



**Chesapeake Bay Program**  
*Science. Restoration. Partnership.*

STAR 3/26/26 Meeting

# **2025 Revised Brook Trout Outcome**

How our work has evolved since 2014

# The Team

---

---

---



**Katie  
Ombalski**  
(Co-chair)



**Dan Goetz**  
(Co-chair)



**Nick Staten**  
(Staffer)



**Chris Guy**  
(Thriving Habitats,  
Fisheries and Wildlife  
Goal Co-Coordinator)



**Emily Young**  
(Brook Trout Outcome  
Data Manager)

# Agenda

---

---

---

1

## **2014 Outcome**

What it was how did we work towards its attainment.

2

## **2014 Attainment**

Did we meet our outcome, what did we learn? What needed to change?

3

## **2025 Revised Outcome**

How we revised our outcome and calculated our baselines

4

## **Target Attainment**

How will we track and meet our outcome targets?

5

## **Next Steps**

What's next?

6

## **Appendix**

How do we define healthy brook trout watersheds?

# 2014 Outcome

Restore and sustain naturally reproducing brook trout populations in Chesapeake headwater streams with an eight percent increase in occupied habitat by 2025.

---

---

# **How did we work towards our 2014 outcome?**

1. Statewide assessments 2014-2018
2. Outreach to Bay Program that there was no way to track whether we are going to achieve 8% increase.
3. BTWG GIT Funding for outcome attainability  
2021-2023-apparent 0.5 % increase

# 2014 Outcome Attainment

Did we meet our outcome, what did we learn? What needed to change?

# 2014 Outcome Attainment

## Key Takeaways of the report:

1. 0.5% increase
2. Need to define what projects benefit brook trout.
3. A lot of work is being done, but less than 1% is specifically for brook trout.

### Facilitating Brook Trout Outcome Attainability through Coordination with CBP Jurisdictions and Partners

July 2024



**Recommended Citation:** Rummel, S.M., M. Mayfield, L.A. Maloney, H.C. Smith, and O.H. Devereux. Facilitating Brook Trout Outcome Attainability through Coordination with CBP Jurisdictions and Partners. Final Report to the Chesapeake Bay Trust. Trout Unlimited, Arlington, Virginia.

This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement CB 96374201 to the Chesapeake Bay Trust. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does EPA endorse trade names or recommend the use of commercial products mentioned in this document.

### Executive Summary

The objective for this project was to populate a database to better evaluate progress on the Chesapeake Bay Program (CBP) Brook Trout Outcome, which is to increase occupied brook trout habitat within the Chesapeake Bay watershed by 8% by 2025. This objective included goals to identify collaborations with other CBP Goal Implementation Teams (GITs), to strengthen stakeholder relationships, and to develop a robust tracking and reporting framework. This work was performed by Trout Unlimited (TU) and the Eastern Brook Trout Joint Venture (EBTJV), in collaboration with the Brook Trout Workgroup, the Habitat GIT, and Devereux Consulting. Key findings from the project include:

- **Limited progress towards the CBP Brook Trout Outcome:** Analysis of EBTJV assessment data from 2016 and 2024 revealed a 0.5% increase in occupied brook trout habitat within the Chesapeake Bay watershed. Although this is significantly below the targeted 8% increase, the gain is notable in that it happened despite habitat loss and increasing stressors to the landscape, climate, and water quality.
- **Extensive restoration efforts:** We compiled a comprehensive database of 5,419 implementation projects (2016-2022) within the Chesapeake Bay watershed. We then worked with the Habitat GIT and contractors to integrate the database into the Habitat Tracker, providing a valuable resource for tracking and reporting the impact of various restoration activities on brook trout populations.
- **Opportunities for improving data sharing and reporting:** We identified potential synergies and data sharing opportunities with other CBP GITs and workgroups, particularly the Fish Passage Workgroup (FPWG) and its Chesapeake Bay Fish Passage Tool. The CBP GITs share many of the same stakeholders and partners across the watershed. By annually querying upcoming GIT related data requests, the CBP could reduce duplication of requests and centralize reporting by the partners, thereby increasing engagement. Data requests should also be directed at higher level agencies and funders.
- **Recommendations for future management:** In this report we reviewed project types known to benefit brook trout, and made an argument for increased, scientifically based monitoring of projects to better understand their effectiveness. We also argued for improving and conserving existing high-quality habitat and remediating impairments in the most degraded habitats (especially Abandoned Mine Drainage, AMD).

By leveraging the newly established database, tracking system, and collaborative networks, the CBP and its partners can develop more targeted and effective management strategies. To better understand project effectiveness and guide future goals, the CBP should support a scientifically based monitoring plan, and focus on strengthening existing brook trout populations in addition to increasing occupancy. Ultimately, the Brook Trout Outcome is a call to support brook trout not just for related habitat and water quality improvements but for its own sake. This analysis showed that a net gain to brook trout occupancy is indeed possible, but requires the combined efforts of many organizations, practitioners, and funders.

---

---

---

# What needed to change?

1. Not just focusing on monitoring to determine occupancy.
2. Include measurement of abundance within occupied habitat.
3. Focus on keeping the best populations resilient in the face of changing environmental conditions.
4. Direct conservation work in areas supporting the “best of the best” populations



# 2025 Revised Outcome

Protect and enhance brook trout within the Chesapeake Bay watershed by increasing occupancy, abundance and resilience to changing environmental conditions.

**Target 1:** By 2040, increase brook trout **occupancy by 1.5% (233 miles)** in watersheds supporting healthy populations while achieving no net loss in other watersheds.

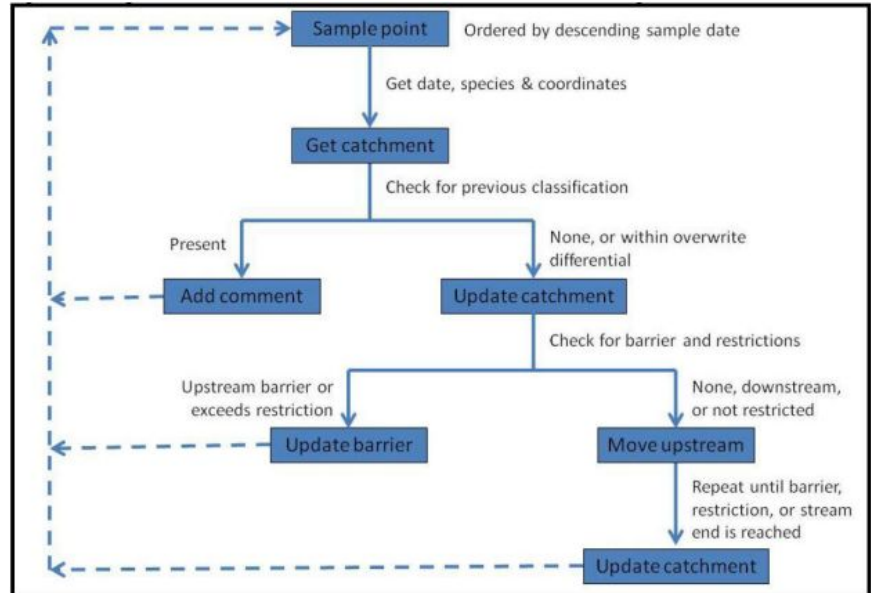
**Target 2:** By 2040, increase **abundance** at **10 long-term monitoring sites**.

**Target 3:** By 2040, **reduce identified threats by 15%** to increase brook trout **resilience** in watersheds supporting healthy populations.

# Target 1: Occupancy

**Target 1:** By 2040, increase brook trout **occupancy by 1.5% (233 miles)** in watersheds supporting healthy populations while achieving no net loss in other watersheds.

## EBTJV Assessment Algorithm Decision Tree:



# Target 2: Abundance

**Target 2:** By 2040, increase **abundance** at **10 long-term monitoring sites**.

By March 30th each state will have identified 2 **Brook Trout Abundance Monitoring Sites (BTAMS)**  $2 \times 5 = 10$  total sites

By March 30th each monitoring entity will send the metrics they monitor at their abundance monitoring sites.

- Ex. water quality metrics, trout sampling methodology, habitat characteristics
- Will allow us to tease out variables over time with any changes of abundance at a BTAMS

## Maryland Brook Trout Monitoring

Brook Trout Numbers, Monitoring Entity

- ★ Y, Fishing and Boating Services
- ★ Y, Maryland Biological Stream Survey

## Trout Unlimited Brook Trout Monitoring

Brook Trout Numbers, Monitoring Entity

- ☆ N, TU - PA
- ★ Y, TU
- ★ Y, TU - PA

## Virginia Brook Trout Monitoring

Brook Trout Numbers, Monitoring Entity

- ★ Y, VDWR

## West Virginia Brook Trout Monitoring

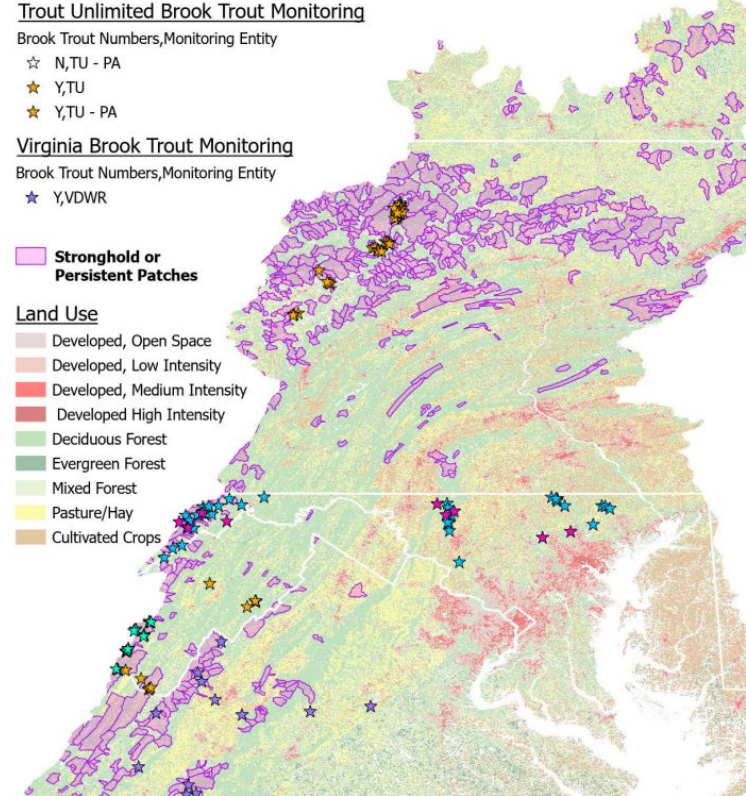
Brook Trout Numbers, Monitoring Entity

- ★ Y, Forest Service (none: x/y coordinates not supplied)
- ★ Y, WVU

Stronghold or Persistent Patches

## Land Use

- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Pasture/Hay
- Cultivated Crops




**Target 3:** By 2040, **reduce identified threats by 15%** to increase brook trout **resilience** in watersheds supporting healthy populations.

1. Acid mine drainage
2. Unforested riparian zones (shading keeps water temperature cool)
3. Sediment runoff from dirt and gravel roads
4. Fragmented habitat from culverts and road/stream crossings
5. Threat of urbanization and development

Baseline calculations, data sources and percentage setting methodology documentation:  
<https://www.chesapeakebay.net/files/Calculating-Brook-Trout-Workgroups-Resiliency-Target.pdf>

**Calculation Methodology of the Chesapeake Bay Program's Brook Trout Resiliency Target of Reducing Identified Threats by 15%**

**Chesapeake Bay Program**  
 **Partnership for a Healthier Bay**

## Background and Context

As per direction of the Chesapeake Bay Program's December 2020 Executive Charge the Brook Trout Workgroup has revised the 2014 Brook Trout resiliency of "Resilient and sustainably reproducing brook trout populations in Chesapeake headwater streams with an eight percent increase in expected hatchery by 2027" to a new outcome with three targets:

Protect and enhance brook trout within the Chesapeake Bay watershed by increasing occupancy, abundance and resilience to changing environmental conditions:

- By 2040, increase brook trout occupancy by 1.5% (21 miles) in watersheds supporting healthy populations while achieving no net loss in other watersheds;
- By 2040, increase abundance of 10 long-term monitoring sites;
- By 2040, reduce identified threats by 15% to increase brook trout resilience in watersheds supporting healthy populations.

The new outcome partially focuses on improving the capacity of brook trout population to persist in changing environmental conditions. To do this the Chesapeake Bay Program Partnership set a goal to reduce identified threats by 15%, achieved by completing habitat restoration projects.

## Who Will Do This Work?

The Resiliency Target is meant for the Workgroup to work with partners and others in states who are already doing good deeds of BMPs, and direct their effort to areas directly hindering brook trout. Leveraging existing programs and highlighting priority areas will help rapidly restore additional fish to streams, while setting up new strong brook trout populations to be resilient in a changing system. The following sections describe how the workgroup identified the current extent of each of the five identified threats to set a reasonable threat reduction goal.

## Identified Threats

Note: This breakdown shows the numeric association for each threat category with the target greater's 15% threat reduction, but the partnership can overperform in one category to offset underperformance in another and still reach the resiliency target goal. All numerical values were calculated down within watersheds supporting healthy brook trout populations. Therefore progress towards this target will only be counted from work performed within these healthy watersheds.

Averaging all categories:  $108 + 108 + 128 + 361 + 330 + 1 + 15 = 1,143$  for 2040

The majority of impaired roads affecting watersheds of Pennsylvania, Virginia and the distal gravel road basins, the amount of impaired roads that were not reach the resiliency target goal. At all estimated values were calculated down within watersheds supporting healthy brook trout populations. Therefore progress towards this target will only be counted from work performed within these healthy watersheds.

326 of 2,265 miles = 14.4% for 2040

- Mileage of impaired roads: Distal and gravel road Basins
- Watersheds supporting healthy brook trout populations: [James L. Whitcomb's Eastern Brook Trout Conservation Portfolio](#)

## 4) Reduction of Fragmented Habitat: Improve Closures

What is the Current State of this Threat?

Existing barrier data were obtained from the Chesapeake Bay Program's Protection Team (version 3.4), which included removal feasibility ratings and upstream functional network miles for each barrier. Barriers were identified to include only those within watersheds supporting healthy brook trout populations. 500 assessed closures and its feasibility potential assessed data matched their criteria. Additionally, the scope was limited to only assessed closures. Upstream functional miles were then summed for each assessed feasibility rating. Further information about the calculation of upstream functional network miles are described in the [2021 Chesapeake Bay Program Assessment](#).

Forecasting on just assessed closures, there are 390 closures associated with 740 miles of potential habitat fragmentation in watersheds supporting healthy brook trout populations. According to previous research, two closures per site over a year's time was very reasonable and achievable. With New York, Pennsylvania, Virginia, West Virginia and Maryland by habitat fragmentation of brook trout populations,

2 closures \* 8 miles \* 5 years = 80 closures by 2040

300 of 740 miles/500 closures = 40.7% (150 closures by 2040)

## Accidental Threat of Acid Mine Drainage: Treat AMD

What is the Current State of this Threat?

A healthy brook trout watershed, the M&D basins within the GRS Integrated Riparian Program's Pennsylvania and Maryland that explicitly address acid mine drainage as a source of a hazard was not the byproduct where the source of impairment due to this acid mine. Impaired streams with high pH addition to the presence of metals, impaired streams from the byproduct where the source was brought into the GRS environment. [Eastern Brook Trout Conservation](#) identifies a conservation strategy of the. The extent of impairment by AMD was calculated in miles from these

watersheds supporting healthy brook trout populations were  
 7+ 18 miles (15V) = 394 miles

40 miles by 2040

Target is to improve 270 (15%) of the AMD affected miles watershed-wide miles  
 40 Therefore the Partnership anticipates being able to direct AMD work at the same

Data Sources

impaired Watersheds within the EPA's Assessment, Total Maximum Daily Load, and Watershed Assessment (TMDL) dataset

By brook trout populations: [James L. Whitcomb's Eastern Brook Trout Conservation](#)

## Threat of Unforested Land Cover: Plant Riparian Buffers

What is the Current State of this Threat?

Several riparian areas, the Workgroup wanted to calculate both unforested stream of the analysis was defined by the Chesapeake Bay Watershed (2018) evaluation (p. 10 of 2021). All stream reaches with greater than 60% (10% of 2021) were defined as having an issue buffer. Streams that were defined as not being reaches (mileage 2,374 miles) and average (33,494 acres) calculation for the  
 most buffer (131 miles) = 2,374 miles or 33,494 acres

500 miles/500 acres by 2040

15% by 2040

Note: The "Healthy Forests and Trees" Outcome's Riparian Buffer Targets target is to plant and maintain 7,500 acres of forest buffers annually. To approximate a realistic goal, the percentage of area and acres of watersheds supporting healthy brook trout populations to total Chesapeake Bay Watershed land area (15%) was applied to "Healthy Forests and Trees" Outcome's Target of 7,500 acres by 2033. This showed that 970 acres by 2033 would be realistic assuming the same proportion applied to the whole watershed were applied to watersheds supporting healthy brook trout populations. However, being more conservative the restoration goal was set at 15% restoration (300 miles / 5000 acres of acres without forest buffers by 2040).

led to be 2,005,676 acres. For more information on the dataset, its definition of potential lands to see the [Pennsylvania Land Analysis and](#)

sources by 2040.

Data Sources

By Watershed: [The CMR Potential Land Indicator Dataset](#)  
 by brook trout populations: [James L. Whitcomb's Eastern Brook Trout](#)

# Target Attainment

How will we track and meet our outcome targets?

---

---

# Tracking the Targets

**Target 1:** By 2040, increase brook trout **occupancy by 1.5% (233 miles)** in watersheds supporting healthy populations while achieving no net loss in other watersheds.

Tracking: EBTJV Assessments (2016, 2024, 2032, approx. 2040)

**Target 2:** By 2040, increase **abundance** at **10 long-term monitoring sites**.

Tracking: Workgroup Chairs/Staffer will coordinate with each BTAMS administrator to acquire abundance data each year. Online GIS map will be available to show the BTAMS and potentially their associated data through time.

**Target 3:** By 2040, **reduce identified threats by 15%** to increase brook trout **resilience** in watersheds supporting healthy populations.

Tracking: Habitat Tracker Submissions

---

---

---

---

# Habitat Tracker Functionality for Tracking Resiliency Target

Regular data calls request project data from partners:

- Acid Mine Drainage Treatment - Miles
- Riparian Buffer Planting - Acres and/or Miles
- Dirt and Gravel Road Improvement - Miles
- Culvert Improvement - Upstream Miles Opened
- Land Protection - Acres



5

# Next Steps





---

---

---

# Next Steps

Establish/formalize  
BTAMS abundance  
monitoring network and  
create an online map of  
the network

Determine how to best  
display data on  
Chesapeake progress

Analyze recent data  
collected from the most  
recent datacall (Feb 2026)

Consider whether to expand  
the online abundance map  
to include spatial  
distribution of identified  
threats throughout the  
watershed

Determine extirpation  
criteria in order to deem  
previously occupied  
habitat as now  
unoccupied

# Credits

---

---

---

A special thanks to:

- **Gina Hunt**, *MDE* (Former HGIT Chair)
- **Chris Guy**, *USFWS* (Thriving Habitats, Fisheries, and Wildlife Goal Co-coordinator)
- **Nick Staten**, *Chesapeake Research Consortium* (Brook Trout Workgroup Staffer)
- **Stephen Faulkner**, *USGS - retired* (Former Brook Trout Workgroup Co-chair)
- **Shawn Rummel**, *Trout Unlimited* (Brook Trout Workgroup Member)
- **Matt Mayfield**, *Trout Unlimited*
- **Lori Maloney**, *Eastern Brook Trout Joint Venture* (Brook Trout Workgroup Member)
- **Brook Trout Workgroup Members**
- **Coral Howe**, *USGS*
- **John Wolf**, *USGS*
- **Alex Gunnerson**, *Arlluk Technology Solutions, LLC*
- **Michelle Katoski**, *USGS*
- **Emily Young**, *ICPRB* (Brook Trout Outcome Data Manager)





# Thank you!!

Want to get involved with the workgroup? Email  
[staten.nick@epa.gov](mailto:staten.nick@epa.gov)



**Chesapeake Bay Program**  
*Science. Restoration. Partnership.*

# Appendix

# How are “healthy populations” defined?

“Stronghold” and “Persistent” patches of Trout Unlimited’s range-wide conservation strategies.

Link to 1-pager:

<https://www.chesapeakebay.net/files/BTWG-Classifying-Healthy-Brook-Trout-Watersheds.pdf>

### Defining “Healthy Populations” of Brook Trout in the Chesapeake Bay Program’s Brook Trout Outcome.

**Background and Context**

As per direction of the Chesapeake Bay Program’s December 2024 Executive Charge the Brook Trout Workgroup has revised the 2014 Brook Trout outcome of “Restore and sustain naturally reproducing brook trout populations in Chesapeake headwater streams with an eight percent increase in occupied habitat by 2025” to a new outcome with three targets:

- Protect and enhance brook trout within the Chesapeake Bay watershed by increasing occupancy, abundance and resilience to changing environmental conditions.
- By 2040, increase brook trout occupancy by 1.5% (233 miles) in **watersheds supporting healthy populations** while achieving no net loss in other watersheds.
- By 2040, increase abundance at 10 long-term monitoring sites.
- By 2040, reduce identified threats by 15% to increase brook trout resilience in **watersheds supporting healthy populations**.

The new outcome attempts to focus conservation and restoration activities in areas supporting **healthy populations of brook trout**.

**How does the Chesapeake Bay Program’s Brook Trout Workgroup Classify Healthy Brook Trout Watersheds?**

The Chesapeake Bay Program’s Brook Trout Workgroup (BTWG) defines healthy watersheds based on Trout Unlimited’s (TU) Eastern Brook Trout Conservation Portfolio highest priority conservation areas. For the brook trout outcome goal beyond 2025, BTWG will prioritize and direct land conservation and habitat restoration practices in the top two classifications, stronghold and persistent populations (i.e. healthy brook trout watersheds). This will ensure conservation funding is spent in the “best of the best” watersheds and have the greatest benefit to brook trout and their habitats. BTWG’s new focus also aligns with the conservation teams held by Eastern Brook Trout Joint Venture (EBTJV), TU and other conservation funding entities.

**Eastern Brook Trout Catchment & Patch Assessments**

[Access the Assessment](#) | [View EBTJV Information Here](#)

The most recent EBTJV assessment assigns brook trout, brown trout, and rainbow trout occupancy to “catchments” – watersheds of stream reaches approximately 2-5 km long. Since field data exist for only about 20-30% of these small reaches, the EBTJV assessment employs a rule set in GIS that predicts trout

**Figure 1. From (Feeney et al., 2017) Visual representation of how multiple brook trout catchments translate into a brook trout patch of varying classification.**

**Figure 2. From (Feeney et al., 2017) Color coded map and legend of Eastern’s Brook Trout Conservation Portfolio’s strategies.**

in is assigned upstream until a barrier, different sample, etc. Catchments with the same classification are tied by wild brook trout. Patches are not connected to populations.

other salmonid species (i.e., brown and/or rainbow watershed).

yer et al., 2017)

**Conservation Portfolio**

Resilience	Abundance	Representation	Eastern Brook Trout Conservation Portfolio
Resilient	Abundant	Representative	Resilient
Persistent	Abundant	Representative	Persistent
Stronghold	Abundant	Representative	Stronghold

patches with high natural integrity scores that have relatively few stressors present. Resilient, or stronghold patches have at least 25km of brook trout-only stream habitat and at least one occupied large stream. TU’s [Resilient \(Stronghold\) Populations](#) strategy is assigned to populations that “do not meet the resiliency or redundancy criteria. These populations do still contribute to representation.” For more details see [Trout Unlimited’s Conservation Portfolio Documentation](#).

**References**

Feeney, K., Haak, A., Rummel, S., Mayfield, M., McFall, S., & Williams, J. (2017). *Eastern Brook Trout Conservation Portfolio, Range-wide Habitat Integrity and Future Security Assessment, and Focal Area Risk and Opportunity Analysis*. <https://doi.org/10.31149/0562-2311/2076887>

Maloney, L. A., Raab, J. M., & Simard, L. G. (2025). Eastern Brook Trout Joint Venture: Helping Brook Trout for over 20 years as a National Fish Habitat Partnership. *Fisheries*, 50(12), 548–554. <https://doi.org/10.1093/fishmag/afaf070>