

Example Applications

The following example applications are intended to present how the tools developed for Trout Unlimited's Brook Trout Conservation Portfolio and Range-wide Assessment of Habitat Condition and Threats can be used to help evaluate and identify potential projects.

We present the following examples:

- Identifying populations within regions with specific restoration needs (Riparian restoration in Delaware Basin, AMD projects in Susquehanna basin, cold water source protection in Chesapeake basin)
- Identifying conservation need of populations within a specific geography (Upper Lehigh River in Delaware basin)
- Placing local restoration efforts within the broader Brook Trout conservation context (Ammonoosuc barrier removal, Connecticut basin)

Example 1: Identifying priority EBT populations requiring specific restoration activities – riparian restoration

In this example, EBT populations in the Delaware basin are prioritized based on riparian restoration need using the DE basin focal area visualization tool, and on-the-ground opportunities are evaluated within one priority population using the Riparian Restoration Decision Support Tool viewer.

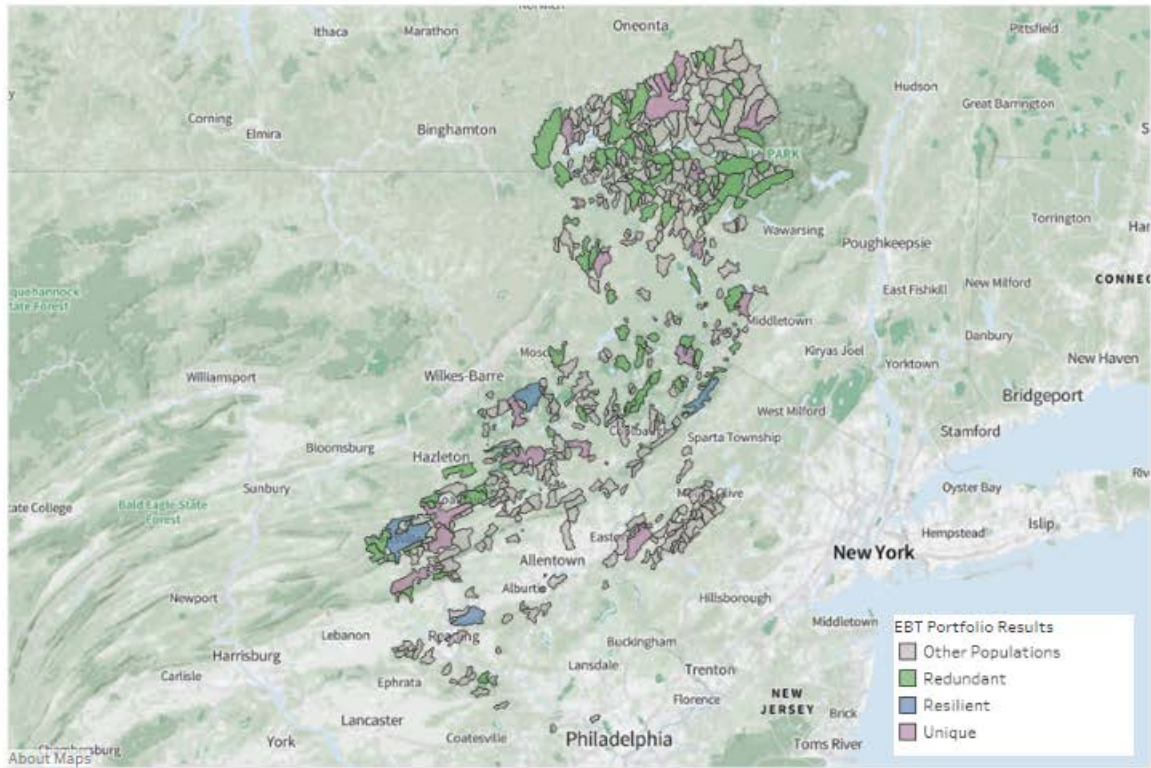
Criteria for prioritizing riparian restoration at the basin-scale:

- Patch has coldwater habitat likely to remain viable under future climate scenarios (Mean summer temperature in Letcher (Ecosheds) model ranges 0 – 17 °C)
- Patch has some riparian restoration need (% mean canopy cover range is 60-80%)
- Patch is high value EBT population (is resilient or redundant)

The screenshot shows a web-based interface for the Eastern Brook Trout Joint Venture, Delaware Patches. It features a navigation menu with tabs for Description, Data Sources, Service Profiles and Ecosystem Services, Climate Change and Ecosheds Services, AAD, Abandoned Road, Aztec Deposition, Riparian Restoration, Evaluate/Restore Pop. Package, and Manage Outreach Activities. The main content area is titled "Eastern Brook Trout Joint Venture, Delaware Patches" and contains several paragraphs of text explaining the tool's purpose and how to use it. The text describes the larger analysis, the tool's function, and provides instructions for interacting with the map.

The screenshot shows the "Riparian Restoration Decision Support Tool" interface. It features a navigation menu with tabs for Conservation Planning, Tools & Resources, Planning in Practice, Data, Training, News, and Appl.CC Home. The main content area is titled "Riparian Restoration Decision Support Tool" and contains several paragraphs of text explaining the tool's purpose and how to use it. The text describes the tool's function, its benefits, and provides instructions for interacting with the map.

The screenshot shows a map visualization tool displaying the Delaware basin focal area. The map is overlaid with a yellow outline representing the basin boundary. The interface includes a legend on the left side with various layers such as Hybrid Imagery, Terrain, Land Cover, Surface Lithology, Elevation, Base Flow Index, Mean Precipitation, Mean Max Temperature, Mean Min Temperature, SOD Deposition, Canopy Cover, Soil Class, Imperious Surface, Counties, US States, EBT JV Sites, National Forest, 10 M Stream Corridor, Watershed Assessment, Watershed Priority Scores, MUC 12, MUC 13, MUC 10, MUC 8, MUC 6, MUC 5, MUC 4, MUC 3, MUC 2, MUC 1, MUC 0, MUC -1, MUC -2, MUC -3, MUC -4, MUC -5, MUC -6, MUC -7, MUC -8, MUC -9, MUC -10, MUC -11, MUC -12, MUC -13, MUC -14, MUC -15, MUC -16, MUC -17, MUC -18, MUC -19, MUC -20, MUC -21, MUC -22, MUC -23, MUC -24, MUC -25, MUC -26, MUC -27, MUC -28, MUC -29, MUC -30, MUC -31, MUC -32, MUC -33, MUC -34, MUC -35, MUC -36, MUC -37, MUC -38, MUC -39, MUC -40, MUC -41, MUC -42, MUC -43, MUC -44, MUC -45, MUC -46, MUC -47, MUC -48, MUC -49, MUC -50, MUC -51, MUC -52, MUC -53, MUC -54, MUC -55, MUC -56, MUC -57, MUC -58, MUC -59, MUC -60, MUC -61, MUC -62, MUC -63, MUC -64, MUC -65, MUC -66, MUC -67, MUC -68, MUC -69, MUC -70, MUC -71, MUC -72, MUC -73, MUC -74, MUC -75, MUC -76, MUC -77, MUC -78, MUC -79, MUC -80, MUC -81, MUC -82, MUC -83, MUC -84, MUC -85, MUC -86, MUC -87, MUC -88, MUC -89, MUC -90, MUC -91, MUC -92, MUC -93, MUC -94, MUC -95, MUC -96, MUC -97, MUC -98, MUC -99, MUC -100. The map is displayed on a Google Maps background.



- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

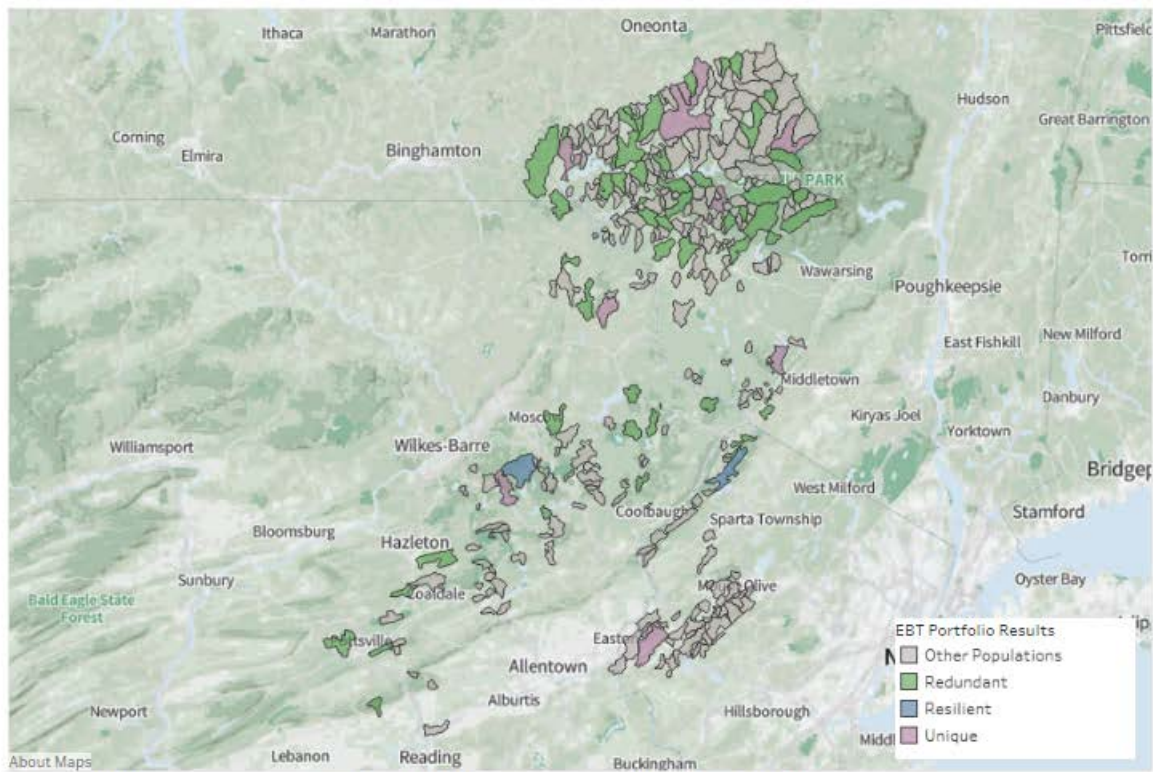
- Resiliency & Redundancy
- Both
 - Neither
 - Redundant

- Unique Life History
- Missing Data
 - Resident Not Productive
 - Unique



Use Riparian Restoration tab

All patches (no criteria)



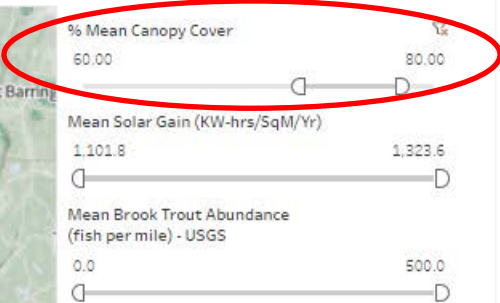
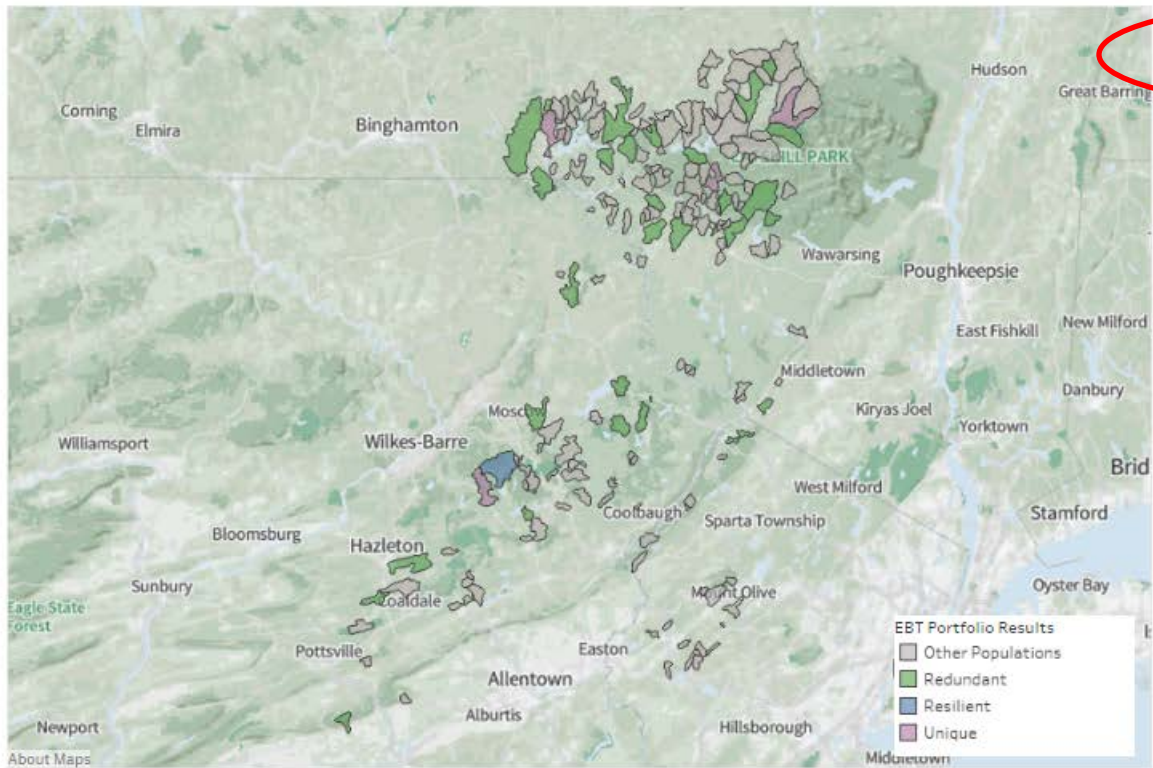
Stream temp. criterion

- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Resiliency & Redundancy
- Both
 - Neither
 - Redundant

- Unique Life History
- Missing Data
 - Resident Not Productive
 - Unique



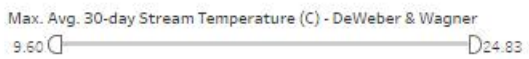


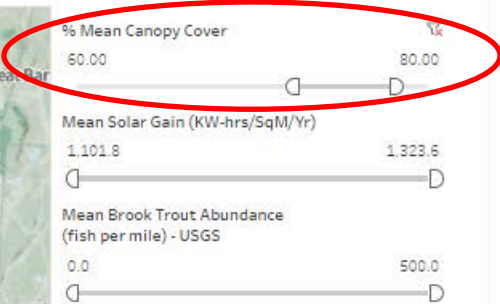
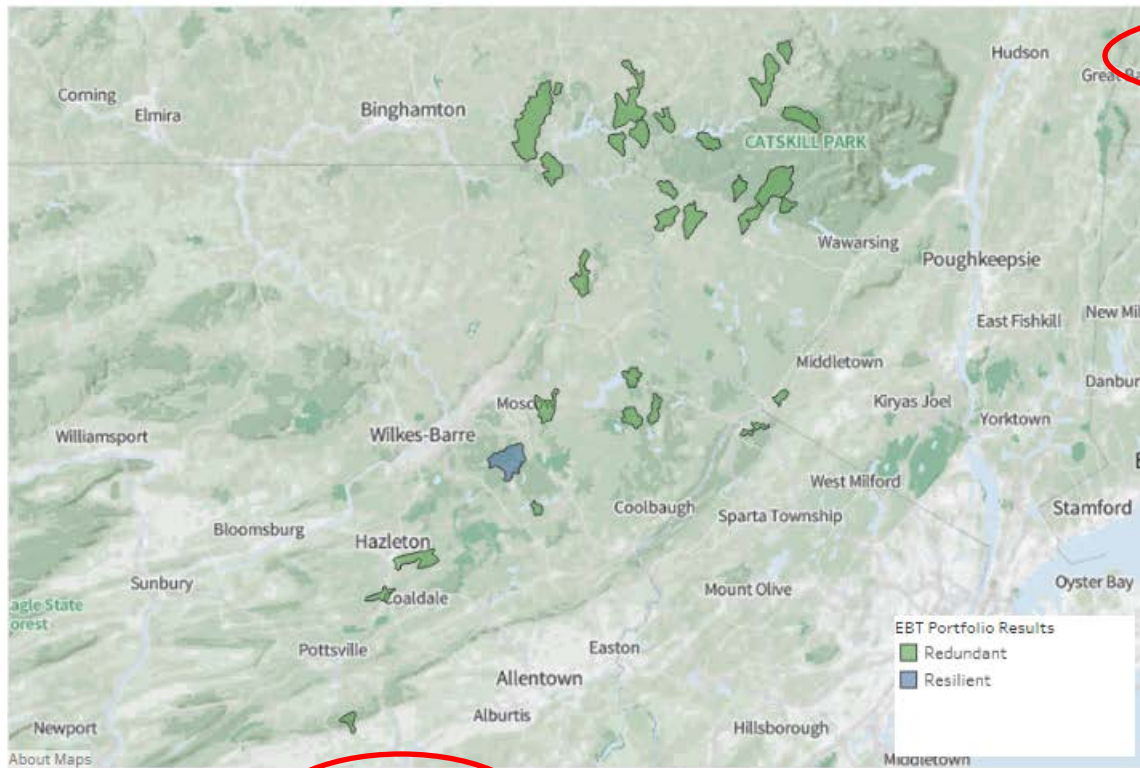
Stream temp. & riparian restoration need criteria

- Trout Community**
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Resiliency & Redundancy**
- Both
 - Neither
 - Redundant

- Unique Life History**
- Missing Data
 - Resident Not Productive
 - Unique





- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, ENT, & RBT

- Resiliency & Redundancy
- Both
 - Neither
 - Redundant

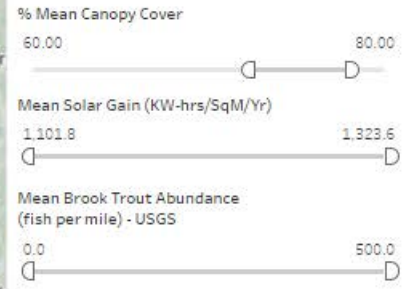
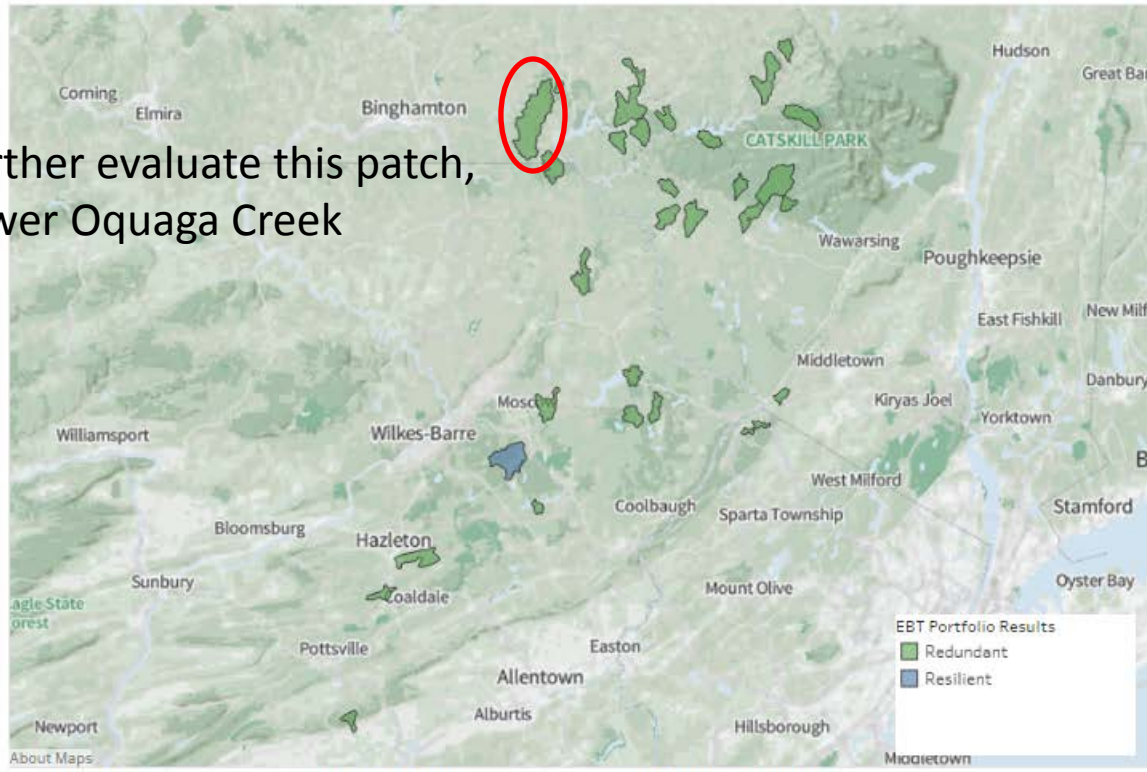
- Unique Life History
- Missing Data
 - Resident Not Productive
 - Unique



Stream temp., riparian restoration need & portfolio criteria

(Other criteria can be added to further refine priorities)

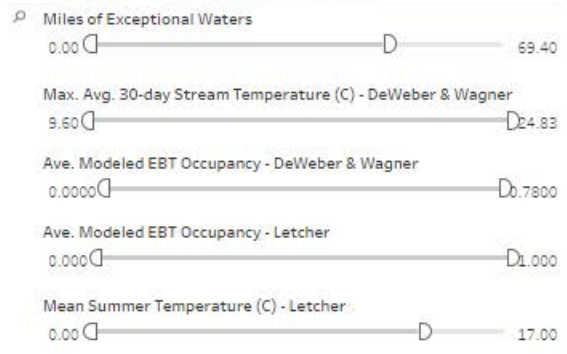
Further evaluate this patch, Lower Oquaga Creek



- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Resiliency & Redundancy
- Both
 - Neither
 - Redundant

- Unique Life History
- Missing Data
 - Resident Not Productive
 - Unique



Description | *Data Sources* | *Secure Portfolio Elements*

Watershed Name: Lower West Branch Delaware River
Subwatershed Name: Lower Oquaga Creek

All Filters
Portfolio Results: Redundant
Trout Community: Sympatric EBT & BNT
Life History: Migratory river and lake
Mi of Exceptional Wtrs: 69.40
Ave Modeled EBT Occ - Letcher: 0.5800
Mean Summer Temp (C) - Letcher: 16.52
Max Ave 30-day Strm Temp (C) - DeWeber & Wagner: 17.800
Ave Modeled EBT Occ - DeWeber & Wagner: 0.4600
Mean EBT Ab (fish per mile) - USGS: 21.0
Allopatric EBT Hab Extent (km): 8.22

Secure Portfolio Elements
% Fed, St, Local & Private Cons Land: 11.00
% Ag Land: 16.00
% Imp Surface: 0.000
% Rip Forest Cov: 80.00

Climate Change & Ecosystem Services
% Strm Network Overlap w/ Karst: 0.00
Index of Importance to Drinking Water (F2F): 73.00
% Pop. Proxiplan: 10.00
Ave Prob of EBT Occ w/ +2C - Letcher: 0.4400
Ave Prob of EBT Occ w/ +4C - Letcher: 0.3100

AMD, Abandoned Mine Lands, Acid Drainage
Ac Aband Mine Lands: 0
Mi 303d for AMD: 0.000
Mean Acid Dep (kg/ha): 1.5000

Riparian Restoration
% Mean Canopy Cover: 68.34
Mean Solar Gain: (KW-hrs/SqM/Yr): 1,245.5

Evaluate/Restore Fish Passage
Complete Barriers: 1
Road-Stream Crossings: 0.540
Fragmentation Index: 1.0000
Sum of Norm Impact Index - Barriers: 632.0
Mean of Norm Impact Index - Barriers: 5.850
Culvert Inventory Status: Incomplete

Mitigate Sedimentation & Nutrients
Road Dens (km/km2): 2.420
Mi of 303d Sed: 0.000
Mi 303d Nutr: 0

Watershed Designations
Ac Grndwater Prot. Area: 0
Ac Special Prot. Wtrs Zone: 32,187
Ac Priority Hw Rip. Patches: 15
Ac Priority Hw Catchments: 0
Ac Floodplain Patches: 42.0
Ac Tier 1 Priority Cons Watersheds: 0
Mi Least Disturbed Streams: 0.96

[ArcGIS Online | See more data](#)
[DRWI | Reports and Maps](#)
[EBTJV Data & Tools | Riparian Restoration Decision Support](#)
[Ecosystems | Interactive Catchment Explorer](#)

✓ Keep Only ✕ Exclude

Riparian Restoration | **Evaluate/Restore Fish Passage** | **Mitigate Sediment and Nutri**

% Mean Canopy Cover: 60.00 to 88.39

Mean Solar Gain (KW-hrs/SqM/Yr): 1,101.8 to 1,323.6

Mean Brook Trout Abundance (fish/mile) - USGS: 0.0 to 500.0

EBTJVc

Allopatric EBT
 Sympatric EBT & BNT
 Sympatric EBT & RBT
 Sympatric EBT, BNT, & RBT

Resiliency & Redundancy

Both
 Neither
 Redundant

Unique Life History

Missing Data
 Resident Not Productive
 Unique

Moderate probability of EBT persistence under future climate scenarios (which can be elevated w/ restoration of riparian conditions)

Direct access to Riparian Decision Support Tool for evaluating on-the-ground opportunities

Within Riparian Restoration Decision Support tool, zoom to NE PA

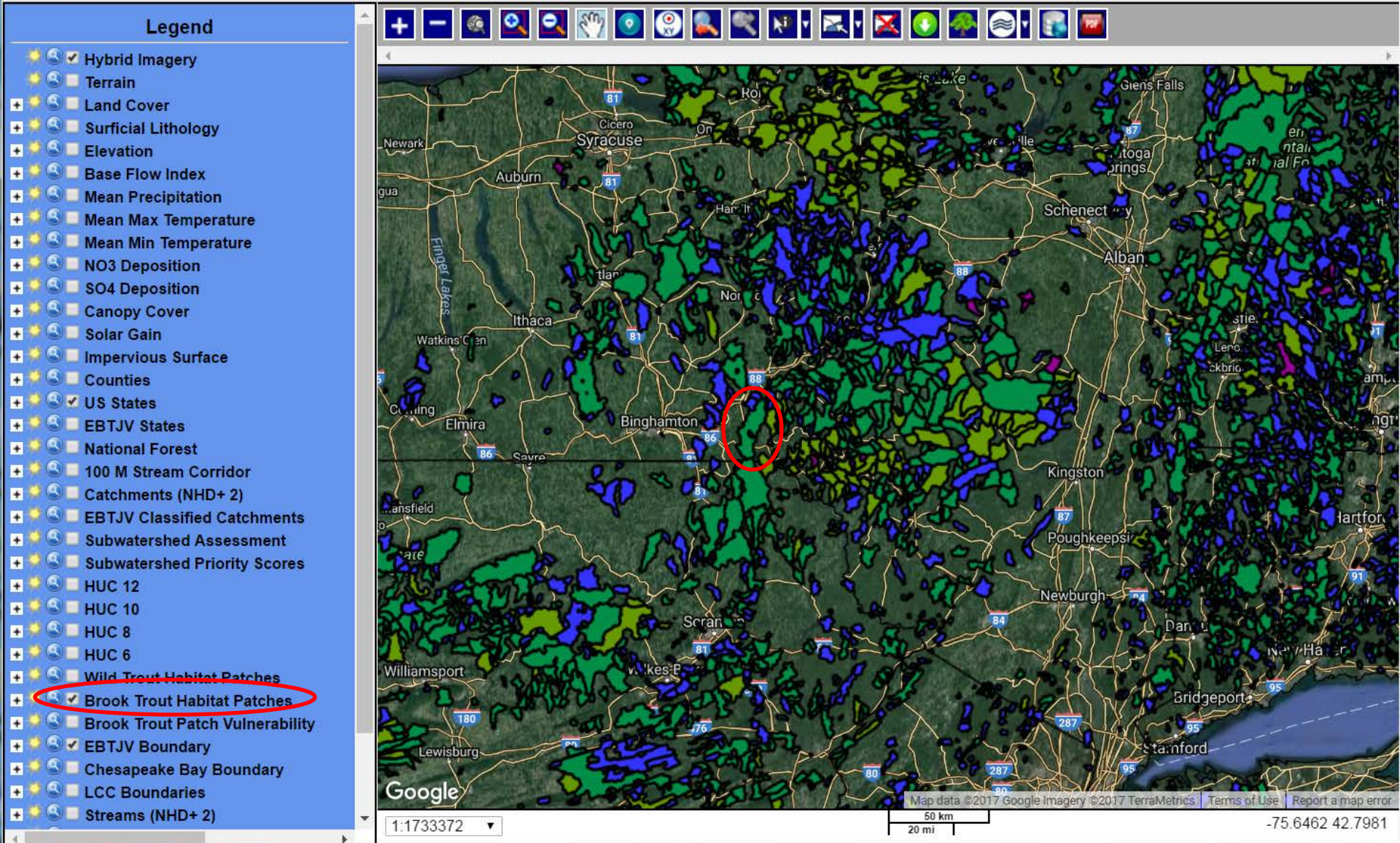
Legend

- Hybrid Imagery
- Terrain
- Land Cover
- Surficial Lithology
- Elevation
- Base Flow Index
- Mean Precipitation
- Mean Max Temperature
- Mean Min Temperature
- NO3 Deposition
- SO4 Deposition
- Canopy Cover
- Solar Gain
- Impervious Surface
- Counties
- US States
- EBTJV States
- National Forest
- 100 M Stream Corridor
- Catchments (NHD+ 2)
- EBTJV Classified Catchments
- Subwatershed Assessment
- Subwatershed Priority Scores
- HUC 12
- HUC 10
- HUC 8
- HUC 6
- Wild Trout Habitat Patches
- Brook Trout Habitat Patches
- Brook Trout Patch Vulnerability
- EBTJV Boundary
- Chesapeake Bay Boundary
- LCC Boundaries
- Streams (NHD+ 2)

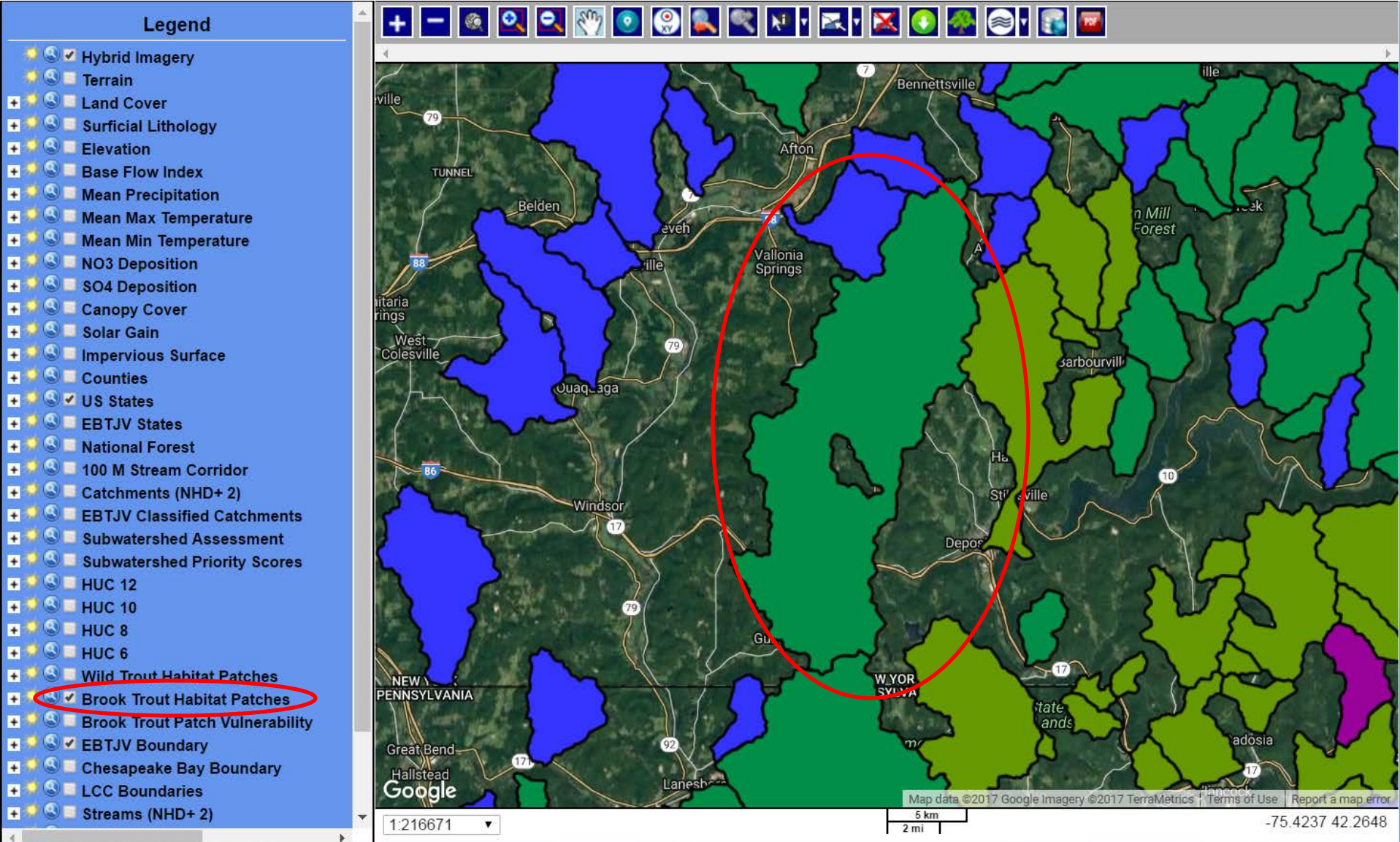
Map data ©2017 Google Imagery ©2017 TerraMetrics Terms of Use Report a map error

Scale: 1:1733372 | 50 km / 20 mi | Coordinates: -76.6240 43.3038

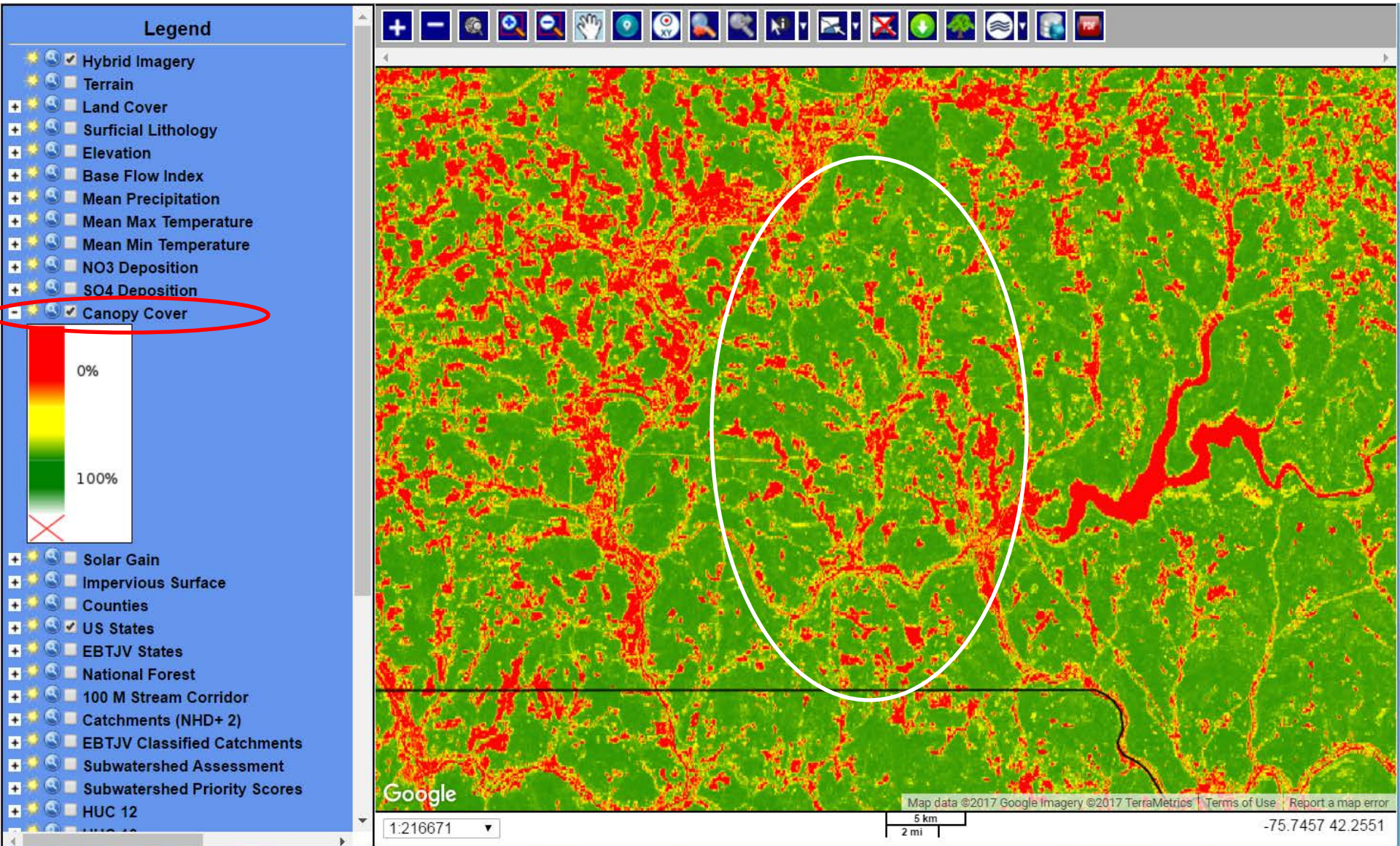
Locate patch of interest



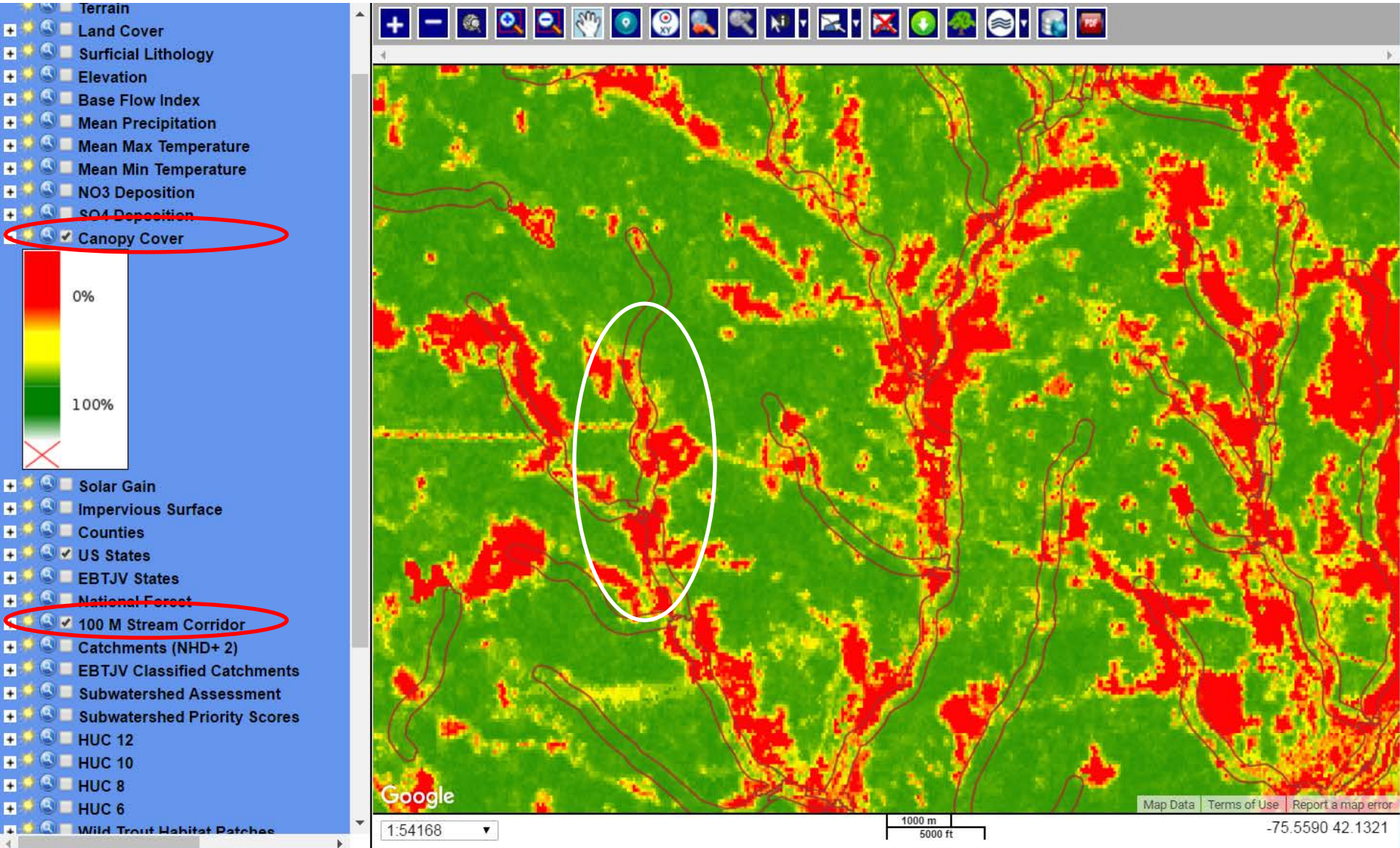
Locate patch of interest



Turn on canopy cover layer



Turn on stream corridor, zoom to area with low canopy cover in corridor



Turn off canopy cover and explore aerial imagery

Legend

- Hybrid Imagery
- Terrain
- Land Cover
- Surficial Lithology
- Elevation
- Base Flow Index
- Mean Precipitation
- Mean Max Temperature
- Mean Min Temperature
- NO3 Deposition
- SO4 Deposition
- Canopy Cover
- Solar Gain
- Impervious Surface
- Counties
- US States
- EBTJV States
- National Forest
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- Catchments (NHD+ 2)
- EBTJV Classified Catchments
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- HUC 12
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- Wild Trout Habitat Patches
- Brook Trout Habitat Patches
- Brook Trout Patch Vulnerability
- EBTJV Boundary
- Chesapeake Bay Boundary
- LCC Boundaries
- Streams (NHD+ 2)

Map data ©2017 Google Imagery ©2017, DigitalGlobe, New York GIS, USDA Farm Service Agency Terms of Use Report a map error

1:3385 100 m 200 ft -75.5258 42.0890

Example 2: Evaluating restoration needs of EBT patches in a particular geography

In this example, EBT populations are evaluated through the lens of a particular funding source, the National Fish and Wildlife Foundation's Delaware River Restoration Fund. Upper Lehigh Basin EBT populations are selected using the DE basin focal area visualization tool and compared within an Excel spreadsheet table.



Delaware River Restoration Fund *continued*

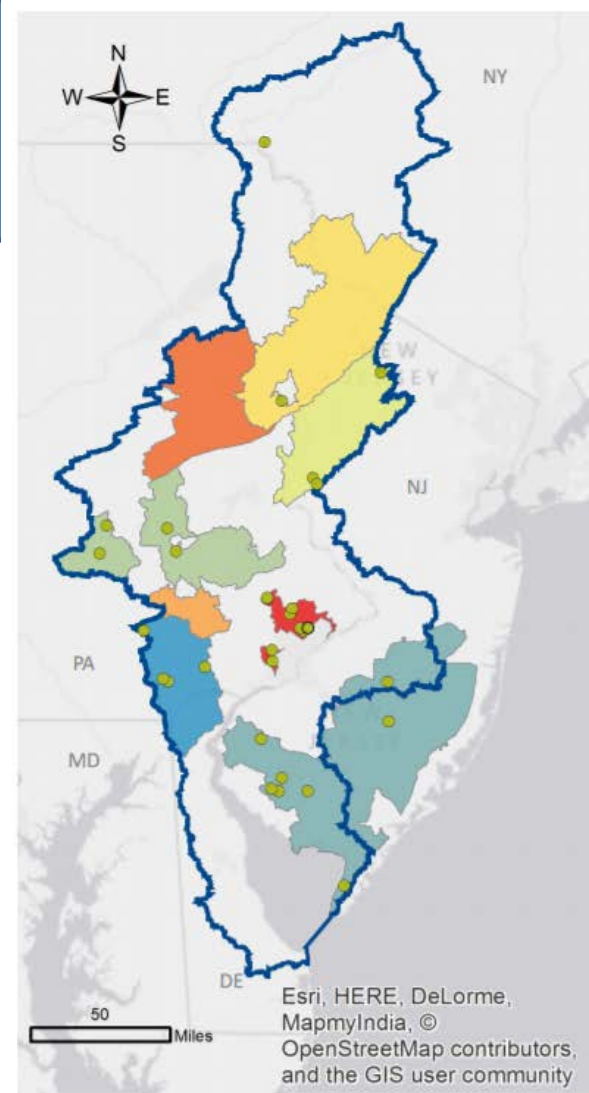
GOALS AND OBJECTIVES

The goals of the DRRF include:

- Increase delivery of agriculture BMPs to reduce nutrient and sediment loads
- Expand conservation outreach to new farmers and landowners
- Restore stream banks, shoreline and wetlands
- Establish, expand and improve riparian buffers
- Promote and install green stormwater infrastructure BMPs and reduce suburban runoff
- Improve municipal policies for green stormwater infrastructure
- Reach, train and provide technical assistance to new audiences
- Engage significant numbers of new volunteers

The DRRF's investments are targeted primarily to DRWI "Clusters," sub-watersheds within the broader Delaware River Watershed where investments in restoration are expected to realize the greatest return. These geographies include important habitat and are critical for improving water quality.

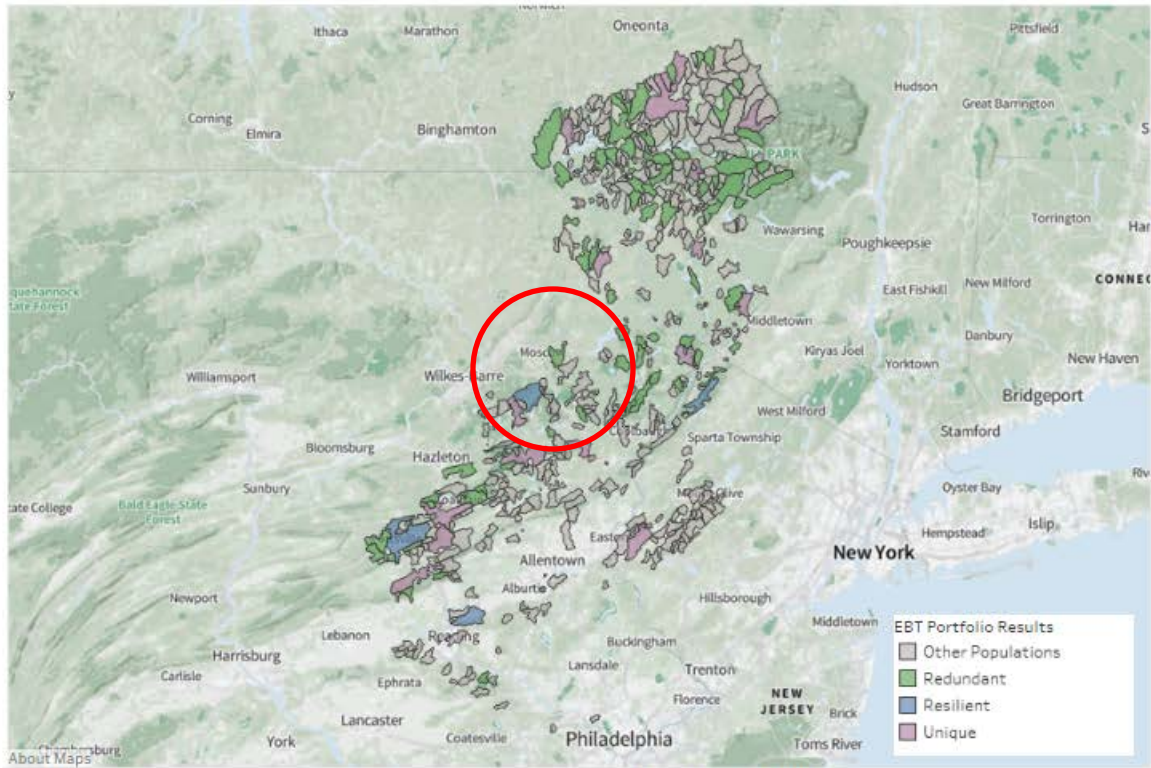
The strategy for restoration in these places is determined by a team of local partners with on-the-ground knowledge of conservation needs and opportunities. The DRRF awards grants to projects that address these strategies.



CONSERVATION IN THE DELAWARE WATERSHED

In its first two years, the fund has invested a total of \$4.45 million in 30 projects (shown as green dots in the map above) to improve water quality and restore habitats. DRWI targeted geographies include:

- Poconos and Kittatinny
- Upper Lehigh
- New Jersey Highlands
- Middle Schuylkill
- Schuylkill Highlands
- Upstream Suburban Philadelphia
- Brandywine and Christina
- Kirkwood Cohansey Aquifer



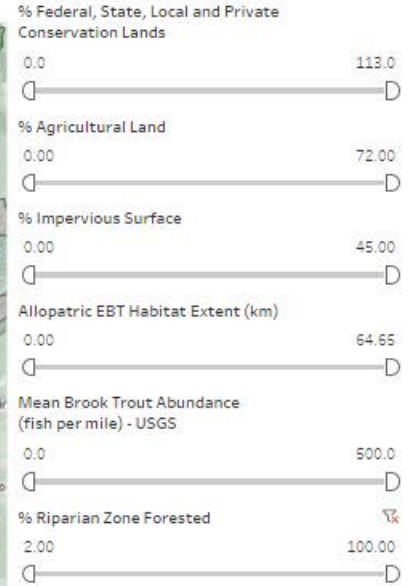
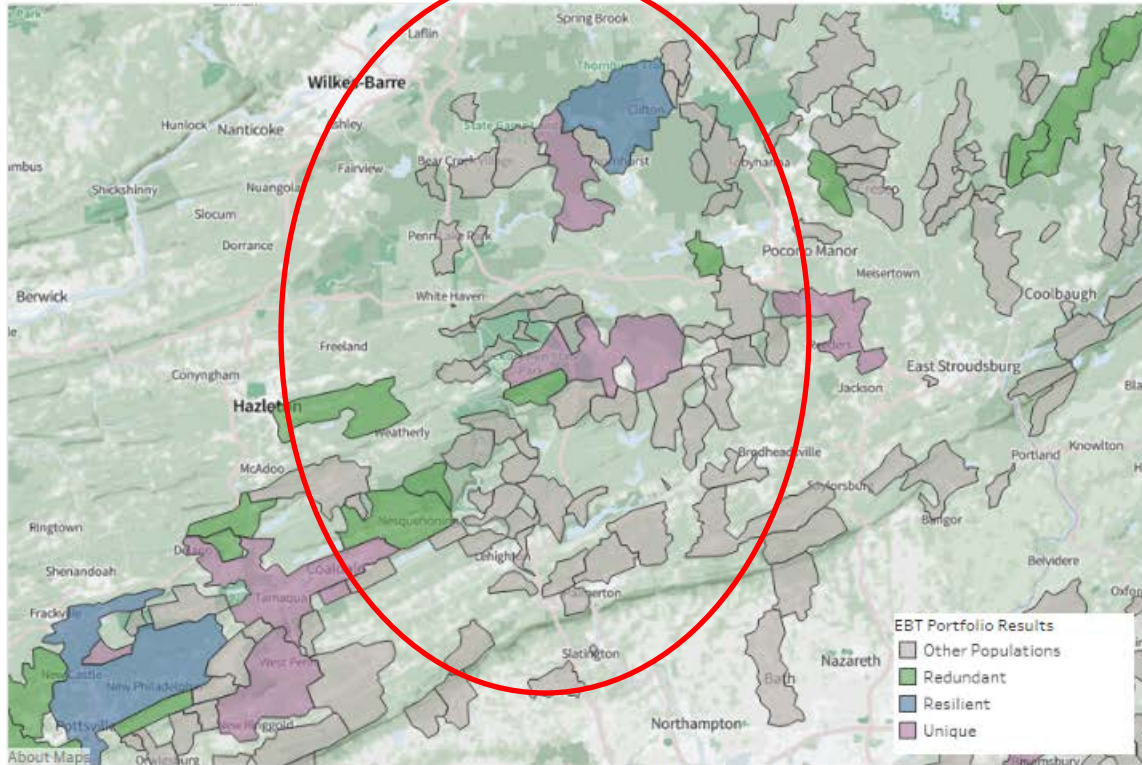
Zoom to Upper Lehigh in the Secure Portfolio Elements tab

- Trout Community**
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Resiliency & Redundancy**
- Both
 - Neither
 - Redundant

- Unique Life History**
- Missing Data
 - Resident Not Productive
 - Unique

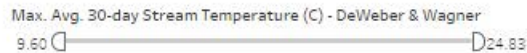




- Trout Community**
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

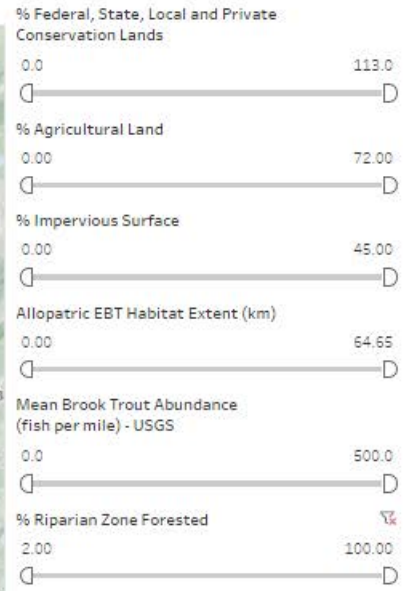
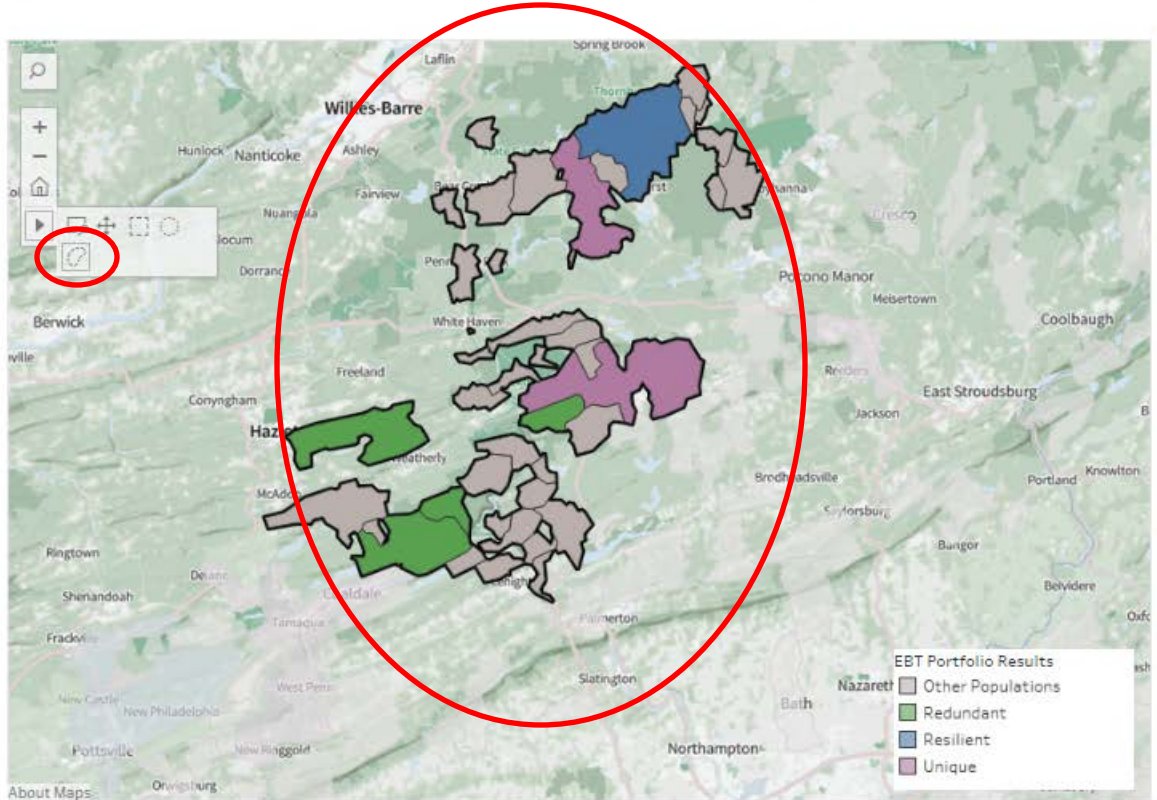
- Resiliency & Redundancy**
- Both
 - Neither
 - Redundant

- Unique Life History**
- Missing Data
 - Resident Not Productive
 - Unique



Max. Summer Temperature (C) - Letcher

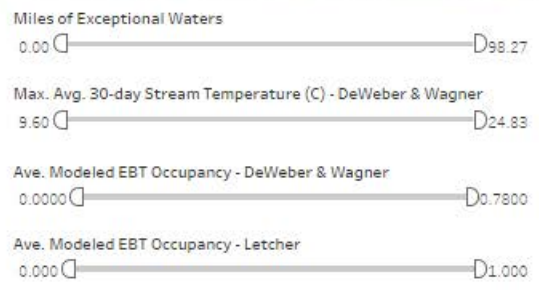
Zoom to Upper Lehigh in the Secure Portfolio Elements tab



- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Resiliency & Redundancy
- Both
 - Neither
 - Redundant

- Unique Life History
- Missing Data
 - Resident Not Productive
 - Unique



Use the select by lasso tool to select Upper Lehigh populations

←
Description
Data Sources
Secure Portfolio Elements
Climate and Ecosystem Services
→

Evaluate/Restore Fish Passage
Mitigate Sedimentation and Nutrients

Watershed Name: Middle Lehigh River
Subwatershed Name: Mud Run

All Filters
 Trout Community: Sympatric EBT & BNT
 Resiliency & Redundancy: None
 Life History: Migratory river
 MI. of Exceptional Waters:
 Max. Avg. 30-day Stream Temperature (C) - DeWeber & Wagner: 19.25
 Ave. Modeled EBT Occupancy - Letcher:
 Ave. Modeled EBT Occupancy - DeWeber & Wagner:
 Mean Brook Trout Abundance (fish per mile) - USGS:
 Allopatric EBT Habitat Extent (km):
 TEST: 0

Secure Portfolio Elements
 % Federal, State, Local and Private Conservation Land:
 % Ag. Land:
 % Impervious Surface:
 % Allopatric EBT Habitat Extent (km):

Climate Change & Ecosystem Services
 % Stream Network Overlap w/ Karst:
 Index of Importance to Drinking Water (F2F):
 % Dev. Floodplain:
 Mean Summer Temperature (C) - Letcher:
 Ave. Probability of EBT Occupancy w/ +2C - Letcher:
 Ave. Probability of EBT Occupancy w/ +4C - Letcher:

Riparian Restoration
 % Rip. Canopy Cover:
 % Mean Canopy Cover:
 Mean Solar Gain: (KW-hrs/SqM/Yr):

Evaluate/Restore Fish Passage
 # Barriers:
 Fragmentation Index:
 Sum of Norm. Impact Index for Barriers:
 Culvert Inventory Status:

Mitigate Sedimentation & Nutrients
 Miles of 303(d)-listed Sedimentation:
 Miles 303(d)-listed Nutrients:

Watershed Designations
 Ac. Grndwater Prot. Area:
 Ac. Special Prot. Wtrrs Zone:
 Ac. Priority Headwaters Rip. Patches:
 Ac. Priority Headwater Catchments:
 Ac. Floodplain Patches:

Federal, State, Local and Private Conservation Lands
113.0

Agricultural Land
72.00

Impervious Surface
45.00

Allopatric EBT Habitat Extent (km)
64.65

Mean Brook Trout Abundance per mile) - USGS
500.0

Riparian Zone Forested
100.00

Trout Community

- Allopatric EBT
- Sympatric EBT & BNT
- Sympatric EBT & RBT
- Sympatric EBT, BNT, & RBT

Resiliency & Redundancy

- Both
- Neither
- Redundant

Unique Life History

- Missing Data
- Resident Not Productive
- Unique

Miles of 303(d)-listed Sedimentation: 0.00

Miles 303(d)-listed Nutrients: 9.60

Max. Avg. 30-day Stream Temperature (C) - DeWeber & Wagner: 19.25

Ave. Modeled EBT Occupancy - DeWeber & Wagner: 0.0000 — 0.7800

Ave. Modeled EBT Occupancy - Letcher: 0.000 — 1.000

Mean Summer Temperature (C) - Letcher: 19.25 — 20.00

919 items selected - SUM of AVG(Longitude): -69,580,016

Keep Only Exclude [Matrix Icon]

Hover over a selected patch and then click on the matrix icon at the bottom of the pop-up to download tabular data for selected populations

Download tabular data, open in Excel, remove duplicate records following the instructions in the General User's Guide, and filter to just Upper Lehigh and Middle Lehigh HUC10 watersheds

View Data - Google Chrome

Secure | https://public.tableau.com/vizq/w/EBTJVDelawarePatches/v/Story/viewData/sessions/5D6A996B23A74BE580C25FC453645CB2-0-0/views/17959594089844235404_141175872!

Summary Full data

Showing first 200 rows.
Download all rows as a text file

app_url

File Home Insert Page Layout Formulas Data Review View Acrobat

From Access From Web From Text From Other Sources Existing Connections Refresh Properties Edit Links Connections Filter Reapply Sort Filter Reapply Advanced Text to Columns Remove Duplicates Data Validation Consolidate What-If Analysis Group Ungroup Subtotal

G21 Middle Lehigh River

	A	B	C	D	E	F	G	H	I	J	
1	app_url	Port ID	portf	cntMon	culInVst	EBTJvc	huc10	huc12	Lifestat	portf	%ag
2	http://trout.map MidAtl_2339	Unique	7	Incomplete	Sympatric EBT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique		
3	http://trout.map MidAtl_2112	Other Population	1	Incomplete	Allopatric EBT	Upper Lehigh River	Headwaters Lehigh River	Resident less pro	Other Population		
4	http://trout.map MidAtl_2111	Other Population	1	Incomplete	Allopatric EBT	Upper Lehigh River	Wright Creek-Lehigh River	Resident less pro	Other Population		
5	http://trout.map MidAtl_2110	Other Population	0	Incomplete	Allopatric EBT	Upper Lehigh River	Headwaters Lehigh River	Resident less pro	Other Population		
6	http://trout.map MidAtl_2109	Other Population	0	Incomplete	Allopatric EBT	Upper Lehigh River	Bear Creek	Resident less pro	Other Population		
7	http://trout.map MidAtl_2108	Other Population	0	Incomplete	Sympatric EBT	Upper Lehigh River	Headwaters Lehigh River	Resident less pro	Other Population		
8	http://trout.map MidAtl_1720	Other Population	1	Incomplete	Allopatric EBT	Middle Lehigh River	Mud Run	Resident less pro	Other Population		
9	http://trout.map MidAtl_1719	Other Population	2	Incomplete	Sympatric EBT	Middle Lehigh River	Mauch Chunk Creek-Lehigh River	Resident less pro	Other Population		
10	http://trout.map MidAtl_1718	Other Population	0	Incomplete	Sympatric EBT	Middle Lehigh River	Mauch Chunk Creek-Lehigh River	Resident less pro	Other Population		
11	http://trout.map MidAtl_1715	Other Population	1	Incomplete	Sympatric EBT	Upper Lehigh River	Wright Creek-Lehigh River	Resident less pro	Other Population		
12	http://trout.map MidAtl_1707	Other Population	1	Incomplete	Sympatric EBT	Middle Lehigh River	Mauch Chunk Creek-Lehigh River	Resident less pro	Other Population		
13	http://trout.map MidAtl_1705	Redundant	2	Incomplete	Allopatric EBT	Middle Lehigh River	Stony Creek-Lehigh River	Resident less pro	Redundant		
14	http://trout.map MidAtl_1704	Other Population	3	Incomplete	Allopatric EBT	Middle Lehigh River	Stony Creek-Lehigh River	Resident less pro	Other Population		
15	http://trout.map MidAtl_1464	Other Population	0	Incomplete	Sympatric EBT	Upper Lehigh River	Headwaters Lehigh River	Resident less pro	Other Population		
16	http://trout.map MidAtl_1463	Other Population	3	Incomplete	Sympatric EBT	Upper Lehigh River	Headwaters Lehigh River	Resident less pro	Other Population		
17	http://trout.map MidAtl_1167	Other Population	9	Incomplete	Sympatric EBT	Middle Lehigh River	Black Creek-East Side of Lehigh R	Resident less pro	Other Population		
18	http://trout.map MidAtl_1165	Other Population	2	Incomplete	Sympatric EBT	Middle Lehigh River	Quakake Creek	Resident less pro	Other Population		
19	http://trout.map MidAtl_1163	Other Population	3	Incomplete	Sympatric EBT	Middle Lehigh River	Stony Creek-Lehigh River	Resident less pro	Other Population		
20	http://trout.map MidAtl_1162	Other Population	0	Incomplete	Sympatric EBT	Middle Lehigh River	Stony Creek-Lehigh River	Resident less pro	Other Population		
21	http://trout.map MidAtl_1160	Redundant	3	Incomplete	Allopatric EBT	Middle Lehigh River	Nesquehoning Creek	Resident less pro	Redundant		
22	http://trout.map MidAtl_1159	Redundant	0	Incomplete	Allopatric EBT	Middle Lehigh River	Hazle Creek	Resident less pro	Redundant		
23	http://trout.map MidAtl_1158	Other Population	3	Incomplete	Sympatric EBT	Middle Lehigh River	Stony Creek-Lehigh River	Resident less pro	Other Population		
24	http://trout.map MidAtl_1154	Other Population	4	Incomplete	Sympatric EBT	Upper Lehigh River	Wright Creek-Lehigh River	Resident less pro	Other Population		
25	http://trout.map MidAtl_1153	Other Population	1	Incomplete	Sympatric EBT	Pohopoco Creek	Beltzville Lake-Pohopoco Creek	Resident less pro	Other Population		
26	http://trout.map MidAtl_971	Other Population	5	Incomplete	Sympatric EBT	Upper Lehigh River	Bear Creek	Resident less pro	Other Population		
27	http://trout.map MidAtl_970	Other Population	1	Incomplete	Sympatric EBT	Upper Lehigh River	Bear Creek	Resident less pro	Other Population		
28	http://trout.map MidAtl_968	Resilient	7	Incomplete	Sympatric EBT, B	Upper Lehigh River	Headwaters Lehigh River	Migratory river	Resilient		
29	http://trout.map MidAtl_809	Redundant	12	Incomplete	Sympatric EBT	Middle Lehigh River	Nesquehoning Creek	Migratory river	Redundant		
30	http://trout.map MidAtl_806	Unique	8	Incomplete	Sympatric EBT	Middle Lehigh River	Mud Run	Migratory river	Unique		
31	http://trout map MidAtl_66R	Other Population	0	Incomplete	Sympatric EBT	Upper Lehigh River	Wright Creek-Lehigh River	Miscellaneous stream	Other Population		
26	MidAtl_2339	Unique	7	Incomplete	Sympatric EBT & BNT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique	41.19486	-75.665933
27	MidAtl_2339	Unique	7	Incomplete	Sympatric EBT & BNT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique	41.193015	-75.669792
28	MidAtl_2339	Unique	7	Incomplete	Sympatric EBT & BNT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique	41.194165	-75.673514
29	MidAtl_2339	Unique	7	Incomplete	Sympatric EBT & BNT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique	41.202634	-75.678418
30	MidAtl_2339	Unique	7	Incomplete	Sympatric EBT & BNT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique	41.206616	-75.675585
31	MidAtl_2339	Unique	7	Incomplete	Sympatric EBT & BNT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique	41.208795	-75.670714
32	MidAtl_2339	Unique	7	Incomplete	Sympatric EBT & BNT	Upper Lehigh River	Wright Creek-Lehigh River	Migratory river	Unique	41.217504	-75.665216

Looking populations in the Upper and Middle Lehigh, the following habitat condition or future threat attributes stand out. Conditions are listed with restoration actions in parenthesis, and *italicized* if they align with an activity eligible for NFWF funding:

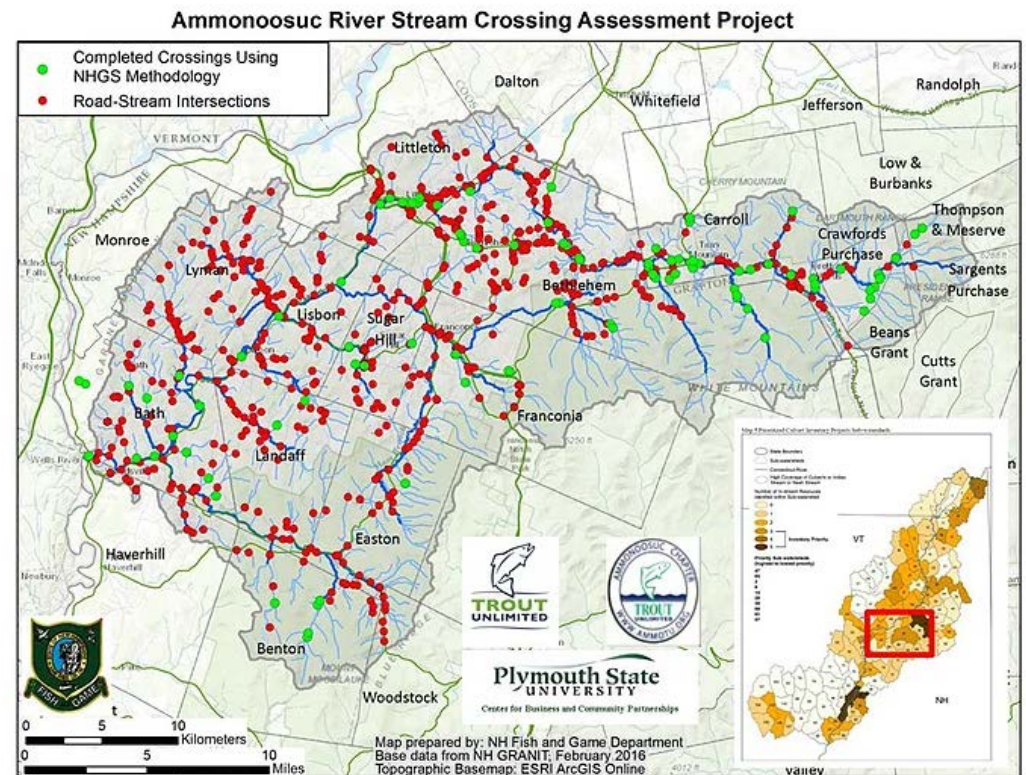
- All populations meeting portfolio criteria for resiliency, redundancy, or unique life history (Hazle Cr., Nesquehoning Cr., Mud Run, Wright Cr., Stony Cr., Headwaters Lehigh) have incomplete barrier assessments (barrier assessment)
- *2 redundant populations have 1% agricultural lands (Hazle Cr. and Nesquehoning Cr.) and 4 other populations have 10-30% agricultural lands (agricultural BMPs)*
- *2 redundant populations have 2-5% impervious surfaces (Hazle Cr. and Nesquehoning Cr.; stormwater runoff BMPs)*
- 2 redundant populations have abandoned mine lands, 303d listing, and lower amounts of forested riparian zones (Hazle Cr. and Nesquehoning Cr.; AMD restoration or treatment and reforestation of abandoned lands)
- 2 redundant populations (Wright Cr. and Stony Cr.) have around 40% public or private conservation lands (conservation easements around public lands)
- *1 unique life history population (Mud Run) falls within the proposed path of a natural gas pipeline (citizen science and monitoring)*

Example 3: Placing a local restoration effort within a range-wide brook trout context

In this example, we evaluate several potential culvert removal projects in the Ammonoosuc River basin of NH and show how the conservation portfolio and range-wide assessment results can be used to articulate project value to brook trout. This process may assist entities that conduct culvert replacement work (such as towns or counties) in accessing information about local brook trout fisheries values.

Process:

- Use conservation portfolio and range-wide assessment map viewer to overlay a recent barrier survey to place a local restoration opportunity within a broader brook trout conservation context using patch habitat condition and future security percentile scores.



Open the Eastern Brook Trout Conservation Portfolio and Rangewide Assessment map application:

<http://www.arcgis.com/apps/webappviewer/index.html?id=f70da52f45304ab8be440885d32d3866>

EBT Rangewide Analysis with Web AppBuilder for ArcGIS Esri World Geocoder

Welcome to the EBT Rangewide Assessment web mapping application.

To interact with the map, simply pan and zoom with your mouse controls or with the zoom controls on the left of the map pane. You can search for place names in the 'Search locations' textbox.

Several widgets are provided in the bottom center. Hover over each and a description will appear. Click 'Legend' to view a legend which will help interpret map layers. Click 'Layer List' to view a list of the layers and turn them on and off. Most layers are turned off by default. Click 'Basemap Gallery' to pick a new basemap layer. Basemaps that may be particularly interesting to you are the 'USA Topographic' basemap (USGS topo quads) and the 'Imagery' basemap, which provides very high resolution aerial imagery and resolves to higher resolution as you zoom in. Finally, there are four filtering widgets that can be used to apply thresholds to four of the layers.

Within the layer list, keep in mind that many layers are grouped. Anytime there is a small arrow/triangle next to the layer name you can click the layer name and further expand the group.

You can also view the table for layers that are turned on in the map by clicking the 'Attribute Table' widget at the bottom right.

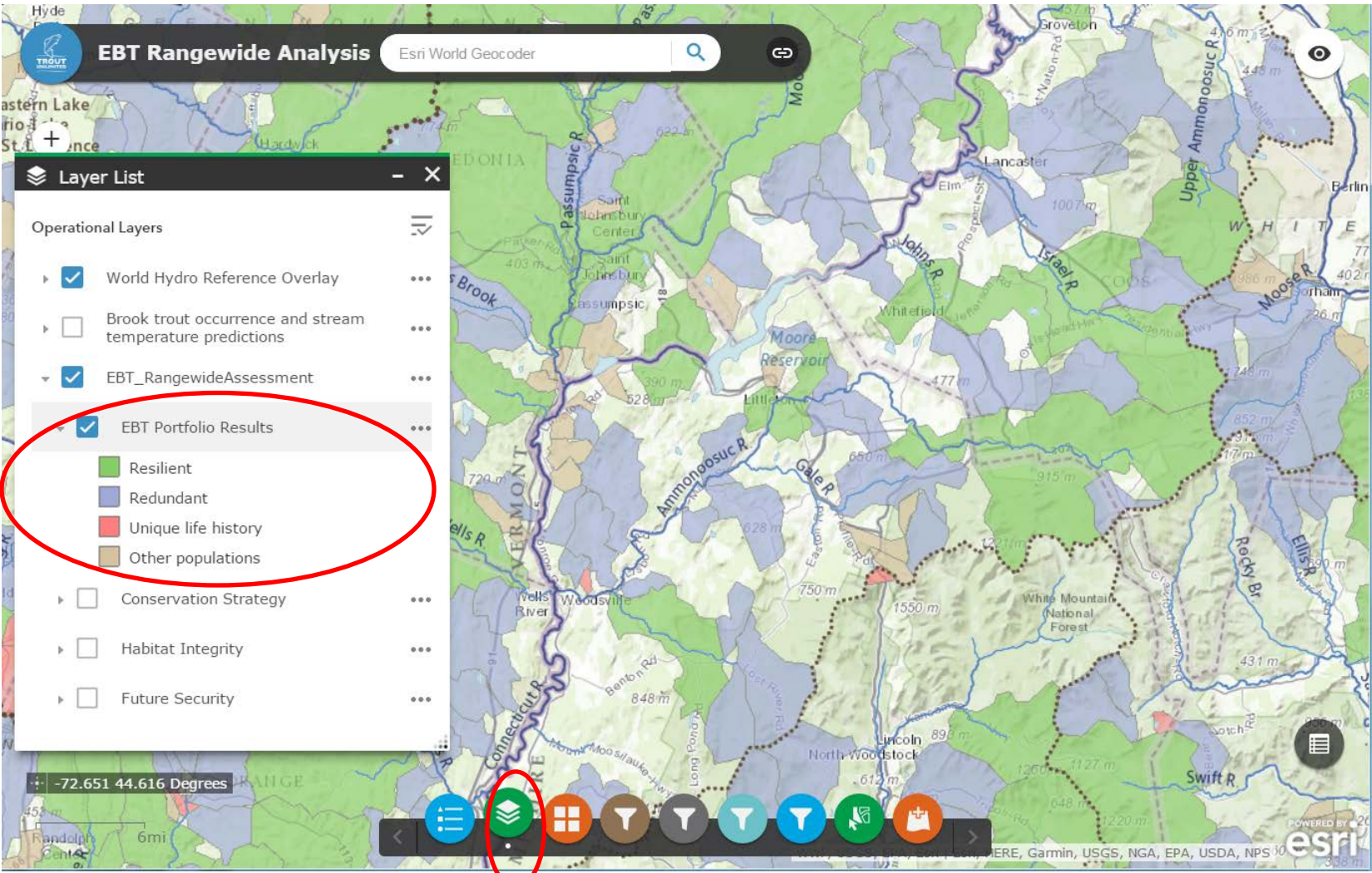
Do not show this splash screen again.

OK

Move mouse to get coordinates

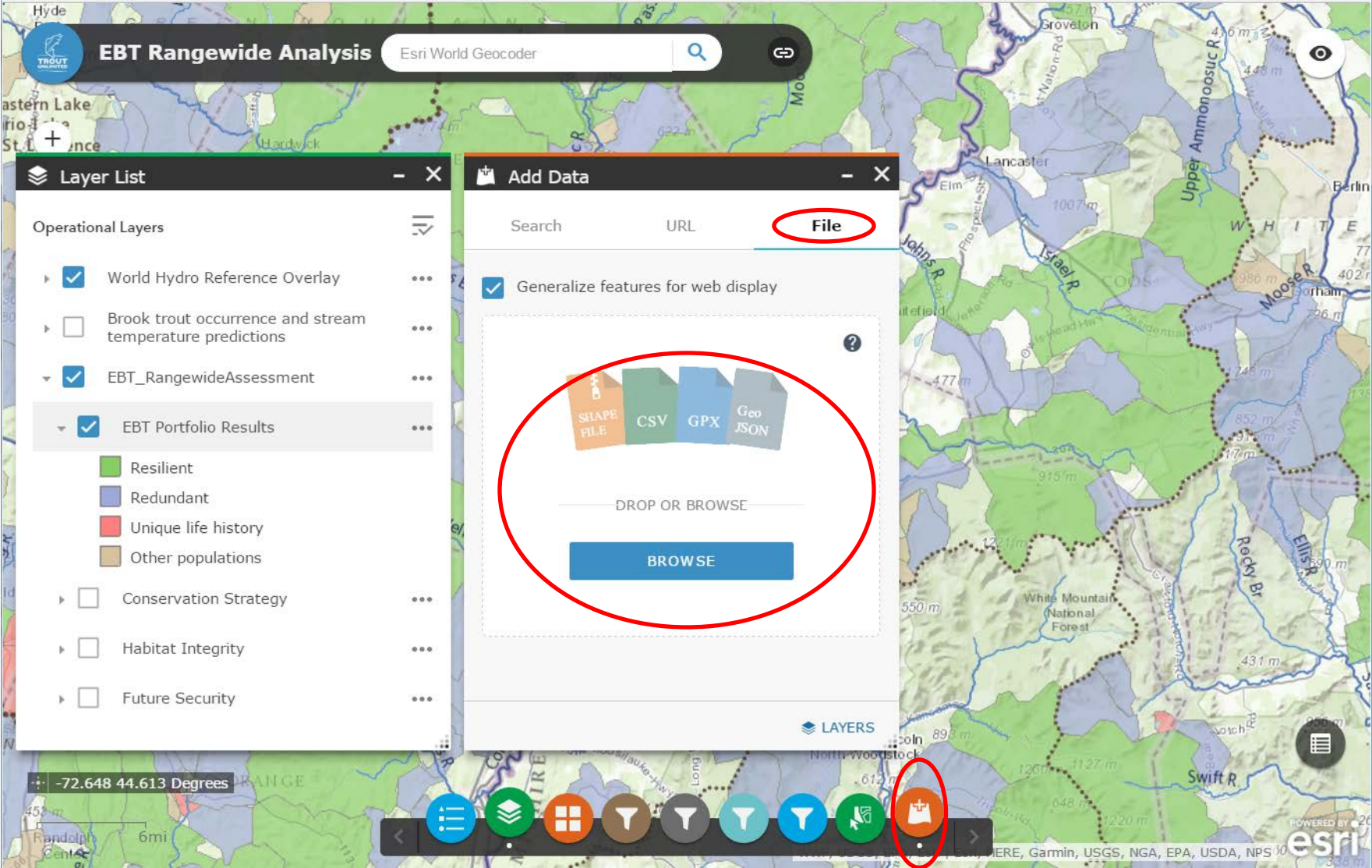
POWERED BY esri

Zoom to the Ammonoosuc River basin and change the visible layer in the layer list to show the portfolio results – resilient (green) and redundant (blue) brook trout populations are populations that TU has identified as highly likely to be viable in the long-term based on the amount of connected habitat available to populations based on the Conservation Portfolio analysis.



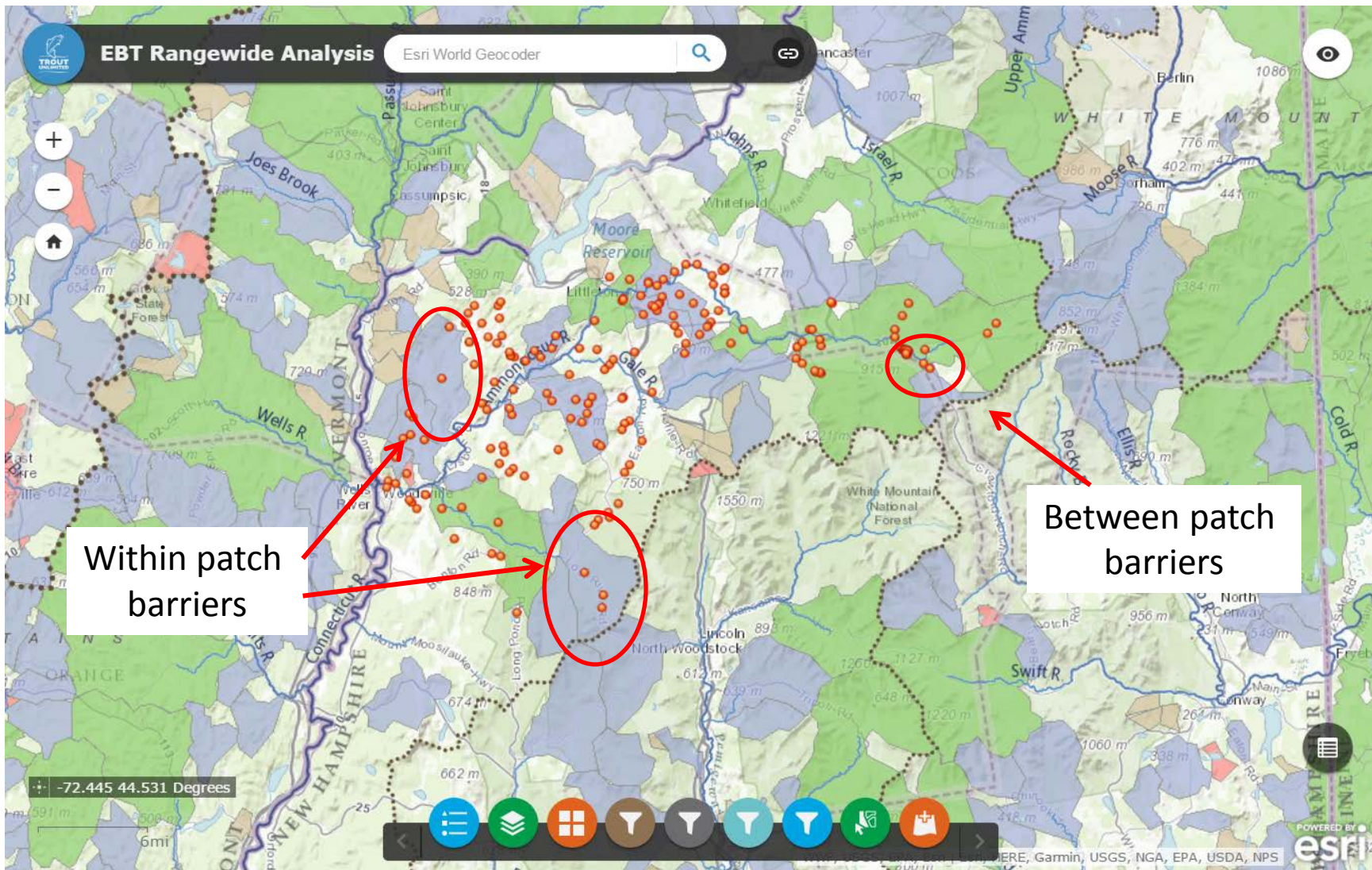
Layers tool

Add a local barrier survey dataset. The dataset we are using was provided as an excel spreadsheet – to make it visible in the map and limit the amount of data shown, filter the dataset to just show crossings with “Reduced AOP” status, save the dataset as a .csv file, and drag onto the map.

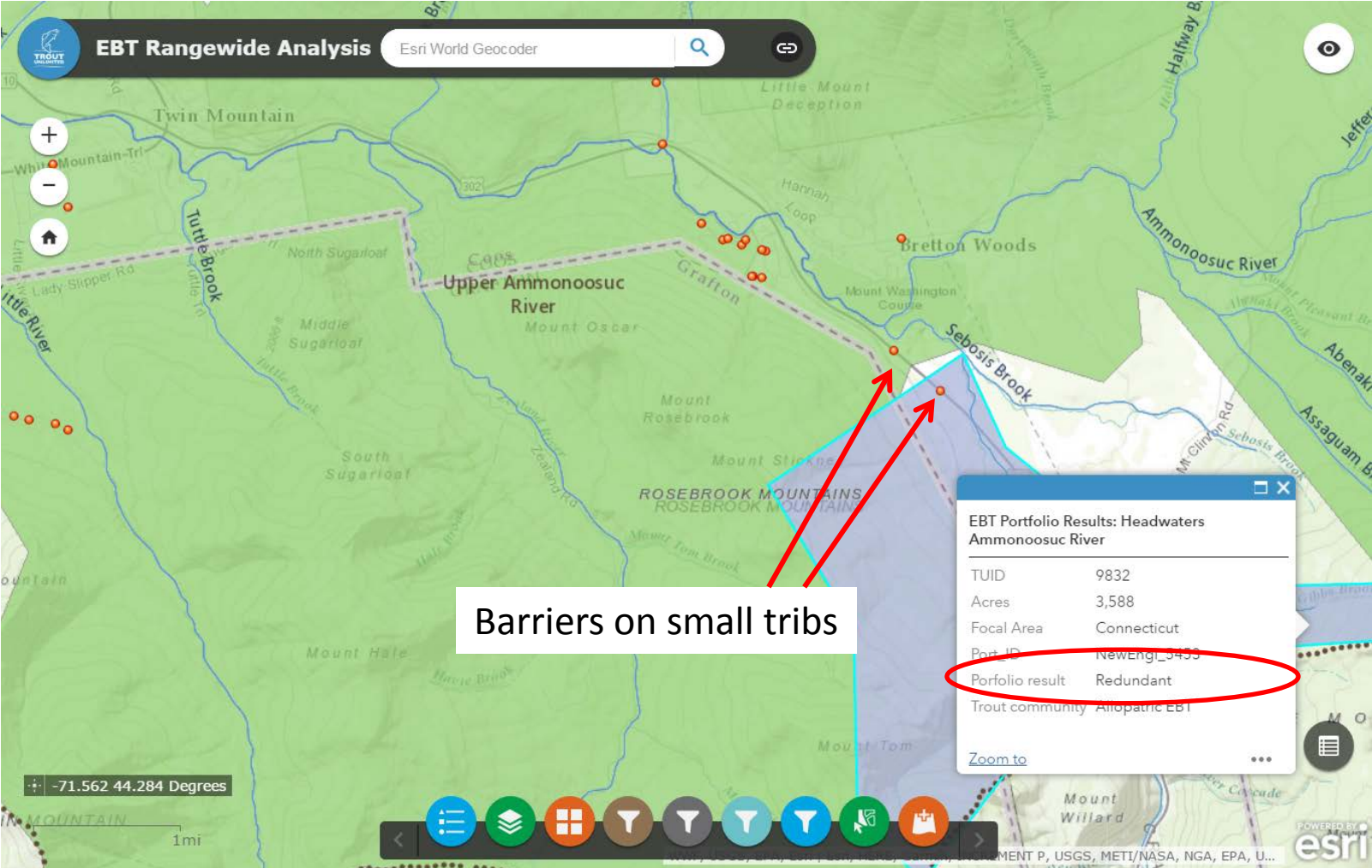


Add data tool

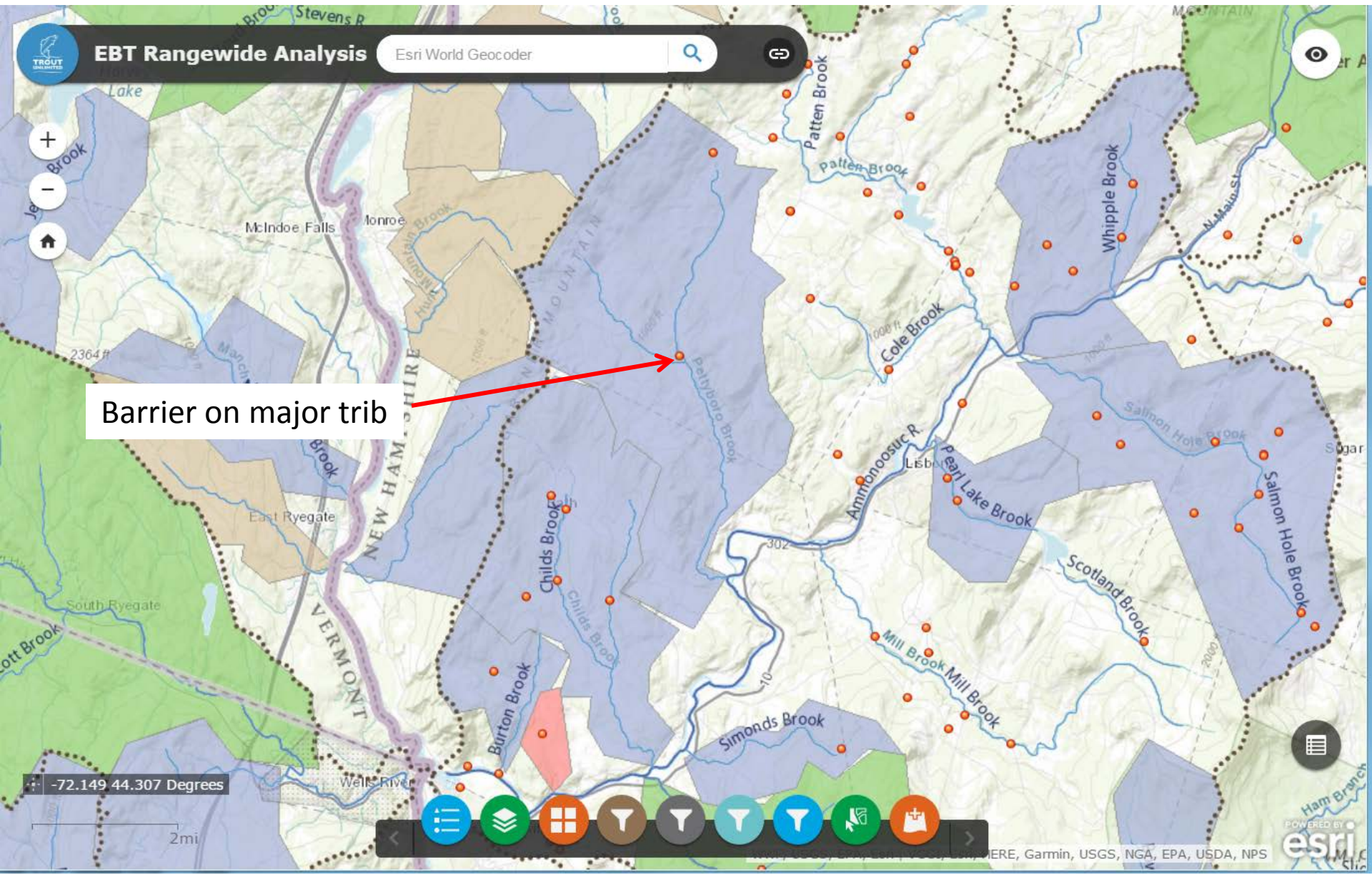
A quick scan of the map reveals several types of critical barriers – those that appear to fall within existing population patches (and were not accounted for in the patch delineation process) and those that appear to be at the downstream extent of patches and fall between patches.



Zooming into the map shows that the between patch barriers are actually road crossings on smaller tributaries within the patches – not significant obstacles to stream connectivity. Even if the barriers were between patches, clicking on the map shows that the adjacent trout communities differ – the redundant patch (blue) is brook trout-only, while the downstream patch is mixed brook trout and brown or rainbow trout – given the competitive interaction of brook trout and brown trout, reconnecting the brook trout-only patch to downstream brown trout would not be a brook trout priority.



Zooming into the map to explore the within patch barriers shows that both fall on major streams – Pettyboro Brook.



Barrier on major trib

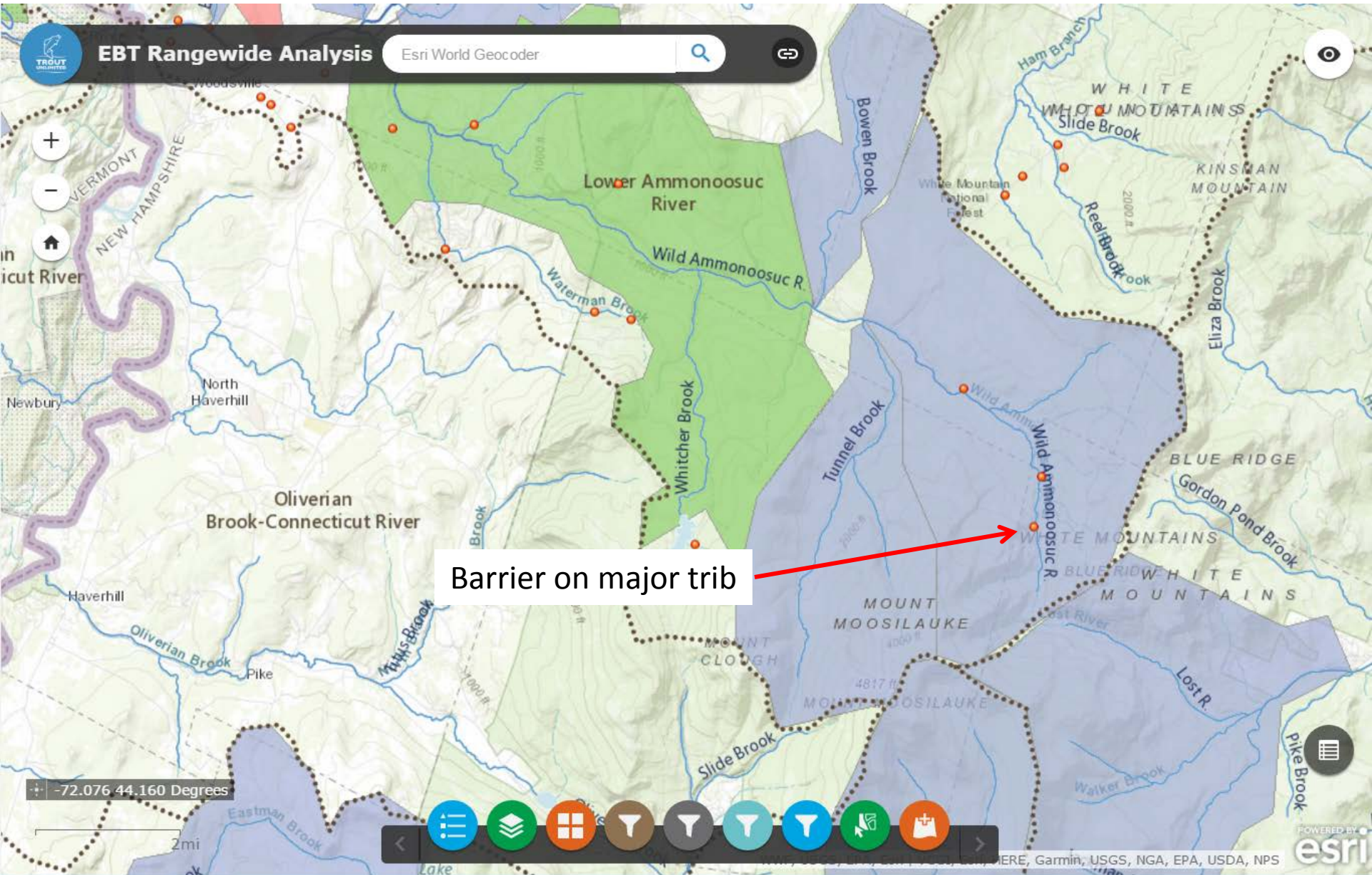
-72.149 44.307 Degrees

2mi

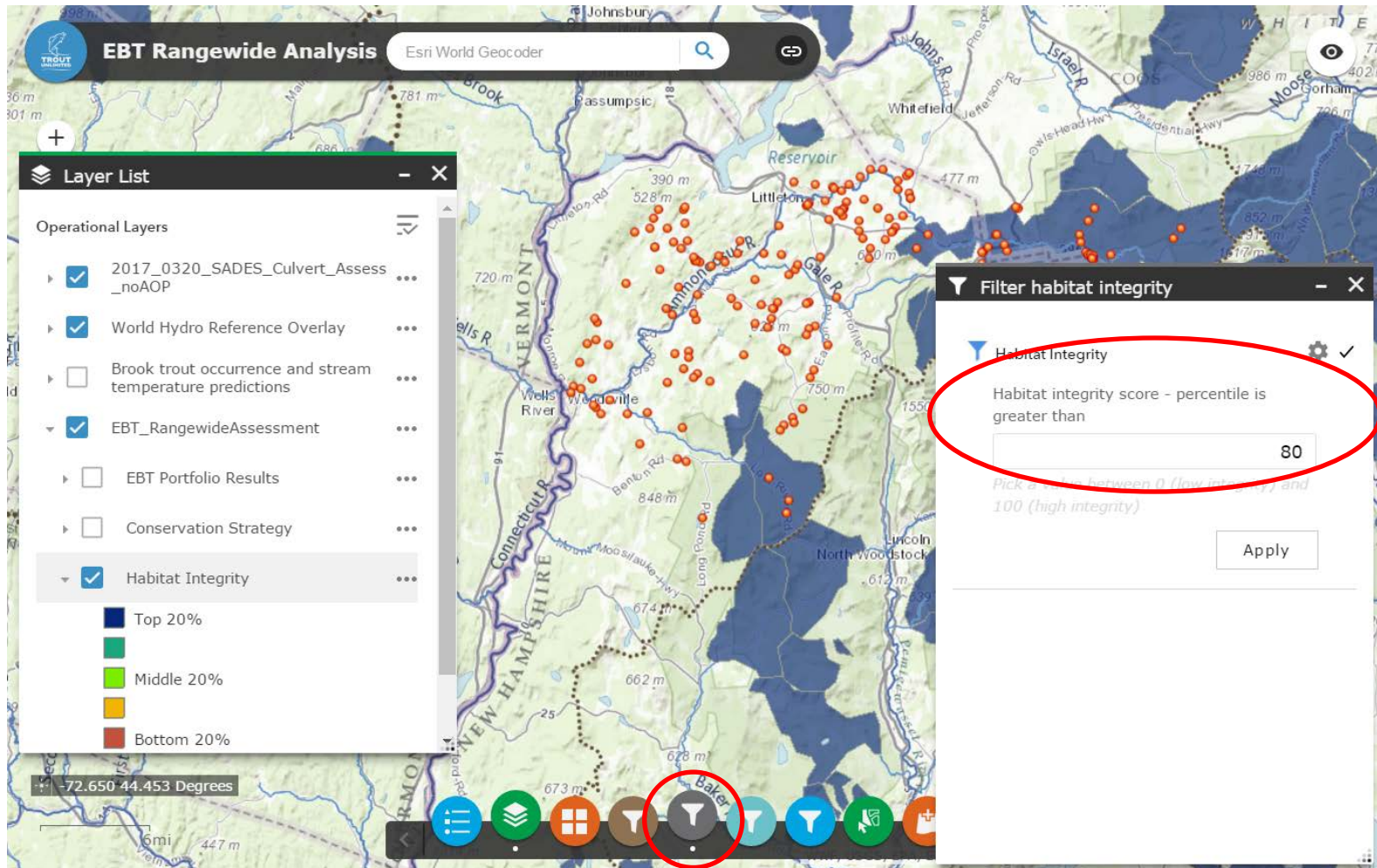
HERE, Garmin, USGS, NGA, EPA, USDA, NPS

POWERED BY esri

Zooming into the map to explore the within patch barriers shows that both fall on major streams - Upper Wild Ammonoosuc River.

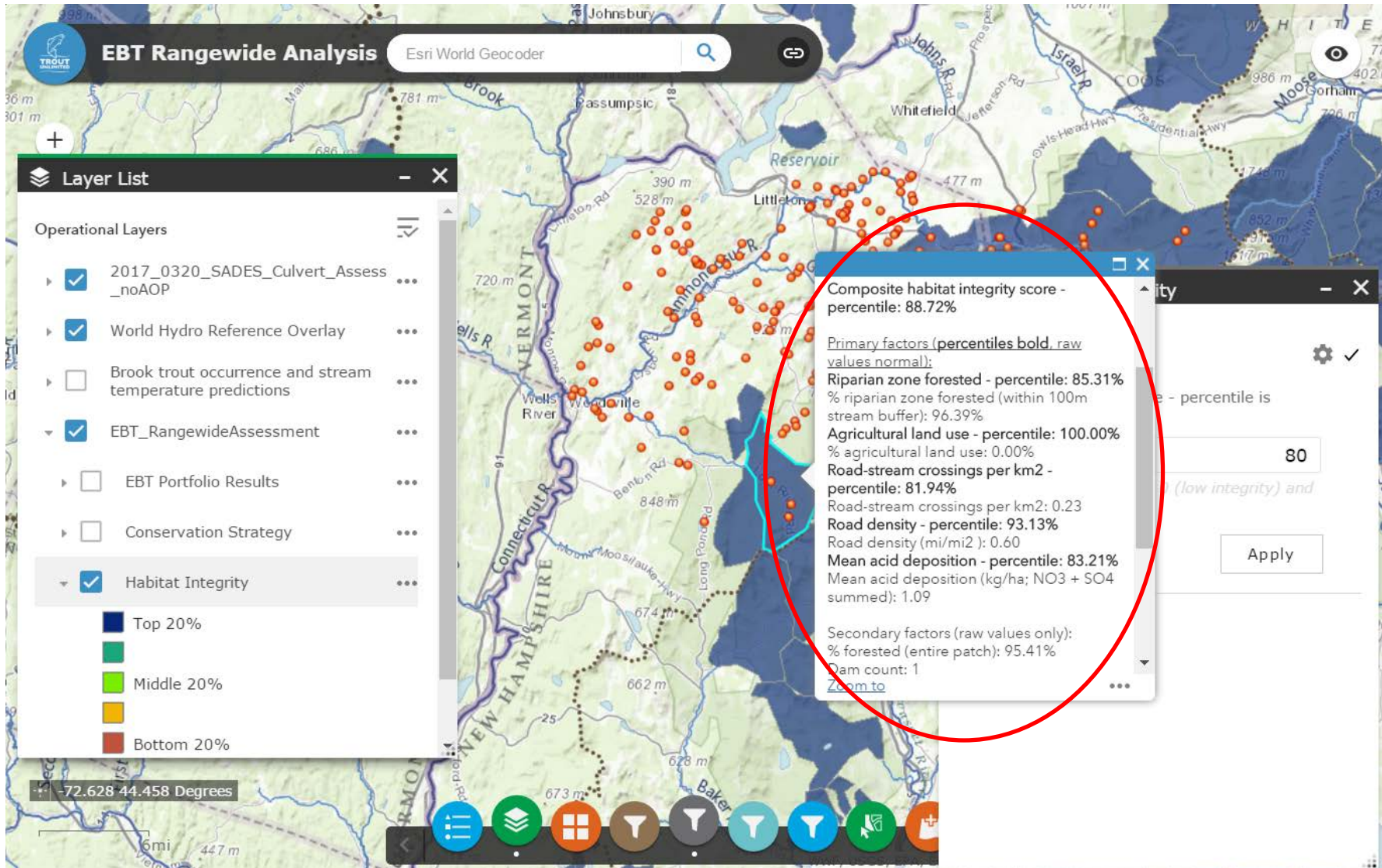


To further evaluate the potential benefit of the two potential project areas, filter the habitat integrity results show only those habitat patches with average habitat condition percentile scores of 80 or higher. The habitat condition score is based on agricultural land use, riparian forest cover, road density, road x stream crossing density, and acid deposition within patches. The patches remaining on the map are among the top 20% least impaired watersheds in brook trout range in the eastern US. Of the 2 populations, only the Upper Wild Ammonoosuc population has very high condition.

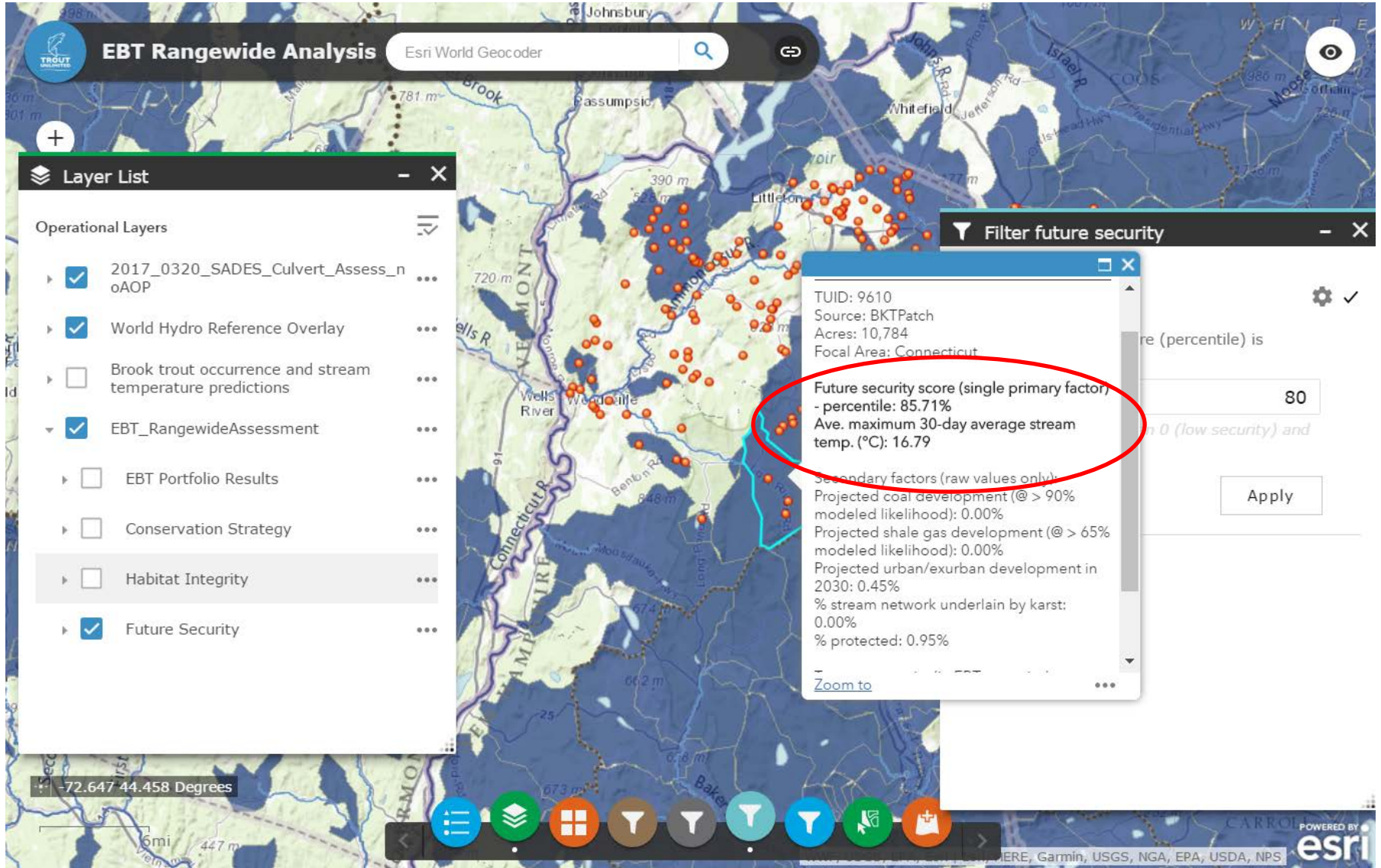


Habitat integrity filter tool

Click on the Upper Wild Ammonoosuc River patch to learn about the scores for that population. This population is in the 88th percentile for overall habitat integrity and in the 80th percentile or higher (among the top 20% of brook trout populations) for agricultural land use, road densities, acid deposition, and riparian forest cover. These numbers suggest that these populations have high habitat integrity relative to other brook trout populations.



Repeat these steps for the future security layer. The future security factor is based on stream temperature within patches. The Upper Wild Ammonoosuc River population has very high percentile scores – 85.7%, placing it within the top 15% coldest watersheds in brook trout range in the eastern US.



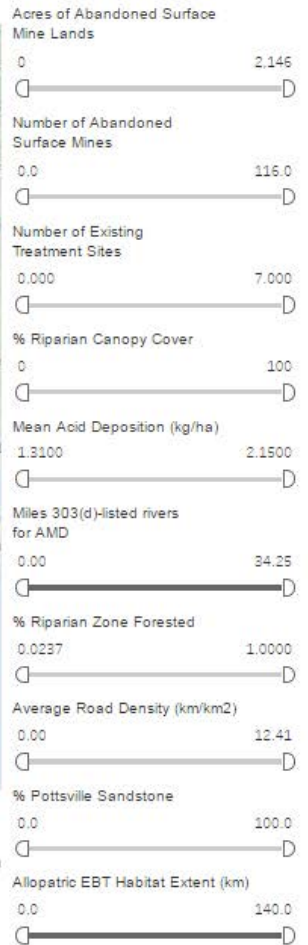
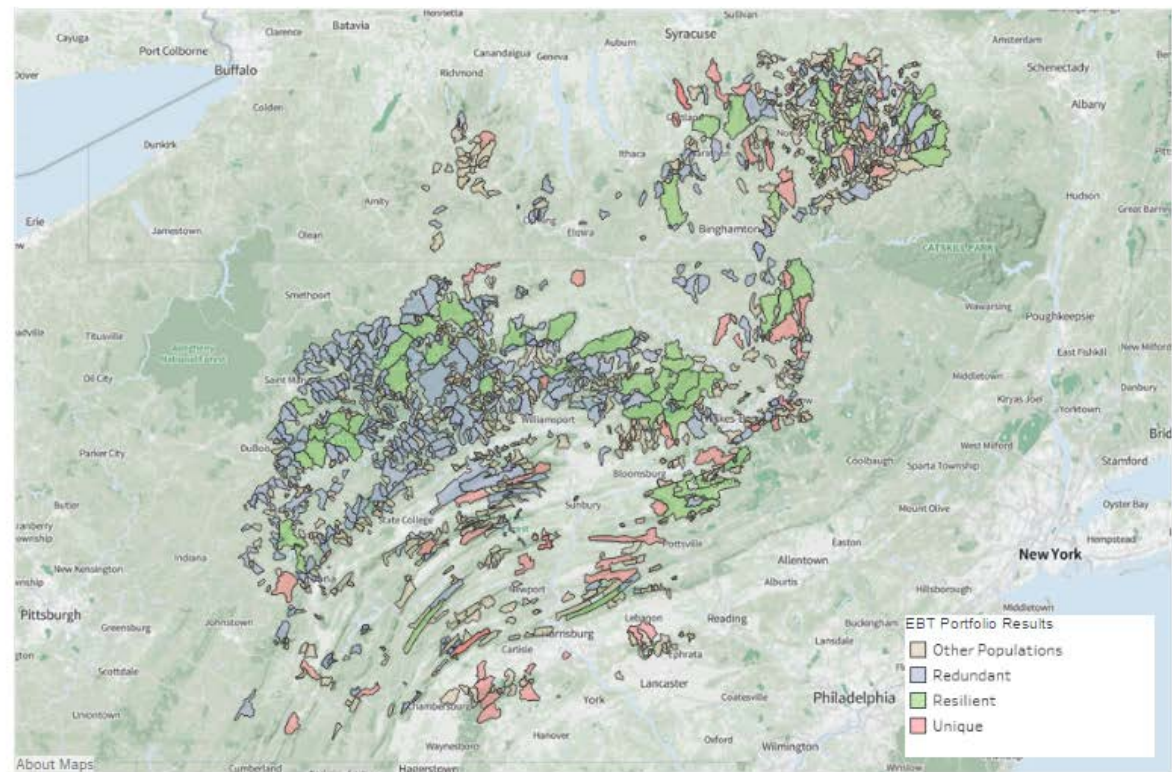
Example 4: Identifying priority EBT populations requiring specific restoration activities – AMD treatment

In this example, EBT populations in the Susquehanna basin are evaluated to identify abandoned mine drainage (AMD) restoration opportunities in high value brook trout populations using the Susquehanna basin focal area visualization tool.

Criteria for identifying AMD restoration opportunities likely to have significant benefit to brook trout:

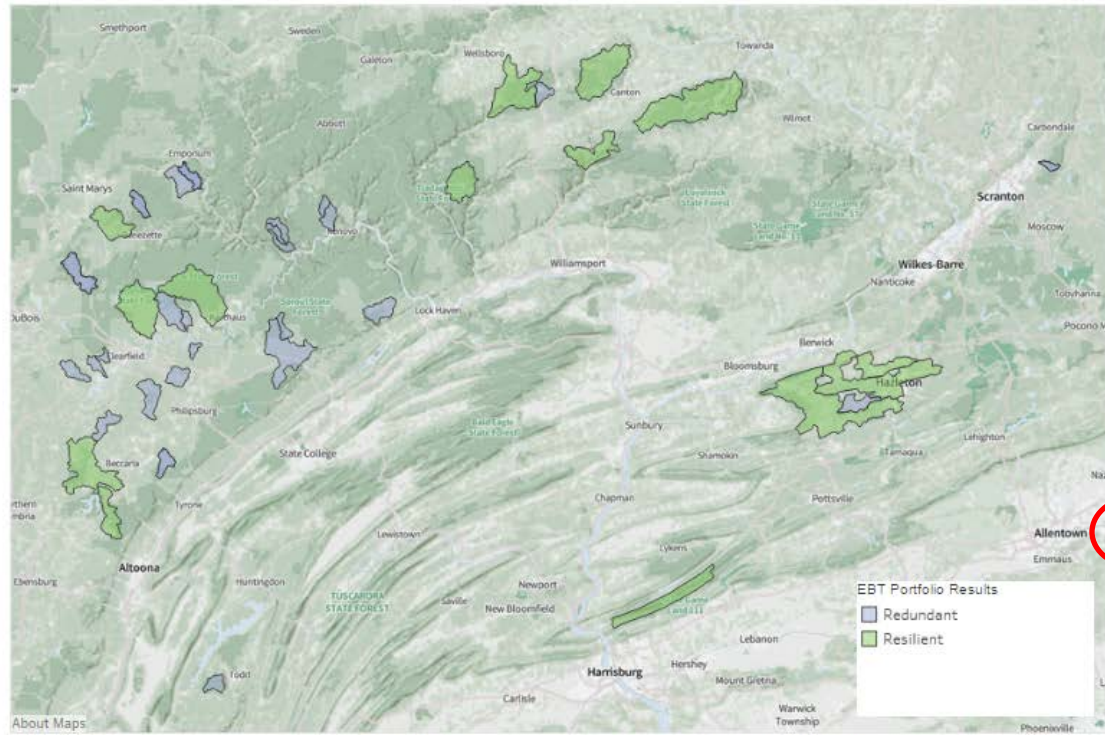
- High Portfolio value – resilient or redundant patch
- A 303d listed stream with AMD impairment
- High brook trout habitat suitability
- Contains an exceptional value stream

- Description
- Data Sources
- Secure Portfolio Elements
- Climate Change and Ecosystem Services
- AMD, Abandoned Mines and Acid Deposition
- Riparian Restoration
- Evaluate/Restore Fish Passage
- Mitigate Sedimentation and Nutrients



Open the Susquehanna basin focal area tool and go to the "AMD, Abandoned Mines, and Acid Deposition" tab

- Description
- Data Sources
- Secure Portfolio Elements
- Climate Change and Ecosystem Services
- AMD, Abandoned Mines and Acid Deposition
- Riparian Restoration
- Evaluate/Restore Fish Passage
- Mitigate Sedimentation and Nutrients



Acres of Abandoned Surface Mine Lands: 2,146

Number of Abandoned Surface Mines: 116.0

Number of Existing Treatment Sites: 7.000

% Riparian Canopy Cover: 100

Mean Acid Deposition (kg/ha): 2,1500

Miles 303(d)-listed rivers for AMD: 34.25

% Riparian Zone Forested: 1.0000

Average Road Density (km/km2): 12.41

% Pottsville Sandstone: 100.0

Allopatric EBT Habitat Extent (km): 140.0

- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Unique Life History
- Missing Data
 - Resident Not Productive
 - Unique

- Redundancy & Resiliency
- Both
 - Neither
 - Redundant

Max. 30-day Ave. Stream Temperature (C) - DeWeber & Wagner: 14.930 - 24.350

Miles of Exceptional Waters: 0.0 - 140.6

Ave. Modeled EBT Occupancy - DeWeber & Wagner: 0.0200 - 0.8900

Ave. Probability of Brook Trout Occurrence - Chesapeake Bay Assessment: 0.0000 - 0.9800

Mean Summer Temperature (C) - Letcher: 13.370 - 20.870

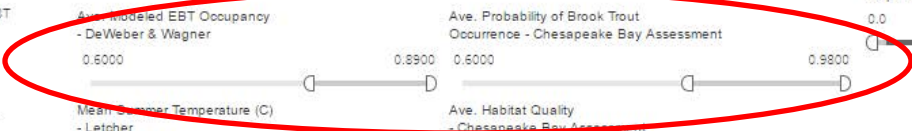
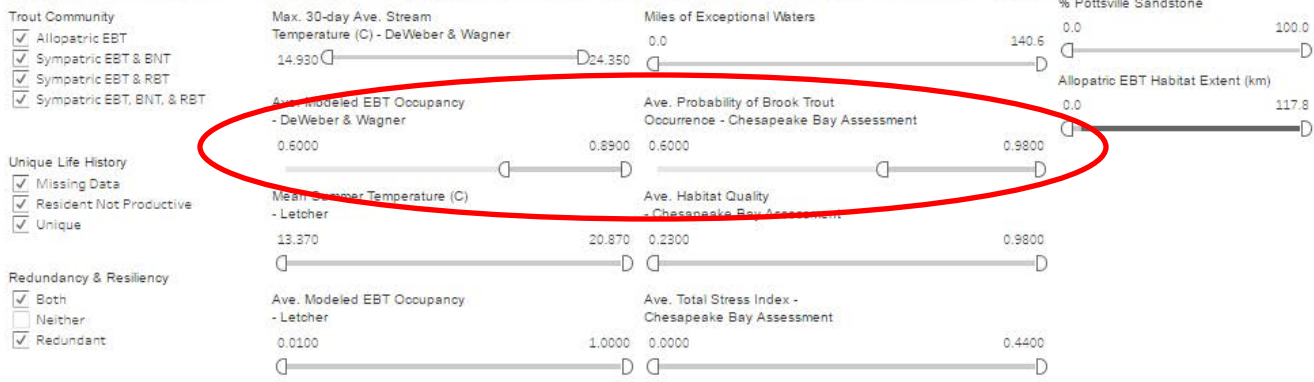
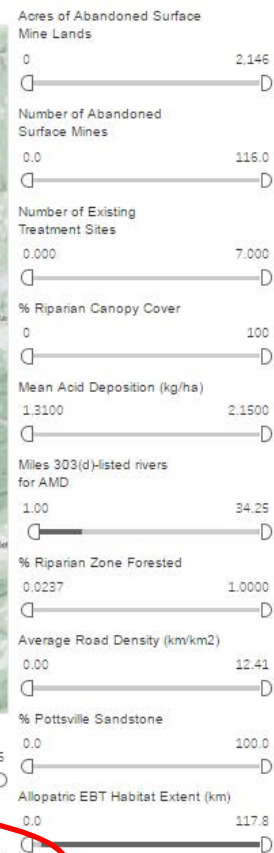
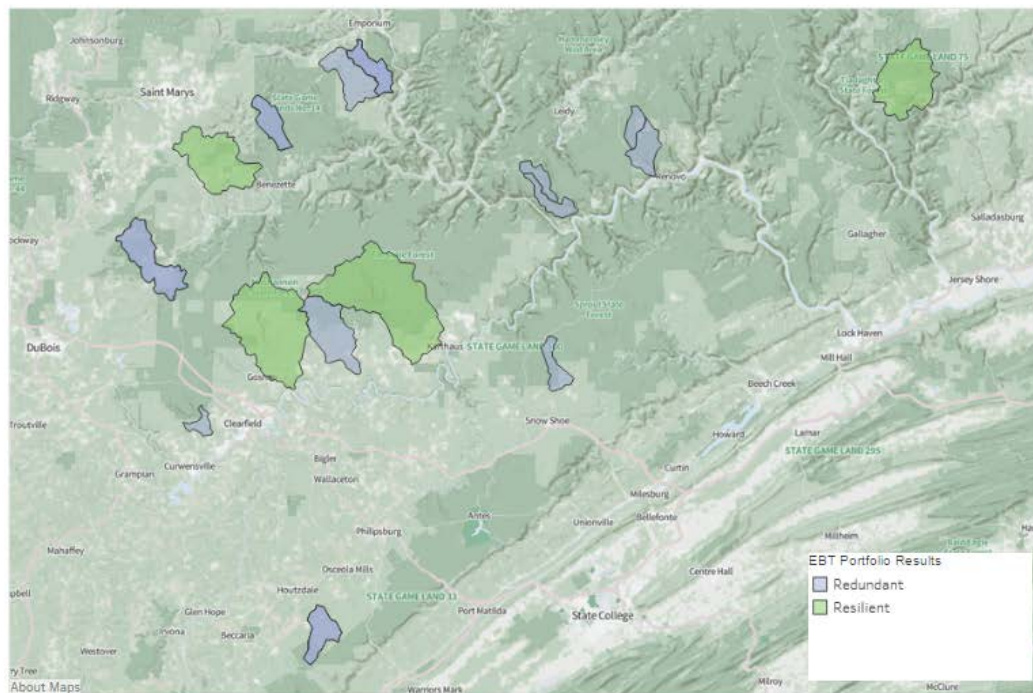
Ave. Habitat Quality - Chesapeake Bay Assessment: 0.2300 - 0.9800

Ave. Modeled EBT Occupancy - Letcher: 0.0100 - 1.0000

Ave. Total Stress Index - Chesapeake Bay Assessment: 0.0000 - 0.4400

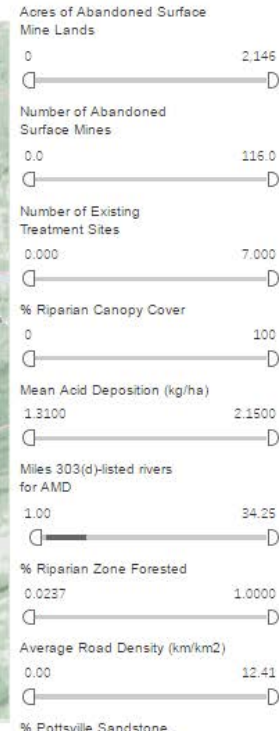
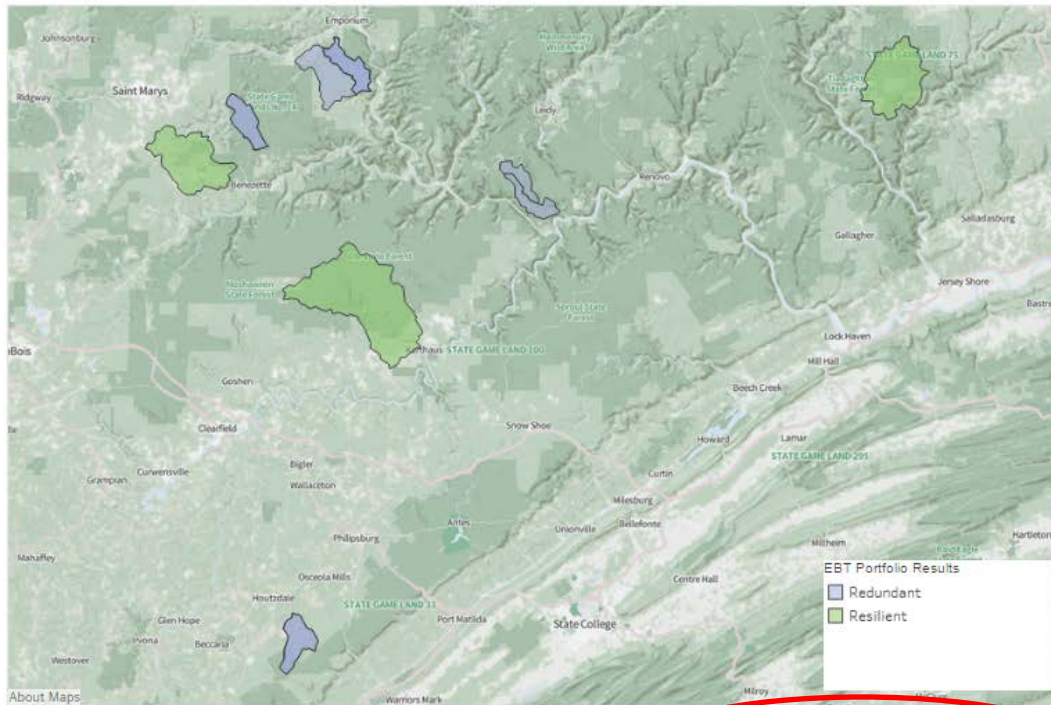
Apply filters to only show resilient or redundant brook trout populations and those with at least 1 mile of stream 303d listed for AMD

- Description
- Data Sources
- Secure Portfolio Elements
- Climate Change and Ecosystem Services
- AMD, Abandoned Mines and Acid Deposition
- Riparian Restoration
- Evaluate/Restore Fish Passage
- Mitigate Sedimentation and Nutrients



Apply additional filters to only show those with high probability of brook trout occurrence (>0.6) for 2 different models (DeWeber/Wagner and Downstream Solutions' Chesapeake Bay Assessment). Note that neither model explicitly incorporates AMD into their predictions, so this is a general habitat suitability filter indicating that other stressors are largely absent

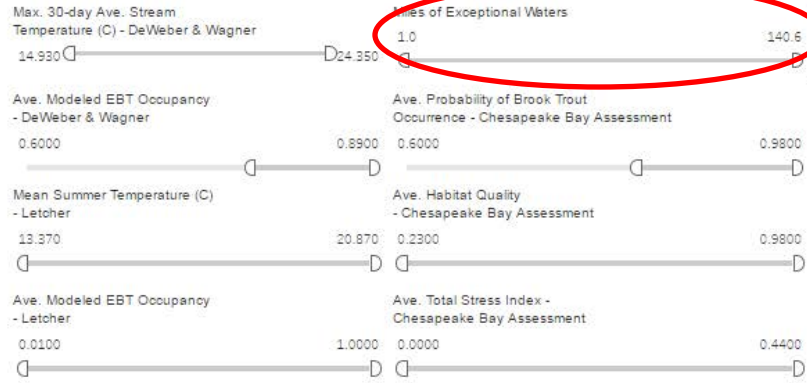
- Description
- Data Sources
- Secure Portfolio Elements
- Climate Change and Ecosystem Services
- AMD, Abandoned Mines and Acid Deposition
- Riparian Restoration
- Evaluate/Restore Fish Passage
- Mitigate Sedimentation and Nutrients



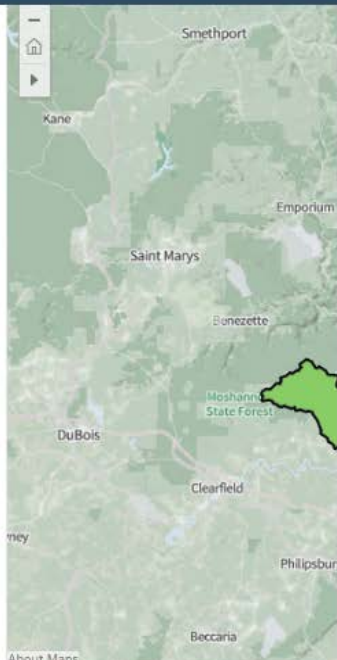
- Trout Community
 - Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Unique Life History
 - Missing Data
 - Resident Not Productive
 - Unique

- Redundancy & Resiliency
 - Both
 - Neither
 - Redundant



Apply an additional filters to only show those also containing a stream meeting exceptional water criteria. The 9 populations can be further evaluated using other criteria in the tool (e.g., acres of abandoned mines), or further evaluated in the field to determine the feasibility of treatment.



Max Avg. 30-day Stream Temp (DeWeber): 18.100
 Ave Modeled EBT Occupancy (Letcher): 0.8200
 Mean Summer Temp (Letcher): 16.860
 Ave Prob EBT Occur (ChA): 0.8800
 Ave Hab Qual (ChA): 0.9100
 Ave Tot Stress Index (ChA): 0.0400

Secure Portfolio Elements
 % Fed/State/Local/Priv Cons Lands: 81.0
 % Rip Forest Cover: 0.8463
 % Ag Land: 0.17
 % Impv. Surface: 0.000
 Allopatric EBT Habitat Extant: 117.8

Climate Change And Ecosystem Services
 % Karst Geology: 0.00
 Ave Drinking Water Importance Index: 76.00
 Mean Brook Trout Occ. Under 2C Increase (Letcher): 0.7600
 Mean Brook Trout Occ. Under 4C Increase (Letcher): 0.6800
 % Dev Floodplain: 0.000
 Ave % Change Hab Qual 2062 (ChA): -7.48

AMD, Abandoned Mines, Acid Deposition
 # Ab Surface Mines: 0.00
 Ac Ab Surface Mines: 529
 % Pottsville Sandstone: 100.0
 # Existing Treatment Sites: 0.000
 Mean Acid Deposition (kg/ha): 2.0000
 Miles 303d-listed AMD: 4.94

Riparian Restoration
 % Mean Canopy Cover: 71.62
 Mean Solar Gain (KW:hrs/Sqm/yr): 1,282.83

Evaluate/Restore Fish Passage
 # Complete Barriers: 4
 # Potential Barriers: 41
 Fragmentation Index: 0.9200
 Mean of Norm. Impact Index for Barriers: 8.080
 Sum of Norm. Impact Index for Barriers: 331.4
 Culvert Inventory Status: Incomplete

Mitigate Nutrients & Sedimentation
 Mi Proposed Pipeline: 0
 Mi 303d-listed Sediment: 4.940
 Mi 303d-listed Nutrients: 0.000
 Road Density (km/km²): 0.950
 Gravel Rd Dens: 0.0400

[ArcGIS Online | More data here](#)
[SRITV Data & Tools | Riparian Restoration Decision Support](#)
[ECOSHEDS | Interactive Catchment Explorer](#)
[Fish Habitat Decision Support Tool](#)

Keep Only Exclude



Number of Abandoned Surface Mines: 0.0 / 116.0

Number of Existing Treatment Sites: 0.000 / 7.000

% Riparian Canopy Cover: 0 / 100

Mean Acid Deposition (kg/ha): 1.3100 / 2.1500

Miles 303(d)-listed rivers for AMD: 1.00 / 34.25

% Riparian Zone Forested: 0.0237 / 1.0000

Average Road Density (km/km²): 0.00 / 12.41

% Pottsville Sandstone: 0.0 / 100.0

Allopatric EBT Habitat Extent (km): 0.0 / 140.0

Brook Trout Chesapeake Bay Assessment: 140.6

Brook Trout Chesapeake Bay Assessment: 0.9800

Brook Trout Chesapeake Bay Assessment: 0.9800

Brook Trout Chesapeake Bay Assessment: 0.4400

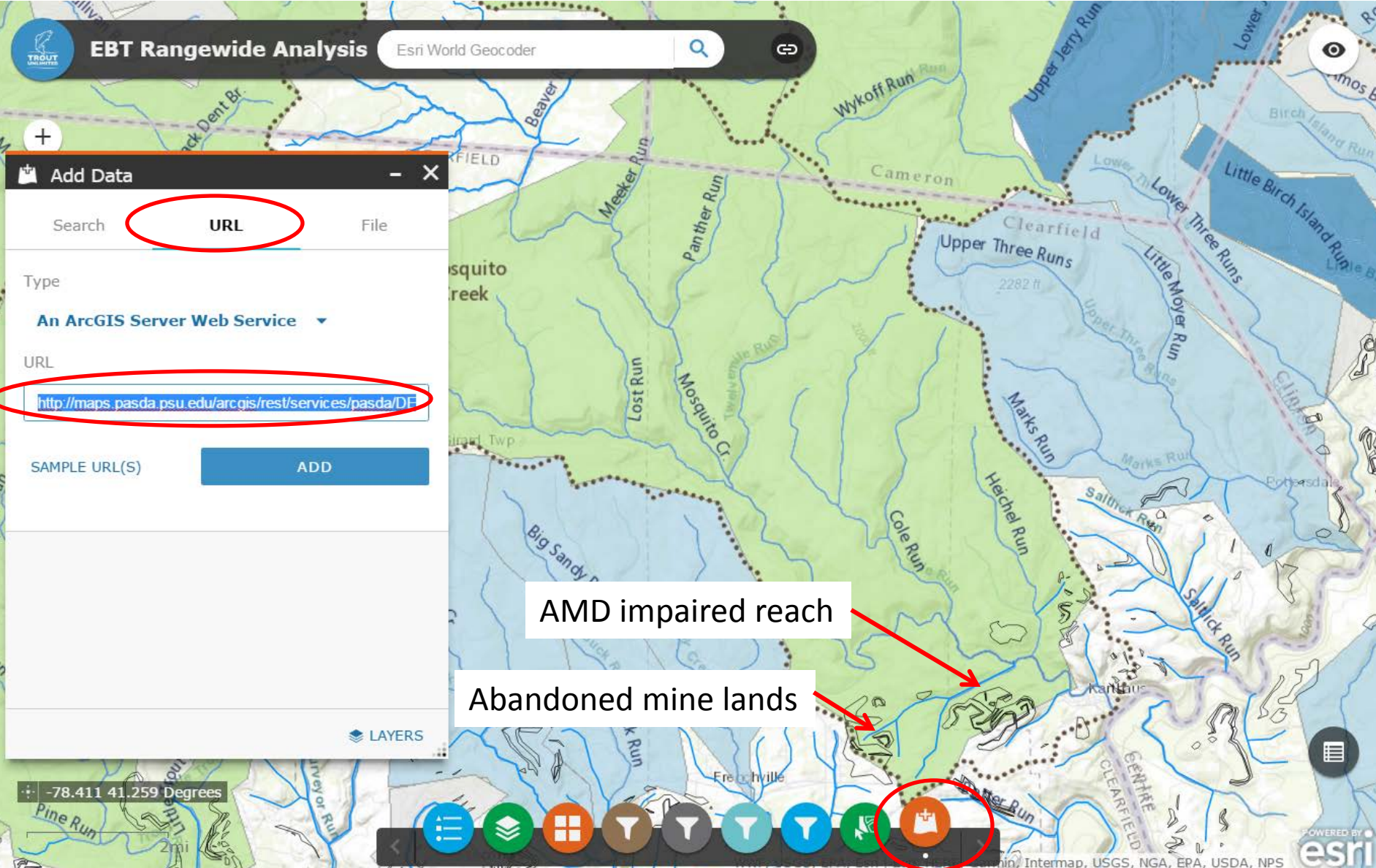
- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT
- Unique Life History
- Missing Data
 - Resident Not Productive
 - Unique
- Redundancy & Resiliency
- Both
 - Neither
 - Redundant

Additional datasets can be overlaid on the patches using the Portfolio and Range-wide assessment ArcGIS Online tool accessed by clicking on a patch of interest and the ArcGIS Online hyperlink.

Here we can add the PA DEP 303d impaired streams layer to further explore where AMD impaired reaches fall within individual patches and the location of abandoned mine lands.

<http://maps.pasda.psu.edu/arcgis/rest/services/pasda/DEP/MapServer/17>

<http://maps.pasda.psu.edu/arcgis/rest/services/pasda/DEP/MapServer/1>



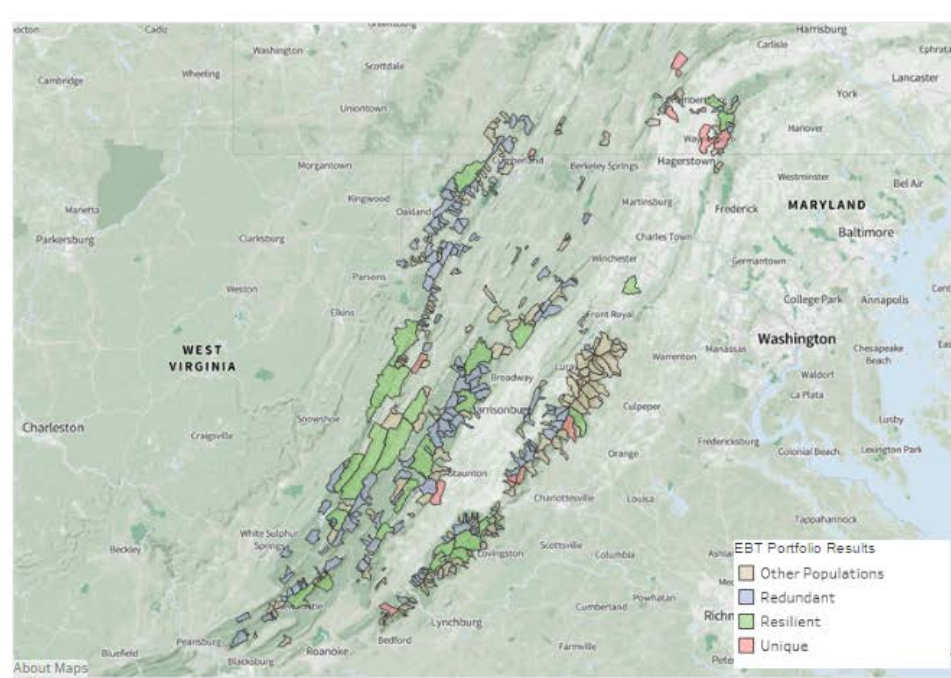
Example 5: Identifying priority EBT populations requiring specific restoration activities – cold water source protection

In this example, EBT populations in the Chesapeake basin are evaluated to identify cold water source protection opportunities in high value Brook Trout populations using the Chesapeake basin focal area visualization tool.

Criteria for identifying cold water source protection opportunities likely to have significant benefit to brook trout:

- High Portfolio value – resilient or redundant patch
- High modeled stream temperature
- Presence of karst geology on stream network
- Some agricultural land use

Navigation tabs: Description, Data Sources, Secure Portfolio Elements, **Climate Change and Ecosystem Services**, AMD, Abandoned Mines, Acid Deposition, Riparian Restoration, Evaluate/Restore Fish Passage



Interactive sliders for various metrics:

- % Stream Network Overlap with Karst: 0.0 to 100.0
- Index of Importance to Drinking Water (Forests to Faucets): 61.83 to 98.00
- % Developed Floodplain: 0.00 to 69.00
- Ave. Probability of EBT Occupancy +2C - Letcher: 0.0200 to 0.9900
- Ave. Probability of EBT Occupancy +4C - Letcher: 0.0100 to 0.9800
- % Mean Canopy Cover: 9.27 to 99.39
- Average Habitat Quality Proj. 2062 (Chesapeake Assessment): -49.3 to 88.5

Trout Community

- Allopatric EBT
- Sympatric EBT & BNT
- Sympatric EBT & RBT
- Sympatric EBT, BNT, & RBT

Resiliency & Redundancy

- Both
- Neither
- Redundant

Unique Life History

- Not Applicable
- Resident Not Productive
- Unique

Miles of Exceptional Waters: 0.000 to 9.750

Ave. Modeled EBT Occupancy - Letcher: 0.0300 to 1.0000

Ave. Modeled EBT Occupancy - DeWeber & Wägner: 0.0000 to 0.7200

Mean Summer Temperature (C) - Letcher Model: 13.140 to 21.760

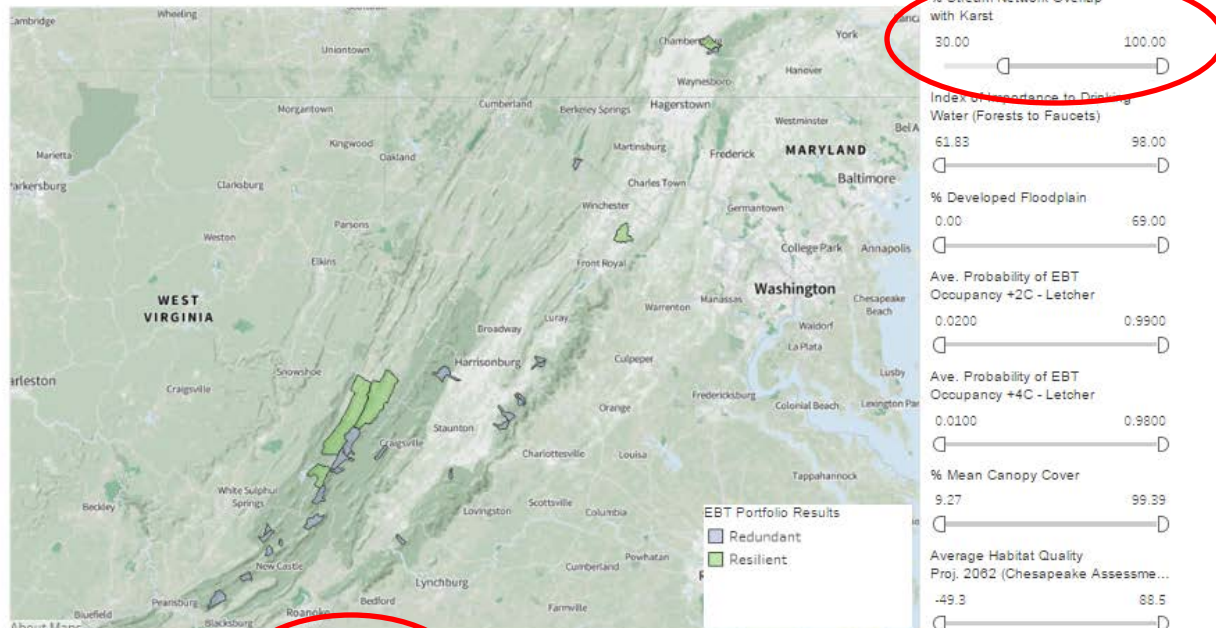
Avg. Habitat Quality Projected 2062 (Chesapeake Assessment): 0.1200 to 0.9100

Ave. Total Stress Index (Chesapeake Assessment): 0.0000 to 0.4100

Ave. Prob. EBT Occurrence (Chesapeake Assessment): 0.0000 to 0.9000

Open the Chesapeake basin focal area tool and go to the “Climate Change and Ecosystem Services” tab

- Description
- Data Sources
- Secure Portfolio Elements
- Climate Change and Ecosystem Services
- AMD, Abandoned Mines, Acid Deposition
- Riparian Restoration
- Evaluate/Restore Fish Passage



- Trout Community
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT

- Resiliency & Redundancy
- Both
 - Neither
 - Redundant

- Unique Life History
- Not Applicable
 - Resident Not Productive
 - Unique

Miles of Exceptional Waters: 0.000 - 3.750

Ave. Modeled EBT Occupancy - Letcher: 0.000 - 1.000

Ave. Modeled EBT Occupancy - DeWeber & Wagner: 0.0000 - 0.7200

Mean Summer Temperature (C) - Letcher Model: 17.500 - 21.760

Avg. Habitat Quality Projected 2082 (Chesapeake Assessment): 0.1200 - 0.9100

Ave. Total Stress Index (Chesapeake Assessment): 0.0000 - 0.4100

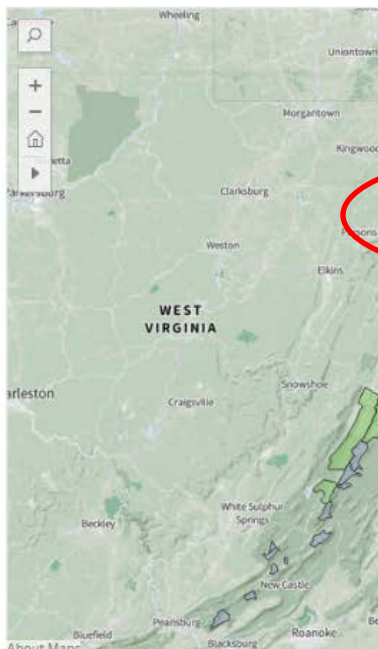
Ave. Prob. EBT Occurrence (Chesapeake Assessment): 0.0000 - 0.0000

Apply filters to only show resilient or redundant brook trout populations, those with warmer stream temperatures (> 17.5°C), and at least 30% of the stream network overlapping with karst geology

Description

Data Sources

See Elements



- Trout Community**
- Allopatric EBT
 - Sympatric EBT & BNT
 - Sympatric EBT & RBT
 - Sympatric EBT, BNT, & RBT
- Resiliency & Redundancy**
- Both
 - Neither
 - Redundant
- Unique Life History**
- Not Applicable
 - Resident
 - Unique

Watershed Name: Upper Jackson River
 Subwatershed Name: Dry Branch-Jackson River

All Filters

Portfolio Results: Resilient
 Resiliency & Redundancy: Both
 Life History: Not Applicable
 Trout Community: Sympatric EBT & RBT
 Mi. of Exceptional Waters: 0
 Max Avg. 30-day Stream Temperature (C) - DeWeber/Wagner: 19.700
 Ave Mod. EBT Occupancy - Letcher: 0.5000
 Ave Mod. EBT Occupancy - DeWeber/Wagner: 0.2000
 Mean Summer Temp (C) - Letcher: 18.140
 Ave. Prob. EBT Occurrence (ChA): 0.5200
 Ave Habitat Quality (ChA): 0.6500
 Ave Total Stress Index (ChA): 0.1300

Special Portfolio Elements

- % Fed/St/Lc/Priv Conservation Land: 25.00
- % Rip. Zone Forested: 81.00
- % Ag. Land: 15.00
- % Imp. Surface: 0.000
- Allopatric Brook Trout Extent (km): 82.37

Climate Change and Ecosystem Services

- % Stream Network Overlap with Karst: 51.00
- Index of Importance to Drinking Water (F2F): 72.28
- % Dev. Floodplain: 0.00
- Ave. Prob. EBT Occ. +2C - Letcher: 0.3600
- Ave. Prob. EBT Occ. +4C - Letcher: 0.2400
- % Mean Canopy Cover: 73.53
- Ave Hab Qual Proj 2062 (ChA): -15.6

Remediate AMD, Deposition

- % Pottsville: 0
- Acres Ab Mine Lands: 0
- Miles 303(d)-listed for AMD: 0
- Miles AMD Streams (WV): 0

Riparian Restoration

- Mean Solar Gain (KW-hrs/SqM/Yr): 1,365.6

Evaluate/Restore Fish Passage

- # Potential Barriers: 432
- Sum of Norm. Impact Index for Crossings: 2,789
- Mean of Norm. Impact Index for Crossings: 6.460
- # Complete Barriers: 28
- Fragmentation Index: 0.6100
- Culvert Inventory Status: Incomplete

Mitigate Sedimentation/Nutrients

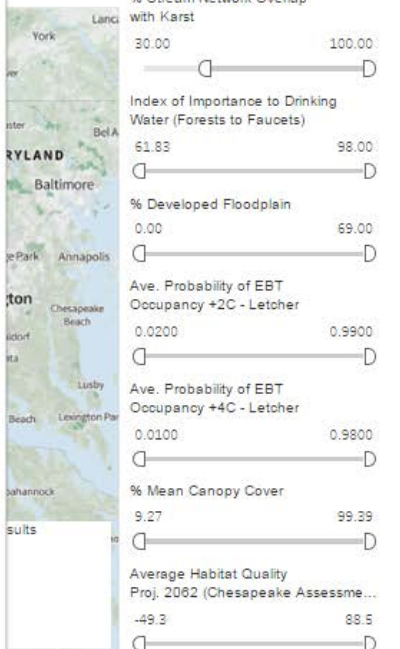
- Miles Proposed Pipeline: 12.56
- Miles 303(d)-listed for Sediment: 0
- Road Density(Mi/SqMi): 2.340
- Miles ACP Pipeline: 6.430
- Miles 303(d)-listed for Nutrients: 0



Position

Riparian Restoration

Evaluate/Restore Fish Passage



- % Stream Network Overlap with Karst: 30.00
- Index of Importance to Drinking Water (Forests to Faucets): 61.83
- % Developed Floodplain: 0.00
- Ave. Probability of EBT Occupancy +2C - Letcher: 0.0200
- Ave. Probability of EBT Occupancy +4C - Letcher: 0.0100
- % Mean Canopy Cover: 9.27
- Average Habitat Quality Proj. 2062 (Chesapeake Assessment): -49.3
- Avg. Habitat Quality Projected 2062 (Chesapeake Assessment): 0.1200
- Ave. Total Stress Index (Chesapeake Assessment): 0.0000
- Ave. Prob. EBT Occurrence (Chesapeake Assessment): 0.0000

Hover the mouse over individual patches and evaluate other stressors present, looking for some with agricultural land use, since those patches may have degraded pasture lands and spring systems that could be restored and protected.

Resiliency & Redundancy: Both
 Life History: Not Applicable
 Trout Community: Sympatric EBT & RBT
 MI. of Exceptional Waters: 0
 Max Avg. 30-day Stream Temperature (C) - DeWeber/Wagner: 19.700
 Ave Mod. EBT Occupancy - Letcher: 0.5000
 Ave Mod. EBT Occupancy - DeWeber& Wagner: 0.2000
 Mean Summer Temp (C) - Letcher: 18.140
 Ave. Prob. EBT Occurrence (ChA): 0.5200
 Ave Habitat Quality (ChA): 0.6500
 Ave Total Stress Index (ChA): 0.1300

Secure Portfolio Elements
 % Fed/St/Lc/Priv Conservation Land: 25.00
 % Rip. Zone Forested: 81.00
 % Ag. Land: 15.00
 % Imp. Surface: 0.000
 Allopatric Brook Trout Extent (km): 82.37

Climate Change and Ecosystem Services
 % Stream Network Overlap with Karst: 51.00
 Index of Importance to Drinking Water (F2F): 72.28
 % Dev. Floodplain: 0.00
 Ave. Prob. EBT Occ. +2C - Letcher: 0.3600
 Ave. Prob. EBT Occ. +4C - Letcher: 0.2400
 % Mean Canopy Cover: 73.53
 Ave Hab Qual Proj 2062 (ChA): -15.6

Remediate AMD, Deposition
 % Pottsville: 0
 Acres Ab Mine Lands: 0
 Miles 303(d)-listed for AMD: 0
 Miles AMD Streams (WV): 0

Riparian Restoration
 Mean Solar Gain (KW-hrs/SqM/Yr): 1,365.6

Evaluate/Restore Fish Passage
 # Potential Barriers: 432
 Sum of Norm. Impact Index for Crossings: 2,789
 Mean of Norm. Impact Index for Crossings: 6.460
 # Complete Barriers: 28
 Fragmentation Index: 0.6100
 Culvert Inventory Status: Incomplete

Mitigate Sedimentation/Nutrients
 Miles Proposed Pipeline: 12.56
 Miles 303(d)-listed for Sediment: 0
 Road Density(Mi/SqMi): 2.340
 Miles ACP Pipeline: 6.430
 Miles 303(d)-listed for nutrients: 0

Trout Community
 Allopatric EBT
 Sympatric EBT & BNT
 Sympatric EBT & RBT
 Sympatric EBT, BNT, & RBT

Resiliency & R
 Both
 Neither
 Redundant

Unique Life Hi
 Not Appli
 Resident
 Unique

[ArcGIS Online | See more data](#)
[EBTJV Data & Tools | Riparian Restoration Decision Support](#)
[ECOSHEDS | Interactive Catchment Explorer](#)
[Fish Habitat Decision Support Tool](#)

Keep Only Exclude

% Stream Network Overlap with Karst
 30.00 100.00

Index of Importance to Drinking Water (Forests to Faucets)
 61.83 98.00

% Developed Floodplain
 0.00 69.00

Ave. Probability of EBT Occupancy +2C - Letcher
 0.0200 0.9900

Ave. Probability of EBT Occupancy +4C - Letcher
 0.0100 0.9800

% Mean Canopy Cover
 9.27 99.39

Average Habitat Quality Proj. 2062 (Chesapeake Assessme...
 -49.3 88.5

Avg. Habitat Quality Projected 2062 (Chesapeake Assessment)
 0.1200 0.9100

Ave. Total Stress Index (Chesapeake Assessment)
 0.0000 0.4100

Ave. Prob. EBT Occurrence (Chesapeake Assessment)
 0.0100 0.8900

Other tools can be explored using the hyperlinks at the bottom of the pop-up, including the Downstream Strategies' Chesapeake Bay assessment tool (Fish Habitat Decision Support Tool) and ECOSHEDS Interactive Catchment Explorer