# Forest Buffers and Streams

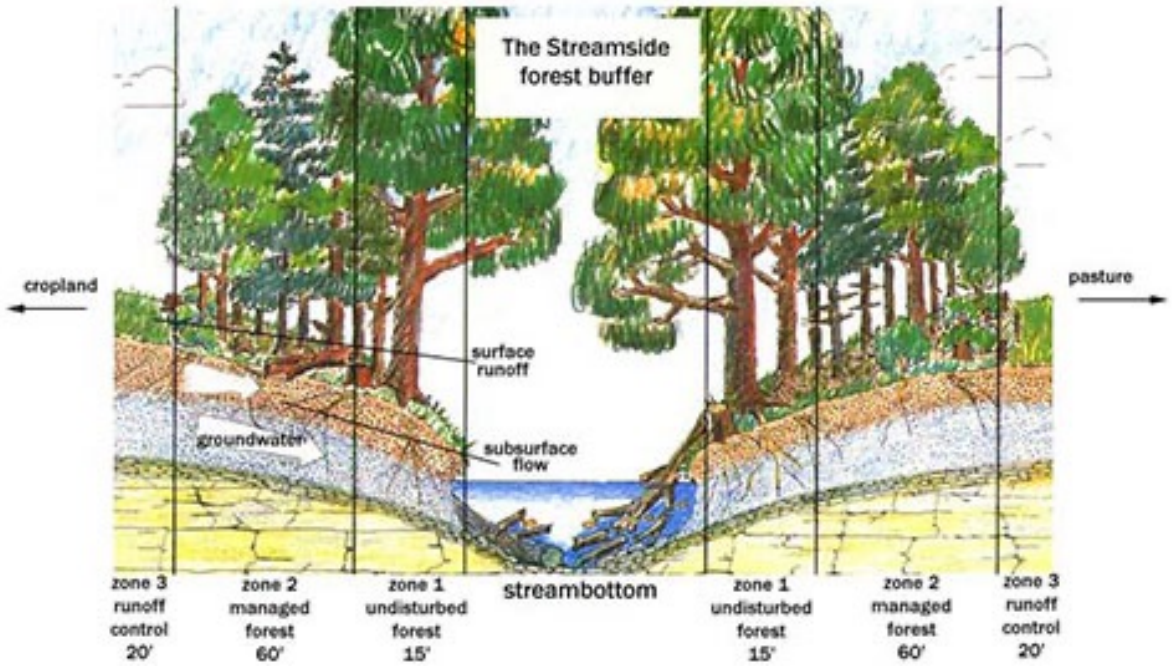
Many wetland types are naturally forested.

Many are functionally interdependent with streams.

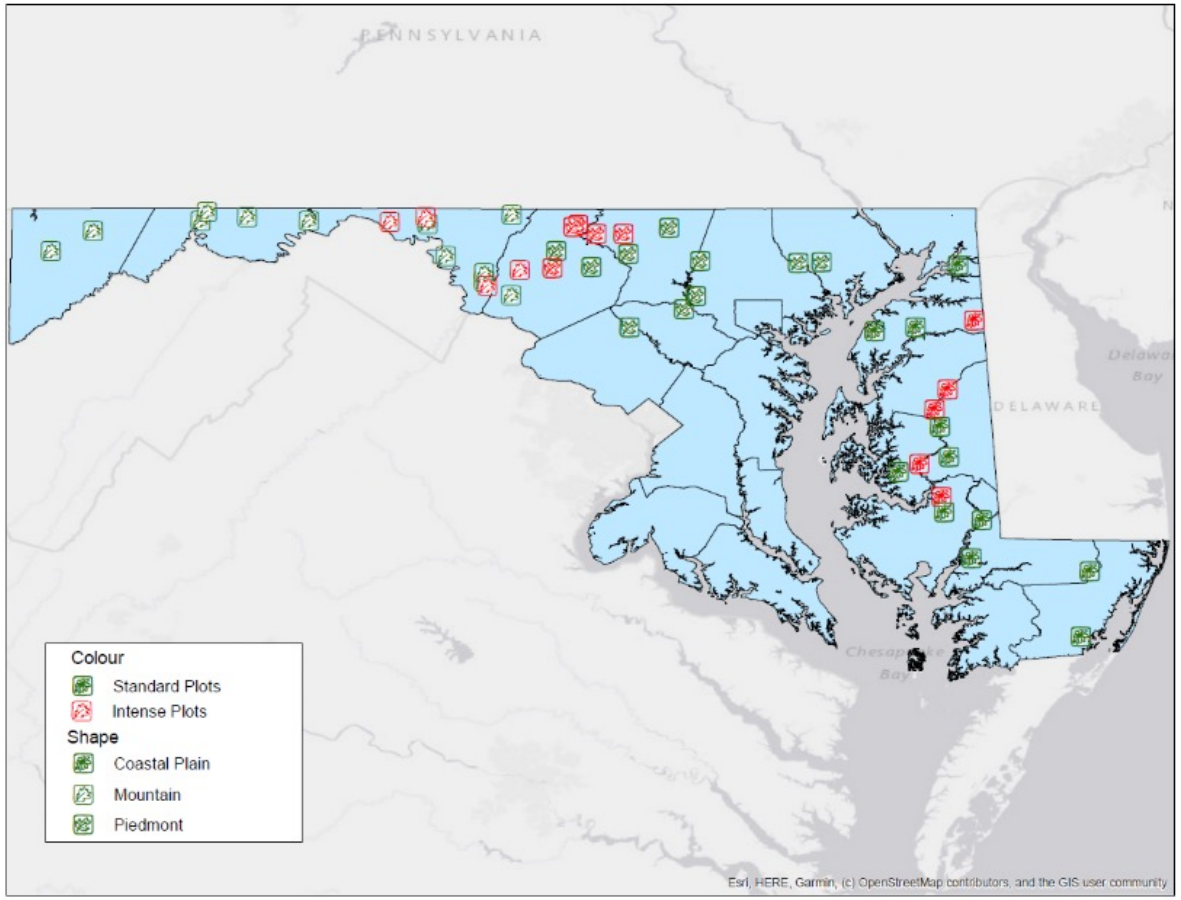
Natural habitat complex parsed into BMP types

<u>Added Value from forests</u>:

- **Shade** (natural land cover in a lot of the Mid-Atlantic)
- **Canopy layers** for wildlife habitat niches, in-stream and out
- **Woody debris and leaf packs** build fish habitat, benthic
- **Rooting** stabilizes streambanks
- **Infiltration**- increase in macropores, recharge



# 2018 NFWF project- Enhancing RFBs




Built on 15-year Monitoring in Two Projects: Long-Term and Potomac Watershed Partnership Monitoring Sites

Expanded Geography- Added Coastal Plain, more Mountains and Piedmont

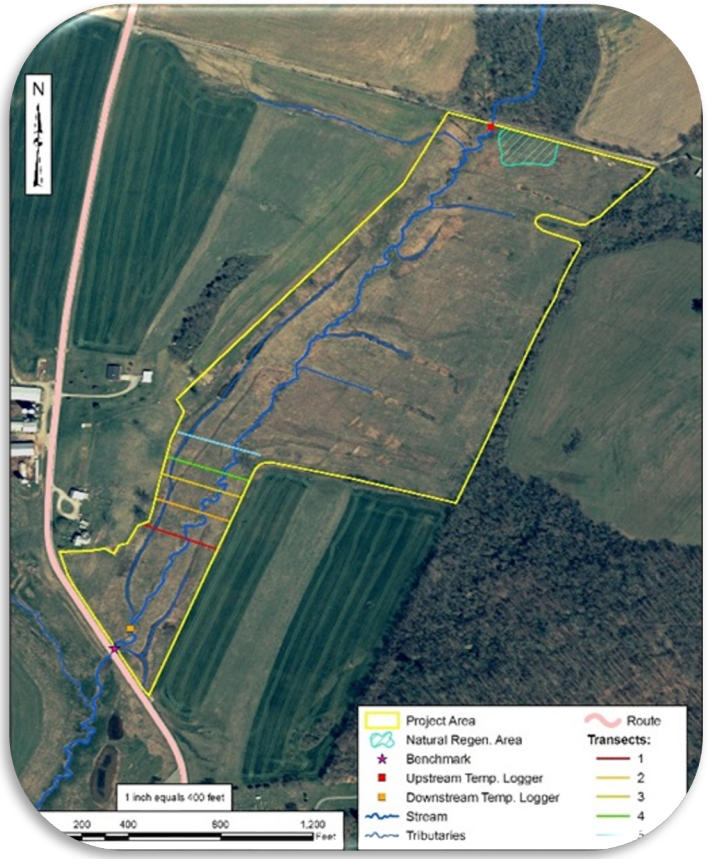
Field Data to Inform Persistent Issues-

- What concentrated flows are present that might diminish buffer function/decrease travel time?
- Are invasive plants increasing?

47 sites total, 14 using more intensive Long-term RFB protocol

Staff: Tim Culbreth, Colleen Kenny, Tyler McKee, more

# Evaluating Buffer Function over 15 years




# Before and After – 15 years

# How Fast did Forest Buffer Functions Develop?

**Shading**- Crown closure common by age 15

**Temperature**- Significant decrease in days with stream temperatures that stress fish (75F threshold) within 15 years

**Soil Infiltration-** Higher infiltration within 15 years

Large Woody Debris- too early for much downed wood, not expected

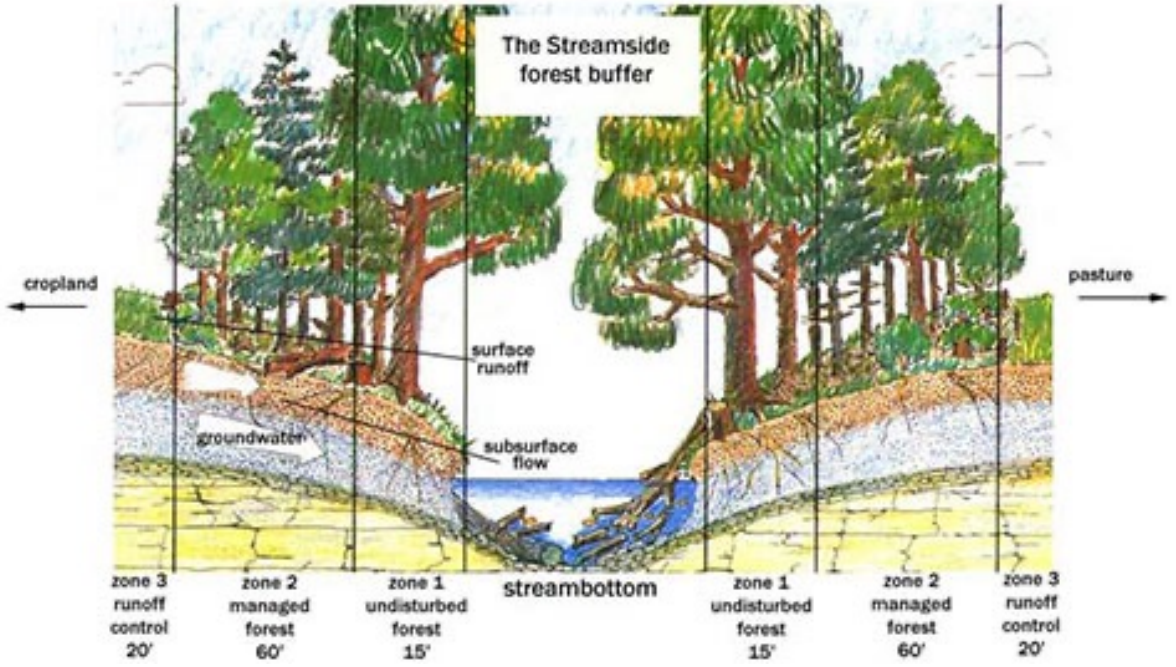
**Streambank stability-** bank stability increased modestly in most streams

Stream Width- Not significantly wider by age 15, still changing

**Cleaner water-** trend of decreased nutrients and turbidity

**Benthic macroinvertebrates IBI-** increased in most sites by year 5

**Wildlife Habitat-** Canopies over 20 feet high by 15 years increasing habitat volume and layers



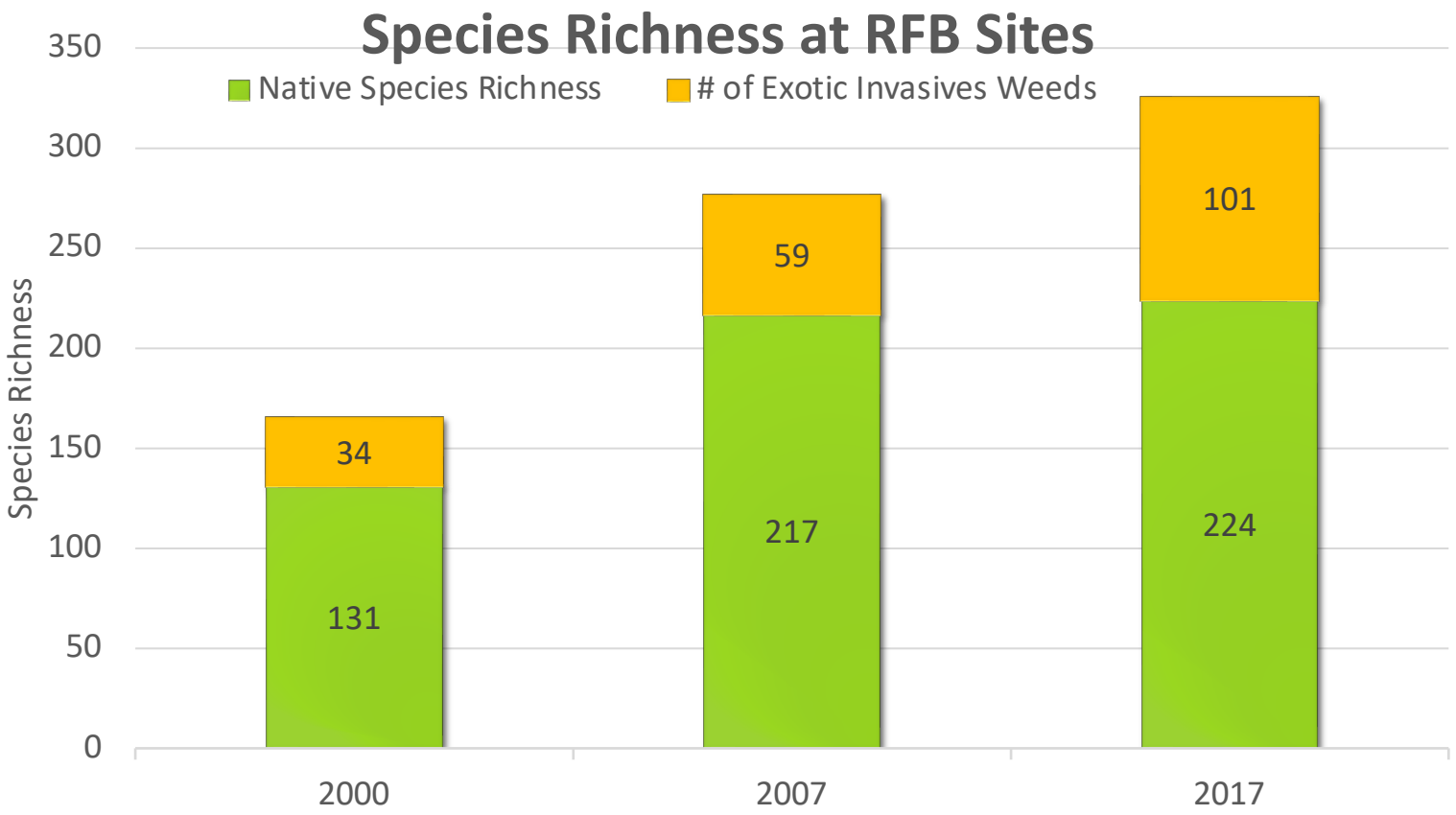
# Species Richness, 9 RFB sites

## Good News

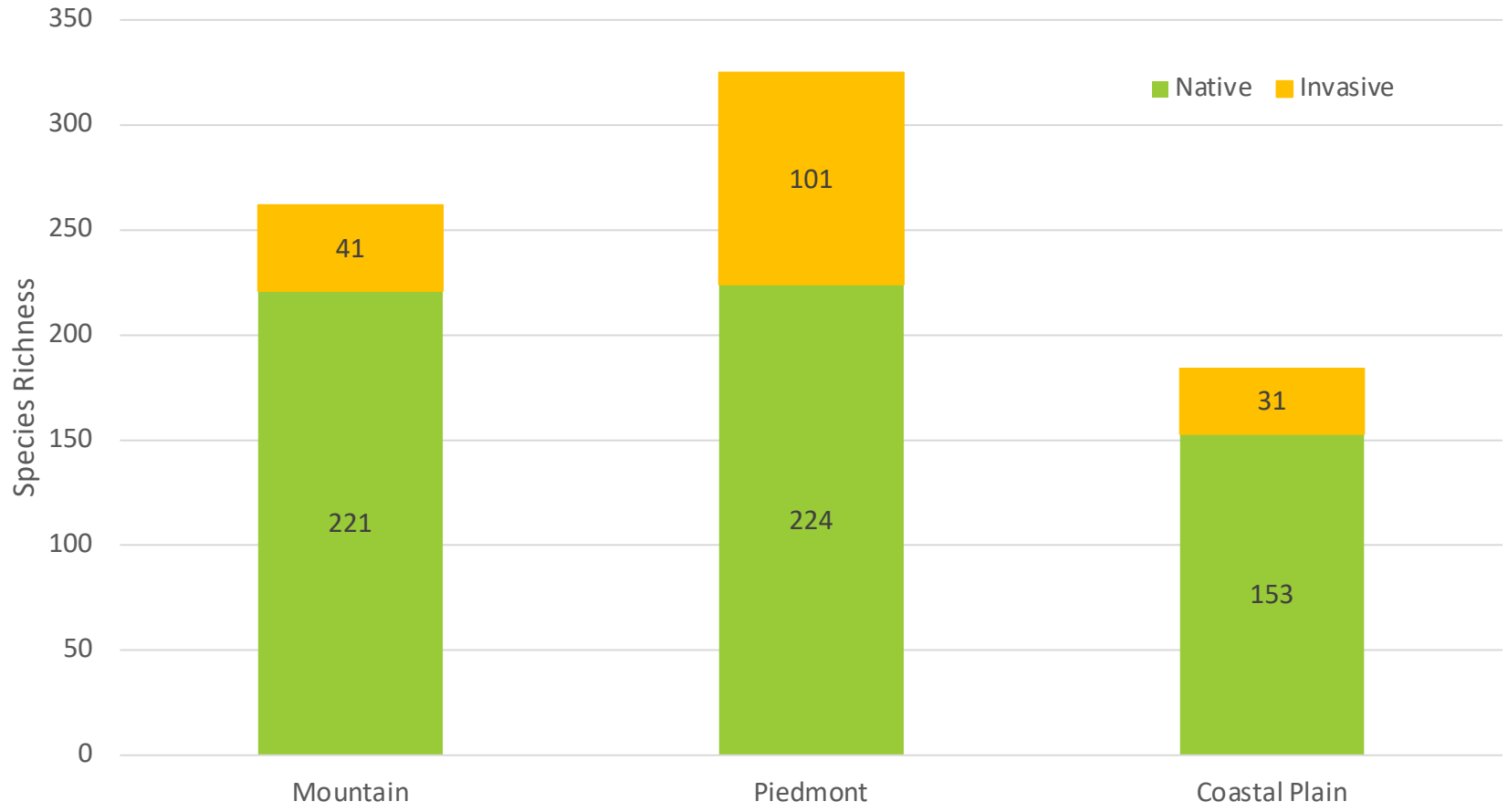
- Native species are dominant
  - Native richness doubled
- Natural regeneration present and helped increase diversity

## Bad News

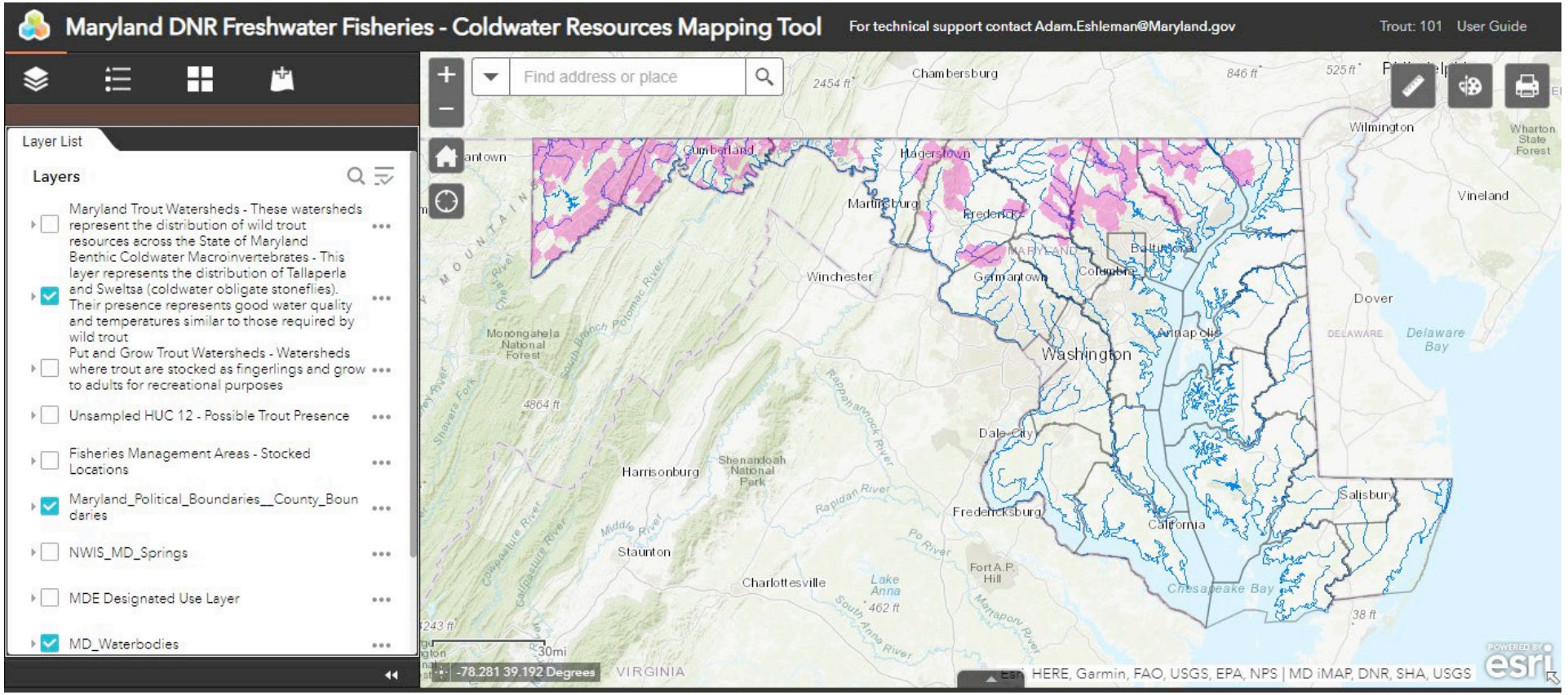
- Invasive species richness tripled
- Sun-loving species declining but shade-tolerant increasing



# Species Richness by Region with NFWF Sites



# Cold-Water Resource Mapper- MD iMap




At lower elevations, consider ability to connect cold-water watersheds for better trout habitat

# Concentrated Flows: Problem or Opportunity?

- Example in Washington County
- Many possible concentrated flows
- Visited in 2018, a very wet year

# NFWF Example: Washington County

- Feature found at red circle on previous page
- Active water, non-sorted bottom, originated out of buffer
- Max 16 inches deep, 7 inches to 69 inches wide, over 200 ft long, 0% vegetated

# GIS Accuracy

- Max Width and Run had a significant influence on detectability
- Depth and minimum width did not have significant influence

| Cause | Total | GIS | Not | Percent Found |
|---|---|---|---|---|
| Surface Accumulation | 56 | 29 | 27 | 52 |
| Constructed Drainage | 11 | 6 | 5 | 55 |
| Ground water | 27 | 14 | 13 | 52 |
| Waterways | 13 | 9 | 4 | 69 |
| Roads | 9 | 7 | 2 | 78 |
| Paths | 13 | 1 | 12 | 8 |
| Indeterminate | 10 | 4 | 6 | 40 |

# Concentrated Flow Types and Prediction

How common?

70% of buffers had some form of surface water coming in, not following protective subsurface pathways expected for buffers

At least in 2018 with rainfall almost twice the normal amount (72” vs. 44” normal)

TYPES

- Springs, groundwater, and other unbuffered streams
- Game trails, footpaths, ATV trails, and roads
- Pipes, drains, and ditches from agricultural fields
- Surface runoff that collects and concentrates (most common)

Can they be found with GIS?

Used Flow Accumulation model in ArcMap Spatial Analyst to predict location of concentrated flows from LIDAR

**Over 51%** of all field-identified features were found by GIS, and usually captured the most problematic features.

Features not located by the GIS analysis were most commonly deer trails or features with unknown causes, and not usually a resource concern.

Could **identify flow paths with resource concerns** to couple forest buffers with other supporting practices to maximize water and stream quality- **treatment train** along the flow path

# Potential Practices Across the Landscape

In the buffer

- Variable buffer widths
- Zoned buffers

On the Flow path

- Critical area planting
- Grassed waterways
- Pocket wetlands
- Level spreader
- Terraces
- Water and Sediment Control Basins

Upland

- Augmenting soil health
- Increasing forest cover
  - agroforestry

# Chesapeake Healthy Watershed Assessment

Metrics under development by

**Healthy Watersheds Goal Implementation Team** (Renee Thompson staff)

1) % Natural Land Cover in Watershed

2) % Tree Canopy in Riparian Zone in Watershed

3) % Natural Land in Riparian Zone in Watershed

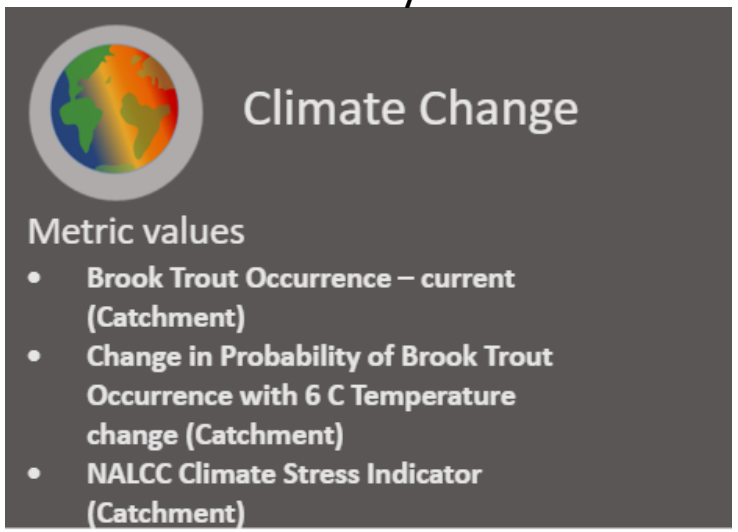
4) % Impervious Cover in Watershed

5) % Effective Impervious Cover in Watershed

6) % Managed Turf Grass

7) % Forest in Watershed

1 of 4 Vulnerability Measures




8) % Wetlands in Watershed

9) % Impervious in Riparian Zone in Watershed

10) Forest Habitat

11) Recent Change in Forest (% change), 2013-2017

12) Recent Change in Impervious Cover (% change), 2013-2017

13) Projected Future Change in Forest (% change), 2017-2035

14) Projected Future Change in Impervious Cover (% change), 2017-2035

## Landscape Condition

Subindex score:

### Metric values

- % Natural Land Cover (Ws)*
- **% Forest in Riparian Zone (Ws)**
- Population Density (Ws)
- **Housing Unit Density (Ws)**
- Mining Density (Ws)
- **% Managed Turf Grass in Hydrologically Connected Zone (Ws)***
- **Historic Forest Loss (Ws)**

## Hydrology

Subindex score:

### Metric values

- % Agriculture on Hydric Soil (Ws)
- **% Forest (Ws)***
- % Forest Remaining (Ws)
- % Wetlands Remaining (Ws)
- % Imperviousness Cover (Ws)*
- Road Stream Crossing Density (Ws)
- **% Wetlands (Ws)***

## Habitat

Subindex Score:

### Metric values

- National Fish Habitat Partnership (NFHP) Habitat Condition Index (Catchment)
- **% Natural Connectivity (Catchment)**
  - **Habitat Condition Index – Local**
  - **Habitat Condition Index – Network**
  - **Habitat Condition Index – Cumulative**

## Geomorphology

Subindex Score:

### Metric values

- Dam Density (Ws)
- % Vulnerable Geology (Ws)
- Road Density in Riparian Zone (Ws)
- % Impervious in Riparian Zone (Ws)*

## Water Quality

Subindex score:

### Metric values

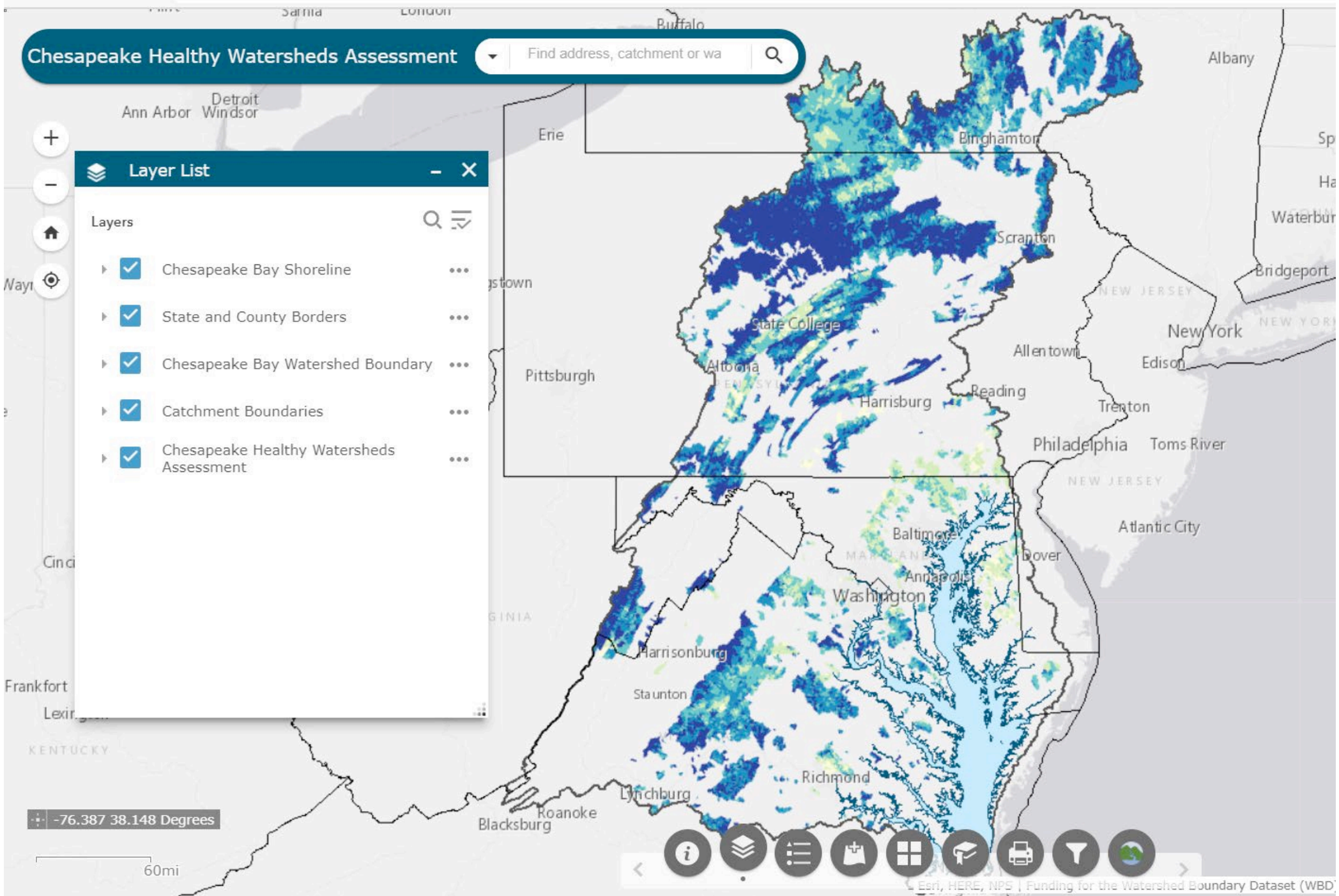
- **% of Stream Length Impaired (Catchment)**
- **Estimated Nitrogen Load from SPARROW Model (lbs/acre/yr) (Ws)**
- **Nitrogen, Phosphorus, and Sediment Load from Chesapeake Bay Model, by Sector (Ws)**

## Biological Condition

Subindex score:

### Metric values

- **Outlet Aquatic Condition Score (Catchment)**


Chesapeake Healthy Watersheds Assessment
Find address, catchment or wa
Layer List
Layers
Chesapeake Bay Shoreline
State and County Borders
Chesapeake Bay Watershed Boundary
Catchment Boundaries
Chesapeake Healthy Watersheds Assessment
Buffalo
Albany
Detroit
Ann Arbor
Windsor
Erie
Binghamton
Scranton
Bridgeport
State College
New York
Allentown
Edison
Altoona
Pittsburgh
Harrisburg
Reading
Trenton
Philadelphia
Toms River
Atlantic City
Baltimore
Dover
Annapolis
Washington
Harrisonburg
Staunton
Richmond
Lynchburg
Roanoke
Blacksburg
Frankfort
KENTUCKY
-76.387 38.148 Degrees
60mi
Esri, HERE, NPS | Funding for the Watershed Boundary Dataset (WBD)