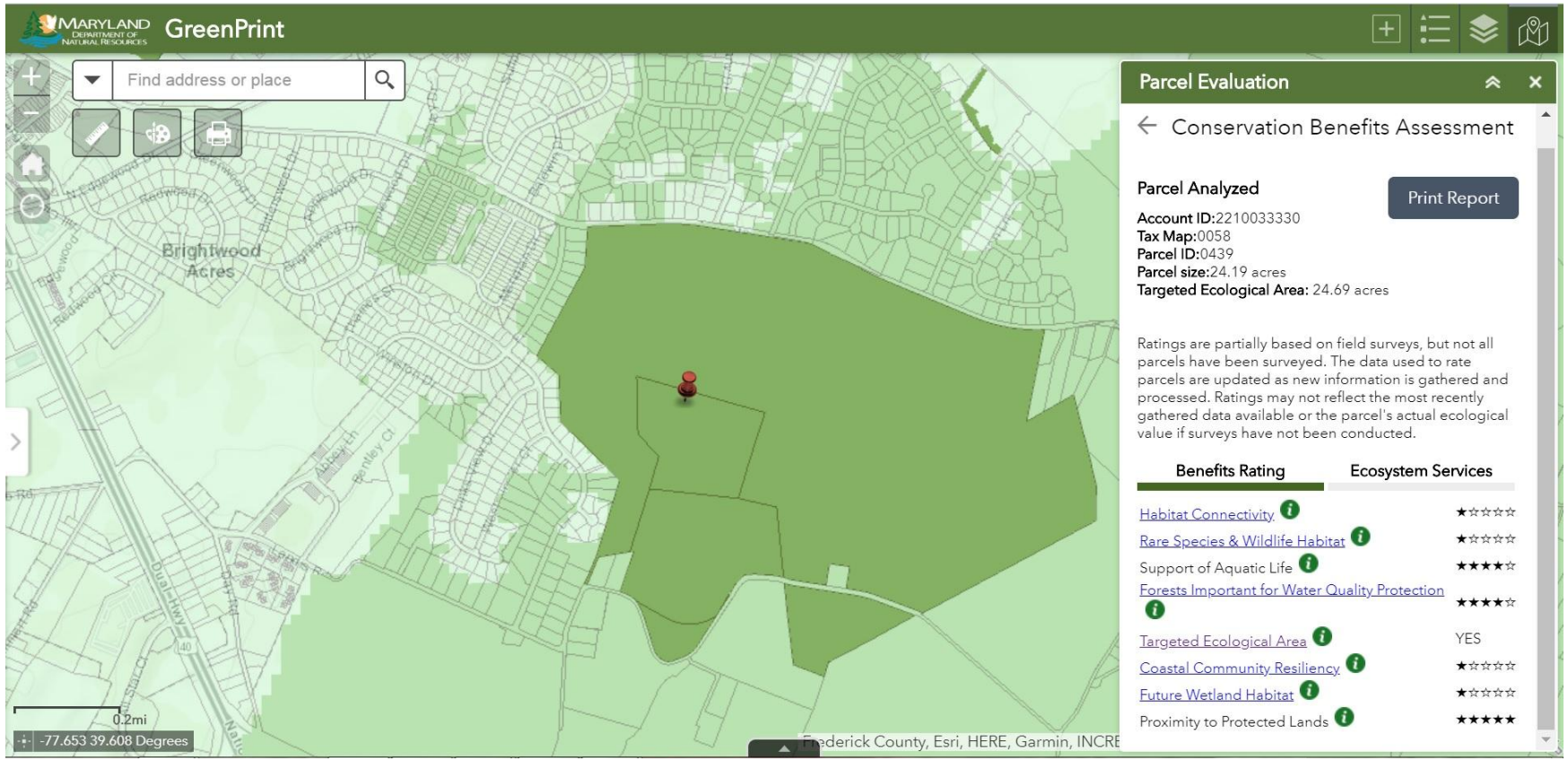
Maryland Parcel Evaluation Tool 101



The Parcel Evaluation Tool was prepared by the Maryland Environmental Service using Federal funds under award number NA15NOS4190165 from NOAA, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of NOAA or the U.S. Department of Commerce. The authors acknowledge the financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office for Coastal Management, National Oceanic and Atmospheric Administration.

MD DNR Parcel Evaluation Tool

- The **Parcel Evaluation Tool** provides a ***Conservation Benefits and Ecosystem Service Assessment Report Card*** for every land parcel in Maryland.

- Report card values reflect many of the ecological priorities established for Stateside Program Open Space (POS).

- Additionally, land trusts have asked for this information to help them target and evaluate lands for protection, as well as to document conservation values for tax benefits.

- Tool compliments existing internal DNR parcel evaluation process.

MD DNR Parcel Evaluation Tool

<u>Two components:</u>

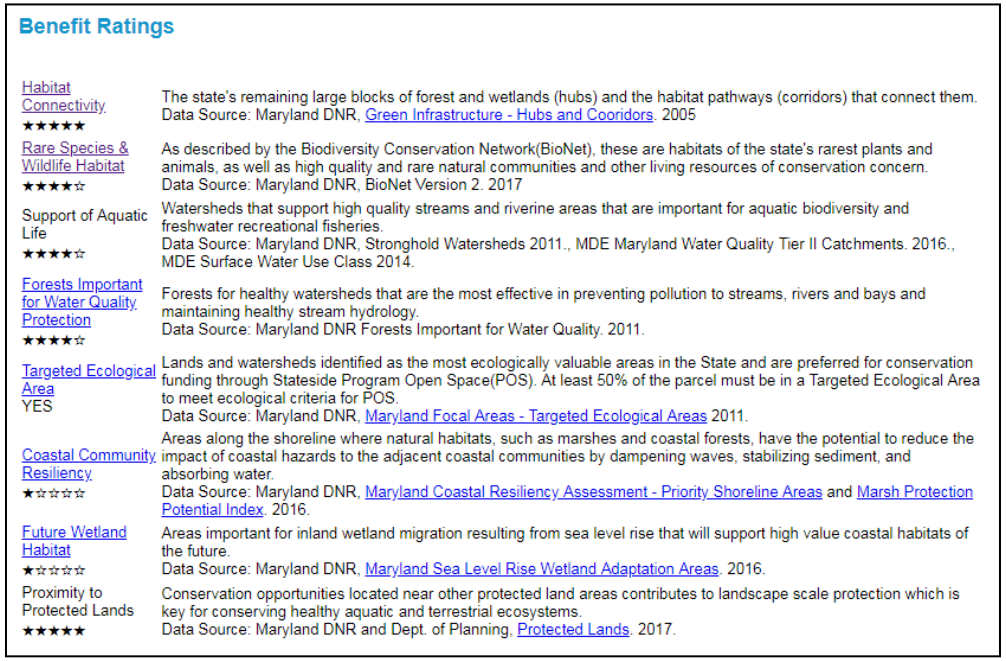
1) Conservation Benefit Assessment

2) Ecosystem Service Assessment

Conservation Benefit Assessment

Conservation Benefit Assessment

- Provides a “star” benefit rating (1= low to 5 = high) for each of seven categories of ecological benefit
- Benefit rating valuation methods were developed in consultation with experts from units across DNR
- Values are used by the DNR to score lands acquired by the state



Benefit Ratings

Habitat Connectivity ★★★★★	The state's remaining large blocks of forest and wetlands (hubs) and the habitat pathways (corridors) that connect them. Data Source: Maryland DNR, Green Infrastructure - Hubs and Cooridors. 2005
Rare Species & Wildlife Habitat ★★★★☆	As described by the Biodiversity Conservation Network(BioNet), these are habitats of the state's rarest plants and animals, as well as high quality and rare natural communities and other living resources of conservation concern. Data Source: Maryland DNR, BioNet Version 2. 2017
Support of Aquatic Life ★★★★☆	Watersheds that support high quality streams and riverine areas that are important for aquatic biodiversity and freshwater recreational fisheries. Data Source: Maryland DNR, Stronghold Watersheds 2011., MDE Maryland Water Quality Tier II Catchments. 2016., MDE Surface Water Use Class 2014.
Forests Important for Water Quality Protection ★★★★☆	Forests for healthy watersheds that are the most effective in preventing pollution to streams, rivers and bays and maintaining healthy stream hydrology. Data Source: Maryland DNR Forests Important for Water Quality. 2011.
Targeted Ecological Area YES	Lands and watersheds identified as the most ecologically valuable areas in the State and are preferred for conservation funding through Stateside Program Open Space(POS). At least 50% of the parcel must be in a Targeted Ecological Area to meet ecological criteria for POS. Data Source: Maryland DNR, Maryland Focal Areas - Targeted Ecological Areas 2011.
Coastal Community Resiliency ★☆☆☆☆	Areas along the shoreline where natural habitats, such as marshes and coastal forests, have the potential to reduce the impact of coastal hazards to the adjacent coastal communities by dampening waves, stabilizing sediment, and absorbing water. Data Source: Maryland DNR, Maryland Coastal Resiliency Assessment - Priority Shoreline Areas and Marsh Protection Potential Index. 2016.
Future Wetland Habitat ★☆☆☆☆	Areas important for inland wetland migration resulting from sea level rise that will support high value coastal habitats of the future. Data Source: Maryland DNR, Maryland Sea Level Rise Wetland Adaptation Areas. 2016.
Proximity to Protected Lands ★★★★★	Conservation opportunities located near other protected land areas contributes to landscape scale protection which is key for conserving healthy aquatic and terrestrial ecosystems. Data Source: Maryland DNR and Dept. of Planning, Protected Lands. 2017.

Conservation Benefit Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

- **Habitat Connectivity** (★★★★★)
  - The state's remaining large blocks of forest and wetlands (hubs) and the habitat pathways (corridors) that connect them.
  - *Data Source:* Maryland DNR, Green Infrastructure - Hubs and Corridors. 2005

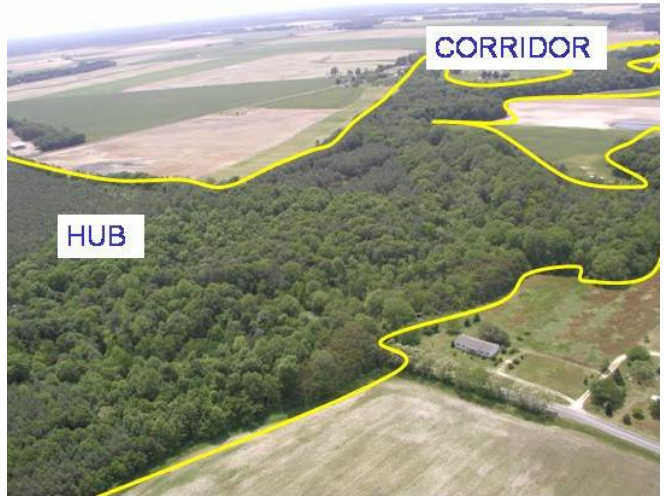
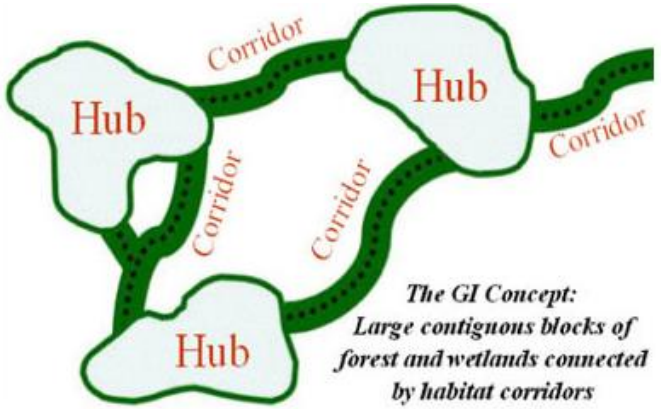


Photo Source: dnr.maryland.gov



http://dnr.maryland.gov/land/Pages/Green-Infrastructure.aspx

Conservation Benefit Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

- **Rare Species & Wildlife Habitat** (★★★★★)
  - As described by the Biodiversity Conservation Network(BioNet), these are habitats of the state's rarest plants and animals, as well as high quality and rare natural communities and other living resources of conservation concern.
  - *Data Source:* Maryland DNR, BioNet Version 2. 2017

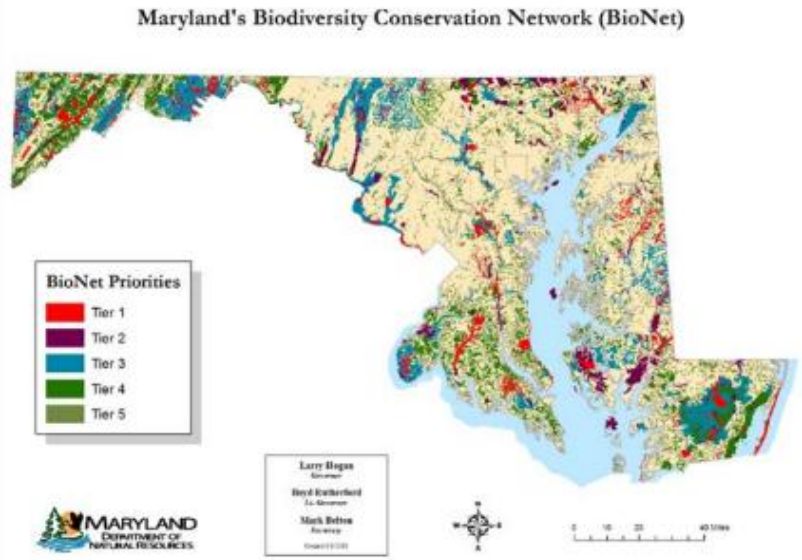


Photo Source: dnr.maryland.gov

http://dnr.maryland.gov/wildlife/Documents/BIONET_FactSheet.

Conservation Benefit Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

- **Support for Aquatic Species**(★★★★★)
  - Watersheds that support high quality streams and riverine areas that are important for aquatic biodiversity and freshwater recreational fisheries.
  - *Data Source:* Maryland DNR, Stronghold Watersheds 2011., MDE Maryland Water Quality Tier II Catchments. 2016., MDE Surface Water Use Class 2014.
  - *NOTE: Current rating values focus on freshwater ecosystems. Consideration of tidal ecosystems and blue infrastructure will be incorporated soon.*

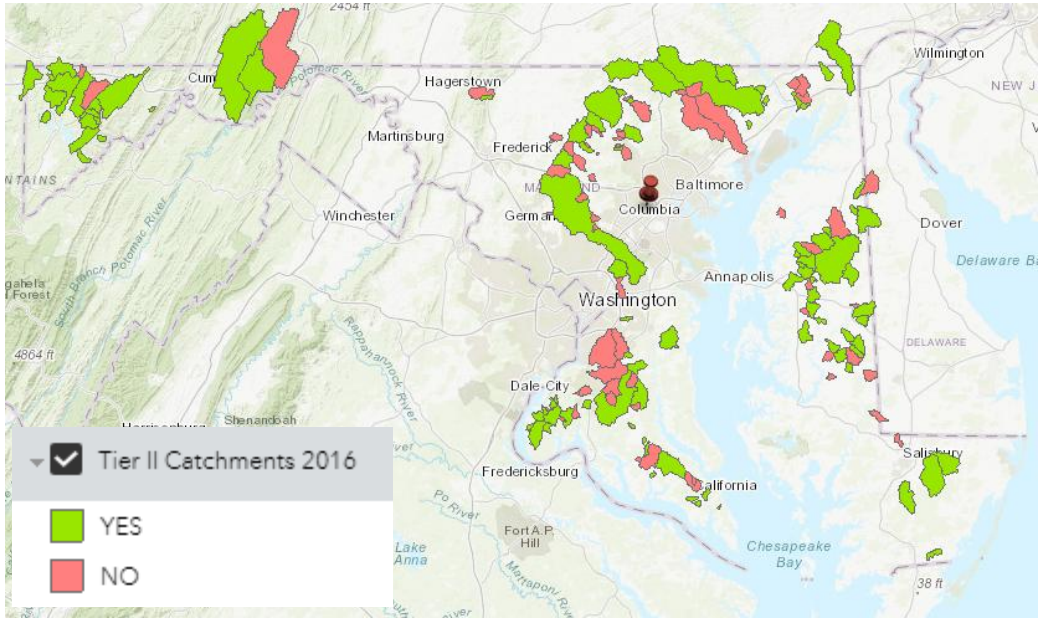


Photo Source: dnr.maryland.gov

Conservation Benefit Assessment

- **Forests Important for Water Quality Protection** (★★★★★)
  - Forests for healthy watersheds that are the most effective in preventing pollution to streams, rivers and bays and maintaining healthy stream hydrology.
  - *Data Source:* Maryland DNR Forests Important for Water Quality. 2011.

Photo Source: dnr.maryland.gov

Conservation Benefit Assessment

- **Coastal Community Resiliency**
  (★★★★★)
  - Areas along the shoreline where natural habitats, such as marshes and coastal forests, have the potential to reduce the impact of coastal hazards to the adjacent coastal communities by dampening waves, stabilizing sediment, and absorbing water.
  - *Data Source:* Maryland DNR, Maryland Coastal Resiliency Assessment - Priority Shoreline Areas and Marsh Protection Potential Index. 2016.

Photo Source: dnr.maryland.gov

Conservation Benefit Assessment

- **Future Wetland Habitat**
  (★★★★★)
  - Areas important for inland wetland migration resulting from sea level rise that will support high value coastal habitats of the future.
  - *Data Source:* Maryland DNR, Maryland Sea Level Rise Wetland Adaptation Areas. 2016.

Photo Source: dnr.maryland.gov

Conservation Benefit Assessment

- **Protected Lands** (★★★★★)
  - Conservation opportunities located near other protected land areas contributes to landscape scale protection which is key for conserving healthy aquatic and terrestrial ecosystems.
  - *Data Source:* Maryland DNR and Dept. of Planning, Protected Lands. 2017.

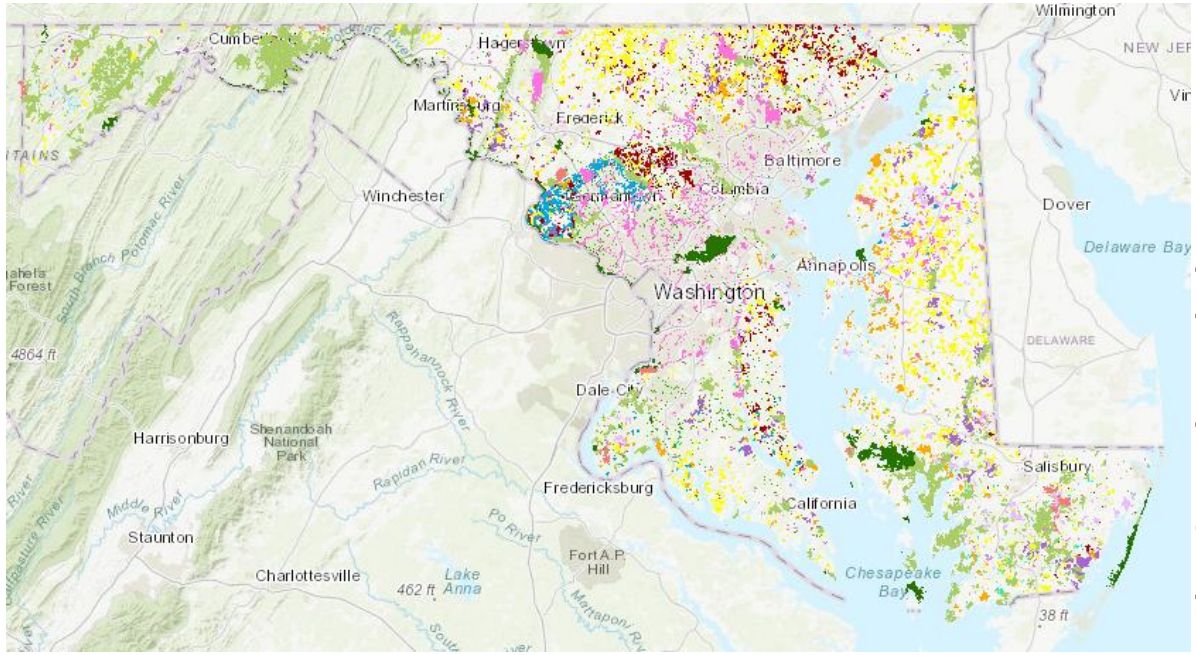


Photo Source: dnr.maryland.gov

Conservation Benefit Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

- **Targeted Ecological Area** (YES or NO)
  - Lands and watersheds identified as the most ecologically valuable areas in the State and are preferred for conservation funding through Stateside Program Open Space(POS). At least 50% of the parcel must be in a Targeted Ecological Area to meet ecological criteria for POS.
  - *Data Source:* Maryland DNR, Maryland Focal Areas - Targeted Ecological Areas 2011.

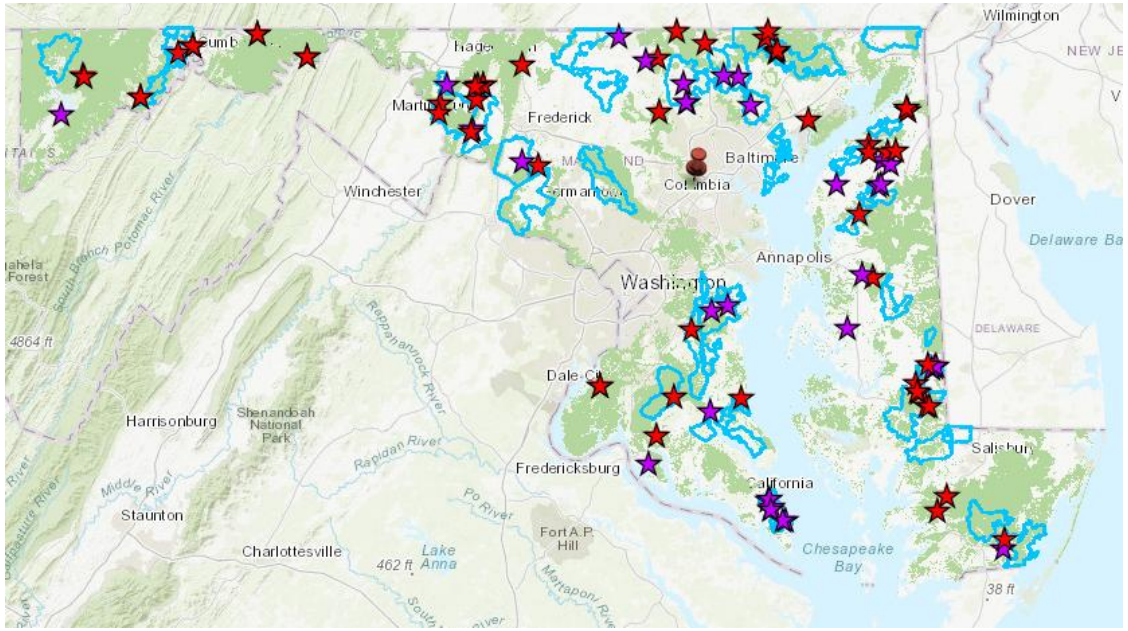


Photo Source: dnr.maryland.gov

Ecosystem Service Assessment

Ecosystem Service Assessment

- Ecosystem Services = *"the benefits that people gain from the environment"*
- Assessment considers 7 ecosystem services provided by forests and wetlands across the state
- Report card provides quantitative values for the **biophysical** quantity of the benefit , as well as the resulting **economic** value of each service
- Quantification methods leverage existing ecological models and datasets

Ecosystem Service Assessment

Ecosystem Service Name *(and biophysical unit)(range)*	Annual Parcel-Level Values*		Annual Per-Acre Values**	
	Biophysical	Economic	Biophysical	Economic
Air Pollution Removal: Carbon Monoxide (CO) *(kg per year)(0-1.35 kg per acre per year)*	2.56	$3.77	0.31	$0.46
Air Pollution Removal: Nitrogen Dioxide(NO_2) *(kg per year)(0- 9.01 kg per acre per year)*	41.86	$13.54	5.09	$1.65
Air Pollution Removal: Sulfur Dioxide(SO_2) *(kg per year)(0- 6.67 kg per acre per year)*	5.53	$0.43	0.67	$0.05
Air Pollution Removal: Ozone (O_3) *(kg per year)(0-34.35 kg per acre per year)*	167.27	$244.96	20.33	$29.77
Air Pollution Removal: Particulate Matter(PM_{10}) *(kg per year)(0-8.34 kg per acre per year)*	25.91		3.15	
Air Pollution Removal: Particulate Matter($PM_{2.5}$) *(kg per year)(0-1.80 kg per acre per year)*	9.86	$652.89	1.20	$79.34
Carbon Sequestration *(mT per year)(0-4 mt per acre per year)*	6.03	$839.24	0.73	$101.99
Groundwater Recharge *(m3per year)(445 - 1236 m3 per acre per year)*	654.08	$3,631.00	79.49	$441.27
Nitrogen Uptake Potential Index *(1 = low to 3 = high)**	1.00	$296.00	No Data	$35.97
Stormwater Mitigation Potential Index *(1 = low to 5 = high)**	2.43	$7,291.00	No Data	$886.06
Wildlife Habitat and Biodiversity Potential Index *(0 = low to 100 = high)**	83.19	$8,720.00	No Data	$1,059.72
Surface Water Protection	No Data	$0.00	No Data	$0.00
Total Annual Economic Value	No Data		No Data	$2,658.03

The Eco-Price Method for Valuing Ecosystem Services

MARYLAND DEPARTMENT OF NATURAL RESOURCES

- Ecosystem services are paid for in many different ways

- We look at the many different ways society invests in protecting or replacing the environment
  - In a market
  - Cost of restoration
  - Avoidance costs
  - Through mitigation fees
  - Cost to regulate

This method assesses the **Social Value** for decision making which is not the same as **Market Value**

Eco-Price Method Example Nitrogen Removal

MARYLAND DEPARTMENT OF NATURAL RESOURCES

- Price Signals
  - Bay Restoration Fund
    - It costs, on average $13.33 per lbs of nitrogen load reduction
  - Nutrient Trading in the Chesapeake Bay Watershed
    - $3.80 per lbs nitrogen on the PA market
  - Maryland BMP Cost Share
    - $1.80 per pound of nitrogen reduction
  - Average cost for BMP implementation/maintenance
    - 14.50 per pound nitrogen reduction
- Average: $8.36 per pound of N

Photo Source: Pinchot Institute, 2010

Ecosystem Service Assessment

Ecosystem Service Assessment

- Values can be used:
  - by DNR to evaluate lands acquired by the state
  - Calculate the cost of impacts to activities on existing state lands
  - To estimate the benefits of ecological restoration
    - working to leverage data available through the Maryland Watershed Resources Registry (WRR) , which ranks lands based on potential for upland, riparian, wetland, and stormwater infrastructure restoration.

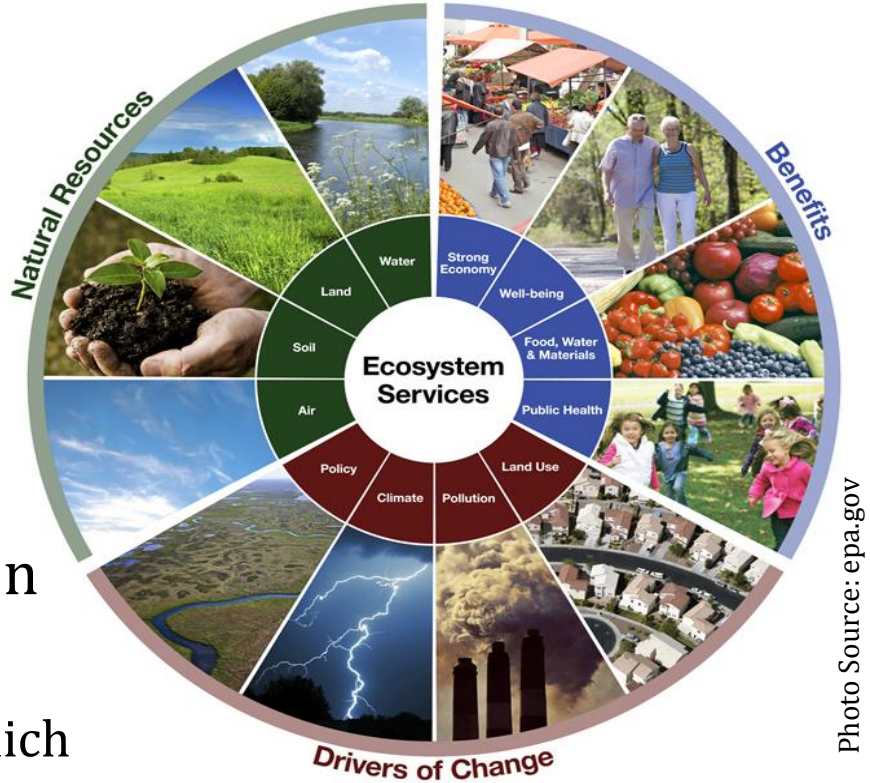


Photo Source: epa.gov

NOTE: Ecosystem service monetary values are meant to inform decision making and tradeoffs but do not imply market value or value to be paid by the state for land acquisition

Ecosystem Service Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Absolute Values:

- **Air Pollution Removal** (kg/yr)
  - Trees remove pollution from the air that would otherwise contribute to human health problems, such as asthma and cardiovascular stress.
  - *Data Source: US Forest Service iTree Landscape Tool*

Photo Source: cleanwateraction.org

i-Tree Landscape

https://landscape.itreetools.org/

Ecosystem Service Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Absolute Values:

- **Carbon Sequestration** (mT/yr)
  - Ecosystems take up carbon and store it in their biomass, offsetting some of the emissions from human activity and helping to reduce climate change.
  - *Data Source: US Forest Service iTree Landscape Tool; DNR*

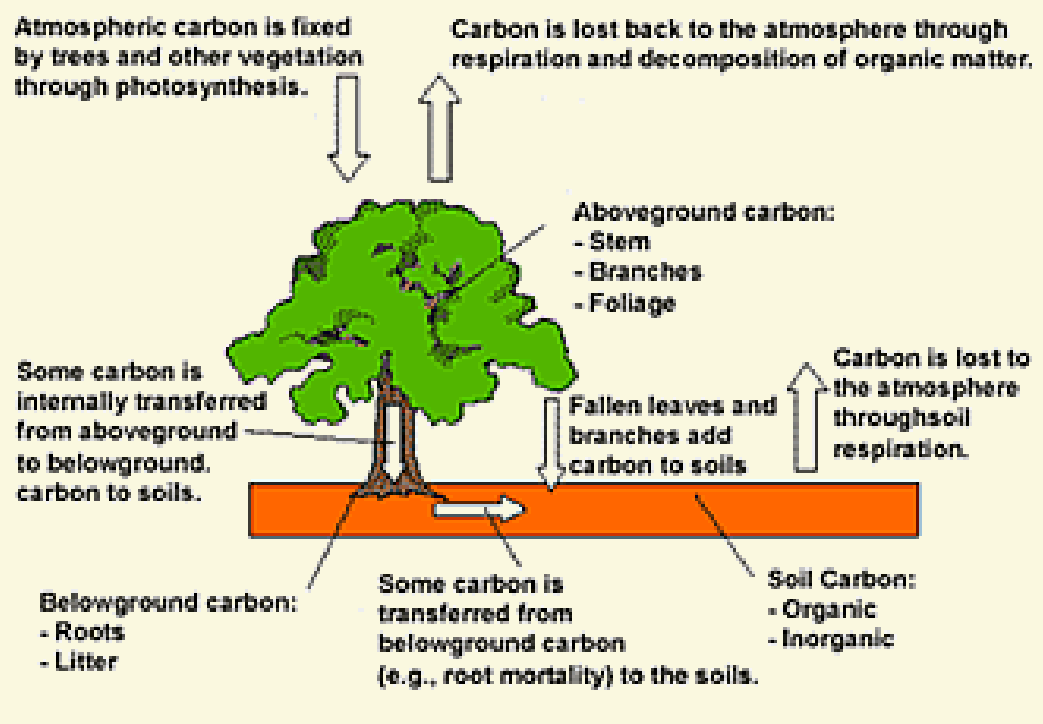


Photo Source: nrs.fs.fed.us

i-Tree Landscape

https://landscape.itreetools.org/

Ecosystem Service Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Absolute Values:

- **Groundwater Recharge** (m^3/yr)
  - Ecosystems allow for water to percolate through the soil and recharge aquifers, which Maryland relies on for 50% of its drinking water supply.
  - *Data Source:* USGS "Estimated Mean Annual Natural Groundwater Recharge, 2002" for MRB1 Catchments (mid-Atlantic)

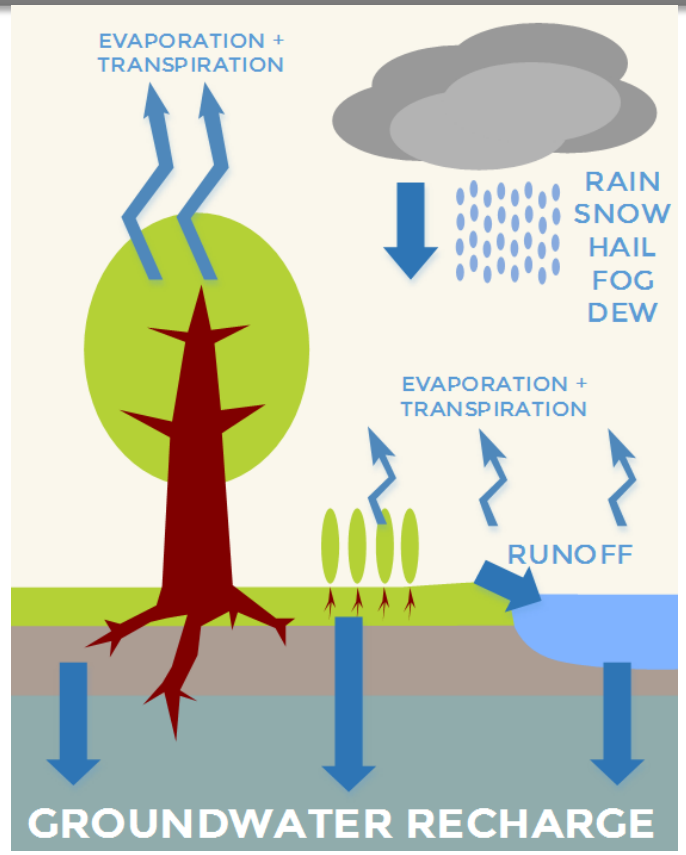


Photo Source: upgro.org

USGS science for a changing world
Water Resources NSDI Node

https://water.usgs.gov/GIS/metadata/usgswrd/XML/mrb_e2rf1_recharge.xml

Ecosystem Service Assessment

Relative (Index) Values:

- **Wildlife Habitat and Biodiversity Potential Index** (1=low to 100=high)
  - Certain forests and wetlands are better able to support wildlife and more likely to support rare and threatened species. These are typically ecosystems that are less impacted by people.
  - *Data Source:* Maryland DNR, BioNet Version 1

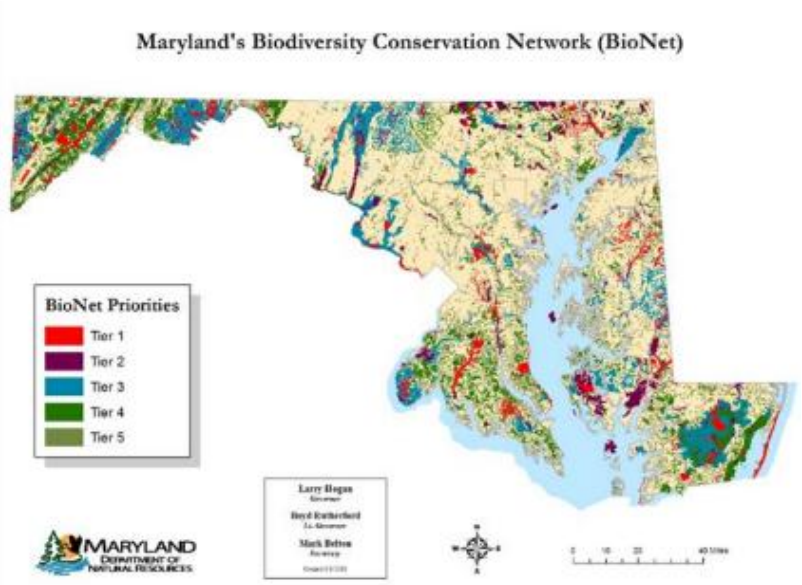


Photo Source: dnr.maryland.gov

Ecosystem Service Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Relative (Index) Values:

- **Nitrogen Uptake Potential Index** (1=low to 5=high)
  - Nitrogen pollution is critically important to the health Chesapeake Bay. Forests and wetlands remove nitrogen through taking it up in their biomass and soils.
  - *Data Source:* USGS Spatially Referenced Regression on Watershed Attributes Model (SPARROW)

Photo Source: dnr.maryland.gov

USGS science for a changing world

National Water-Quality Assessment (NAWQA) Project

https://water.usgs.gov/nawqa/sparrow/#

Ecosystem Service Assessment

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Relative (Index) Values:

- **Stormwater Mitigation/Flood Prevention Potential Index** (1=low to 5=high)
  - Forests and wetlands absorb rainfall, lessening the amount of runoff that would otherwise cause erosion, need to be treated by stormwater systems, or cause flood damage.
  - *Data Source:* Modified version of the Maryland Watershed Resources Registry (WRR) Stormwater Preservation Model

Photo Source: smithsonianmag.org

watershed resources registry

http://watershedresourcesregistry.com/detailsHp.html

Ecosystem Service Assessment

- **Surface Water Protection**
  - Forests reduce pollutant runoff into reservoirs, increasing water quality in the reservoir and reducing the cost of treating water to meet drinking water standards.
  - *Data Source:* 8 digit watersheds *;* Literature Review

Photo Source: md.water.usgs.gov

More Information

- The GreenPrint Map

http://geodata.md.gov/greenprint/

- Chesapeake & Coastal Service Ecosystem Service Website

http://dnr.maryland.gov/ccs/Pages/Ecosystem-Services

- Maryland Ecosystem Service Webinar

https://www.youtube.com/watch?v=56mDu3lH0-0&feature=youtu.be

More Information

Christine Conn
christine.conn@maryland.gov

Kevin Coyne
Kevin.coyne@maryland.gov