# Land Prioritization Mapping to Protect Drinking Water Quality (2025)

Chesapeake Bay Program
Forestry Workgroup meeting
April 9, 2026

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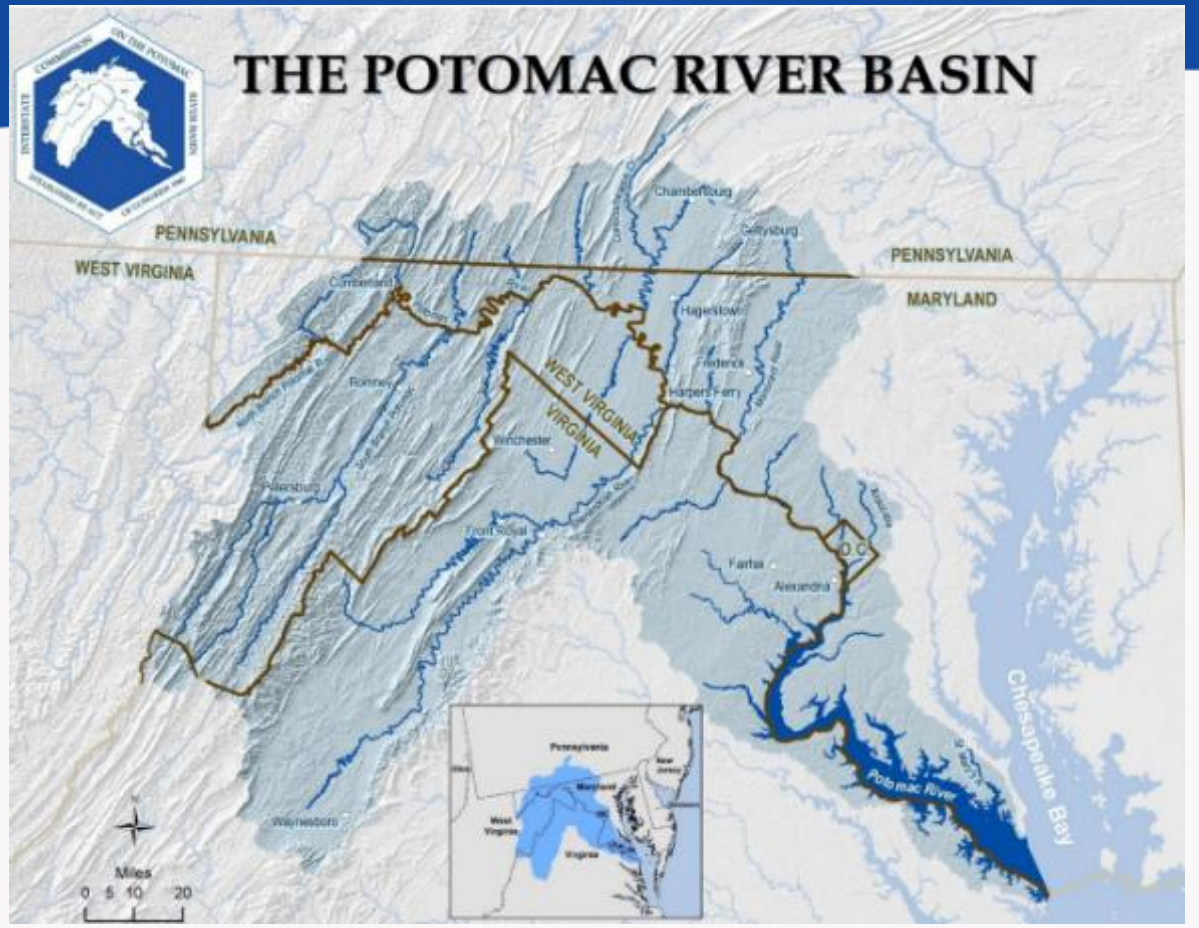
# Background on the Potomac and ICPRB

**What is the Potomac River Basin?**

- The Potomac River Basin spans **~14,700 square miles**, covering parts of **Maryland, Virginia, West Virginia, Pennsylvania**, and **Washington, DC**.
- It includes the **Potomac River**, its **major tributaries**, and thousands of miles of streams that feed into the Chesapeake Bay.
- About **6 million people** rely on the Potomac for **drinking water**, making it one of the most important water sources on the East Coast.
- The basin includes a diverse landscape — from **Appalachian headwaters** to **fast-growing suburban corridors** and the **urban core** of DC.



# What is ICPRB

**What is ICPRB?**

- The **Interstate Commission on the Potomac River Basin (ICPRB)** was established in **1940**, with a mission to **protect and enhance the waters and related resources of the Potomac River Basin**.
- It works across state lines to solve water issues that **no single jurisdiction can address alone**.
- Because the basin spans 5 political jurisdictions, ICPRB serves as a **neutral, science-based convener**.

# LAND PRIORITIZATION MAPPING TO PROTECT DRINKING WATER QUALITY: A TIMELINE

www.potomacriver.org www.potomacdwspp.org

## A DECADE OF PROGRESS

Sparked by discussions among land conservation groups and the Potomac River Basin Drinking Water Source Protection Partnership (DWSPP) a decade ago, this tool for prioritizing lands for protection from a drinking water source perspective has evolved through the collaborative efforts of many funders and stakeholders, who have informed ICPRB's technical and participatory work. Key milestones are shown on the timeline below.

### 2015

**FOREST IMPACTS ON WATER TREATMENT**

Among other findings, the WRF #4651 study* of forest cover impacts on drinking water treatment costs in the Potomac basin proposed a "risk-based geospatial analysis to identify and prioritize forest protection opportunities."

October 2015 - September 2018

Funders:
Water Research Foundation, U.S. Endowment for Forestry and Communities
Participants:
Fairfax Water, Washington Aqueduct, Washington Suburban Sanitary Commission, DC Water
Principal Investigator: ICPRB

### 2018

**FEEDBACK**

Representatives from DWSPP, land conservation groups, and ICPRB met to discuss resources needed to include a source water perspective in land conservation efforts in the basin.

August 2018

Participants:
U.S. Endowment for Forestry and Communities, DWSPP, Fairfax Water, Washington Aqueduct, Washington Suburban Sanitary Commission, DC Water, The Conservation Fund, Potomac Conservancy, the Northern Virginia Conservation Trust, Land Trust Alliance
Coordinator: ICPRB

### 2020

**2020 TOOL**

Applying the methodology developed in WRF #4651*, development of the tool was a collaborative effort to rank land parcels to protect drinking water quality in the non-tidal Potomac basin.

Released December 2020

Funder:
U.S. Endowment for Forestry and Communities
Participants:
Berkeley County Public Service District, DC Water, Fairfax Water, Frederick County, Loudoun Water, Town of Leesburg, Washington Aqueduct, WSSC Water
Technical Support: ICPRB

### 2025

**FOCUS GROUP**

An end-user focus group meeting was held to get feedback on the 2025 tool, prior to finalization.

June 2025

Funder:
EPA
Participants:
Adams County, PA; Cacapon and Lost River Land Trust; Fairfax County, VA; Northern Virginia Conservation Trust; MDDNR
Coordinator: ICPRB

### 2025

**2025 TOOL**

The tool was expanded to include the entire jurisdictions of DC, MD, PA, VA, and WV and the methods and data were updated.

Released October 2025

Funders:
ICPRB, EPA
Participants:
EPA, Berkeley County Public Service District, DC Water, Fairfax Water, Frederick County, Loudoun Water, Town of Leesburg, Washington Aqueduct, WSSC Water, WV DHSWAP, PADEP, Cacapon Lost Rivers Land Trust
Technical Support: ICPRB

## PROJECT PURPOSE

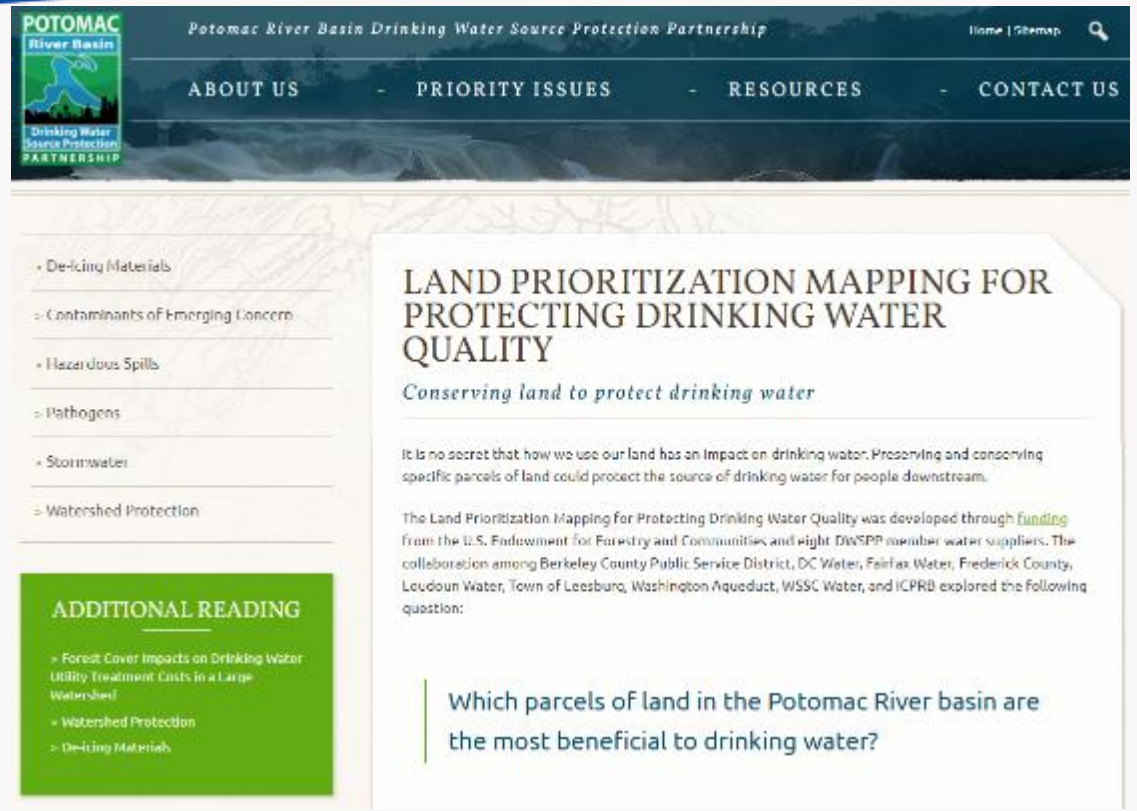
The land prioritization tool provides a robust, data-driven framework for identifying parcels critical to drinking water source protection. By integrating multiple geospatial metrics and offering flexible visualization options, the tool supports informed land conservation decisions.

*PUBLICATIONS


- Water Research Foundation (WRF) Project #4651. Moltz, H.L.N., R. Mandel, K.R. Bencala, J.B. Palmer, A. Nagel, S. Kaiser, and A. Gorzalski. 2018. Forest Cover Impacts on Drinking Water Utility Treatment Costs in a Large Watershed.
- Gorzalski, A.S., A. Spiesman, P. To, and G. Prelewicz. 2019. Broadening the Case for Source Water Protection. JAWWA 111(1): 86-87.

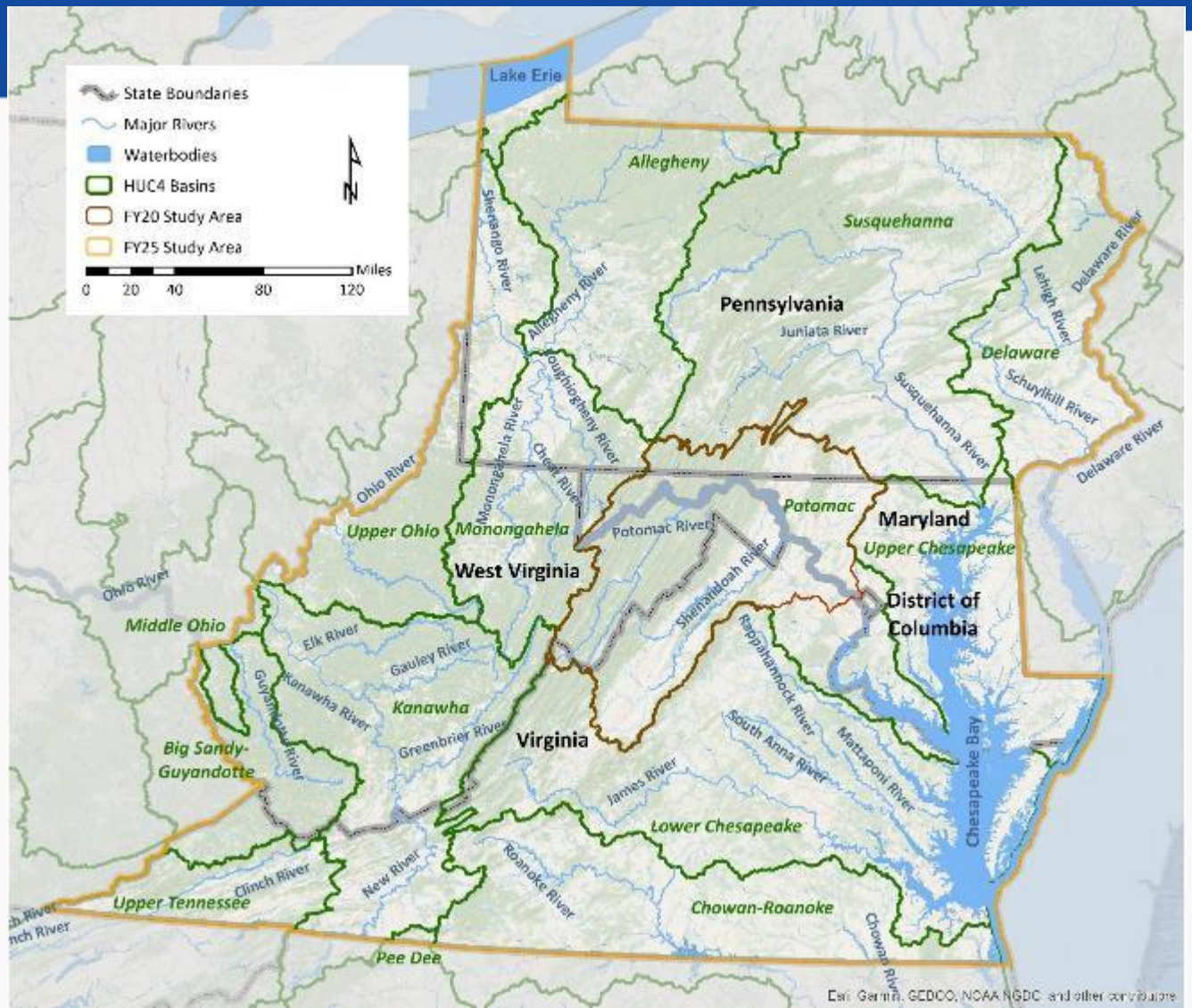
# Land Prioritization Mapping for Protecting Drinking Water Quality (2025)

Ranking parcels to protect drinking water quality and their potential to degrade long-term water quality




https://www.potomacdwspp.org/priority-issues/watershed-protection/land-prioritization-mapping-for-protecting-drinking-water-quality/

# Study Area


State Boundaries
Major Rivers
Waterbodies
HUC4 Basins
FY20 Study Area
FY25 Study Area
Miles
0 20 40 80 120
Lake Erie
Allegheny
Susquehanna
Pennsylvania
Juniata River
Delaware
Upper Ohio
Monongahela
West Virginia
Potomac
Maryland
Upper Chesapeake
District of Columbia
Middle Ohio
Kanawha
Virginia
Big Sandy-Guyandotte
Lower Chesapeake
Chowan-Roanoke
Upper Tennessee
Pee Dee
Ohio River
Allegheny River
Monongahela River
Youghiogheny River
Susquehanna River
Delaware River
Schuylkill River
Lehigh River
Potomac River
Shenandoah River
Rappahannock River
Chesapeake Bay
James River
Roanoke River
New River
Clinch River
Kanawha River
Greenbrier River
Elk River
Gauley River
Guyandotte River
South Anna River
Mattaponi River

# Overview of Land Prioritization Process

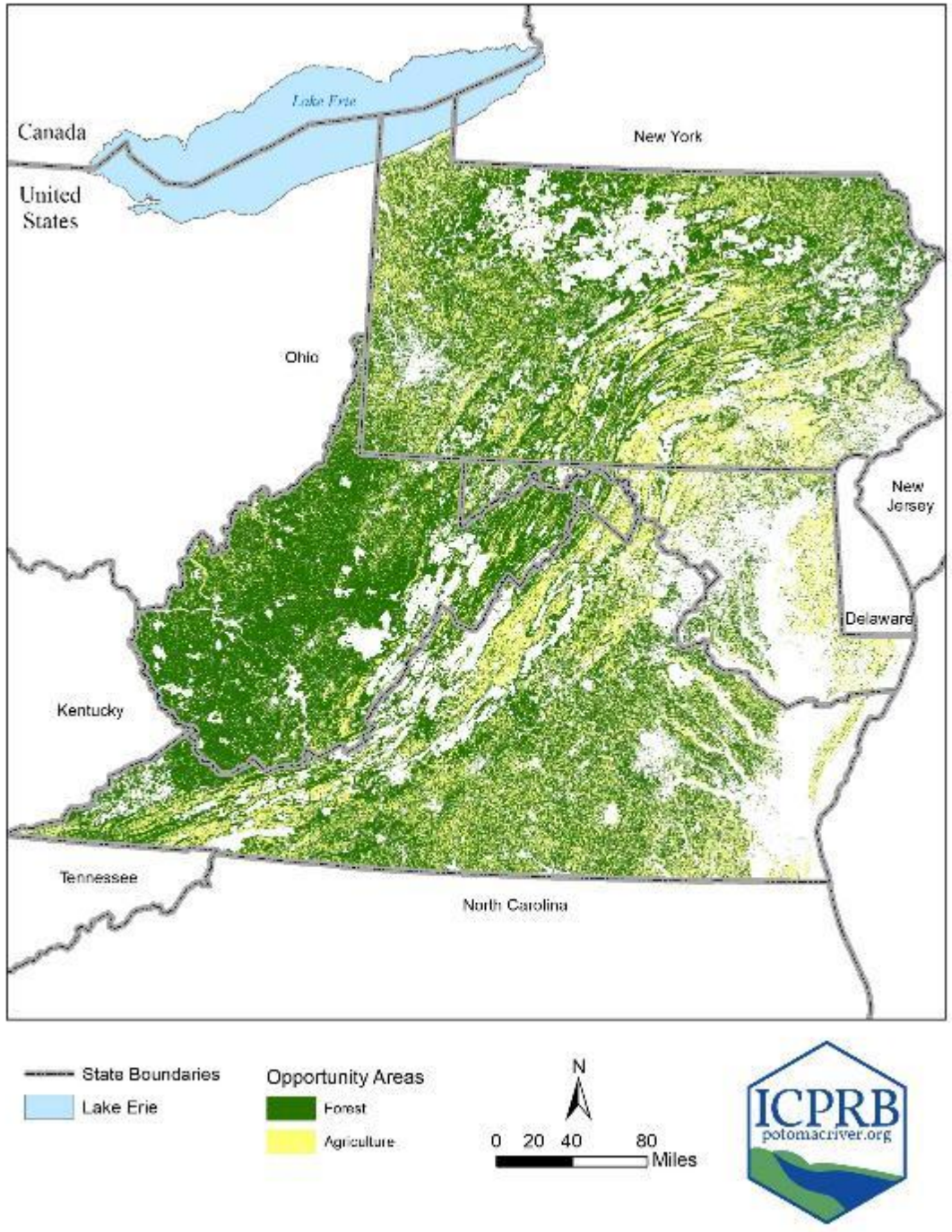
- Identify protected agricultural and forest lands
- Identify potential opportunities for agricultural and forest protection (inverse of protected lands)
- Identify geospatial metrics to quantify protection priority
- Calculate geospatial risk metrics
- Evaluate correlation of metrics
- Develop cumulative prioritization for non-correlated metrics

# Opportunity Areas

**Forests**
**+ Agricultural Areas**
**- Protected Areas**
**= Opportunity Areas**

U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2024, Protected Areas Database of the United States (PAD-US) 4: Chesapeake Bay Program Protected Lands Dataset 2023.

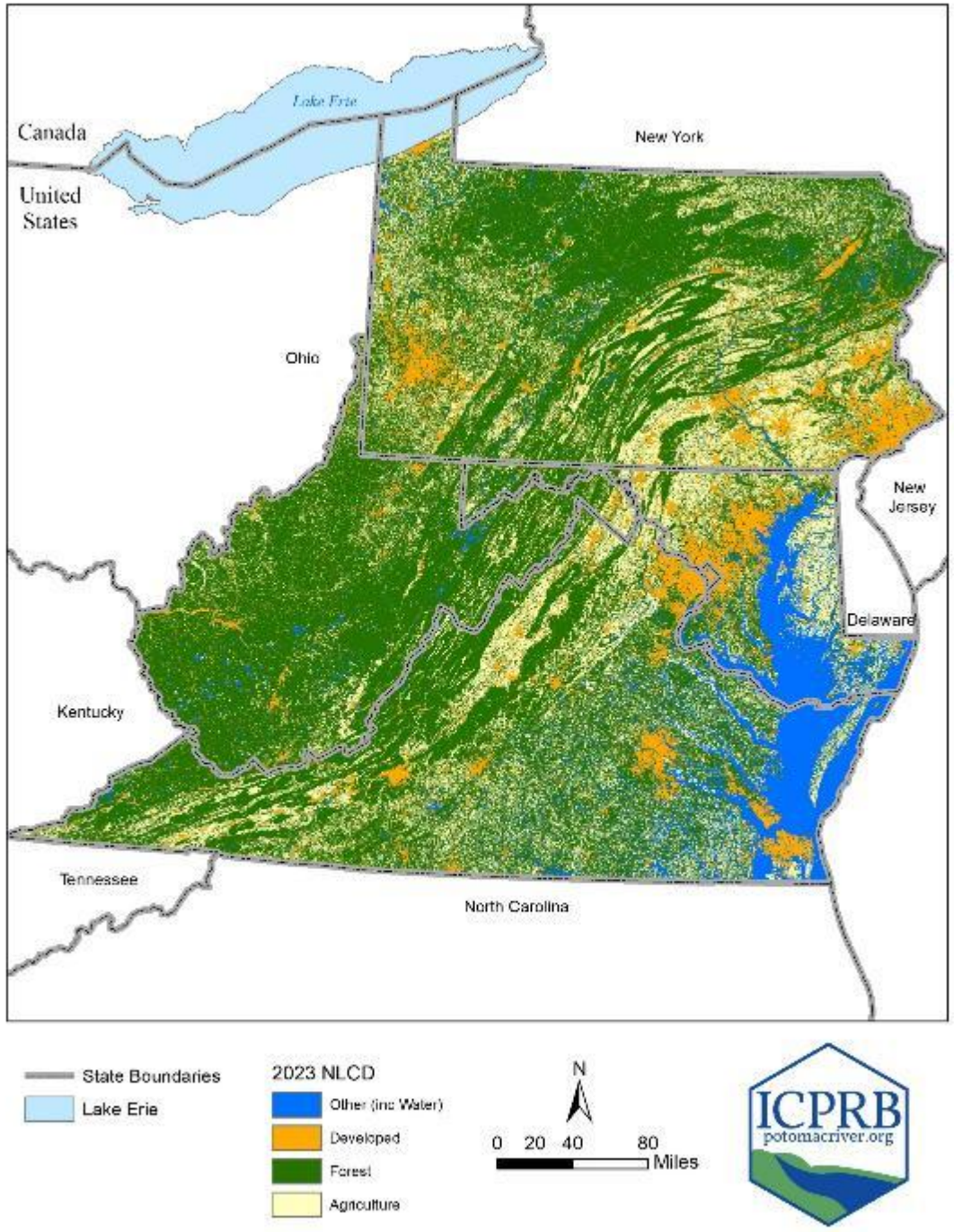
Opportunity areas include agricultural and forested lands in the study area that are not already protected (government owned, under easement, etc.) USGS. 2023. Annual National Land Cover Database (NLCD)



# Land Use

| Land Cover | Percent |
|---|---|
| Forest | 57 |
| Agriculture | 20 |
| Developed | 12 |
| Other | 11 |

Data source: 2023 National Land Cover Database (NLCD)



# Forest (FOR)

Includes:

- **NLCD Code 41** – *Deciduous Forest*: Dominated by trees that shed leaves seasonally.
- **NLCD Code 42** – *Evergreen Forest*: Dominated by trees that retain leaves year-round.

These areas are typically used for **timber production**, **wildlife habitat**, **watershed protection**, and **recreation**. They are critical for maintaining ecological balance and water quality.

# Agriculture (AG)

- **NLCD Code 71** – *Grassland/Herbaceous*: Natural or semi-natural grasslands, often used for grazing.
- **NLCD Code 81** – *Pasture/Hay*: Managed grasslands for livestock grazing or hay production.
- **NLCD Code 82** – *Cultivated Crops*: Areas used for growing crops like corn, soybeans, vegetables, etc.

These lands are primarily used for **food production**, **livestock grazing**, and **agricultural operations**. They may also include **rural open space** and **managed landscapes**.

**Prioritization metrics**
**Schematic for normalized values (0-100 scale)**

Lowest priority for conservation — Highest priority for conservation

0 — 100

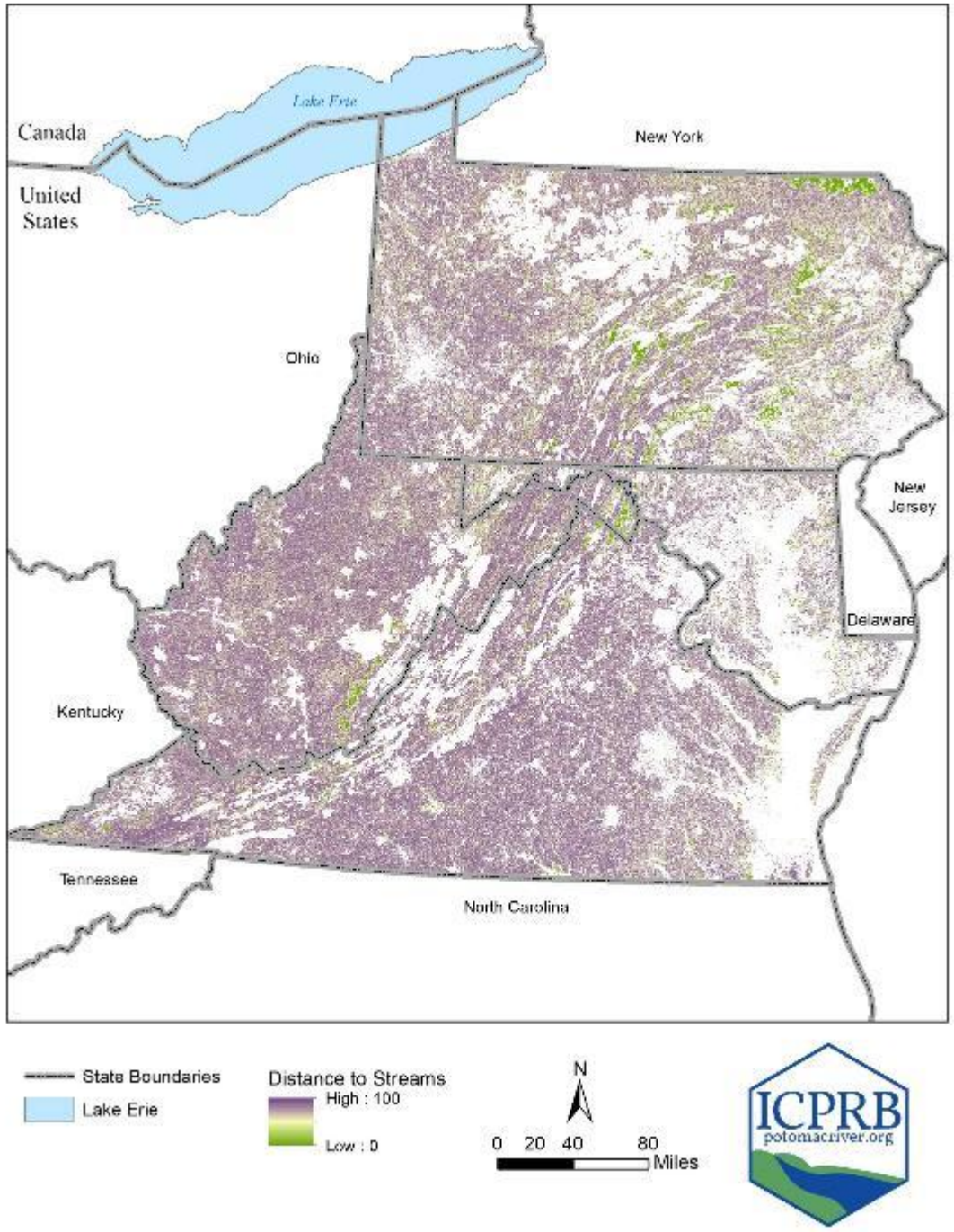
Longer distance from waterway…….. Shorter distance from waterway
Lower percent source water protection area……Higher percent source water protection area
Longer distance from urban areas…….. Shorter distance from urban areas
Lower karst transmissivity…… Higher karst transmissivity

Other land use……Urban……Agriculture……..Forest

Longer distance to high quality streams……. Shorter distance to high quality streams
Longer distance to floodplains…….…….. Shorter distance to floodplains

# Distance from Waterway

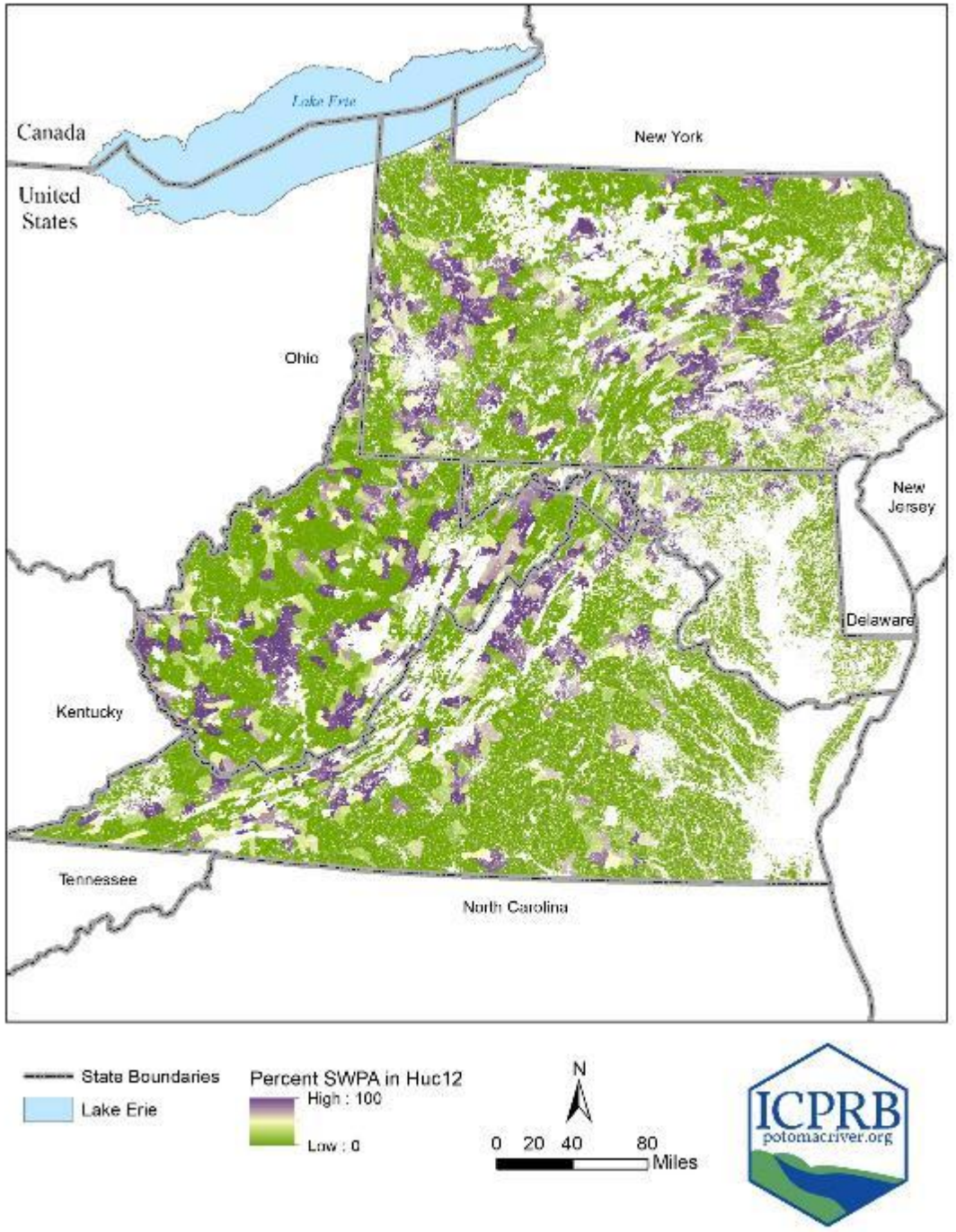
Parcels closer to streams and rivers are prioritized due to higher potential to impact water quality




Data Source: US EPA. 2024. ATTAINS Assessments. https://www.epa.gov/waterdata/attains

# % Source Water Protection Area in HUC12*

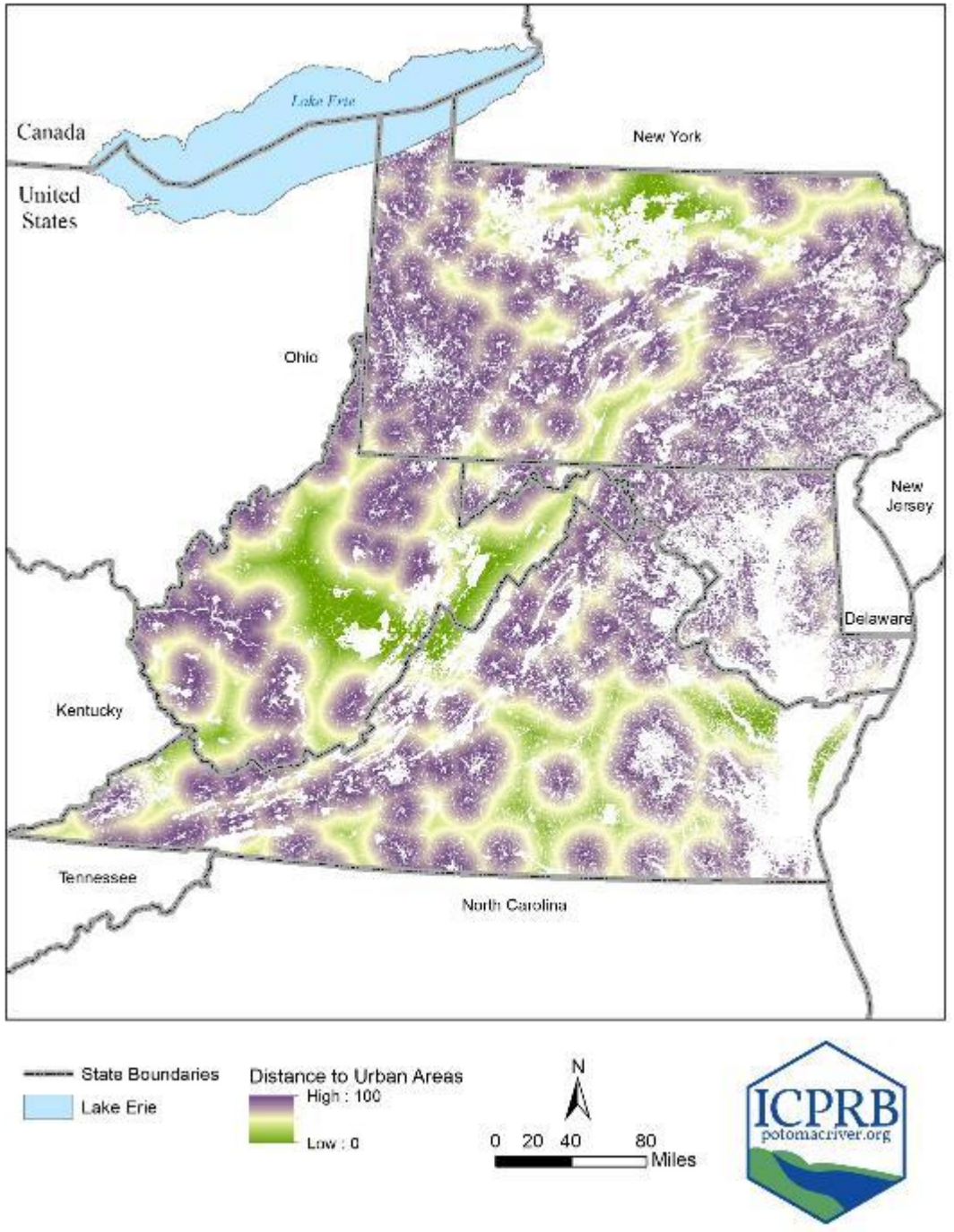
Areas identified as important for Source Water Protection




Data Source: US EPA. 2023. Surface water Source Protection Area (SPA) for each HUC12 unit in the NHDPlus version 2.1 National Watershed Boundary Dataset snapshot.

# Distance from Urban Areas

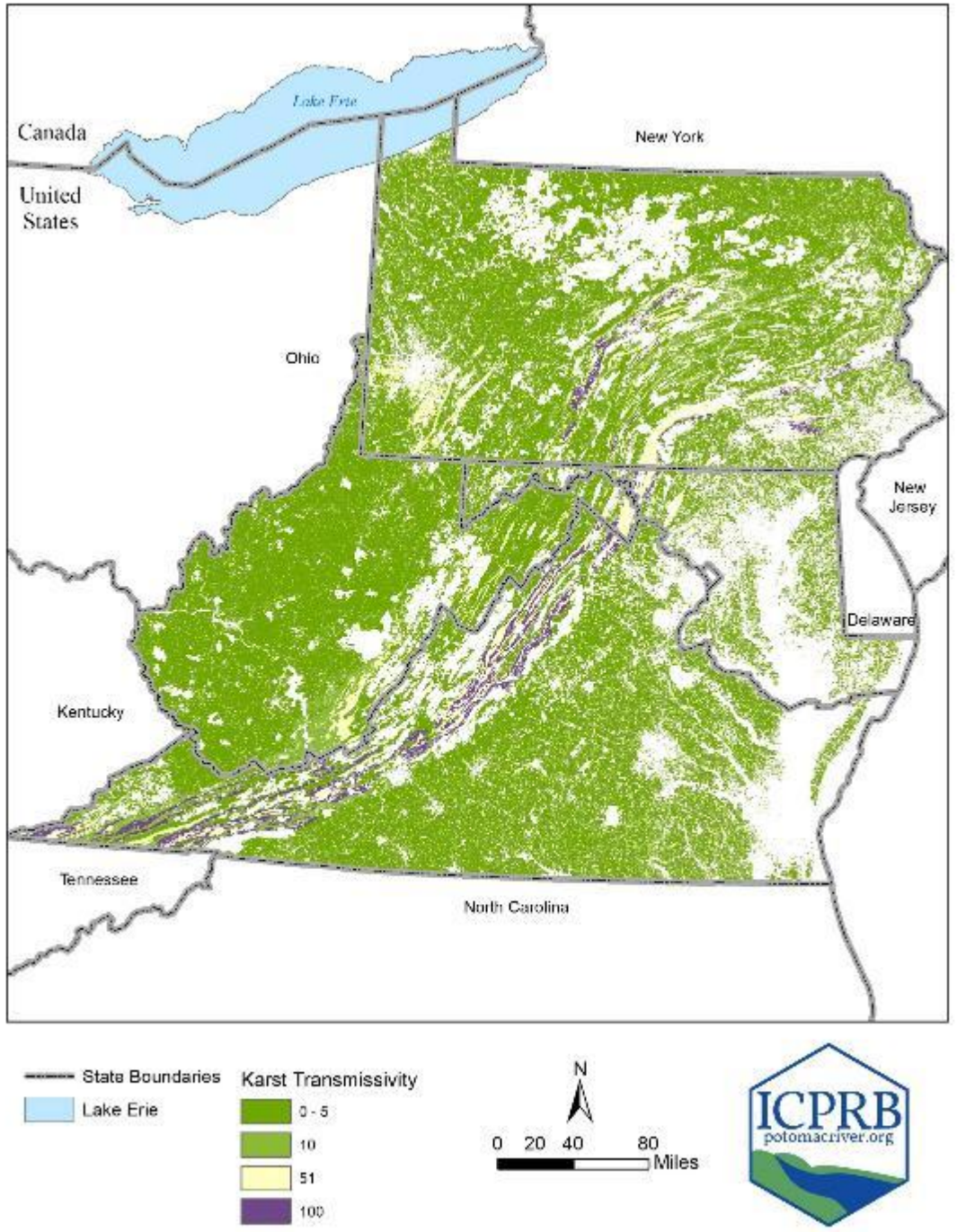
Areas near urban zones are prioritized due to risks like road salt, spills, and runoff.




Data Source: TIGER/Line Shapefile, 2020 Census Urban Areas / prepared by the U.S. Census Bureau, 2020.

# Karst Transmissivity

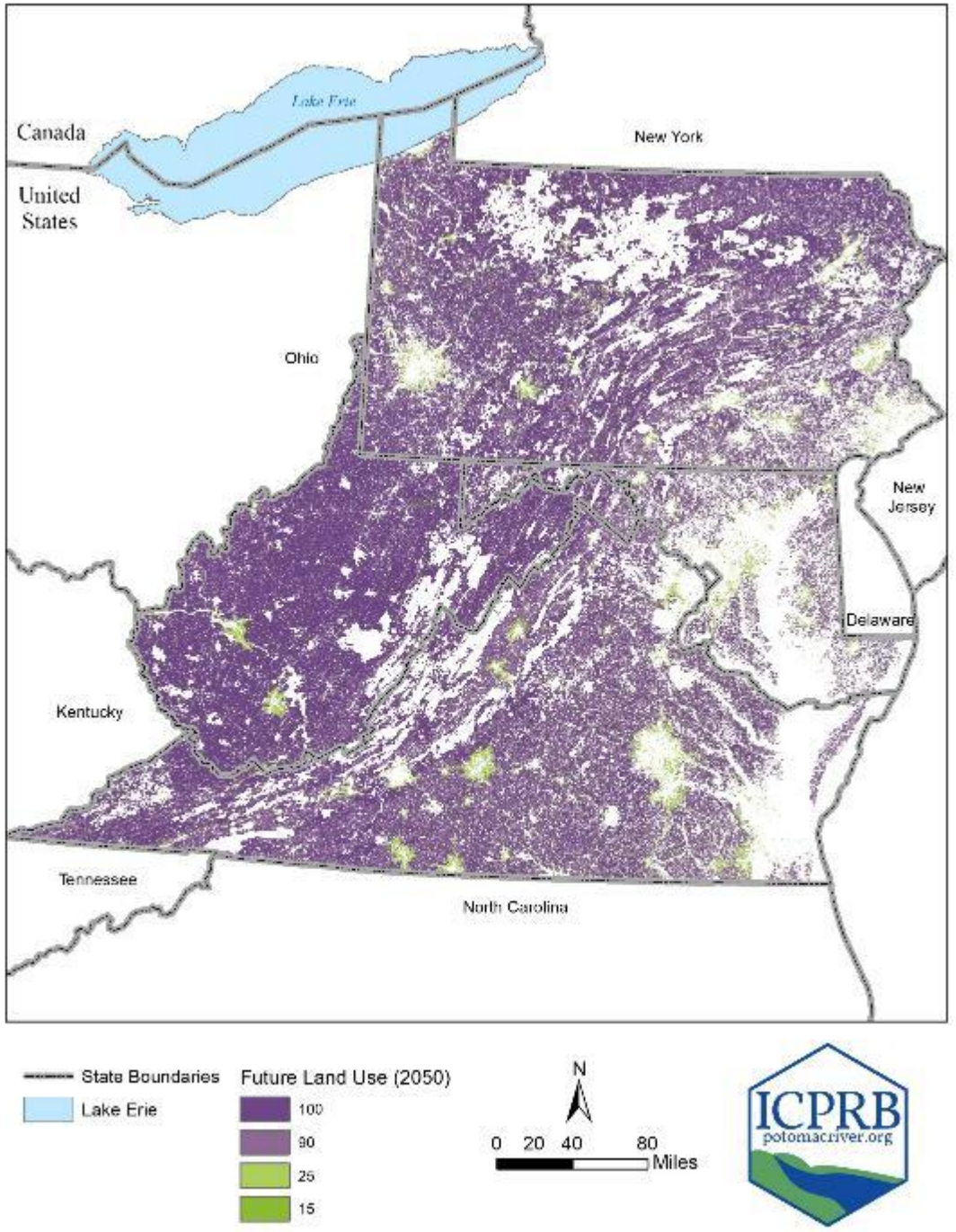
Areas with high karst transmissivity are prioritized because they allow faster contaminant transport.




Data Source: Weary, D.J., and Doctor, D.H., 2014, Karst in the United States: A digital map compilation and database: U.S. Geological Survey Open-File Report 2014–1156, 23 p., http://dx.doi.org/10.3133/ofr20141156.

# Future Land Use

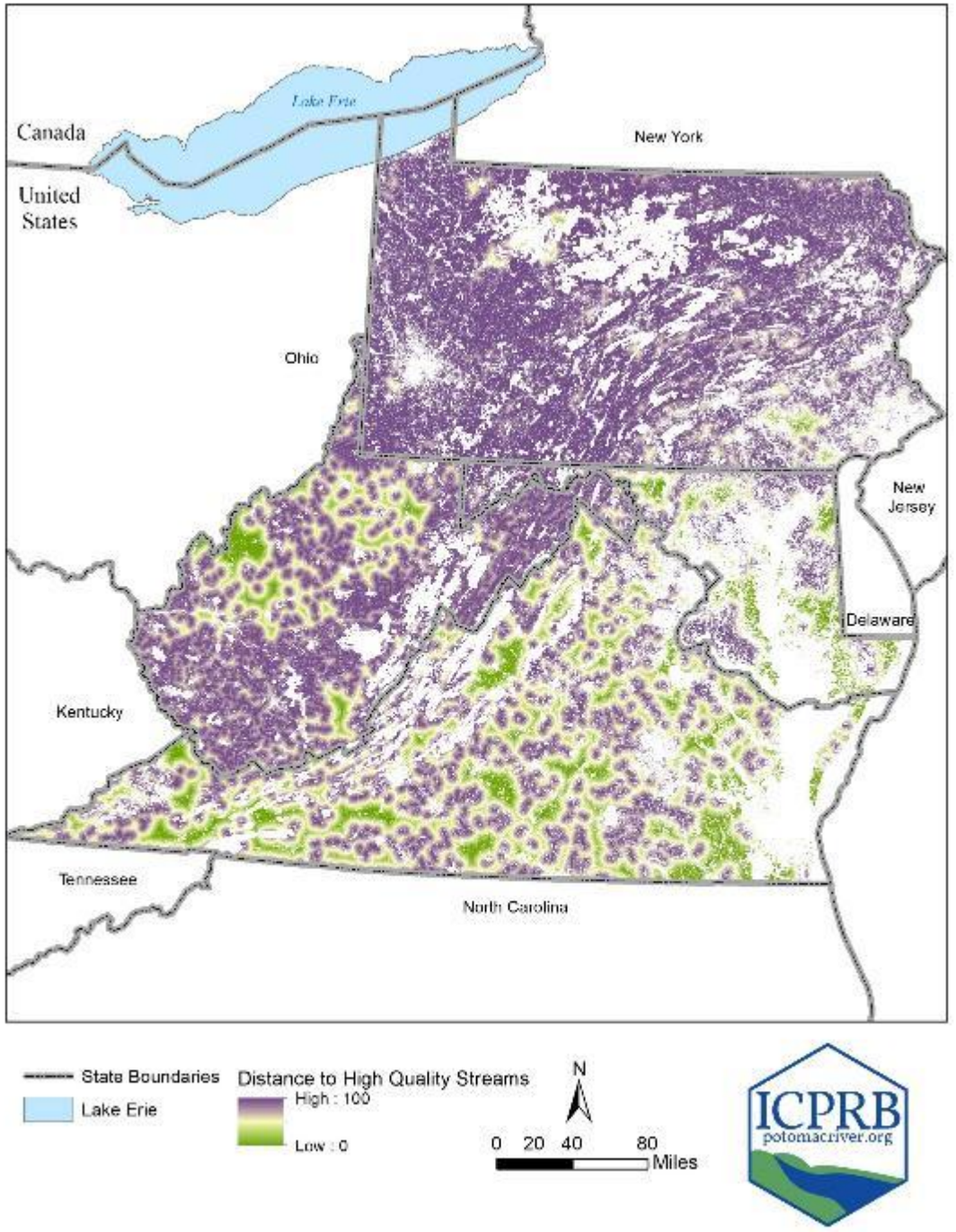
Future land use, where major land use categories are given priority rankings, with forest and then ag being the highest priority for conservation




Data Source: USGS Conterminous United States Land Cover Projections - 1992 to 2100. Sohl, TL et al., 2018; 250m scale

# High Quality Streams

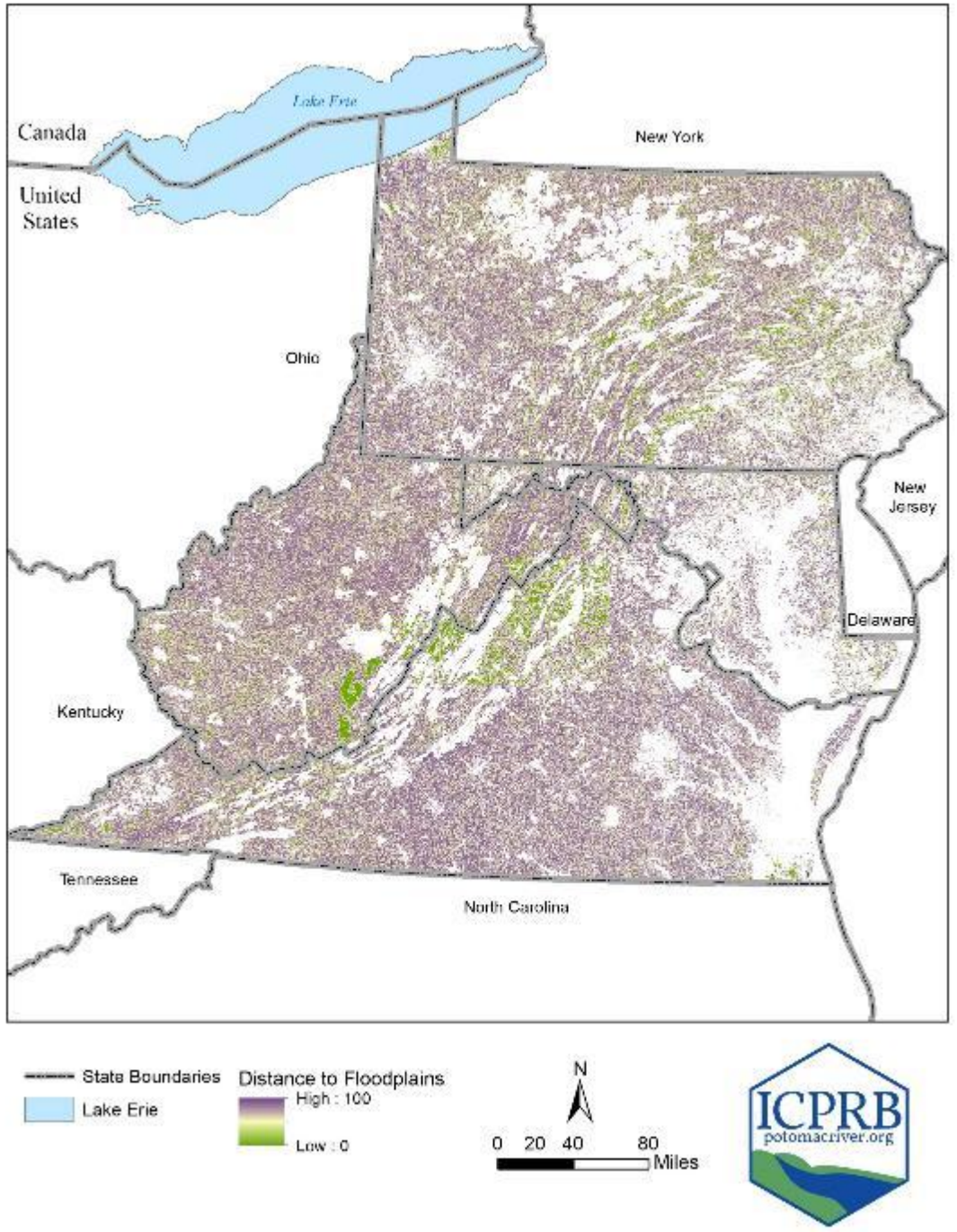
Protects existing high-quality water bodies by prioritizing nearby parcels.




Data Source: US EPA. 2024. ATTAINS Assessments. https://www.epa.gov/waterdata/attains

# Floodplains*

Areas closer to the floodplains received a higher priority because they are more hydrologically connected to the surface waters, making them vulnerable to events that may impact downstream drinking water quality.

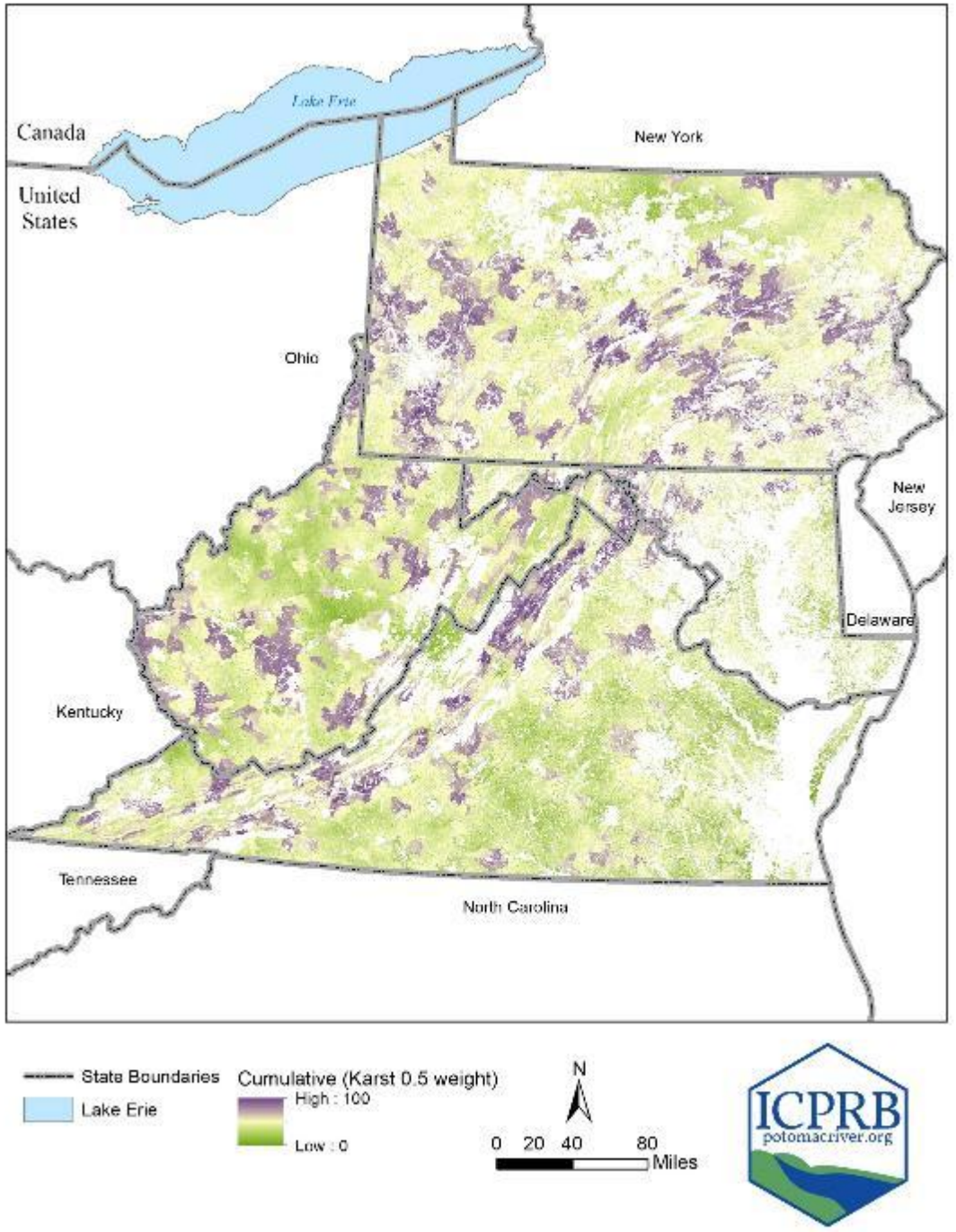



Data Source: Abood, Sinan A.; Spencer, Linda; Wieczorek, Michael. 2022. U.S. Forest Service national riparian areas base map for the conterminous United States in 2019. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2019-0030

# Metric Correlation

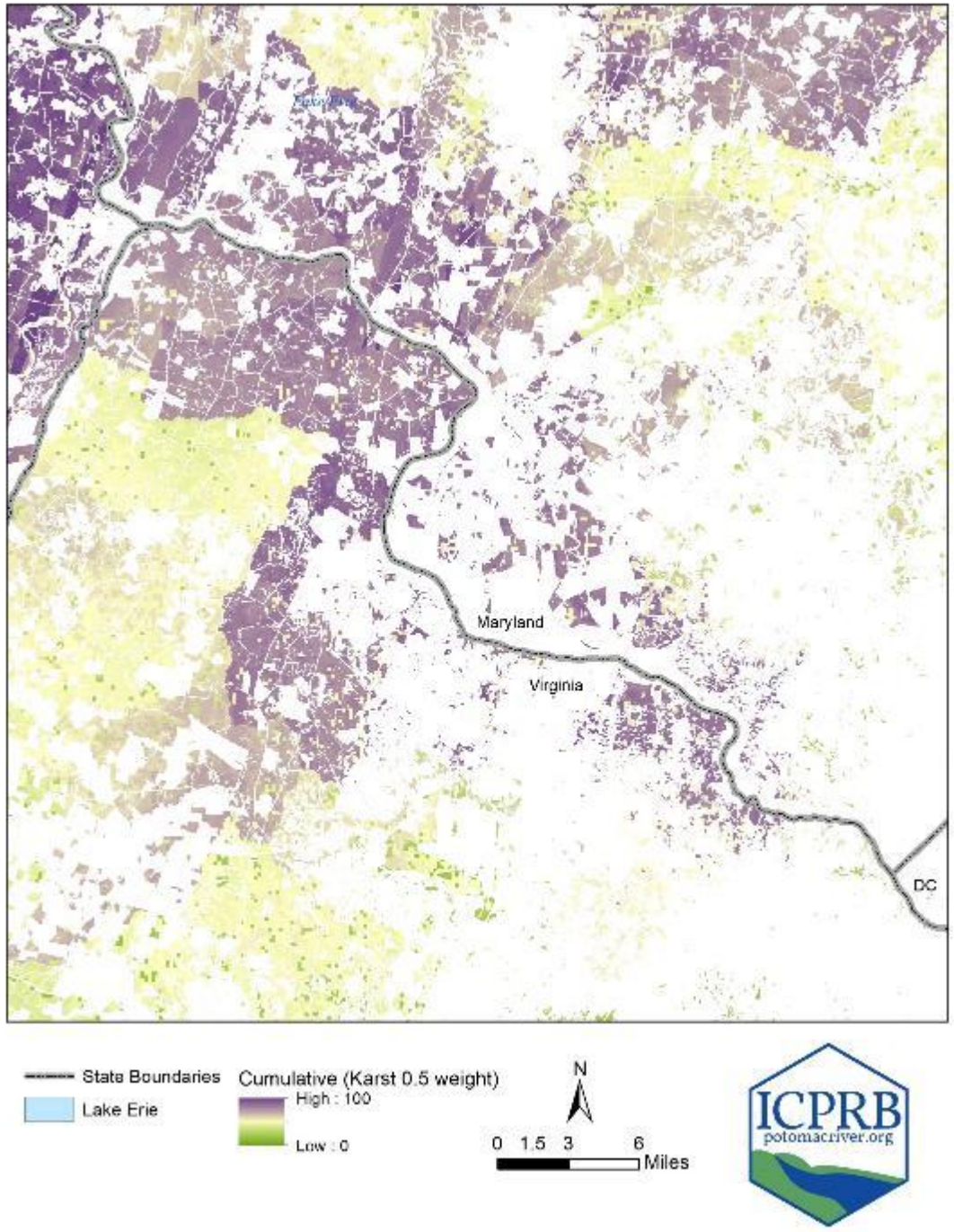
| Layer | Waterways | High Quality Streams | Floodplains | % HUC in SWPA | Karst | Urban Area | Future Land Use |
|---|---|---|---|---|---|---|---|
| Distance from Waterways | 1 | 0.00 | 0.34 | -0.05 | -0.07 | -0.06 | 0.01 |
| Distance from High Quality Streams | | 1 | 0.01 | 0.13 | -0.10 | 0.01 | 0.07 |
| Distance from Floodplains | | | 1 | -0.06 | -0.11 | -0.02 | -0.02 |
| Percent HUC in SWPA | | | | 1 | 0.13 | 0.15 | 0.01 |
| Karst Transmissivity | | | | | 1 | 0.13 | -0.03 |
| Distance from Urban Areas | | | | | | 1 | -0.14 |
| Future Land Use (2050) | | | | | | | 1 |

# Cumulative Prioritization, Grid



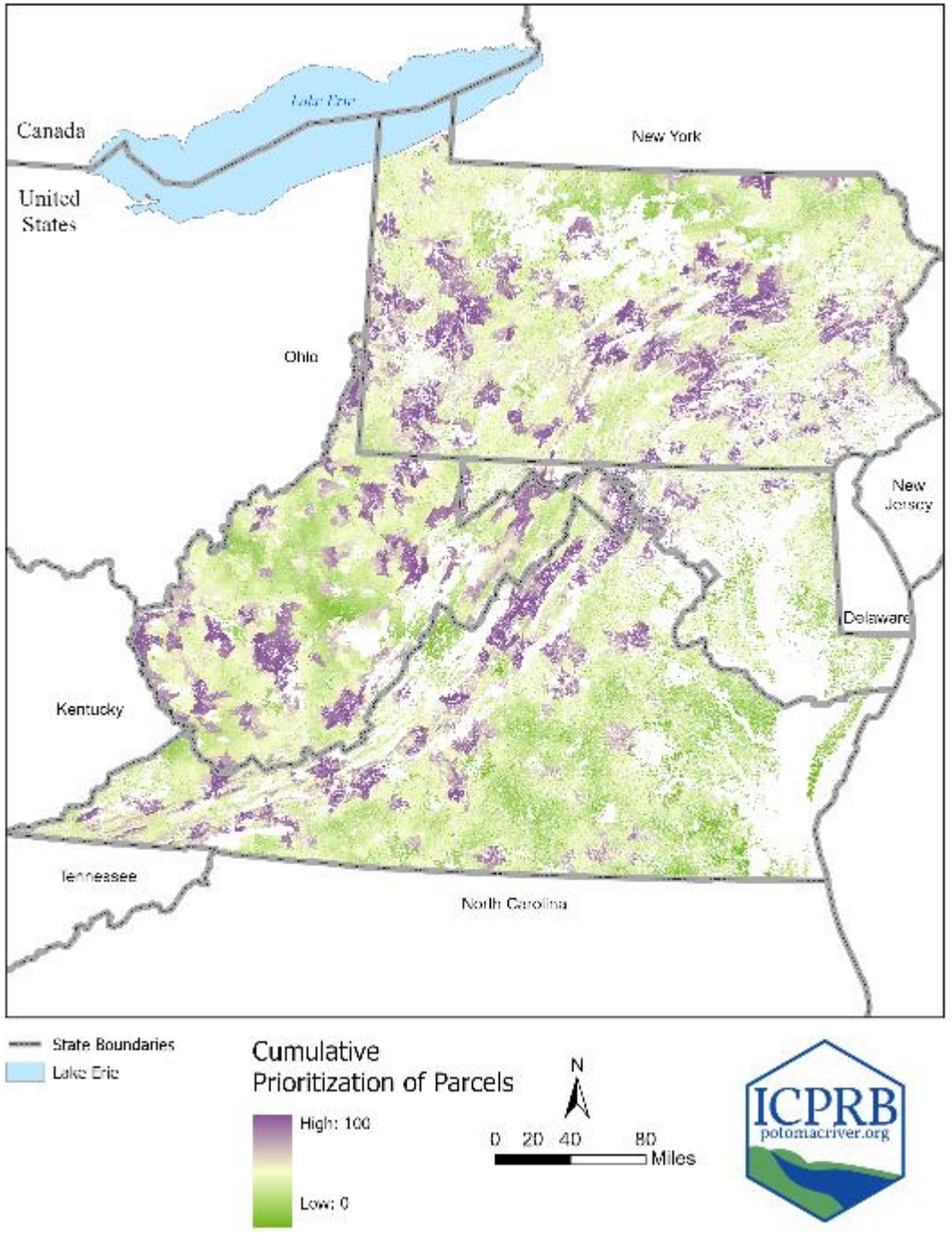

All 7 metrics summed using equal weights (except Karst) and normalized 0-100.

# Cumulative Prioritization, Zoomed In

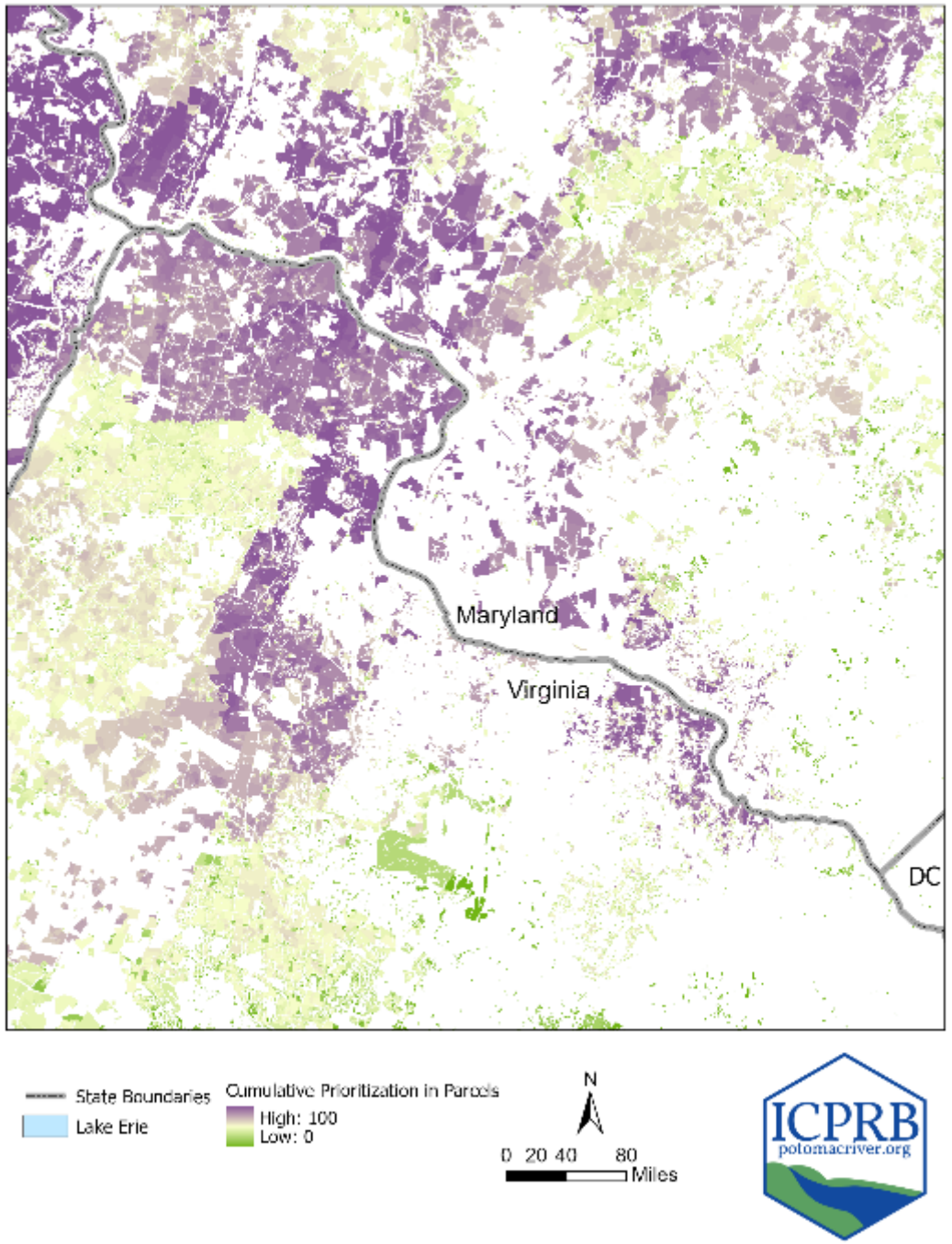


# Cumulative Prioritization, Parcels

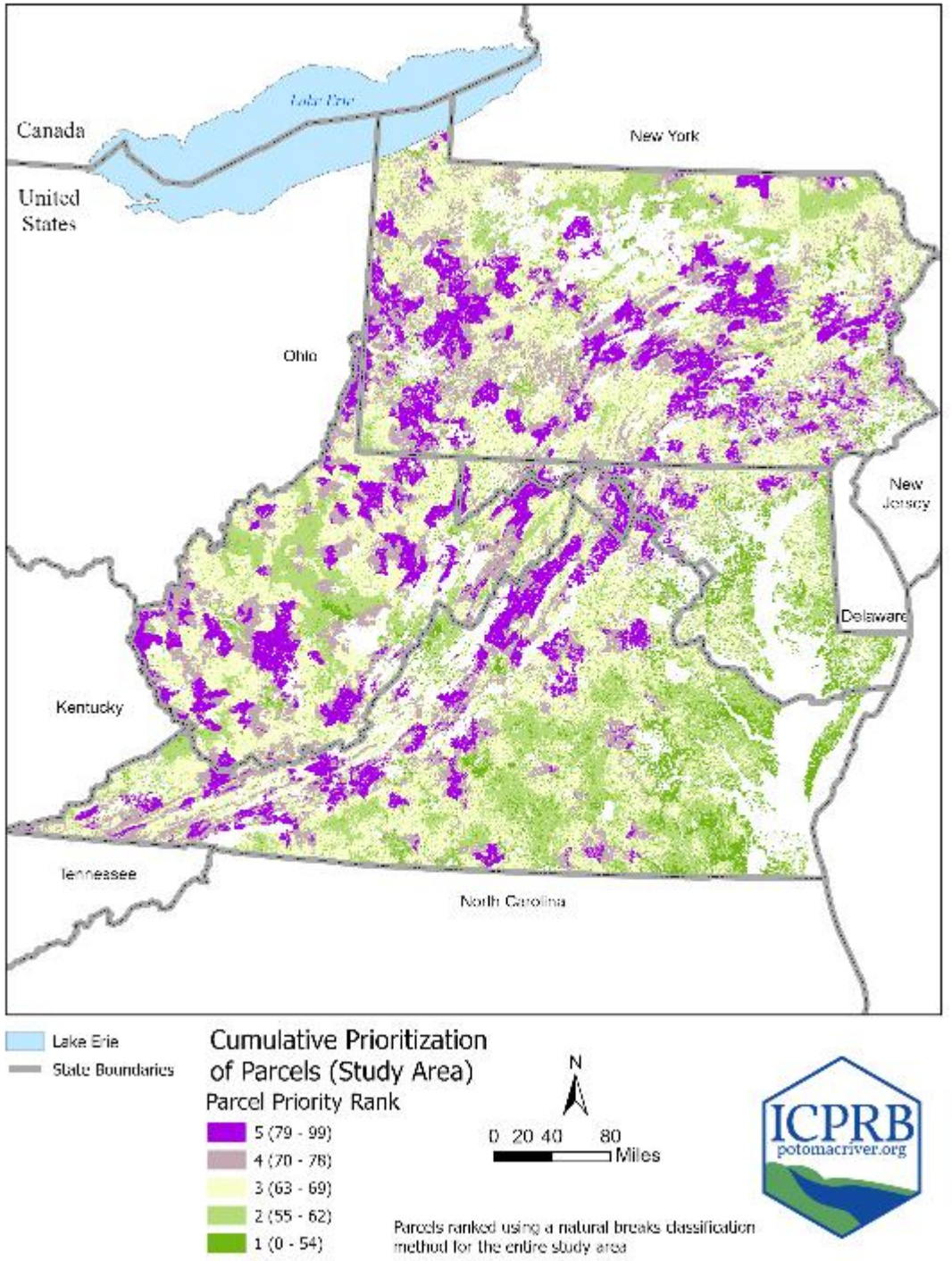
Cumulative prioritization at the parcel scale with an additional metric that gives higher priority to parcels with more opportunity area within them.



# Cumulative Parcels, Zoomed In

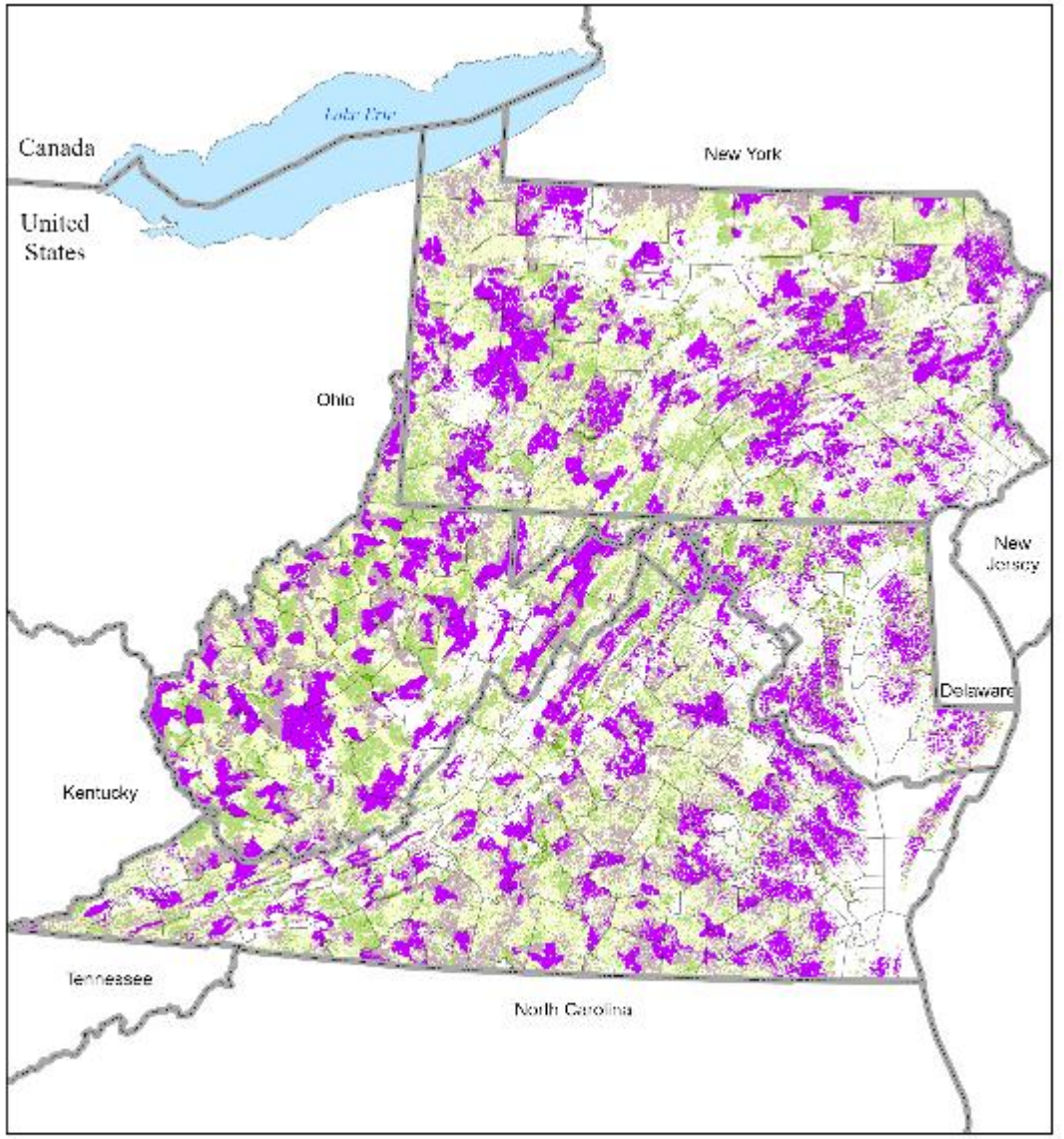


# “High Priority” Parcels, Study Area




Defining high priority using natural breaks classification across the entire study area. Using this approach, anything greater than 79 is high priority and ranked 5.

# “High Priority” Parcels, by County




Defining high priority using natural breaks classification within each county. Using this approach, parcels are ranked 1-5 according to the range of values found within that county.

# High priority acres / Call to Action
## Study area and County scale

| Jurisdiction | County or County Equivalents (#) | High Priority Areas (Counties, Acres) | High Priority Areas (Study Area, Acres) |
|---|---|---|---|
| District of Columbia | 1 | 53 | 0 |
| Maryland | 24 | 756,151 | 323,092 |
| Pennsylvania | 67 | 4,369,724 | 3,638,808 |
| Virginia | 133 | 3,249,311 | 1,866,894 |
| West Virginia | 55 | 2,988,571 | 2,391,232 |

- Users are encouraged to obtain the geospatial layers and identify local high-priority areas based on their own threshold of interest.
- GIS data are available upon request.
- ICPRB is available individually to discuss how you might use this data and talk about your specific areas of interest.

Scan to request the data or learn more!

# Questions/Discussion

**Megan L. McClaugherty (she/her)**
Aquatic Ecologist I
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Scan to request the data or learn more!