From Functions to Ecosystem Services: The Economic Value of Floodplains and Wetlands

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Exploring Opportunities for Integrated Mapping and Functional Assessment of Riverine and Coastal Floodplains and Wetlands Workshop

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Ecosystem Services

Broadly- "*Benefits gained by people from the environment*"

Many typologies of ecosystem services exist BUT

Practical definition for decision making-
"*Benefits gained by people from the environment that are not already being paid for in a market and are contributing to a marginal increase in human well-being*"

i.e.
"Final Ecosystem Services"

Ecosystem Services

- Benefit Relevant Indicators (BRI)- A way to quantify the ecological functions that benefit people
- Quantifying how people benefit economically from a BRI can be difficult, particularly at the landscape scale
- One potential solution is to look at many ways that people benefit and take a categorical average of how we pay for a marginal change in the BRI
- We term this the “eco-price” method – Campbell, 2017
- Incorporates the range of possible values

Mapping Ecosystem Services

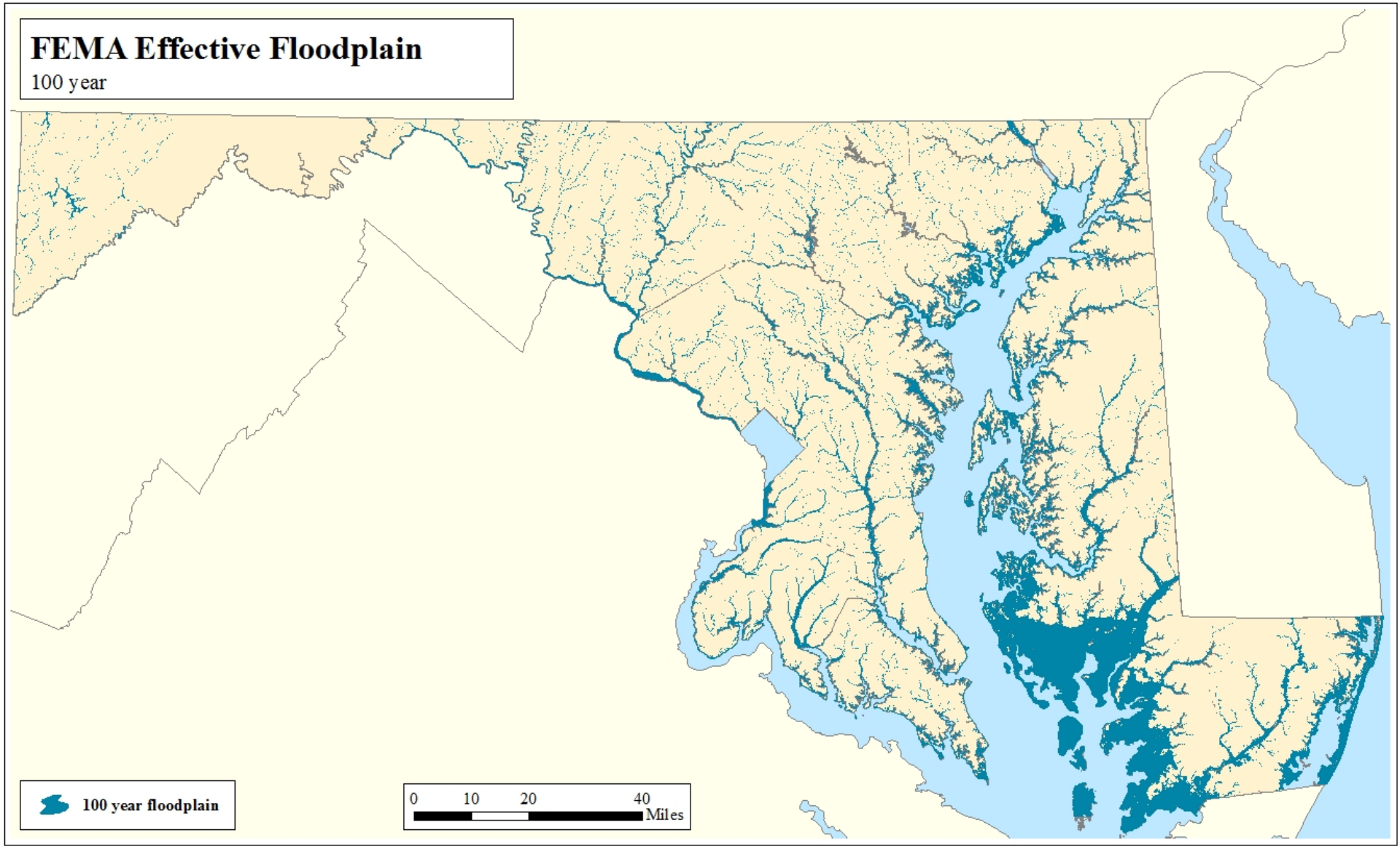
- Ecosystem Services vary spatially across the landscape
- ES vary in the biophysical supply of the service, i.e. benefit relevant indicator (e.g. amount of carbon that is sequestered, water being recharged to aquifers)
- ES vary in the way and amount that people benefit (e.g. number of people and value of infrastructure vulnerable to flooding)
- We attempt to consider both sources of variation when mapping ES in Maryland

Maryland Ecosystems

- Forests- 1 m LiDAR forest cover (UMD/NASA) downscaled to 30 m
- Wetlands- NWI (2006) + MD DNR wetlands

- Percent of ecosystem types in FEMA classified floodplains
  - Estuarine wetlands- 94%
  - Palustrine wetlands- 39%
  - Forests- 5%

Maryland 100 Year Floodplain



Ecosystem Services Mapped

- Air pollution mitigation- USFS i-Tree landscape
- Carbon sequestration- USFS i-Tree and MD DNR
- Groundwater recharge- USGS National Hydrography Dataset (1 km)
- Nitrogen Removal- USGS SPARROW model w/ literature removal rates by loading/ecosystem type
- Flood Prevention/Stormwater mitigation- Index of Mitigation Potential (EPA/MD DNR)
- Wildlife- Habitat Quality Index, MD DNR

Floodplain Ecosystem Services

- A priori- Floodplains have enhanced ecosystem function that will translate into higher ecosystem service value

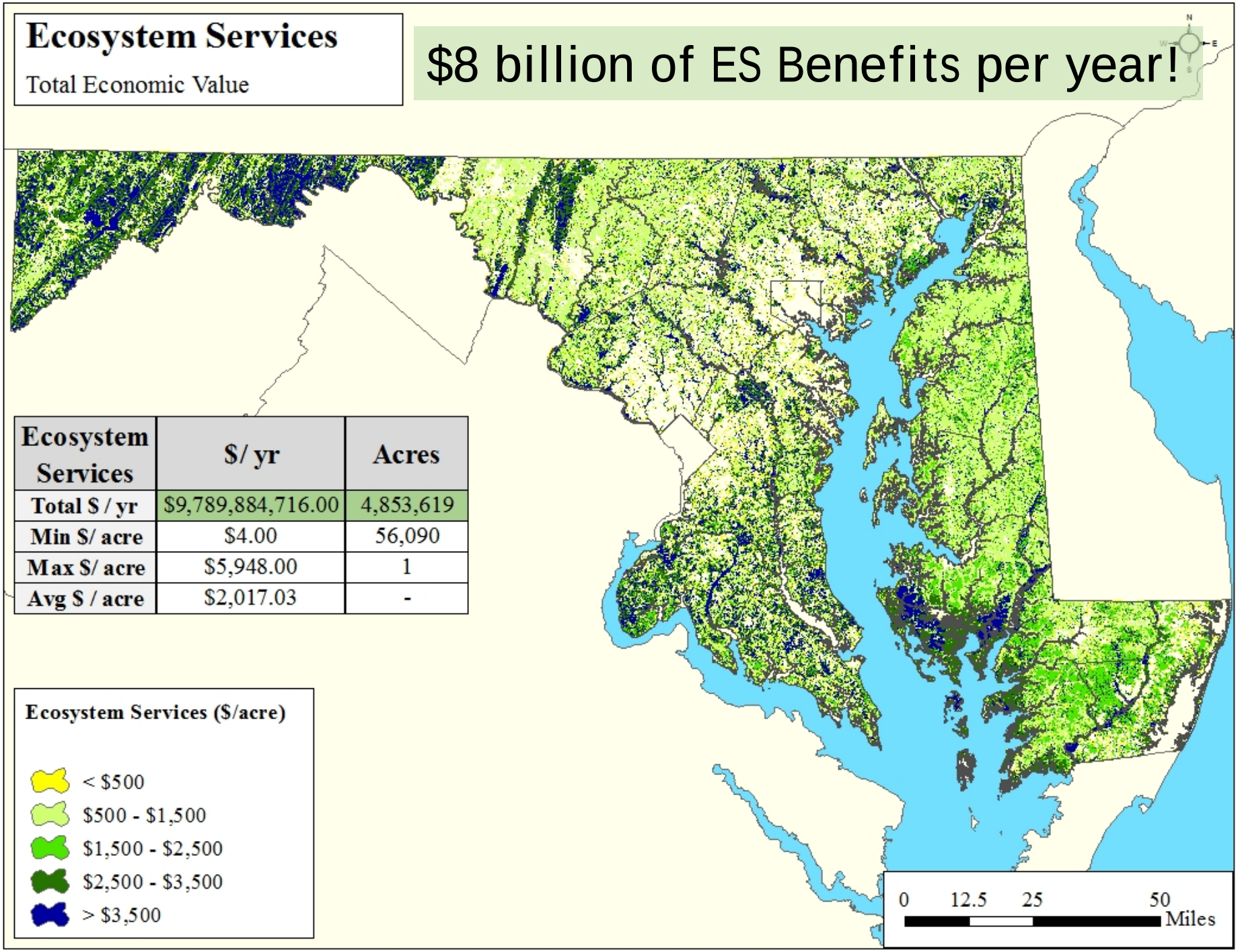
  - Greater ability to mitigate flooding
  - Higher rates of carbon sequestration
  - Higher rates of nitrogen processing
  - Higher quality habitat for wildlife
  - Higher rates of groundwater exchange

  - No impact on air pollution, possible lower due to proximate population

Ecosystem Services

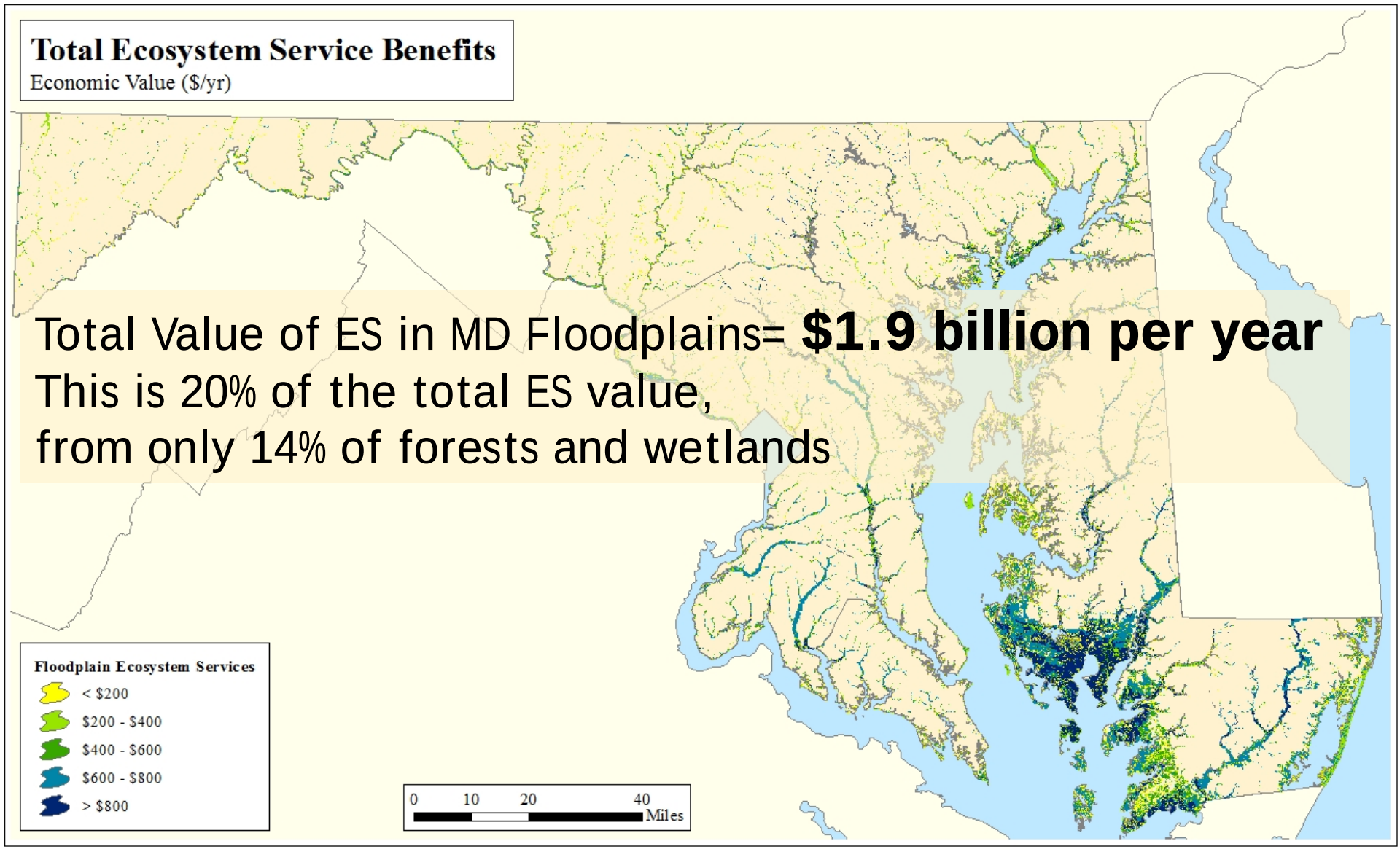
Total Economic Value

$8 billion of ES Benefits per year!



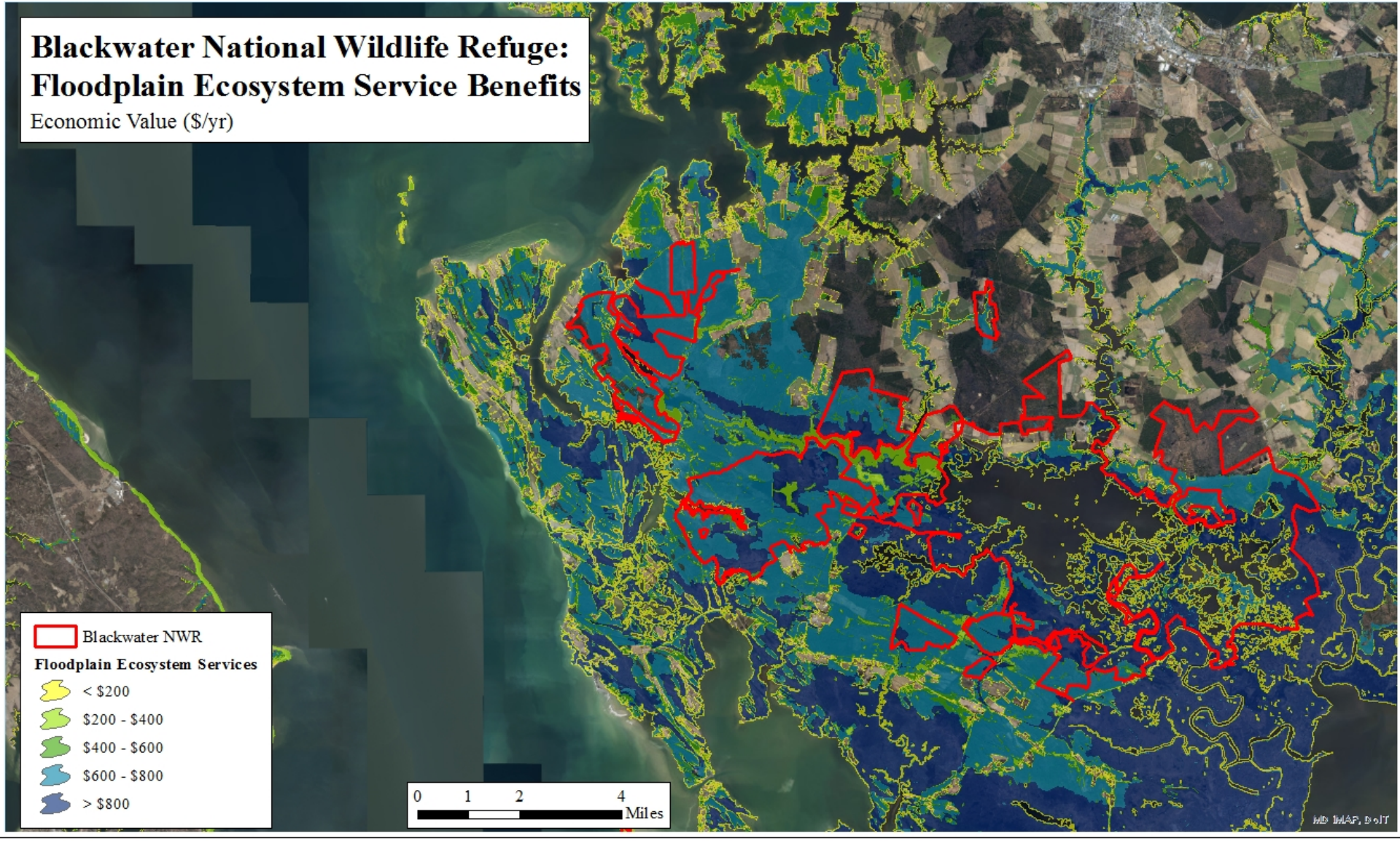
Ecosystem Services	$/ yr	Acres
Total $ / yr	$9,789,884,716.00	4,853,619
Min $/ acre	$4.00	56,090
Max $/ acre	$5,948.00	1
Avg $ / acre	$2,017.03	-

Floodplain Ecosystem Services

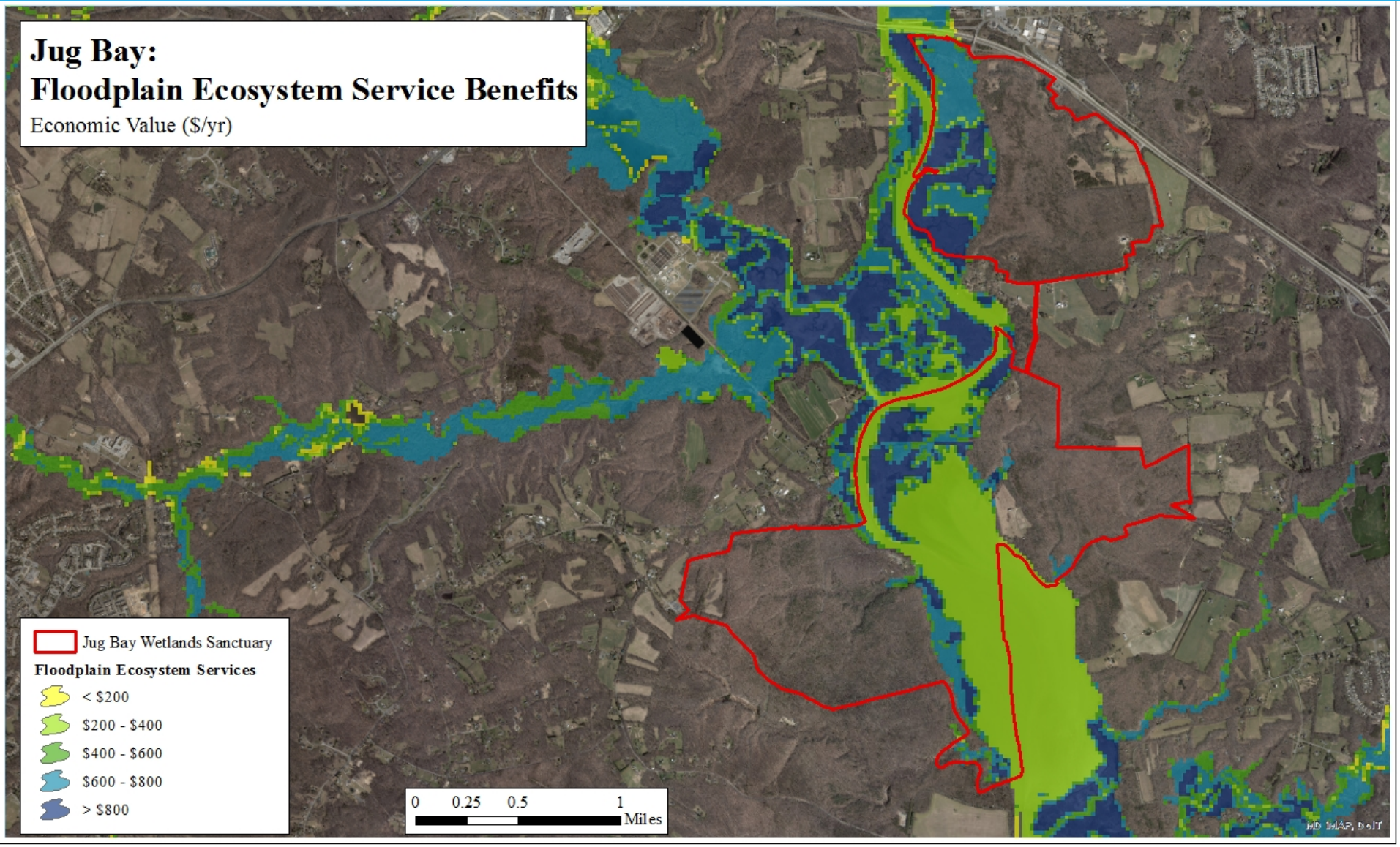


Total Value of ES in MD Floodplains= **$1.9 billion per year**
This is 20% of the total ES value,
from only 14% of forests and wetlands

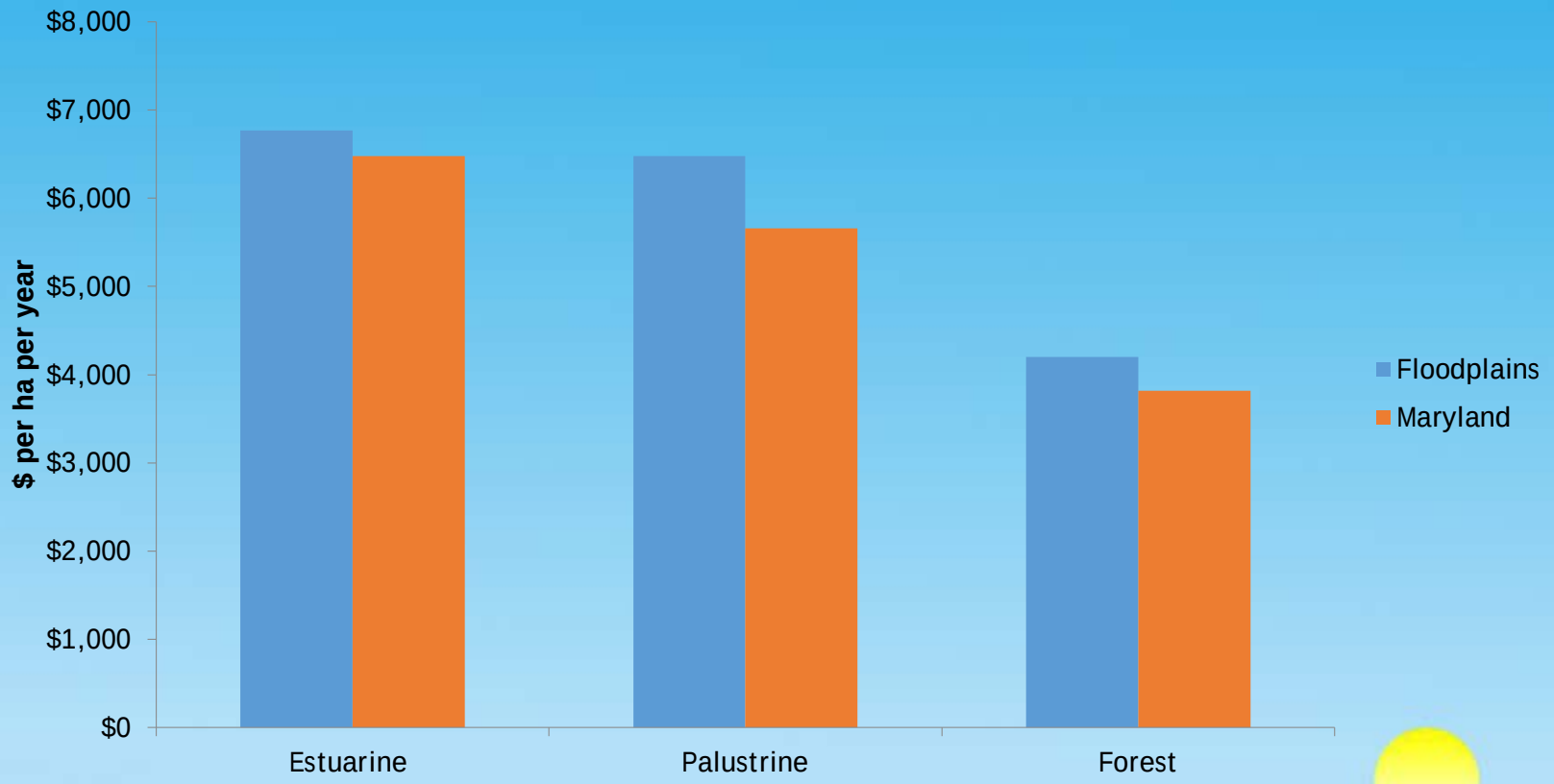
Example: Blackwater NWR



Example: Patuxent River Floodplains

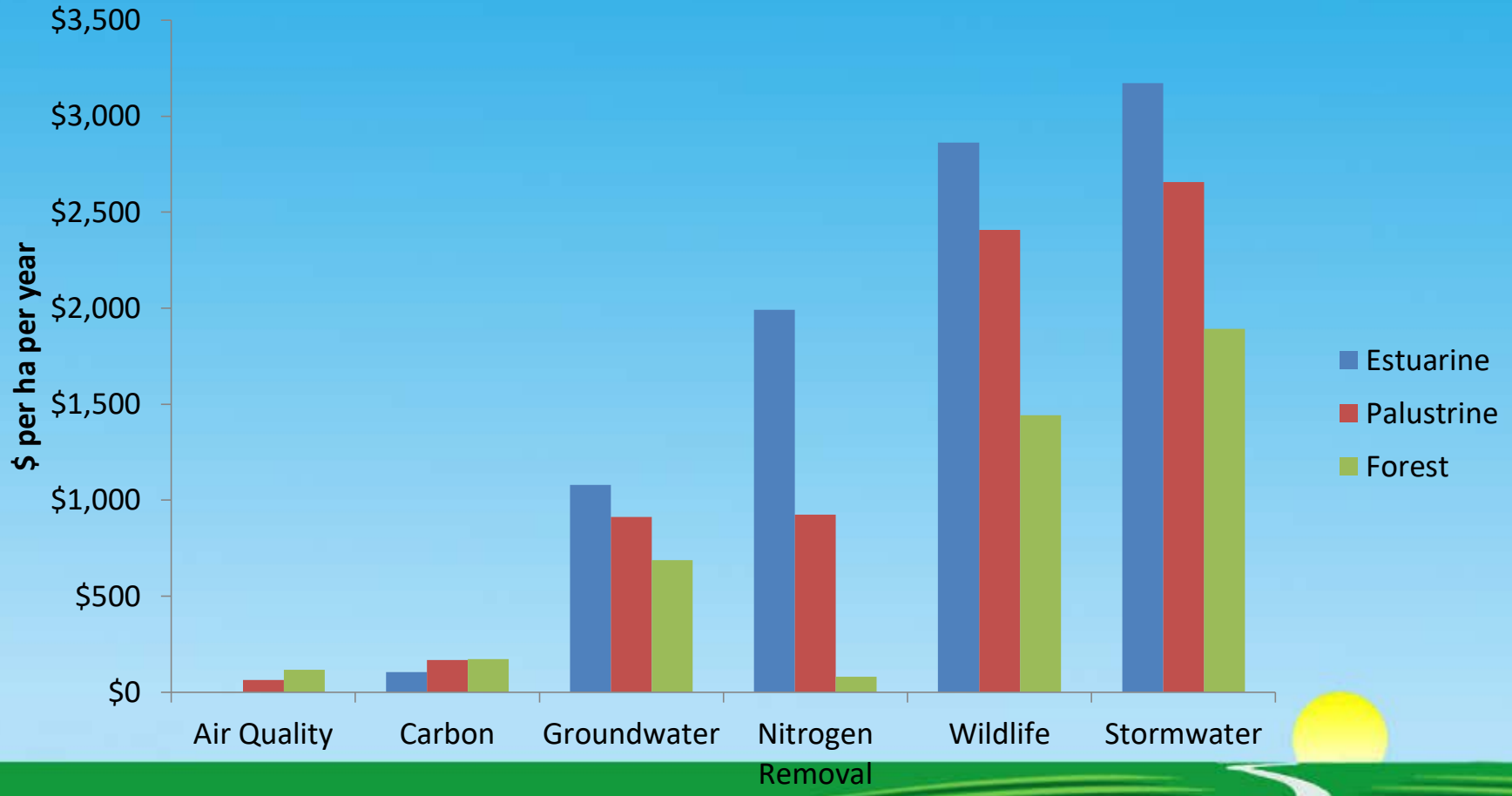


Comparison Floodplains: Average



	Estuarine	Palustrine	Forest
Percent Difference	5%	14%	10%

Floodplain Ecosystem Services



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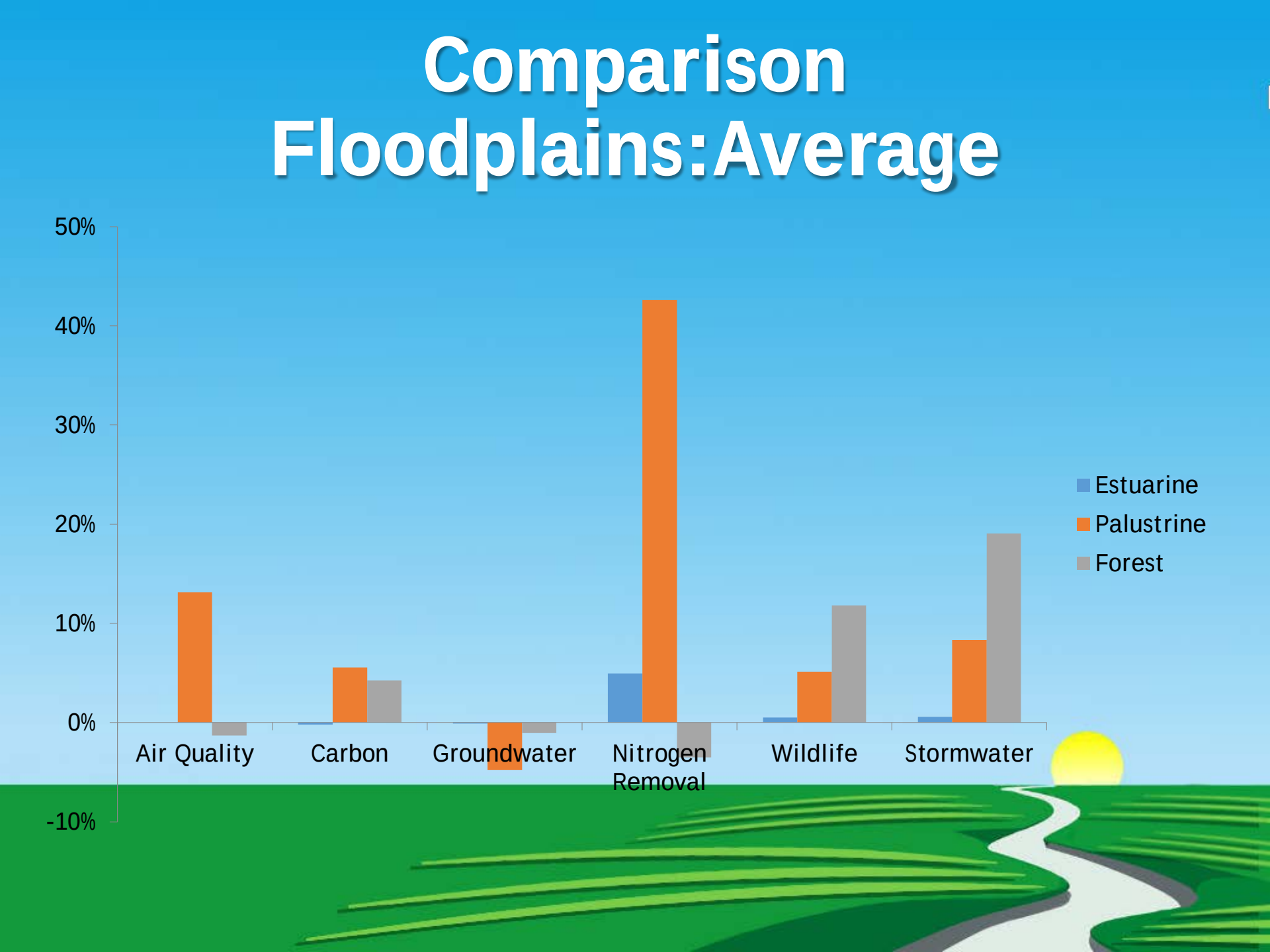

ES Applications by the MD DNR

- Consider ES Value When Selecting Projects and Investments, Evaluating ROI, suggesting compensation

  - Conservation- Program Open Space Investments –Totaled >$100 million for FY2018. We evaluated the ES of the Stump Property Acquisition in 2017. Parcel Evaluator Tool with ES information will be used for prioritizations of future acquisitions.

  - Restoration- Creating a tool to evaluate the ES benefits of restoration work done through the DNR Trust Fund, Restoration through Resiliency for 2018 pilot. Investments of > $25 million per year

  - Worked with the Maryland Park Service to evaluate impact to the park of a natural gas pipeline, suggested fair compensatory value that was accepted in the agreement

Future Work

- Include Services from the Chesapeake Bay
  - Oyster beds
  - Submerged Aquatic Vegetation (SAV)
- Incorporate new data
  - Wetland mapping
  - Better floodplain mapping
  - Higher resolution forest cover
  - New models of BRI's
  - New eco-prices
- Collaborate with instate, interstate, and federal partners- PA, Ches. Bay Program, EPA Reg. 3

Thank You!

- Websites:
- http://geodata.md.gov/greenprint/
- http://dnr.maryland.gov/ccs/Pages/Ecosystem-Services.aspx

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