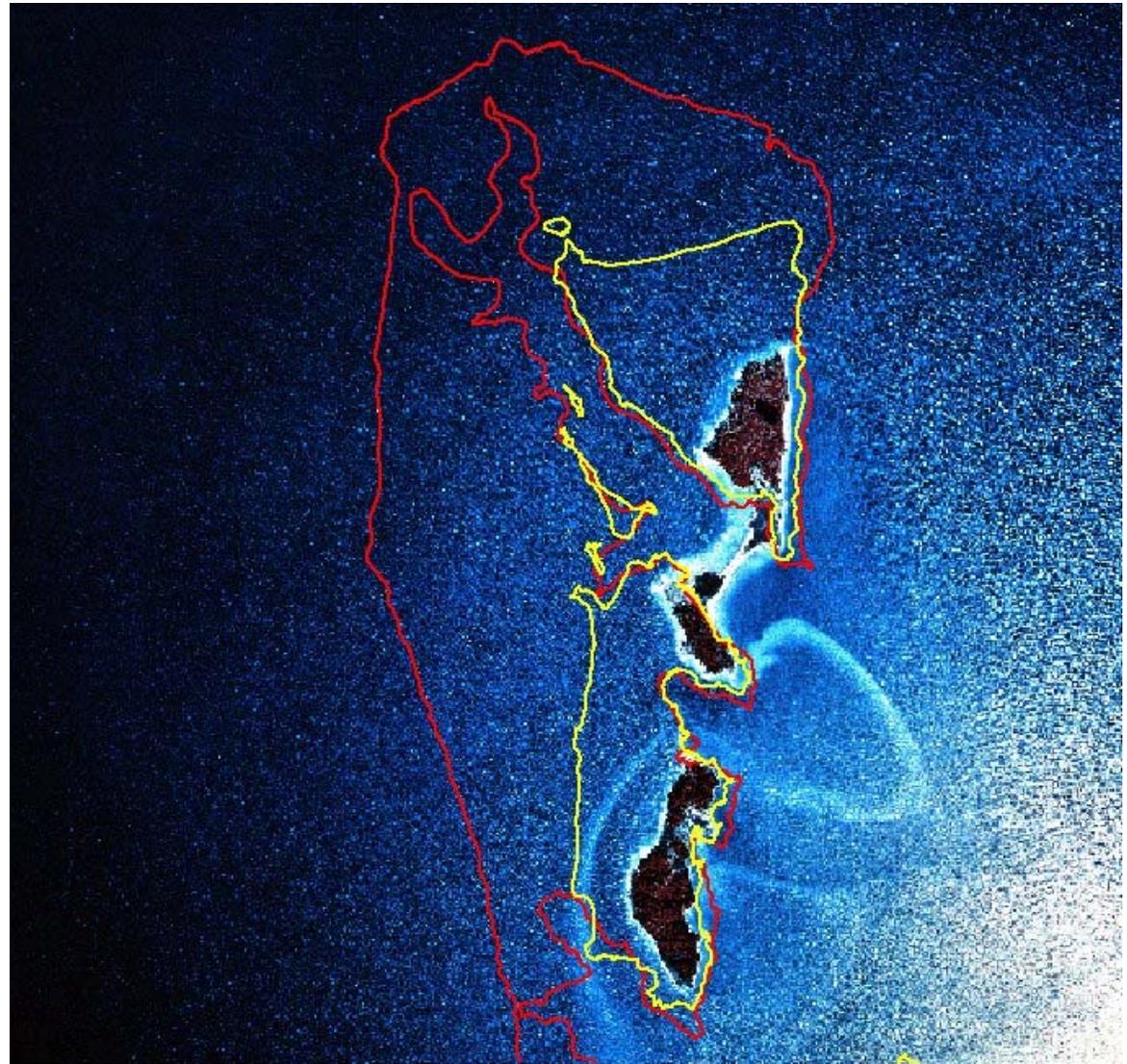
James Island protects
Taylor's Island, Madison,
and Woolford communities

976 acres (1847)

92 acres (1994)

884 acres lost

James has lost 91% of its
acreage since 1847



— 1847

— 1942

Effects of Sea Level Rise

- Open water expands at Blackwater NWR as sea level drowns land surface. High and low marsh migrate to south and west.
- James Island continues to erode from the west due to wave action while low areas are flooded.
- Hoopers Island is slowly inundated by rising water and erodes on western shore.
- Barren Island erodes on west and is slowly inundated.