

# Conservation Innovation:

## Leveraging GIS to Identify Conservation and Restoration Priorities

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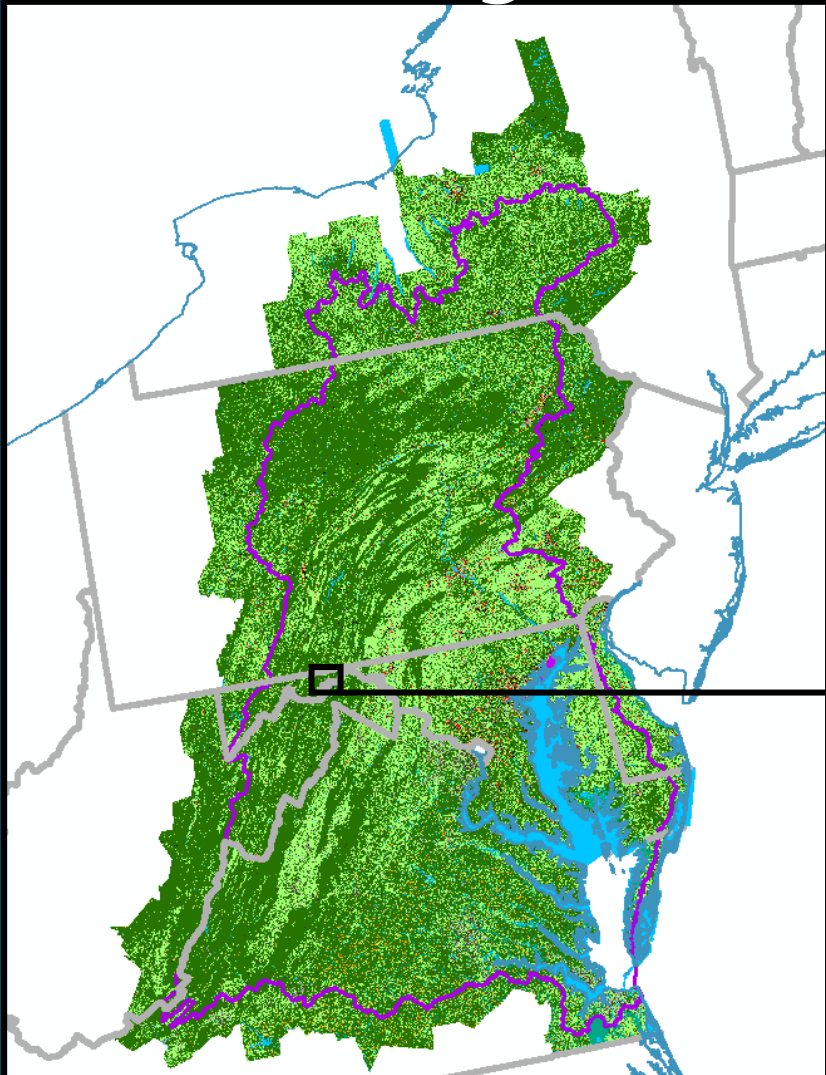


# Precision Conservation



*"Getting the right practices,  
in the right places,  
at the right scale"*

# High-resolution Data *Planning at the Parcel Scale*



# Enhanced Flowpath Mapping

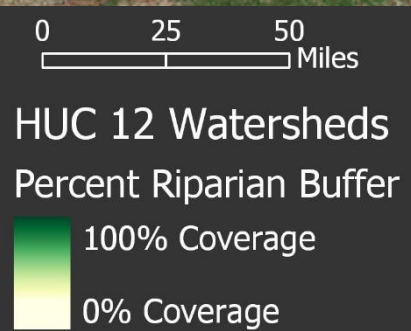
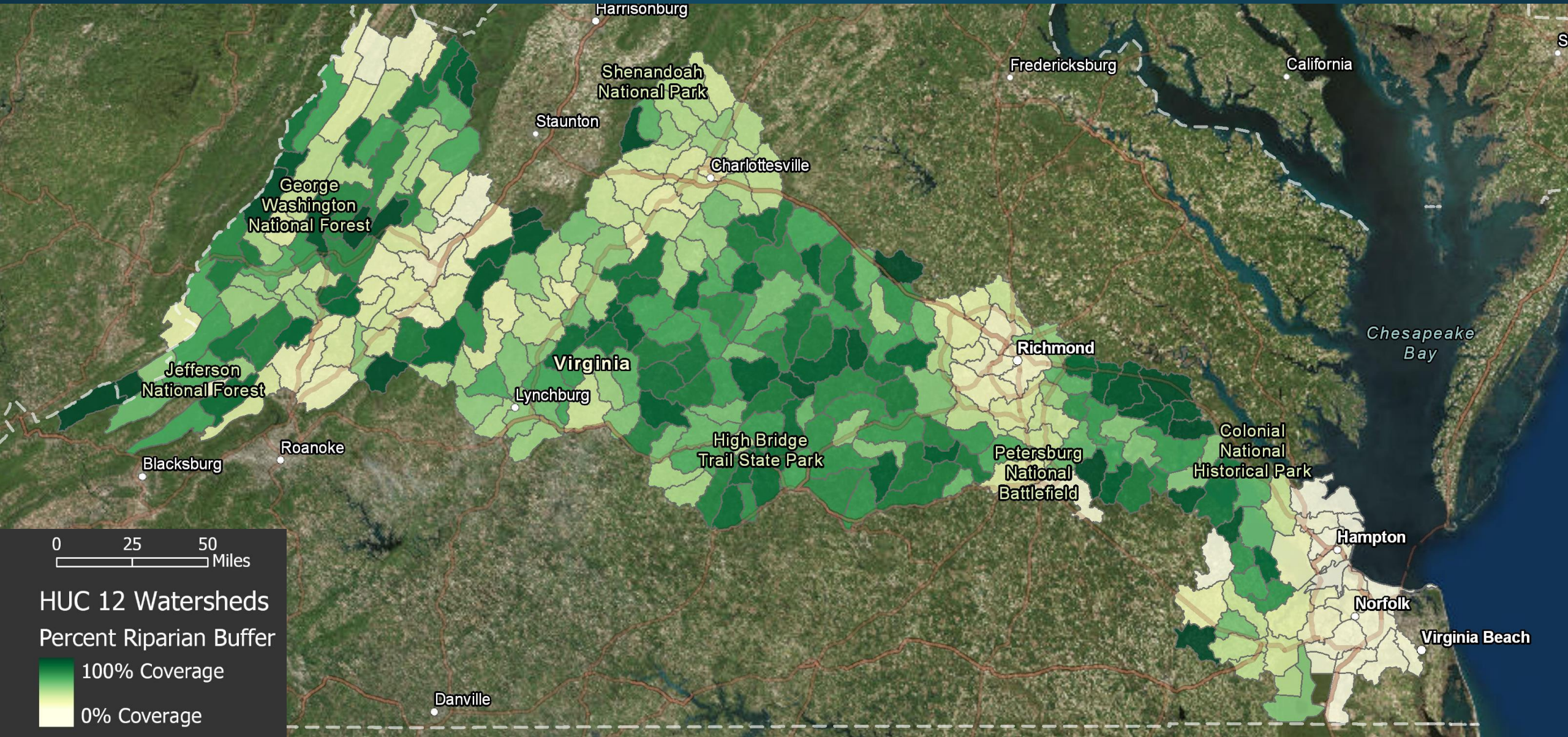
Lidar-derived, 1-m resolution

Land cover and flowpath mapping  
in high resolution and large scale:

- Watershed-wide restoration opportunities identification
- Field Scale Prioritization
- Especially well suited for headwater landscapes



# James River Riparian Buffers



An aerial photograph of a rural landscape. The scene is dominated by large, rectangular green agricultural fields. A road or path runs through the center, separating the fields. To the left, there is a small cluster of buildings, possibly a farm or a small village. The right side of the image shows a dense, dark green wooded area. The overall scene is a typical rural agricultural setting.

**Better data is only useful if it can be harnessed to inform better projects**

Goal: Identify priority locations for BMP implementation

### CBP Land Cover Classification

- Barren
- Impervious Roads
- Impervious Surfaces
- Low Vegetation
- Shrubland
- Structures
- Tree Canopy
- Tree Canopy over Impervious Roads
- Tree Canopy over Impervious Surfaces
- Tree Canopy over Structures
- Water
- Wetlands

Pixel size: 1 meter by 1 meter

High Resolution Land Cover & Concentrated Flow Paths

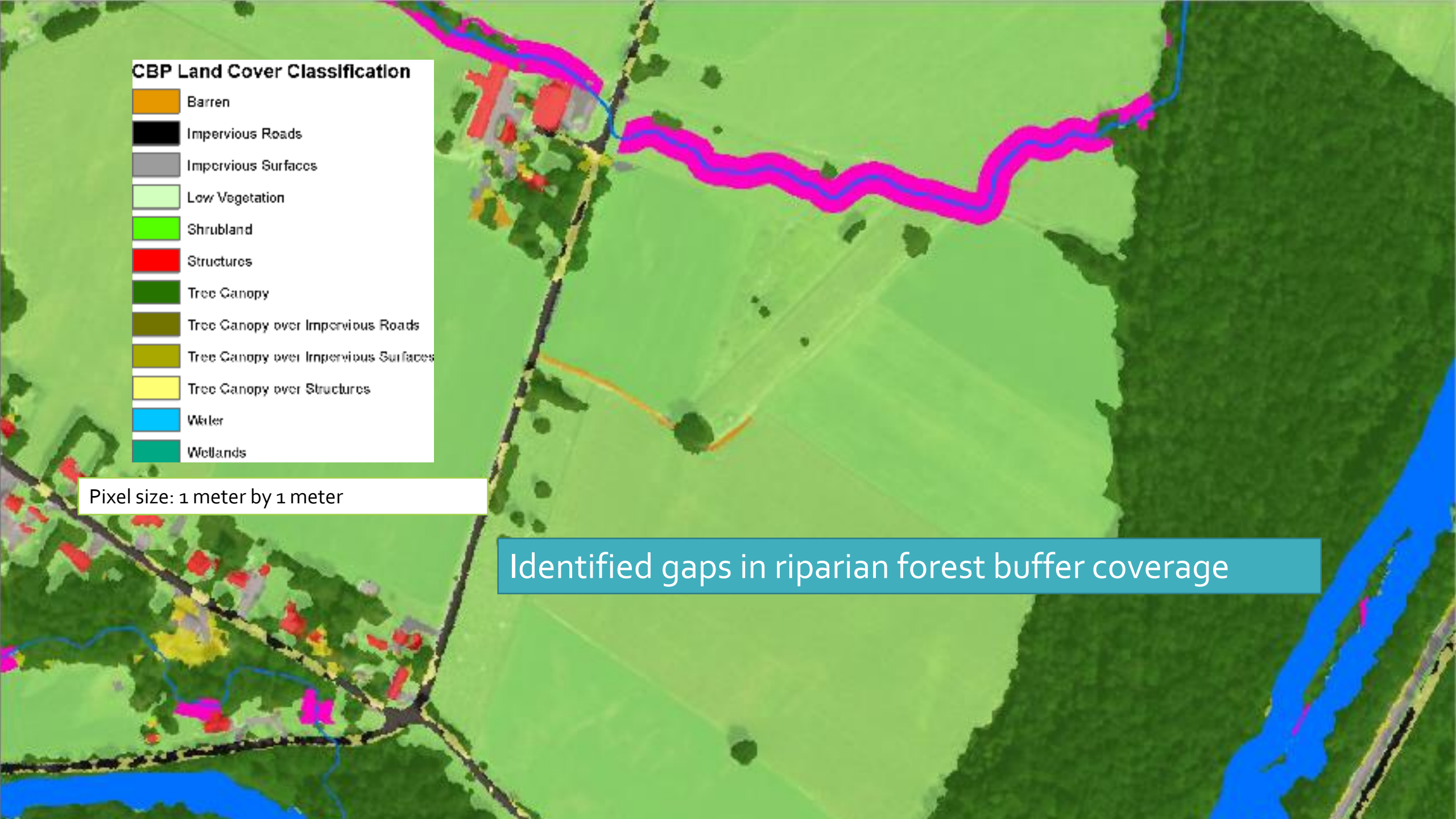


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Identified gaps in riparian forest buffer coverage



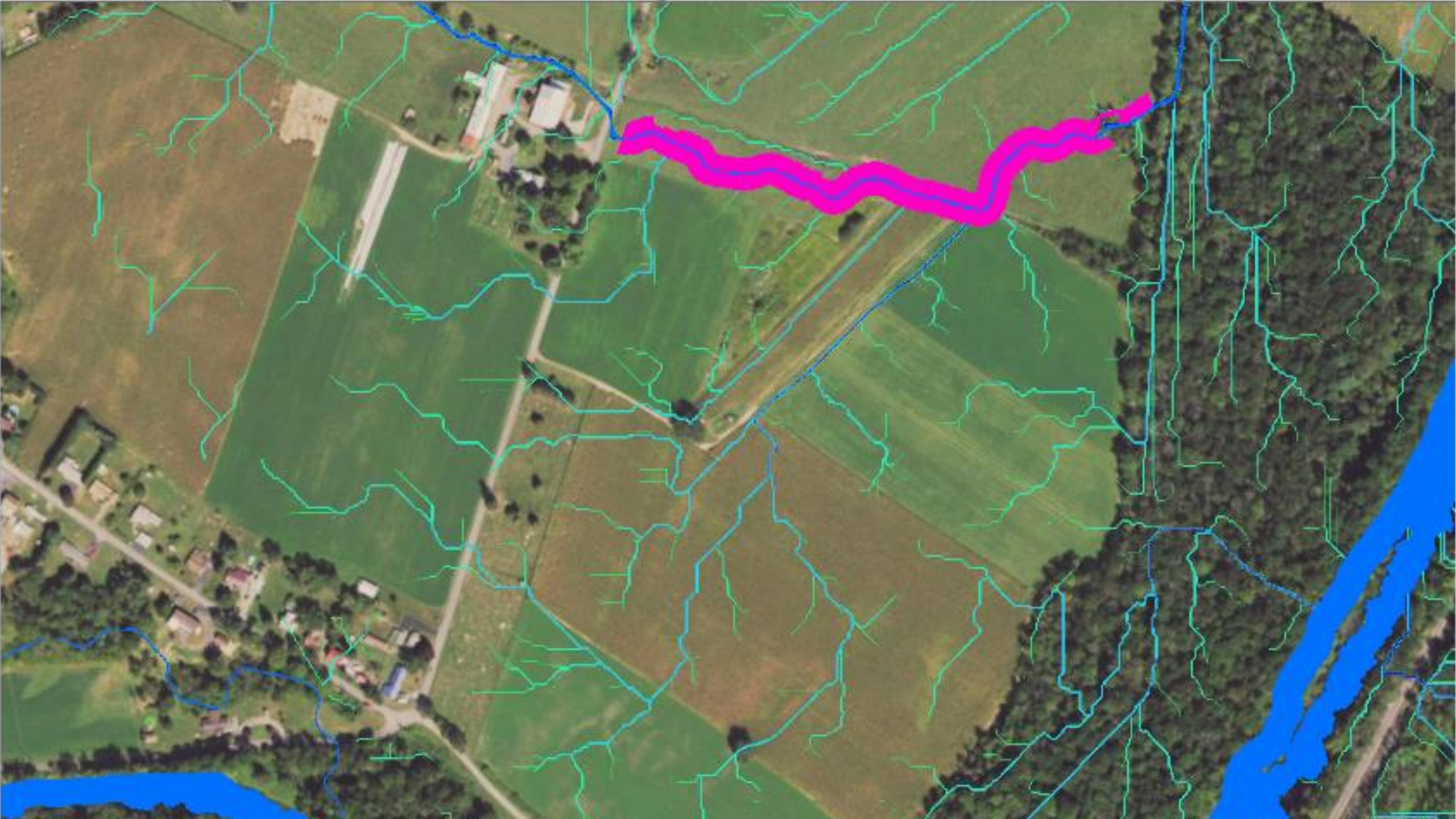




1.18 acres

1.16 acres

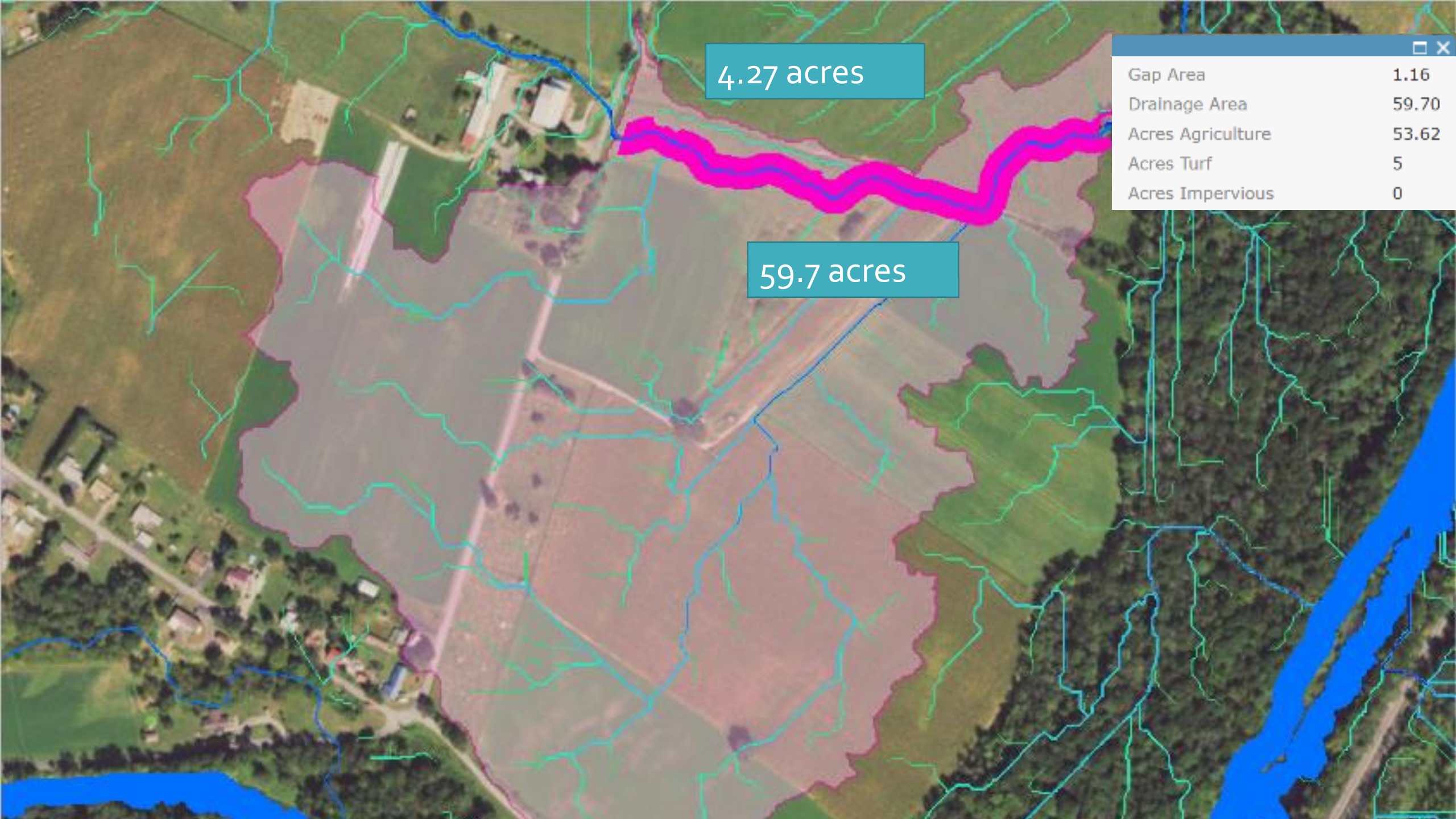
Compare restoration opportunity areas



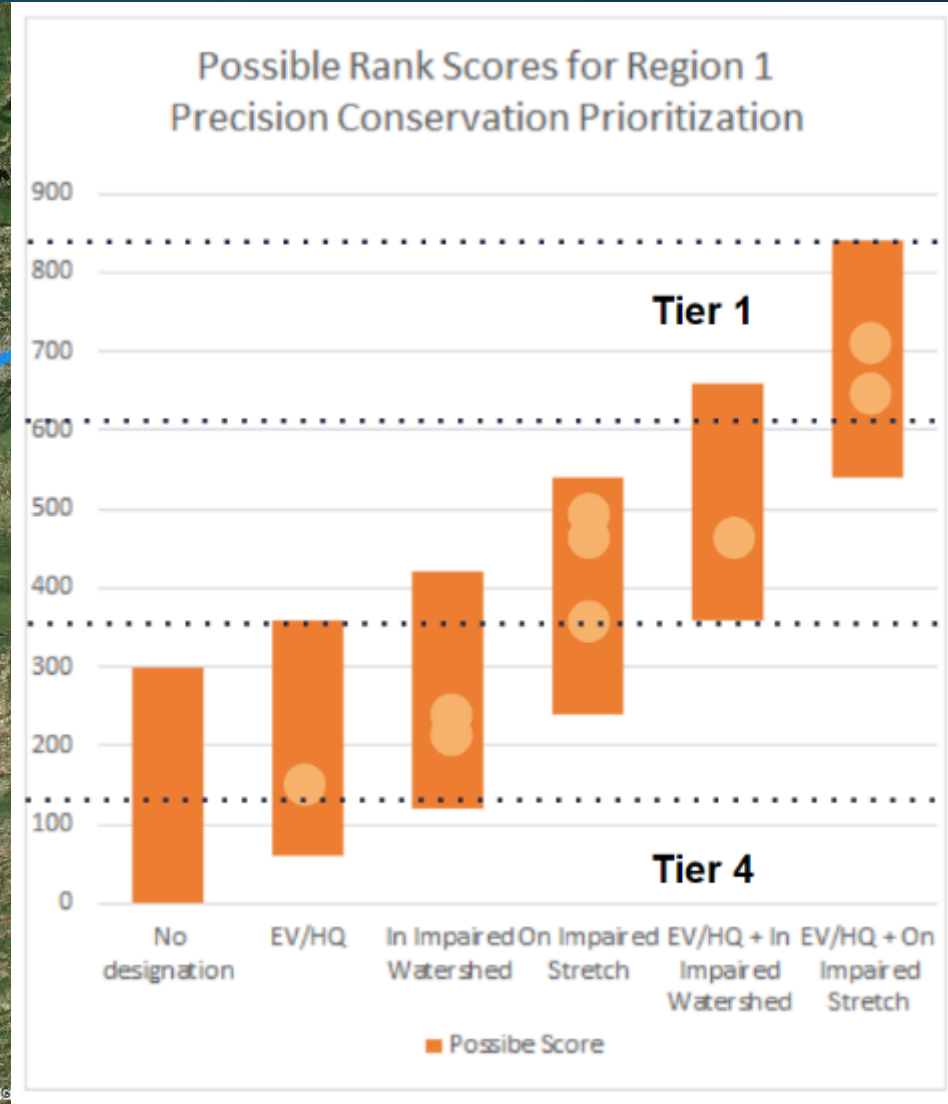
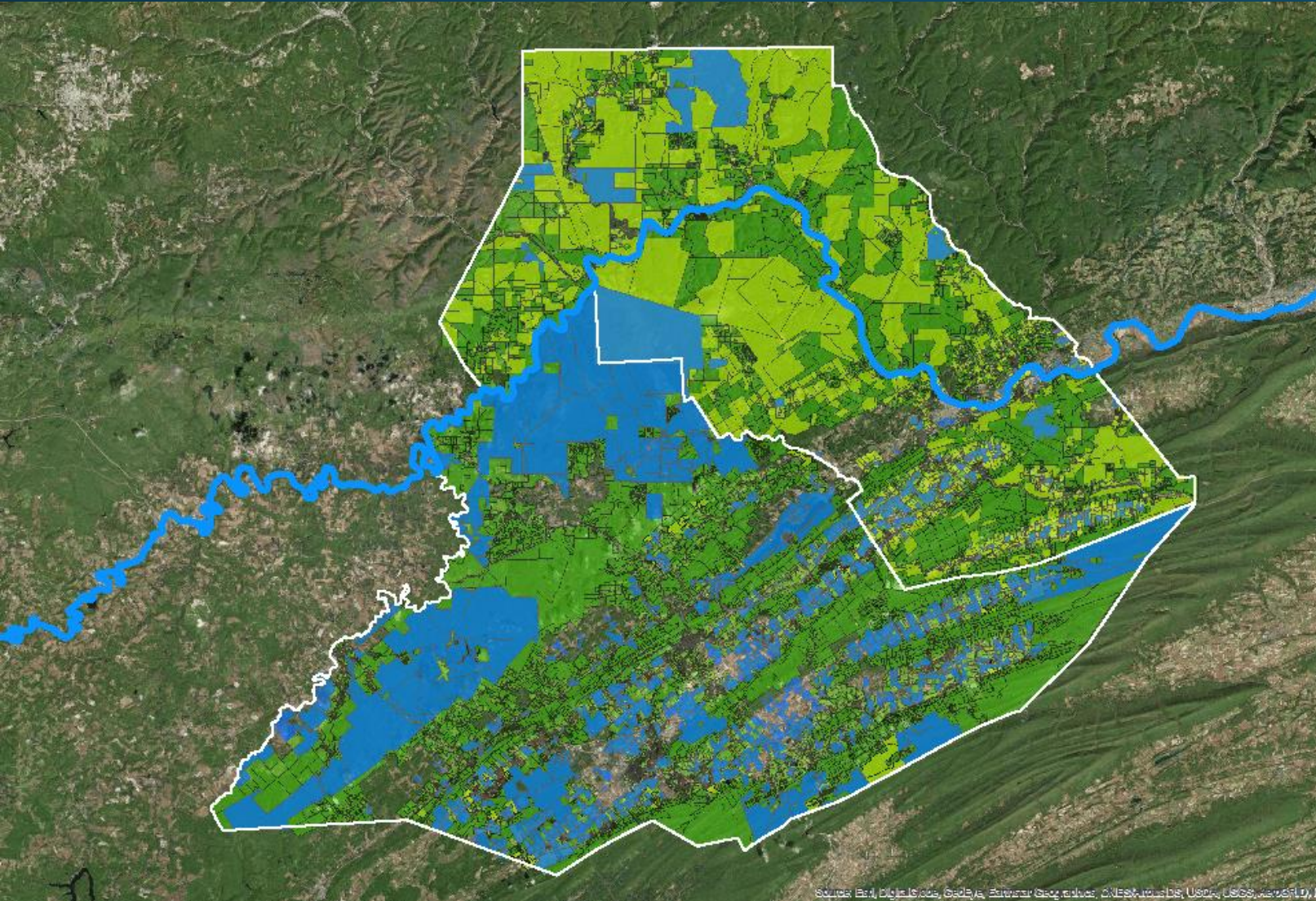
4.27 acres

59.7 acres

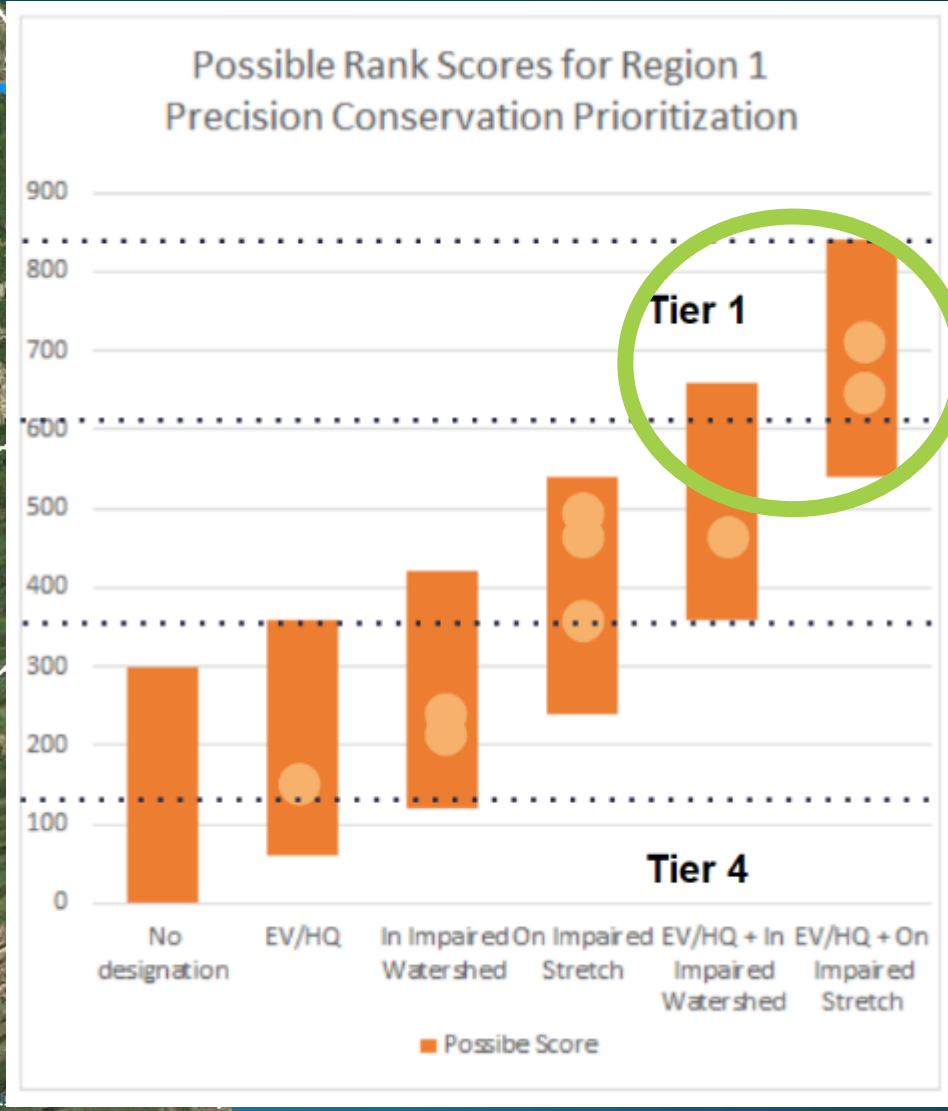
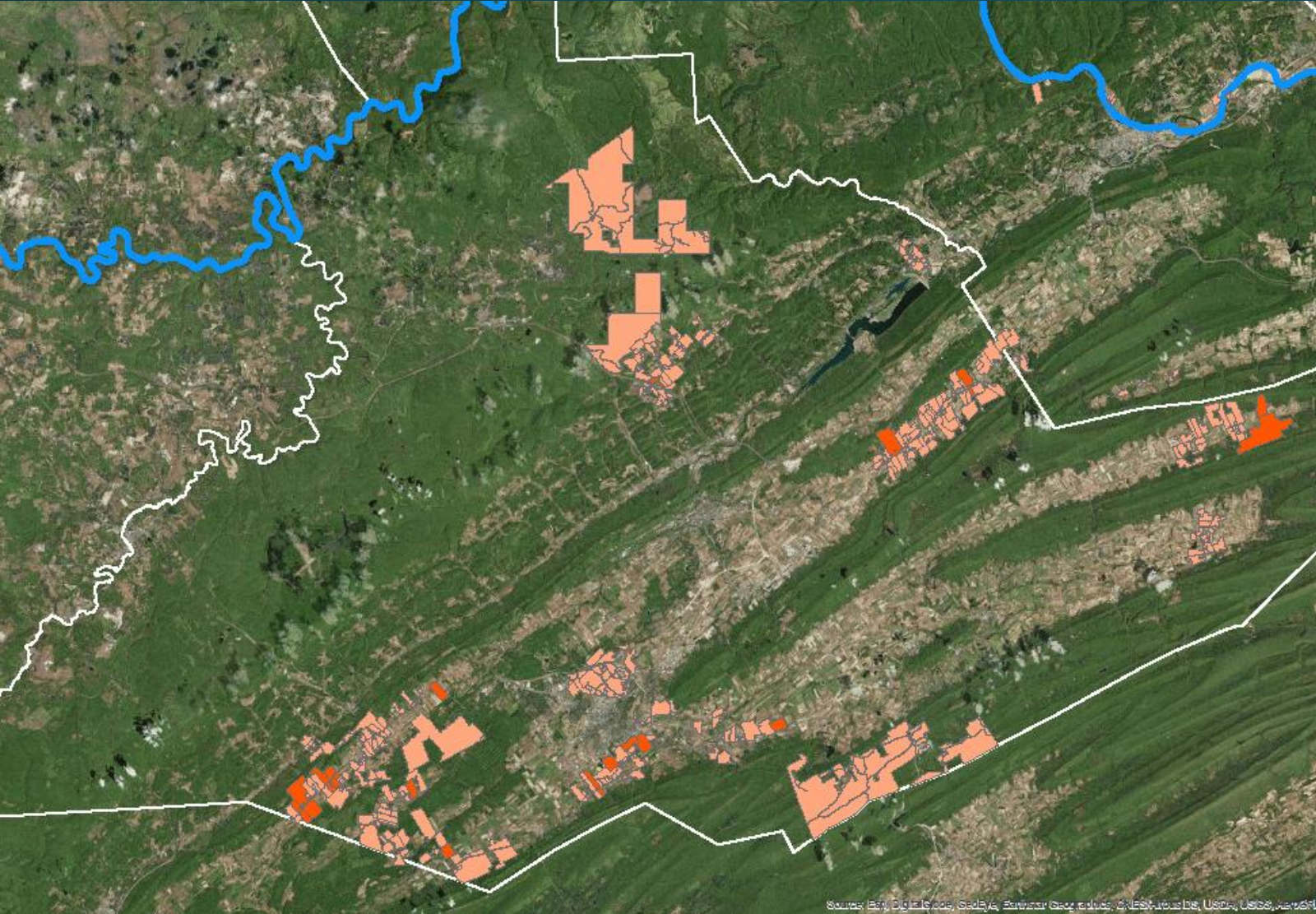
Legend	
Gap Area	1.16
Drainage Area	59.70
Acres Agriculture	53.62
Acres Turf	5
Acres Impervious	0



# Assessing the landscape



# Aligning for High-Impact Restoration



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

# Enabling Partners



## Data

Land Cover/Use  
Stream Maps

+



## Web-based tools

Access  
Products



**High-Impact  
Conservation  
+ Restoration**

# Web-enabling Data

## RESTORATION REPORTS

*Precision conservation for your property*

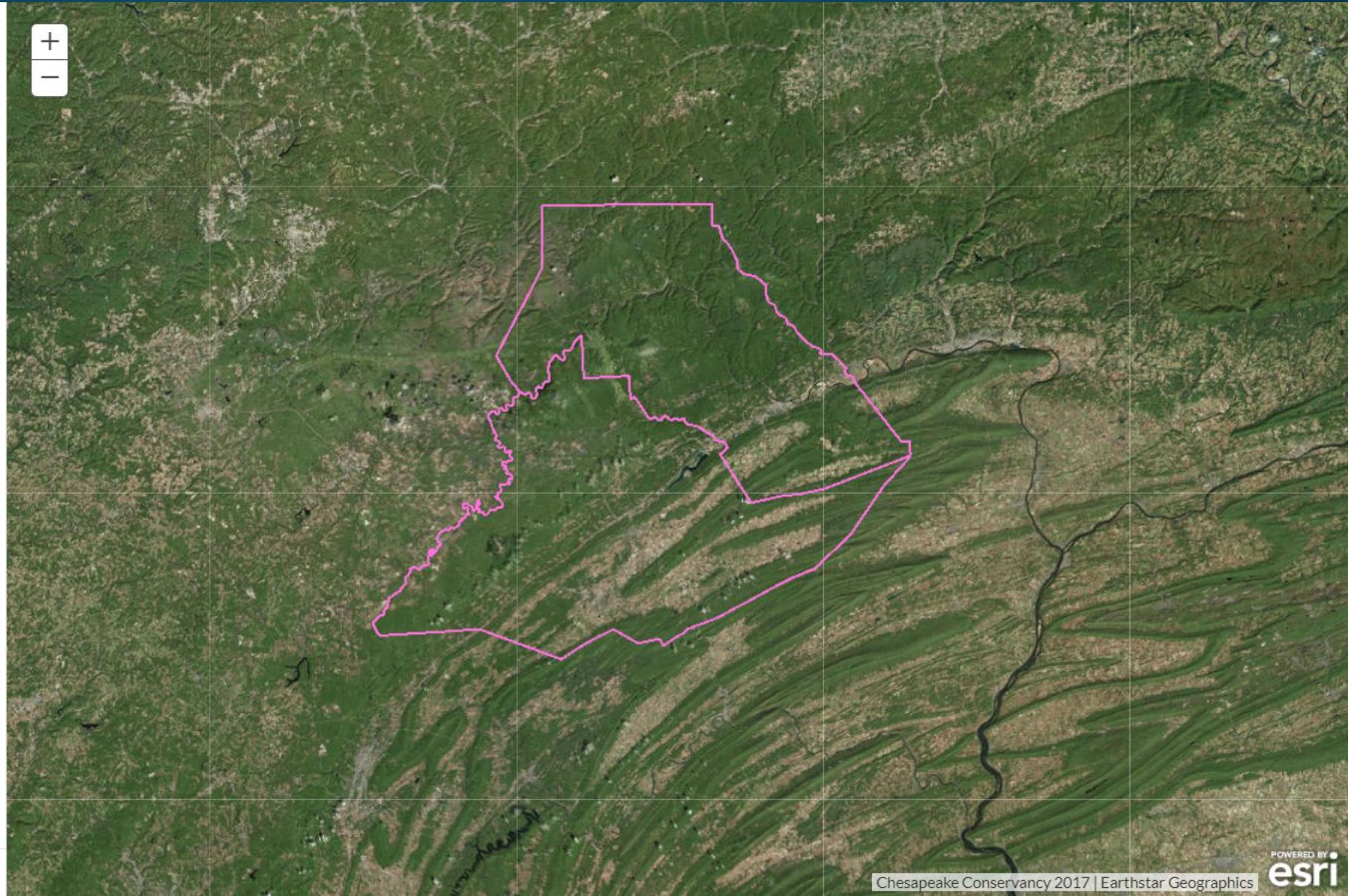
If you are a landowner in Clinton or Centre Counties, Pennsylvania, this free, confidential tool can help you get information about the restoration opportunities on your property that can improve the ecological conditions you care about.

Using state-of-the-art data analysis, Restoration Reports generates a customized report for your property, including the watershed you are a part of, the wildlife species that may live on your property, and whether you are in close proximity to an impaired stream.

You can then select your management priorities, for example, improving the hunting and fishing on your property, or supporting your agricultural land uses.

[Get started](#)

[restorationreports.com](http://restorationreports.com)



# Web-enabling Data

4.24 acres

ACREAGE OF DRAINAGE THROUGH RESTORATION AREA  
72.27 acres

### 2. Select your management priorities

- Agricultural production** 

Restoration can help manage nutrients and improve soil and livestock health.
- Recreation** 

Hunting, fishing, and exploring your property safely.
- Wildlife** 

Young and mature forests and the species that inhabit them.

### 3. Would you like more information?

Yes, please  No, thanks

[Generate new report](#)

[Open report](#)

Info Partners Resources

## RESTORATION REPORTS

Precision conservation for your property

Restoration Reports details specific locations on your land where you can install best management practices.

Parcel ID: No ID available  
In the Bald Eagle Creek watershed

### Restoration on your Property

This report identifies locations on your property where restoration could be most effective. The highest restoration priorities are areas next to streams without trees, shrubs, or wetlands. We suggest planting **riparian forest buffers** in these areas to filter water before it enters a stream. If there are no streams on your property, planting native trees and shrubs can provide many of the same benefits described in this Restoration Report because rainwater that falls onto your property ends up in nearby streams.

#### Example: Identifying restoration areas



1. **Land cover** includes: forests, shrubs, and wetlands; impervious surfaces (structures, driveways, and roads); low vegetation (lawns, farm fields); and barren (exposed dirt). **Low vegetation and barren are most readily restorable.**

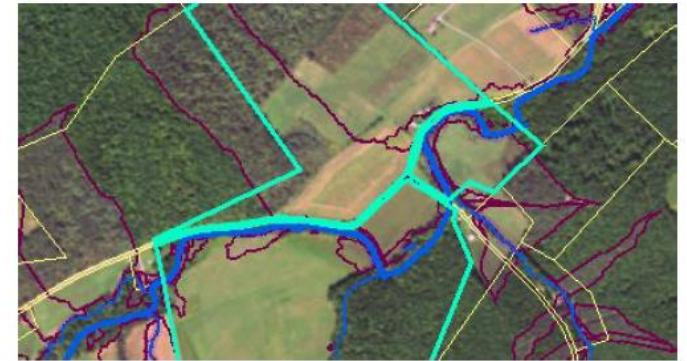
Acres of land cover within your parcel					Most readily restorable		Total acres
Tree canopy	Canopy over impervious	Shrub or wetland	Water	Impervious	Low vegetation	Bare	
61.76	0.12	0	1.80	0.46	87.34	0.00	151.48
Restorable land within a 35 ft. distance of flow paths intersecting your parcel are called <b>Flow Path Restoration Areas</b>						<b>4.24</b>	



2. We focus on **flow paths**, or where rainwater accumulates and travels downslope before a stream is formed and continues as the stream itself.



3. Areas along flow paths that are restorable can filter water from upstream **drainage areas** before it enters a stream. These **flow path restoration areas** are the highest priority for **riparian forest buffer** restoration.



The 4.24 acres of **flow path restoration area** intersecting your property have a total **drainage area of 72.27 acres from your property and your neighbors' property**, including 0 acres of bare earth, 1.14 acres of impervious surface, and 36.34 acres of low vegetation.

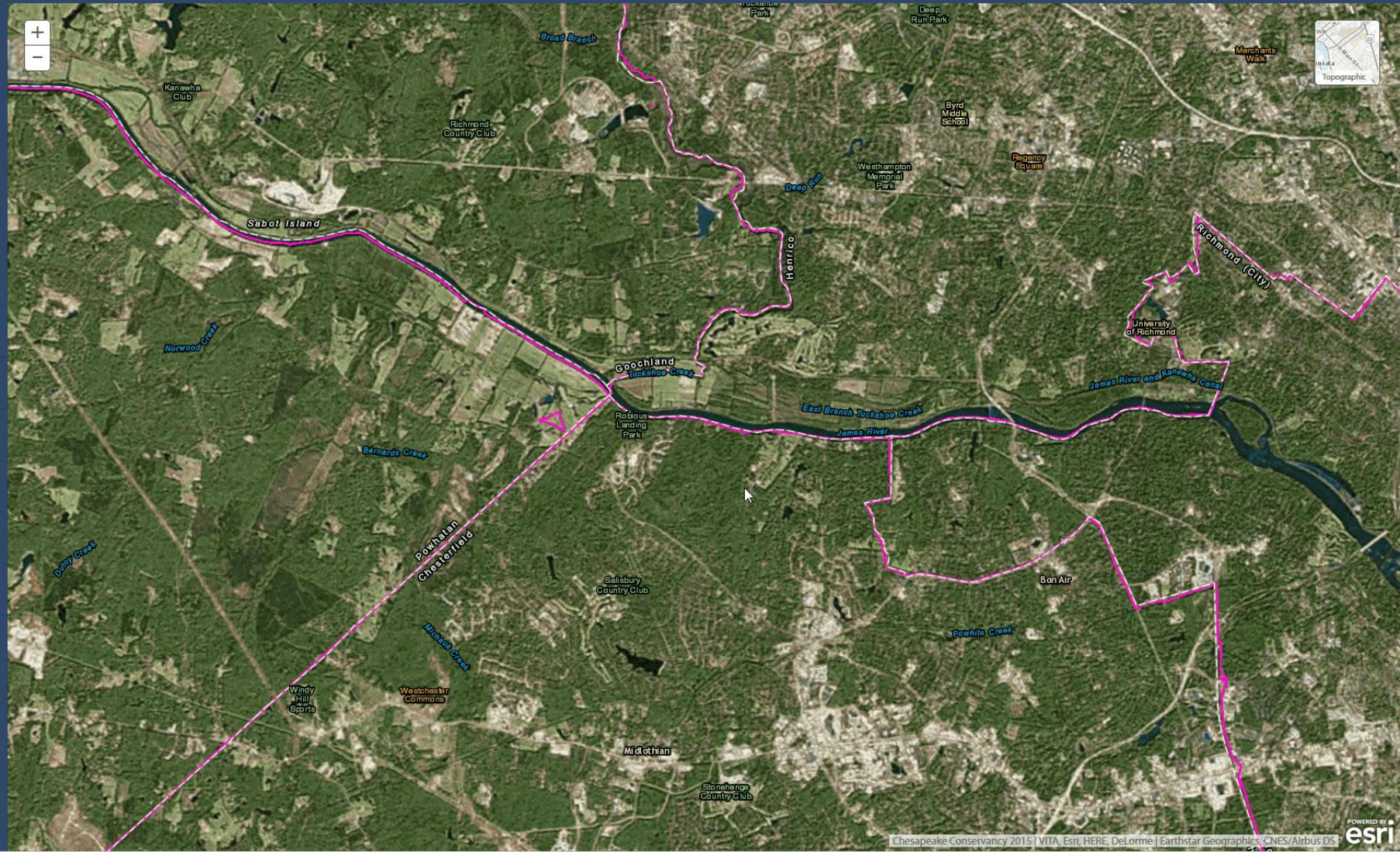


# Web-Based Tools to Access Data and Make Conservation Decisions



CONSERVATION  
TOOLBOX

Chesapeake Conservancy



- Map Layers >
- Search >
- Filter >
- Land Cover >
- Report Generator >
- Watershed Delineation >

# Web-Based Tools to Access Data and Make Conservation Decisions

Search

Chesapeake Conservancy



Search for a parcel using the search box or by clicking the map.

GPIN or parcel ID  Search

Parcel ID: 32-42A

Attribute	Value
County	Powhatan
Area (GIS Acres)	202.25
Area (Public Record Acres)	205.76
Protected	No
Adjacent	No
Estimated Buffer Length (ft.)	9557
100 Year Floodplain	Yes
Historical Point/Site	No



# Web-Based Tools to Evaluate and Compare Potential Project Locations

## Watershed Delineation

## Chesapeake Conservancy



Calculate the 3 largest watersheds (drainage areas) for the selected parcel. This analysis is based on LIDAR-derived elevation and flow path datasets from ArcGIS.

Zoom to Chester

1. Define your area of analysis

Select Parcel

Draw Polygon

Place Point

10 meter buffer

2. Choose the number of drainage areas to display

1 2 3 4 5

3. Begin process (approx. 30 seconds per drainage area)

 Delineate watersheds



# Maryland Environmental Trust



Over 1000 easements to monitor on 134,088 acres !

More than half co-held with our Local Land Trust Partners

# MET post-monitoring process



Paper-based



Microsoft Access database



Manual photo-point entry

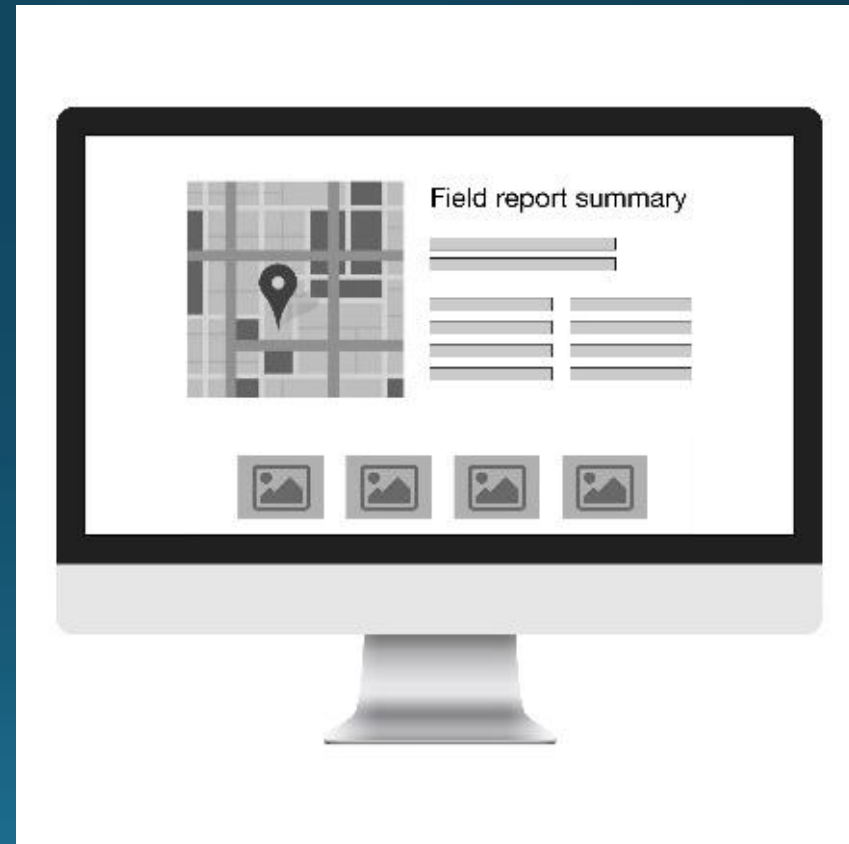
# Updated protocol for monitoring



## 1. Mobile field report form



## 2. Web application for storage / display





## Maryland Land Trust Easement Monitoring Report

### ▼ Easement

**\* Organization**

Maryland Environmental Trust... ▾

**Landtrust identifier**

**Reference name (e.g. Property / Landowner name)**

Easement to visit

**\* Donated?**

- No  
 Yes

**Program / Easement type**

# Locate Integration



LOCATE

- Monitoring reports
  - Photo summary
  - Due Diligence
- Flag items of concern
- Easement management database
  - Reporting tools
  - Strategic stewardship





## Welcome, Maryland Environmental Trust

Find updates and new uploads below, or head over to the [Easements](#) page to view the map.

[Dashboard](#)

[Directory](#)

[Recent Kobo uploads](#)

[Resource kit](#)


### Quick stats


1079  
EASEMENTS

136  
COMPLETED REPORTS


38  
KOBO UPLOADS IN LAST 90 DAYS

### Latest completed reports

 2018/05/02  
For [0782STA03.KENT](#) from J Chapman / M D'arcy

 2018/03/07  
For [0220MAT92.PRIN](#) from Rachel Werderits, Emily Smith, Rachel Kreiger

 2018/05/03  
For [0086PAS83.TALB](#) from Bob and Susan Wason

 2018/05/03  
For [0608ESL01.TALB](#) from Bob and Susan Wason

 2018/01/25  
For [0828WOL05.BACO](#) from David Minges

### Connections



**MD Dep. of Information Technology**  
You are connected!



**KoBo Toolbox**  
You are connected!

# Connected



Monitoring App



Volunteers



Local Land Trust Partners



LOCATE

- Monitoring reports
  - Photo summary
  - Due Diligence
- Flags items of concern

Connected!



- Easement management database
  - Reporting tools
  - Strategic stewardship

# Volunteer Training





[conservationinnovationcenter.org](https://conservationinnovationcenter.org)  
[jallenby@chesapeakeconservancy.org](mailto:jallenby@chesapeakeconservancy.org)

**Michael S. Herzberger, GISP, CFM**  
*Section Chief, Geospatial and Engineering  
Services*

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**Innovation Through Collaboration**  
**Improving Government One Project At A Time....**

# About MES

- Independent Not-For-Profit State Agency
- Provide Wide Array of Environmental Services
- MES' Partners: States, Counties, Municipalities, Federal Government, Private Sector
- Work through: MOU's, IGA's, Grants, Executive Order & Other Contractual Instruments.

# Our Mission

*“...to protect and enhance  
the environment for the  
benefit of the people....”*

# Innovation Through Collaboration

- How is this being achieved?
  - Multi-Agency Coordination
  - Seeking Goals & Objectives that Yield Multiple Benefits
  - Drawing from Pooled Resources / Interdisciplinary Teams
  - Full Engagement with Stakeholders



# Tapping into the 'Silos of Excellence'



# 3 Examples

- Deep Mine Archive
- Resiliency Partnership
- Watershed Resources Registry

# Deep Mine Archive

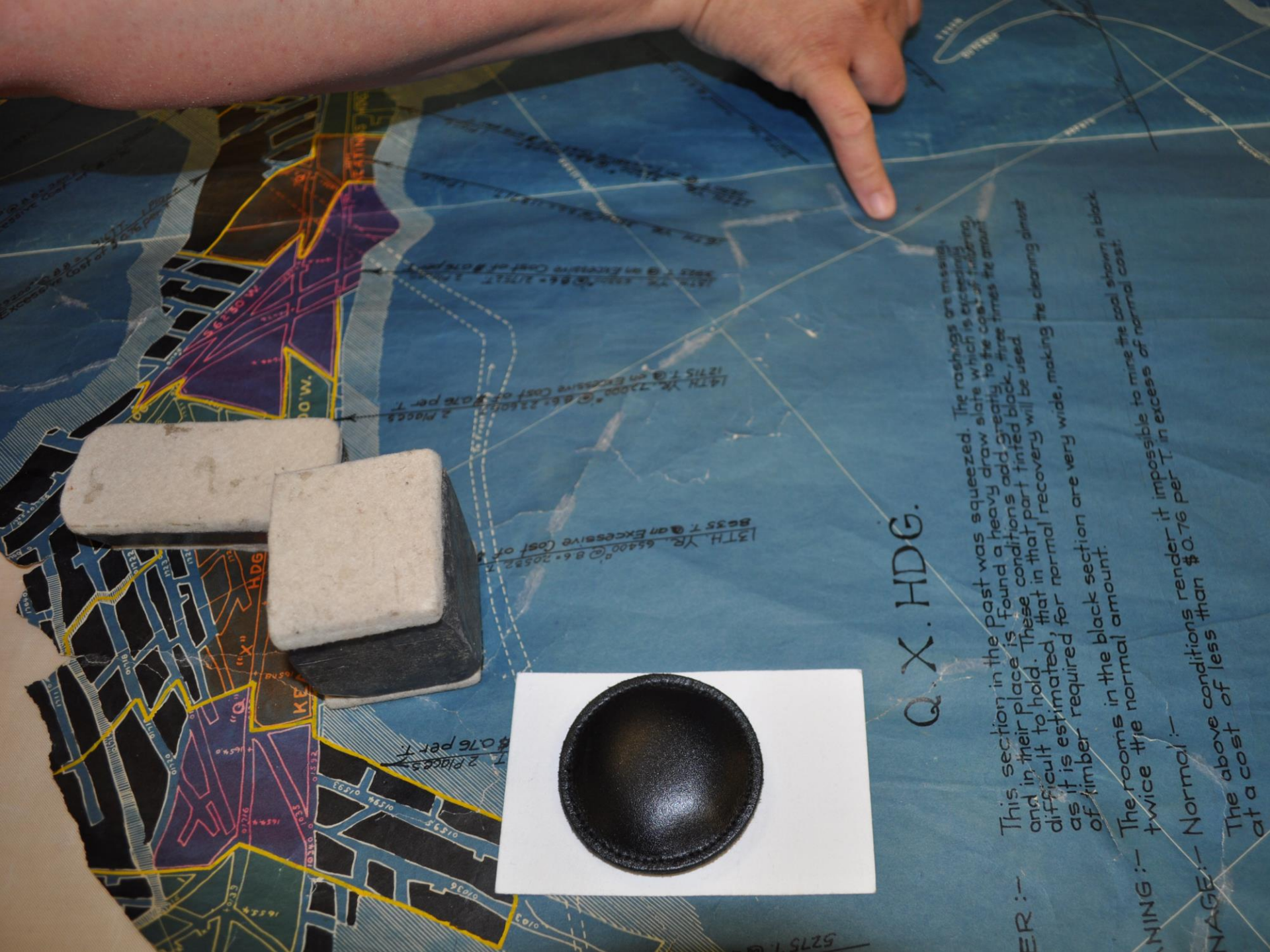
- State Partners: MDE, MSA, MES
- Private collection of 120 deep mine maps from late 1700's early 1900's
- Federal Partners: MDE received grant through Office of Surface Mines (OSM), to acquire, restore, scan, and publish maps

# Acquisition, Scanning, Restoration, & Publication

- MES - purchased private collection
- MSA – restored and scanned all maps
- MDE – geo-located maps using GIS
- MES – developed GIS application for viewing and downloading
- MDE – published application on their servers

*Medium: mix of paper, linen, mylar and blueprints drawn in pencil or ink, both black and colored.*





15TH YR. 65400 @ 8.6 = 2052 T  
 @ 8.6 = 23500 2 Places  
 12715 T @ on Excessive Cost of 2.06 per T  
 15TH YR. 22000 @ 8.6 = 2172 T  
 @ 8.6 = 2172 T on Excessive Cost of 2.06 per T

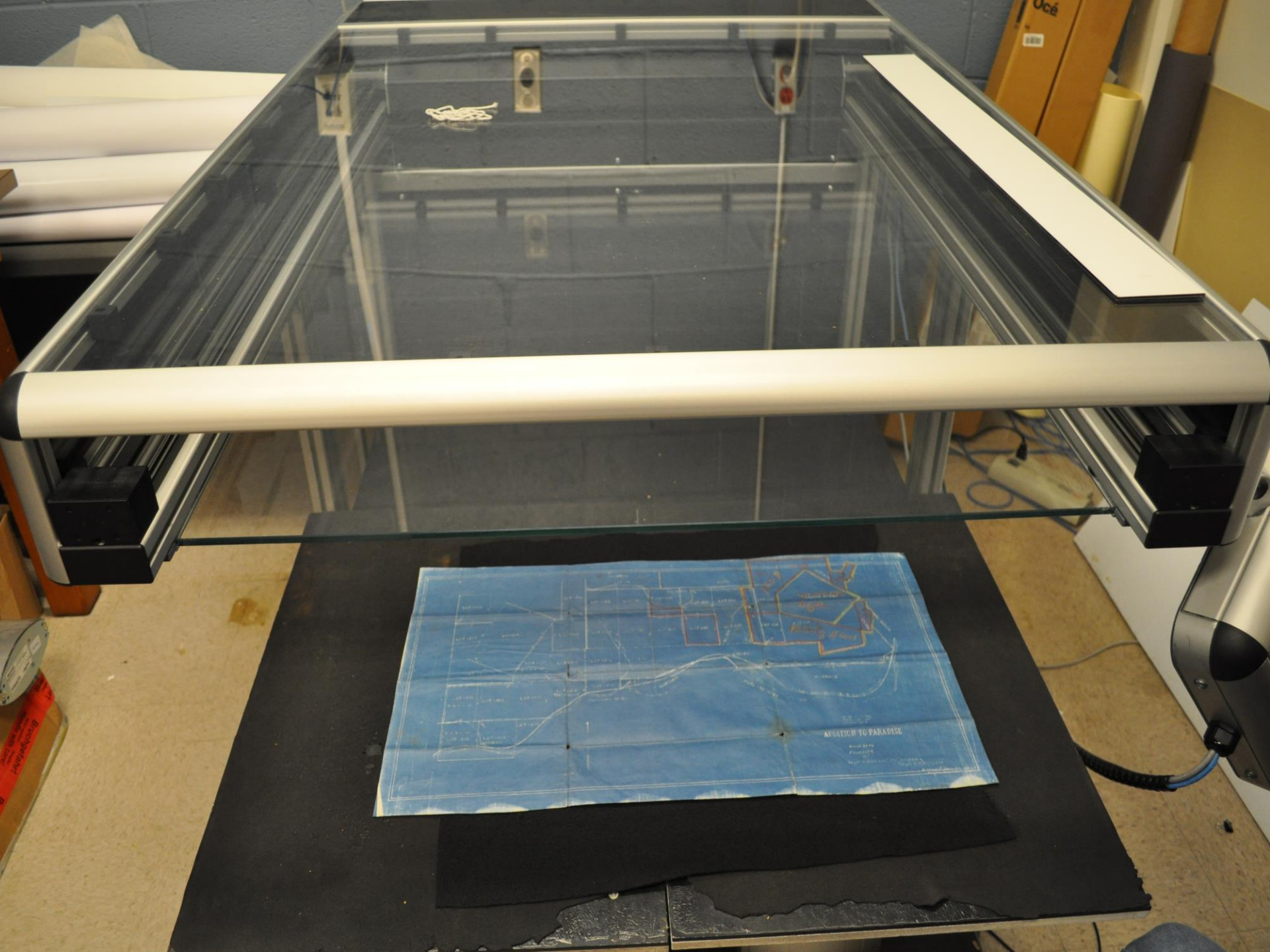
2 Places  
 @ 0.76 per T

Q. X. HDG.

The rashings are missing and in their place is found a heavy draw slate which is exceeding difficult to hold. These conditions add greatly to the cost of rashing, as it is estimated, that in that part tinted black, three times the amount of timber required for normal recovery will be used. This section in the past was squeezed. The rashings are missing and in their place is found a heavy draw slate which is exceeding difficult to hold. These conditions add greatly to the cost of rashing, as it is estimated, that in that part tinted black, three times the amount of timber required for normal recovery will be used.

- WARNING :- The rooms in the black section are very wide, making the clearing almost twice the normal amount.
- NAGE :- Normal :- The above conditions render it impossible to mine the coal shown in black at a cost of less than \$0.76 per T. in excess of normal cost.







# MARYLAND ENVIRONMENTAL SERVICE

The screenshot displays the 'Mining Archive' web application. The main map shows a topographic view of West Virginia with numerous mine locations marked as orange dots. A central pop-up window contains the following text:

The Mapping Services provided herein are for reference only. The user of this information understands and acknowledges that the data may be inaccurate or contain errors or omissions and the user assumes full responsibility for any risks or damages resulting from any use of or reliance upon this data. MDEC and their Agents or Affiliates do not guarantee the accuracy or reliability of the data generated from this service.

I agree to the above terms and conditions

OK

On the right side, the 'Mine Details' sidebar includes a search bar and filters for Mine Name/Alias, Basin, Seam, Company, and County, each with a dropdown menu. Search and Reset buttons are located at the bottom of the sidebar.

At the bottom of the map, a small text credit reads: 'Jason Hawkins, MDE Land Management Administration - Abandoned Mine Lands Division | VITA, West Virginia GIS, & ...'

<http://mde.maryland.gov/programs/LAND/mining/Pages/mapping.aspx>

# Resiliency Partnership

- Partners: MDE, MEMA, DNR, MHT, MTA, DHCD, DoIT, SHA, MIA, MAFSM, MES
- Capitalize on resource sharing
- Support comprehensive projects
- Integrate Hazard Mitigation, Floodplain Management, and Coastal & Climate Resiliency
- Federal partners: FEMA, NOAA, FTA, & FHWA

## Maryland Resiliency Partnership

*Working together to create a more resilient Maryland*

Home Funding Events How We Can Help 

Resiliency is...

...*"the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions."*

### Who We Are

The Resiliency Partnership is a collaboration of public and private partners to leverage funding, personnel, and projects to support efforts that integrate hazard mitigation, floodplain management, and coastal and climate resiliency.



<http://resiliencypartnership.org>



## RESIDENTIAL CONTRACT OF SALE

*This is a Legally Binding Contract; If Not Understood, Seek Competent Legal Advice.*

**THIS FORM IS DESIGNED AND INTENDED FOR THE SALE AND PURCHASE OF IMPROVED SINGLE FAMILY RESIDENTIAL REAL ESTATE LOCATED IN MARYLAND ONLY. FOR OTHER TYPES OF PROPERTY INCLUDE APPROPRIATE ADDENDA.**

### **41. FLOOD DISCLOSURE NOTICE:**

**A. FLOOD INSURANCE PREMIUMS:** The Property or part of the Property may be located in an area established by the government as a "flood plain" or otherwise in an area where flood insurance could be required by Buyer's mortgage lender as a condition of granting a mortgage. In addition, construction on the Property could be prohibited or restricted.

The National Flood Insurance Program ("NFIP") provides for the availability of flood insurance but also establishes flood insurance policy premiums based on the risk of flooding in the area where properties are located. Due to amendments to federal law governing the NFIP those premiums are increasing, and in some cases will rise by a substantial amount over the premiums previously charged for flood insurance. As a result, Buyer should not rely on the premiums paid for flood insurance on the Property as an indication of the premiums that will apply after Buyer completes the purchase. In considering the purchase of this Property, Buyer should consult with one or more carriers of flood insurance for better understanding of flood insurance coverage, the premiums that are likely to be required to purchase such insurance and any available information about how those premiums may increase in the future. Detailed information regarding flood insurance coverage may be obtained at: <http://www.fema.gov/flood-insurance-reform-act-2012>.

**B. FLOOD INSURANCE RATE MAPS:** The State of Maryland in conjunction with the Federal Emergency Management Agency has been systematically updating flood insurance rate maps. The Property may be affected. Buyer is advised to contact the Maryland Department of the Environment and consult a flood insurance carrier to inquire about the status of the Property. Detailed information regarding updated maps may be obtained at: <http://www.mdfloodmaps.net/home.html>.

# Watershed Resources Registry (WRR)

- **Partners:** Delaware Department of Transportation, Delaware Natural Resources and Environmental Control, Federal Highway Administration, Maryland Department of Natural Resources, Maryland Department of Planning, Maryland Department of the Environment, Maryland Department of Transportation, Maryland Department of Transportation, State Highway Administration, Maryland Environmental Service, Maryland Department of Information Technology, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Department of Environmental Protection, Pennsylvania Department of Transportation, US Army Corps of Engineers Baltimore District, US Army Corps of Engineers Huntington District, US Army Corps of Engineers Norfolk District, US Army Corps of Engineers Philadelphia District, US Army Corps of Engineers Pittsburg District, US Environmental Protection, Agency Region 3, US Fish and Wildlife Service, Virginia Department of Conservation and Recreation, Virginia Department of Environmental Quality, Virginia Department of Game and Inland Fisheries, Virginia Institute of Marine Science, Virginia Marine Resource Commission, West Virginia Department of Environmental Protection, West Virginia Department of Highways, West Virginia Department of Transportation, West Virginia Division of Forestry, West Virginia Division of Natural Resources

# WRR Explained

- A web-based user friendly mapping application, encompassing multi-agency collaboration, designed to achieve regulatory streamlining by scoring sites to promote sustainable watershed restoration and preservation

# WRR Explained

A comprehensive mapping tool and replicable framework that:

- Transparent, predictable and reliable
- Facilitates multi-agency input and coordination
- Utilizes both national and regional datasets
- Includes site visit **registered** information

# WRR Use Cases

- *The Watershed Approach for Water Quality Improvements*
- *Clean Water Act Sections: 303(d), 319, 401, 402, 404*
  - *Watershed planning, permit review, mitigation assessments*
  - *Total Maximum Daily Load (TMDL) and Watershed Implementation Plan (WIP) applications*
- *National Environmental Policy Act (NEPA) Review*
- *Land Conservation Priorities to Protect Ecologically Valuable areas including Rare, Threatened and Endangered Species*
- *21<sup>st</sup> Century Act (MAP-21) and Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU)*
- *State Transportation and Land Use planning decision making*
- *Resource Conservation/Environmental Resource planning*
- *Other State and Local regulations*





Maryland  
Department of  
the Environment



US Army Corps  
of Engineers®



# Want to learn more?

- Targeting Conservation Session: Using the Right Tools at the Right Place at the Right Time 2:45pm - 4:15pm
- Or visit:  
<https://watershedresourcesregistry.org>

# Thank You!

**Michael S. Herzberger, GISP, CFM**

*Section Chief, Geospatial and Engineering  
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