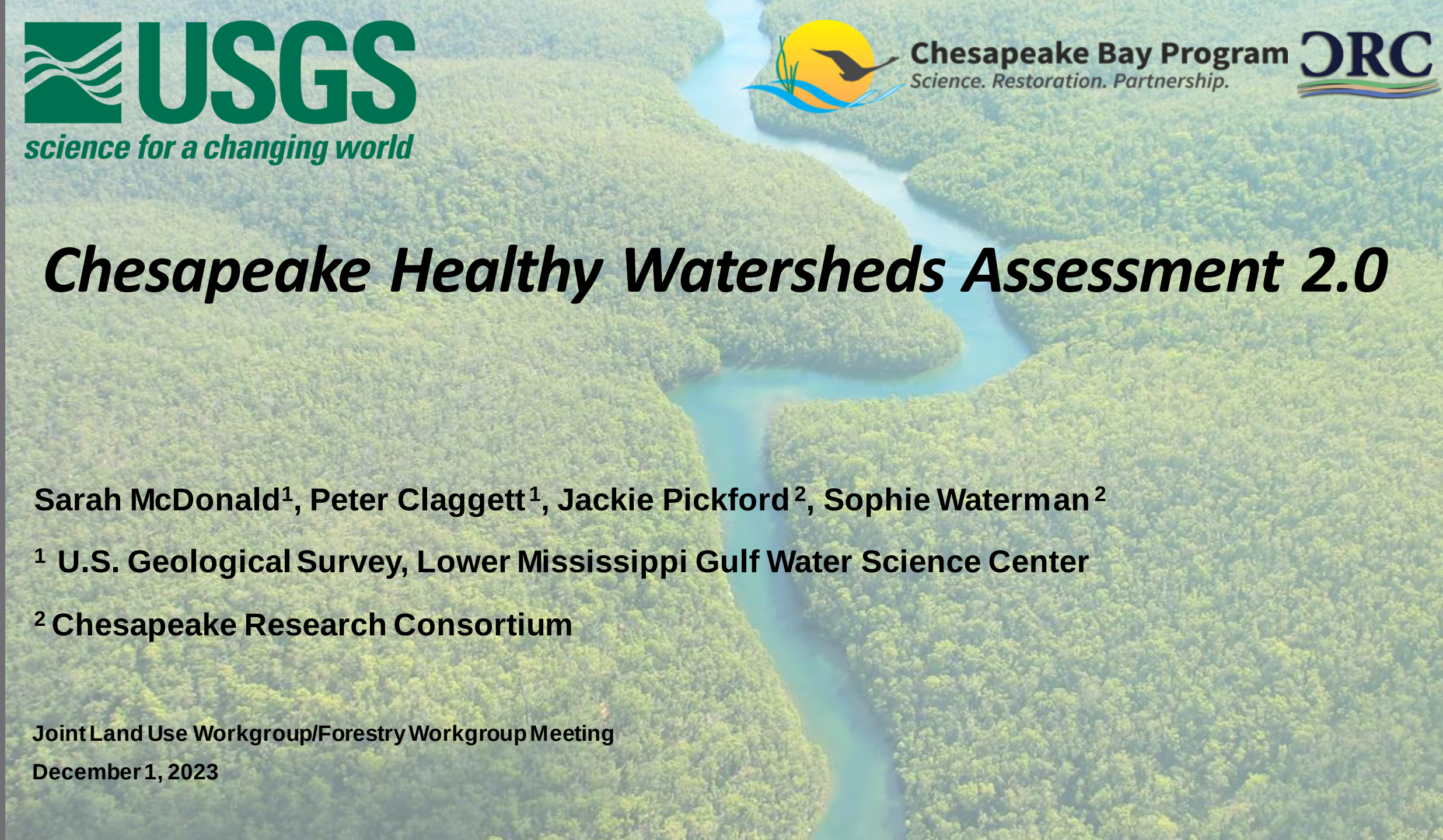


Chesapeake Healthy Watersheds Assessment 2.0

Sarah McDonald[1], Peter Claggett[1], Jackie Pickford[2], Sophie Waterman[2]

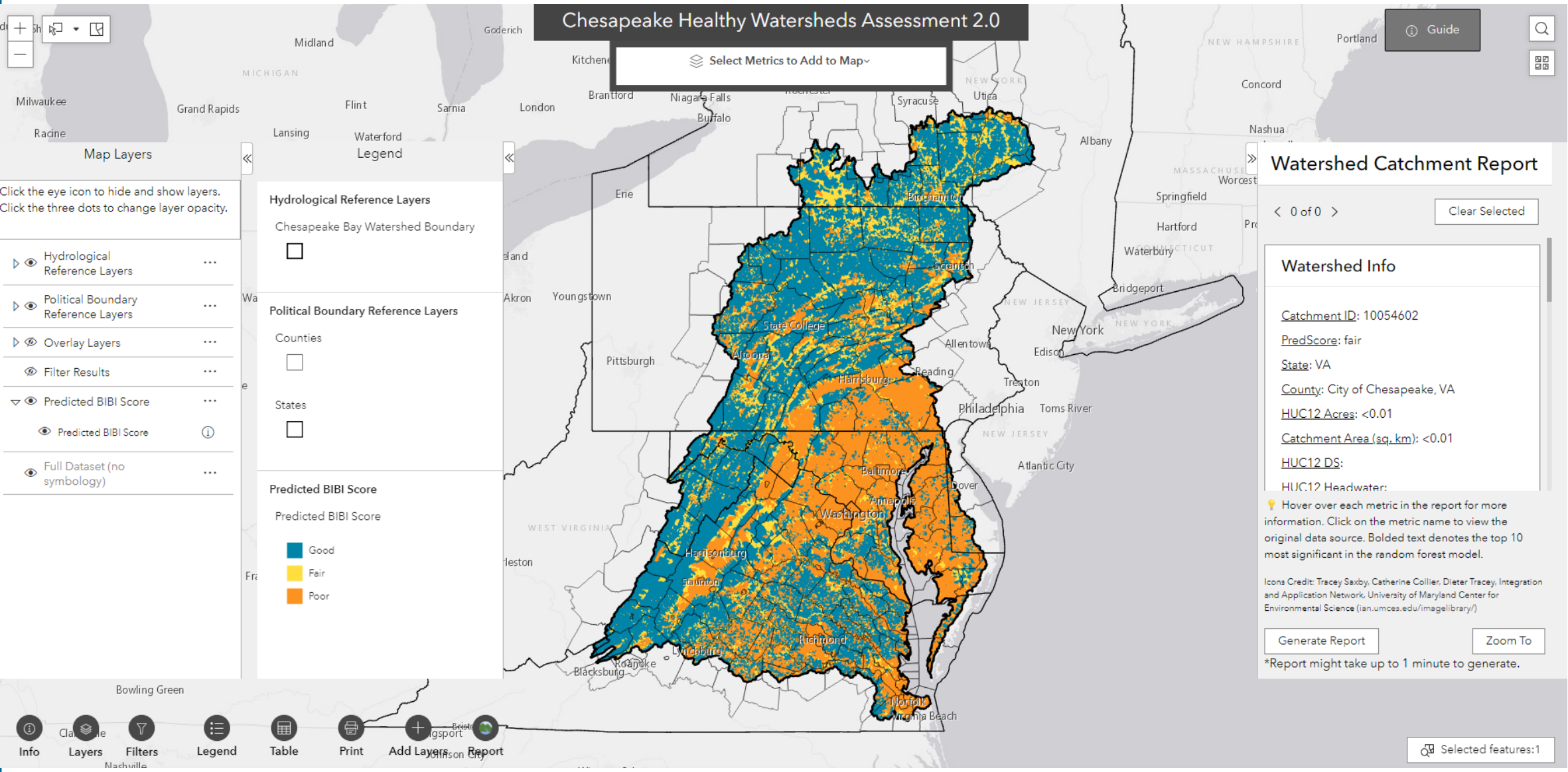
[1] U.S. Geological Survey, Lower Mississippi Gulf Water Science Center

[2] Chesapeake Research Consortium

Joint Land Use Workgroup/Forestry Workgroup Meeting

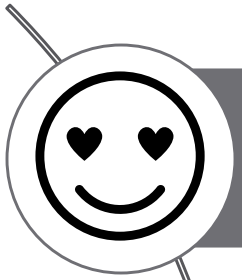
December 1, 2023

https://gis.chesapeakebay.net/chwa



Navigating Chesapeake Healthy Watersheds Assessment 2.0

What can you do with the CHWA 2.0?



Detect signals of change in state-identified healthy watersheds

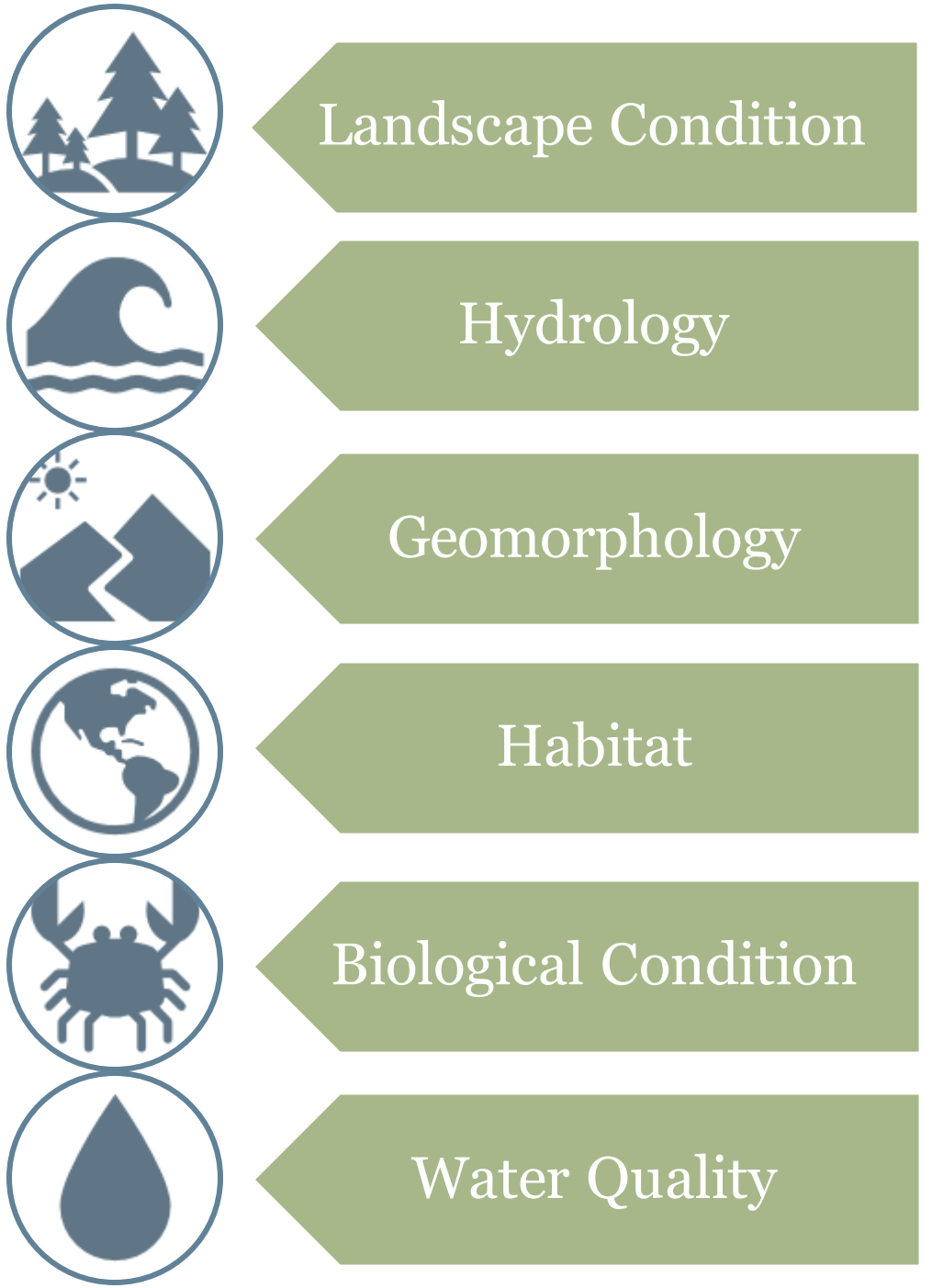
Identify vulnerable areas to future development and climate change

Identify unprotected and potentially healthy watersheds

Identify candidate areas for restoration and conservation

Chesapeake Healthy Watersheds Assessment 2.0

- Over 100 metrics summarized for 83,629 NHD catchments.
- Machine-learning model developed to predict stream benthic macroinvertebrate conditions.
- Overlays included to aid in the interpretation of information.
- Data available on the Chesapeake Bay Open Data Portal.

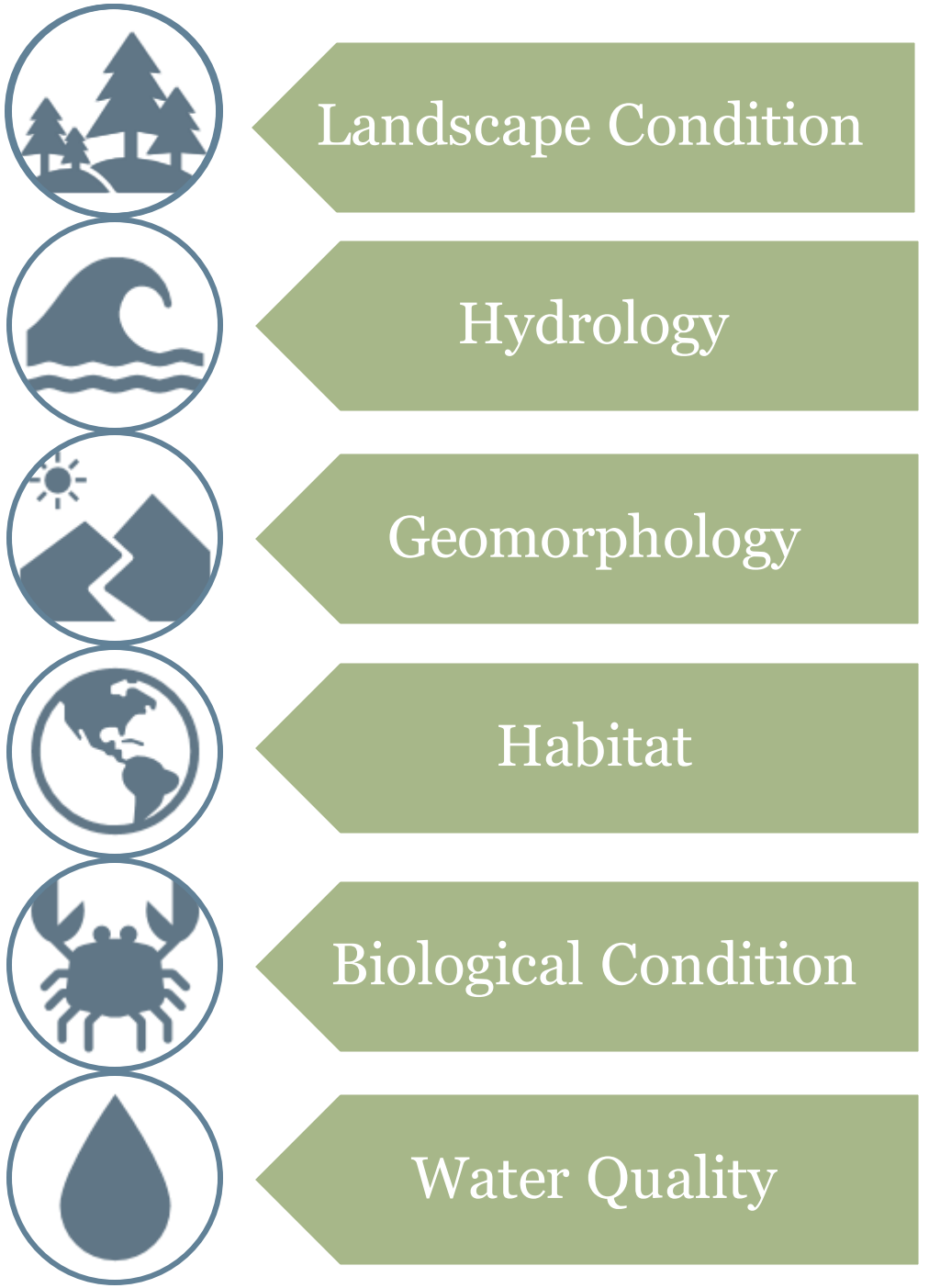


https://data-chesbay.opendata.arcgis.com/documents/ChesBay::chesapeake-healthy-watersheds-assessment-chwa-2-0/about

Chesapeake Healthy Watersheds Assessment 2.0: Landscape Metrics

- Landscape metrics derived the Chesapeake Bay Program's 1-meter resolution Land Use/Land Cover.

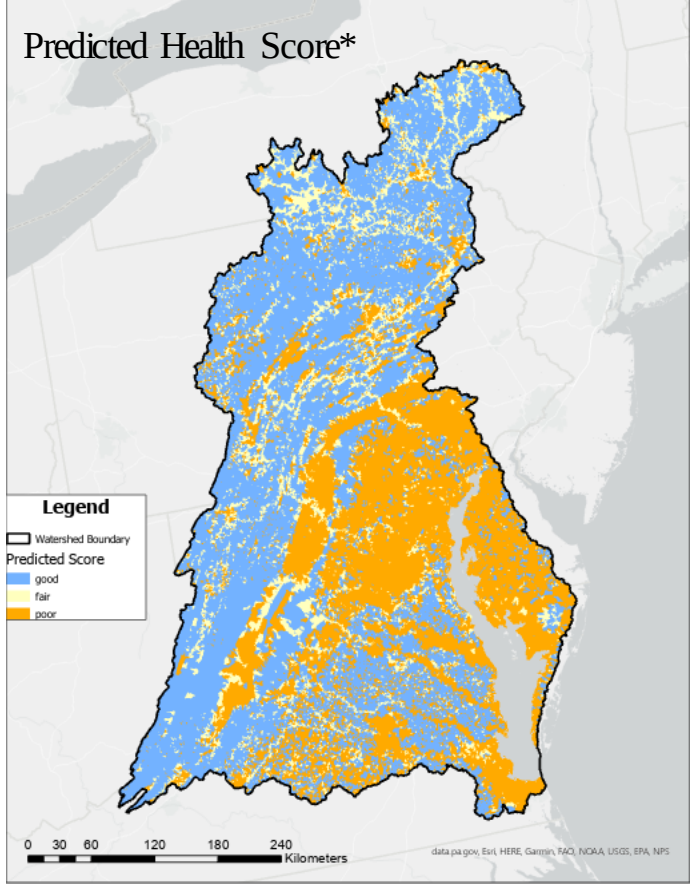
- High-res metrics include forests, natural lands, and impervious summarized by the catchment, upstream watershed, 100-foot riparian, and upstream watershed 100-foot riparian!



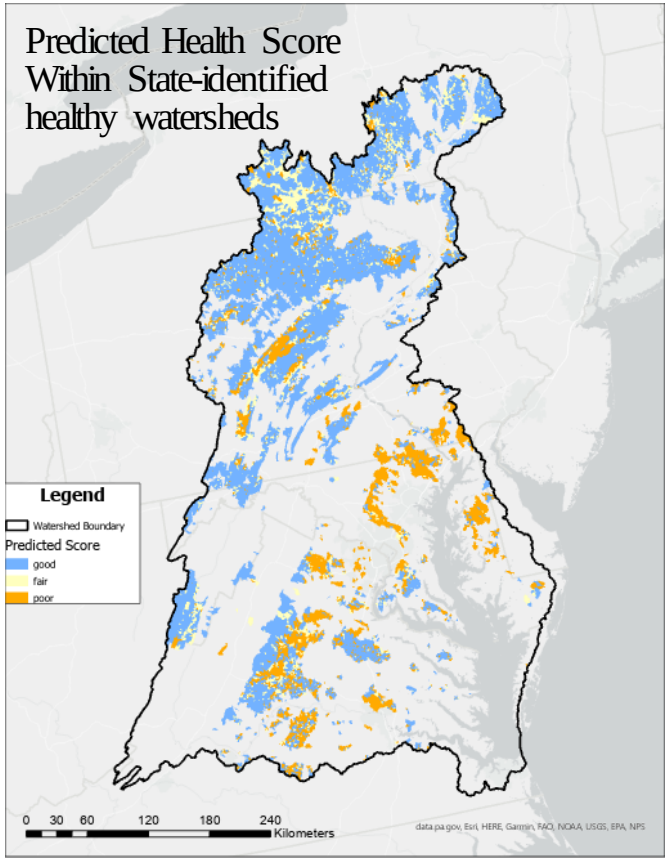
USGS science for a changing world

Chesapeake Bay Program
Science. Restoration. Partnership.

CHWA 2.0



Predicted Score (watershed)	% Area
good	52%
fair	13%
poor	35%



Predicted Score (within State Identified Healthy watersheds)	% Area
good	67%
fair	13%
poor	19%

- **Challenge:** on-the-ground monitoring of all state-identified healthy watersheds not feasible.
- **Potential Solution**: develop an application to monitor “signals of change” in condition that can be used to target follow-up assessments and actions.

* Overall model accuracy is 0.59 with a Cohen’s Kappa of 0.38 (fair agreement). Most confusion is with the fair class.

What metrics were most effective in predicting BIBI?

- Metric importance reflects how well a metric reduces uncertainty in the machine-learning model.
- 60 metrics are included in the model as predictors.
- The top 7 metrics represent conditions in the upstream watershed.

Top 5 Most Important Metrics

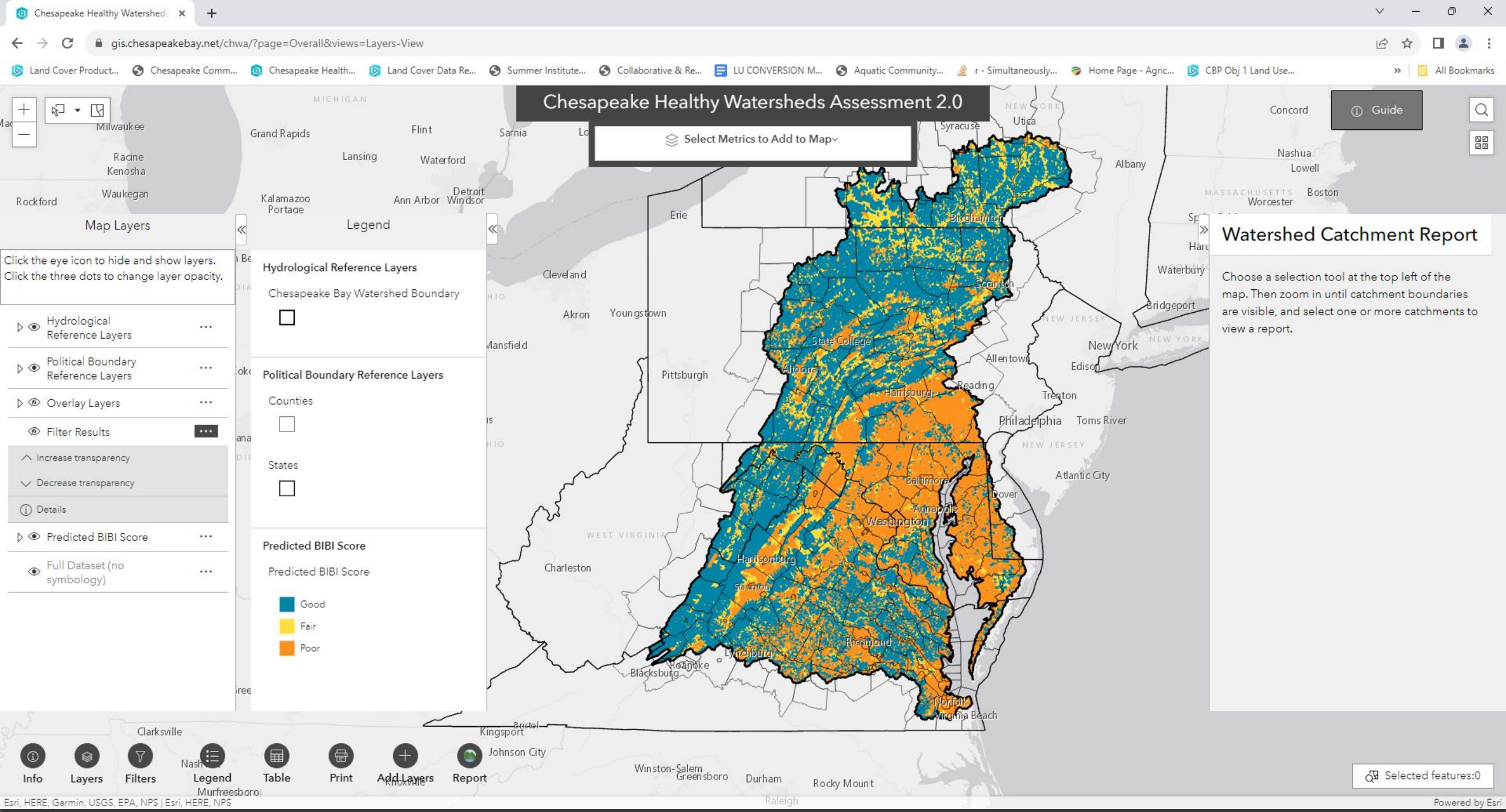
% Tree Cover with Unmanaged Understory 2017/18 Watershed (% forest in the upstream watershed)

% Natural Land in Riparian 2017/18 Watershed (% forest, wetlands, and succession in the upstream watershed)

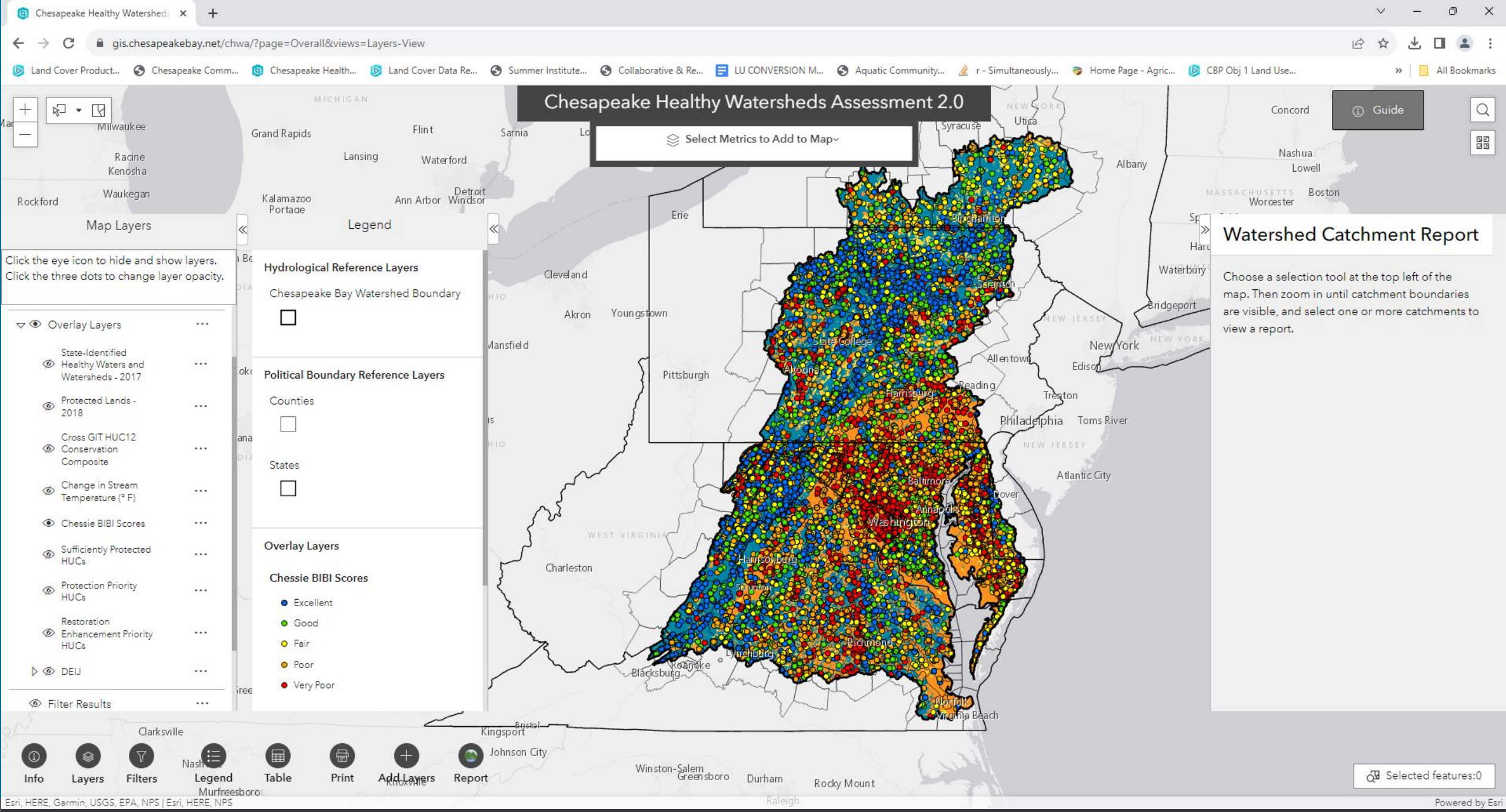
% Impervious Cover 2017/18 Watershed (% roads, structures, parking lots, etc. in the upstream watershed)

Housing Unit Density 2020 Watershed (housing units per area in the upstream watershed)

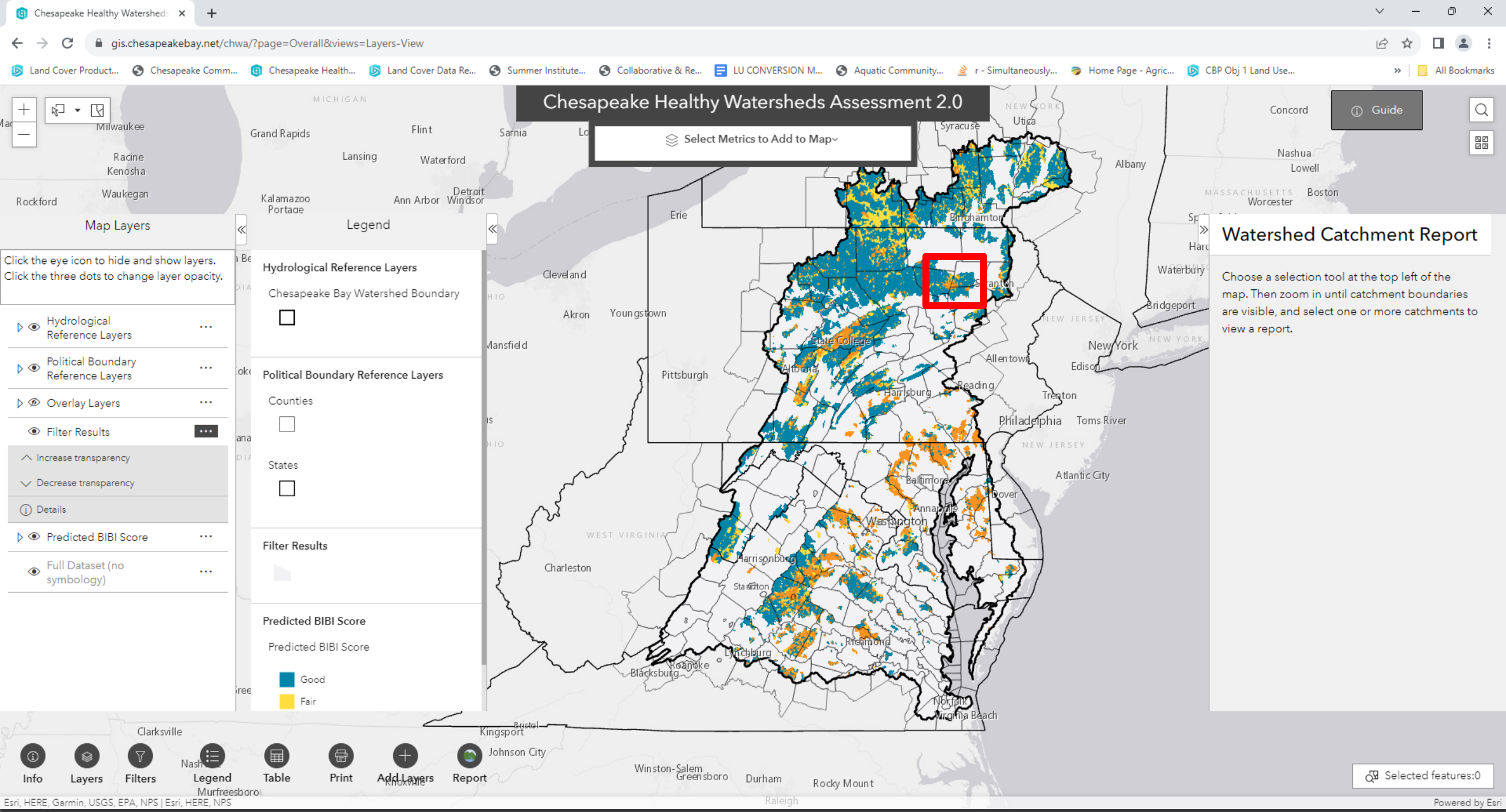
Road Density Watershed (road area per total area in the upstream watershed)



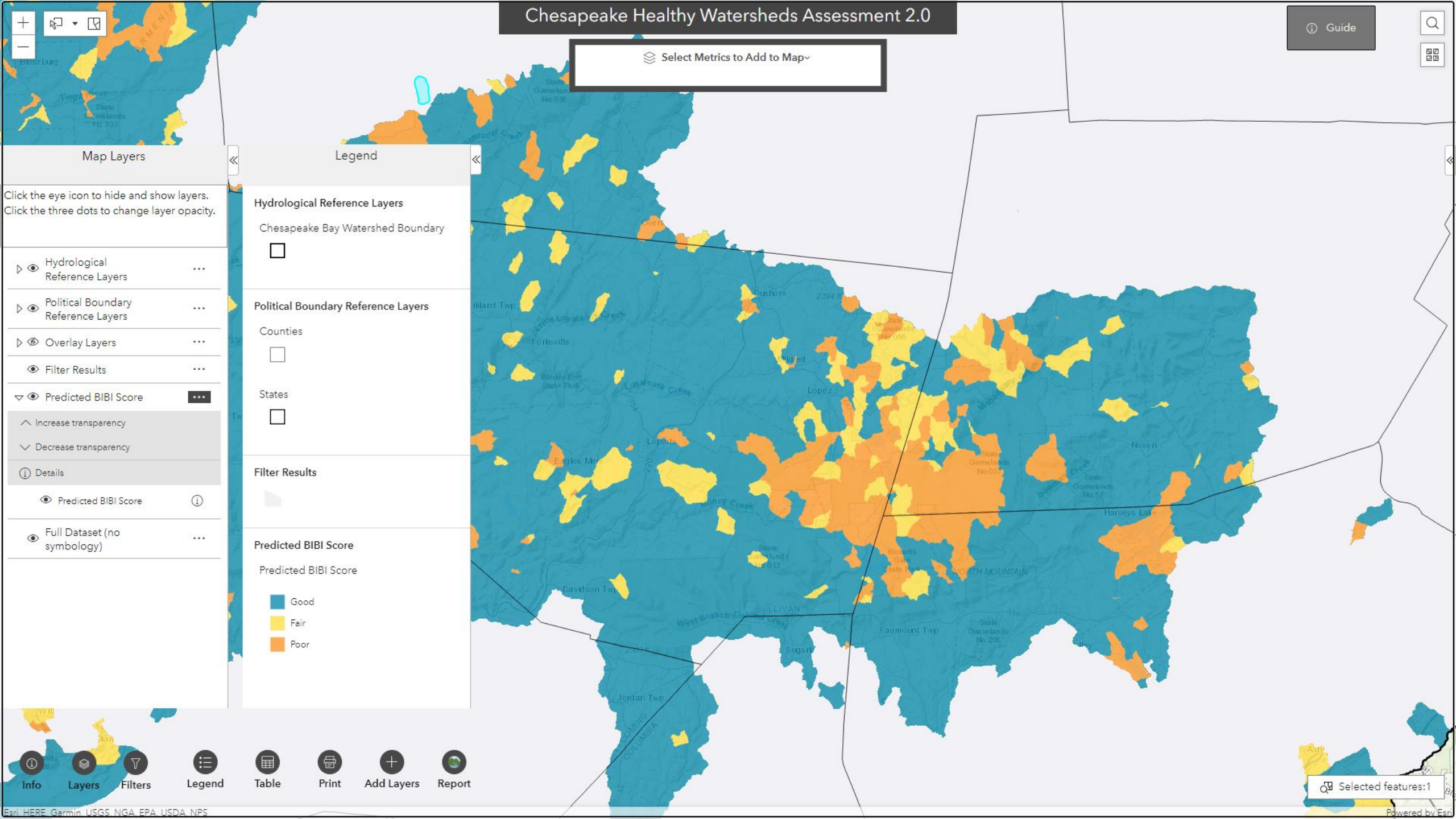
Navigating Chesapeake Healthy Watersheds Assessment 2.0

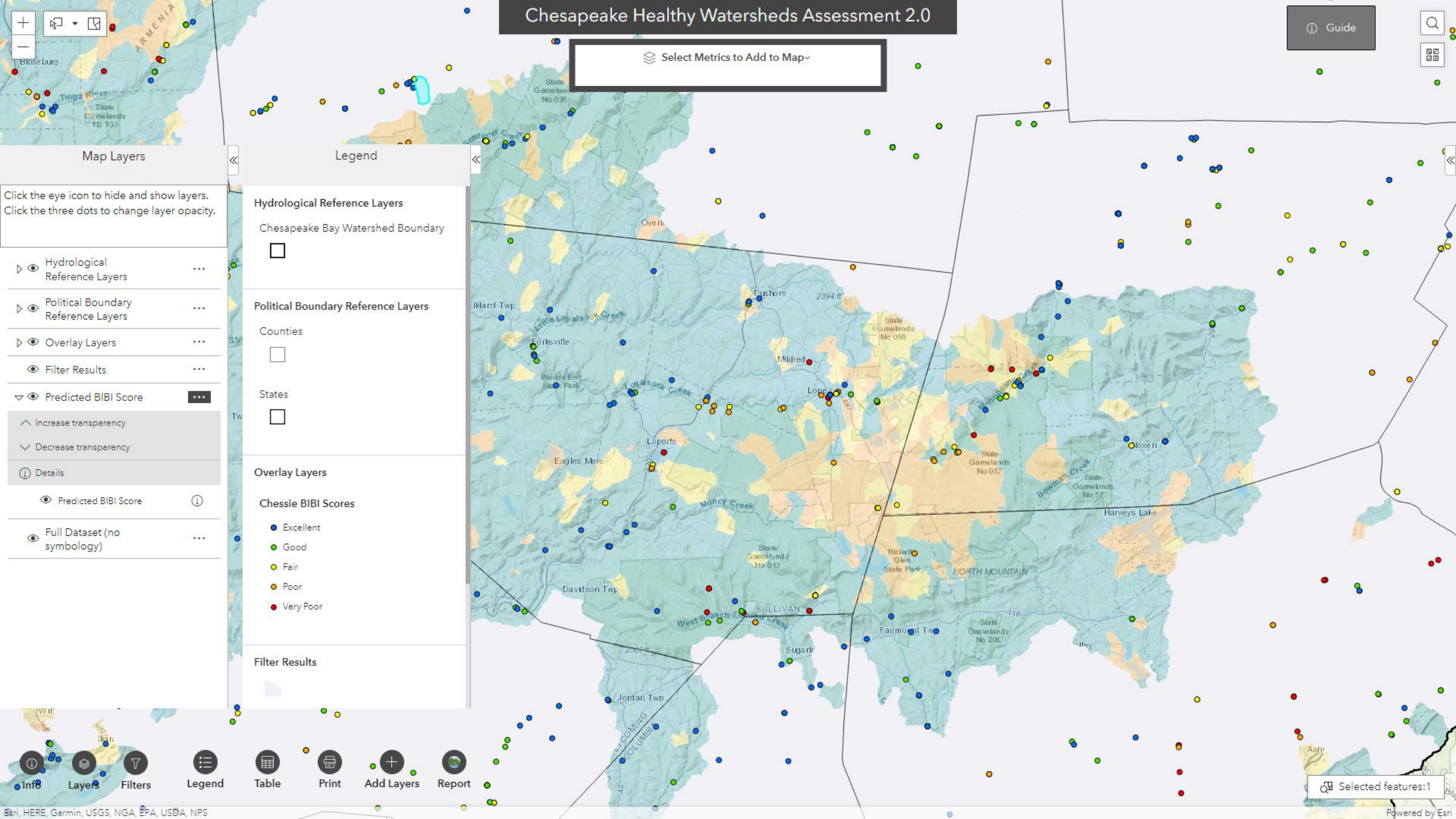


Navigating Chesapeake Healthy Watersheds Assessment 2.0



CHWA 2.0: Viewing State-Identified Healthy Watersheds Boundaries


Chesapeake Healthy Watersheds Assessment 2.0
Select Metrics to Add to Map
Guide
Map Layers
Click the eye icon to hide and show layers.
Click the three dots to change layer opacity.
Hydrological Reference Layers
Political Boundary Reference Layers
Overlay Layers
Filter Results
Predicted BIBI Score
Increase transparency
Decrease transparency
Details
Predicted BIBI Score
Full Dataset (no symbology)
Legend
Hydrological Reference Layers
Chesapeake Bay Watershed Boundary
Political Boundary Reference Layers
Counties
States
Filter Results
Predicted BIBI Score
Predicted BIBI Score
Good
Fair
Poor
Info
Layers
Filters
Legend
Table
Print
Add Layers
Report
Selected features:1
Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS
Powered by Esri


Chesapeake Healthy Watersheds Assessment 2.0
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Chessie BIBI Scores
Excellent
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Poor
Very Poor
Filter Results
Info
Layers
Filters
Legend
Table
Print
Add Layers
Report
Selected features:1
Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS
Powered by Esri

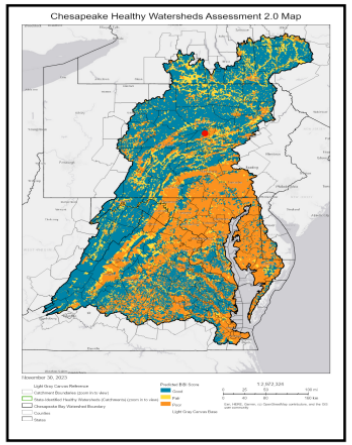
CHWA 2.0 Catchment Report

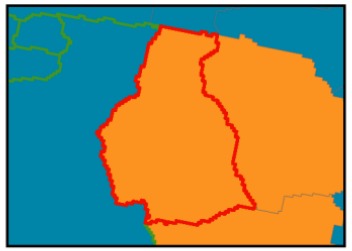
Chesapeake Watersheds Assessment -
Watershed Factsheet for FEATUREID: 8152147
11/30/2023

The Chesapeake Bay Program (CBP), through its Maintain Healthy Watersheds Goal Implementation Team, has a goal of maintaining the long-term health of watersheds identified as healthy by its partner jurisdictions.
Maintain Healthy Watersheds Goal Implementation Team

Watershed Info

Catchment ID	8152147
Predicted BIBI Score	poor
State	PA
County	Union, PA
HUC12 Acres	12148
HUC12 Headwater	Yes
HUC12 ID	020502061004
HUC12 Name	Little Buffalo Creek





Chesapeake Watersheds Assessment -
Watershed Factsheet for FEATUREID: 8152147
11/30/2023

Watershed Health Metrics

Landscape Condition

% Tree Cover in Riparian 2017/18 Catchment	80.53%
% Tree Cover in Riparian 2017/18 Watershed	80.53%
Housing Unit Density 2020 Catchment (units/sq. km)	28.99
Housing Unit Density 2020 Watershed (units/sq. km)	28.99
Population Density 2020 Catchment (people/sq. km)	77.86
Population Density 2020 Watershed (people/sq. km)	77.86
% Extractive 2017/18 Catchment	0.00%
% Extractive 2017/18 Watershed	0.00%
% Forested Extent Loss to Development 2001-2013 Catchment	0.00%
% Forested Extent Loss to Development 2001-2013 Watershed	0.04%
% Impervious Cover 2017/18 Catchment	5.01%
% Impervious Cover 2017/18 Watershed	5.01%
% Natural Land in Riparian 2017/18 Catchment	82.93%
% Natural Land in Riparian 2017/18 Watershed	82.93%
% Protected Lands Catchment	0.00%
% Protected Lands Watershed	0.00%
% Agriculture 2017/18 Catchment	49.64%
% Agriculture 2017/18 Watershed	49.64%

Habitat

Nature's Network Connectivity Catchment	0.00%
Fish Habitat Condition Index (Catchment)	3.80
Fish Habitat Condition Index Cumulative	3.60
Fish Habitat Condition Index Network (Watershed)	3.60
% Tree Cover with Unmanaged Understory 2017/18 Catchment	31.23%
% Tree Cover with Unmanaged Understory 2017/18 Watershed	31.23%

Hydrology

% Tree Canopy with Managed Understory 2017/18 Catchment	3.33%
% Tree Canopy with Managed Understory 2017/18 Watershed	3.33%
% Non-forested Wetlands 2017/18 Catchment	0.00%
% Non-forested Wetlands 2017/18 Watershed	0.00%
Road Stream Crossing Density Catchment (km/sq. km)	0
Road Stream Crossing Density Watershed (km/sq. km)	0
FlowAlteration	1

Geomorphology

Streambed Fine Sediment and Sand Cover Catchment	13.40
Streambed Particle Size D50 Catchment	18.90
Streambank Sediment Flux Catchment (kg-sed m-1 yr-1)	<0.01
Streambank Lateral Erosion Catchment	<0.01
Streambank Fine Sediment Flux Catchment (kg-finesed m-1 yr-1)	<0.01
Streambank Erosional Change Catchment	<0.01
Road Density Catchment (km/sq. km)	0.03
Road Density Riparian Catchment (km/sq. km)	0.02
Road Density Watershed (km/sq. km)	0.03
Road Density Riparian Watershed (km/sq. km)	0.02

Water Quality

% Impaired Stream Catchment	0.00%
Incremental suspended-sediment load from streambank erosion (lbs/acre/yr)	2.09
Incremental total nitrogen load from manure applications (kg/yr)	1649.15
Incremental total nitrogen load from fertilizer applications (kg/yr)	715.48
Incremental total nitrogen load from septic system effluent (kg/yr)	128.26
Incremental total nitrogen load from wastewater treatment facility point sources (kg/yr)	0
Incremental total phosphorus load from manure applications (kg/yr)	91.87

Chesapeake Watersheds Assessment -
Watershed Factsheet for FEATUREID: 8152147
11/30/2023

Watershed Vulnerability Metrics

Land Use Change

Housing Unit Density Change Catchment	9.35
Housing Unit Density Change Watershed	9.35
% Non-forested Wetland Conversion to Development 2013-18 Catchment	0.00%
% Non-forested Wetland Conversion to Development 2013-18 Watershed	0.00%
% Forest Harvesting 2013-18 Catchment	0.01%
% Forest Harvesting 2013-18 Watershed	0.01%
% Change in Impervious Cover 2013-18 Catchment	0.00%
% Change in Impervious Cover 2013-18 Watershed	0.00%
% Change in Forested Extent 2013-18 Catchment	0.00%
% Change in Forested Extent 2013-18 Watershed	0.00%
% Impervious Projected to 2055 Catchment	5.00%

Wildfire

% Wildland Urban Interface Catchment	5.00%
% Wildland Urban Intermix Catchment	0.00%

Climate Change

Probability of Brook Trout (current)	41
Probability of Brook Trout (2-degree Celsius increase)	22
Probability of Brook Trout (4-degree Celsius increase)	10
Probability of Brook Trout (6-degree Celsius increase)	4
Climate Stress Catchment	34
% Resiliant Lands Catchment	4.00%

Water Use

Domestic Water Use	2.63
Industrial Water Use	0.22
Agriculture Water Use	0.04

Symbols from Integration and Application Network, University of Maryland Center for Environmental Science (IAN, UMCES) Image Library; Authors Jane Hawkey, Tracey Saxby, and Jane Thomas

For questions on this report or other questions related to the Chesapeake Healthy Watersheds Assessment, contact Sarah McDonald, smcdonald@chesapeakebay.net

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