

# Using Quantified Ecosystem Services to Interface with and Engage the Public

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# Challenges for Resource Managers

When considering & implementing restoration projects, Resource managers and communities need methods to:



“...Inspire the public to act”

“...Determine local priorities for action”

“...Evaluate alternative restoration options”

“...Gain public support for planned projects”

“...Identify metrics to monitor progress”

“...Communicate benefits post-restoration”

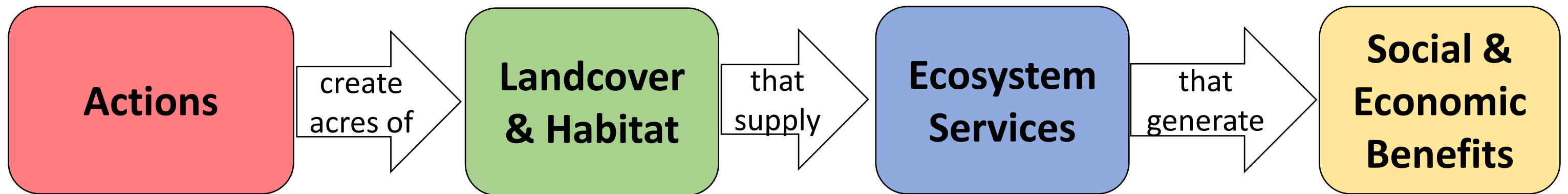
**Pre-restoration Planning**

**Restoration Implementation**

**Post-restoration Monitoring**

# Ecosystem Services as a Bridge

- Actions to restore, conserve, or protect landcover & habitat can be linked to social and economic benefits to people and communities through ecosystem services



# What are Ecosystem Services?

“**[biophysical] components of nature, directly enjoyed, consumed, or used to yield human well-being**” *(Boyd & Banzhaf 2007)*

## Environmental Context



Salt Marsh

Where?

+

## Beneficiary



Birdwatchers

Who?

+

## Ecological Attribute



Charismatic bird species

What?

# Why a Beneficiary-focused Perspective?

- Clarify what is meant and reduce ambiguity
- Directly relevant to stakeholders
- Helps to ensure key stakeholders or benefits aren't overlooked

Water  
quality

**Where?**

**For who?**

**What?**

**Water salinity** in **groundwater** that local **farmers** depend on for irrigating crops

**Water temperature** in **local streams** used by **industrial processors** for cooling

**Water turbidity** in **coastal waters** that are visited by **snorkelers**

# Review of Planning Documents



“gazing at stunning coastal sunsets”

“protect rare and endangered species in the estuary”

“collect mushrooms along the streambank”

“rich agricultural soils preserved for farming”



“fibers from the area used to temper pottery”



“enjoy migratory songbirds near the water”

“open spaces for public use”

“the community depends on natural systems for water resources”

“sailing and windsurfing”

“pollination of agricultural plants”

“a panoramic view of the bay from the observation tower”

“protecting the air our residents breathe”

“the waters provide shellfish for commercial fisheries”



“a natural lab for students to learn about the estuary”

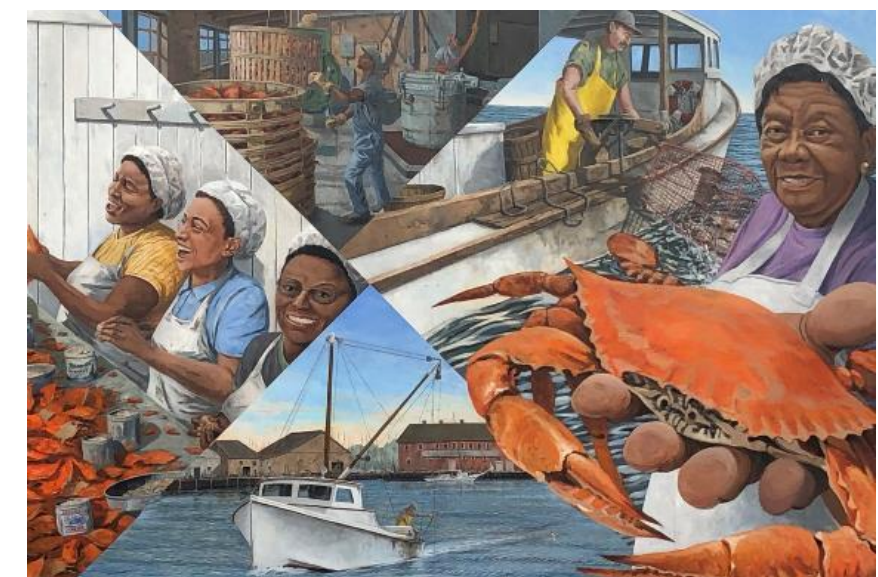
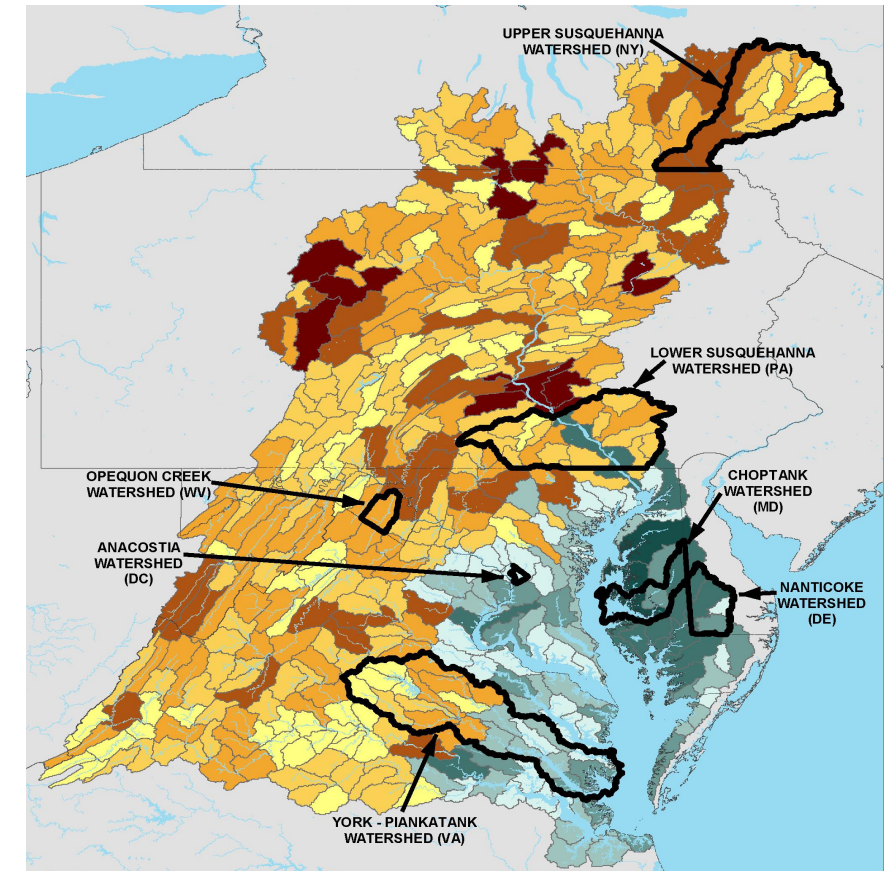


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# Review of Planning Documents

- Illustrates management programs and communities are implicitly considering ecosystem services in planning
- Yet... widespread implementation of ecosystem services assessments is still limited
  - Perceived as too technical or nuanced to convey to stakeholders
  - Perceived as requiring economic or monetary valuation (special expertise)
  - Management & restoration fall back on ecological proxies (habitat cover, water quality) - “easy wins”
- Reinforces that approaches and tools are still needed to simplify ecosystem services assessment

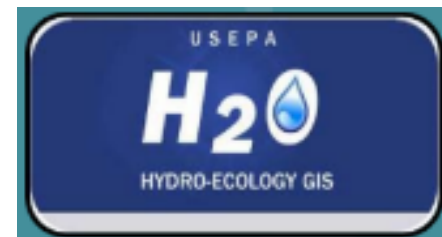
- Provide frameworks, tools, and approaches to link restored biological condition to social and economic benefits via ecosystem services
- Chesapeake Bay RESES - motivate implementation of conservation BMPs in upper watershed
- Crisfield, MD – evaluate nature-based solutions for storm-related flooding





# Research Approach

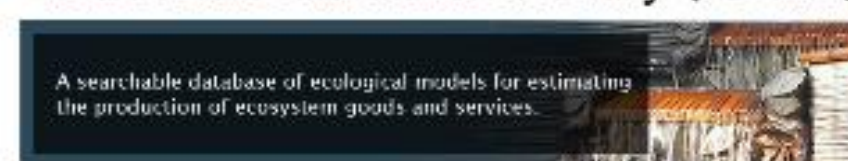
- Step 1. Clarify scope for the project, and how/where ecosystem services play a role
- Step 2. Identify stakeholder objectives and which are ecosystem services
- Step 3. Identify potential metrics to measure ecosystem services
- Step 4. Identify management actions
- Step 5. Apply data/models to compare ecosystem services change under different actions
- Step 6. Communicate links between actions and ecosystem services to support decisions



## FEGS Scoping Tool

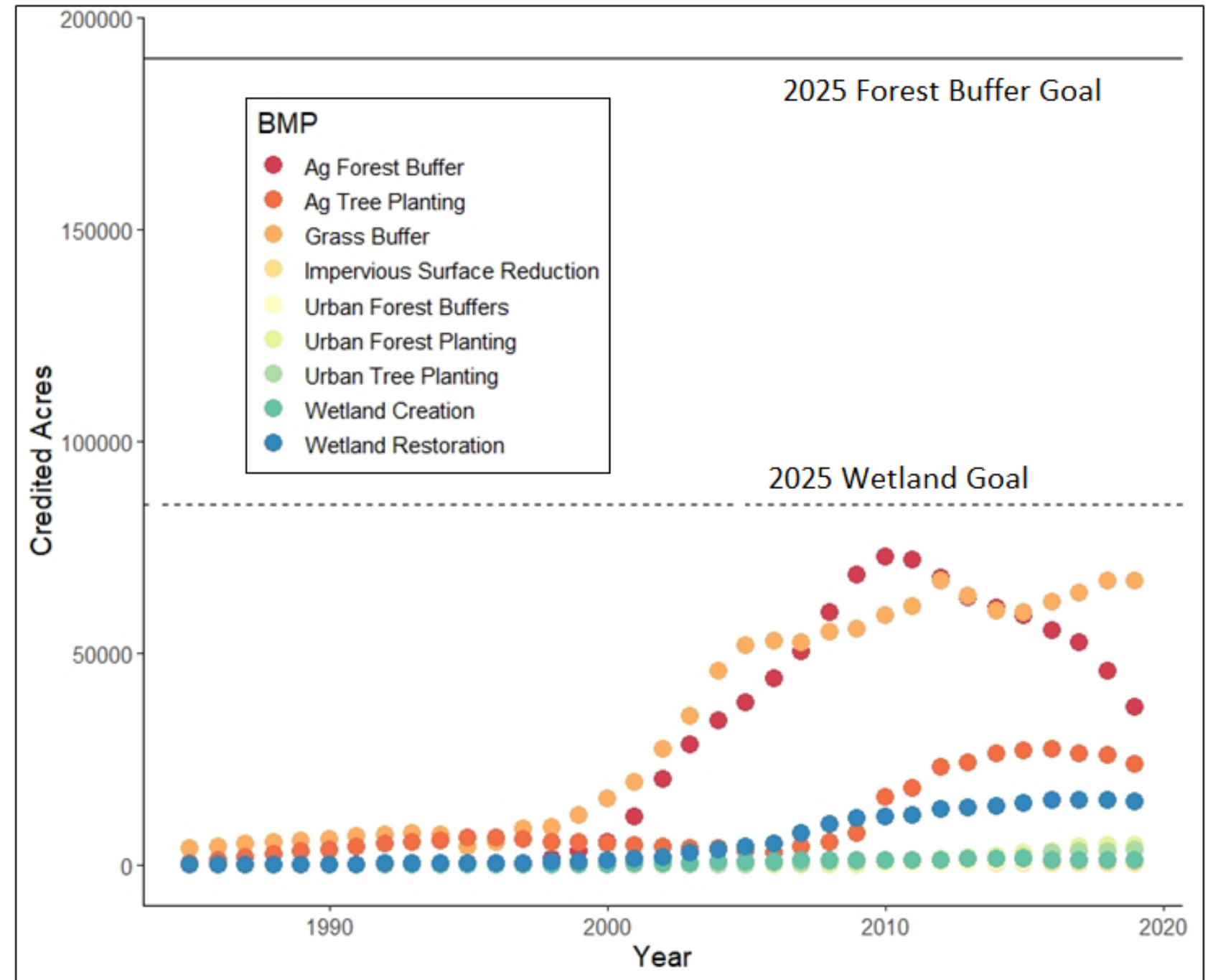


## EcoService Models Library (ESML)



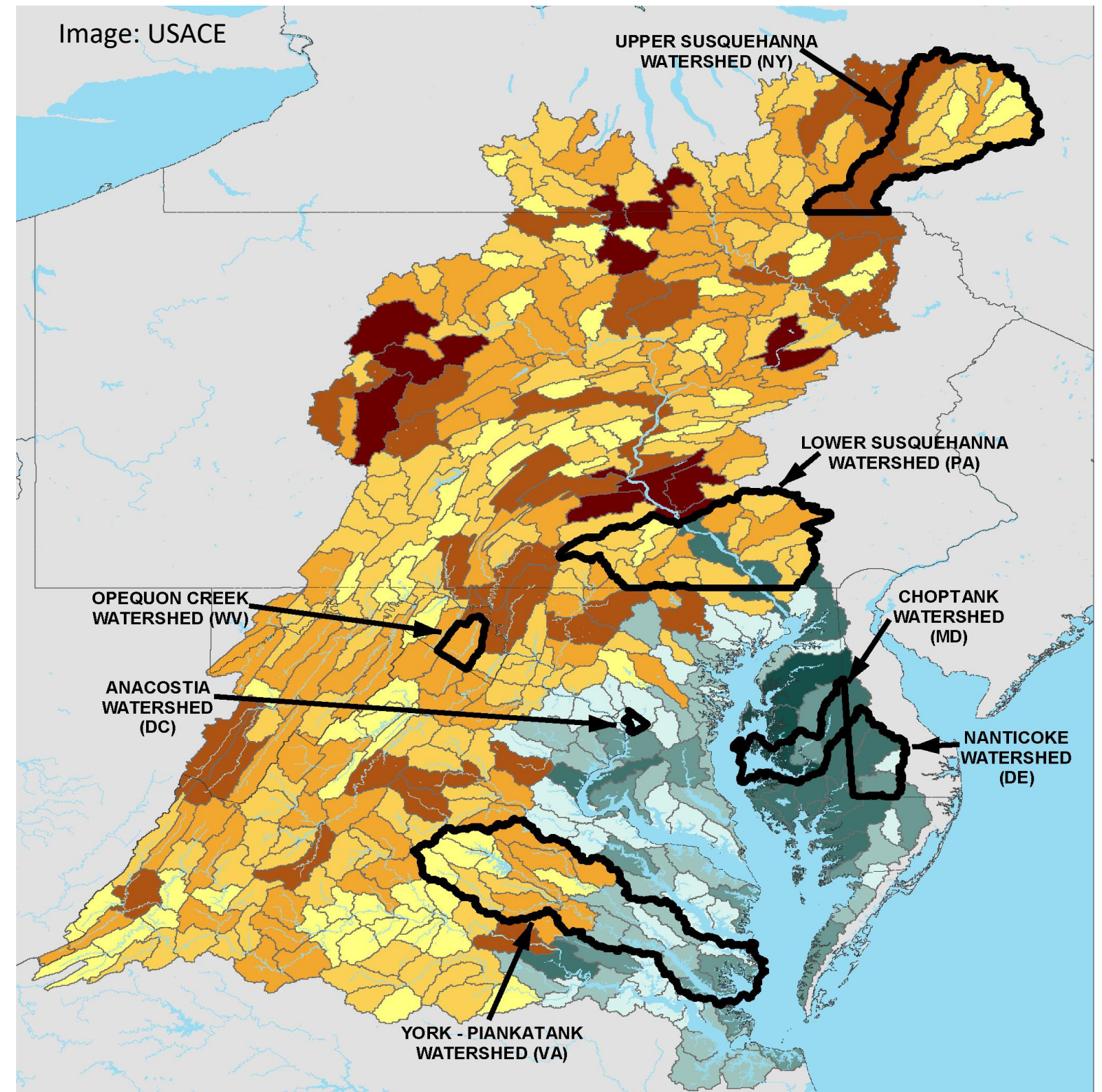
# Case Study 1: Chesapeake Bay RESES

- Some BMPs in the Watershed Agreement are behind on implementation – e.g. wetlands and forest buffers
- Need to enhance stakeholder buy-in of implementation of these practices, especially in headwater communities
- Want to be able to better communicate and quantify benefits associated with these practices, specifically beyond water quality



# Case Study 1: Chesapeake Bay RESES

- Goal: Motivate implementation of Conservation & Restoration Related BMPs that are lagging, especially in upstream communities
- Quantify how BMPs may affect ecosystem services, particularly beyond sediment and nutrient reduction



# Project Approach

- Identify priority ecosystem services and quantify how BMPs may affect them
- Communicate potential contributions of ecosystem services to Watershed Agreement Outcomes
- Build off existing tools like Co-Benefits Report and CAST

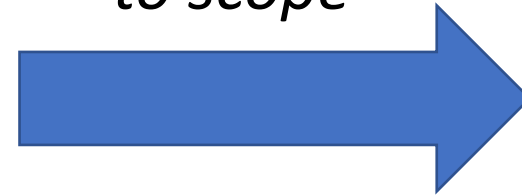


# Determine which BMPs to Focus on

## Focus on BMPs that are:

1. Lagging in implementation
2. Relevant to upstream communities
3. Have associated Watershed Agreement goals that have not been met
4. Related to habitat conservation or restoration

*Used these  
4 "criteria"  
to scope*



## Scoped list of BMPs:

- Agricultural forest buffers
- Agricultural grass buffers
- Agricultural tree planting
- Agricultural cover crops
- Urban forest buffers
- Urban forest planting
- Urban tree planting
- Forest conservation
- Impervious surface reduction
- Wetland creation
- Wetland restoration

# Identify Relevant Ecosystem Services



## Who might benefit?

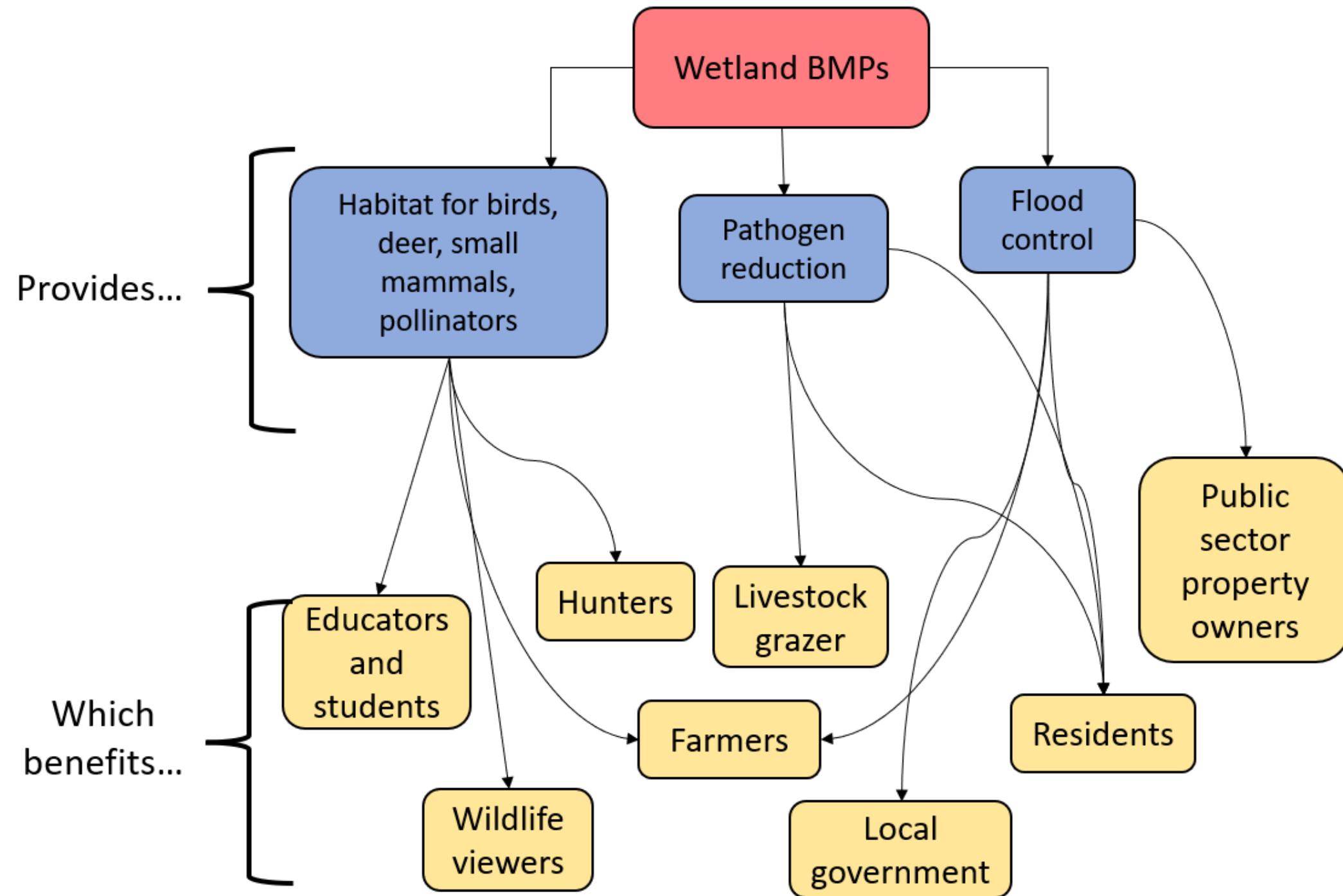
Agricultural	Agricultural Processors	Farmers
	Livestock Grazers	Foresters
	Aquaculturists	
Commercial / Industrial	Private Drinking Water Plant Operators	
	Industrial Processors	Private Energy Generators
	Pharmaceutical and Food Supplement Suppliers	
	Timber, Fiber, and Ornamental Extractors	
	Food Extractors	Fur / Hide Trappers and Hunters
	Property Owner	
Government, Municipal, Residential	Municipal Drinking Water Plant Operators	
	Public Energy Generators	Military / Coast Guard
	Residential & Nonresidential Property Owners	
Humanity	All Humans	
Inspirational	Artists	
	Spiritual/Ceremonial Participants, Participants of Celebration	
Learning	Researchers	
	Educators and Students	
Non-Use	People Who Care - Option / Bequest	
	People Who Care - Existence	
Recreational	Anglers	Boaters
	Waders/Swimmers/Divers	Hunters
	Food Pickers/Gatherers	Experiencers/Viewers
Subsistence	Water Subsisters	Food/Medicinal Subsisters
	Timber/Fiber/Fur/Hide Subsisters	
	Building Material Subsisters	
Transportation	Transporters of Goods	
	Transporters of People	

## What do they care about?

Atmosphere	Air quality	Wind strength/speed	Precipitation	Sunlight	Temperature
Soil	Soil quantity	Soil quality	Substrate quantity	Substrate quality	
Water	Water quality		Water quantity	Water movement	
Fauna	Fauna community	Edible fauna	Medicinal fauna	Keystone fauna	
	Charismatic fauna		Rare fauna	Pollinating fauna	
	Pest predator/depredator fauna		Commercially important fauna		
Flora	Flora community	Edible flora	Medicinal flora	Keystone flora	
	Charismatic flora		Rare flora	Commercially important flora	
	Spiritually/culturally important flora				
Fungi	Fungal community	Edible fungi	Medicinal fungi	Rare fungi	
	Commercially important fungi		Spiritually/culturally important fungi		
Other Natural Components	Fuel quality		Fuel quantity		
	Fiber material quantity		Fiber material quality		
	Mineral/chemical quantity		Mineral/chemical quality		
Other natural materials for artistic use, consumption (e.g. shells, acorns, honey)					
Composite (and Extreme Events)	Site Appeal	Sounds		Scents	Viewscapes
		Phenomena (e.g. sunsets, northern lights, etc)			
	Ecological condition				
	Open space				
	Regulating Services				
Extreme Events	Flooding			Wildfire	
	Extreme weather events			Earthquakes	

# Identify Relevant Ecosystem Services

- Use NESCS Plus to identify potential ecosystem services (ES)
- Mine Chesapeake Bay Program (CBP) documents and reports for ecosystem services to add to list
- Feedback from partners on priorities in their regions on anything missing



# Identify Relevant Ecosystem Services

In total, review identified focal BMPs could provide 45 potential types of ecosystem services benefitting 46 different types of users

## Best Management Practices

Agricultural forest buffers  
Agricultural grass buffers  
Agricultural tree planting  
Agricultural cover crops  
Urban forest buffers  
Urban forest planting  
Urban tree planting  
Forest conservation  
Impervious surface reduction  
Wetland creation  
Wetland restoration

## Ecosystem Services

air pollutant removal	wood and paper products
carbon sequestration	fungi presence
charismatic species richness	fauna for medical uses
brook trout presence	flora for medical uses
striped bass presence	supply of depredators
commercially valuable trees	supply of pest predators
open space for infrastructure	mitigate pest risk
open space for learning	supply of pollinators
open space for spiritual practice	natural materials
open space for training	fire risk
green space	flood control
habitat quality/size	high quality soil
environment for ethical reasons	energy efficiency
environment for future uses	mitigate heat risk
resources for research	viewsapes
erosion control	ability to dilute and receive discharge
deer population	clean water (nutrients)
small mammal presence	contaminant reduction
waterfowl presence	pathogen reduction (from water)
blue crab presence	pathogen reduction (animal health)
oyster presence	water clarity
edible plants presence	quantity of water
grasses for feed/grazing	

## User Groups

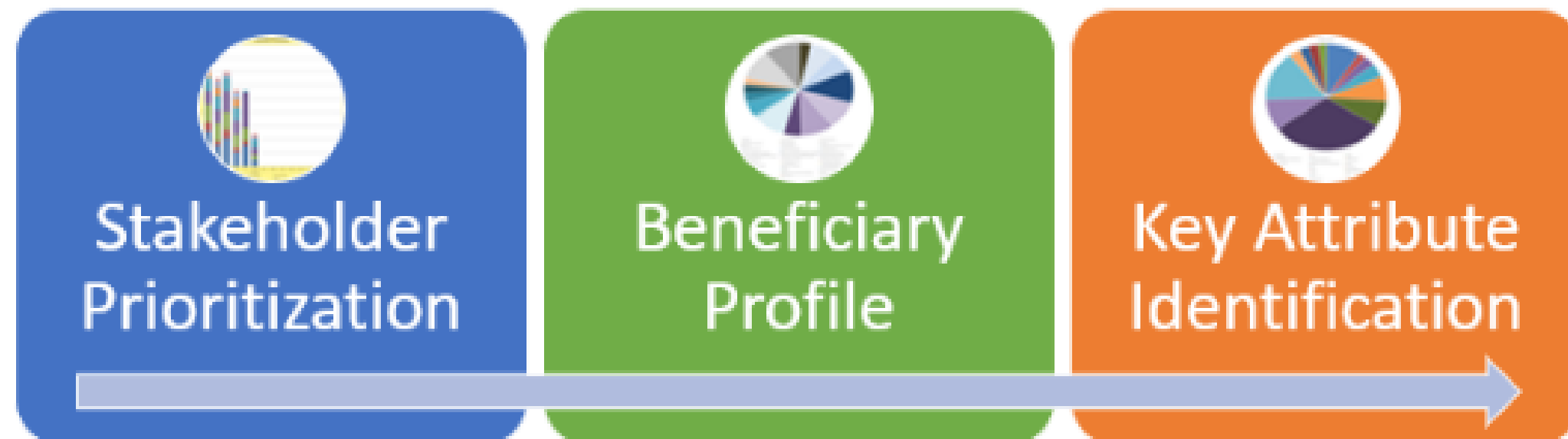
All Humans	Irrigators
Residents	Livestock grazers
Global citizens	Military / Coast Guard
Anglers	Municipal/Private Drinking Water
Aquaculturists	Local water authority
Artists	Public wastewater
Boaters, kayakers	People Who Care (Existence)
Educators & Students	People Who Care (Option /Bequest)
Energy Generators	Pharmaceutical/Supplement Suppliers
Experiencers & Viewers	Public Sector Property Owners
Birder	Local government
Wildlife Viewer	Researchers
Camper	Residential Property Owners
Farmers	Low income/disadvantaged Residents
Ag/Rural landowner	Renters
Food & Medical Subsisters	Resource dependent business
Food Extractors	Restoration businesses
Watermen	Urban businesses
Food Pickers & Gatherers	Recreation business
Foresters	Ceremonial/Celebration Participants
Fur/Hide Trappers/Hunters	Timber, Fiber, Fur/Hide Subsisters
Hunters	Timber, Fiber, Ornamental Extractors
Industrial dischargers	Waders, Swimmers, Divers



# Prioritize Most Relevant Ecosystem Services

- Chesapeake Bay Scientific Technical and Reporting Team (STAR) and Local Government Advisory Committee (LGAC) partners asked to identify **top 5** ecosystem services and users most relevant to their region or expertise
- Final Ecosystem Goods & Services (FEGS) Scoping Tool to assign importance weights

## FEGS Scoping Tool



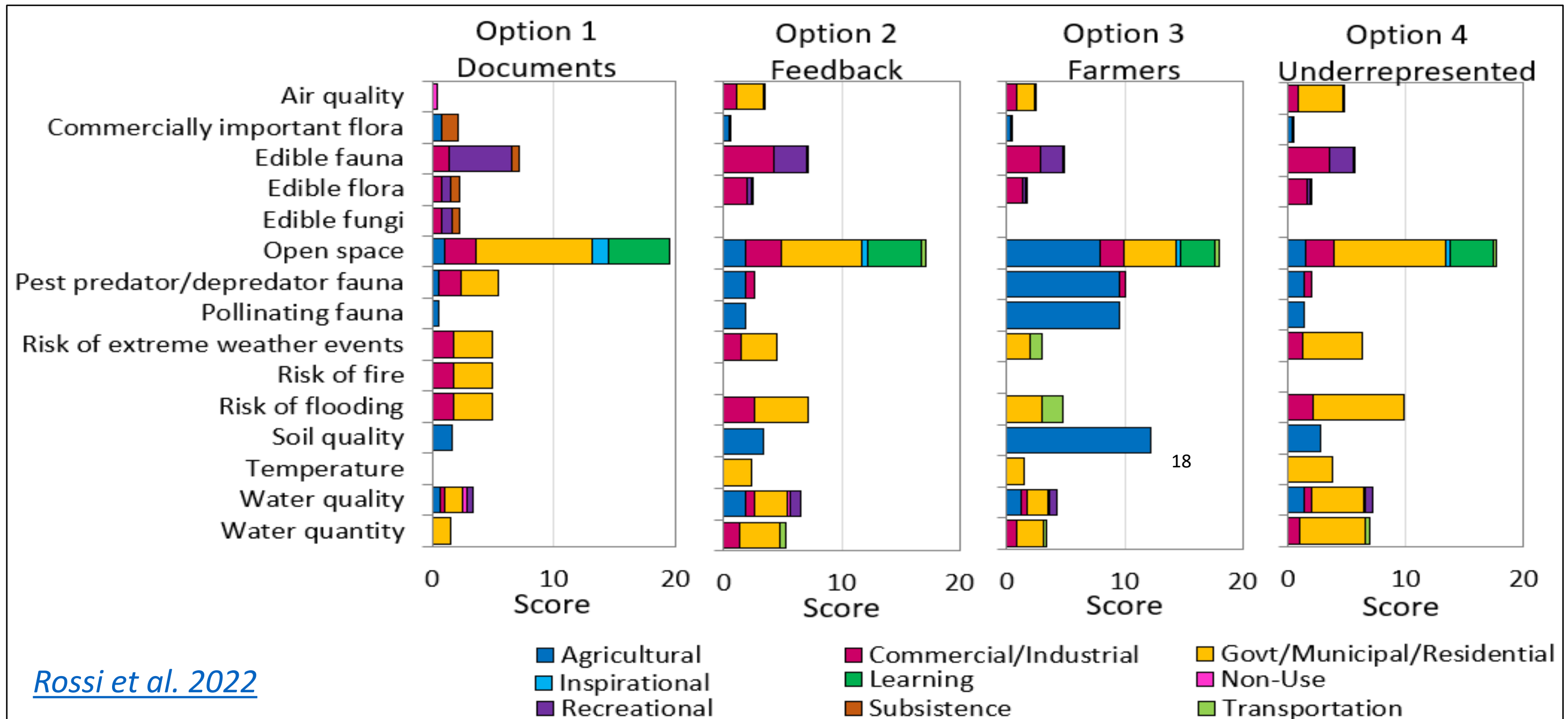
Step 1. Stakeholder groups most likely to be impacted or of high priority

Step 2. The different roles those stakeholders play as users of natural resources

Step 3. The ecosystem services those users care about

# Prioritize Most Relevant Ecosystem Services

Explored different weighting options based on 1) documents, 2) partner rankings, 3) farmers as most likely to be impacted by BMPs, and 4) underrepresented/low-income communities to address inclusivity and EJ goals



# Quantify Ecosystem Services per acre of BMP

- Each BMP associated with a CAST land cover class
- Identified or generated models to describe ES supply per acre of landcover



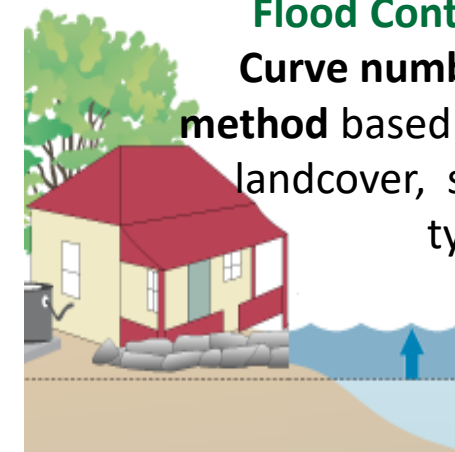
## Air Quality

Air pollutant removal rates in urban and rural areas obtained from **i-Tree** and multiplied by acres of tree cover



## Bird Diversity

**Species area curves** relate increasing acres of land cover type to potential bird species richness, obtained from USGS GAP

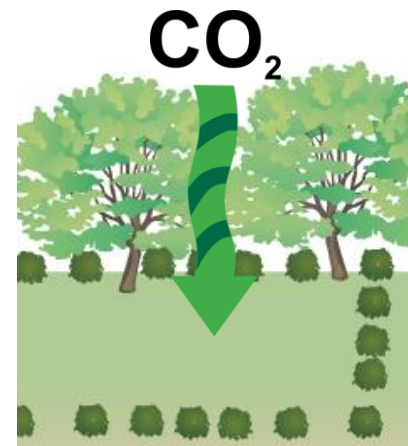
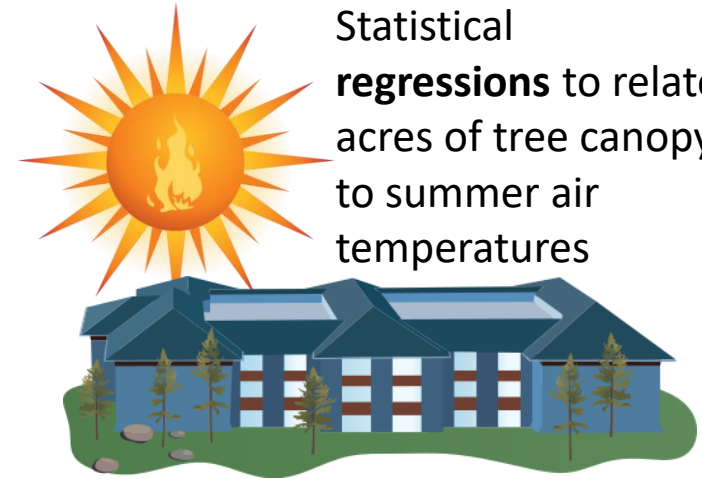


## Flood Control

**Curve number method** based on landcover, soil type

## Heat Risk Reduction

Statistical **regressions** to relate acres of tree canopy to summer air temperatures



## Carbon Sequestration

Average rates of burial of atmospheric carbon into soil (i.e., in support of mitigating climate change) by landcover type, obtained from **COMET-Planner** and literature review, multiplied by acres of landcover

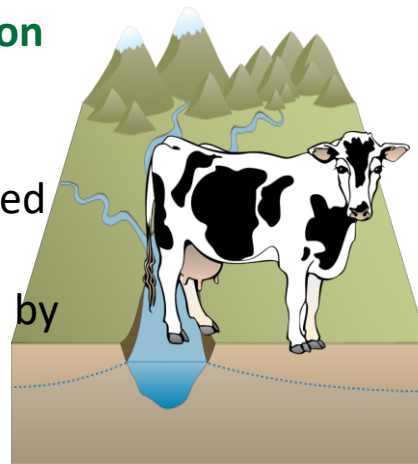


## Pollination

**InVEST pollinator model** to assign index of habitat suitability based on land cover, and characteristics of pollinators such as nesting and foraging distance

## Pathogen Reduction

**Fecal indicator bacteria removal** efficiencies obtained from literature review, multiplied by acres of landcover type



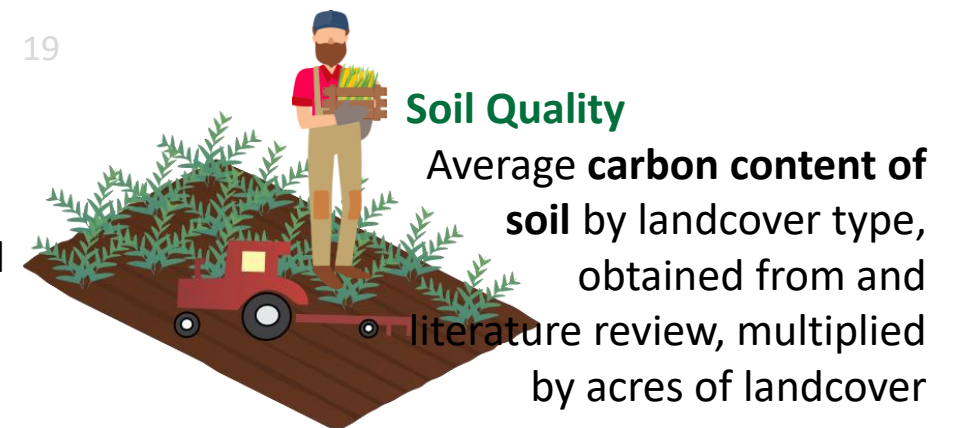
**Water Quantity (Stream Flow)**  
CAST Hydrological Model



## Open Space

Acres of **landcover per capita** identified as wetland, tree canopy, shrubland, and low vegetation

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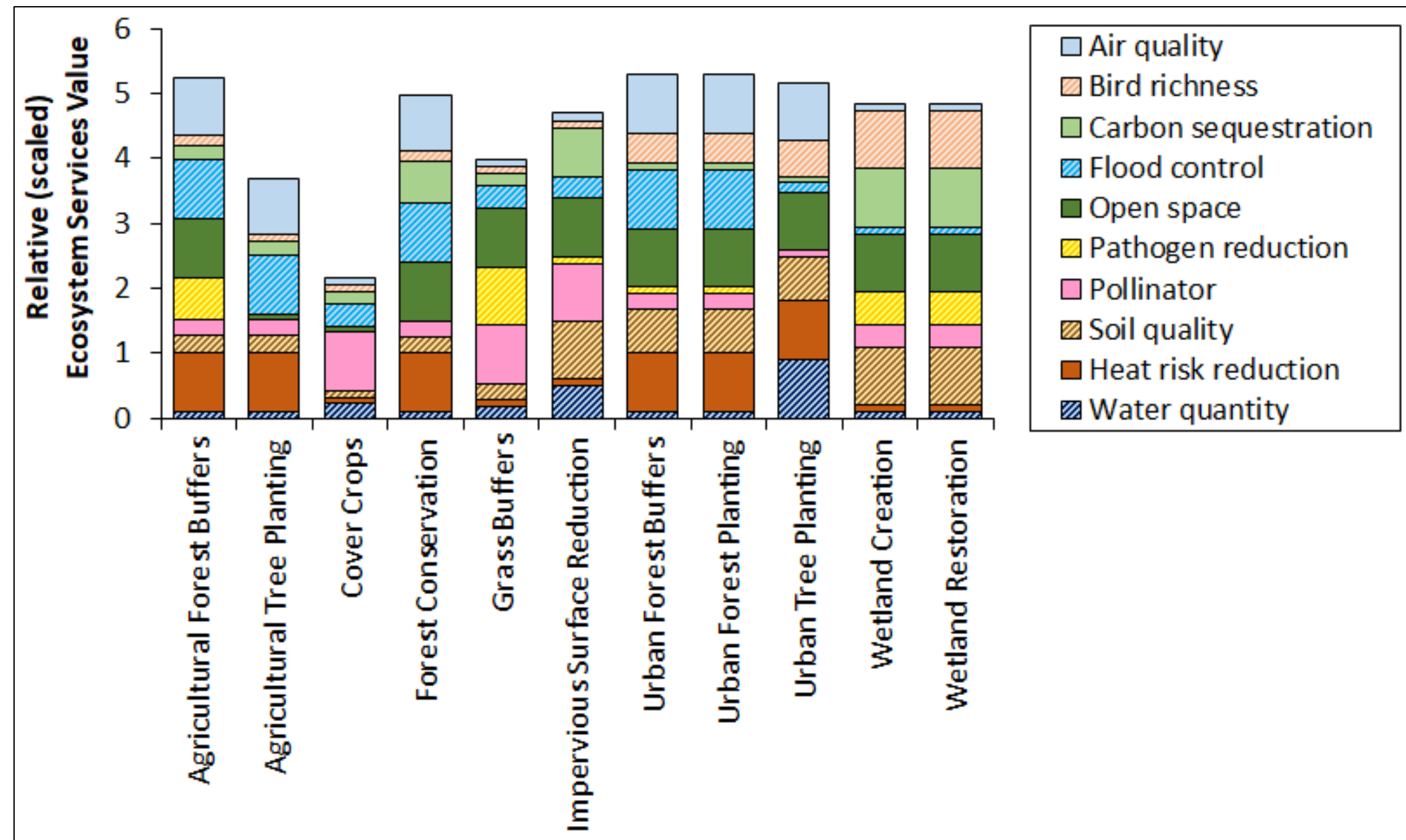


## Soil Quality

Average **carbon content of soil** by landcover type, obtained from and literature review, multiplied by acres of landcover

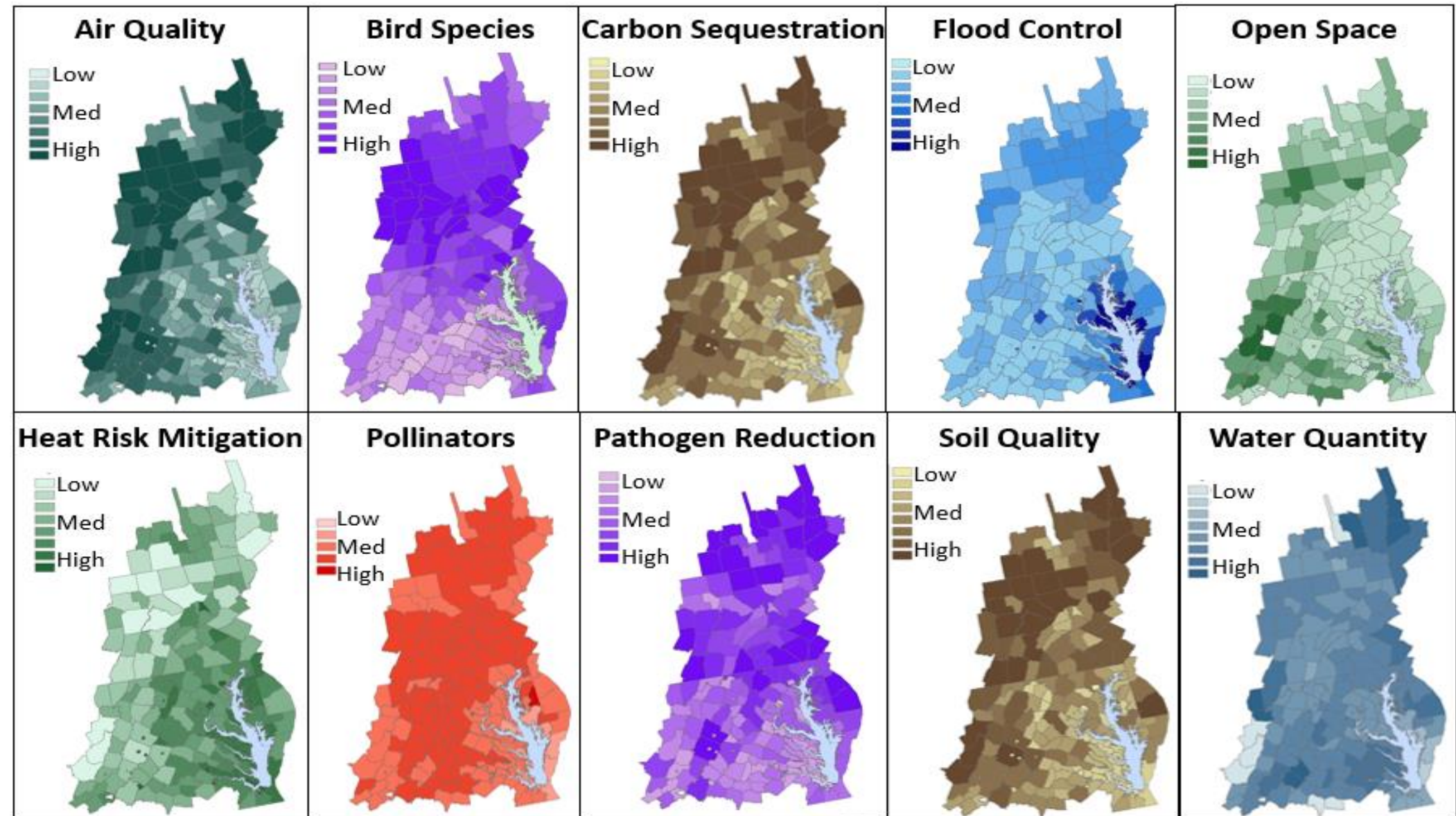
# Decision Support for BMP Implementation

- A demonstration of lookup tables and models to layer ES predictions onto sediment/nutrient reductions in Chesapeake Bay Assessment Scenario Tool



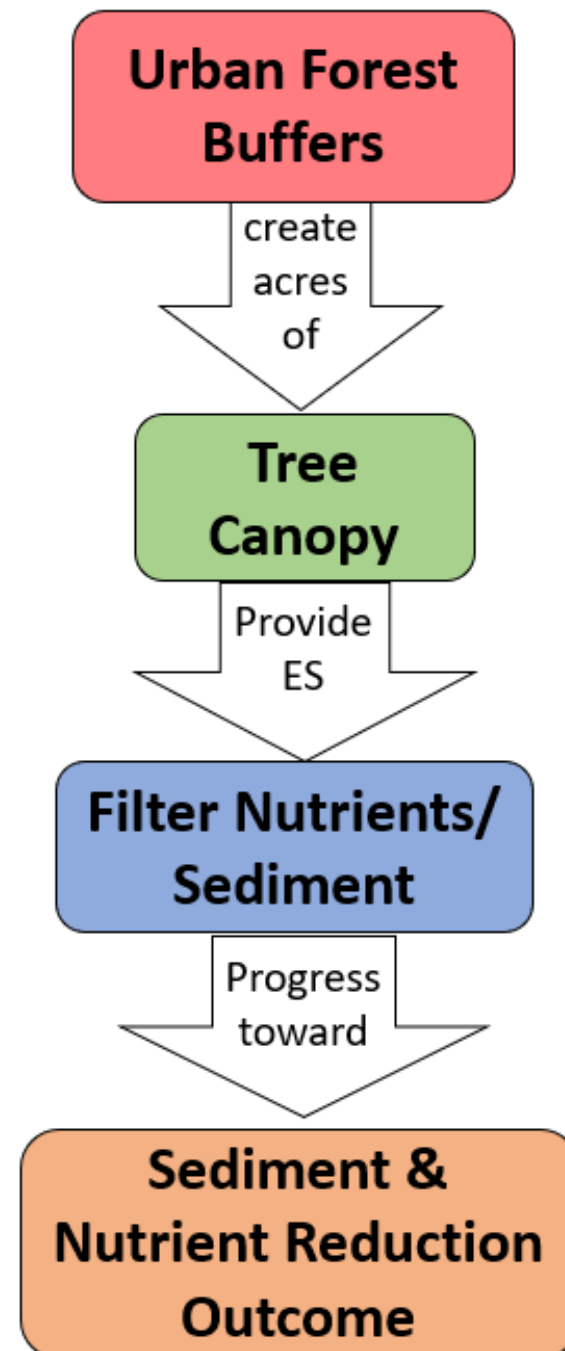
# Decision Support for BMP Implementation

- A demonstration of lookup tables and models to layer ES predictions onto sediment/nutrient reductions in Chesapeake Bay Assessment Scenario Tool
- Maps of current levels of ecosystem services



# Decision Support for BMP Implementation

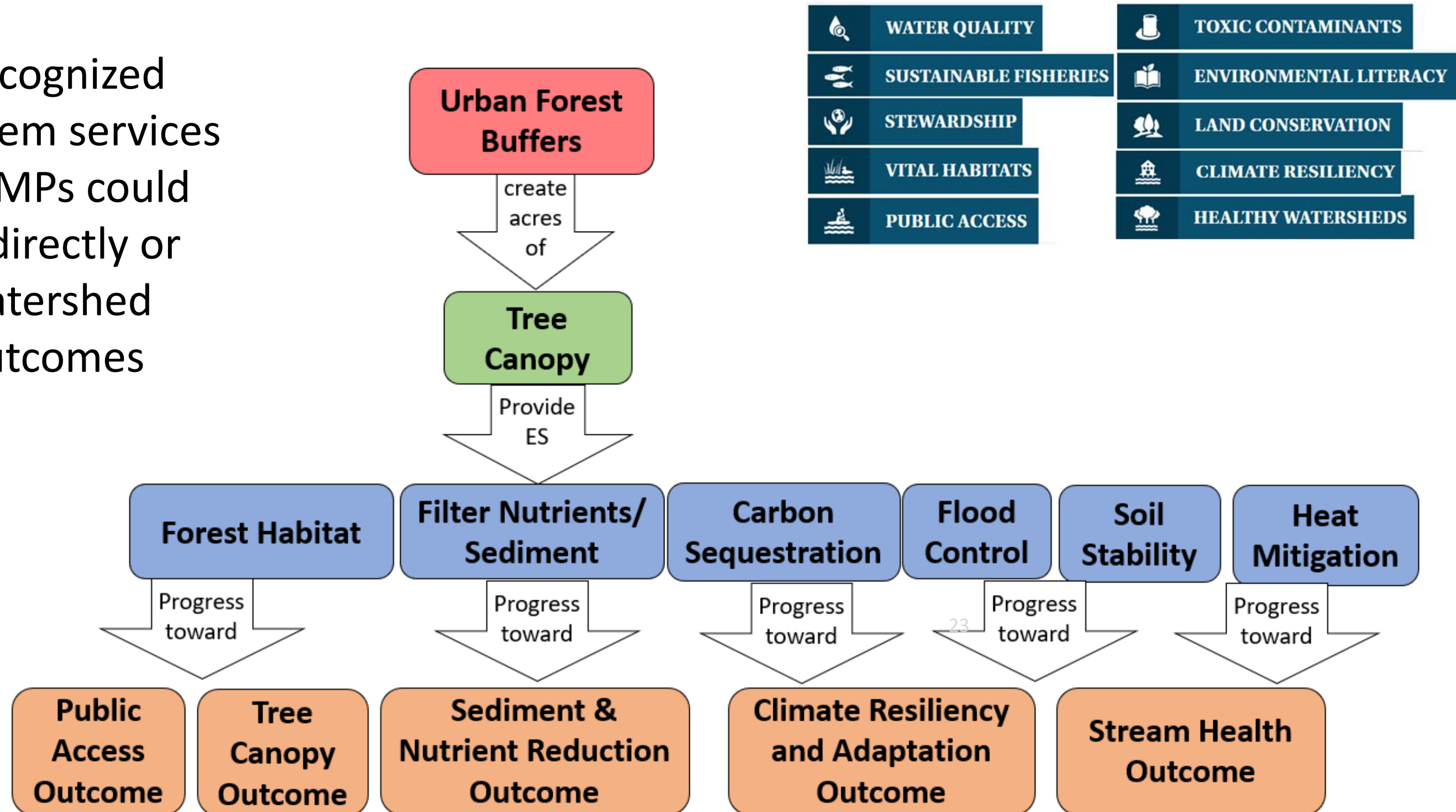
- Project also recognized where ecosystem services gained from BMPs could contribute (indirectly or directly) to Watershed Agreement Outcomes



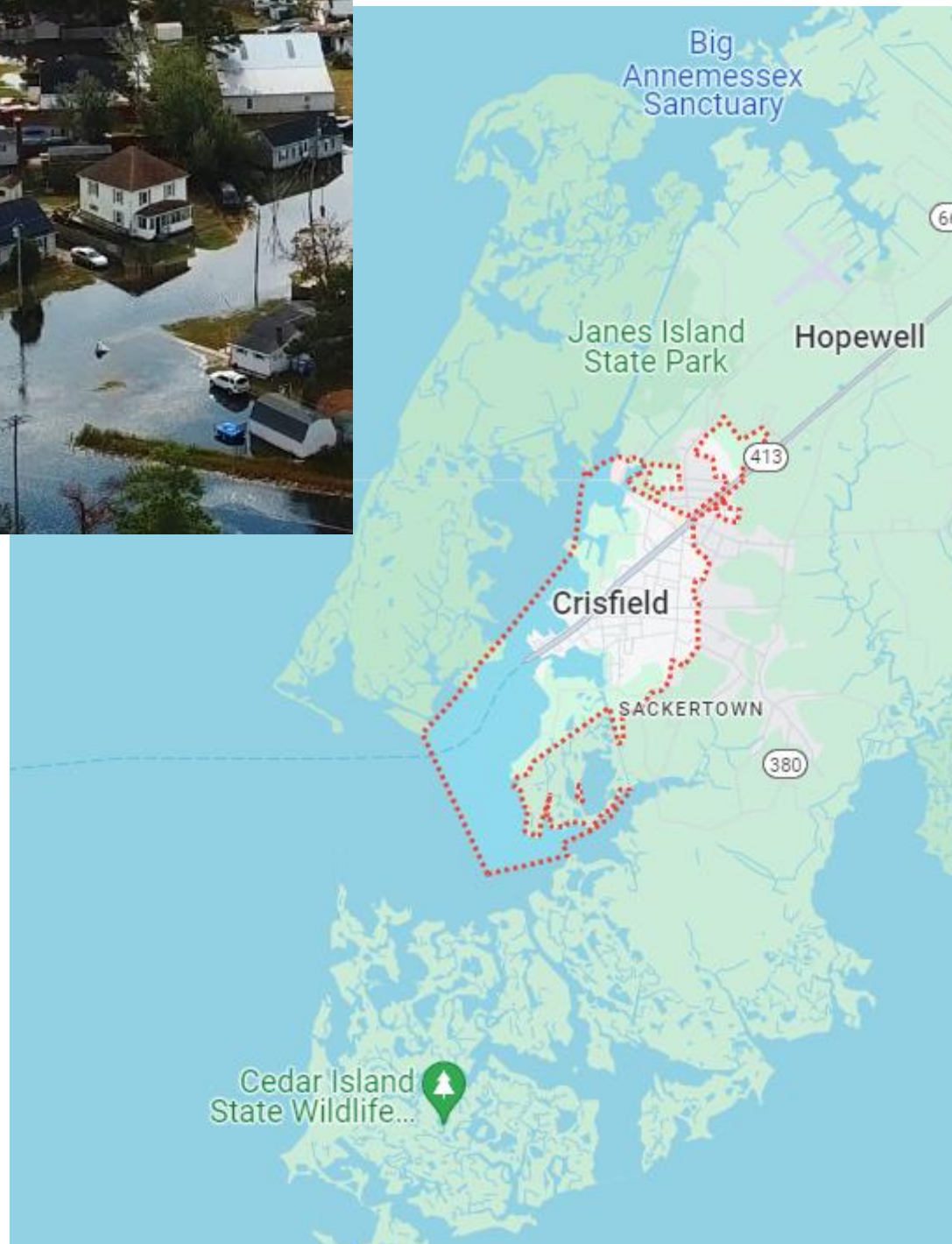
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# Decision Support for BMP Implementation

- Project also recognized where ecosystem services gained from BMPs could contribute (indirectly or directly) to Watershed Agreement Outcomes



# Case Study 2: Storm Flooding in Crisfield, MD



- Climate challenges:
  - Tidal flooding
  - Storm flooding
  - Coastal erosion
- Opportunities for natural infrastructure:
  - Surrounded by salt marshes and seagrasses
  - Extensive existing and historical oyster reefs
- Nature interwoven with community resilience goals:
  - Flood-safe housing and resilient infrastructure
  - Tourism and recreation tied to waterfront
  - Commercial fisheries

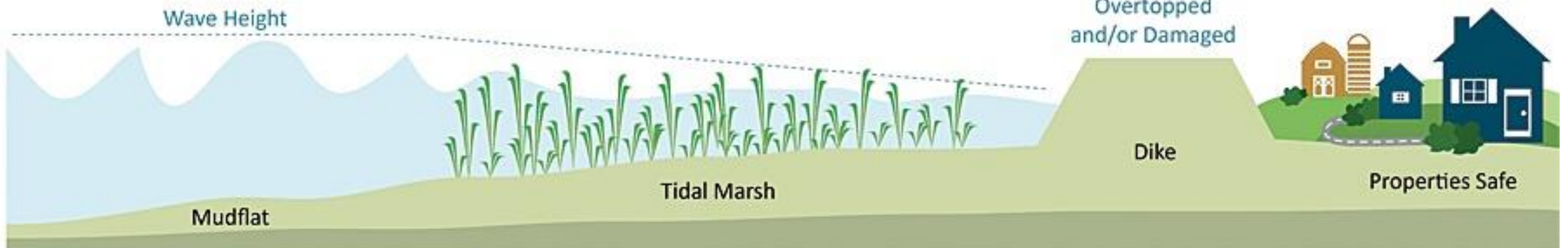


# Research Questions

- Can Nature Based Strategies (NBS) help protect Crisfield from storm surge and flooding?
- What are the social and economic co-benefits of potential NBS?



Wave attenuation with a healthy tidal marsh.



# What kinds of NBS can help with Storm Surge?

## Literature Review

- Success stories from locations similar to Crisfield
- Identify criteria associated with their success and conditions required for them to be successful
  - Shallow water
  - Land slope
  - Historic erosion
  - Wave energy
  - Submerged vegetation
  - Substrate

### Dune Restoration



### Salt Marsh Restoration



### Living Shorelines



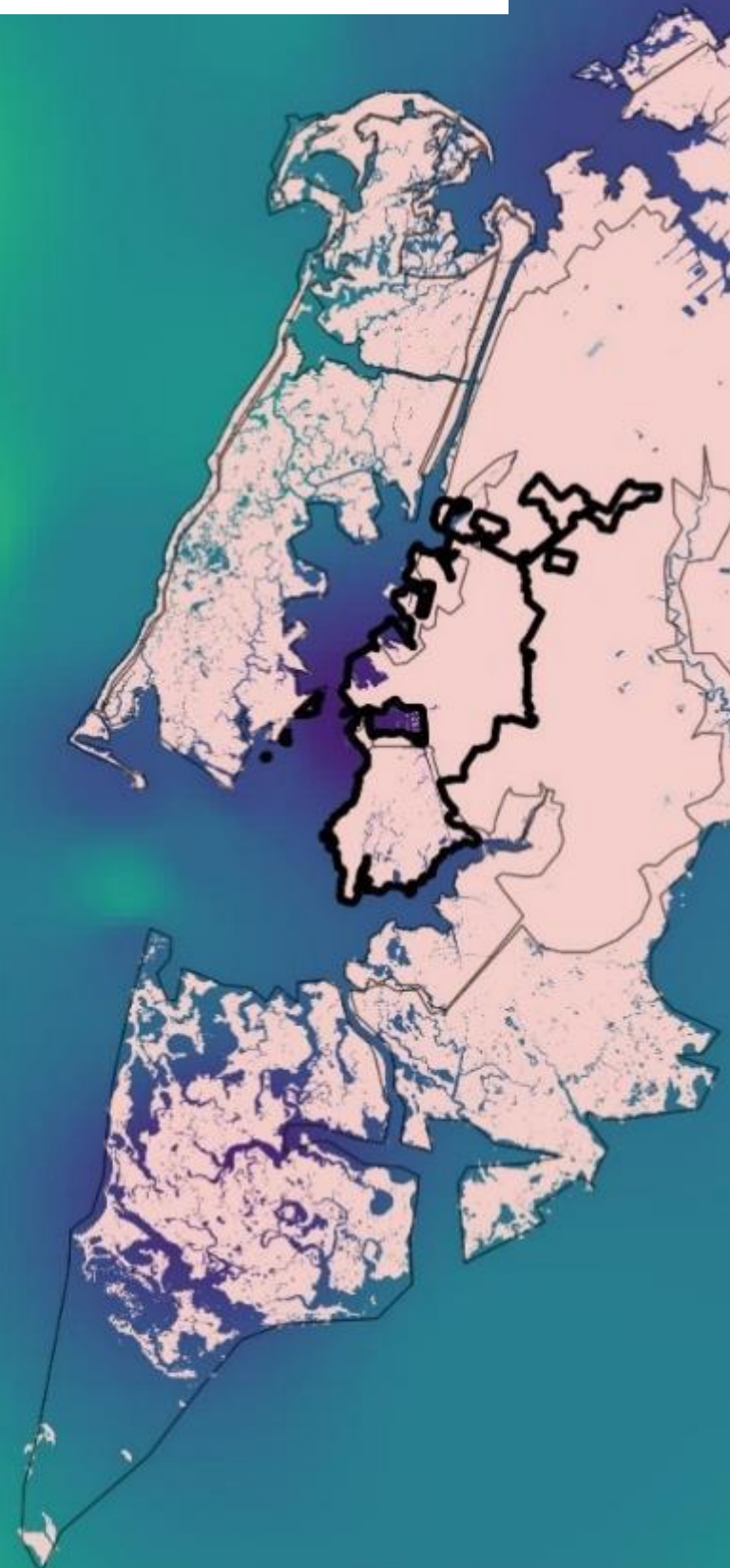
### Artificial Reefs/ Living Breakwaters



98th percentile wave height for 100-year return period tropical storm (feet)



Storm Wave Height



# Next steps

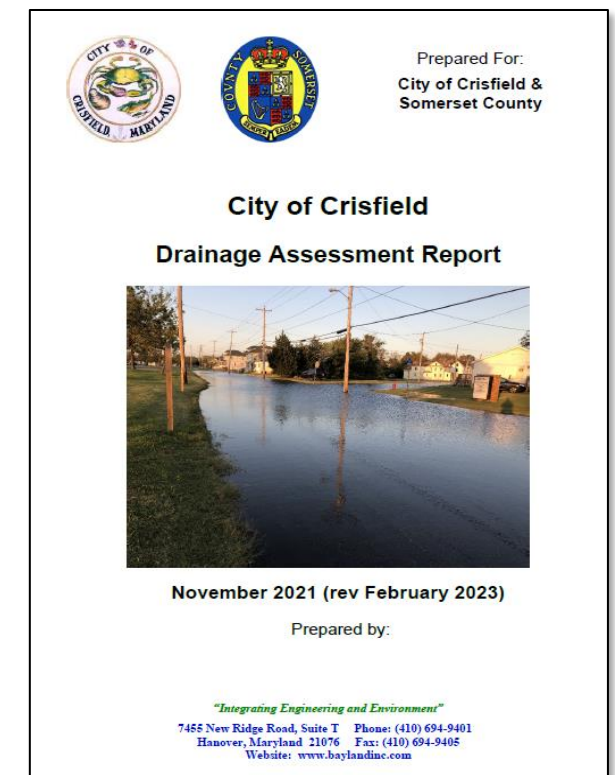
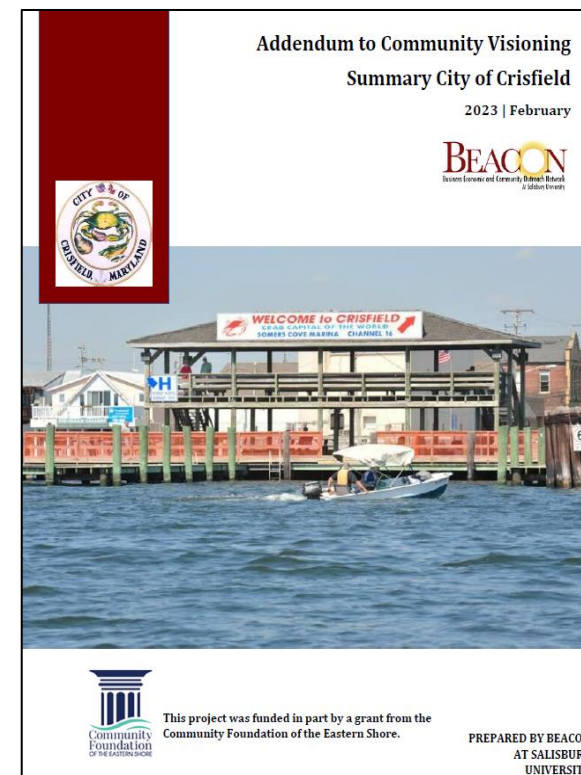
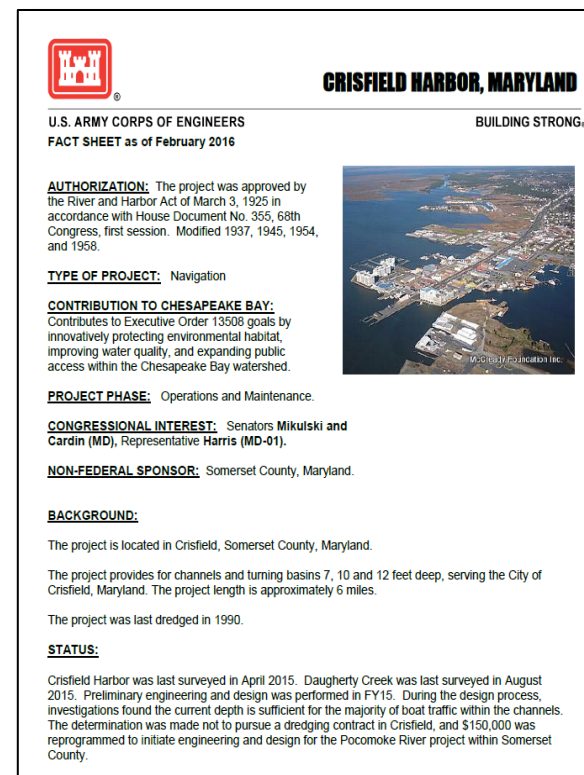
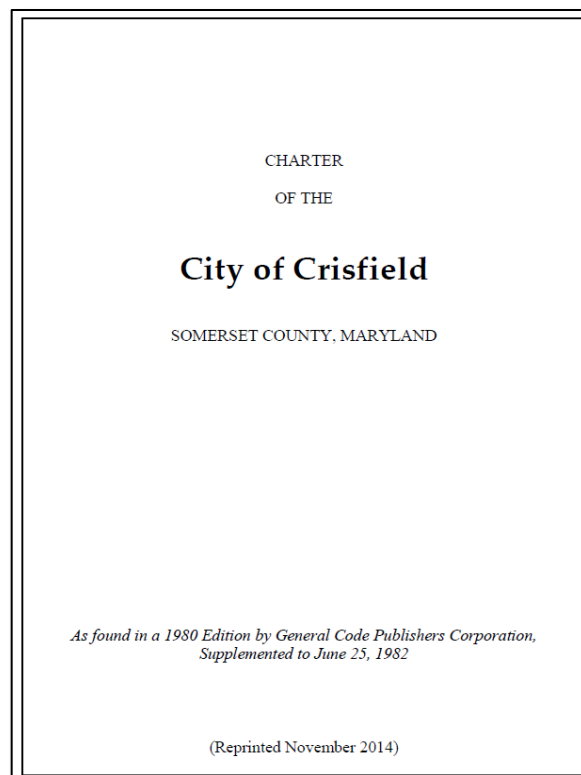


- Baseline storm surge attenuation modeling
  - Current existing natural conditions (2024)
  - “Do nothing” scenario by 2050 and 2100
- Calculate maximum wave and storm surge height reduction possible from selected NBS
  - Estimated attenuation when installed (2024)
  - Attenuation by 2050 and 2100 (including sea level rise)
- Assess additional ecosystem services co-benefits possible from NBS

# What Ecosystem Services Matter to Crisfield?

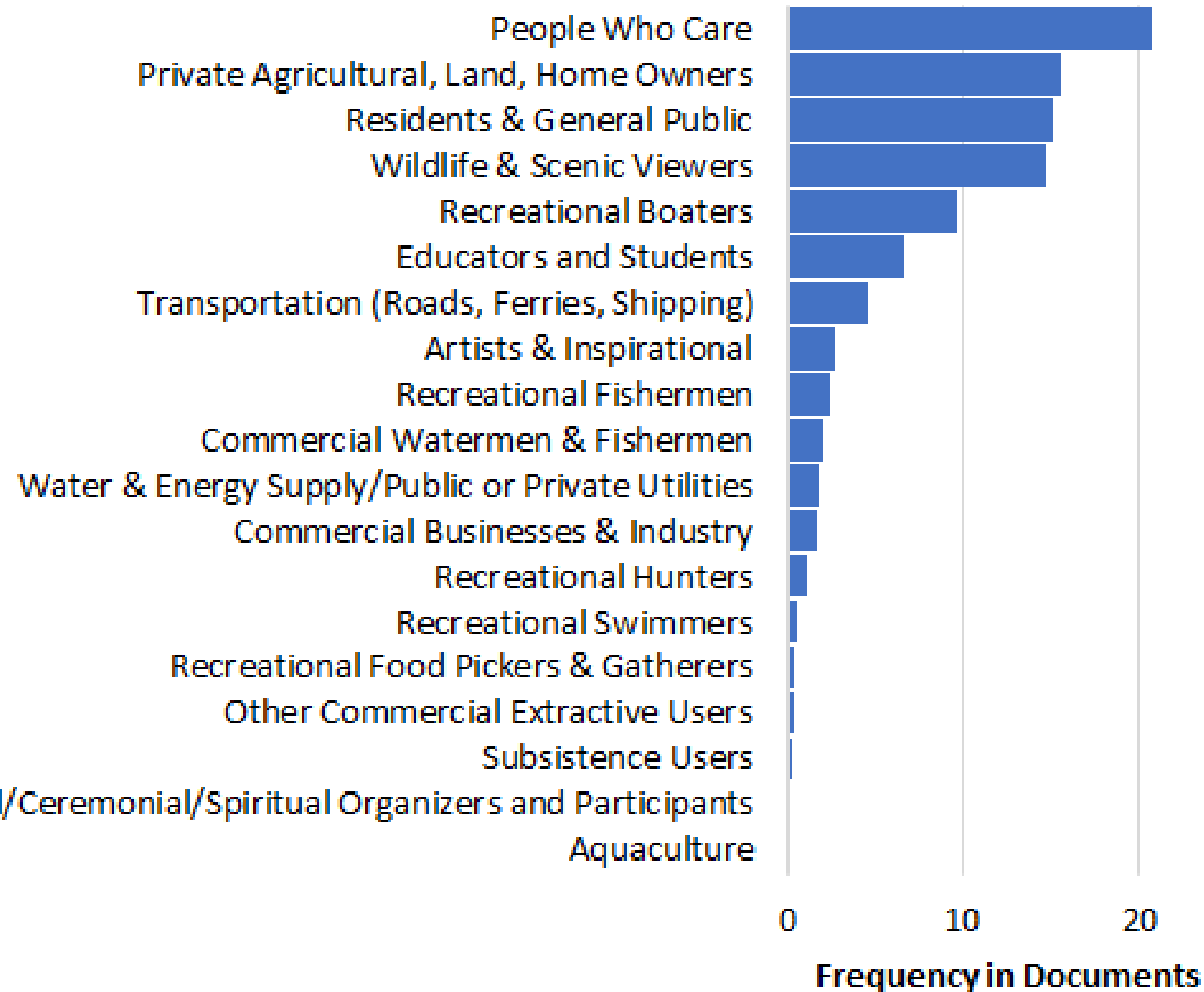
## Review of Crisfield Planning and Management Documents

- Identified sentences mentioning i) coastal habitat, ii) type of user group, and iii) attributes they care about
- “Relative importance” based on frequency of mentions in documents

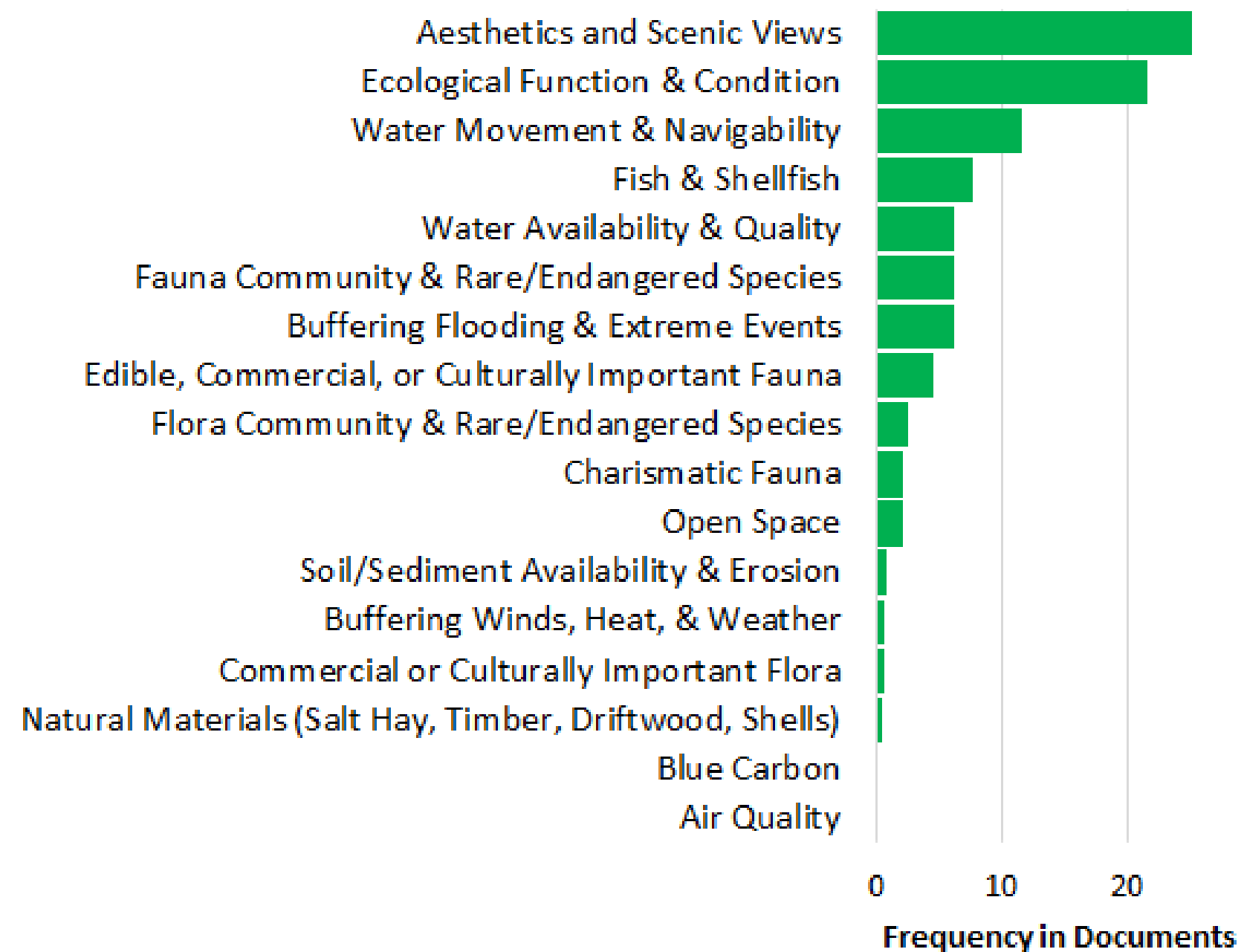


# What Ecosystem Services Matter to Crisfield?

## Who is Using or Benefitting from Coastal Habitats?



## What Attributes do those Users Care about?



## Institutional Partners (Decision-Maker) Workshop April 19, 2024

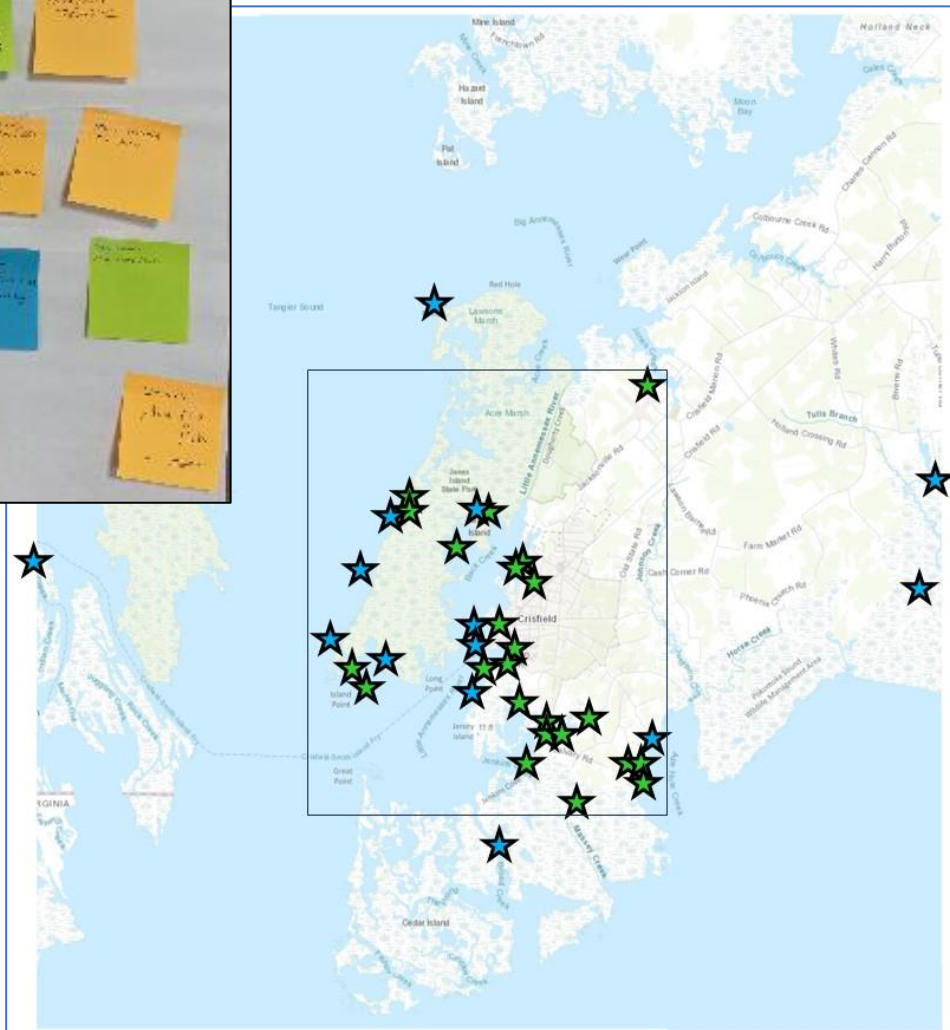


	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>	<u>Option 4</u>
	Status Quo	Janes Island Marsh Restoration	Cedar Island Marsh Restoration	Little Annemessex Living Breakwaters
<b>Criteria that EPA Suggested</b>				
<b>Effectiveness for Storm Surge &amp; Wave Attenuation</b>				
Wave height reduction				
Rates of coastal erosion				
Resilience (Risk of Failure, Lifespan)				
<b>Social/Economic Benefits</b>				
Fish/Oyster/Crab Abundance				
Charismatic or Other Important Birds/Mammals/Reptiles				
Native/Rare Plants				
Seagrass/Marsh (Area & Quality)				
Aesthetics/Viewscapes				
Navigable Water (Boating Conditions)				
Water Clarity				
Access for Recreation/Fishing/Education				
Fairness/Equitability of Benefits				



- Additional Things identified by Meeting Participants**
- Storm flooding as a deterrent to economic development
  - Tax Revenue spent on flooding vs. other stuff
  - Restoring Crisfield to 'what it used to be'
  - Community cohesiveness (working together to solve flooding problem)
  - Whether NBS could help with drainage
  - Availability of dredge material
  - Impacts to navigability of the ferry path

## Crisfield Public Meeting April 20, 2024



- Where and what are some of Crisfield's most important natural spaces?
- Who uses or cares about by Crisfield's coastal habitats and why?
- What are some attributes of coastal habitats that matter most to people?
- How have past coastal habitat changes affected people, and how might you like to see them change in the future?

**Residents & Locals**

**Youth & Educators**

**Recreational  
Hunters**

**Public Property Owners &  
Users (Boardwalk, Library)**

**Recreational Fishermen**

**Artists & Festival  
Participants**

**Septic System  
Users**

**Who might be impacted  
by NBS decisions?**

**Recreational Boaters**

**Local Businesses**

**Local Sources  
for Food**

**Ferry Service & Other  
Public Transportation**

**People Who Care  
(Conservation)**

**Watermen/Seafood Industry**

**Beachgoers &  
Swimmers**

**Bikers, Hikers, Scenic  
Viewers, Wildlife Viewers**



### Residents & Locals

Natural beauty

Flood protection

Food availability

Protection from mold

Recreational opportunities

Air quality (salty, fresh air)

### Youth & Educators

Natural beauty

Access to natural open spaces

Water access

Ecological condition

Fauna & Flora community

Flood protection

### Recreational Hunters

Natural beauty

Access to natural open spaces

Water access

Huntible wildlife

### Public Property Owners & Users (Boardwalk, Library)

Natural beauty

Access to natural open spaces

### Artists & Festival Participants

Natural beauty

Natural materials

Fish & Shellfish (Seafood)

Charismatic fauna

### Septic System Users

Flood protection

### Recreational Fishermen

Target species for fishing

Ecological condition

Invasive or nuisance species

Access to water

## What do they care about?

### Recreational Boaters

Access to water

Navigable water

Natural beauty

### Local Businesses

Flood protection

Natural beauty

Natural materials

Fish & Shellfish (Seafood)

### Local Sources for Food

Fish & Shellfish

(Seafood)

### Ferry Service & Other Public Transportation

Flood protection

Navigable water

Natural beauty

Access to natural open spaces

### People Who Care (Conservation)

Ecological condition

Natural beauty

Water quality

Fauna & Flora community

### Watermen/Seafood Industry

Fish & Shellfish (Seafood)

Access to water

Invasive or nuisance species

### Beachgoers & Swimmers

Water access

Water quality

Invasive or nuisance species

### Bikers, Hikers, Scenic Viewers, Wildlife Viewers

Natural beauty

Access to natural open spaces

Water access

Charismatic wildlife

# 17 Categories of Co-benefits

## FEGS Scoping Tool

- That have the potential to resonate with a wide range of user groups
- That have the potential to be affected by NBS options
- That can be connected to broader Crisfield resilience goals:
  - Resilient infrastructure
  - Flood safe & affordable housing
  - Business and job creation
  - Enhanced recreation
  - Youth development
  - Enhanced community spaces

### Attribute

Natural Beauty (& Cultural Resources)

Ecological Condition

Species for Fishing/Seafood Industry

Species for Hunting

Water Movement & Navigability

Flora Community

Flood Protection

Water Access

Charismatic Fauna

Water Quality

Fauna Community

Mold Reduction

Natural Open Spaces

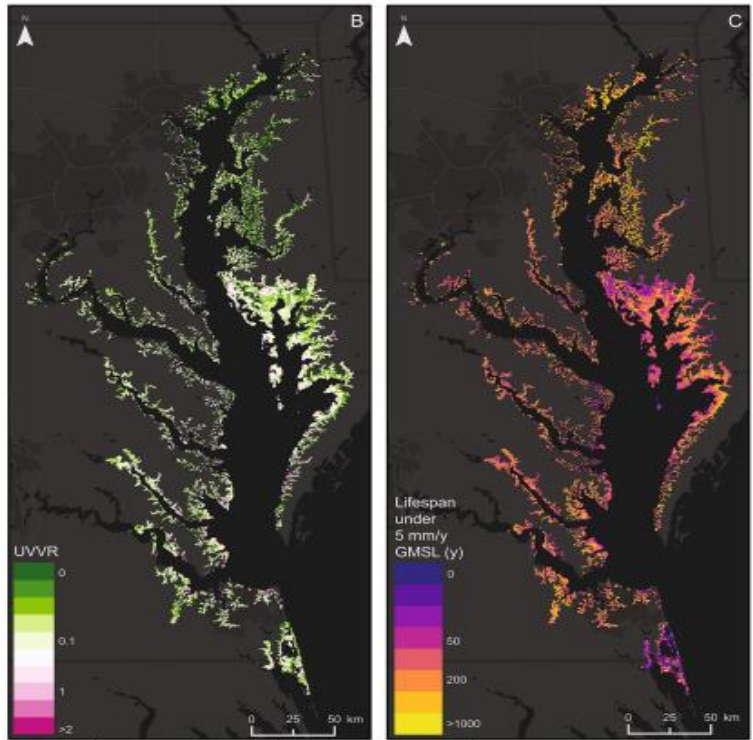
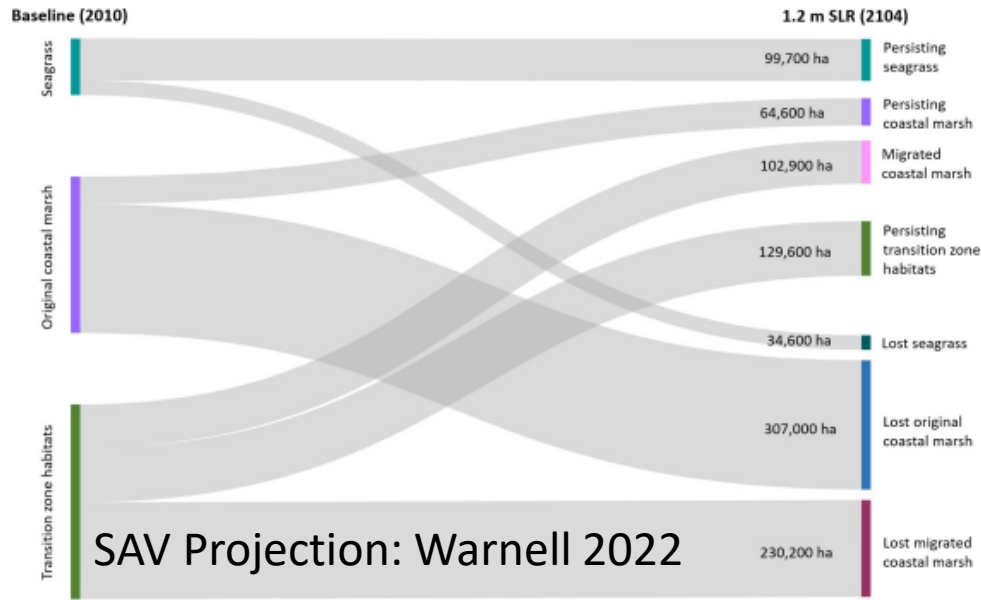
Natural Materials

Air Quality

Weather

Nuisance & Invasive Species

Attribute	Initial Plan for Analysis
Natural Beauty (& Cultural Resources)	Unimpeded view from coast/residence
Ecological Condition	Marsh Unvegetated/Vegetated Ratio; Marsh lifespan; Carbon storage/sequestration
Species for Fishing/Seafood Industry	Fish Habitat Suitability
Species for Hunting	Wildlife habitat suitability
Water Movement & Navigability	Wave heights in non-storm conditions
Flora Community	Marsh Unvegetated/Vegetated Ratio; SAV Distribution & Condition
Flood Protection	Water height attenuation during storms
Water Access	Access and transportation by boats
Charismatic Fauna	Wildlife habitat suitability
Water Quality	Denitrification; Water quality related to SAV
Fauna Community	Wildlife habitat suitability
Mold Reduction	<i>Inferred benefit if waves attenuated</i>
Natural Open Spaces	Access for recreation or education; Acres of coastal habitats
Natural Materials	
Air Quality	
Weather	
Nuisance & Invasive Species	



Marsh UVVR:  
Ganju 2023

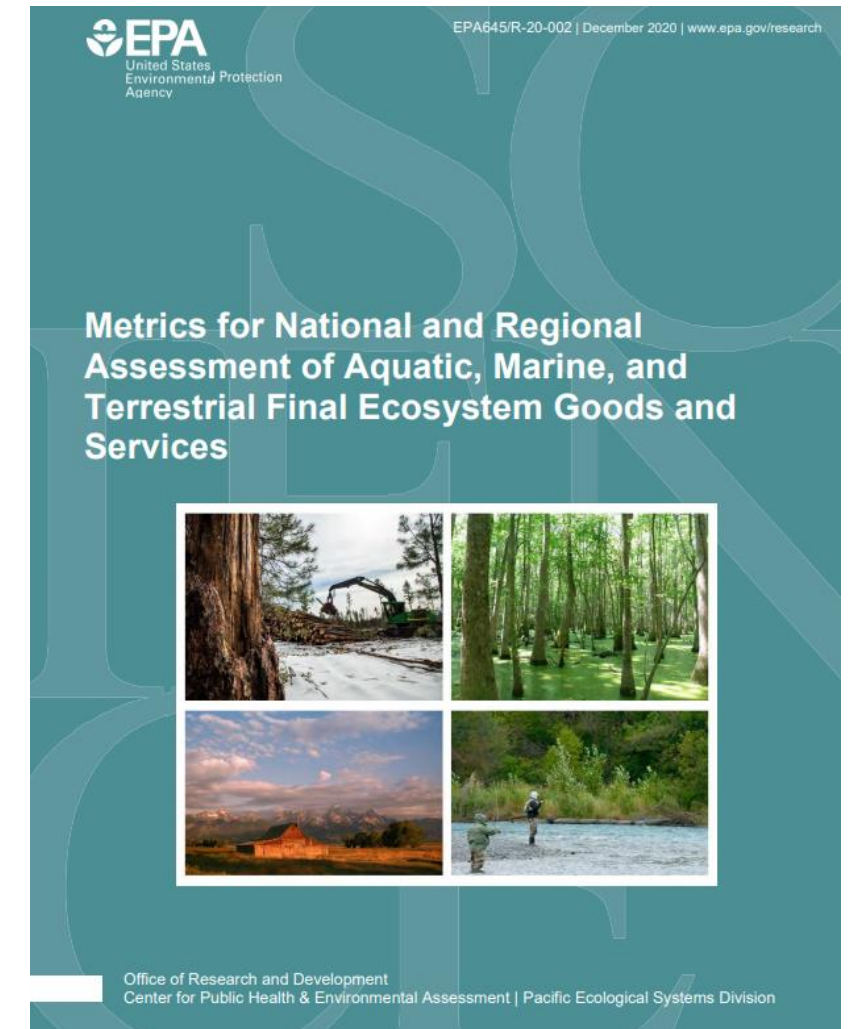
Attribute	Initial Plan for Analysis	Other potential measures (if we can find models/data)
Natural Beauty (& Cultural Resources)	Unimpeded view from coast/residence	Index of 'beauty'; Cultural resources (the stack) protected from erosion or storm damage;
Ecological Condition	Marsh Unvegetated/Vegetated Ratio; Marsh lifespan; Carbon storage/sequestration	Ecological condition index
Species for Fishing/Seafood Industry	Fish Habitat Suitability	Fish; Crabs; Oysters, Shrimp (Biomass)
Species for Hunting	Wildlife habitat suitability	Abundance of Duck or other Target Species
Water Movement & Navigability	Wave heights in non-storm conditions	Currents; Water depth;
Flora Community	Marsh Unvegetated/Vegetated Ratio; SAV Distribution & Condition	Plant diversity; Native, rare plants;
Flood Protection	Water height attenuation during storms	Indicators of flood reduction on land (elevation relative to water height; relative spatial location/disparsity of attenuation); Erosion protection
Water Access	Access and transportation by boats	Water depth; Blocking the Ferry pathway; Access to fishing sites
Charismatic Fauna	Wildlife habitat suitability	Biodiversity (Birds, Mammal richness)
Water Quality	Denitrification; Water quality related to SAV	Water clarity or quality (sediment/nutrient/contaminant)
Fauna Community	Wildlife habitat suitability	Biodiversity (Birds, Mammal richness)
Mold Reduction	<i>Inferred benefit if waves attenuated</i>	Risk of mold x Risk of flooding
Natural Open Spaces	Access for recreation or education; Acres of coastal habitats	Access for educational opportunities
Natural Materials		Shells; Driftwood
Air Quality		Fresh air; salty air
Weather		Ability to serve as a wind buffer
Nuisance & Invasive Species		Snakehead, jellyfish, catfish

# Identifying Relevant Ecosystem Services Metrics

- Step 1: Who is the user group/beneficiary?
- Step 2: What attributes does that user care about?
- Step 3: What would be an 'ideal' metric or model?
- Step 4: What data or models are actually available?



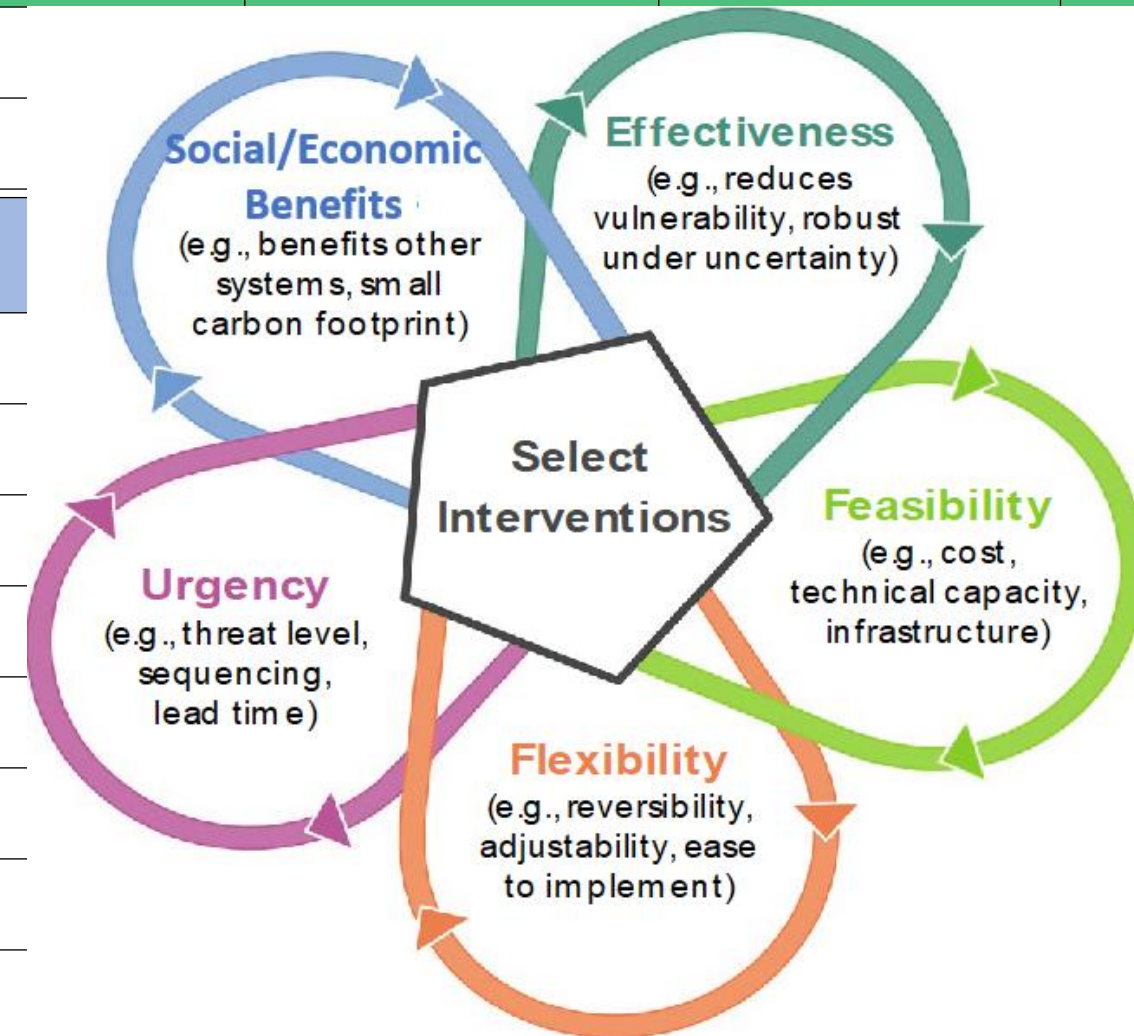
What Matters Directly to this Beneficiary?	Desired Information	Sub-Attribute (Fine Scale)	Ideal Biophysical Data
If in a boat, is it safe and navigable?	Are there any obstructions in the water or along the substrate?	Bottom structure	benthos complexity
	Is it safe to go out? Does the boat captain need a certain level of experience?	Wave Intensity	Wave height, speed and direction
	If in a boat do I have to anchor?	Currents	Tide, weather, wind speed and direction
	Is there sufficient water for my vessel? Can I maneuver around?	Water Depth	NOAA bathymetry Charts
	Is it safe to go out?	Wind intensity	weather, wind speed and direction
Is this a good place to go boating?	Is the location aesthetically enjoyable?	Viewscapes	color of water, algae, clarity, smell, sounds
	Will I see something interesting?	Taxa	Species, size, abundance, diversity



*How might different Nature-based Strategies impact ecosystem services co-benefits?*

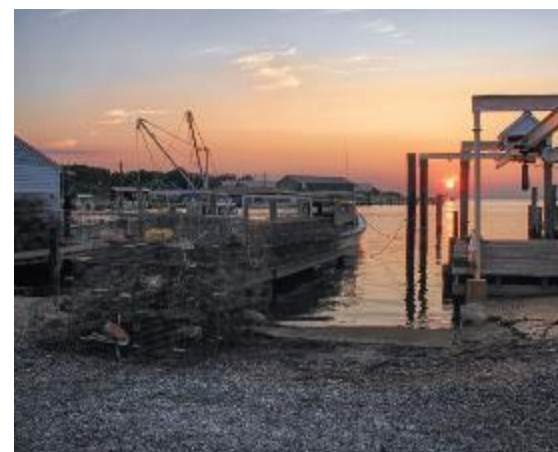
# How do benefits compare across NBS options?

	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>	<u>Option 4</u>	<u>Option 5</u>
Criteria	Status Quo	Janes Island Marsh Restoration	Cedar Island Marsh Restoration	Living Breakwaters	Marsh Restoration + Dunes/ Living Shorelines
<b>Effectiveness for Storm Surge</b>					
Wave height reduction					
Rates of coastal erosion					
<b>Social/Economic Benefits</b>					
Fish/Oyster/Crab Abundance					
Charismatic Fauna/Birds					
Native/Rare Plants					
Seagrass/Marsh (Area & Quality)					
Aesthetics/Viewscares					
Navigable Water (Boating Conditions)					
Water Clarity					
Access for Recreation/Fishing/Education					



# What Can Ecosystem Services be Used For?

- Setting Local community goals – what ecosystem services do we want to protect or restore?
- Communicating locally relevant benefits to motivate projects or sustain long-term interest
- Comparing restoration options
- Identifying creative opportunities for funding




# What Can Ecosystem Services be Used For?

- Increase Progress toward CBP Outcomes
- Work strategically to achieve a broader set of goals for both ecosystems and communities


[https://www.chesapeake.org/stac/wp-content/uploads/2024/02/FINAL\\_Report\\_Ecosystem-Services\\_24\\_003.pdf](https://www.chesapeake.org/stac/wp-content/uploads/2024/02/FINAL_Report_Ecosystem-Services_24_003.pdf)

**Using Ecosystem Services to Increase Progress Toward, and Quantify the Benefits of Multiple CBP Outcomes**



**STAC Workshop Report**

March 16, 2023  
April 18, 2023  
June 6, 2023



**STAC Publication 2024**





# For More Information

- Rossi, R., et al. 2022. Identifying and Aligning Ecosystem Services and Beneficiaries Associated with Best Management Practices in Chesapeake Bay Watershed. Environmental Management 69:384-409. <https://doi.org/10.1007/s00267-021-01561-z>
- Rossi, R., et al. 2023. Quantifying Ecosystem Services Benefits of Restoration and Conservation Best Management Practices in the Chesapeake Bay Watershed. U.S. EPA/ORD, Washington, DC. EPA/600/R-22/170. [https://cfpub.epa.gov/si/si\\_public\\_record\\_report.cfm?dirEntryId=357757](https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=357757)
- National Ecosystem Goods and Services Classification System: [www.epa.gov/eco-research/nescs-plus](http://www.epa.gov/eco-research/nescs-plus)
- Final Ecosystem Goods and Services Scoping Tool: <https://www.epa.gov/eco-research/final-ecosystem-goods-and-services-fegs-scoping-tool>
- FEGS Metrics Report: <https://www.epa.gov/eco-research/final-ecosystem-goods-and-services-fegs-metrics-report>
- Ecosystem Services Models Library: <https://esml.epa.gov>
- EPA H2O: <https://www.epa.gov/water-research/ecosystem-services-scenario-assessment-using-epa-h2o>
- EnviroAtlas: <https://www.epa.gov/enviroatlas>
- InVEST: <https://naturalcapitalproject.stanford.edu/software/invest>
- I-Tree: <https://www.itreetools.org/>
- Rapid Benefits Indicators: <https://www.epa.gov/water-research/rapid-benefit-indicators-rbi-approach>
- Ecosystem Services Tool Selection Portal: <https://www.epa.gov/eco-research/ecosystem-services-tool-selection-portal>
- Shaver E C, et al. 2020. A Manager's Guide to Coral Reef Restoration Planning and Design. NOAA Coral Reef Conservation Program. NOAA Technical Memorandum CRCP 36, 128 pp. [https://www.coris.noaa.gov/activities/restoration\\_guide](https://www.coris.noaa.gov/activities/restoration_guide)

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