

Conservation Planning and TU: Brook Trout Conservation Portfolio Assessment and Tools



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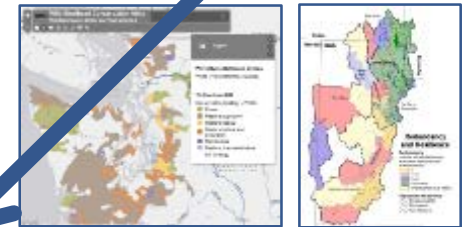
How TU Uses Conservation Planning Tools

Evaluate conservation value & landscape context @ regional scale



Priority watersheds

TU planning tools (CSI, Conservation Portfolio), recovery plans, etc.



The Conservation Success Index evolves...

- Conservation Portfolio
- Multi-species perspectives
- Integration of finer-scale information
- Data delivery with web-based tools focused on specific protection, restoration themes
- Simplified versions for broader audience

... and has plenty of company

- National Fish Habitat Action Plan
- USFS Watershed Condition Framework
- Landscape-specific tools

Watershed plans, decision support tools, etc.




t, local
ner input




TU Brook Trout Assessments: Scales



EBT Portfolio: Scales

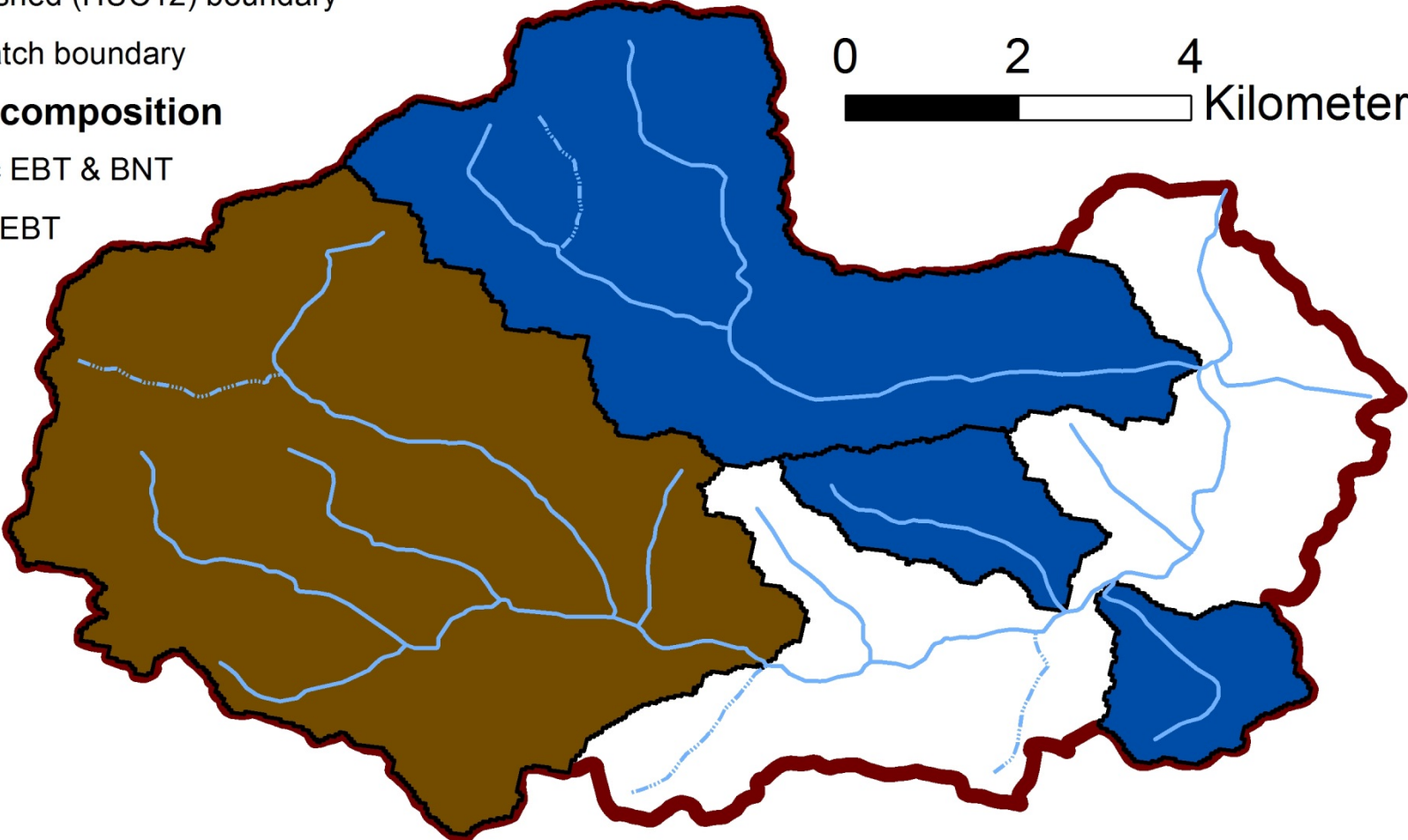
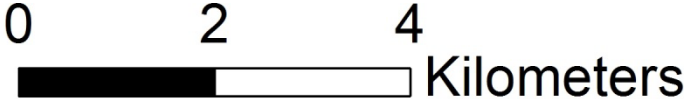
 Subwatershed (HUC12) boundary

 EBTJV patch boundary

EBTJV patch composition

 Sympatric EBT & BNT

 Allopatric EBT



BT Portfolio, Range-wide, and Focal Area Assessments

Conservation portfolio

Identify BT strongholds, persistent populations, and unique 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

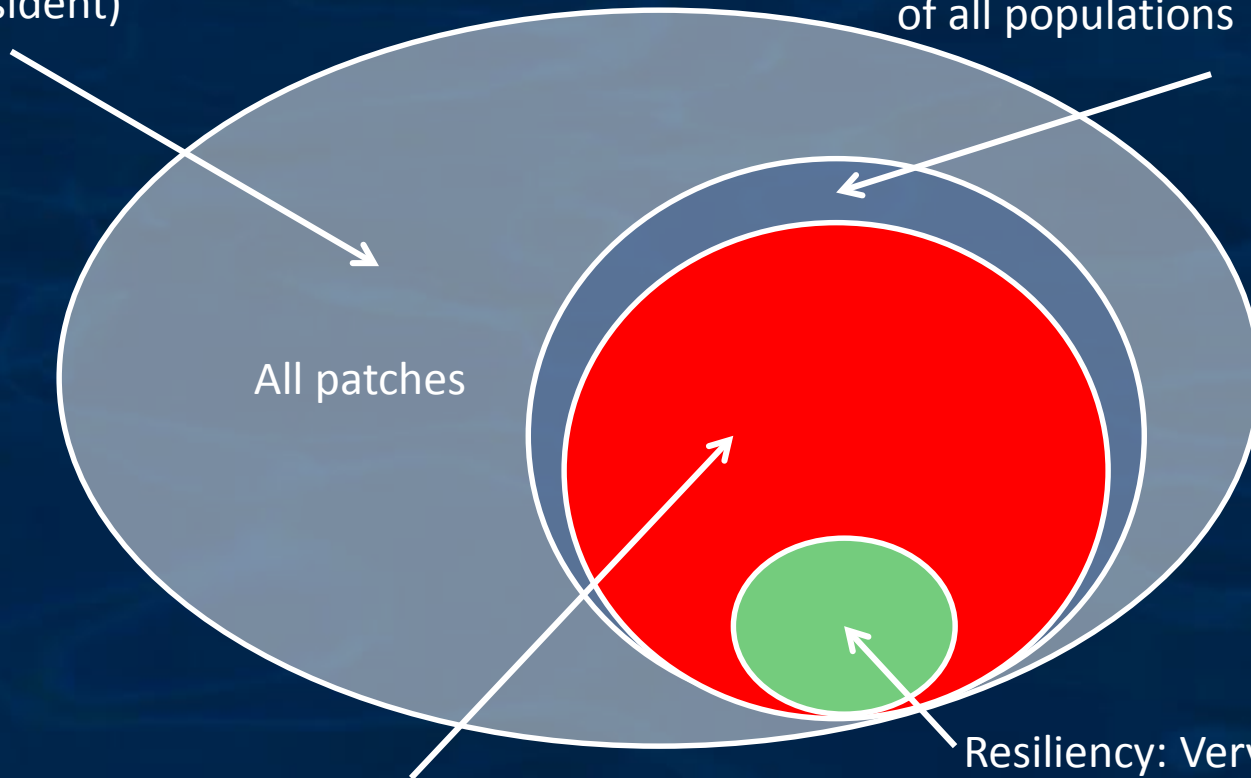


Refine conservation needs and strategies

“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

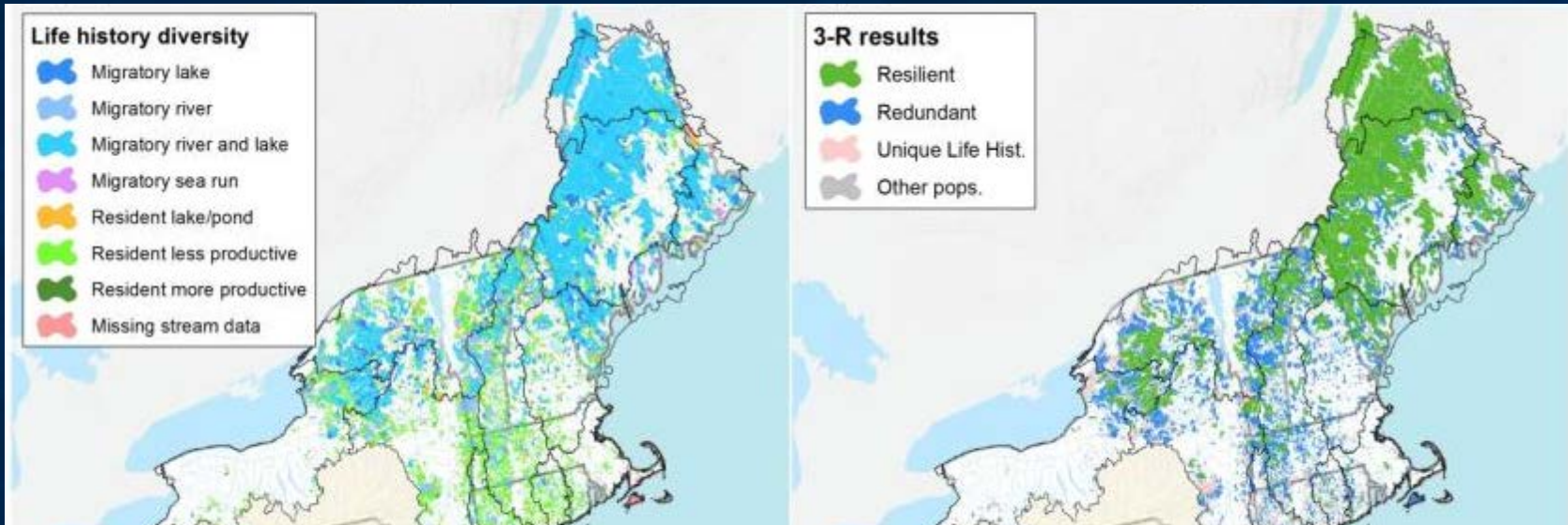


All patches

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

Portfolio Results – Northeast Region



Subregion	Patch Size (Ha)		Populations			Representation								Resilient	Redundant
	Total	Ave.	All	Allo-patric	Geo. Div.	Mig-Lake	Mig-River	Mig-R&L	Mig-Sea	Res-↑Prod	Res-↓Prod	Res-Pond	No Data	Strong-hold pops.	Persistent pops.
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

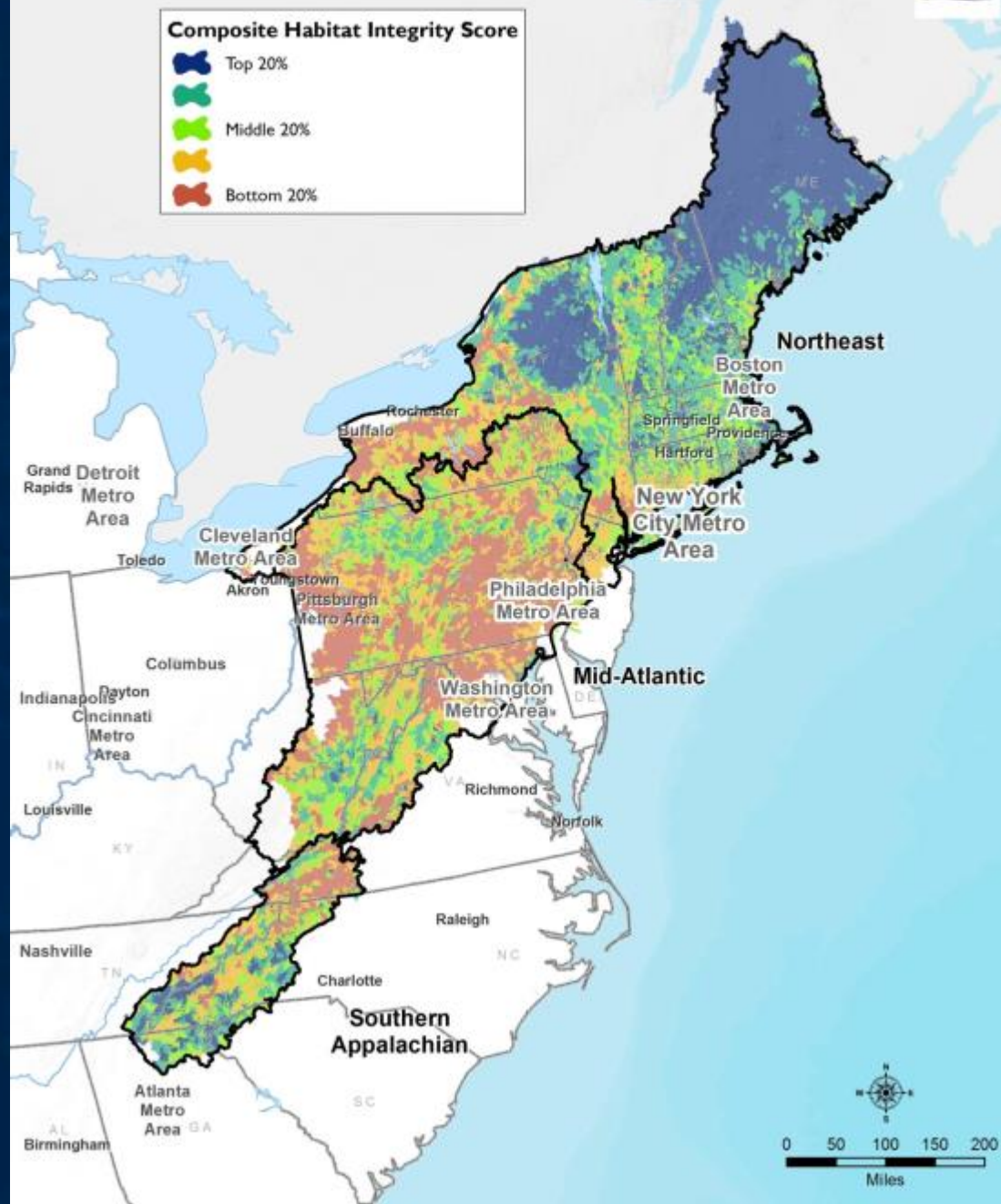
Date: 2/14/2017

Range-wide Assessment: Habitat Integrity

Primary factors (non-correlated, high data quality)

- % riparian forest
- % agricultural land use
- Road-stream crossing density
- Overall road density
- Acid deposition

Reported as percentile scores



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

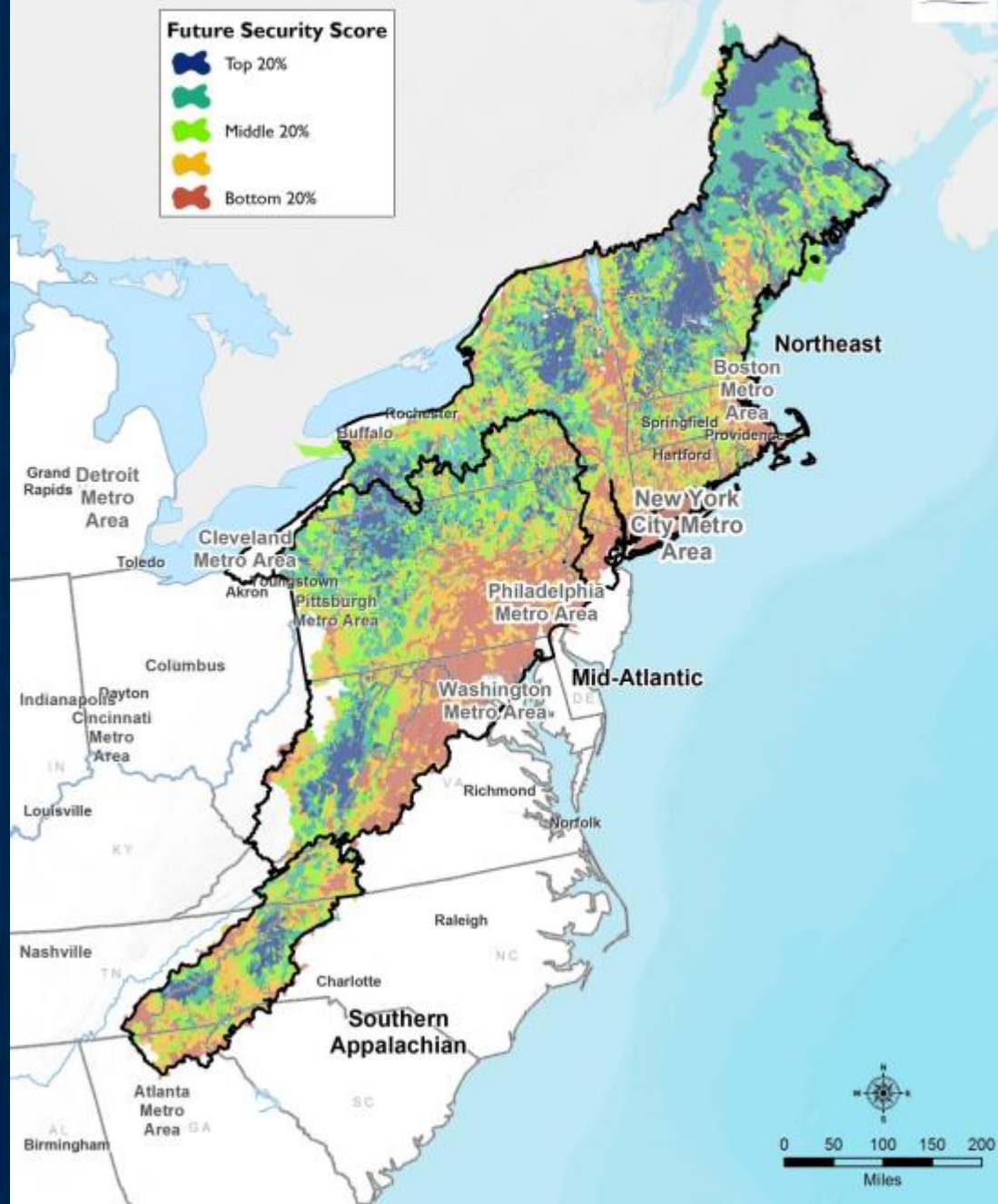
Date: 2/2/2017

Range-wide Assessment: Future Security

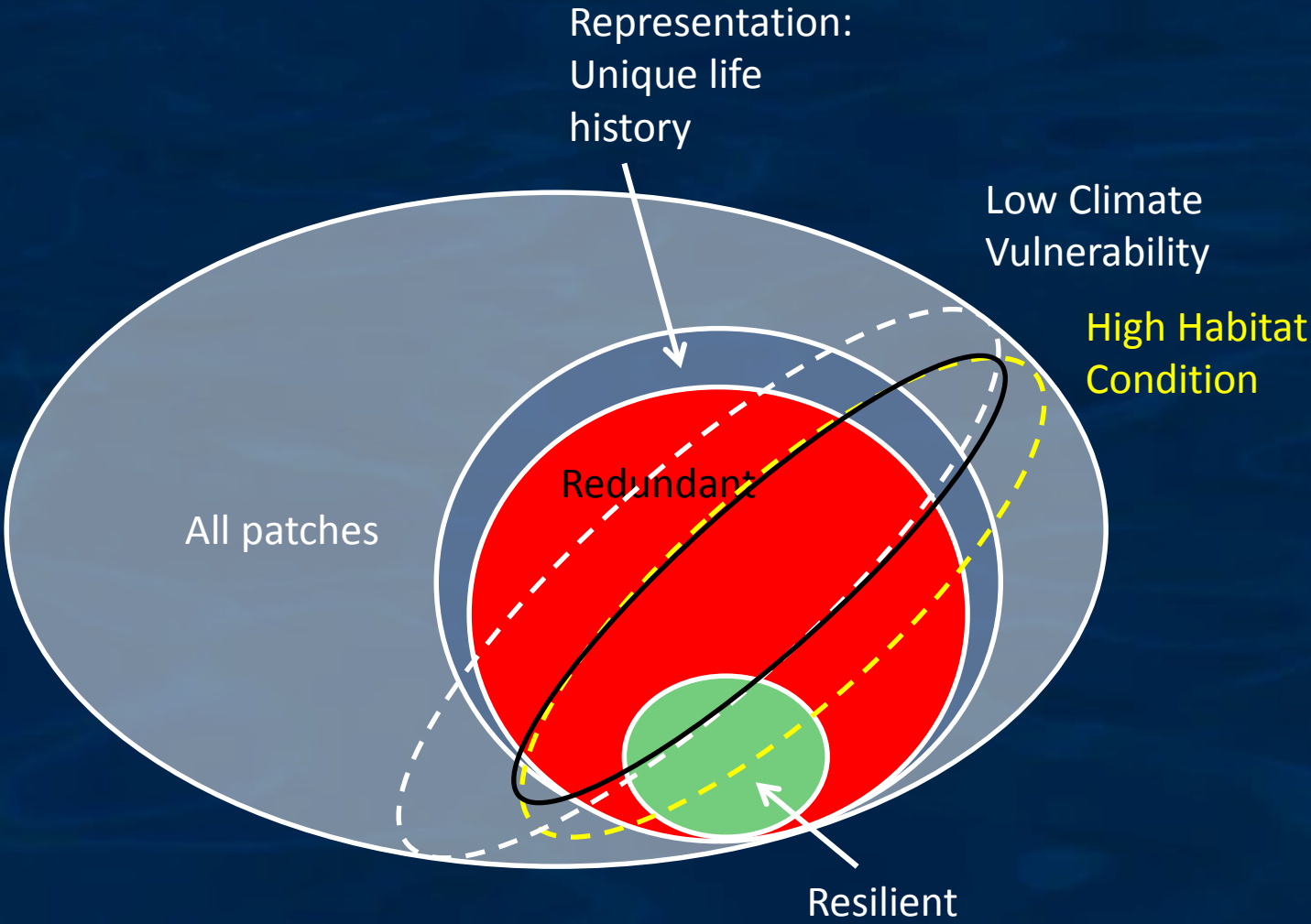
Primary factors (non-correlated, high data quality)

- Stream temperature

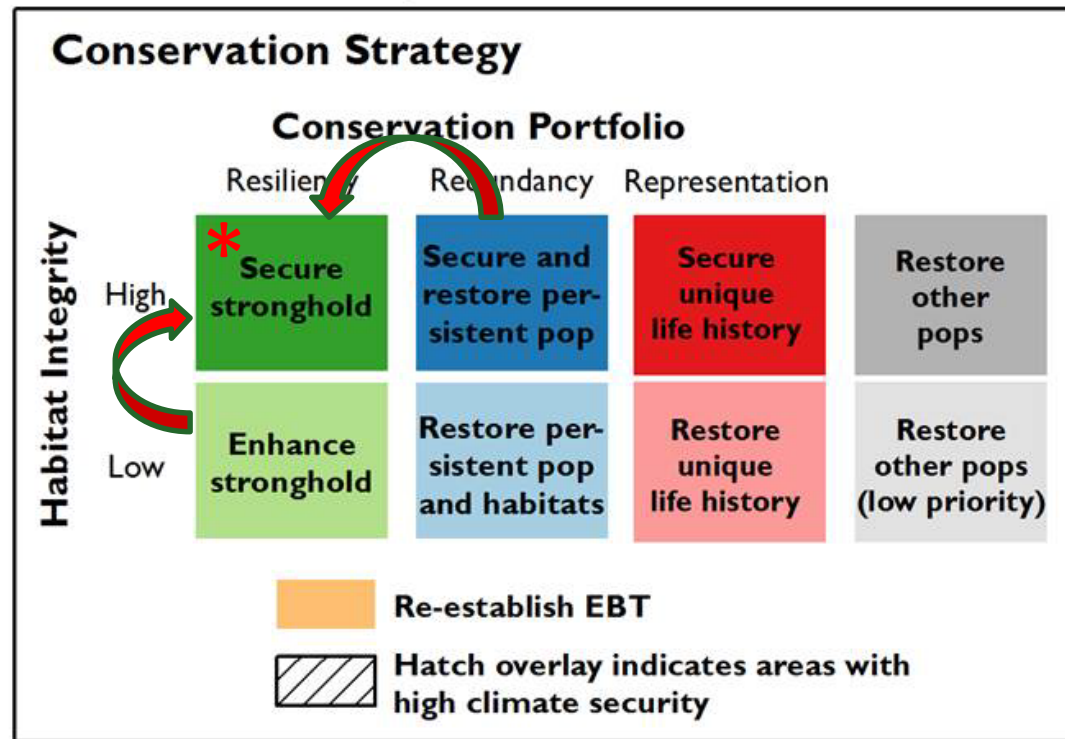
Reported as percentile scores



Brook Trout Portfolio and Range-wide Assessment

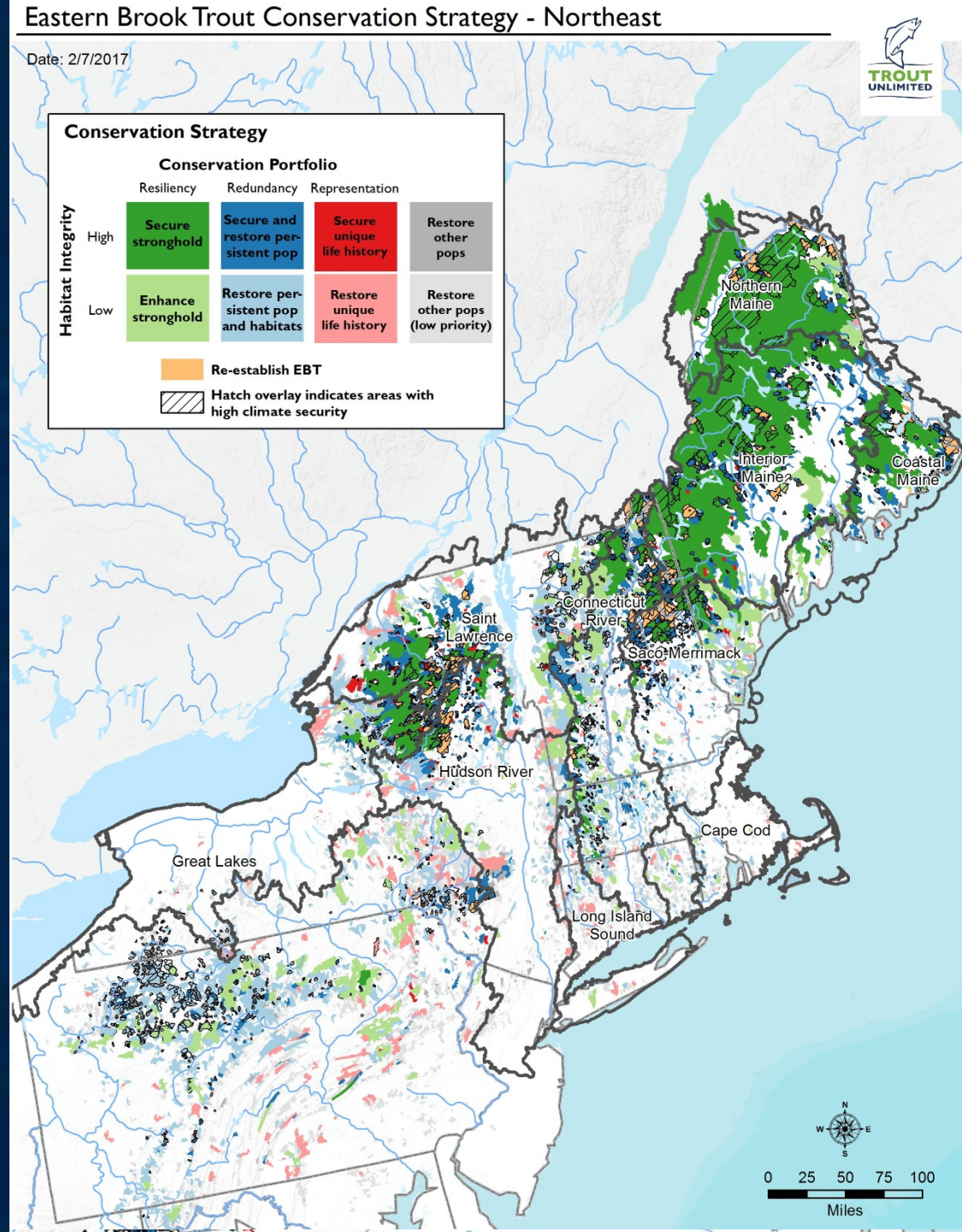
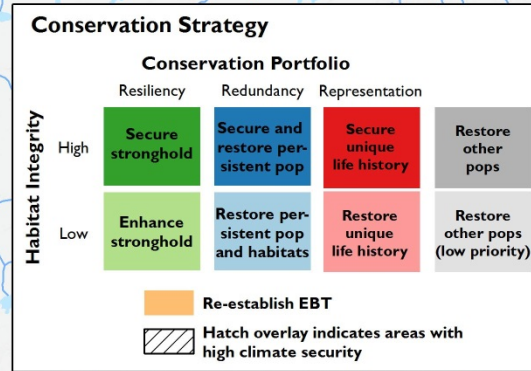


Conservation Strategies based on Portfolio and Range-wide Assessment



Date: 2/7/2017

Conservation Strategies based on Portfolio and Range-wide Assessment



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

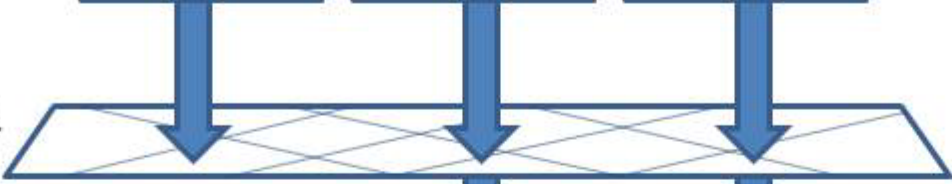
Goal: Take approach of range-wide assessment, but use regionally available or local datasets and present within a visualization tool with emphasis on restoration strategies

Datasets:

- BT occupancy and stream temperature models
- Regional conservation priorities
- 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)



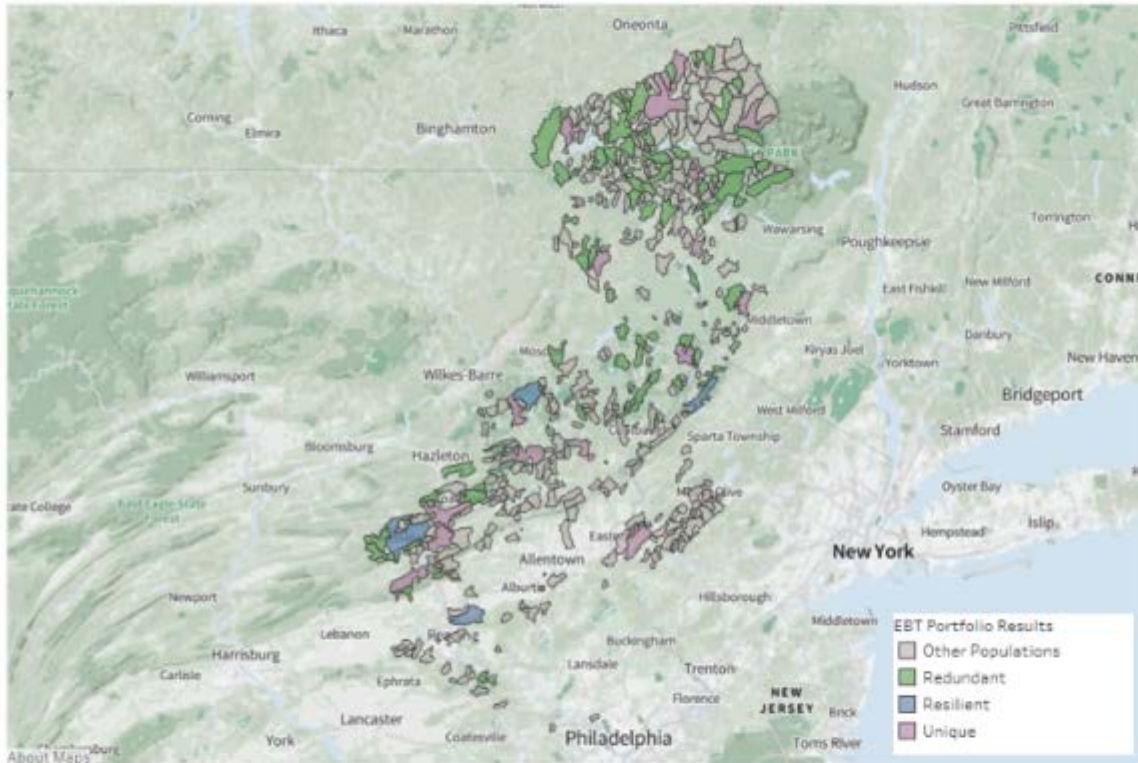
Site assessment, local information, partner input



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



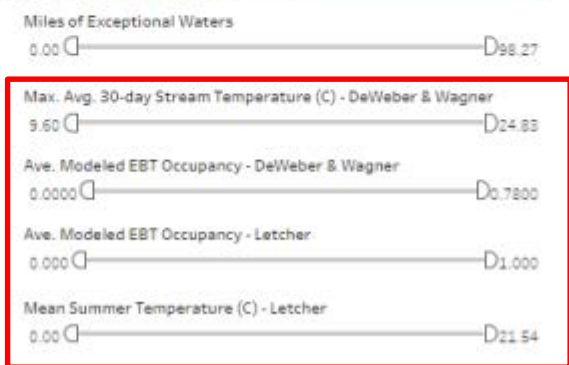
Riparian characteristics

- 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



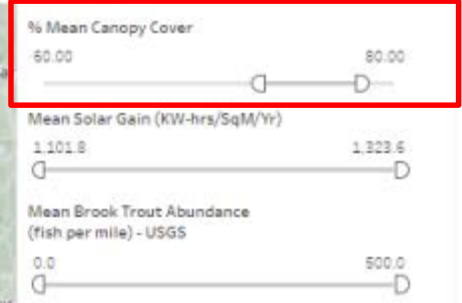
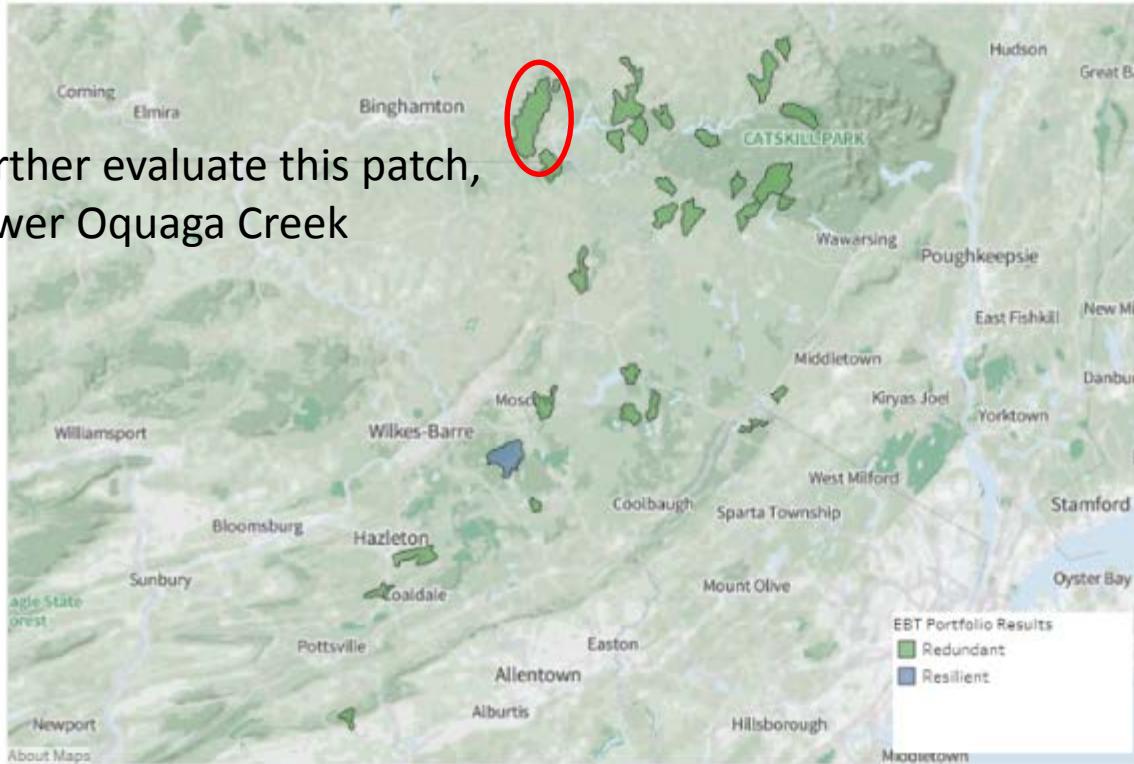
Occupancy and temperature models

Focal Area Data Visualization Tool



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

Further evaluate this patch, Lower Oquaga Creek

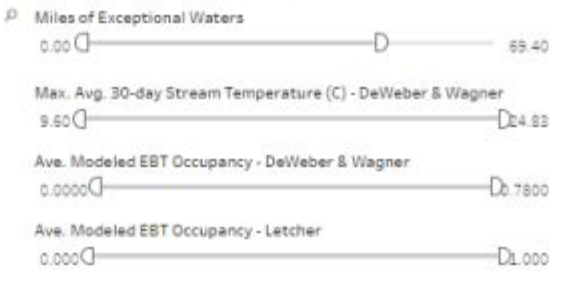


Riparian: 60-80% cover

- 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

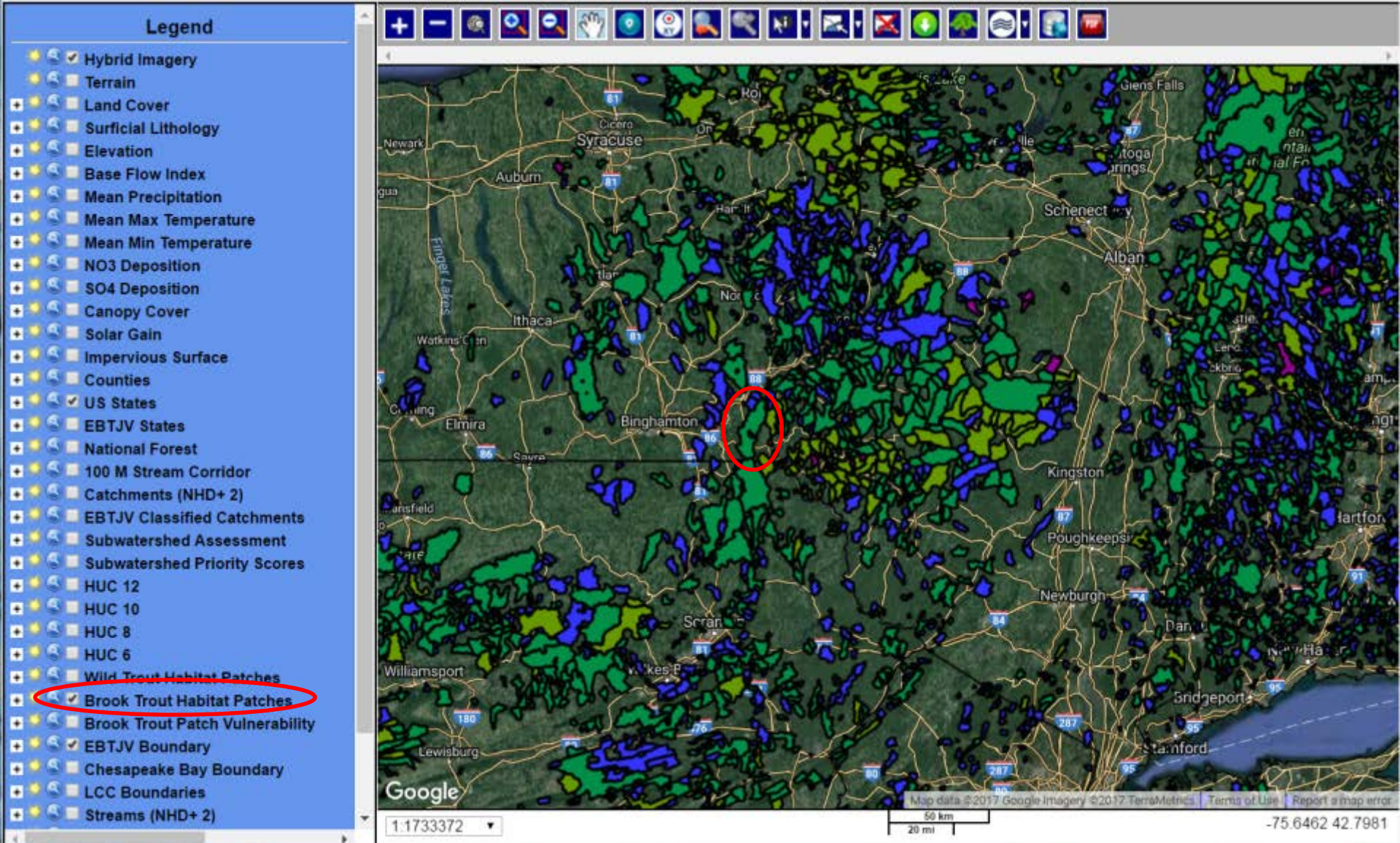


Moderate probability of EBT persistence under future climate scenarios (which can be elevated w/ restoration of riparian conditions)

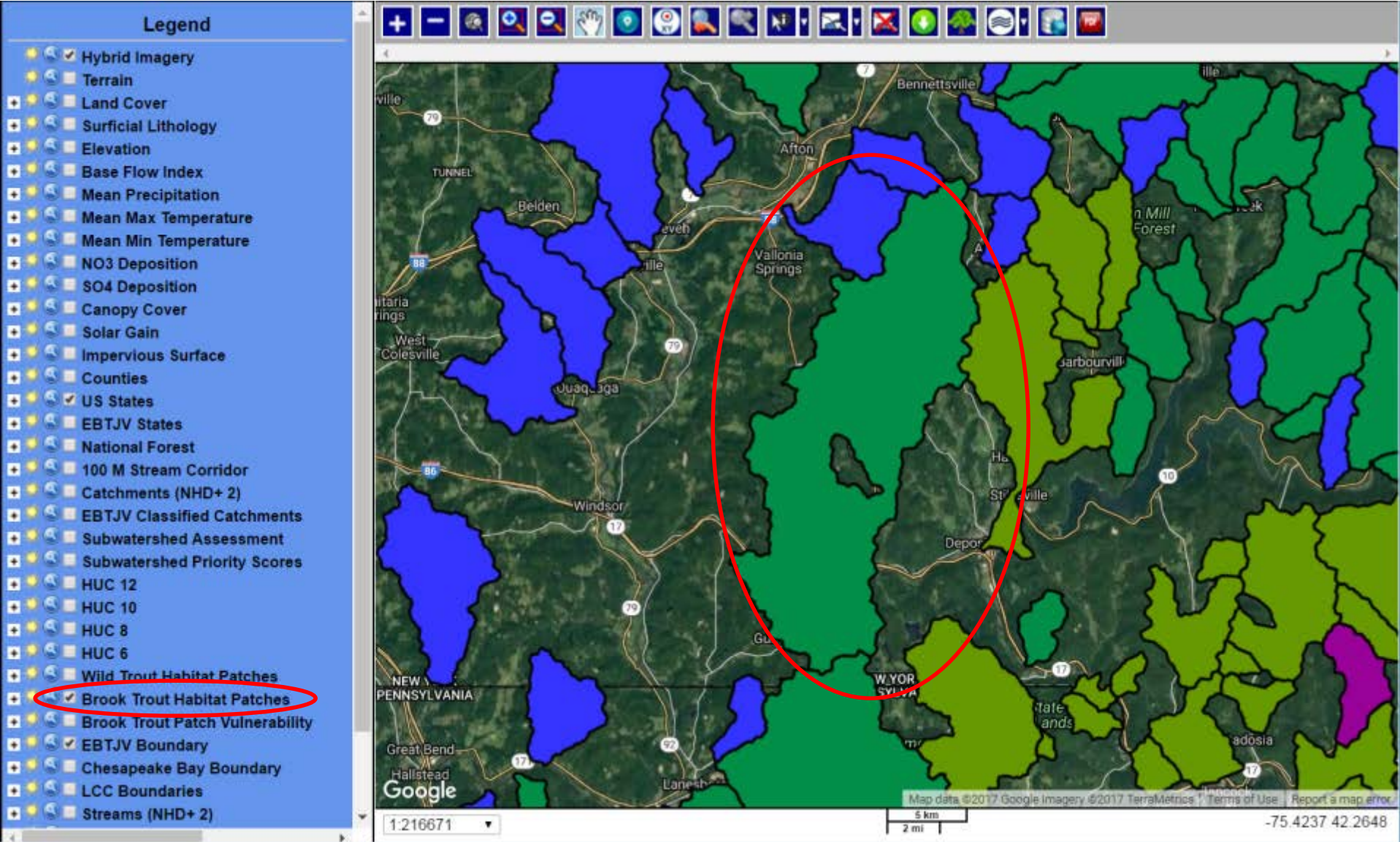


Direct access to Riparian Decision Support Tool for evaluating on-the-ground opportunities

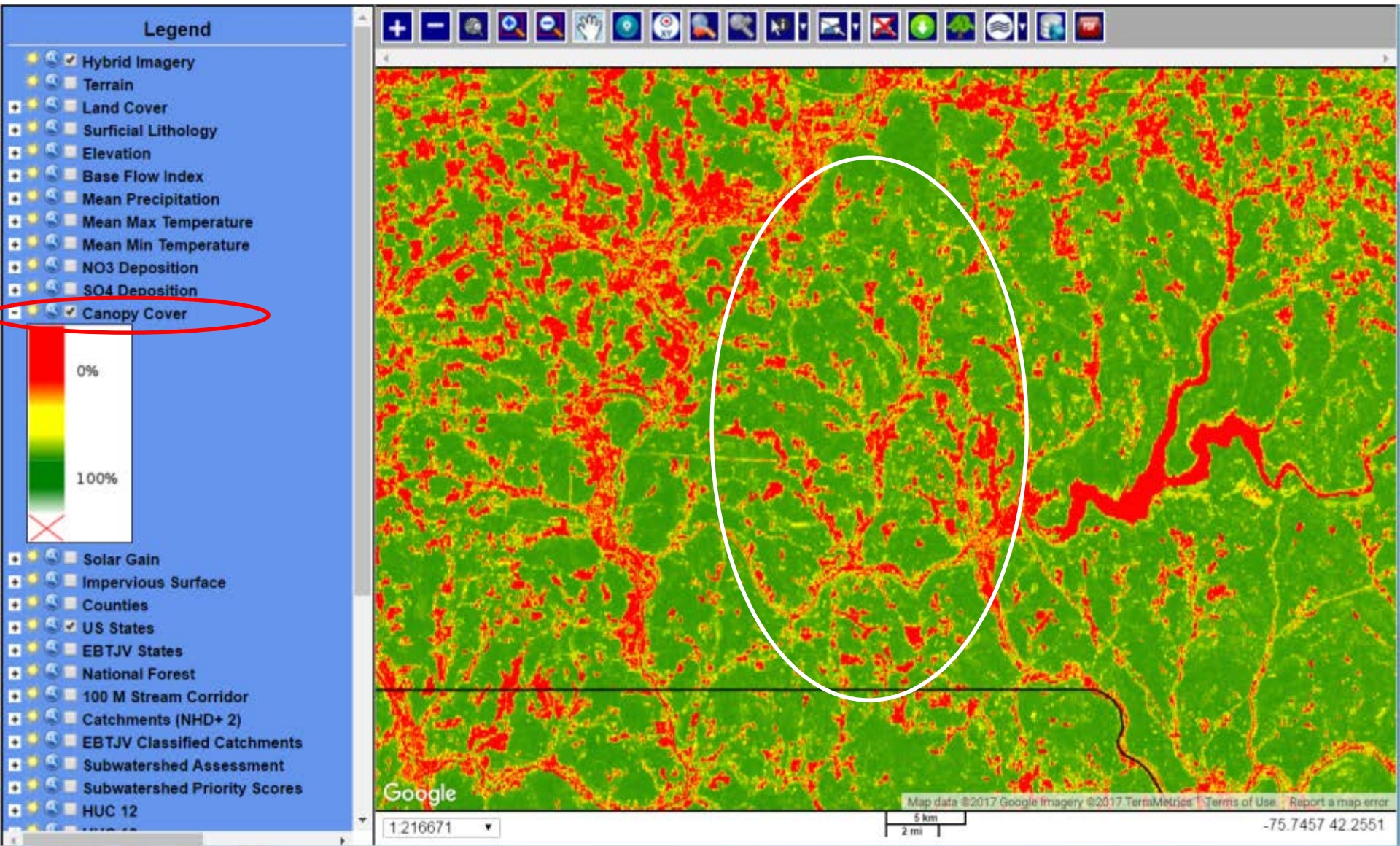
Locate patch of interest in EBTJV Decision Support Tool



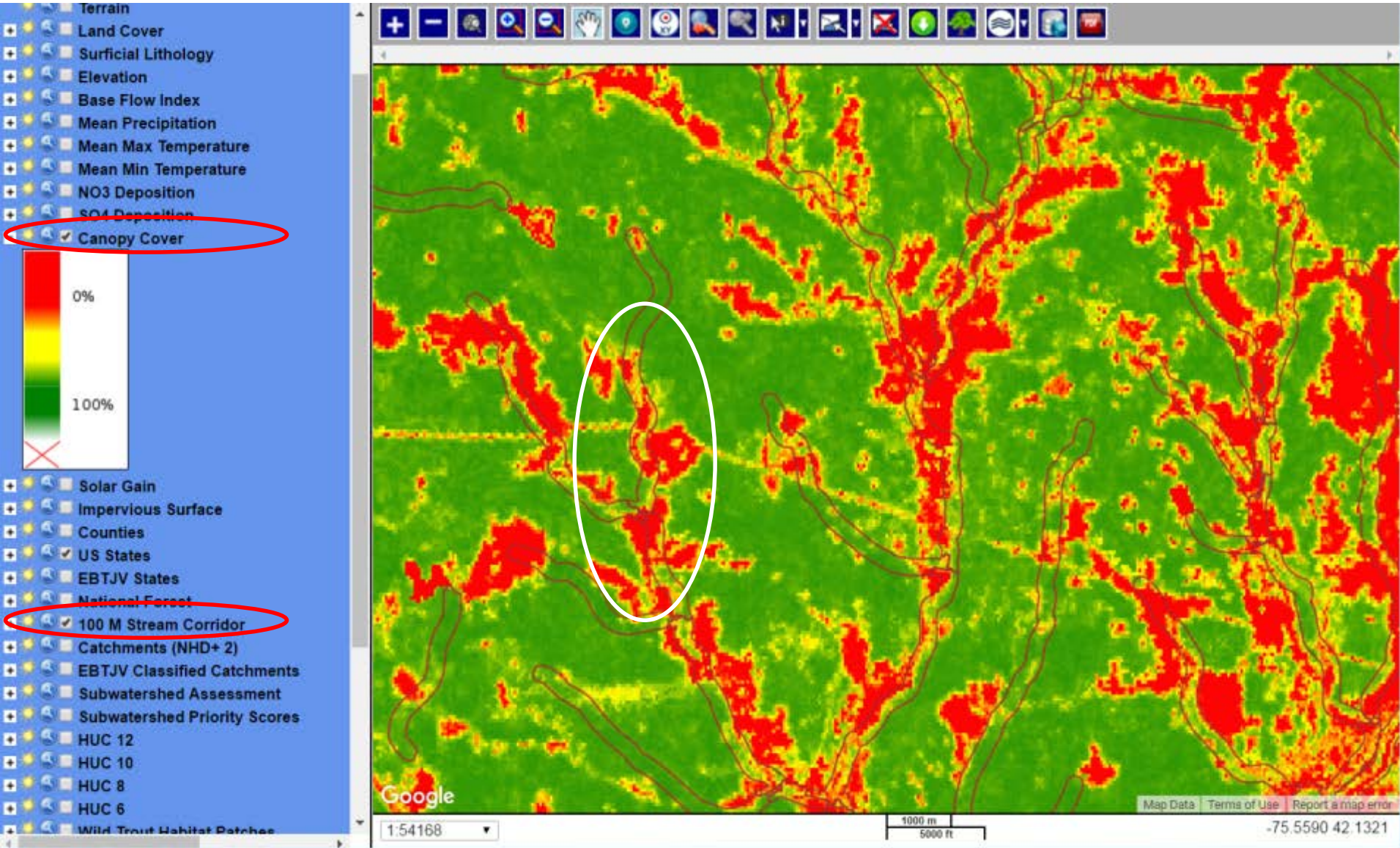
Locate patch of interest



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

The screenshot displays a GIS web application interface. On the left is a legend with the following layers and their status:

- 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)

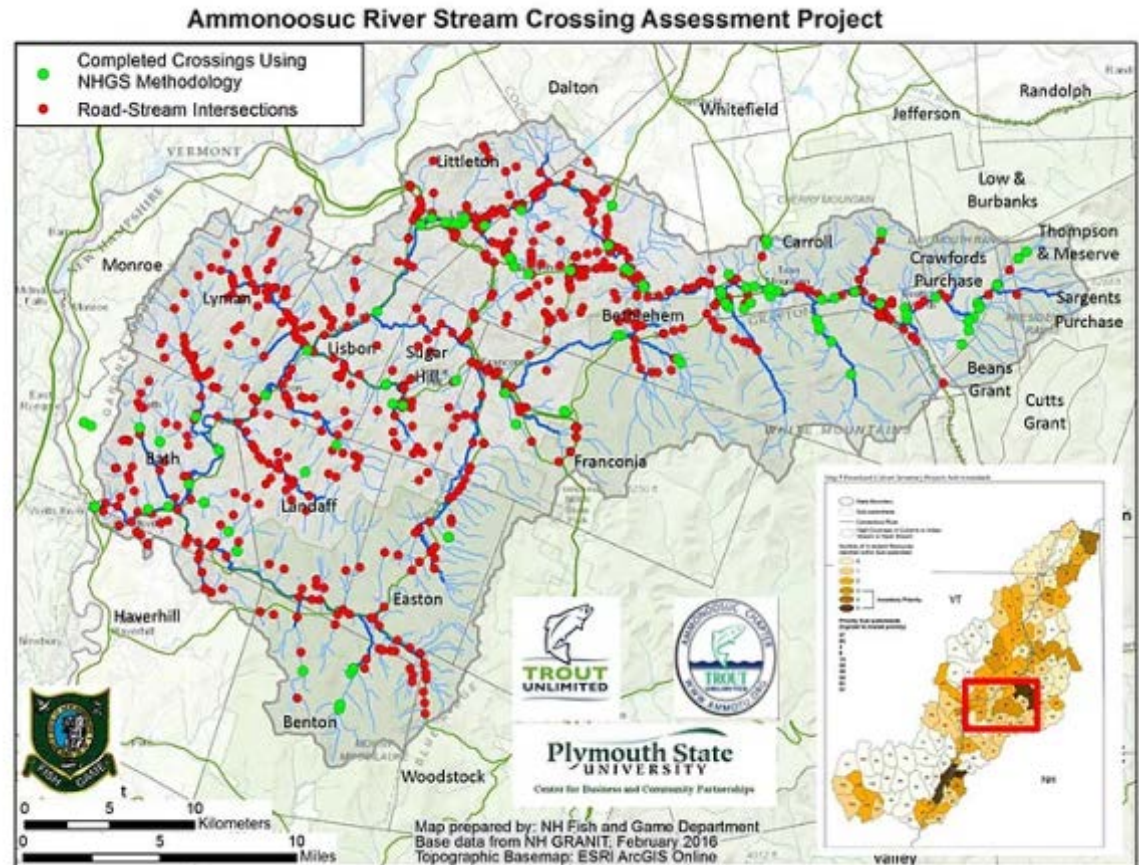
The map shows an aerial view of a rural landscape. Roads labeled include Pazzelli Rd, Farham Rd, and Boyce Rd. Marsh Creek is visible on the right side. A white oval highlights a specific area in the center-right of the map. The interface includes a toolbar at the top with navigation icons, a scale bar at the bottom (1:3385), and a coordinate display (-75.5258 42.0890).

Example 2: Placing a local restoration effort within a range-wide brook trout context

Objective: Evaluate several potential culvert removal projects in the Ammonoosuc River basin of NH and articulate project value to brook trout.

Criteria: Conservation Portfolio habitat condition and future security percentile scores

Tools: Conservation Portfolio and Range-wide Assessment map viewer



Portfolio and Range-wide Assessment webmap

The image shows a screenshot of a web mapping application titled "EBT Rangewide Analysis". The interface includes a search bar at the top with the text "Esri World Geocoder" and a search icon. On the left side, there are navigation controls: a plus sign for zoom in, a minus sign for zoom out, and a home button. At the bottom, there is a toolbar with several icons: a list icon, a stack of layers icon, a window icon, and four funnel icons representing filters. A large, semi-transparent splash screen is centered on the map, containing the following text:

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.

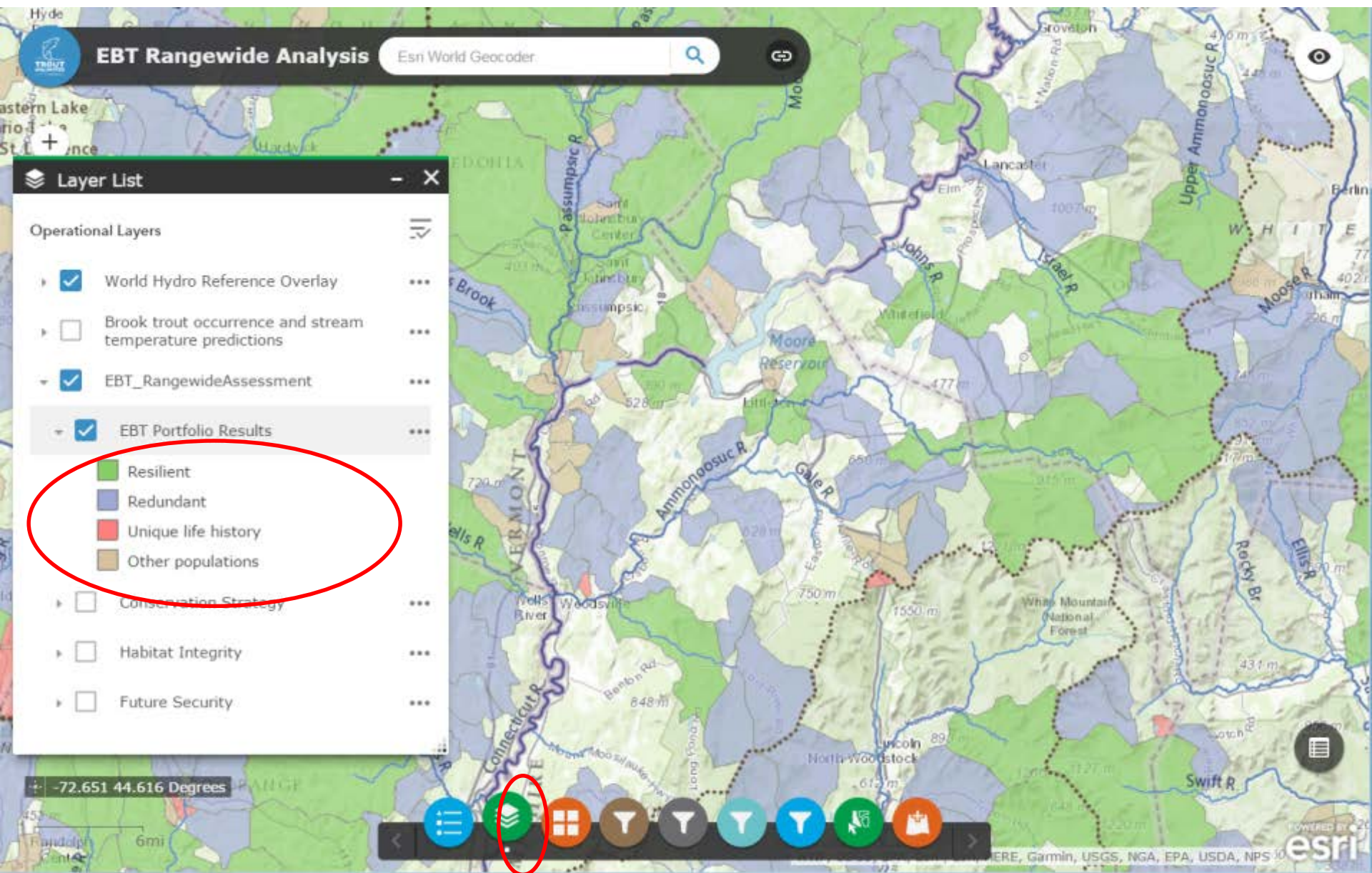
Within the layer list, keep in mind that many layers are grouped. Anytime there is a small arrow/triangle next to the layer name you can click the layer name and further expand the group.

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.

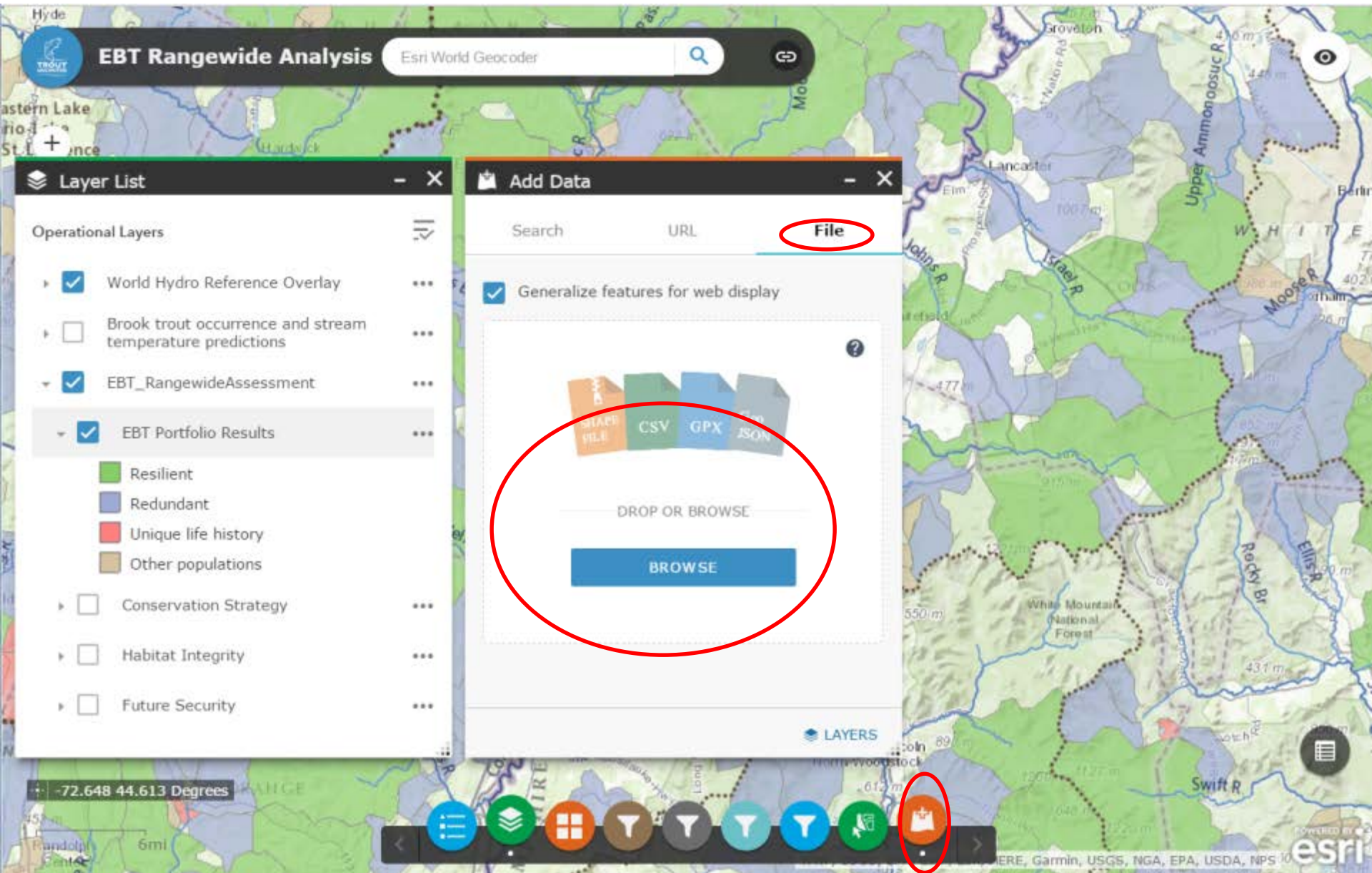
Do not show this splash screen again.

OK

At the bottom right of the map, there is a small text box that says "Move mouse to get coordinates". The map itself shows a geographical area with various place names like "Fredericton", "Moncton", "Halifax", "Wabano", "White", "Louisville", "Barren", "Greenstone", and "Charlottesville". The Esri logo is visible in the bottom right corner.



Layers tool



EBT Rangewide Analysis

Esri World Geocoder

Layer List

- Operational Layers
 - World Hydro Reference Overlay
 - Brook trout occurrence and stream temperature predictions
 - EBT_RangewideAssessment
 - EBT Portfolio Results
 - Resilient
 - Redundant
 - Unique life history
 - Other populations
 - Conservation Strategy
 - Habitat Integrity
 - Future Security

Add Data

Search URL **File**

Generalize features for web display

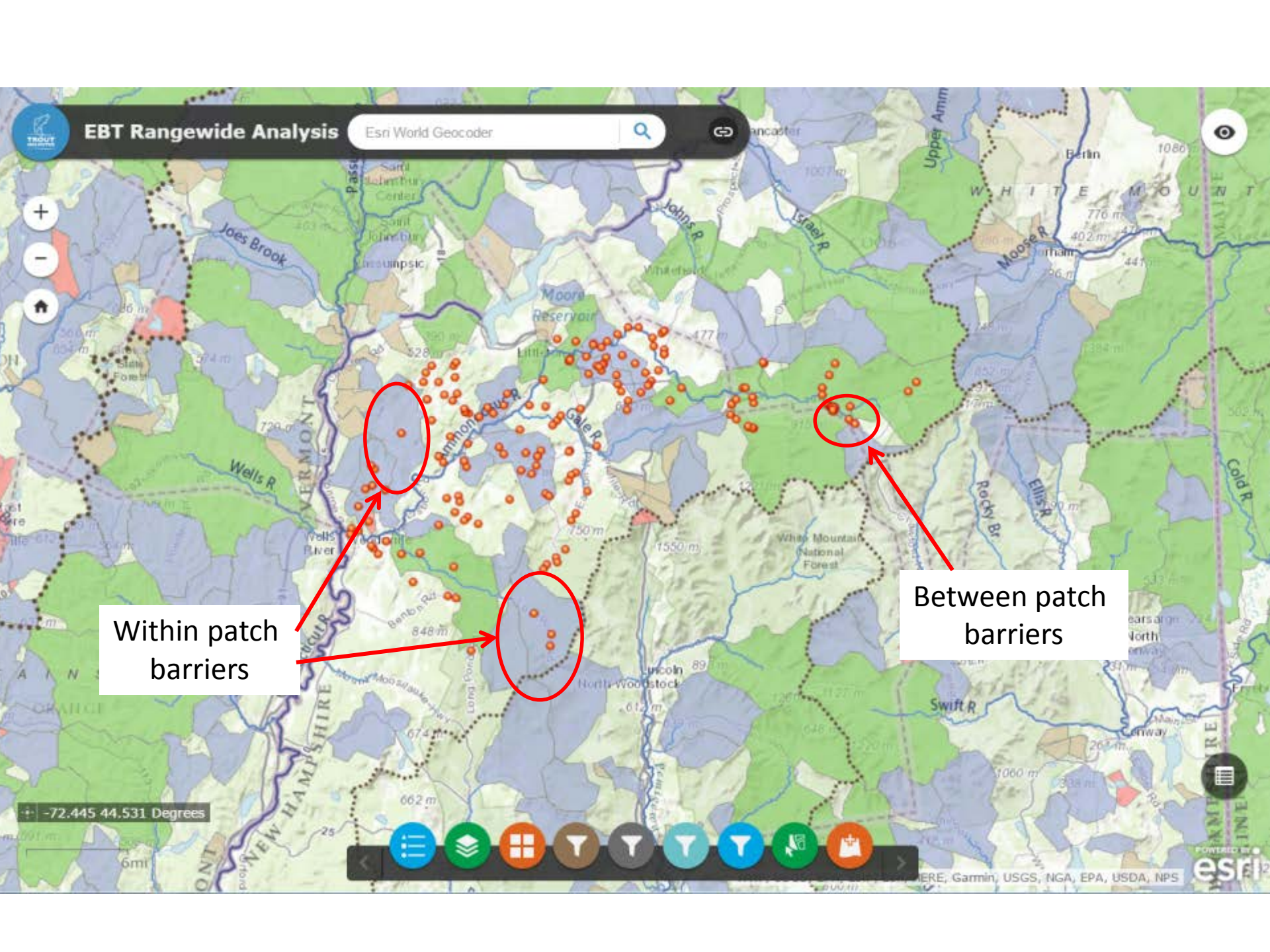
SHAPE FILE CSV GPX JSON

DROP OR BROWSE

BROWSE



Add data tool



EBT Rangewide Analysis

Esri World Geocoder

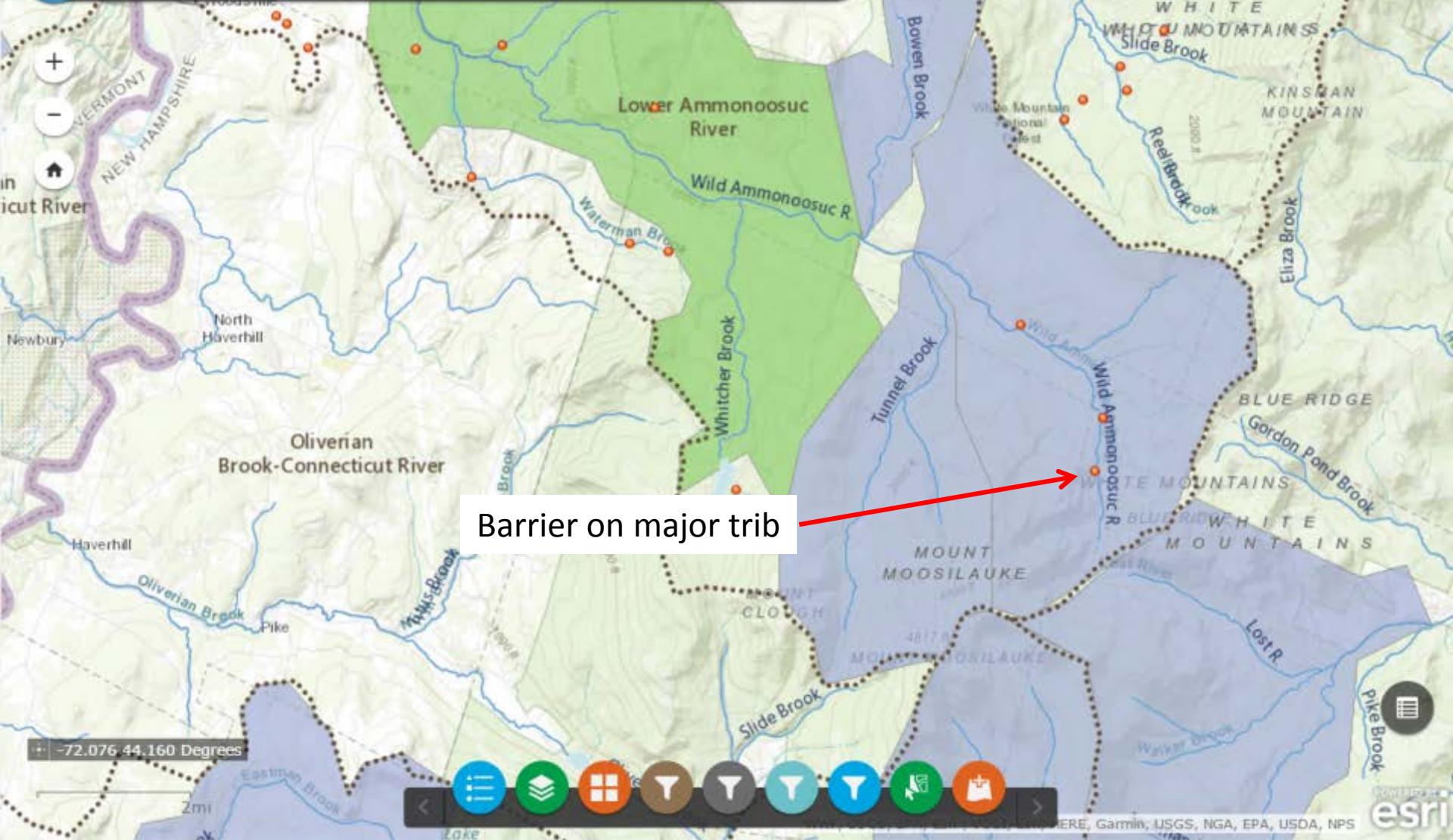
Within patch barriers

Between patch barriers



EBT Rangewide Analysis

Esri World Geocoder



Barrier on major trib

-72.076 44.160 Degrees



Esri, Garmin, USGS, NGA, EPA, USDA, NPS



EBT Rangewide Analysis

Esri World Geocoder



Layer List

Operational Layers

- 2017_0320_SADES_Culvert_Assess_noAOP
- World Hydro Reference Overlay
- Brook trout occurrence and stream temperature predictions
- EBT_RangewideAssessment
- EBT Portfolio Results
- Conservation Strategy
- Habitat Integrity

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

Composite habitat integrity score - percentile: 88.72%

Primary factors (percentiles bold, raw values normal):

Riparian zone forested - percentile: 85.31%
% riparian zone forested (within 100m stream buffer): 96.39%

Agricultural land use - percentile: 100.00%
% agricultural land use: 0.00%

Road-stream crossings per km2 - percentile: 81.94%

Road-stream crossings per km2: 0.23
Road density - percentile: 93.13%
Road density (mi/mi2): 0.60

Mean acid deposition - percentile: 83.21%
Mean acid deposition (kg/ha; NO3 + SO4 summed): 1.09

Secondary factors (raw values only):

% forested (entire patch): 95.41%

Dam count: 1

[Zoom to](#)

-72.628 44.458 Degrees





EBT Rangewide Analysis

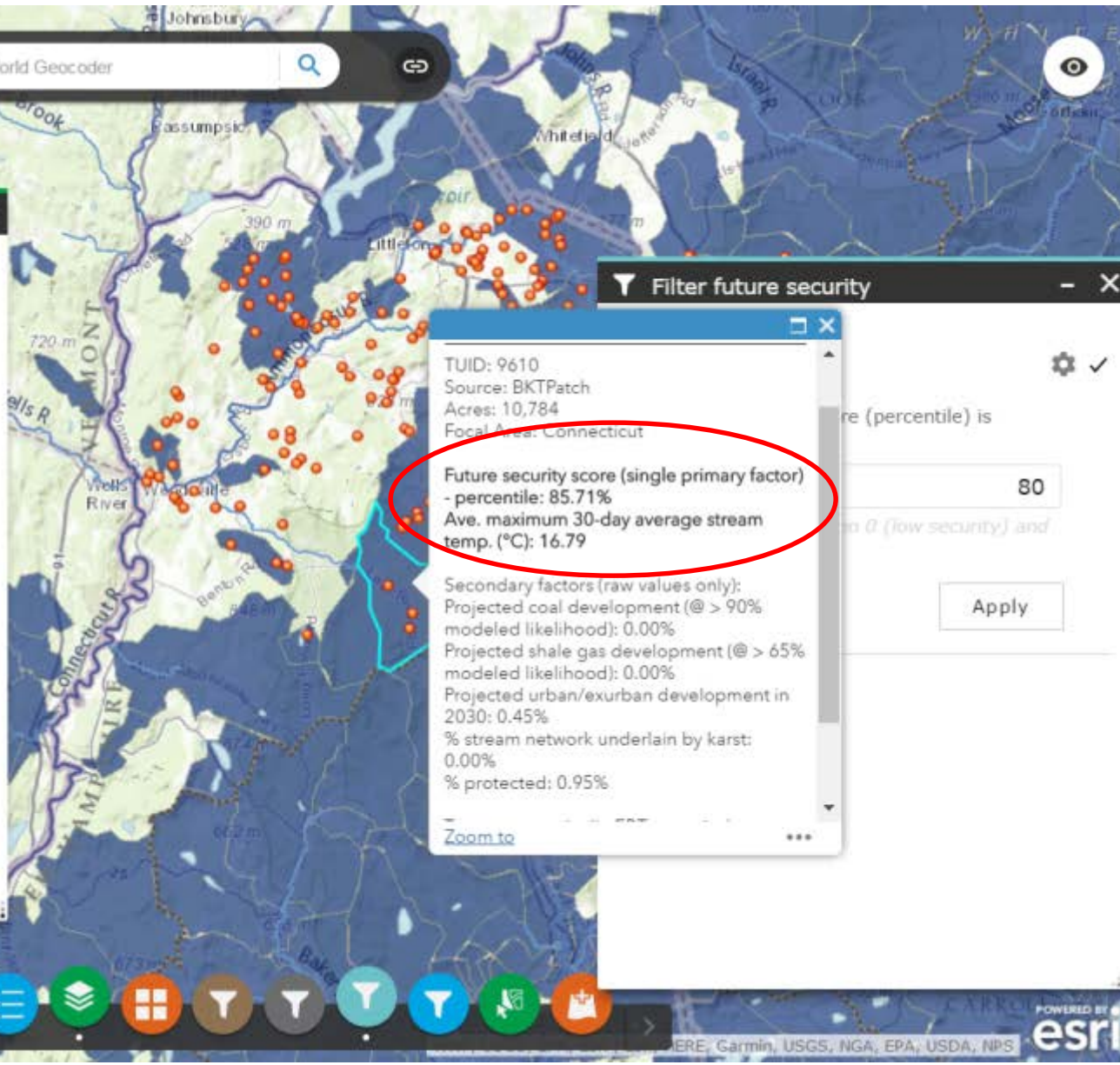
Esri World Geocoder



Layer List

Operational Layers

- 2017_0320_SADES_Culvert_Assess_n oAOP
- World Hydro Reference Overlay
- Brook trout occurrence and stream temperature predictions
- EBT_RangewideAssessment
- EBT Portfolio Results
- Conservation Strategy
- Habitat Integrity
- Future Security



Filter future security

TUID: 9610
 Source: BKTPatch
 Acres: 10,784
 Focal Area: Connecticut

Future security score (single primary factor)
 - percentile: 85.71%
 Ave. maximum 30-day average stream temp. (°C): 16.79

Secondary factors (raw values only):
 Projected coal development (@ > 90% modeled likelihood): 0.00%
 Projected shale gas development (@ > 65% modeled likelihood): 0.00%
 Projected urban/exurban development in 2030: 0.45%
 % stream network underlain by karst: 0.00%
 % protected: 0.95%

...re (percentile) is

...n 0 (low security) and

-72.647 44.458 Degrees



For More Information/Links to Reports and Data Visualization Tools

<https://www.tu.org/science/conservation-planning-and-assessment/conservation-portfolio/eastern-brook-trout-conservation-portfolio/>

Eastern Brook Trout Joint Venture

easternbrooktrout.org

