United States Environmental Protection Agency

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Supporting Coastal Community Resilience through Natural Infrastructure

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EPA Office of Research & Development

11/23/2024

Coastal Resilience and Natural Infrastructure

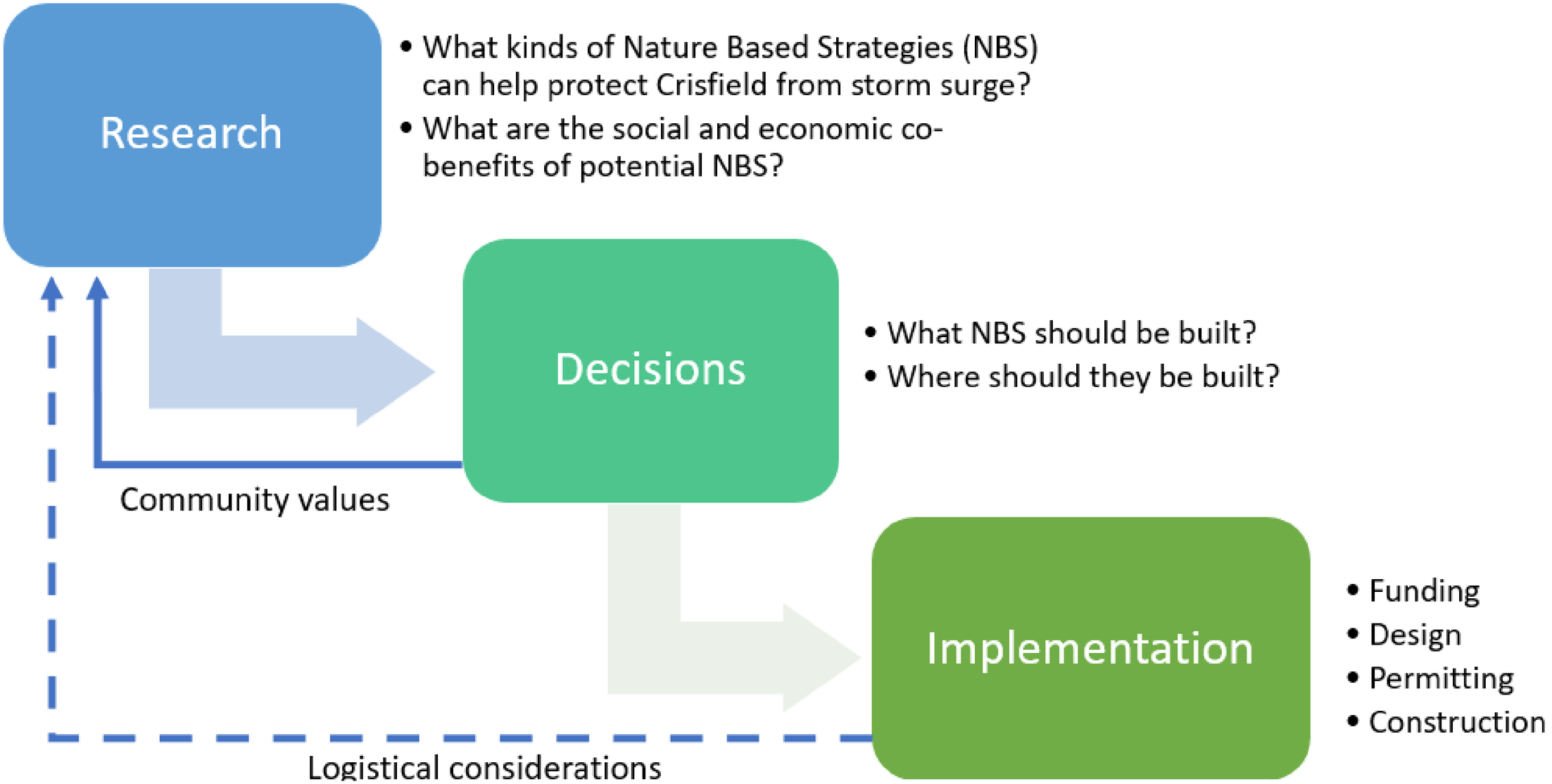
Goals:

- Investigate **natural infrastructure** strategies like saltmarshes or living breakwaters for addressing **coastal resilience issues** in and around Crisfield
- Assess **economic, social and environmental co-benefits** of natural infrastructure strategies
- **Co-develop information** with the community that is useful for decision making about Crisfield's future
- Help increase **community awareness** about resilience and environmental issues and **community capacity** to help address them

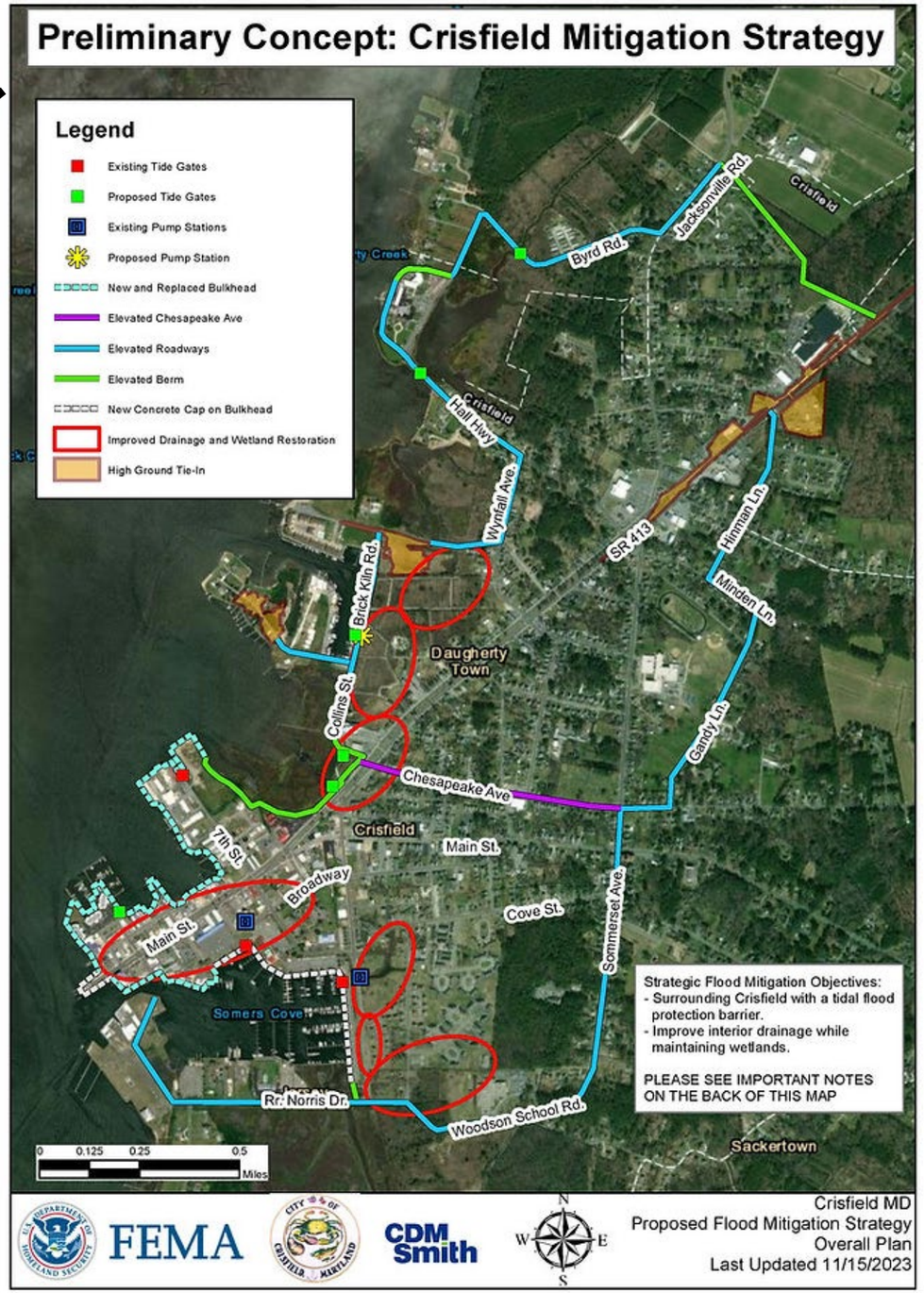
Session topics:

- Session 1: Resilience
  - Saturday, February 1, 2025
- Session 2: Crisfield's ditch drainage system
  - Saturday, February 22, 2025
- Session 3: Flood warning systems
  - Saturday, March 1, 2025
- Session 4: Nature-based solutions
  - Saturday, March 22, 2025
- Session 5: Coastal Tourism and Recreation
  - Saturday, April 5, 2025
- Session 6: Crisfield Resilience Academy Celebration!
  - Saturday, April 26, 2025

Research Co-Production



Nature + FEMA project



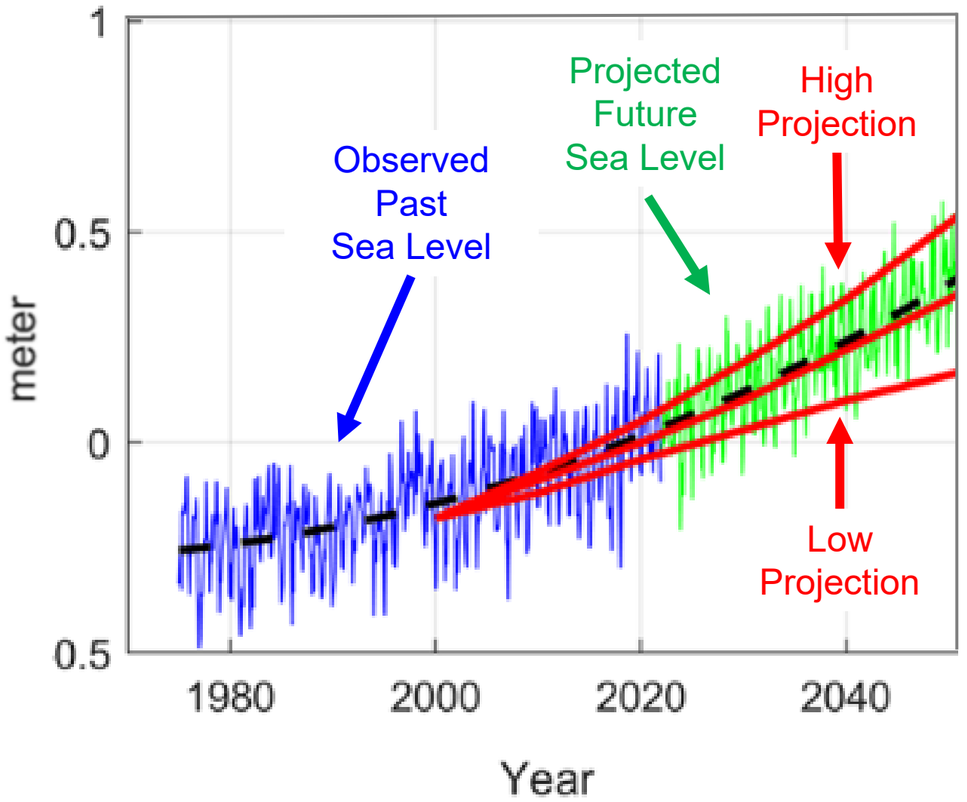
Increasing storms and sea level rise

Storms affecting Maryland by period

Period	Number of storms
1950s	9
1960s	14
1970s	11
1980s	13
1990s	20
2000s	29
2010s	33
2020s	14

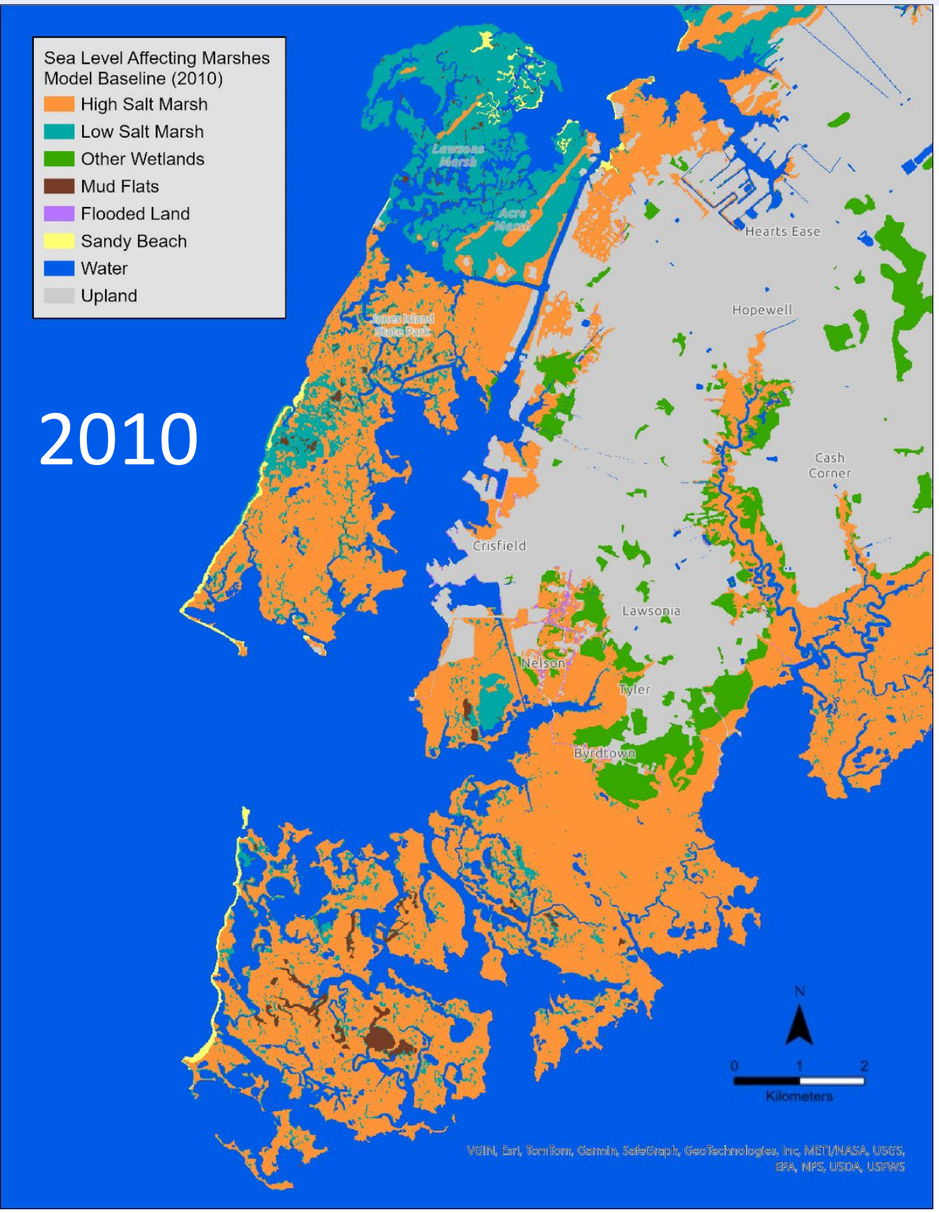
https://www.wpc.ncep.noaa.gov/tropical/rain/tcrainfall.html

Monthly Sea Level Observations and Projection (Chesapeake Bay)



http://www.ccpo.odu.edu/~tezer/PAPERS/2023_ODYN_CB_SL.pdf

Current marsh inundation



High salt marsh =

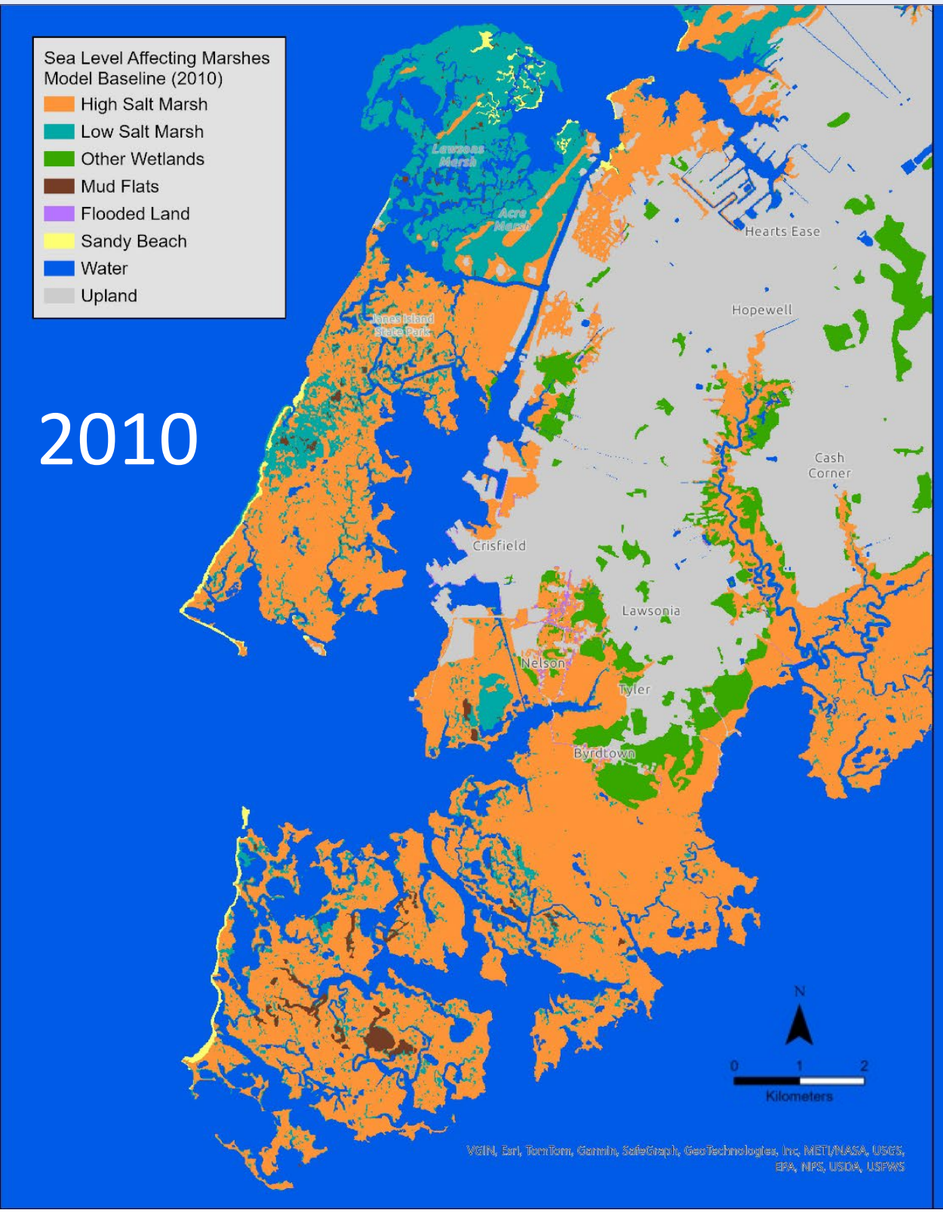
Area flooded irregularly by larger than average tide resulting in weekly to monthly flooding

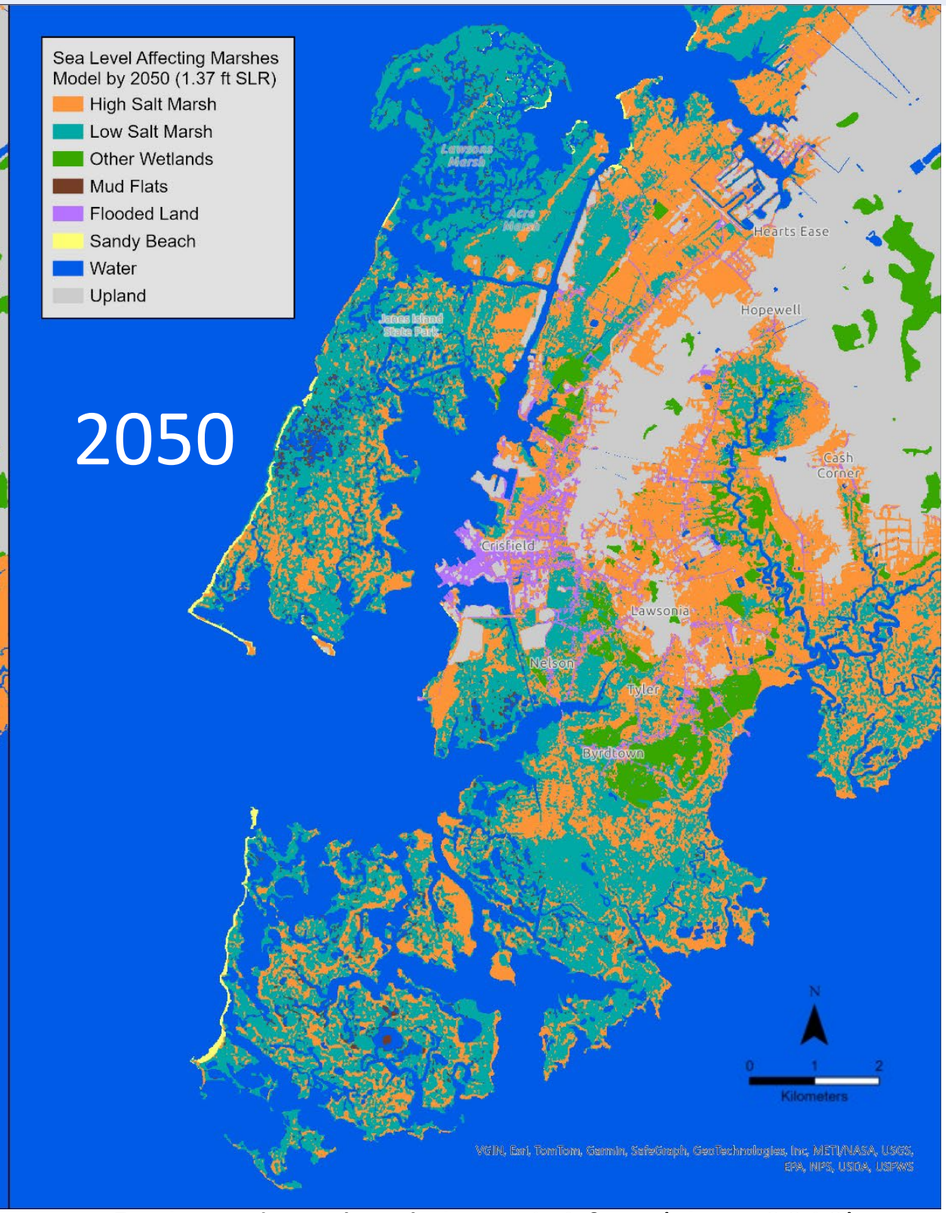
Low salt marsh =

Area flooded regularly by daily tides

https://warrenpinnacle.com/prof/SLAMM/EESLR_MD/EESLR_MD_SLAMM_Report_12-28-2021.pdf

Future expected marsh inundation





High salt marsh

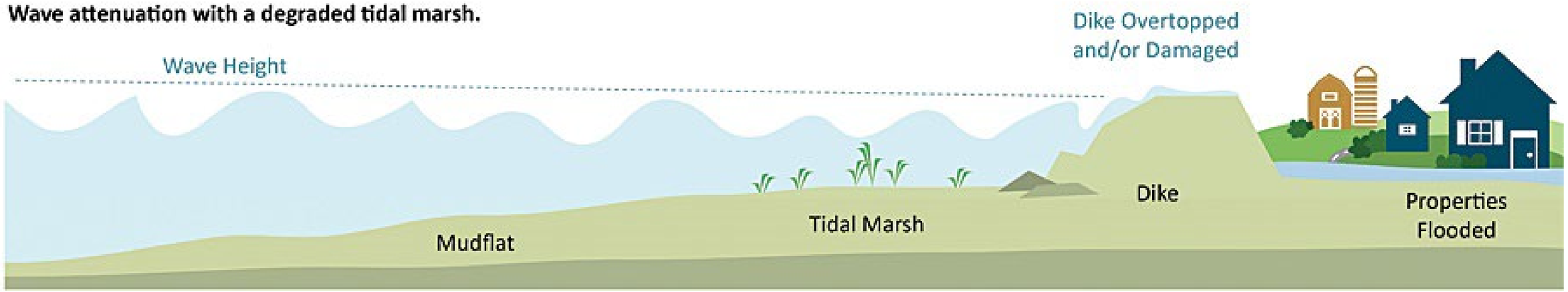
Low salt marsh

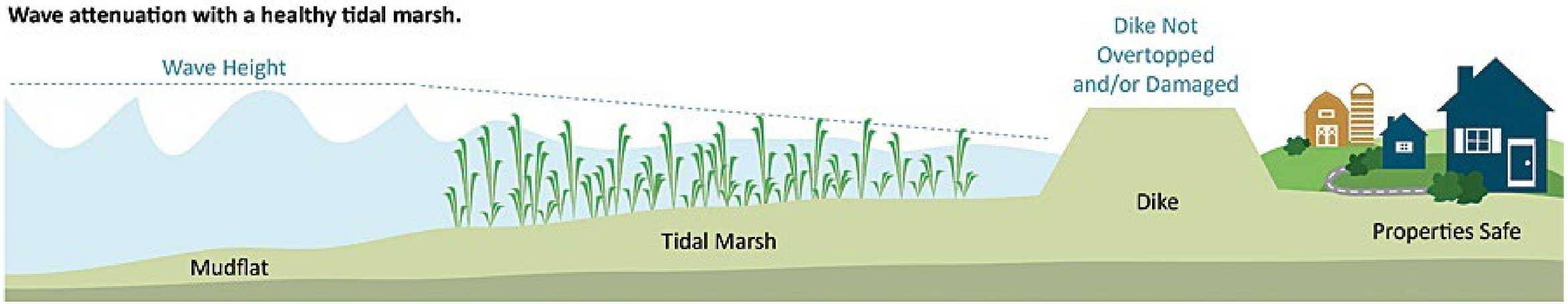
Projected sea level rise: 1.4 feet (since 2010)

https://warrenpinnacle.com/prof/SLAMM/EESLR_MD/EESLR_MD_SLAMM_Report_12-28-2021.pdf

How do Nature-Based Strategies work?

Wave attenuation = Wave energy reduction





https://www.esri.com/about/newsroom/arcnews/gis-helps-integrate-coastal-hazard-risk-and-sea-level-rise/

What are Types of Nature-Based Strategies?

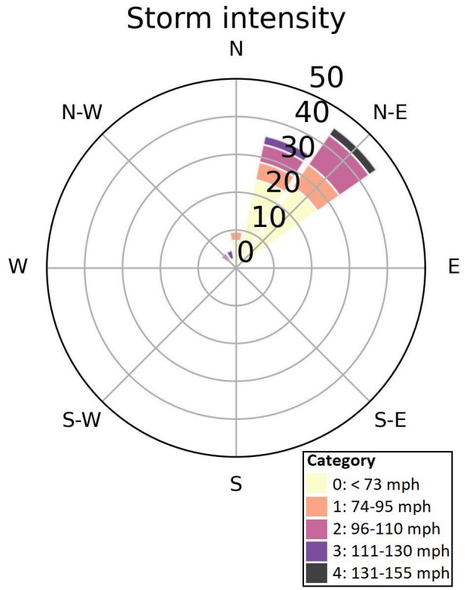
Salt Marsh Restoration

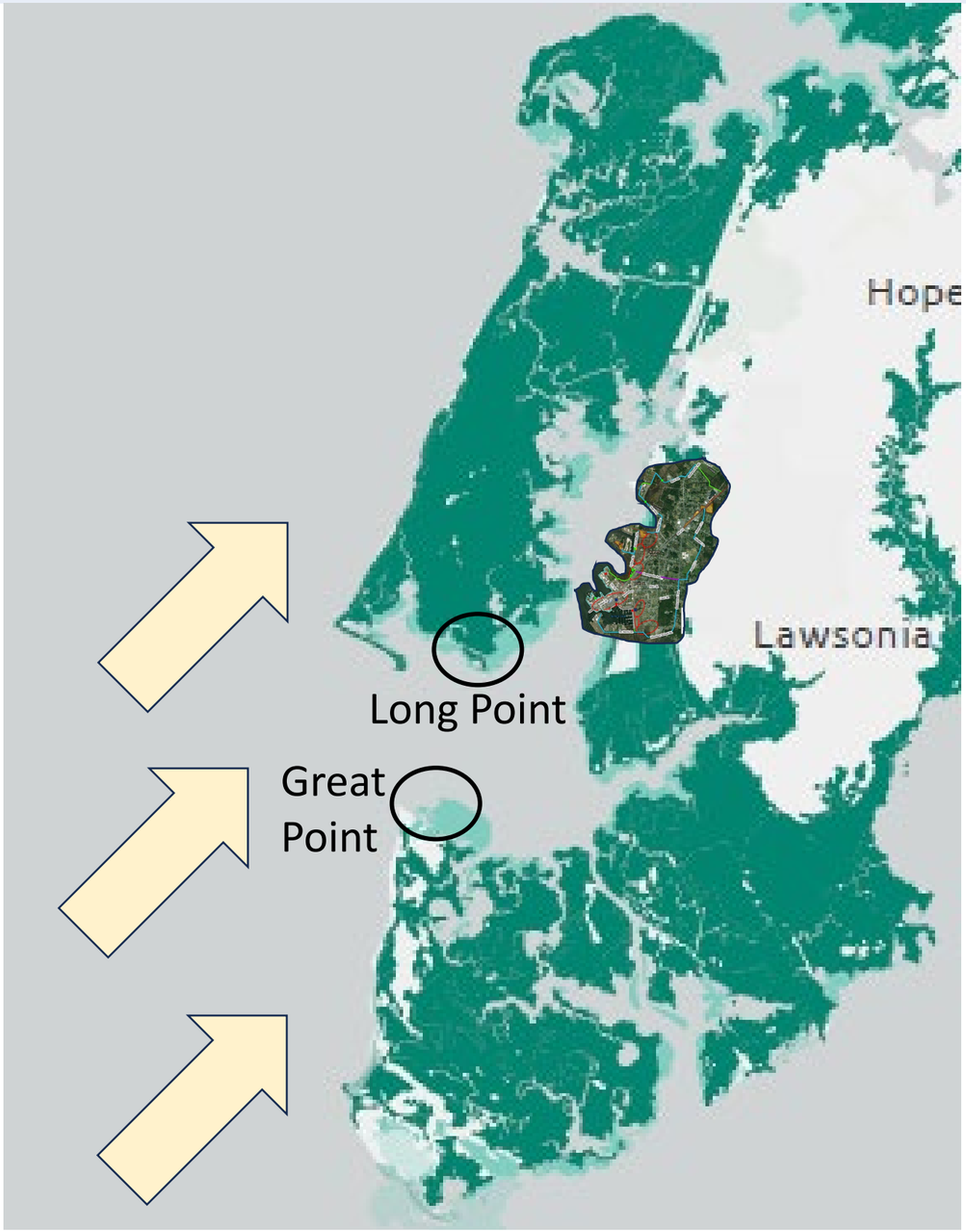
Living Shoreline

Artificial Reef/Living Breakwater

Sand Dune Restoration

Possibilities most likely to attenuate waves and storm surge



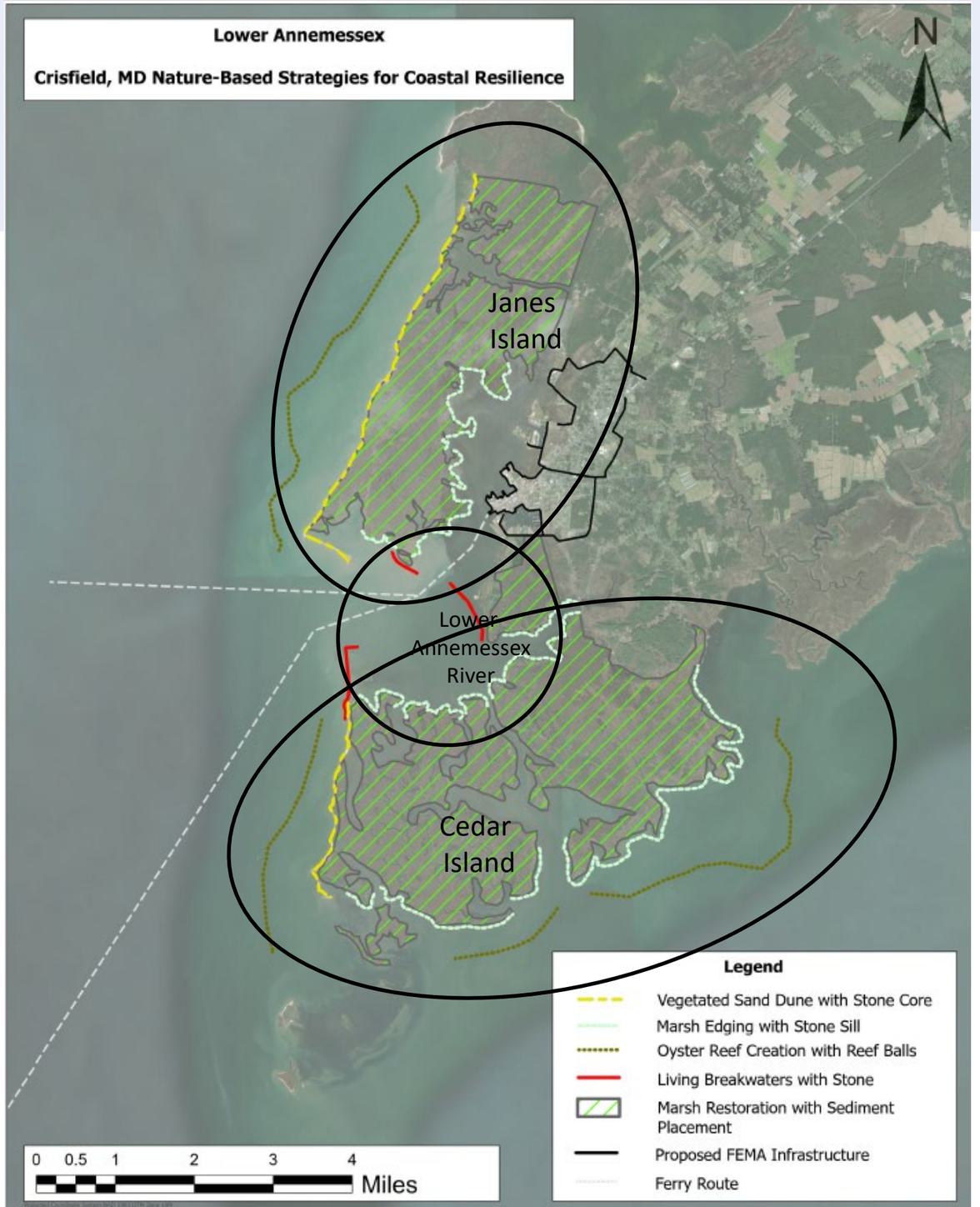


Natural infrastructure success and siting criteria:

- Shallow enough water depth
- Conditions that support vegetation
- Low enough wave height & energy
- Gentle coastal land slope
- Healthy, complex ecosystems

Crisfield nature-based project options

- Janes Island
  - Marsh restoration: ~2,800 acres
    - ~7.8 inches sediment placement by 2050
  - Sand dune restoration: ~24,000 feet
    - ~6.5 feet above local mean sea level
  - Artificial oyster reefs: ~28,000 feet
    - ~60 feet width (multiple lines of reef balls)
    - ~3 feet tall in water depths of ~6-9 feet
- Lower Annemessex River
  - Living breakwaters: ~10,000 feet
    - ~4 feet above local mean sea level
- Cedar Island marsh complexes
  - Marsh restoration: ~5,000 acres
    - ~7.8 inches sediment placement by 2050
  - Sand dune restoration: ~12,000 feet
    - ~6.5 feet above local mean sea level
  - Artificial oyster reefs: ~48,000 feet
    - ~60 feet width (multiple lines of reef balls)
    - ~3 feet tall in water depths of ~6-9 feet



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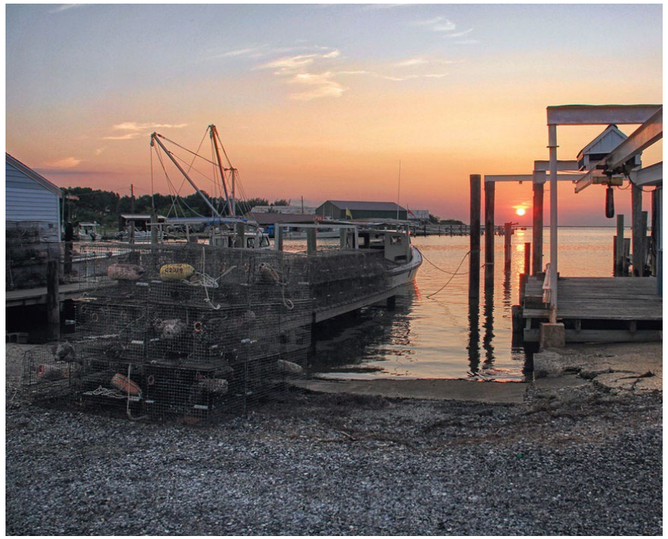
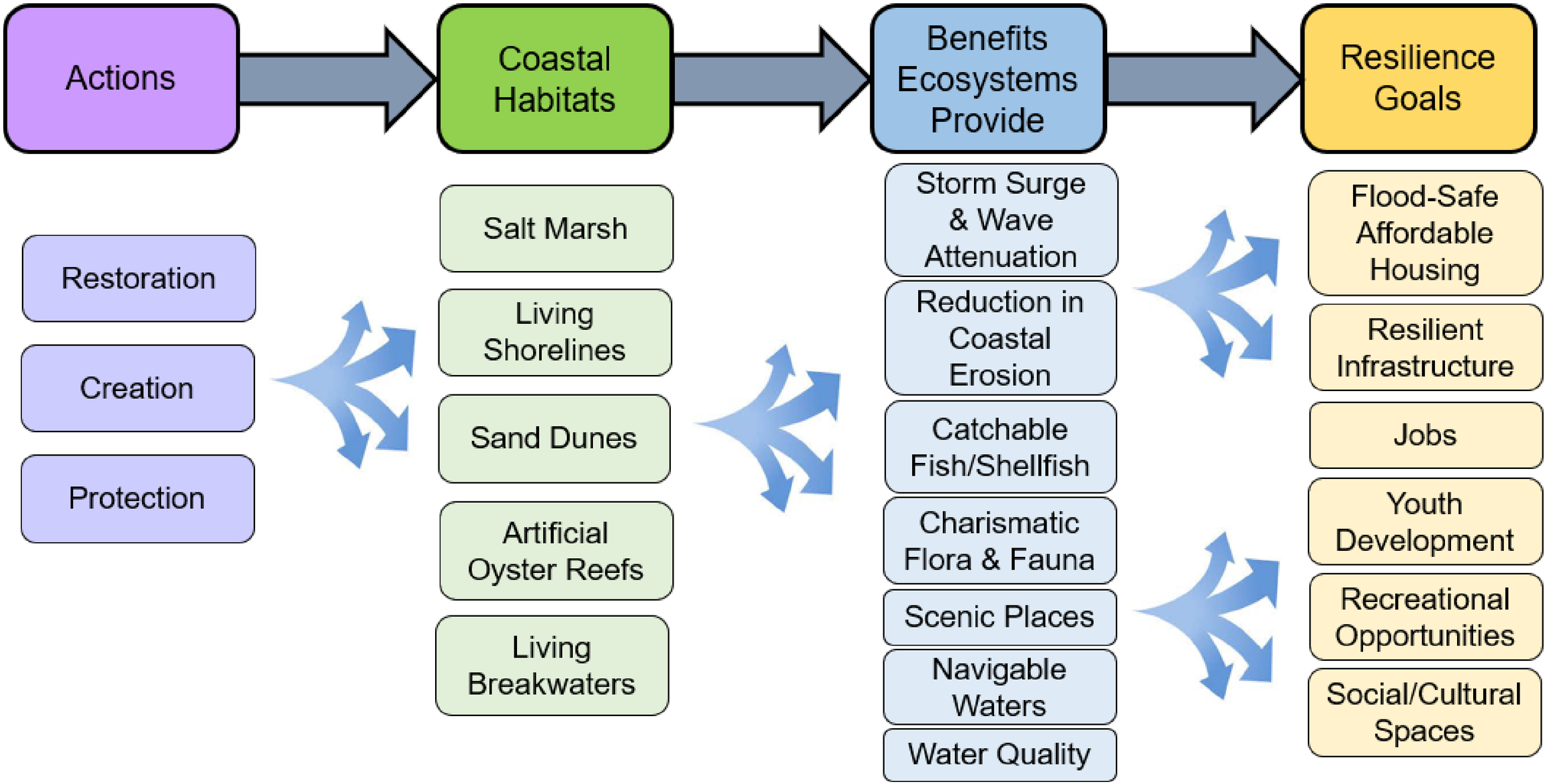
What are Other Potential Social & Economic Benefits of Nature-Based Strategies to Crisfield and the Surrounding Communities?



Crisfield's Community Resilience Goals

- Resilient infrastructure, job creation and training, flood-safe and affordable housing, recreational opportunities, social/cultural spaces, youth development
- Also interested in community retention and cultural preservation, tourism tied to the waterfront (maritime history/heritage tourism, boating, fishing, nature appreciation), and fisheries (oysters, blue crabs)

How might Nature-based Strategies contribute to these goals?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Benefits Ecosystems Provide
Resilience Goals
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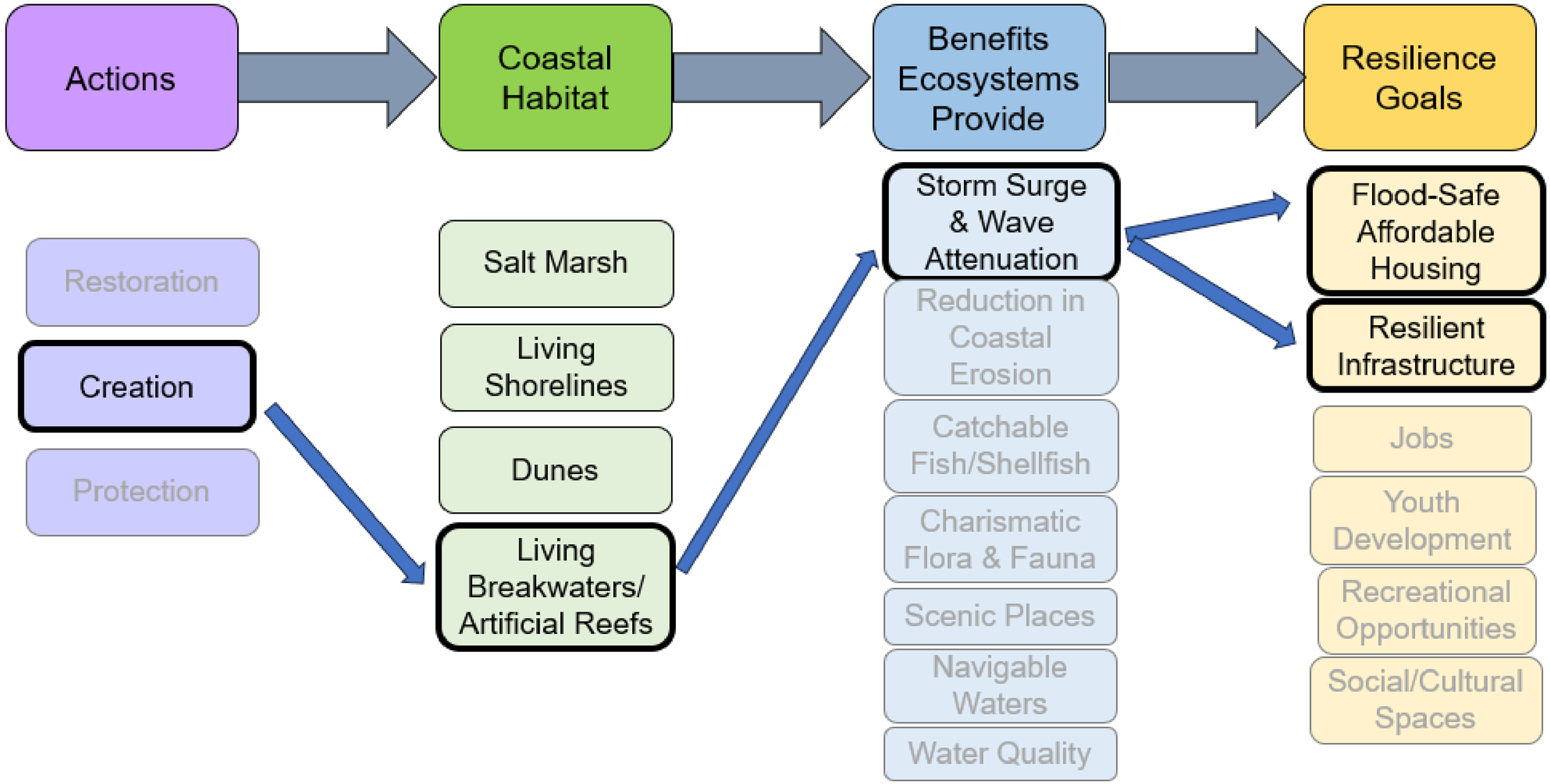
Creation
Protection
Salt Marsh
Living Shorelines
Sand Dunes
Artificial Oyster Reefs
Living Breakwaters
Storm Surge & Wave Attenuation
Reduction in Coastal Erosion
Catchable Fish/Shellfish
Charismatic Flora & Fauna
Scenic Places
Navigable Waters
Water Quality
Flood-Safe Affordable Housing
Resilient Infrastructure
Jobs
Youth Development
Recreational Opportunities
Social/Cultural Spaces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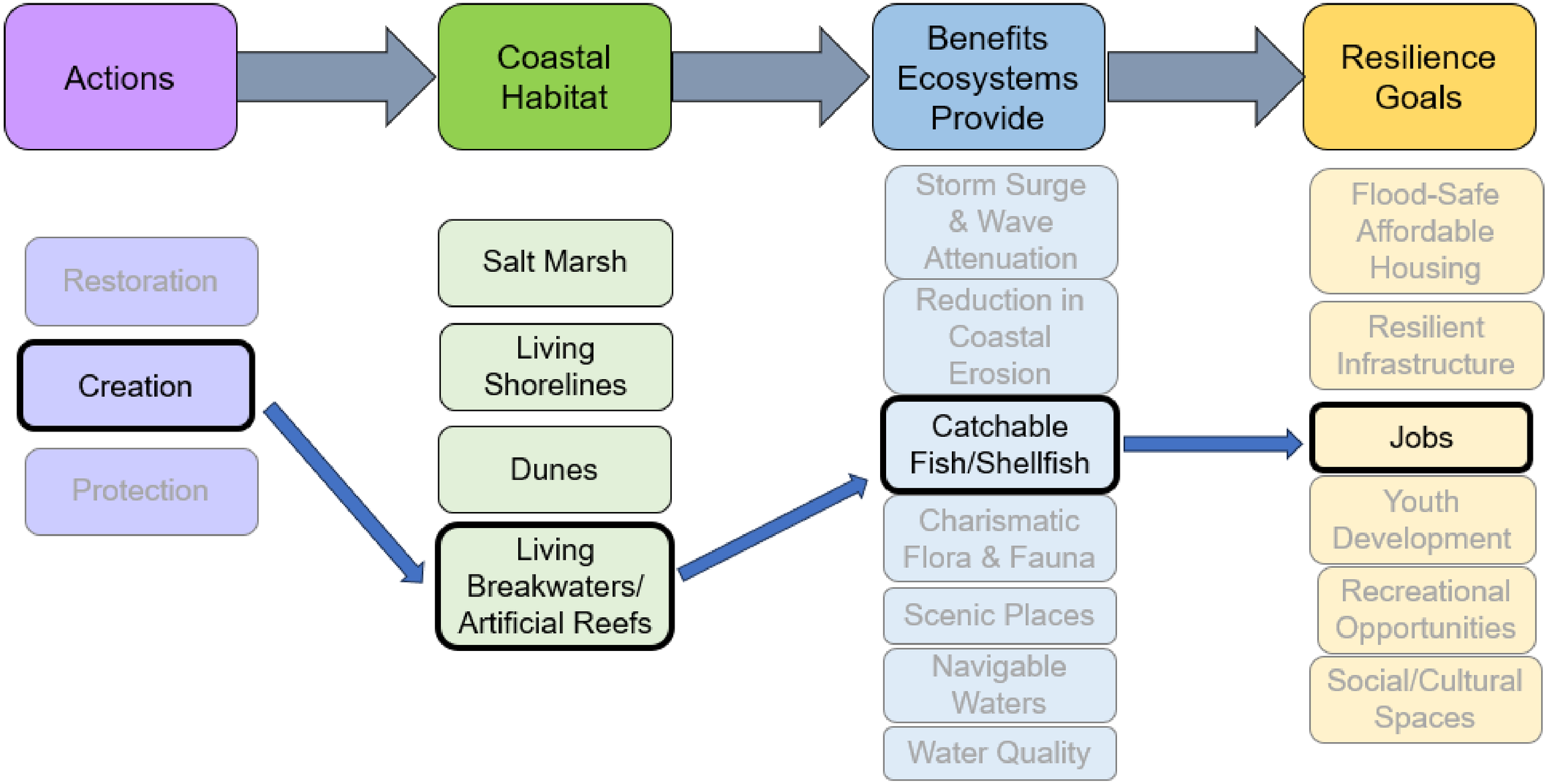
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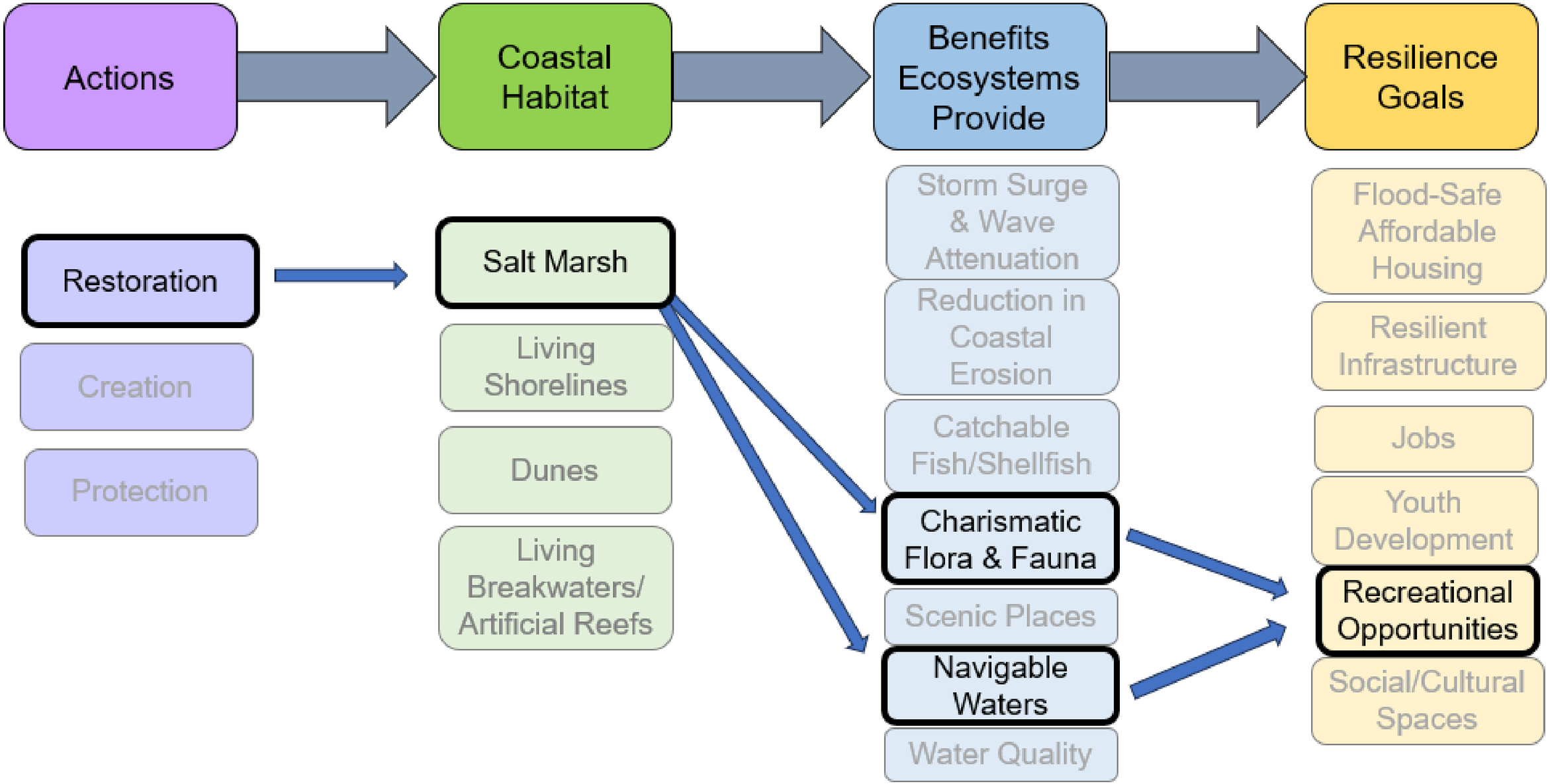
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Community-Identified Co-Benefits

- Storm protection
  - Flood protection
  - Erosion prevention
- Support seafood industry
  - Habitat for fish, crabs, oysters (commercial fishing species)
  - Water access and navigability
  - Improve water quality for seafood species to grow and flourish
- Enhance recreation and tourism
  - Maintain and protect natural beauty
  - Preserve historical and cultural resources
  - Community access to natural open spaces like kayak trails
  - Habitat for animals (birdwatching, recreational fishing, duck hunting)
  - Improve water quality for boating, beaches and swimming

Thank you!

Questions?

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- Veerani Tailor (student services contractor)
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- Emily Trentacoste
- Rich Fulford
- Anne Kuhn
- Justin Bousquin
- Candace May
- Abigail Sullivan
- Communications:
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  - Marie Schneider
  - Caroline Cole
  - Jessica Daniel
  - Virginia Vichi-Miller
- Supported by Tetra Tech

Activity Break

1. How might the NBS affect the community's use of these spaces (positively or negatively)?
   - Add sticky notes to each map

2. How might the NBS contribute to Crisfield's quality of life? E.g. Businesses, recreation, tourism, health, etc.?
   - Write down ideas on paper

Additional questions or comments?

Let us know!