



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



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Agenda

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2014 Outcome

What it was how did we work towards its attainment.

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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

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Target Attainment

How will we track and meet our outcome targets?

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Next Steps

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How do we define healthy brook trout watersheds?



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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
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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.

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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
- 



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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.

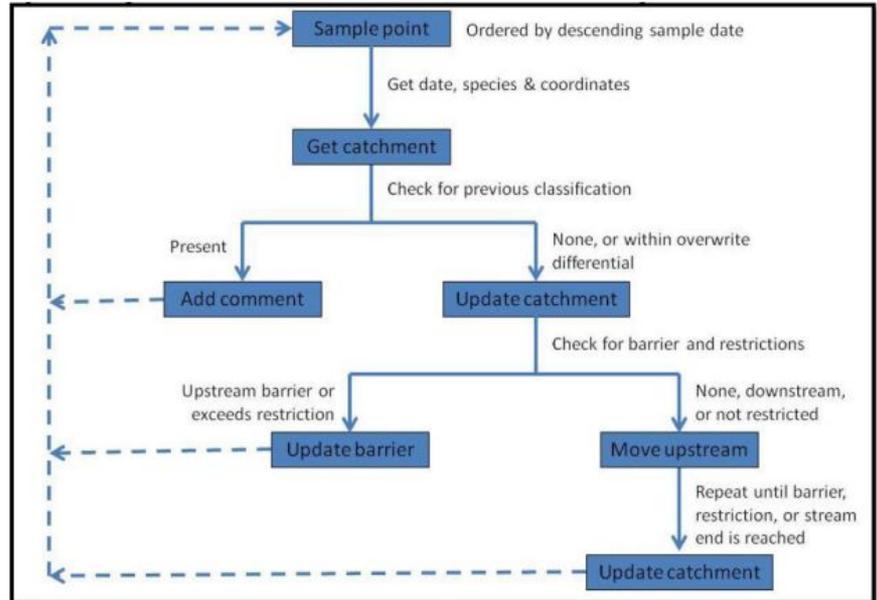
Target 2: By 2040, increase **abundance** at **10 long-term monitoring sites**.

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

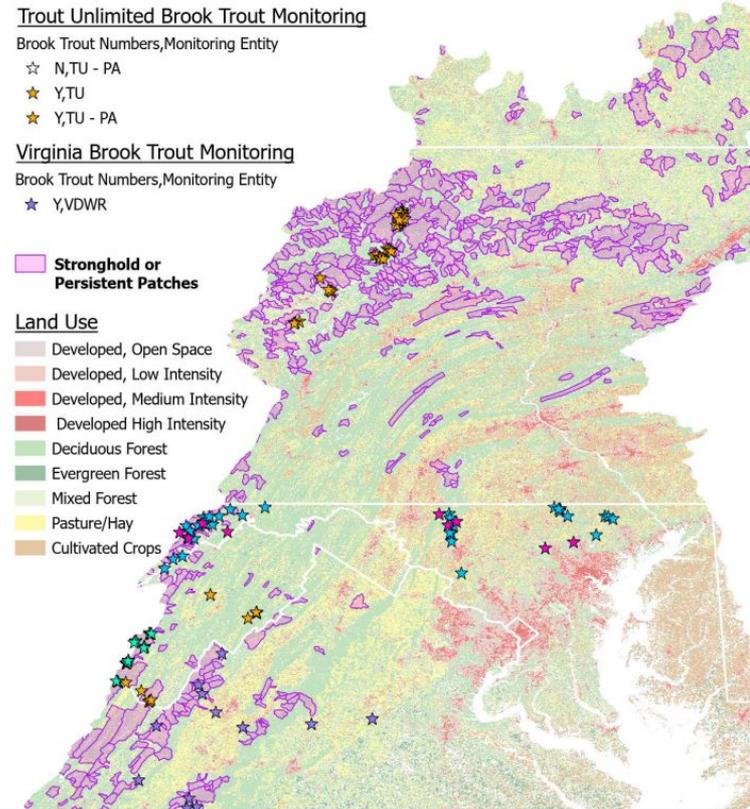
Brook Trout Numbers, Monitoring Entity

- ★ 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: Resilience

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

Identified Threats:

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%

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 outcomes of "Restore and sustain naturally reproducing brook trout populations in Chesapeake headwater streams with an eight-percent increase in occupied habitat by 2027" to a new outcome with three targets:

- 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 streamflow 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 partially focuses on improving the capacity of healthy populations 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 improvement 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 these kinds of BMPs, and direct their effort to areas directly benefiting brook trout. Leveraging existing programs and highlighting priority areas will helpfully minimize additional fill to partners, while setting up an ongoing 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 larger target's 15% threat reduction, but the partnership can over-perform in one category to offset under-performance in another and still reach the resiliency target goal. All numeric values were calculated from 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: $(308 + 104 + 128 + 305 + 426) \times 0.15 = 15\%$ for 2040

Threat of Acid Mine Drainage: Threat AMD

What is the Current State of this Threat?

8 healthy brook trout watersheds, the 304d Listings within EPA's Integrated Report Protection and Assessment that explicitly address acid mine drainage as a source of AMD was used for the jurisdictions where the source of impairment due to acid in the case, impaired streams with low pH in addition to the presence of metals-impaired streams from the datasets by state were brought into the GIS environment at [United's Eastern Brook Trout Conservation Database](#) conservative estimate of 40. The extent of impairment by AMD was then calculated in miles from these watersheds supporting healthy brook trout populations were **9 = 18 miles (WY) = 194 miles**

What is the Goal?

1 target is to improve 278 (15%) of the AMD affected miles watershed-wide miles 40. Therefore the Partnership anticipates being able to direct AMD work at the same brook trout for most.

Data Sources

[Approved Water Quality Reports](#) and the EPA's [Assessment, Lead Maximum Daily Limitation, and Maximum Contaminant Level](#) dataset.

Brook trout populations: [Joan Valindero's Eastern Brook Trout Conservation Database](#)

Threat of Unforested Land Cover: Riparian Buffers

What is the Current State of this Threat?

Forced riparian zones, the Workgroup wanted to calculate both watershed stream miles for this analysis was defined by the Chesapeake Bay Watershed (24,000 miles) [\(EPA, 2024\)](#). All stream reaches with greater than 65% [\(EPA, 2024\)](#) or were defined as being in a riparian buffer. Streams that were defined as not being in a riparian buffer (12,378.8 miles) and acreage (3,498.4 acres) calculation for the **100 miles / 500 acres = 2,378.4 miles or 33,498.4 acres**

What is the Goal?

100 miles / 500 acres = 2,378.4 miles or 33,498.4 acres

Data Sources

Note: The "Healthy Forests and Trees" Outcome's Riparian Forest Buffers target is to plant and maintain 7,500 acres of forest buffers annually. To approximate a realistic goal, the percentage of land area of watersheds supporting healthy brook trout populations in the Chesapeake Bay Watershed land area (15%) was applied to "Healthy Forests and Trees" Outcome's "Dual" Forest Buffer" target of 71,000 acres by 2035. This should total 9750 acres by 2035 would be realistic assuming the same recovery applied to the other watersheds were applied to watersheds supporting healthy brook trout populations. However, being more conservative the restoration goal was set at 15% restoration (100 miles / 5000 acres) of acres without intact buffers by 2040.

4 | Reduce Threat of Fragmented Habitat: Improve Culverts

What is the Current State of this Threat?

Existing barrier data were obtained from the [Chesapeake Fish Passage Prioritization Tool](#) (version 3.4.0), which included current facility rating and upstream functional network miles for each barrier. Barriers were filtered to include only those within watersheds supporting healthy brook trout populations, 500 assessed culverts and six functionally assessable barriers matched these criteria. Additionally, the scope was limited to only assessed culverts. Upstream functional miles were then summed for each assessed facility rating. Further information about the calculation of upstream functional network miles are described in the [2022 Chesapeake Fish Passage Prioritization Report](#).

Focusing on just assessed culverts, there are 500 structures associated with 740 miles of potential habitat accumulation in watersheds supporting healthy brook trout populations. According to jurisdiction partners, new culverts per mile every year was very variable and achievable. With New York, Pennsylvania, Virginia, West Virginia and Maryland all having healthy brook trout populations,

2 culverts * 1 miles * 15 years = 10 culverts by 2040

500 of 740 miles/500 culverts = 222 miles / 100 culverts by 2040.



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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
- 



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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

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- **Gina Hunt**, *MDE* (Former HGIT Chair)
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- **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**
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- **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



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Appendix



How are “healthy populations”

“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

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- 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 (EBTVJ), TU and other conservation funding entities.

Eastern Brook Trout Catchment & Patch Assessments

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

The most recent EBTVJ 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 EBTVJ assessment employs a rule set in GIS that predicts trout

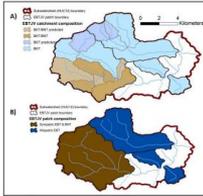


Figure 1. From (Feeney et al., 2017) Visual representation of how multiple brook trout catchments translate into a brook trout patch of varying classifications.

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 trout) (Feeney et al., 2017)



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

patches with high natural integrity across their range 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. TUs (Resilient Catchment 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 Fishery Security Assessment, and Fiscal Year Risk and Opportunity Analysis*. <https://doi.org/10.1148/RS-2-2-11170-2687>

Makovey, 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/fishery/50/12/548>