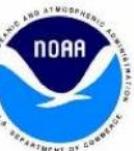


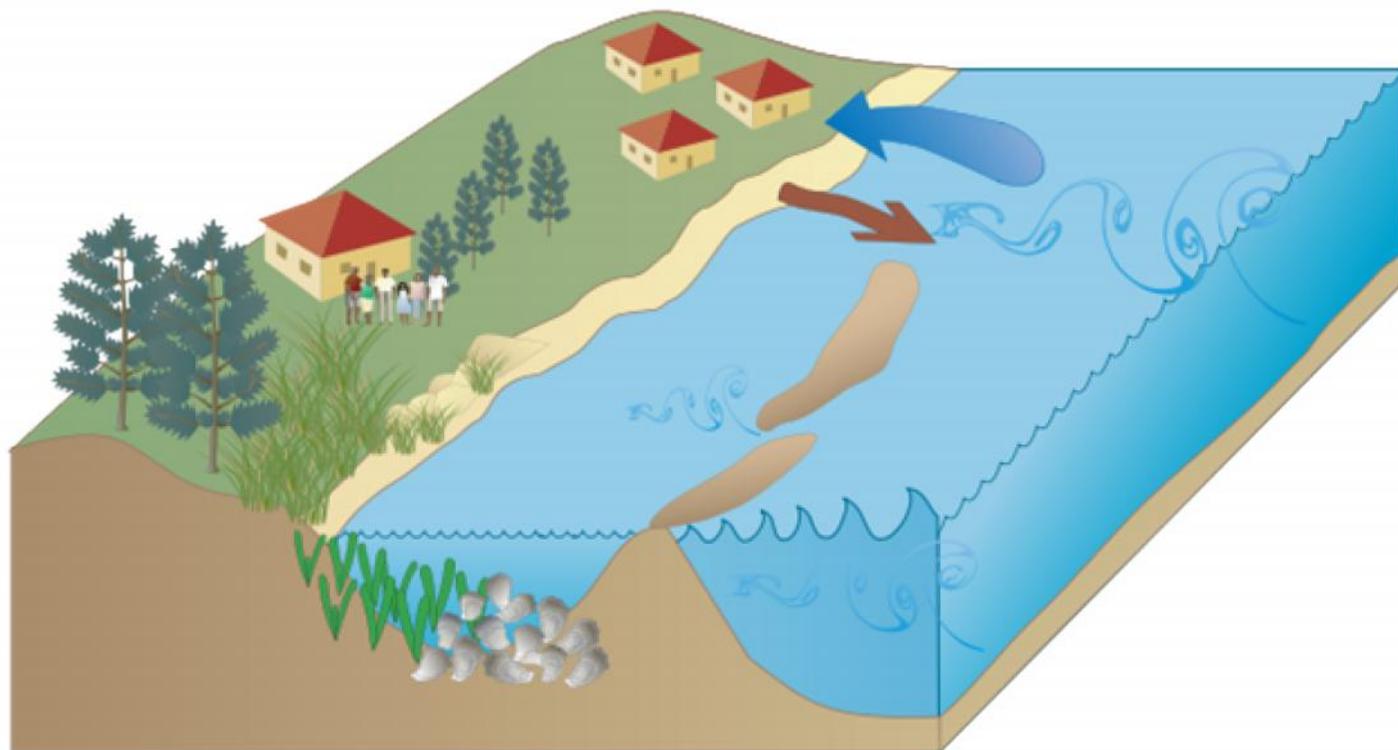
Maryland Coastal Resiliency Assessment: Natural Solutions for More Resilient Communities

Nicole Carlozo, Maryland Department of Natural Resources

Adaptation & Response Working Group
September 15, 2016



Coastal Resiliency Goal



-  Inundation
-  Erosion
-  Wave Energy
-  Oyster/SAV
-  Coastal Forest
-  Tidal Wetlands/Marshes
-  Barrier Islands
-  Dunes

Identify locations where existing **natural features** provide **risk-reduction benefits to coastal communities** impacted by erosion and flooding. Protect and restore habitats that will enhance resiliency.

“Natural Features”



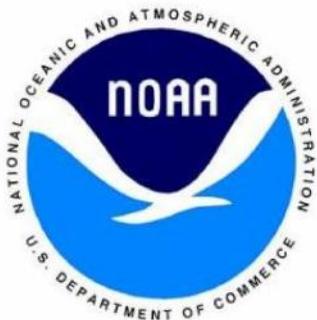
				
Dunes and Beaches	Vegetated Features (e.g., Marshes)	Oyster and Coral Reefs	Barrier Islands	Maritime Forests/Shrub Communities
Benefits/Processes Breaking of offshore waves Attenuation of wave energy Slow inland water transfer	Benefits/Processes Breaking of offshore waves Attenuation of wave energy Slow inland water transfer Increased infiltration	Benefits/Processes Breaking of offshore waves Attenuation of wave energy Slow inland water transfer	Benefits/Processes Wave attenuation and/or dissipation Sediment stabilization	Benefits/Processes Wave attenuation and/or dissipation Shoreline erosion stabilization Soil retention

US Army Corps 2015, *Use of NNBF for Coastal Resilience*

Coastal Resiliency Partnerships



US Army Corps of Engineers
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Coastal Resiliency Evaluation

Terms & Definitions



Resiliency – The ability of a community to prepare for, respond to, and recover from a coastal hazard event.

•Where are the people?

- Are there demographic/social metrics or community characteristics that limit community resiliency?

•Where are the hazards?

- Identify physical parameters that contribute to erosion and inundation risk.

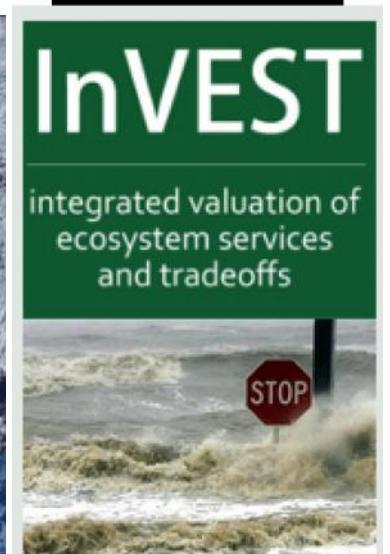
•Where are the habitats?

- Identify natural features that provide risk-reduction benefits.

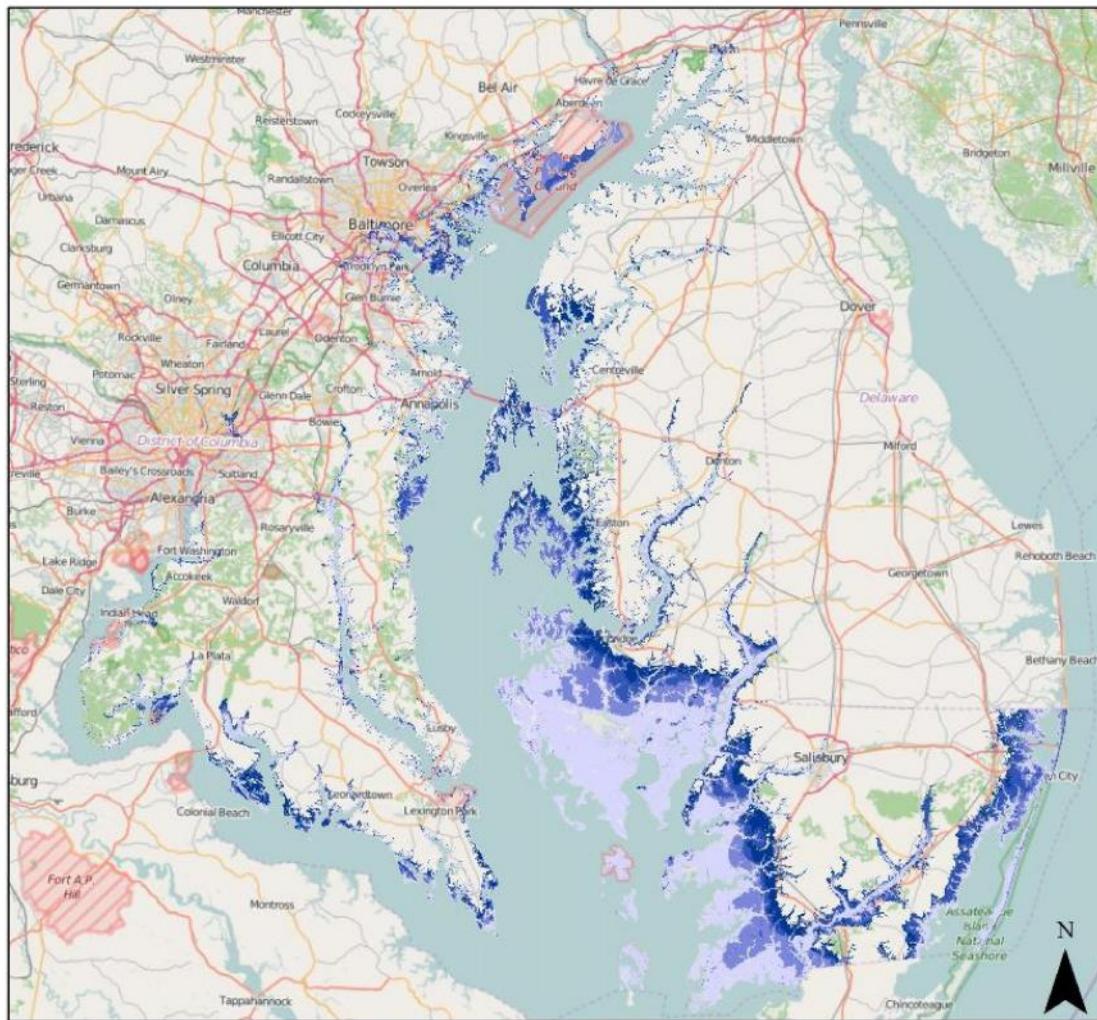


US Army Corps of Engineers
BUILDING STRONG.

natural
capital
PROJECT



Study Area



0 5 10 20 30 40 Miles



Furthest
extent of flood hazard event:

Hurricane Events Category 1-4

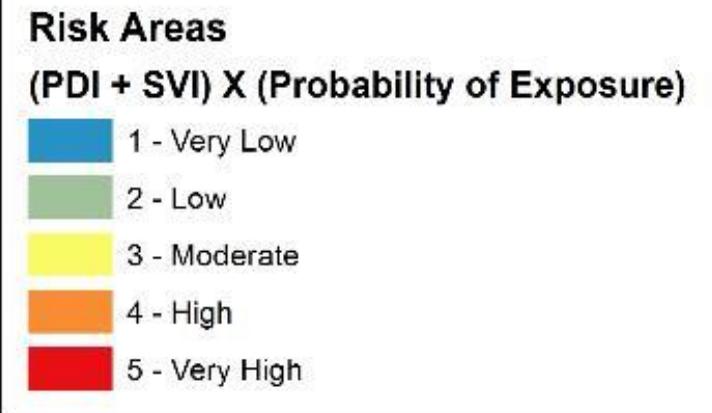
Sea, Level, and Overland Surges
from Hurricanes Model

Landscape Scale – Coast

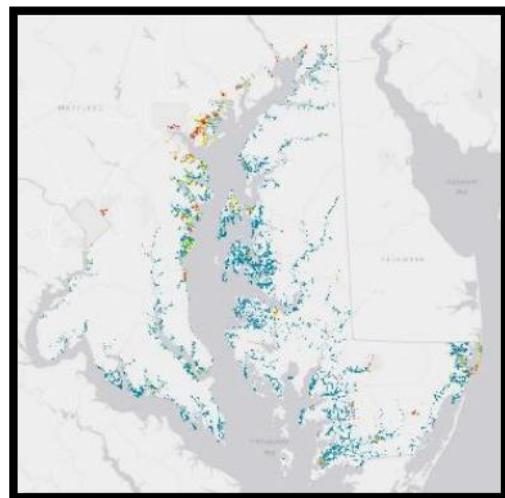
Community Flood Risk Areas



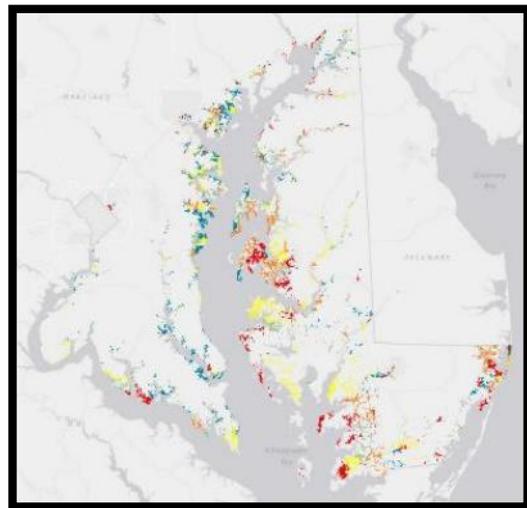
- Residential areas less equipped to prepare for, respond to, or recover from coastal hazard events.
 - Population Density (Residential Focus)
 - Social Vulnerability (Age, Income, Language Proficiency)
 - Probability of Exposure (Floodplain)



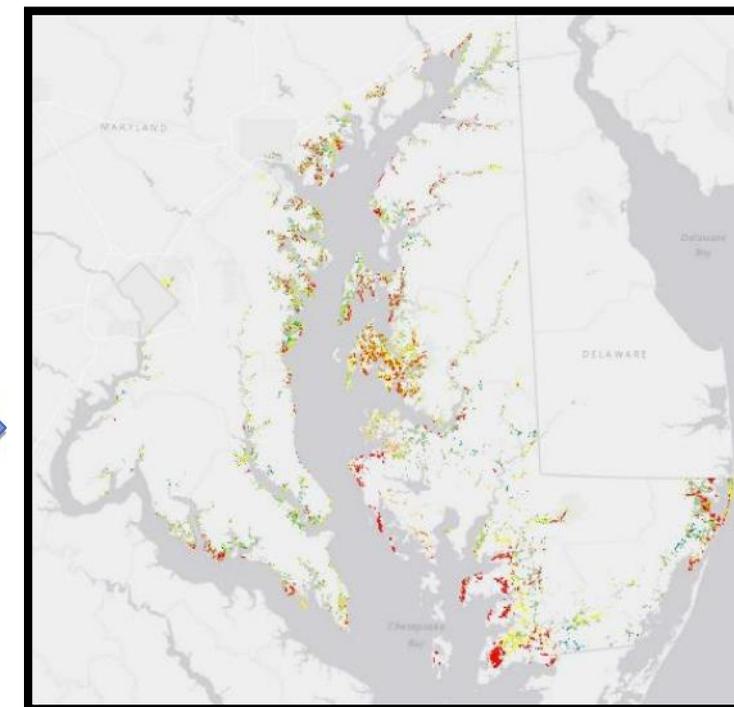
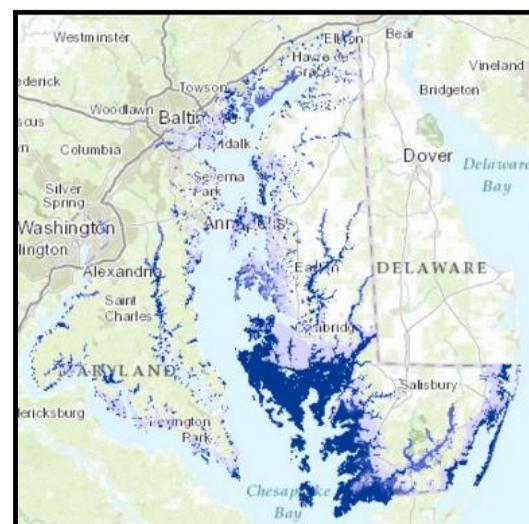
Population Density

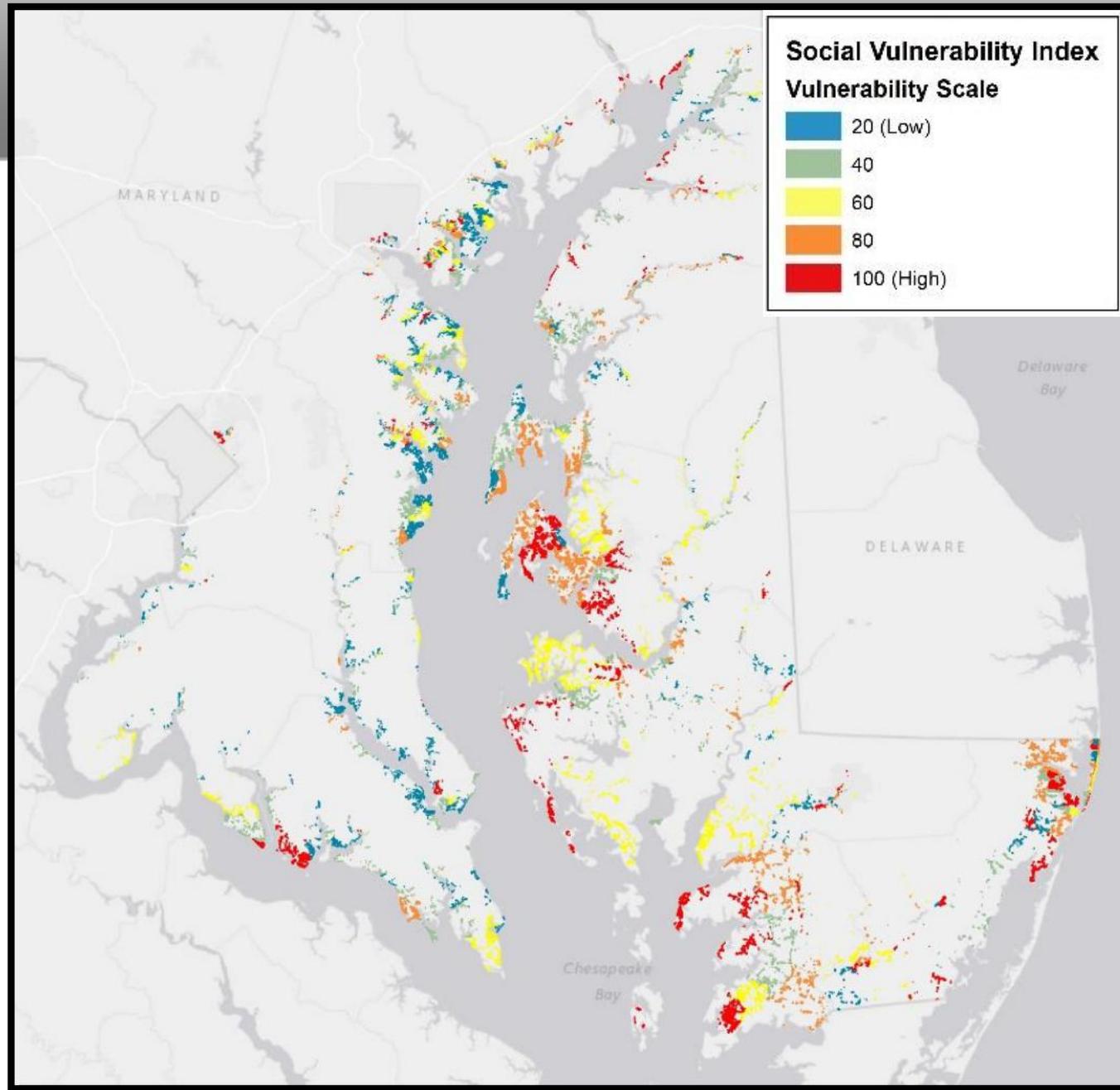


Social Vulnerability



Exposure Probability





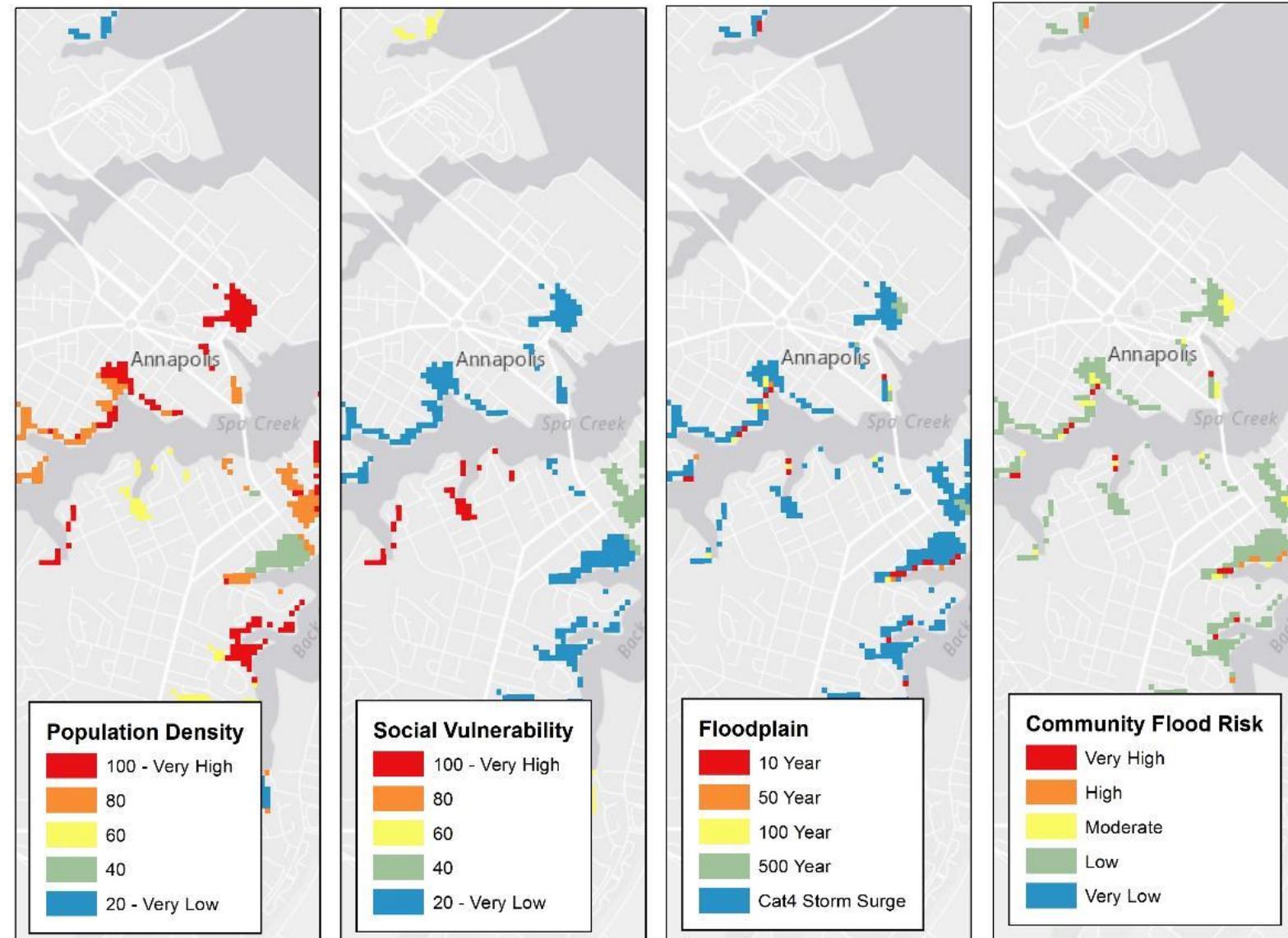
Social Vulnerability Index:

- US Census Bureau Block Groups
- 2013 American Community Survey, 5-year estimate
 - % Population ≤ 17 or ≥ 65 yrs old
 - % Population with Income Below Poverty
 - % Population of non-proficient English Speakers
- 5 Quantile Re-Classification

A Closer Look at Annapolis: Community Flood Risk



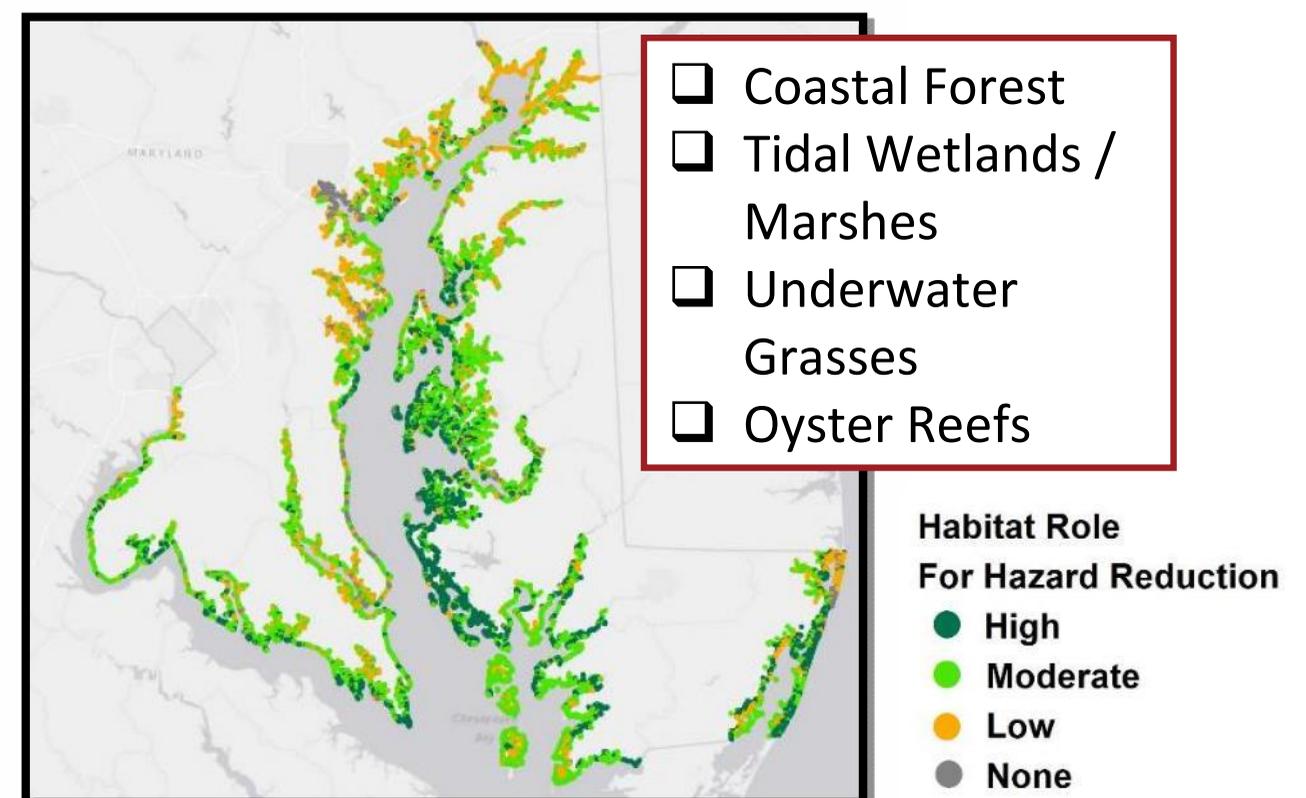
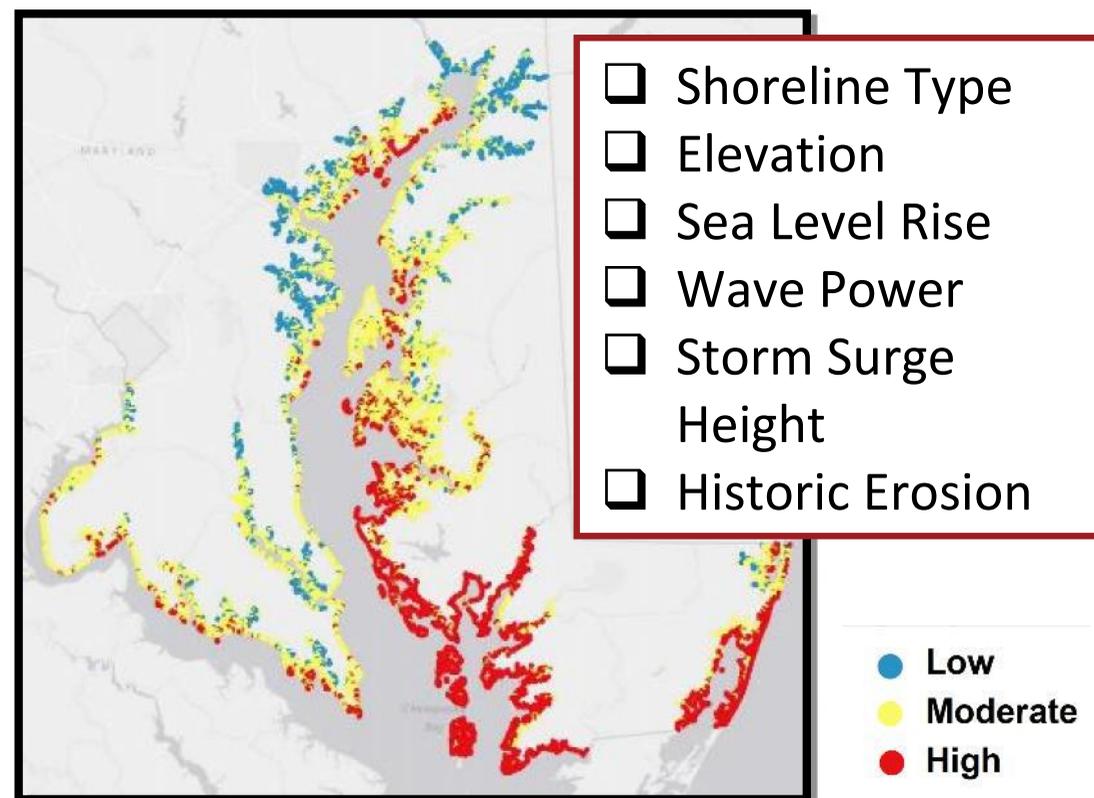
- Focus on residential land use limits applicability to commercial/industrial areas.
- Demographics are not weighted, leading to greatest influence by floodplain layer.
- Risk based on flood inundation, not SLR



Coastal Exposure and Habitat Role



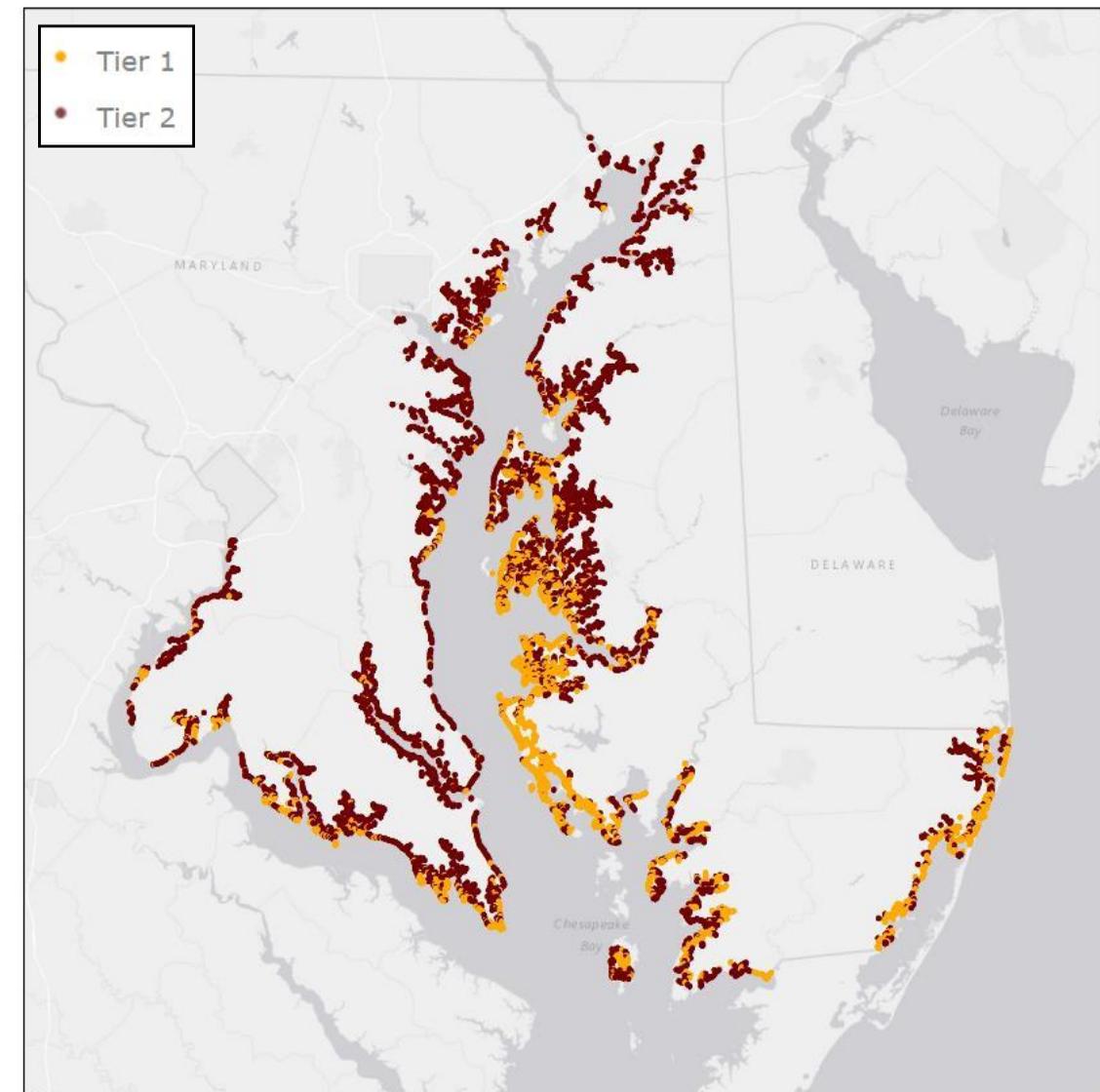
- Where do Habitats Reduce Exposure to Coastal Hazards?
 - Identify High, Moderate, Low Hazard Shorelines based on physical characteristics.
 - Evaluate Habitat Role in Reducing Exposure based on habitat presence/protectiveness.



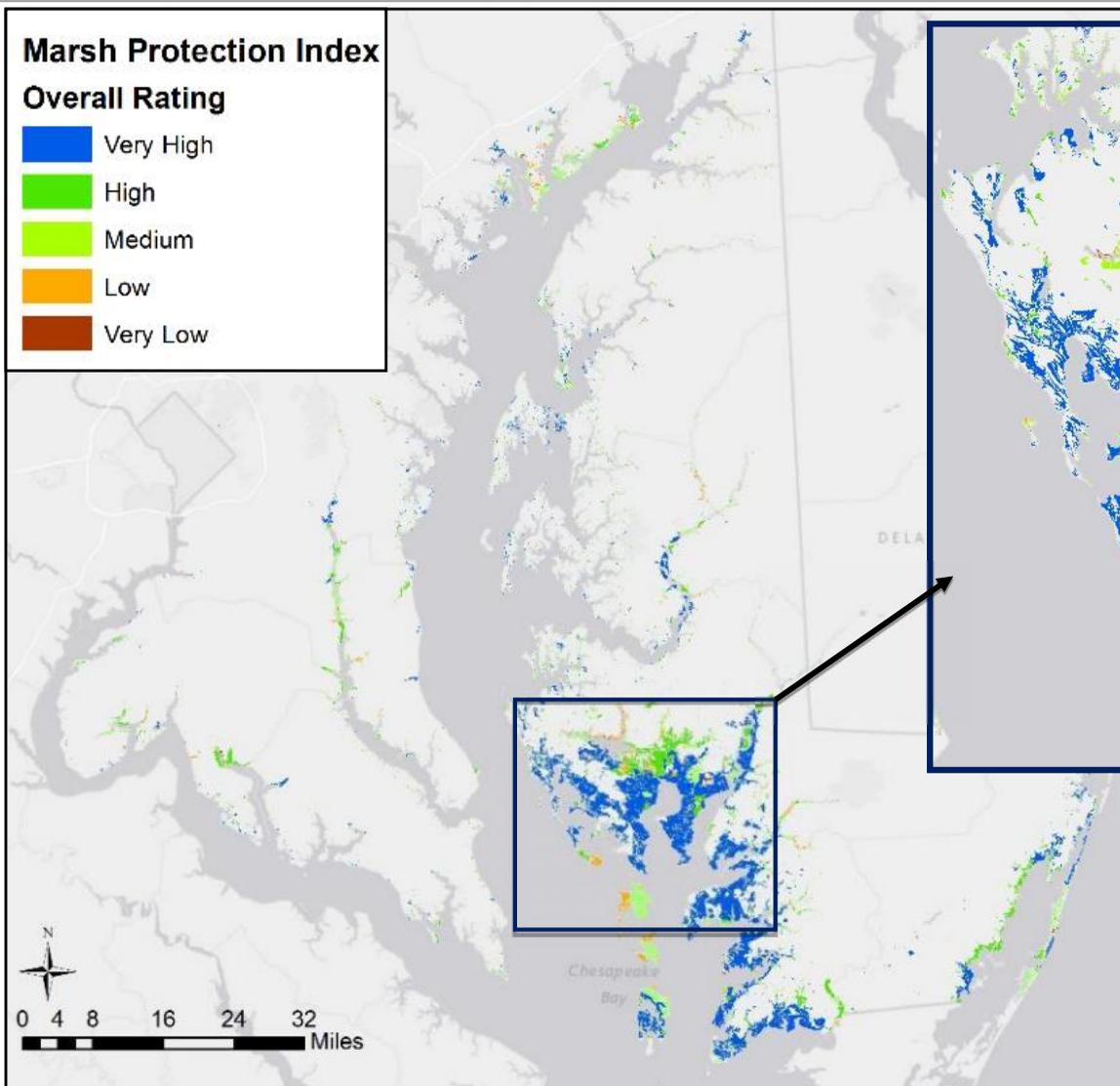
Priority Shoreline Areas



- **Tier 1 Shorelines**
 - High Habitat Role
 - Within 2km of Risk Area
 - 22% of shoreline
 - Conserve/Maintain/Enhance Habitats
- **Tier 2 Shorelines**
 - Moderate Habitat Role
 - Within 2 km of Risk Area
 - 40% of shoreline
 - Restore – action depends on site conditions (hazard level, development level)



Marsh Protection Potential Index



- Marsh Size (Area)
- Proximity to Hazards (High, Moderate, Low, or Floodplain)
- Proximity to people (Residential Areas – High density / social vuln.)
- Persistence (SLR and Migration)
- Proximity to Other Coastal Habitats

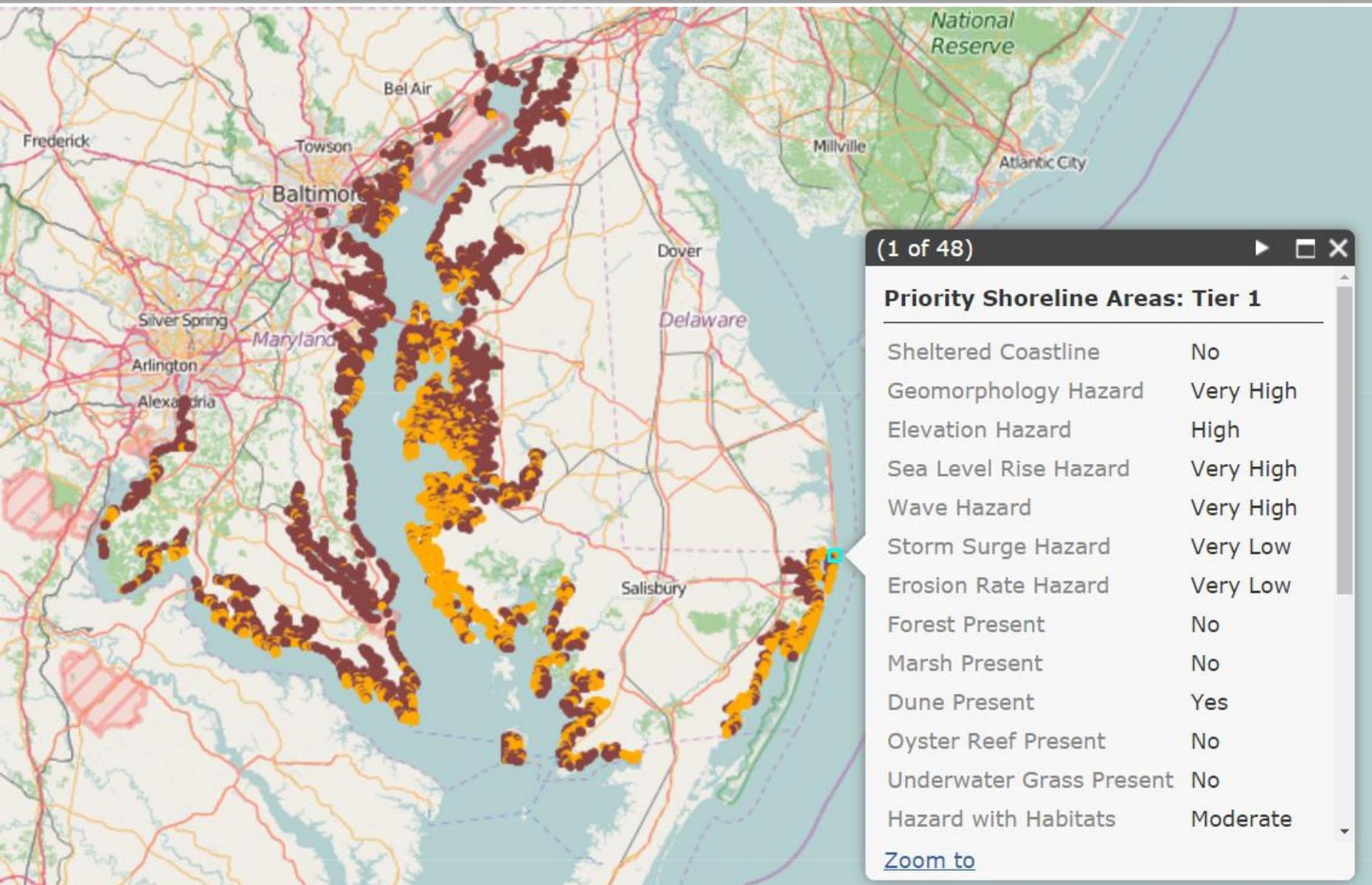
The Index ranks marshes based on their ability to protect people from coastal hazards.

The Index will be updated as we increase our knowledge of marsh role in coastal protection.

Data Access: Coastal Atlas



<http://gisapps.dnr.state.md.us/coastalatlus/WAB/index.html>

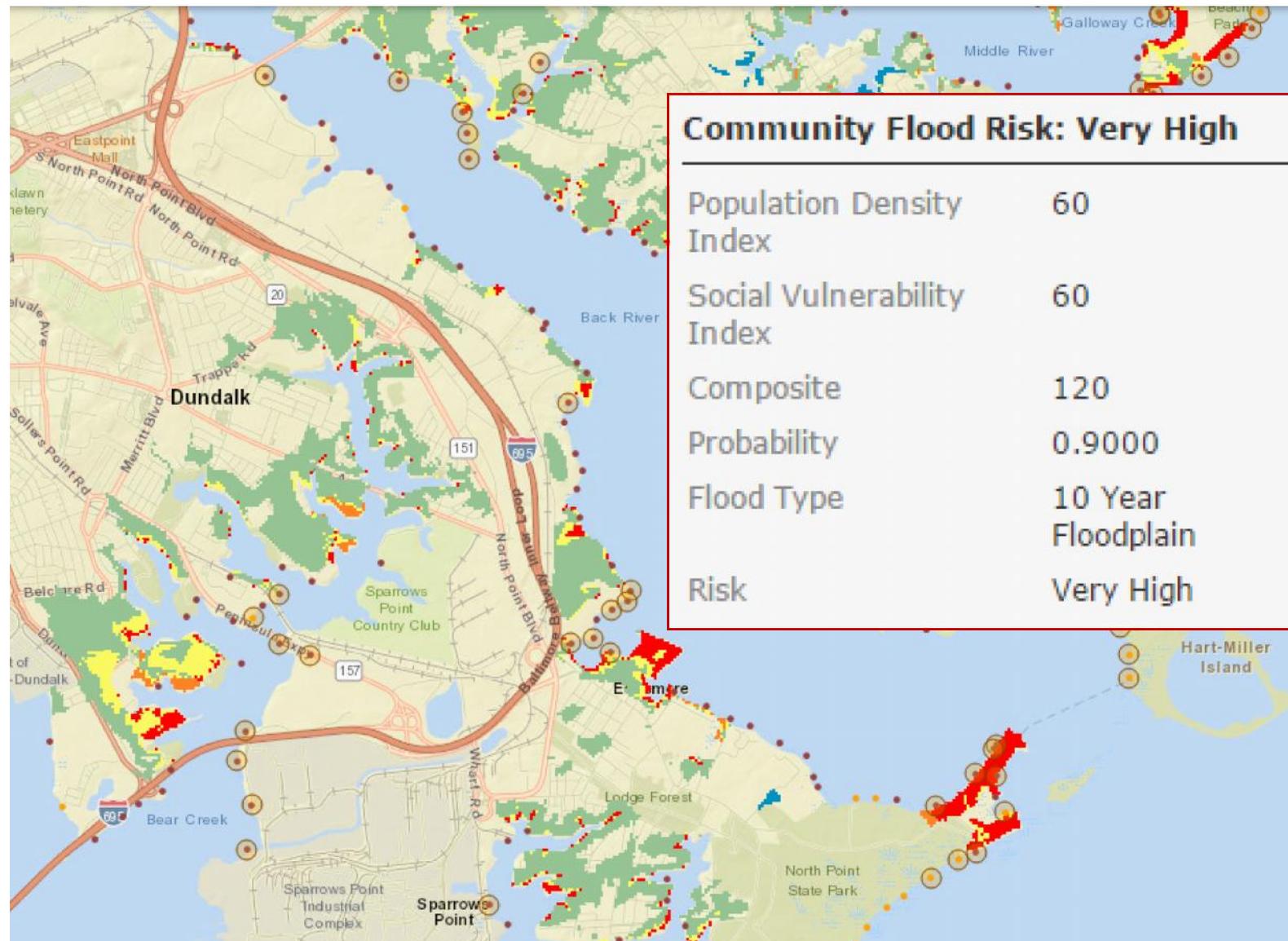


Where should I work?

- Along Tier I shorelines for larger system enhancement or conservation
- Along Tier II shorelines for restoration
- Where coastal habitat is absent/minimal but hazards are high (hybrid green/gray projects)
- Adjacent to dense and/or socially vulnerable communities
- Adjacent to critical infrastructure

Data Queries

<http://gisapps.dnr.state.md.us/coastalatl/WAB/index.html>



Legend ⏪ ✕

Conservation Priorities based on Community Flood Risk _Query Result

○

Coastal Resiliency Assessment

Priority Shoreline Areas

- Tier 1
- Tier 2

Community Flood Risk Areas

- Very High
- High
- Moderate
- Low
- Very Low

Questions?

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nicole.carlozo@maryland.gov

For more information:

<http://dnr.maryland.gov/ccs/Pages/CoastalResiliencyAssessment.aspx>

Coastal Atlas:

<http://gisapps.dnr.state.md.us/coastalatlus/WAB/index.html>

