

Eastern Brook Trout Range-wide Conservation Portfolio and Focal Area Risk and Opportunity Analysis

EBTJV Review

May 1, 2017



Kurt Fesenmyer, Amy Haak, Shawn Rummel, Matt Mayfield, Jack Williams, and Sean McFall

Acknowledgements

Funding

- National Fish and Wildlife Foundation

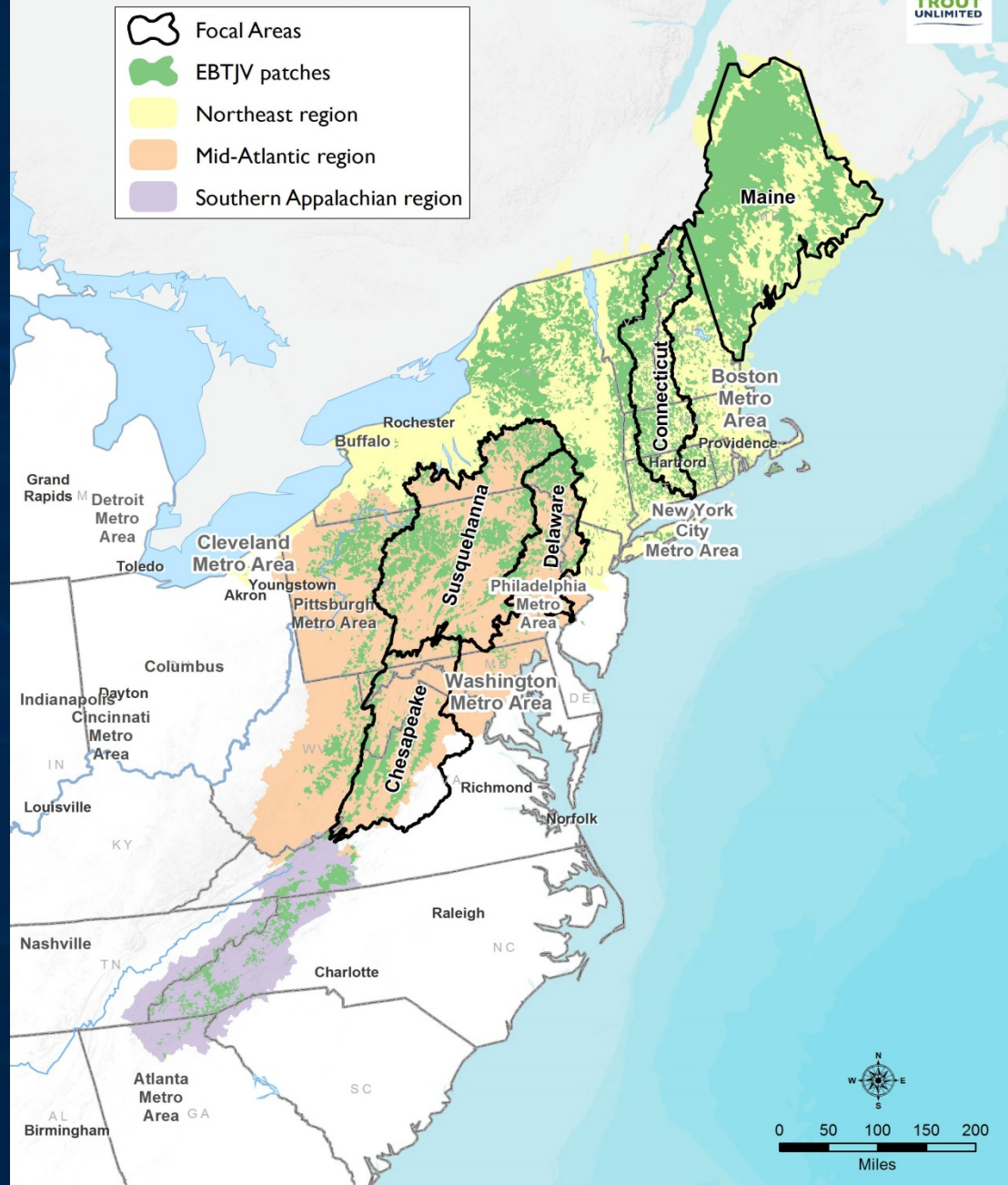
Data Providers

- Eastern Brook Trout Joint Venture, Ecosheds, Ty Wagner, The Nature Conservancy, Appalachian and North Atlantic LCCs, Downstream Strategies, and state and federal agency partners

Review

- EBTJV, Dave Lawrence, Merry Gallagher, Diane Timmons, Jason Coombs, Ty Wagner, Mark Hudy, Steve Perry, Nat Gillespie, Alan Heft, Matt Kulp, Dave Kazyack, Tim King, Than Hitt, Amy Wolfe, Keith Curley, Jeff Reardon, Gary Berti, Dustin Wichterman, Seth Coffman, Colin Lawson, Erin Rodgers, Tracy Brown, Jake Bolin, Joseph Norton, Richard Biemiller

TU Brook Trout Assessments: Scales



BT Portfolio, Range-wide, and Focal Area Assessments

Conservation portfolio

Identify BT strongholds, persistent populations, and migratory life histories based on EBTJV data, stream habitat diversity, and BT habitat suitability



Identify critical and missing elements



Range-wide assessment

Characterize habitat integrity and future security of patches using widely available GIS datasets



Determine conservation value and strategies




Focal area assessment


Characterize BT populations, habitat integrity, and future security of patches using focal area-specific GIS datasets + other data or plans



Refine conservation needs and strategies

Brook Trout Portfolio and RW Assessment: Scales

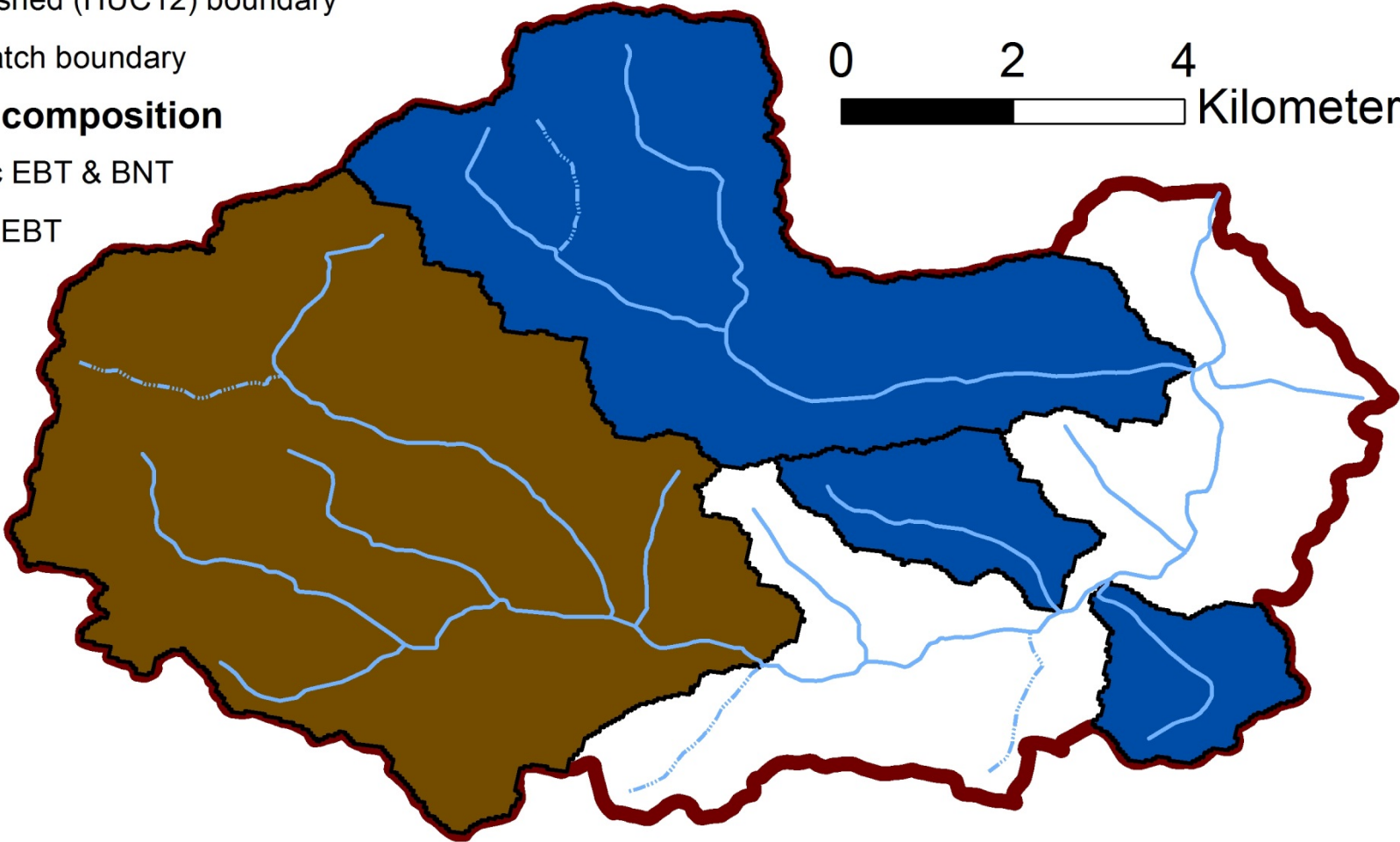
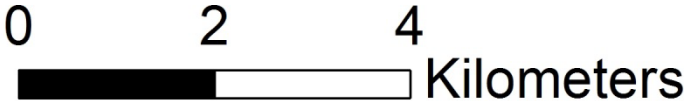
 Subwatershed (HUC12) boundary

 EBTJV patch boundary

EBTJV patch composition

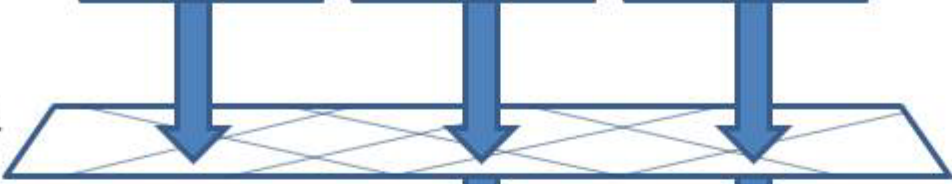
 Sympatric EBT & BNT

 Allopatric EBT





Evaluate conservation value & landscape context @ population scale



Low value

High value

High value

Evaluate conservation need @ reach scale



Poor fit

Good fit

Evaluate opportunity, feasibility @ site scale



Feasible

Project priority

Low priority project

Low priority project

High priority project

Portfolio, Range-wide, and focal area assessments



Decision support tools (Ecosheds, LCC Riparian Tool, Ches. Bay Tool)



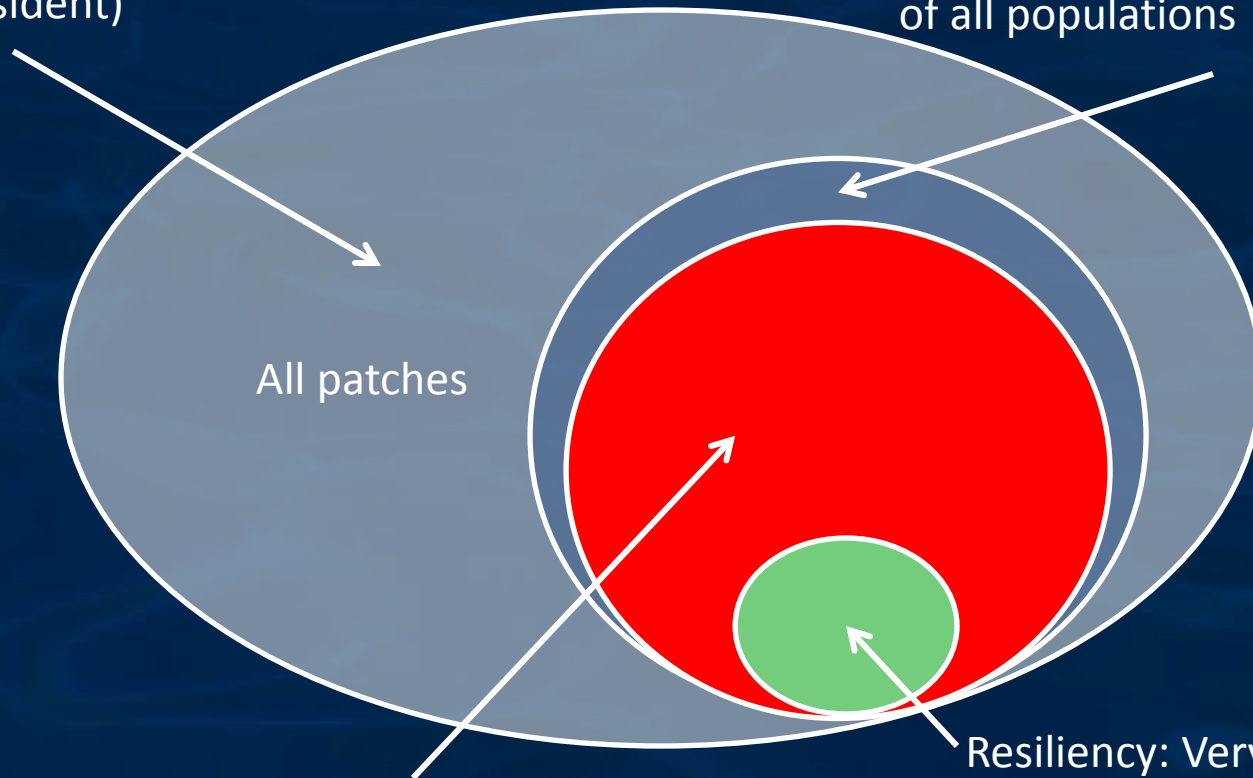
Site assessment, local information, partner input



“3-R” Framework: Diversity confers long-term viability in face of disturbances and environmental variability (Haak and Williams 2012)

(Other populations – small, resident)

Representation: Unique life histories (river, lake, sea-run migratory; small ponds in ME; alkaline streams) – 40% of all populations



Redundancy: Populations large enough to have demographic persistence - 35% of populations

Resiliency: Very large stronghold populations likely able to withstand environmental disturbance - 5% of populations

Brook Trout Portfolio

Range-wide data sources

- BT population characteristics – size & extent, trout community
 - EBTJV patch and catchment data (2015)
- Habitat diversity as a proxy for likely life history expression
 - TNC/Southern Appalachian LCC stream classification (2015)
 - TNC/North Atlantic LCC stream and lake/pond classification (2013, 2014)
 - NHD+ attributes
- Observed life history expression
 - Dauwalter et al. 2014 – coastal and anadromous brook trout
- Habitat suitability as proxy for population density
 - DeWeber and Wagner brook trout occupancy model and stream temperature (2015)

Unavailable range-wide data

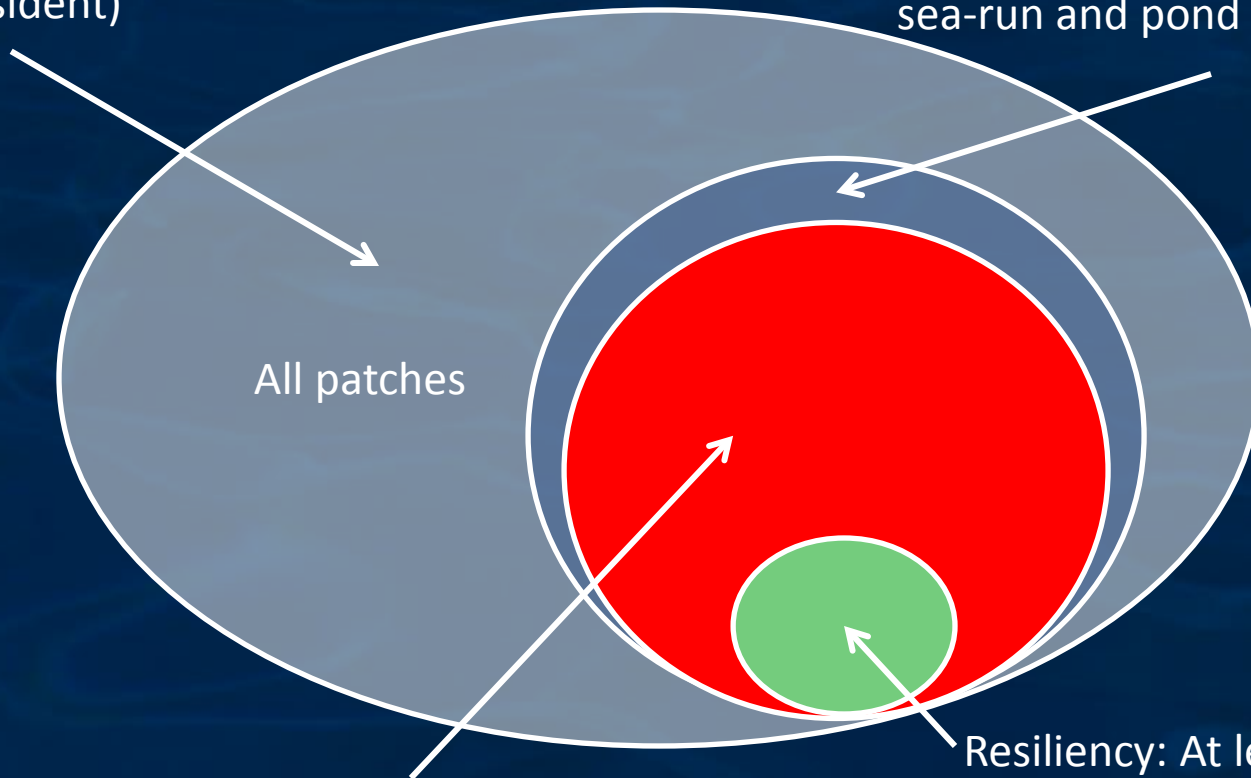
- BT population density
- BT historical distribution
- Genetic status

Our reliance these available stream habitat characteristics comes with the assumption that all potential habitat within designated patches is accessible to and used by at least some individuals within a population of brook trout and is therefore a *best case scenario*

“3-R” Framework: Diversity confers long-term viability in face of disturbances and environmental variability (Haak and Williams 2012)

(Other populations – small, resident)

Representation: Based on stream size class, lake size, stream alkalinity class from TNC habitat mapping; observed sea-run and pond life histories



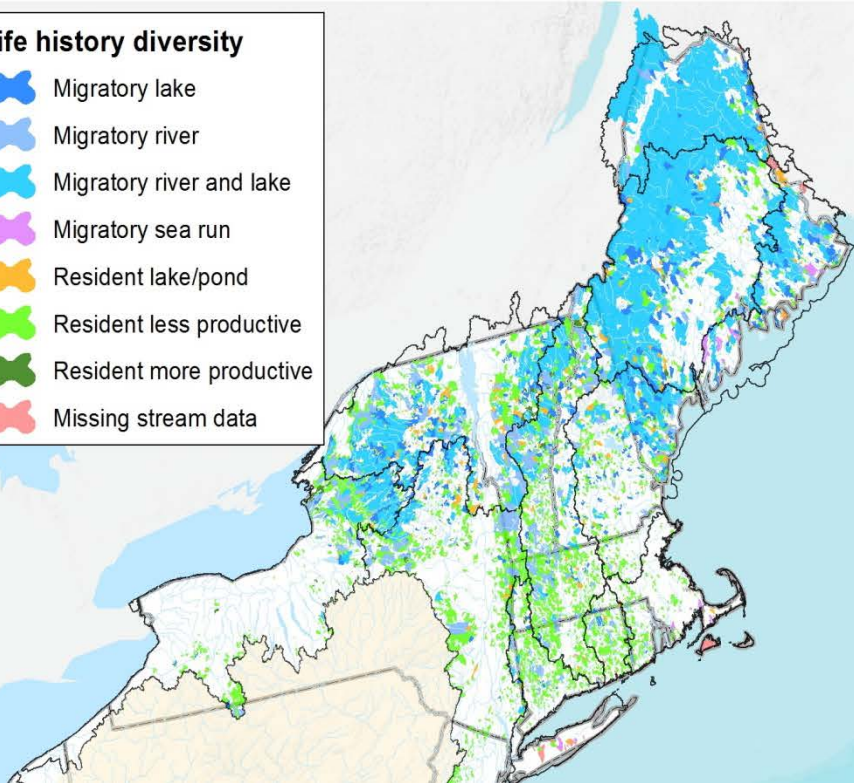
Redundancy: At least 25 km allopatric BT
OR 5 – 25km and occurrence probability > 0.3
OR < 5km BT and occurrence probability > 0.5

Resiliency: At least 25km allopatric BT, 1 stream w/ at least 50km² drainage area

Portfolio Results – Northeast Region

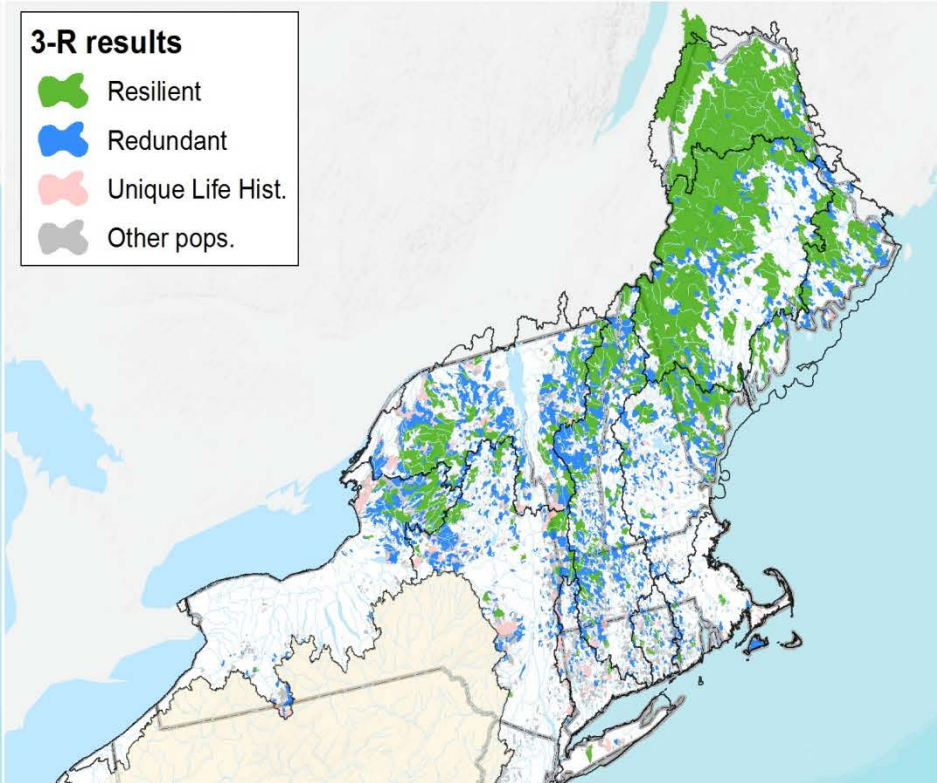
Life history diversity

- Migratory lake
- Migratory river
- Migratory river and lake
- Migratory sea run
- Resident lake/pond
- Resident less productive
- Resident more productive
- Missing stream data



3-R results

- Resilient
- Redundant
- Unique Life Hist.
- Other pops.



Portfolio Results – Northeast Region

Subregion	Patch Size (Ha)		Populations			Representation								Resilient	Redundant
	Total	Ave.	All	Allo- patric	Geo. Div.	Life History Diversity								Strong- hold pops.	Persistent pops.
						Mig- Lake	Mig- River	Mig- R&L	Mig- Sea	Res- ↑Prod	Res- ↓Prod	Res- Pond	No Data		
Cape Cod	164,410	694	237	213	91	1	3	0	16	0	204	2	11	5	60
Saco-Merrimack	897,080	1,400	641	601	145	112	14	35	1	0	441	33	5	37	310
<i>Total Coastal RI/MA/NH</i>	1,061,490	-	878	814	236	113	17	35	17	0	645	35	16	42	370
Connecticut River	1,547,743	1,540	1,005	698	73	60	50	34	0	16	810	28	7	68	480
<i>Total Connecticut River</i>	1,547,743	-	1,005	698	73	60	50	34	0	16	810	28	7	68	480
Hudson River	1,152,275	1,419	812	385	0	75	24	17	0	18	615	50	13	23	236
Long Island Sound	515,502	863	597	380	149	17	13	2	7	1	530	7	20	8	130
<i>Total Hudson/L.I. Sound</i>	1,667,777	-	1,409	765	149	92	37	19	7	19	1145	57	33	31	366
Coastal Maine	761,195	3,368	226	226	147	63	6	23	16	0	90	20	8	37	150
Interior Maine	3,041,108	6,058	502	491	45	137	10	84	1	2	224	40	4	112	360
Northern Maine	1,783,679	17,660	101	100	0	23	4	28	0	1	26	7	12	37	68
<i>Total Maine</i>	5,585,982	-	829	817	192	223	20	135	17	3	340	67	24	186	578
Great Lakes	806,412	1,133	712	164	712	56	22	26	0	21	558	12	17	20	160
Saint Lawrence	1,769,823	2,493	710	249	0	125	38	53	0	14	409	66	5	54	303
<i>Total St. Lawrence</i>	2,576,234	-	1,422	413	712	181	60	79	0	35	967	78	22	74	463

Range-wide Assessment: Habitat Integrity

Primary factors (non-correlated, high data quality)

- **Land use:** % riparian forest, % agricultural land use
- **Fragmentation:** Road-stream crossing density, overall road density
- **Water quality:** Acid deposition

Secondary factors





- Include % forested watershed, dams, mines, oil/gas wells

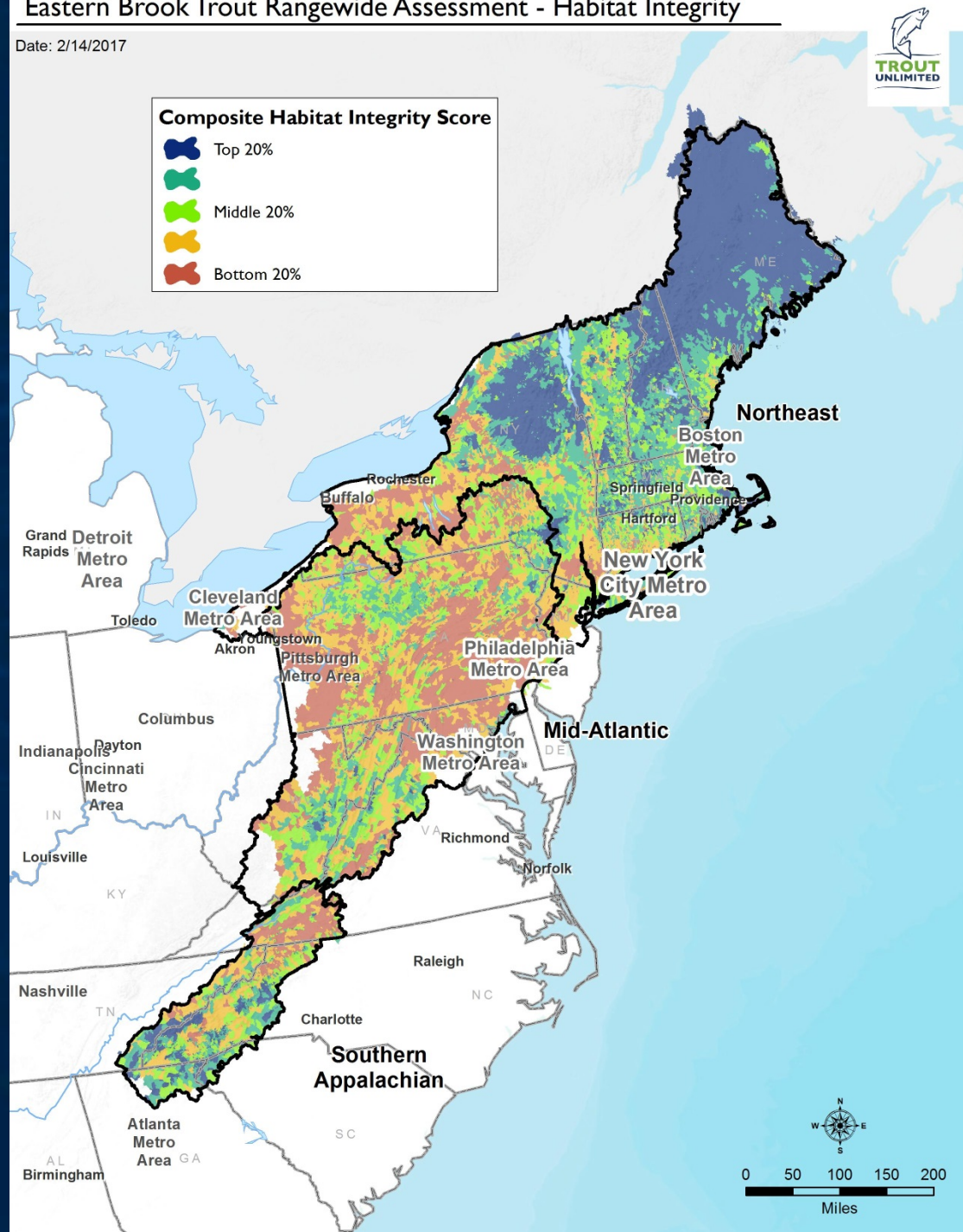
All factors scored as percentile, composite score is average of primary factor percentile scores



Range-wide Assessment: Habitat Integrity

Composite Habitat Integrity Score

-  Top 20%
-  Middle 20%
-  Middle 20%
-  Bottom 20%



Range-wide Assessment: Future Security

Primary factors (non-correlated, high data quality)

- **Climate:** Stream temperature

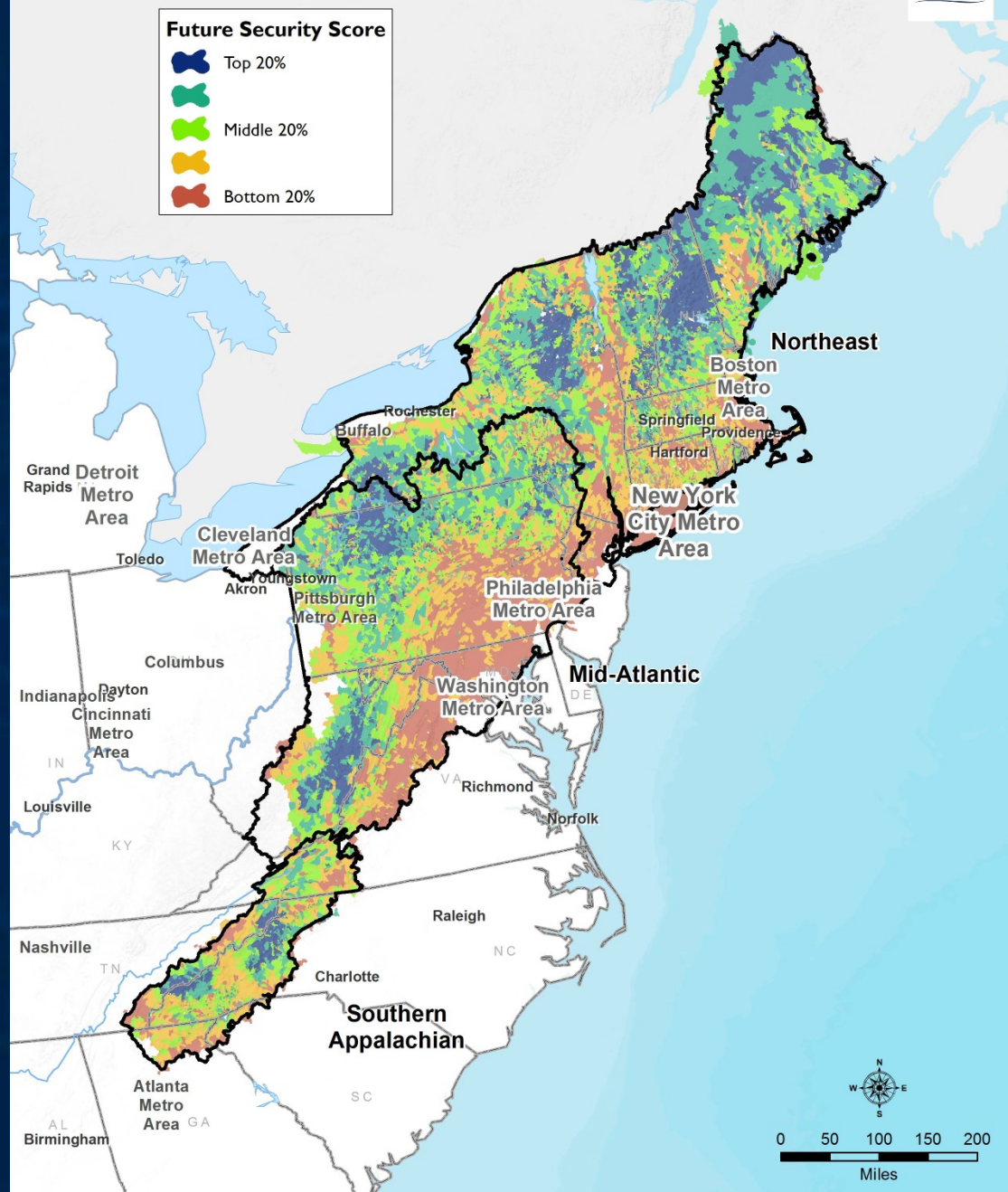
Secondary factors

- Include forecast shale gas development, urbanization, karst geology, protected areas

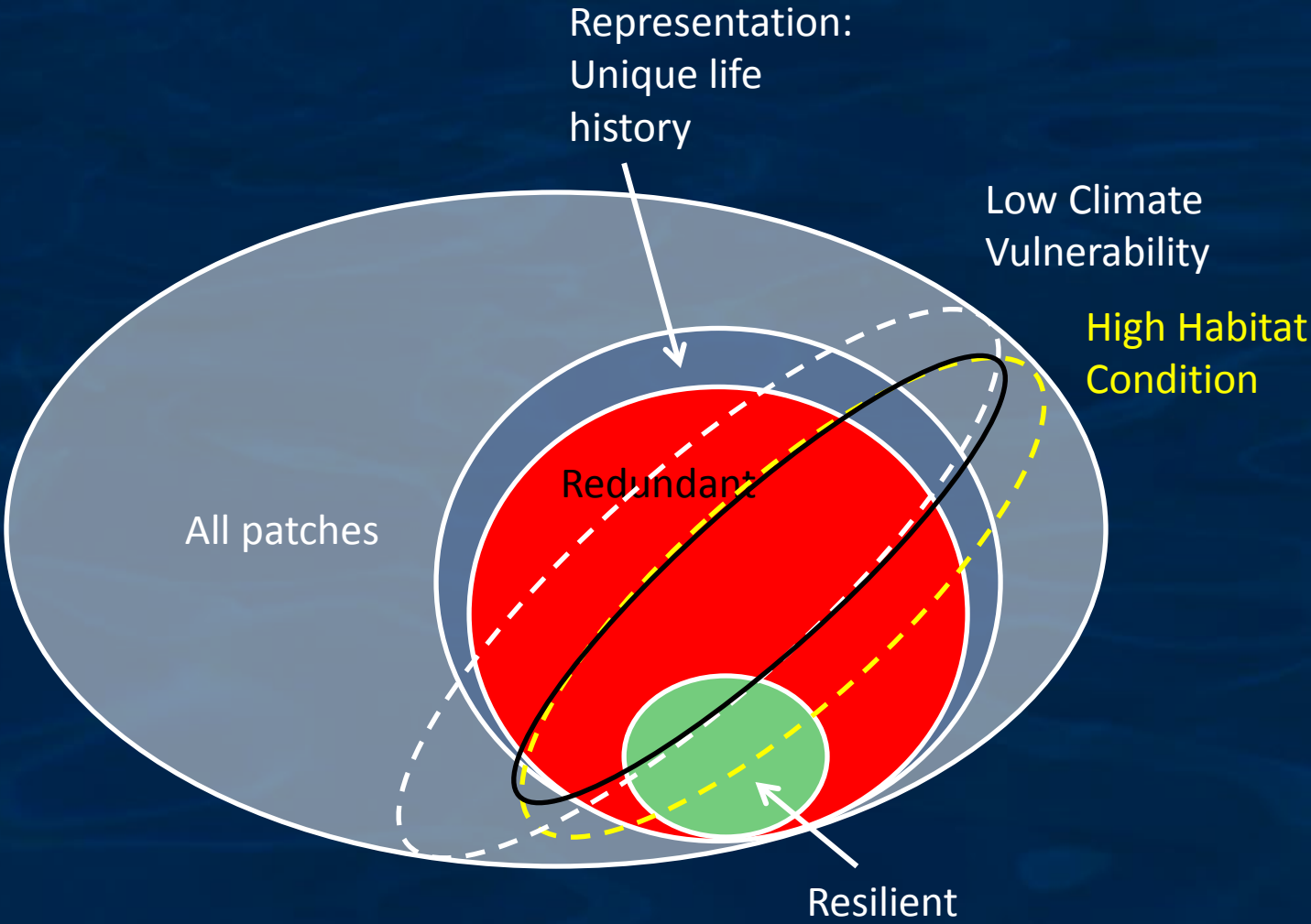
All factors scored as percentile, composite score is average of primary factor percentile scores



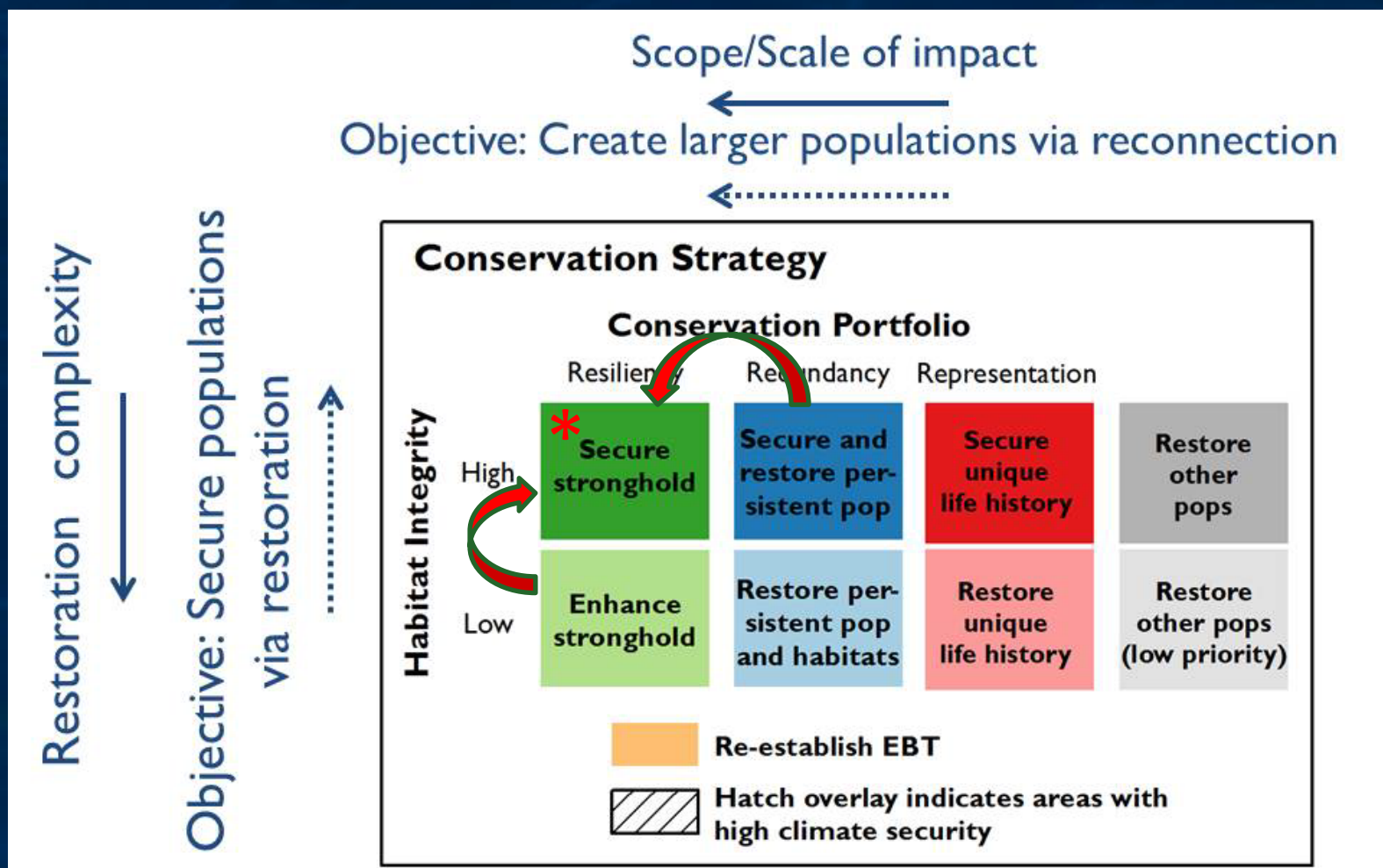
Range-wide Assessment: Future Security



Brook Trout Portfolio and Range-wide Assessment

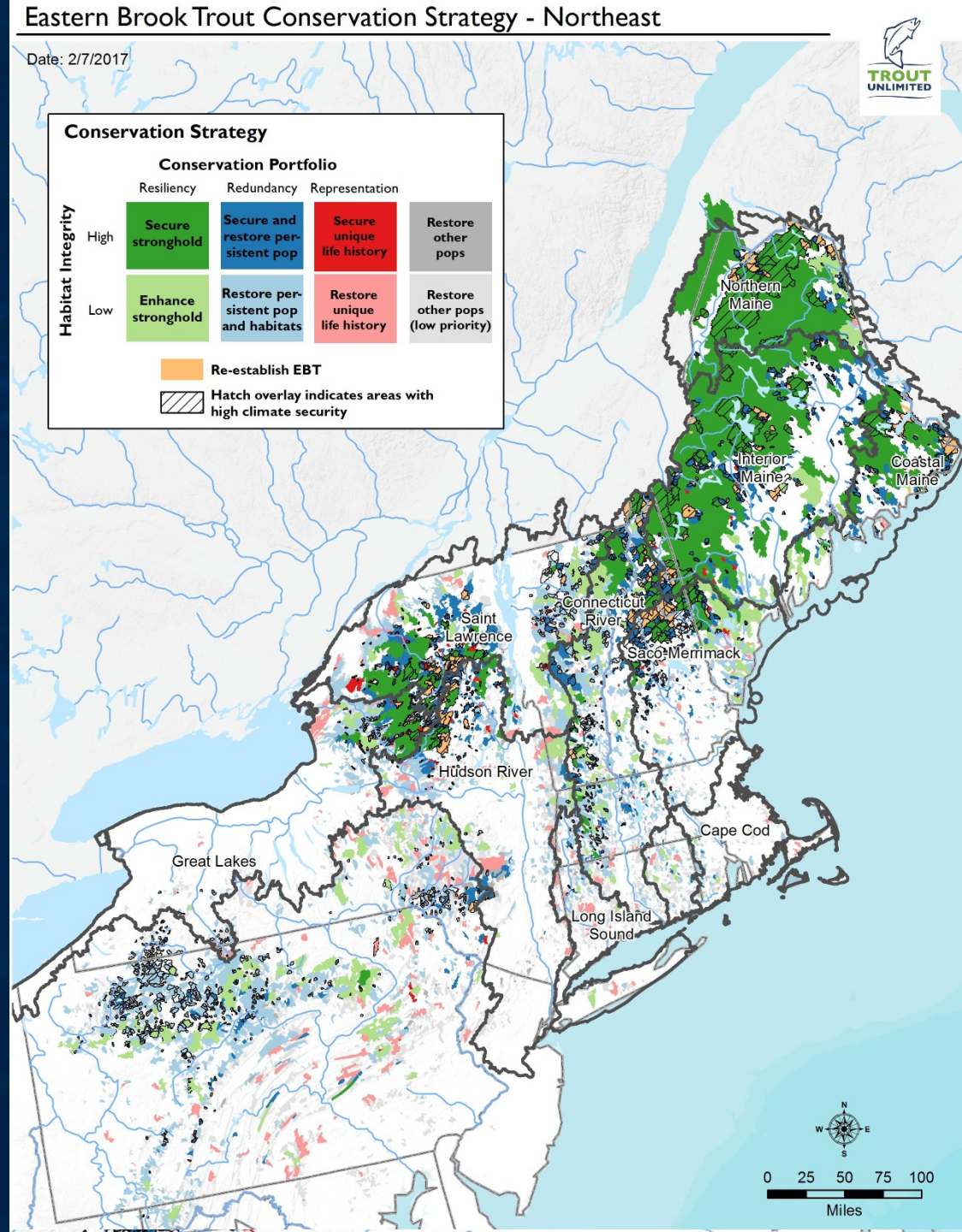
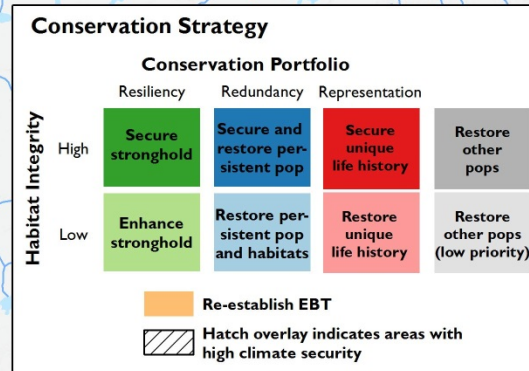


Conservation Strategies based on Portfolio and Range-wide Assessment



Date: 2/7/2017

Conservation Strategies based on Portfolio and Range-wide Assessment



Focal Area Assessments (Upper Connecticut, Delaware, Susquehanna, and Chesapeake Basins)

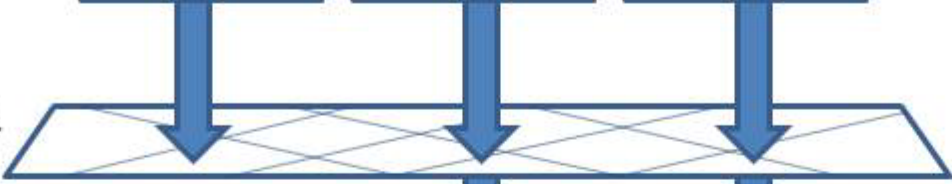
Goal: Take approach of range-wide assessment, but use regionally available or local datasets and present within a visualization tool with emphasis on restoration strategies

Datasets:

- BT occupancy and stream temperature models produced by as part of the Spatial Hydro-Ecological Decision System project (Ecosheds 2016) and BT occupancy models and habitat quality and total stress indices produced by Downstream Strategies in the Chesapeake Bay (Clingerman et al. 2015)
- Regional conservation priorities, including Delaware River Basin Initiative (The Nature Conservancy 2011) and Connect the Connecticut (North Atlantic Landscape Conservation Cooperative 2016).
- State-specific designations, including exceptional waters and trout water designations.
- Regional tools, including the Riparian Restoration Decision Support Tool (Coombs and Nislow 2014).
- Regional condition and threat datasets, including North Atlantic Aquatic Connectivity Collaborative barriers, abandoned mine lands, proposed natural gas pipelines



Evaluate conservation value & landscape context @ population scale



Low value

High value

High value

Evaluate conservation need @ reach scale



Poor fit

Good fit

Evaluate opportunity, feasibility @ site scale



Feasible

Project priority

Low priority project

Low priority project

High priority project

Portfolio, Range-wide, and focal area assessments



Decision support tools (Ecosheds, LCC Riparian Tool, Ches. Bay Tool)



Site assessment, local information, partner input



Example 1: Identifying priority BT populations requiring a specific restoration activity – riparian restoration – within a focal geography

In this example, brook trout 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 $< 17^{\circ}\text{C}$)
- Patch has some riparian restoration need (% mean canopy cover range is 60-80%)
- Patch is high value brook trout population (is resilient or redundant)

Eastern Brook Trout Joint Venture, Delaware Patches

This Eastern Brook Trout Delaware Basin visualization and mapping tool provides a means to query and display local area results associated with Trout Unlimited's Eastern Brook Trout Range-wide Conservation Portfolio and Focal Area Risk and Opportunity Analysis, towards identifying locations where specific restoration opportunities may be appropriate for securing and enhancing Eastern Brook Trout (EBT) populations. This project is funded by the National Fish and Wildlife Foundation.

The larger analysis is comprised of three components – an EBT Conservation Portfolio analysis, a range-wide habitat condition and threat assessment, and a focal area analysis. The EBT Conservation Portfolio component characterizes EBT population "patches" produced by the Eastern Brook Trout Joint Venture (EBTJV 2015) based on how each existing population contributes to the range-wide diversity of EBT through representation of genetics, life history, geographic diversity, resiliency to disturbances, and demographic persistence. The EBT range-wide assessment characterizes the EBT population patches and their adjacent subwatersheds (HUC-12s) across the range of EBT in the eastern US based on the current pattern of habitat alteration and articulated threats. The focal area assessments further evaluate habitat conditions and future threats within EBT patches using local datasets. The focal area assessments identify existing projects to help inform EBT patch characterization, map region-specific stressors, and imagine additional factors, including ecosystem services, climate, and monitoring data into the range-wide assessment. Full documentation for the analyses is available on TU's website.

Tab within this visualization tool correspond to the common suite of restoration activities used to improve Eastern Brook Trout populations and habitats. For each restoration activity, we provide filters and criteria related to portfolio, range-wide assessment, and focal area-specific factors we identified as relevant for evaluating restoration need and opportunity within EBT population patches. The tab labeled "Data Descriptions" provides a list of the sources used in each of the subsequent tabs.

By adjusting the slider bars and check boxes associated with each filter, the map panel responds to show those patches meeting custom criteria. Hovering over a patch in the map reveals a pop-up box with additional information for the patch. Clicking on a patch will highlight a single patch and add a hyperlink to the pop-up which links to an ArcGIS Online map application which provides access to a subset of mapped information within patches.

The visualization tool allows for the exploration of opportunities across EBT patches by highlighting portions of broad geographies that meet user-defined criteria. The map application allows for the exploration of the pattern of factors such as stream temperature and EBT occupancy models, riparian condition, and land use within patches. Taken together, the two tools serve as a "one-stop" conservation plan to facilitate EBT conservation within the Delaware basin.

APPALACHIAN LANDSCAPE CONSERVATION COOPERATIVE

GIS & Planning

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You are here: Home > Tools & Resources > Riparian Restoration Decision Support Tool

Riparian Restoration Decision Support Tool

An innovative riparian planting and restoration decision support tool, funded by the Appalachian LCC, is now available to the conservation community. This user-friendly tool allows managers and decision-makers to rapidly identify and prioritize areas along the banks of rivers, streams, and lakes for restoration, making these ecosystems more resilient to disturbance and future changes in climate. It will also help the conservation community invest limited conservation dollars wisely, helping to deliver sustainable resources.

The tool works by identifying vulnerable stream and riverbanks that lack tree cover and shade in coldwater stream habitats. By locating the best spots to plant trees in riparian zones, resource managers can provide shade that limits the amount of solar radiation heating the water and reduces the impacts from climate change. This well-established management strategy will benefit high-elevation, cold-water aquatic communities.

Quicklinks

- Riparian Restoration Decision Support Tool
- Report: Riparian Prioritization and Status Assessment for Climate Change Resilience of Coldwater Stream Habitats within the Appalachian and Northeastern Regions
- Riparian Restoration Decision Support Tool Fact Sheet
- Riparian Restoration Appendix 1-Canopy Cover Statistics
- Background Materials: Riparian Restoration to Promote Climate Change Resilience in Eastern U.S. Streams

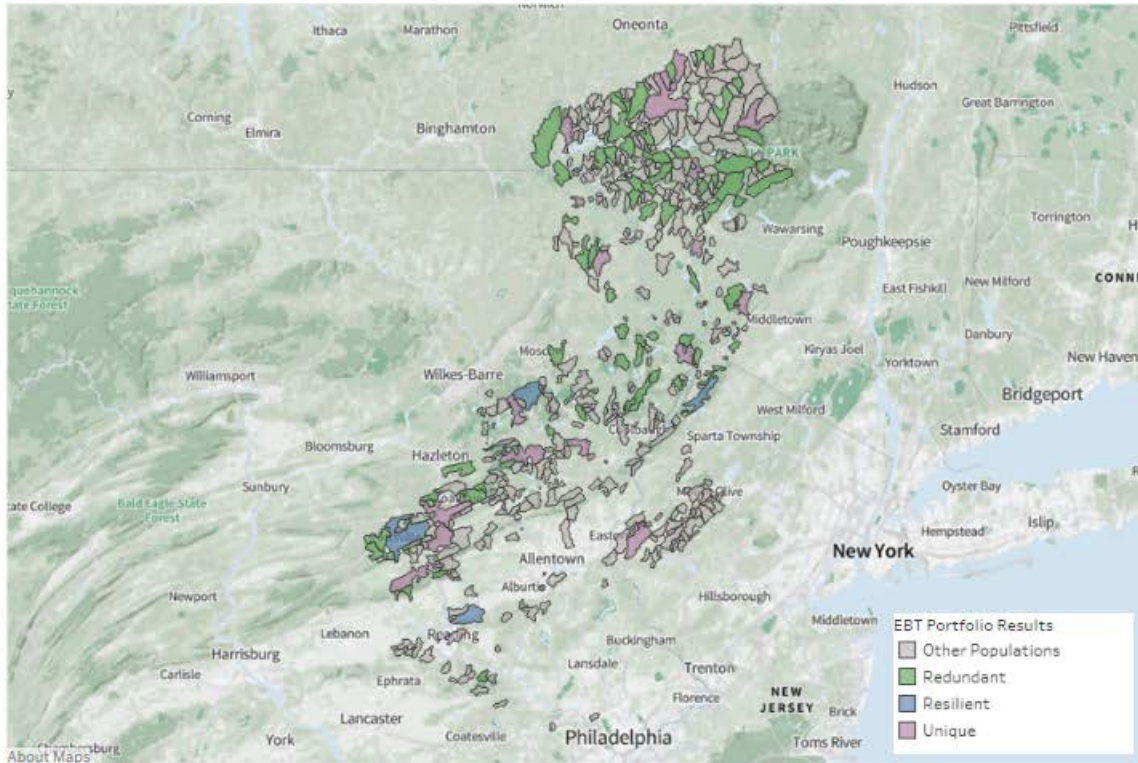
Legend

- Hybrid Imagery
- Basin
- Land Cover
- Surface Lithology
- Elevation
- Base Flow Index
- Mean Precipitation
- Mean Max. Temperature
- Mean Min. Temperature
- SO2 Deposition
- Canopy Cover
- Soil Cato
- Impervious Surface
- Counties
- US States
- EBTJV Basins
- National Forest
- 10 M Stream Corridor
- Catchments (HUC-12)
- Subwatershed Assessment
- Subwatershed Priority Scores
- HUC 12
- HUC 8
- HUC 6
- EBTJV Stream
- Brook Trout Habitat Patches
- Brook Trout Patch Vulnerability
- Catchments (HUC-12)
- EBTJV Boundary
- Chesapeake Bay Boundary
- LCC Basins
- Streams (HUC-12)
- Waterbodies (HUC-12)
- Dams
- Crossings

Google

Focal Area Data Visualization Tool

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



Riparian characteristics

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

EBTJV trout community

- Resiliency & Redundancy**
- Both
 - Neither
 - Redundant
- Unique Life History**
- Missing Data
 - Resident Not Productive
 - Unique

Portfolio results

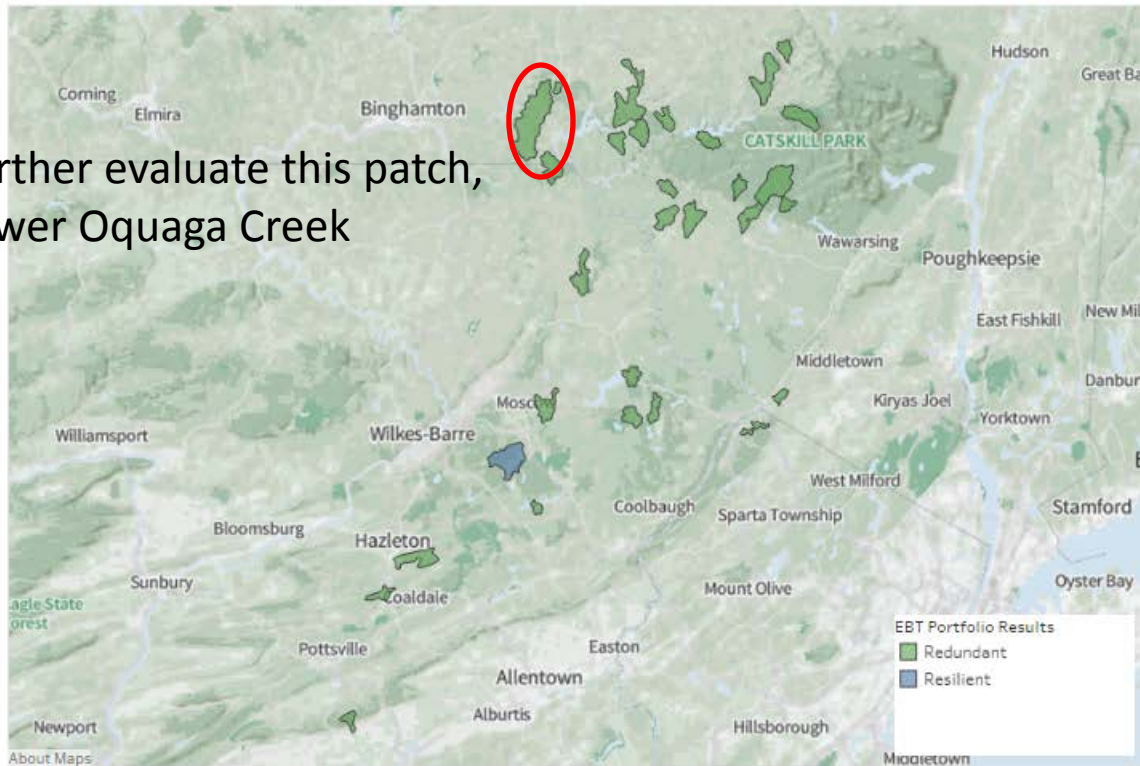


Occupancy and temperature models

Focal Area Data Visualization Tool

- Description
- Data Sources
- Secure Portfolio Elements
- Climate Change and Ecosystem Services
- AMD, Abandoned Mines, Acid Deposition
- Riparian Restoration
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- Mitigate Sediment and Nutri

Further evaluate this patch,
Lower Oquaga Creek

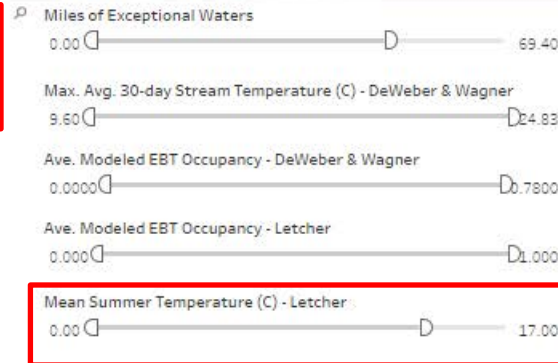


Riparian: 60-80% cover

- 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



Portfolio Results – resilient or redundant

Modeled stream temps < 17°C

Focal Area Data Visualization Tool

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

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

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
% Dev Floodplain: 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](#)
[EBTJV Reports and Maps](#)
[EBTJV Data & Tools | Riparian Restoration Decision Support](#)
[ECCS/EDS | 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

Great Barrington, New Milford, Danbury, Bric, Stamford, Oyster Bay, Alburts, Pottsville, Coaldale, Hazleton, Bloomsburg, Sunbury, Allentown, Alburts, Newport, Elmira, Binghamton, Williamport, Moscoville, Danbury, Bric, Stamford, Oyster Bay, Alburts, Pottsville, Coaldale, Hazleton, Bloomsburg, Sunbury, Allentown, Alburts, Newport

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

Locate patch of interest in EBTJV Decision Support Tool

The screenshot displays the EBTJV Decision Support Tool interface. On the left is a legend with various data layers, and on the right is a map of the EBTJV region. A red circle highlights a specific patch of interest near Binghamton.

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
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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 Interface

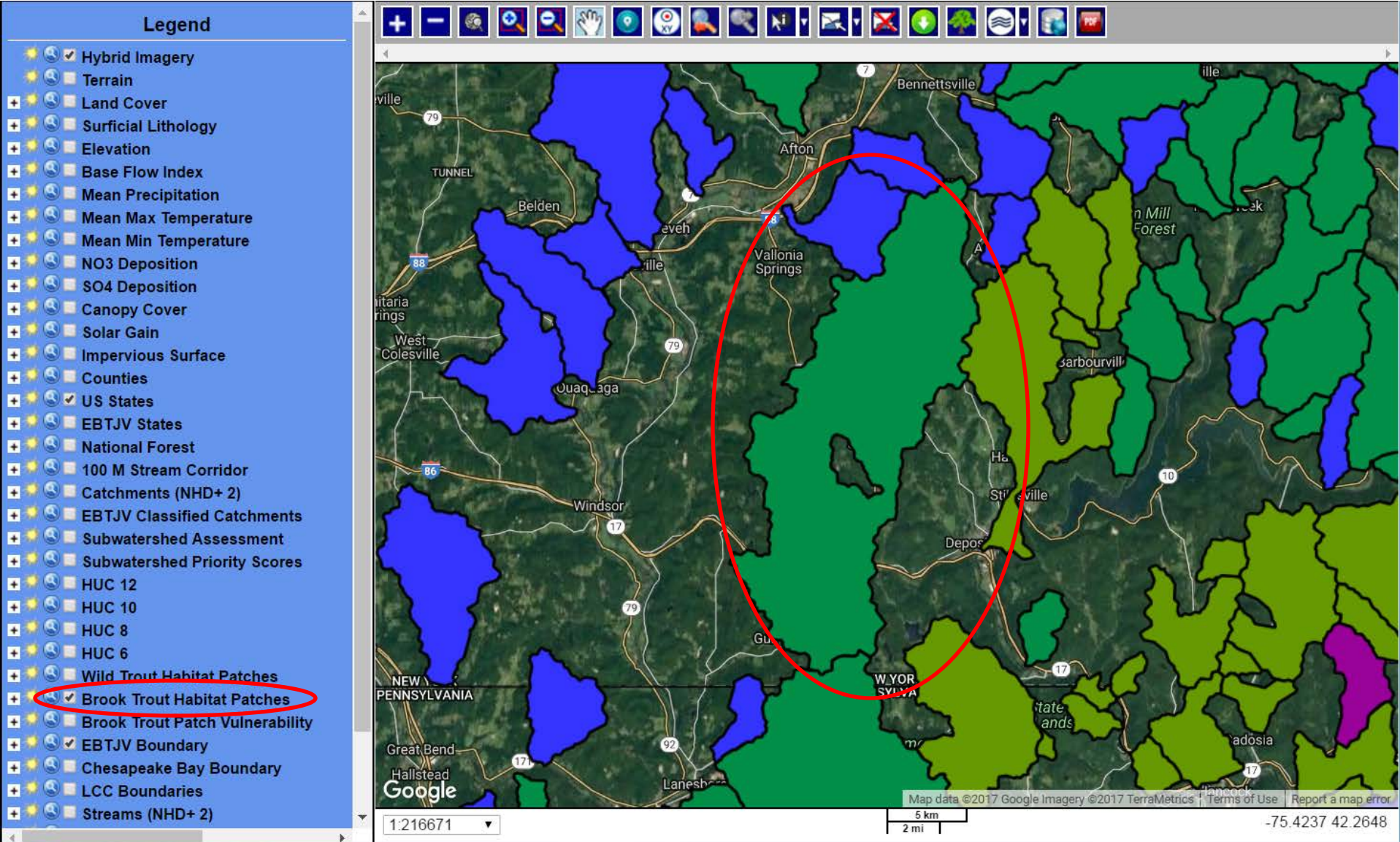
Map data ©2017 Google Imagery ©2017 TerraMetrics Terms of Use Report a map error

Scale: 1:1733372

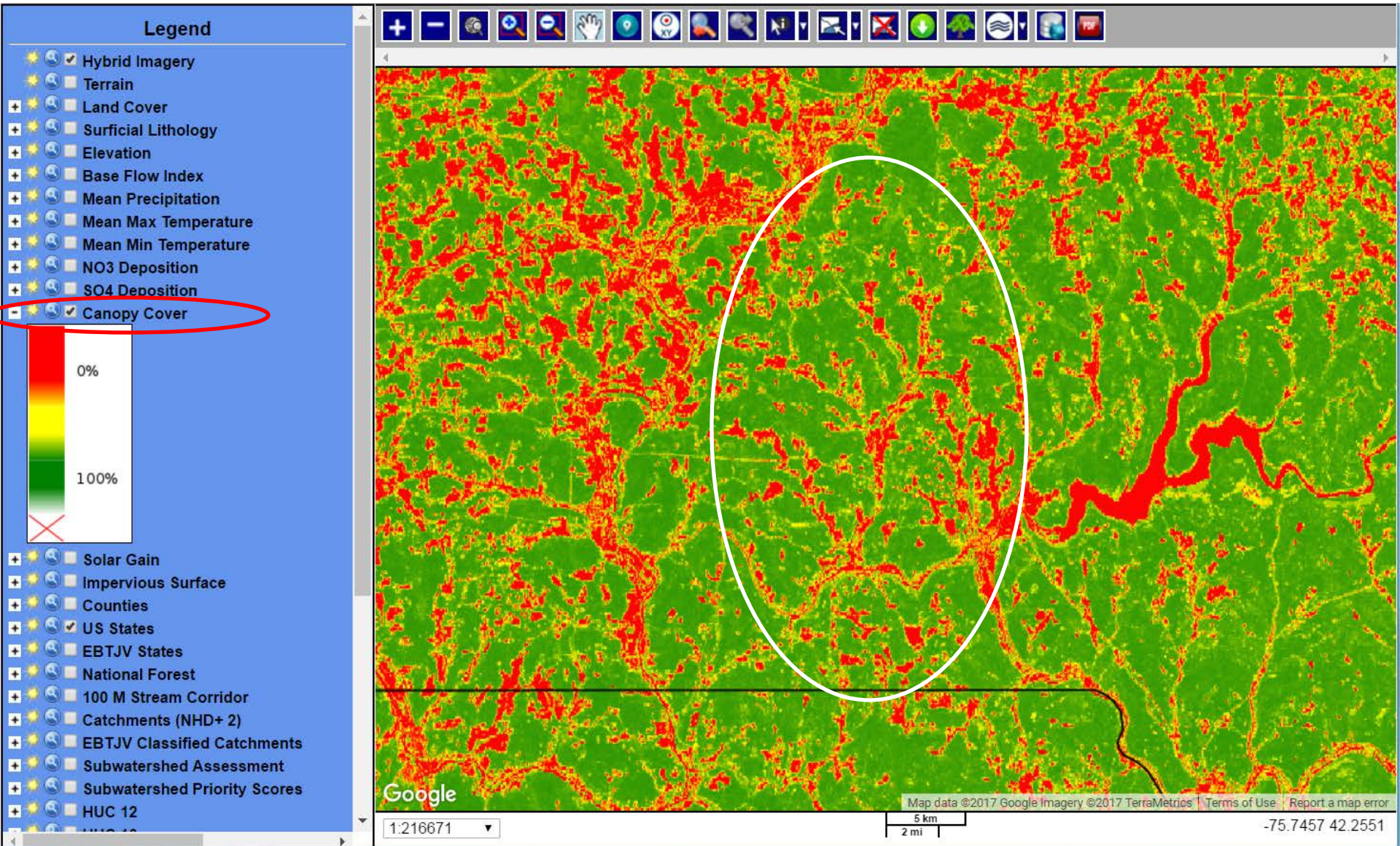
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Coordinates: -75.6462 42.7981

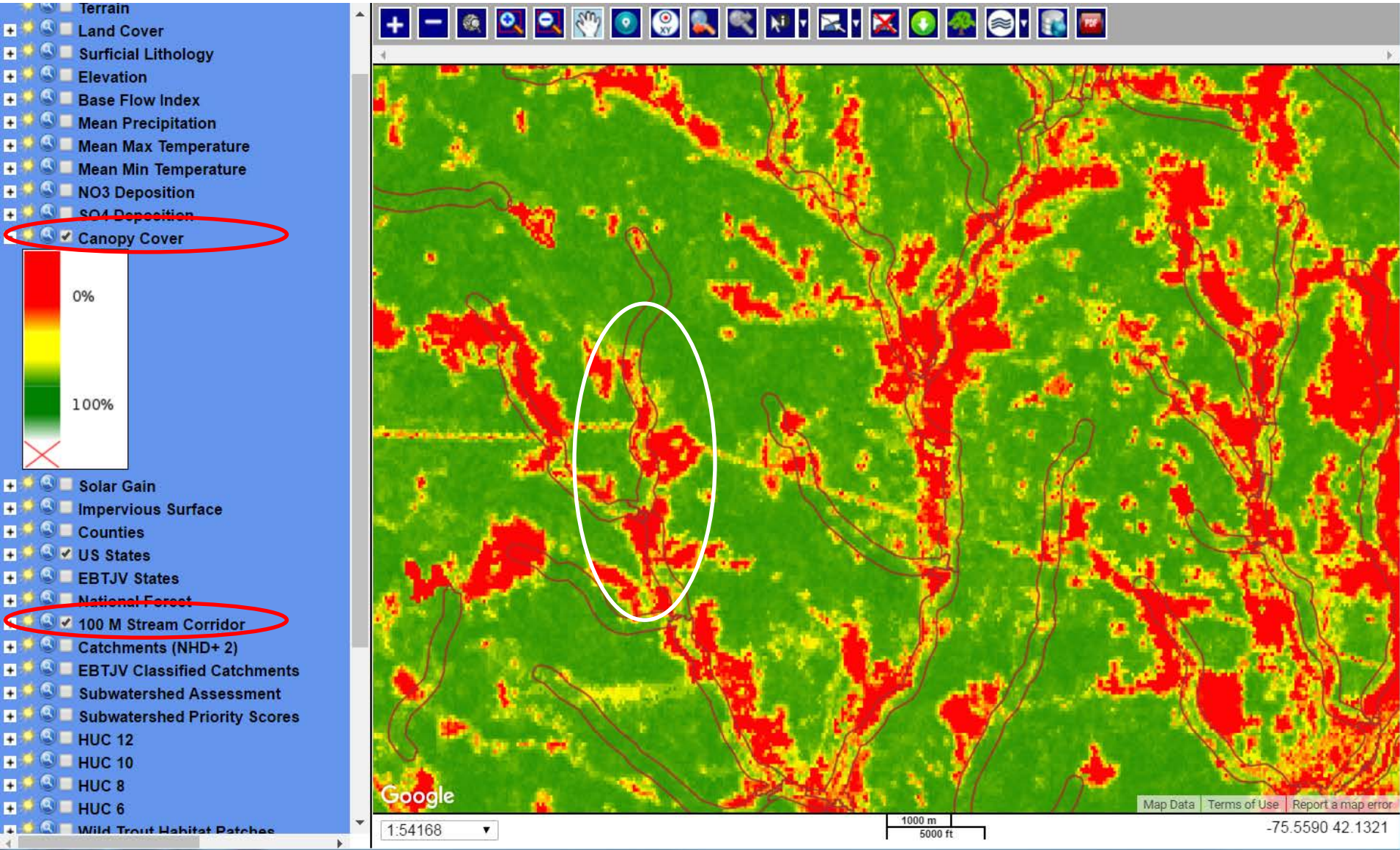
Locate patch of interest



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

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

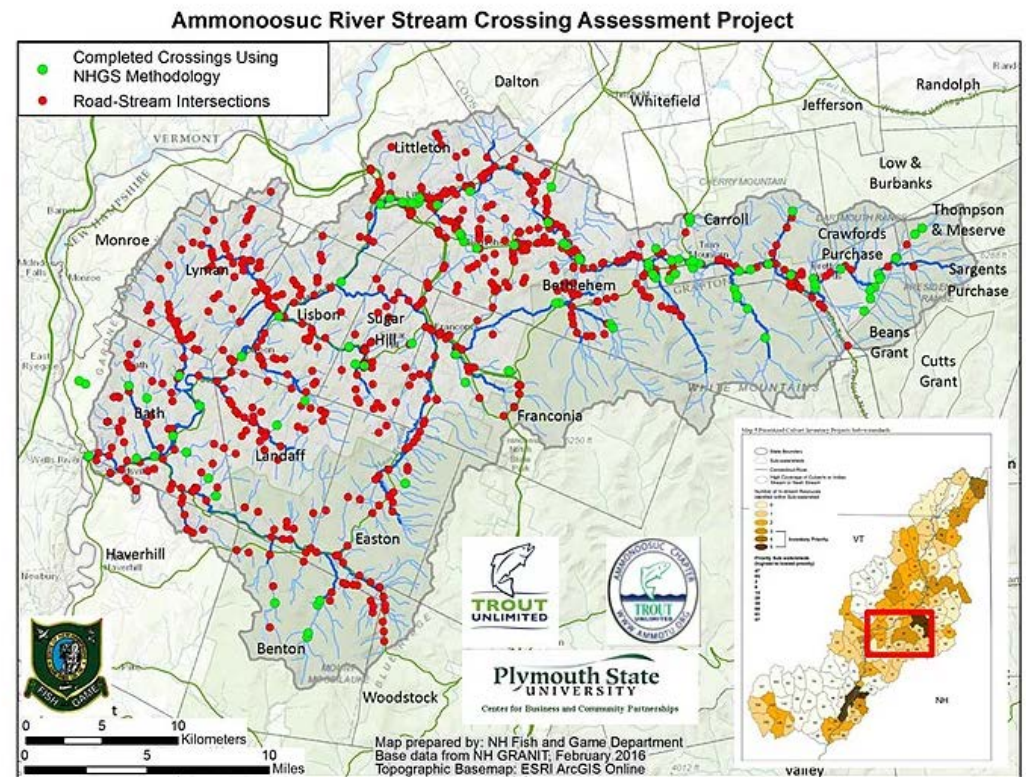
Scale: 1:3385 | 100 m / 200 ft | -75.5258 42.0890

Example 2: 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.



Portfolio and Range-wide Assessment webmap

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.

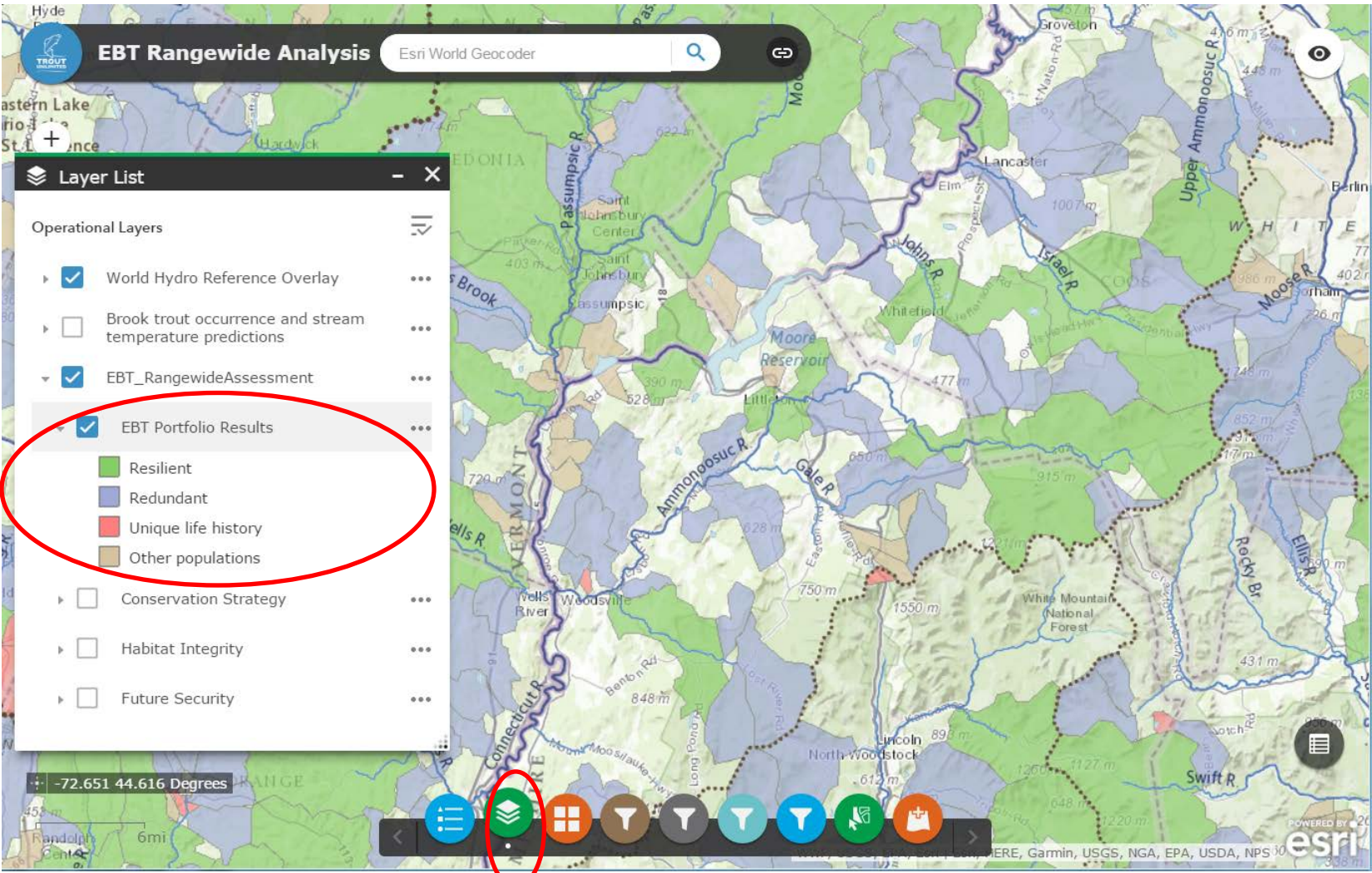
Do not show this splash screen again.

OK

Move mouse to get coordinates

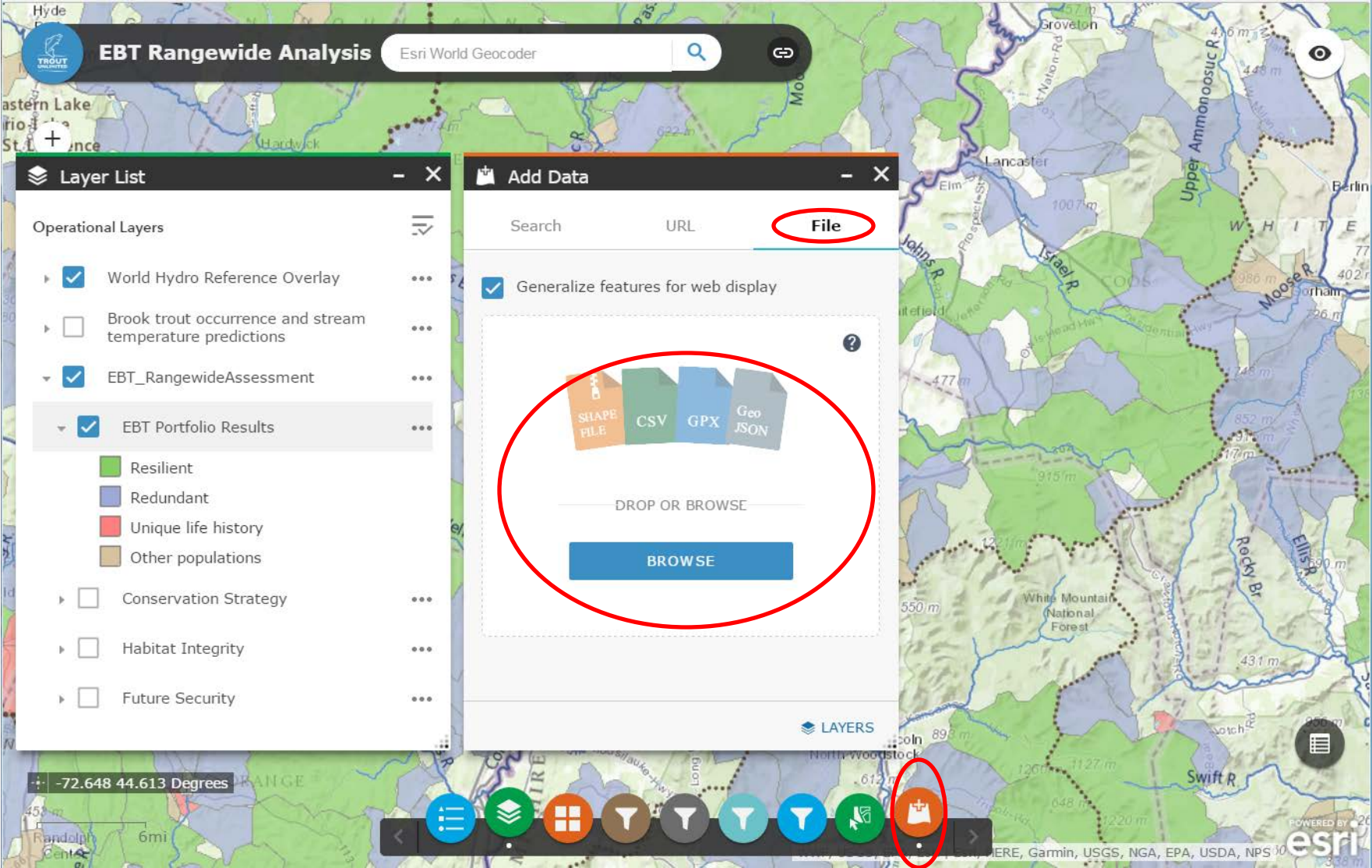
POWERED BY esri

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.



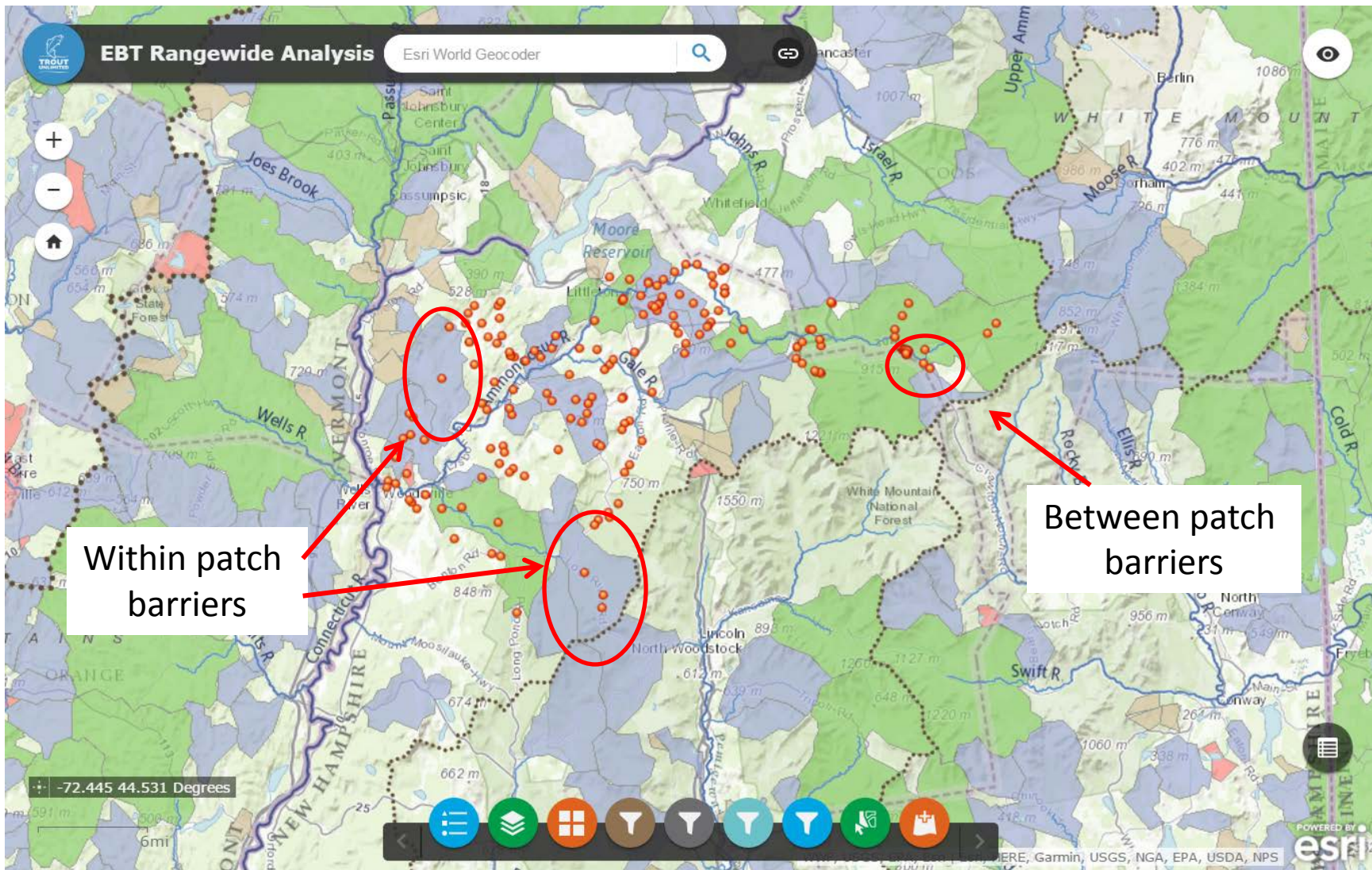
Layers tool

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.

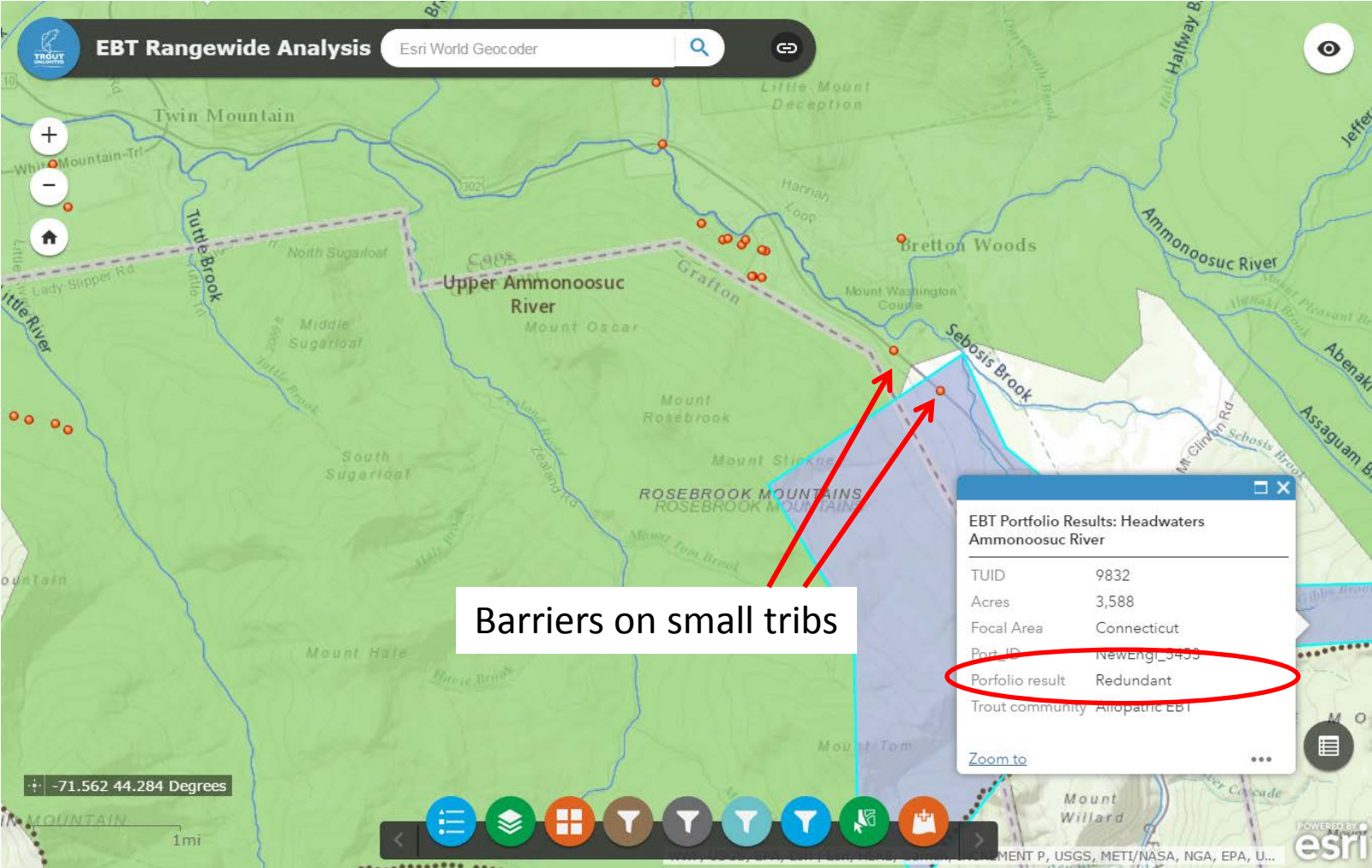


Add data tool

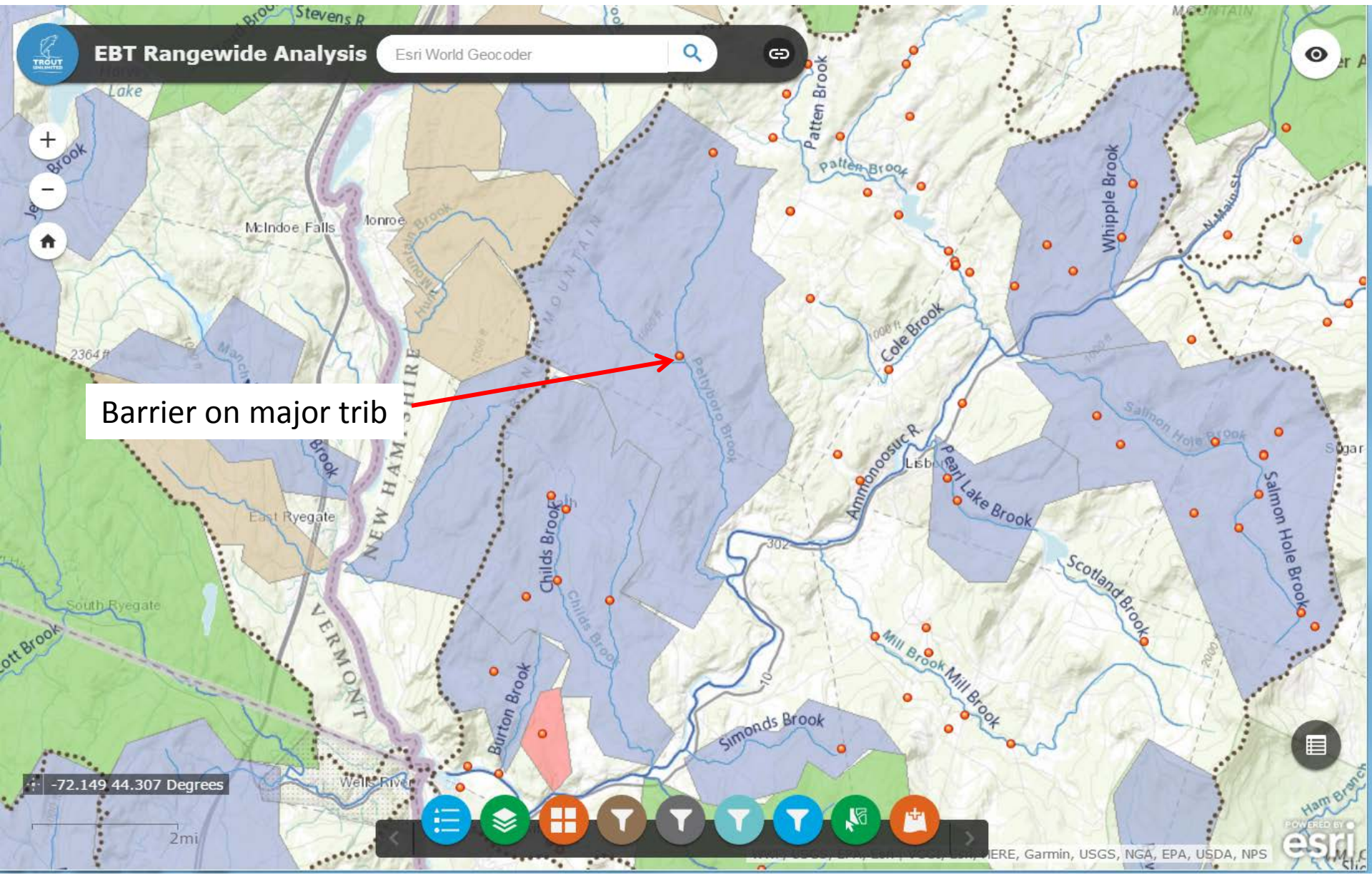
A quick scan of the map reveals several types of critical barriers – those that appear to fall within existing population patches (and were not accounted for in the patch delineation process) and those that appear to be at the downstream extent of patches and fall between patches.



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.

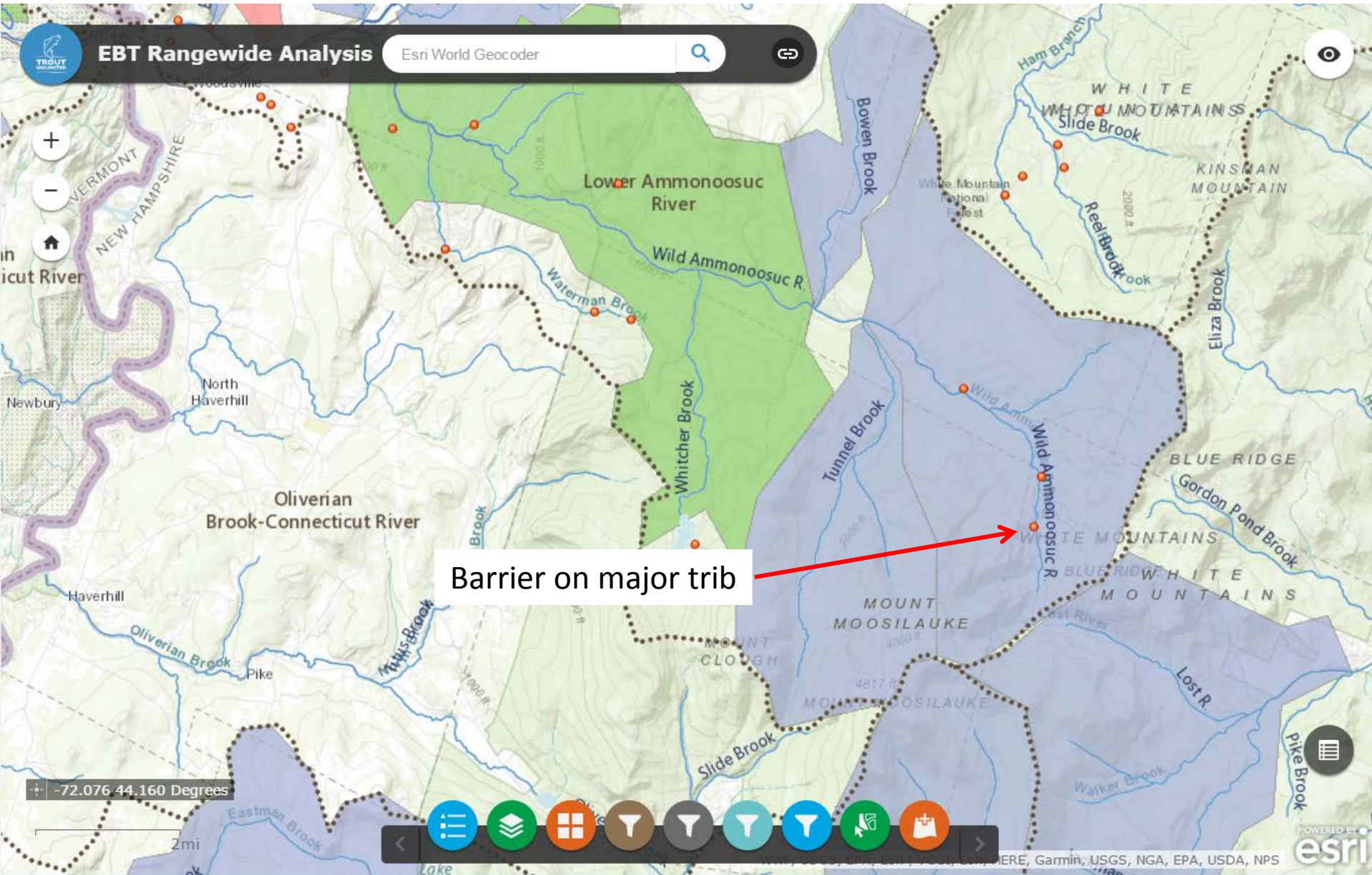


Zooming into the map to explore the within patch barriers shows that both fall on major streams – Pettyboro Brook.



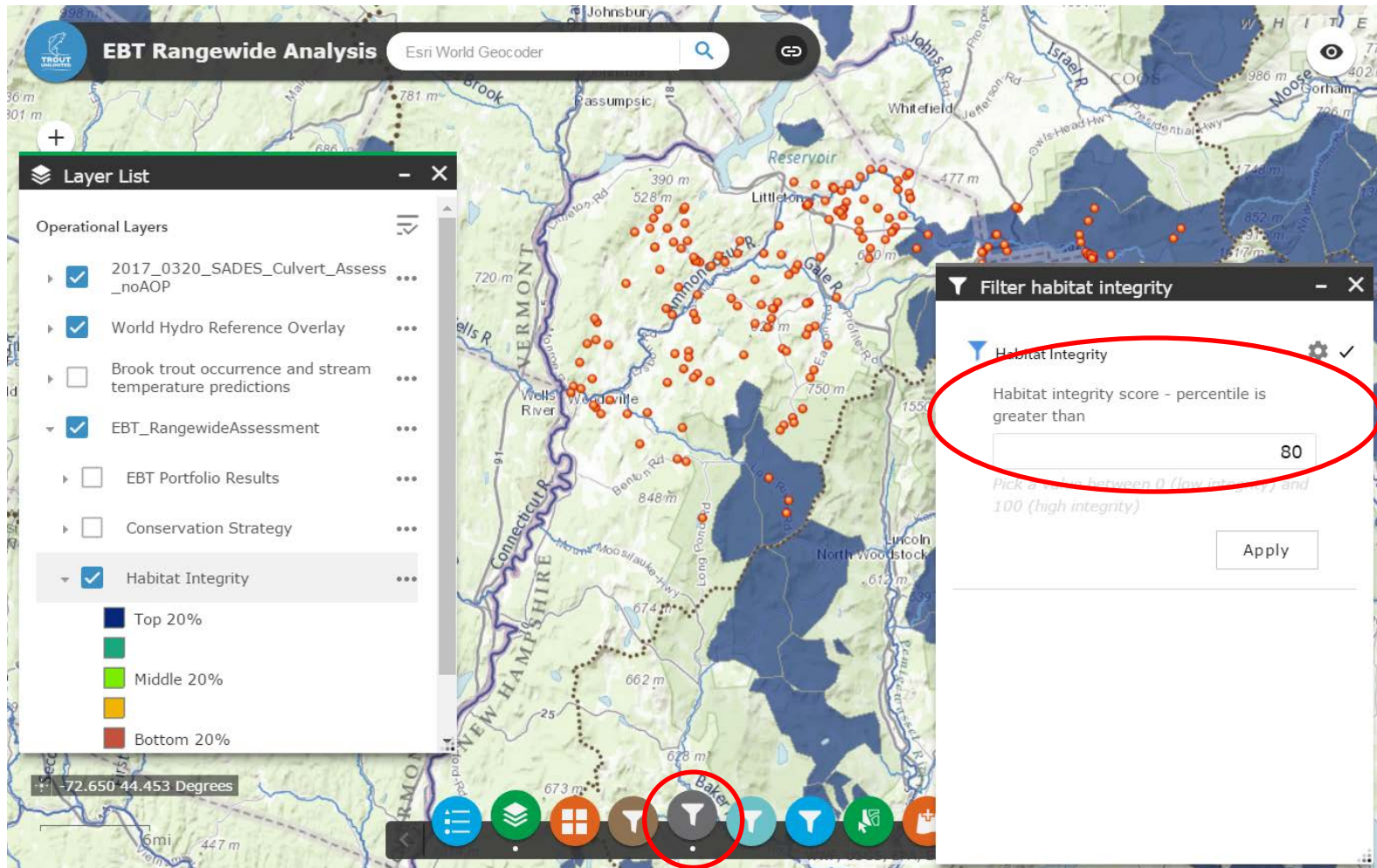
Barrier on major trib

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



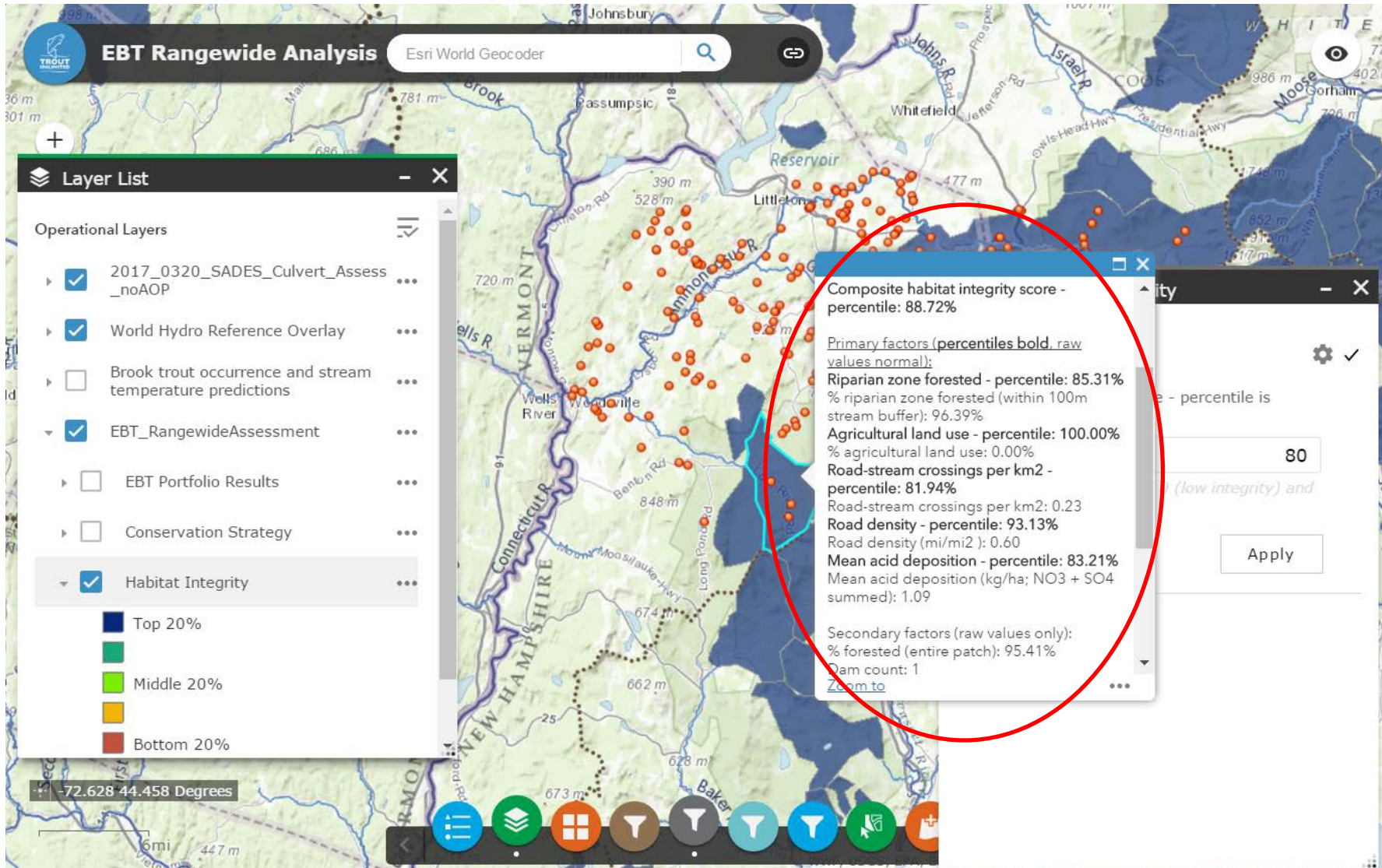
Barrier on major trib

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.

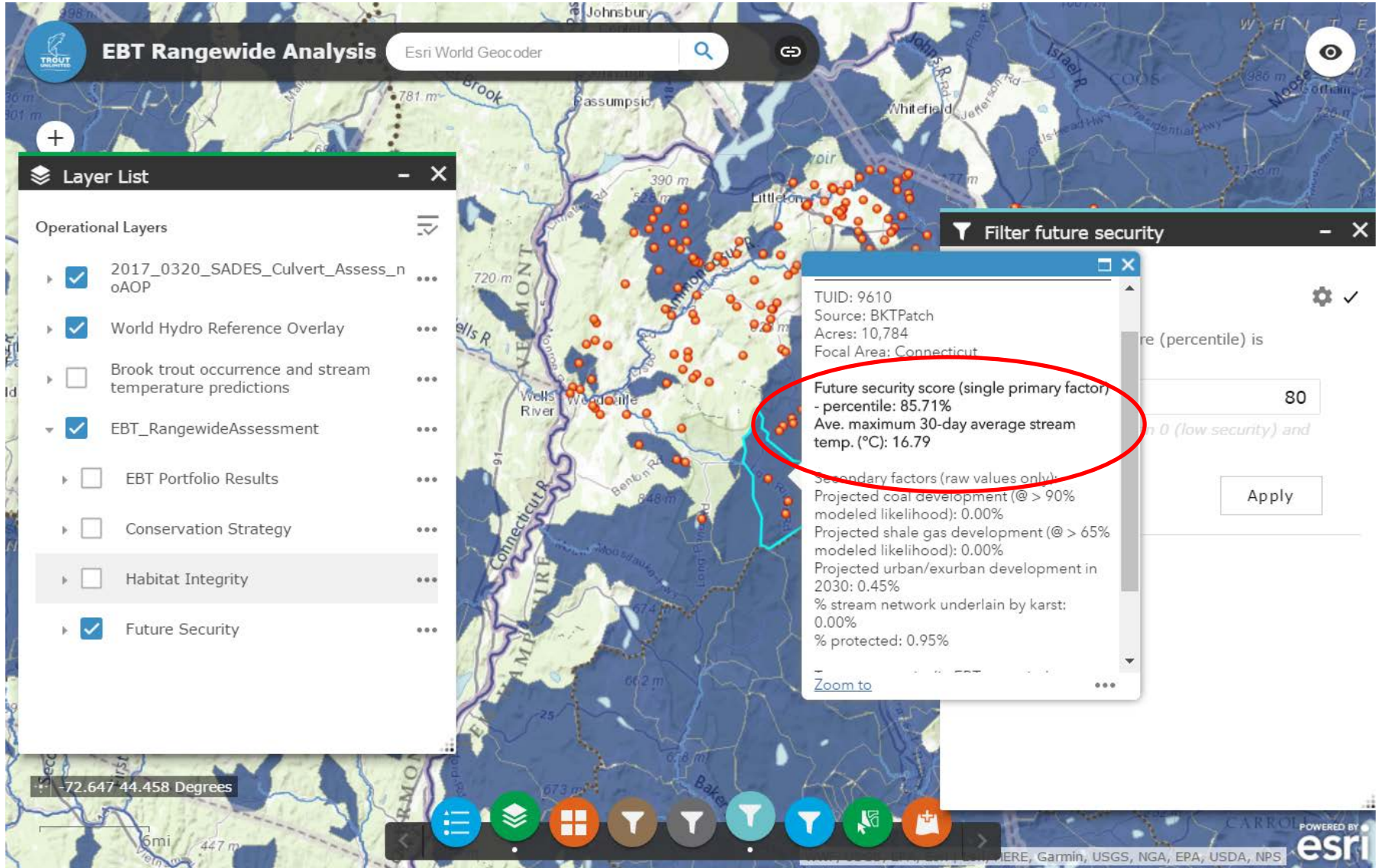


Habitat integrity filter tool

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.



More information:

www.tu.org/ebt-portfolio-rwa

The screenshot shows the Trout Unlimited website. At the top, there is a navigation bar with links for NEWSLETTER, BLOG, MEDIA, GO FISHING, FIND YOUR CHAPTER, and SHOP. A search bar is also present. Below the navigation bar, there are buttons for JOIN, RENEW, DONATE, and MY TU. The main content area features a large image of a trout's head. On the left, there is a sidebar with a 'CONSERVATION' menu. The main article is titled 'Eastern Brook Trout Conservation Portfolio, Range-wide Assessment and Focal Area Tools'. The article text describes the development of three conservation planning products. Below the text, there are links to various reports and appendices. On the right side of the page, there is a 'Login To My TU' section with input fields for email address and password, and a 'LOG IN' button. Below that, there is a 'Life Member Offer Is Back!' section with an image of fishing gear and a 'JOIN NOW' button.

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Eastern Brook Trout Conservation Portfolio, Range-wide Assessment and Focal Area Tools

Trout Unlimited developed three conservation planning products to help identify strategic conservation opportunities and evaluate potential projects within the range of Eastern Brook Trout (EBT) in the eastern US. The Conservation Portfolio uses the 3-R framework (Representation, Resiliency, and Redundancy) to evaluate each EBT population patch for its resiliency to disturbances, likelihood of demographic persistence, and representation of genetic, life history, and geographic diversity. The Range-wide habitat integrity and future security assessment uses broad-scale GIS information to characterize the general habitat condition and vulnerability of EBT patches. The focal area analyses add regional data sources to provide additional resolution on habitat condition and threats within specific geographies. Taken together, the products allow us to characterize the continuum of viability, habitat condition, and vulnerability of EBT populations and the corresponding conservation strategies they likely require. This project was supported by funding from the National Fish and Wildlife Foundation.

Reports and tools associated with this project:

- [EBT Conservation Portfolio, Range-wide Assessment, and Focal Area assessment report](#)
- [Appendix 1: Range-wide habitat integrity and future security factor data sources](#)
- [Appendix 2: Focal area data sources](#)
- [Appendix 3: Focal area tool user guide](#)
- [Appendix 4: Focal area tool example applications](#)
- [EBT Portfolio and Range-wide assessment webmap](#)
- [Upper Connecticut focal area tool](#)
- [Upper Delaware focal area tool](#)
- [Upper Susquehanna focal area tool](#)
- [Upper Chesapeake focal area tool](#)

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