Chesapeake Bay Program: Brook Trout Workgroup

Fall 2024 Meeting Minutes

Chesapeake Bay Program
Science. Restoration. Partnership.

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Chesapeake Bay Program
Science. Restoration. Partnership.

BROOK TROUT WORKGROUP FALL 2024 MEETING

Tuesday, November 12th, 2024, from 10:00 am - 1:00 pm ET

Link to Meeting Details

ATTENDEES:

- Staten, Nick (CRC)
- Guy, Chris (USFWS)
- Flynn, Thomas (Upper Susquehanna Coalition)
- Rogers, Karli M (USGS Eastern Ecological Science Center)
- Ombalski, Katie (Woods and Waters Consulting)
- Goetz, Dan (MD DNR)
- Rummel, Shawn (Trout Unlimited)
- Austerman, Peter C (DEC)
- Thorne, David (WV Division of Natural Resources)
- Kirsch, Joseph E (USFWS)
- Lawrence, Matt (MD DNR)
- Kazyak, David C (USGS Eastern Ecological Science Center)
- Yactayo, Guido (MDE)
- Fink, Brad (VA DWR)
- Thompson, Jim (MD DNR)
- Mayfield, Matthew (Trout Unlimited)
- Young, Emily (ICPRB)
- Long, Eli (Western Pennsylvania Conservancy)
- Weglein, Sara (MD DNR)
- Lutz, Allison (Trout Unlimited)
- Lucas, Ranier (Upper Susquehanna Coalition)
- Maloney, Lori (EBTJV)
- Olinger, Charles (Thomas) (unknown affiliation)
- Kasko, Anna (MDE)
- Harris, Ben (Trout Unlimited)
- Tango, Peter (USGS)
- McCauley, Martha (EA Engineering Science and Technology Inc.)
- Detar, Jason (PFBC)
- Anna Kasko (MDE)

10:00 – WELCOME, ROLL CALL, & INTRODUCTIONS (15 minutes)

Presenters: Workgroup Co-Chairs Katie Ombalski (Woods and Waters Consulting) and Dan Goetz (MD DNR)

10:15 – UPDATES AND ANNOUNCEMENTS (5 minutes)

- **Management Strategy Update**
- **STAC Proposal Approved**
- **HABITAT GIT FALL MEETING**: The Habitat Goal Implementation Team Fall Meeting was on October 2nd and 3rd. This was a hybrid meeting with the in-person location at Virginia Institute of Marine Sciences.
    - **LINK TO DAY 1 INFORMATION**
    - **LINK TO DAY 2 INFORMATION**

- **Upcoming Meetings:**
    - The Habitat Goal Implementation Team Spring Meeting will be **during the week of April 28th or the following week May 5th**. More information on this to come.
    - Decide on a date for Spring and Fall 2025 workgroup meetings.
- Highlights for HGIT meeting (Chris Guy)
    - Presentation by Faren Walter on where do we want to go as a collective or group as it relates to the ability for us to work together successfully.
    - NCTC upcoming PSC meeting on Beyond 2025 will provide new insights on how we will address the EC Charge.
- Dan Goetz: Emphasis with cross GIT coordination. Lets streamline this as we work strategically on collaborating towards multiple goals
- Next Brook Trout meeting: Number of members who prefer to have in April: 6, Prefer to have it in May: 4, Prefer to have it in June: 3
    - When2meet will be sent out for April.

10:20 - PROJECT PRESENTATION: *FACILITATING BROOK TROUT OUTCOME ATTAINABILITY THROUGH COORDINATION WITH CBP JURISDICTIONS AND PARTNERS* (30 minutes)

Presenters: Shawn Rummel (Trout Unlimited), Matthew Mayfield (Trout Unlimited), and Lori Maloney (Eastern Brook Trout Joint Venture)

Slides: See Appendix I

- Overview and Objectives
    - The project aims to assess progress toward the Chesapeake Bay Program's brook trout habitat goal: an 8% increase in occupied brook trout habitat by 2025.
- Primary goals:
    - Identify opportunities for cross-GIT collaboration.
    - Strengthen communication and coordination with other stakeholders.
    - Collect and compile existing data and analyze monitoring and implementation of data necessary to track progress.
    - Work with the CBP EPA Data Center Team and Devereux Consulting to develop a tracking/reporting application.
- Key Findings
    - Between 2016 and 2023 there was an apparent 0.5% increase in occupied Brook Trout habitat (will cover important data caveats).
- Data Background
    - EBTJV Data was used to establish a baseline of Brook Trout occupancy based on NHD medium resolution catchments.
        - 33,000 km occupied by Brook Trout.
        - Breaks down to allopatric and sympatric.
    - It is important to keep in mind that EBTJV's assessment is a model.

        - The GIS Algorithm predicts occupancy in upstream catchments from downstream samples and hydroline (hand-coded in southern states).
    - EBTJV repeated this analysis through 2023 and created a web interface for state data upload.
    - Comparison of time periods (between 2016 dataset) and what we are calling the 2024 dataset requires we can accurately identify changes due to actual vs. predicted gains/losses.
    - EBTJV data will continue to improve with annual updates addressing some of the data caveats.
    - Logic flow models were used to identify catchments as a gain/loss
        - Northern Region (NY and PA)
            - Were BT present?
            - Was the determination of BT presence based on a sample?
            - Was the catchment itself sampled or was it inferred from downstream?
                - Catchment Count Attribute: allows determination whether a catchment was directly sampled or if it's species code was modeled from a downstream catchment.
                    - Catchment Count Attribute was not valid for states south of PA which required a separate Logic Flow Model for that region.
        - Southern Region (MD, WV, and VA)
            - Were BT present?
            - Was the determination of BT presence based on a sample?
            - ~~Was the catchment itself sampled or was it inferred from downstream?~~
        - Determinations were reviewed with state biologists
            - Unable to review all 80,000 catchments
            - Reviewed assessment with experts to see if there was confidence from them.
            - Main sources of error:
                - Unassessed waters/new sampling
                    - ex. sampled in 2017 but not in 2016. So not new BT, just new sampling.
                - Incorrect 2016 code: 2016 model code didn't seem right to the expert.
    - Results - EBTJV data comparison
        - Apparent net gain total gain minus total loss (8.9%)
            - Not realistic, high number probably due to new sampling dynamic.
        - 2.2% without new sampling, but theis could be faulty because a lot of gains in this number were inferred from downstream data and applied to upstream, so removing those instances:

        - 0.5% without inferred data. Trout Unlimited's most confident number for the status of habitat for BT.
- Tracking Habitat Restoration Projects and the Habitat Tracker
    - Objective of the database was to serve as a template for the development of an online tracking system and begin to populate that database.
    - Building something into the Habitat Tracker would be ideal.
    - Compiled data into the database including projects between 2016 and 2022 only.
        - AMP
        - Reintroductions
        - Dirt and gravel road improvements
        - AOP
        - Instream habitat improvement
        - Land restoration
        - Riparian protection
        - Other
    - 7,490 total projects, 5,419 within the Chesapeake Bay watershed
        - May or may not have a direct goal for increasing habitat in brook trout catchments.
        - 39% submitted with a HUC12 code, making location data not fully accurate. Which limited knowing exact catchment project took place in.
    - Report details specific analysis of each type
        - See Appendix I (slides 20-21) to see insights on how much work has been done on each project type.
    - Data limitations - project tracking database
        - Optional metrics are underreported.
        - Exact project locations are not always reported.
        - Limited time frame (2016-2022)
            - Projects implemented before 2016 still could be affecting data due to lagging biological effect on ecosystems
        - Database is not a complete dataset of all projects, but rather a template for future project tracking.
        - Not all projects were designed with the goal of eliciting a brook trout response.
    - Results - project tracking database
        - AMD, AOP and BT reintroduction most likely to lead to gains in occupancy.
        - Other projects are more likely to enhance current populations and build resiliency within those populations.
        - 73% of the projects were located in catchments that don't currently have BT or are unclassified.
        - Only 21% projects are doing work in areas with a known BT presence in both 2016 and 2024 assessments.
    - Recommendations - project tracking database

- EBTJV data should be considered preliminary.
- Results should be interpreted cautiously due to data limitations.
- There was general agreement that the logic flow model correctly aligns catchments to gains/losses. It may be beneficial to be re-run once the EBTJV data is finalized.
- A more thorough data review with state biologists to identify areas where actual gains have occurred is necessary.
- Due to low response rate to metrics that were not required, BTWG should evaluate which metrics should be required within the Habitat Tracker moving forward.
- Additional recommendations are outlined within the final report.

- Questions for Shawn and Matt:
  - Lori Maloney: Looking at slide 17, what are your initial thoughts as it relates to the gain numbers?
  - Dan Goetz: Looks like PA has the most improvement.
  - Martha McCauley : Did you look at numbers by state
    - Shawn Rummel: No, but in the final report they are grouped by HUC6 (major watershed).
  - Jason Detar: Regarding PA's data, at least for the west branch, a lot of the gains are in the headwaters which is attributable to improvements in water quality. I would interpret the number cautiously. A lot of our sampling is finding new populations and going back to monitoring our established populations. We do not have a robust sampling approach for populations that are more on the margin. I suspect we are more status quo perhaps even some minor losses that haven't been documented.
  - Dan Goetz: There were about 232 miles opened up due to AOP, is this something Fish Passage Workgroup is tracking?
  - Jim Thompson: No, we are working on getting this data reported at our next meeting in the fall. There are more and more players in fish passage and we are missing a lot of projects.

- Using the Habitat Tracker Reporting Application
  - Developed by Devereux consulting
  - Originally for black duck and wetlands workgroups
  - Tool for assessing habitat improvements classified by several project types and geographic location over time.
  - Tracker is not tracking gains in occupancy, it is tracking projects.
  - Annual Habitat Tracker Process
    - EPA Liaison or BT Workgroup: Recruit data
      - Request data of higher level data stewards
    - Funders data steward Water Quality Agencies: Add data

- Respond to request by specific date to inform report
- Devereux Consulting: Run Report
- EPA Liaison or BT Workgroup: Share Report
- Co-chairs: Review and Interpret with EBTJV Data
- Habitat GIT/ BTWG: Assess and Revise the Process

- Current action items for BTWG:
  - Review data for contact list
  - Appoint liaisons
  - Review report needs that we are asking from Devereux consulting
  - Setup report framework

- Recommendations for implementation of habitat tracker
  - BTWG should work proactively and collaboratively with higher level data stewards for data reporting.
  - Help partners help you by being precise about types of data you request. Soliciting a well designed study with pre and post project monitoring will help better understand which project types are expected to benefit brook trout.
  - Annual BT data updates solicited by the BTWG chairs.
- Identification of Cross-GIT collaborations
  - In addition to BT's own page, have a dedicated BT landing page on the CBP page that includes videos, discussions, and links to all the good work done by other workgroups.
  - BT is an **indicator** for Healthy Watershed and Water Quality.
  - Fish passage
    - Goal: 1000 miles opened for fish passage (2025)
    - TNC tool serves as a prioritization tool for severe barriers from NAACC Database
    - Brook trout priority score (EBTJV; DeWeber and Wagner Model of Brook Trout Occupancy)
    - Recommendation: BT workgroup could ask FP or TNC to give a demo on how the tool works with BT.
    - Recommendation: BTWG should provide annual data updates to the FP workgroup
      - Fish passage projects from habitat tracker.
      - Catchments classifications.
      - Monitoring data for the habitat tracker.
    - Other items for the FP and BT workgroup
      - Maryland Stream crossing guidelines for Chesapeake bay wide application.
      - Development of brook trout monitoring plans for watersheds of shared interest.
      - Share communication needs.
  - Brook Trout and the Chesapeake Bay Landscape

        - TU identified that there is a need to have pre and post monitoring of projects to identify effects of projects.
    - Emerging Themes: Maximizing Stream Restoration Outcomes
        - STAC Stream Restoration Workshop (2023)
            - Restoration outcomes summarized at the workshop and showed a mix of positive and negative outcomes.
            - Recommendations from the workshop mirrored Trout Unlimited's Recommendations:
                - Avoid harming intact habitat during project implementation.
                - If biological uplift is the goal, use appropriate approaches for that goal.
                - Target in stream work to more degraded streams.
                - Design for the location.
                - Use scientifically driven monitoring plans.
        - GIT and Workgroups - Emerging Themes on Targeting Work
            - Scientifically based plans for watershed-specific monitoring: Promote scientifically sound monitoring methods to track the progress of restoration efforts .
            - Added focus on AMD work within the Habitat GIT and track the benefits to fish and macroinvertebrates.
            - Focus on protecting areas that are relatively healthy: Brook Trout are often cited as an indicator of these "intact" watersheds.
    - Additional recommendations
        - Focus on protecting areas that are relatively healthy.
        - Prioritization of Brook Trout conservation in watershed restoration projects.
        - Scientifically-based and watershed specific monitoring.
        - Fund or otherwise support pre- and post- project monitoring that is specific to BT outcome.
        - Beyond 2025 goal setting:
            - New goals should be clear, concise, and **quantifiable**.
            - Alignment of goals with other agencies and conservation groups.
            - Consider BT conservation as a priority in addition to its use as an icon or indicator.
            - Focus on the restoration and protection of resiliency in existing populations with potential expansion of occupied habitat limited to appropriate areas through removal or AOP barriers, BT reintroductions, and improvement of water quality and habitat.
            - Develop focal areas where pre- and post- project monitoring can be located.

Break at 11:20 coming back at 11:30

~~**10:50 - PROJECT QUESTIONS AND FEEDBACK (15 minutes)**~~

~~**11:05 - BREAK (10 minutes)**~~

11:25 – BREAK (5mins)

~~**11:15**~~ **11:30 - PROJECT DISCUSSION (45 minutes)**
Facilitators: Dan Goetz, Katie Ombalski

Points to discuss include but are not limited to:

- *BMPs to increase occupancy vs resilience.*
- *Beyond 2025 strategy and possibility for a new outcome.*
- *Opportunity for collaboration.*
- *Importance of updating Habitat Tracker annually.*
- *Priority recommendations based on the Report findings.*

- Overarching question: How do we combine recommendations from this report, understanding what BMPS or projects increase occupancy or resiliency, and how do we report and track progress on Brook Trout outcomes while prioritizing these projects/BMPs? Consider specific watersheds as well.
    - Beyond 2025: As a workgroup do we want to shift towards resiliency instead of occupancy?
    - Jason Detar: EBTJV have been focusing on resiliency in strongholds and it is key. There will be opportunities to expand brook trout in some areas, but this is few and far between and not as helpful as bringing resiliency. AMD remediation and water temperatures will have the greatest effect on populations. Don't see many populations being expanded just from riparian plantings or habitat improvements. Trying to maintain what we have and building on it when possible is how we should move past 2025.
    - Chris Guy: I want to talk about why the outcome is what it is now. The 8% increase in habitat was decided upon because it was viewed as doable. A lot of fishery groups in the area notably USFWS defined this 8%. I am not really in favor of having a number for Brook Trout. I think we should just keep Brook Trout strongholds strong. Three R's for endangered species, not that Brook Trout is an endangered species (but it is an increasingly possible reality with climate change): resiliency, redundancy, and representation shows the path for recovery of endangered species. We want to create resilient areas in strongholds, we want them to be spread out in the watershed so in the event of a catastrophic event there are other populations to repopulate. Lastly, representation, the greater the amount of fish allows more resiliency. The fourth R can be restoration to increase populations outside of the watersheds we were originally

working in. I think these need to be our principles going post 2025. Additionally, I think the EBTJV and Bay Program outcomes need to be aligned, there were discrepancies. As we move beyond 2025 the Bay Program has agreed on the EC charge was that conservation and climate will be additions to post-2025 Bay Program main priorities. First make sure the strongholds are strong then we can move into the fourth R of restoring other areas.

- Dan Goetz: In our work plans we should have language about cross GIT goals. AMD barriers are obvious for Brook Trout, and Fish Passage, Stream Health success. Riparian buffers could do a percent in brook trout waters.
- Chris Guy: In conversations at the upcoming NCTC meeting, we will speak about simplifying outcomes. Thinking about Brook Trout being an indicator to support cold water stream health. Where Stream Health is the outcome, and the overarching goal with 100% fish passage and stream health in the bay watershed.
- Chris Guy: I do think that Brook Trout has the additional stressor of non-native species. e.g., do you open a culvert where Brown Trout can move up stream. The PSC has also charged the MB to come up with long term monitoring. There will be money for long term monitoring, no guarantee it will include Brook Trout but it is part of the SAV sentinel site GIT funded project.
- Jim Thompson: AMD's are not considered blockages for Fish Passage Workgroup currently, but they are definitely fish barriers.
- Dan Goetz: Along those lines could thermal barriers be a consideration?
- Jim Thompson: Absolutely. The Fish Passage scope has evolved throughout the years.
- Eli Long: I appreciate the nod to needing more rigorous monitoring of Brook Trout, but how can that get funded when so much funding is geared towards implementation?
- Katie Ombalski: In the perspective of NFWF monitoring is of great interest in terms of projects, but the scope needs to be located in specific areas. We should guide funding into specific geographic areas.
- Dan Goetz: Specific to monitoring in MD, we offer monitoring as a cost-share handling of monitoring projects as it relates to grant acquisition.
- Lori Maloney: Question for the group: what would you propose is a good way of measuring Brook Trout resiliency? There is some work being done in a Delaware initiative and I think at some point there will need to be some synergy with those groups too so we aren't having parallel conversations with neighboring watersheds.
- Brad Fink: Annual samples on perceived strong populations of Brook Trout. To measure resilience have long term datasets. In VA we have a 7 year rotation to acquire data on out ~700 streams in addition to annual data on what we consider stronger populations. Shenandoah National Park just put out a paper talking about their long term dataset. We need that to be able to measure resilience. I agree with what Jason Detar said in that this is the direction we need to go and not trying to get to that 8% increase in population, but rather focus on maintaining populations and if populations increase then great.

- Karli Rogers: Here is the paper that Brad was referring to: Strong variation in Brook Trout trends across geology, elevation, and stream size in Shenandoah National Park - Childress - 2024 - Transactions of the American Fisheries Society - Wiley Online Library
- Lori Maloney: So look at presence/absence not just count data.
- Brad Fink: Not just presence/absence, you need to look at the numbers of fish you have. Which can just be a 1 pass sample, it doesn't have to be a 3 pass sample.
- Shawn Rummel: In response to Eli's comments, the need for long term monitoring is evident. A lot of grant cycles if they do supply funds for monitoring, you are looking at 2-3 year window. If you are lucky you get 2-3 year pre-project monitoring and 1-2 year post-project monitoring, which is not enough to see biological uplift of the projects. Some implementation projects may take 5-6 years to see any change due to the project that is evident and can collect data about.
- Katie Ombalski: Typically in grant proposals you are asking for monitoring for one specific intervention, but I think we should be monitoring entire catchments/patch. If we are deciding this is a priority for the workgroup we need to be able to communicate that to the funders. We need to hear from the States where their priority watersheds are.
- Dan Goetz: I'd like to hear from other States, but if abundance/density is a metric of resiliency, how do we translate that into an indicator or outcome goal? What levers on the ground can we pull to see increased abundance in our strongholds, because given annual variations with recruitment failures, good years, droughts, floods, ice, etc. is that the best metric of resiliency? Or are there indicators of habitat, or genetic integrity, that still gets us there with less noise?
- Jason Detar: I think there is opportunity to have non-profits to fill in sample gaps and increase sample sizes. There is a lot of behind the scenes that will need to happen to define a sampling SOP. We will be working on this for the next year or two. It's less glamorous to go through marginalized populations, but if we are going to be losing populations it's likely going to be those with increased development or other factors that have led to BT with less abundance, and generally those are the areas we get to least. Reiterating my point that Pennsylvania's situation is probably not as good as what the TU report says, that's likely a best case. Also, there are landscape metrics that do a great job predicting BT presence and sometimes abundance with percent forest and so on. I think other things can come into play, I think we could have a whole workshop on the monitoring side of things, but I do think that we could lean on the non-profits when a robust implementation plan has been created.
- Dan Goetz: There are multiple ways to measure resiliency. So maybe we should have multiple indices or goals. This will still drive projects on the ground. I think as a workgroup I am not sure how convoluted the bay program would accept measurable outcomes, but understanding BT and how difficult and complex it is to recover, restore, and protect resiliency, we have to understand there are multiple ways to success.
- Shawn Rummel: I just wanted to follow up with that because I am thinking along the same lines. dDepending on what project type, that outcome would vary. It wouldn't

necessarily always have that BT response given what we know about BT. If we are looking at increased wood composition we could look at things like water temperature, higher base flow, things like that. It could also tie into other GITs for flood resiliency work and things like that. Wetland creation, etc.. As a workgroup we could come up with associated metrics on each project implementation type that goes above and beyond the actual BT response

- Lori Maloney: Is that proposing the next outcome wouldn't be articulated in BT population density, but based on habitat metrics? Not a biological-based outcome goal?
- Dan Goetz: Abiotic metrics could infer biological uplift and definitely increase resiliency. Is that what you are getting at Lori?
- Lori Maloney: Yes, and I am really to think about things that would be specific to Brook Trout vs things that are done in other workgroups because then you are in a situation where if there isn't a BT outcome, taking a hard look at the other outcomes, and asking about the results of the other outcomes: what do we know about the impact those results have on Brook Trout? Do we want to be in a situation where this isn't any more BT outcome? I would hate there be none, I would like to have something articulated, but I am trying to connect that all this work being done on the landscape for all these other reasons, and linking it back to BT and whether there is a purpose for there being this workgroup. Maybe it could be monitoring, you know maybe our outcome could be something to do with monitoring.
- Dan Goetz: I want occupancy to still be an outcome. A new population is a new population. Could occupancy, resiliency, and abundance be three outcomes? Under each of those there are different ways to count towards progress, but still achieving more BT populations. I think there should be three ways to measure success.

12:00 - STAC WORKSHOP UPDATE (20 minutes)

- STAC, Science Technical Advisory Committee, provides funding every year to support some workshops to produce scientific technical advisor reports to guide outcomes for specific workgroups within the bay program.
- Katie and I discussed how we should move forward with the workgroup as a part of previous Strategic Review System (SRS) cycles and we brought this idea to the Bay Program Management Board that we need to work more at the ground level with local jurisdictions and target restoration efforts in Brook Trout stronghold watersheds. We initially wanted to come up with a Bay-wide county MOU acknowledging that all the counties understand BT needs to be conserved and that they were going to include it in part of their watershed implementation plans and put money into conservation efforts toward BT. However, there are over 100 counties within the Bay watershed with Brook Trout.

- We are going to pilot this effort in MD and PA. MD: Garrett (Savage River Watershed), Baltimore, and Carroll Country (Upper Gunpowder River Watershed). Potter and Clearfield counties in Pennsylvania.
- We are currently in the planning process of these workshops.
- Workshops will be in January and February. Two one day workshops, one in MD and one in PA.
- Trying to develop a blueprint for large scale restoration in BT strongholds. The blueprint should be replicable for other counties outside of the pilot program in MD and PA counties. In addition, there will be specific restoration plans for each county as a report out of the workshop.
- People included in this effort are Federal, State, County, and NGO officials that have anything to do with land conservation or Brook Trout management, on the ground level. We want everyone to come to these workshops and come up with an implementable plan that any organization can submit a grant funding proposal for a project to do restoration work.
- Trying to keep it to ~50 people per workshop.

12:20 – RESEARCH PRESENTATION: *TRENDS IN BROOK TROUT ABUNDANCE IN MARYLAND, USA: CURRENT UNDERSTANDING AND FUTURE WORK* (15 minutes)

Presenter: Karli Rogers (USGS)
Slides: See Appendix II

- Karli Rogers, a fish biologist at the USGS Eastern Ecological Science Center, specializes in brook trout thermal habitat and refugia in the Mid-Atlantic.
- Current work includes hydrologic studies integrating AI and machine learning for stream gauging and flow estimation.
- Declines in Brook Trout Abundance Linked to Atmospheric Warming in Maryland, USA: https://www.mdpi.com/2673-9917/3/4/19
- Research Highlights:
    - Trends in Maryland Brook Trout Populations:
        - Analysis of brook trout density trends (1988–2003) using Maryland DNR electrofishing data from 70 sites.
        - Data covered adult and juvenile trout across three physiographic regions.
        - Declines observed in 27% of sites for adult trout, while juvenile trends were relatively stable.
        - Associations:
            - Declines correlated with warming air temperatures and proximity to ponds.
            - Juvenile trends positively correlated with elevation but negatively with base flow index.

- Future Research Opportunities:
  - Longer-term temperature data and improved monitoring needed to explore trends further.
  - Identification of thermal refugia and groundwater interactions critical for conservation.
  - Potential management actions:
    - Pond removal or retrofitting to mitigate warming.
    - Targeted restoration efforts in areas showing significant trends.
- Looking forward:
  - Funding secured through the Chesapeake Bay Program for FY25 to synthesize brook trout research, focusing on trends, refugia, stream flow, and thermal tolerances.
  - Collaboration with Penn State University to assess Brook Trout resilience and reintroduction potential using genetic and physiological data.

- Key Discussions and Questions:
- Pond Impact Analysis:
- Question by David Thorne: Were the ponds included in the analysis man-made or natural (e.g., beaver ponds)?
- Karli Rogers: Predominantly man-made farm ponds; differentiation between types was not made but could be valuable in future studies.
- Dan Goetz: I assume it's over 99% man-made.
- Dan Goetz: What does base flow index indicate, and why was it linked to declining juvenile trends?
- Karli Rogers: Considered to be a proxy for mean bedrock depth. Index measures groundwater influence on surface water.
- Dan Goetz: So a higher base flow index value is a higher influence of groundwater on stormwater?
- Karli Rogers: Yes, the index of groundwater potential on streams, yes. Unexpected finding: you would think juvenile fish survival would rely more on heavy influence of groundwater.
- Dan Goetz: So just that I am understanding, lower value was correlated with lower recruitment?
- Karli Rogers: Higher Baseflow Index was correlated with declining trends of juvenile fish, which was unexpected and discussed more in the paper.
- Dan Goetz: Main takeaway or management strategy for this work?
- Karli Rogers: We couldn’t identify most of the variation in the trends. Strong monitoring is required to understand these questions that came up, and to focus on areas with declining trends.
- Dan Rogers: Would it be possible to map these populations by HUC12 that are declining?

- Karli Rogers: It might be complex with trying to do this across the board with value being lost since Huc12 may be too coarse.

12:35 – MEMBER UPDATES (15 minutes)

MD (3 minutes) - Matt Lawrence

- Completed the second year of Brook Trout monitoring network with 51 stations collecting population, temperature, and habitat data.
- Considering expanding temperature data collection outside the summer period to spring and fall.
- Identified four previously undocumented Brook Trout populations in 2024.
- Updating the 2020 patch assessment with genetic data from 23 additional populations.
- In 2020 we had identified 10 Brook Trout stronghold populations, and we are adding~5 Brook Trout stronghold patches to our list out of ~127 patches in the state.
- Expanded brook trout reintroduction efforts to three streams with plans to increase occupancy by ~3.5 miles.
- In 2024 we implemented a non-native trout removal policy in BT areas, starting with the Upper Savage River project, to increase allopatric speciation.
- Received a $239,000 Chesapeake WILD grant for riparian planting, land protection, aquatic organism passage improvement, and underserved community outreach.

PA (3 minutes) - Jason Detar, Eli Long, Shawn Rummel

- Stronger than average year class for Brook Trout documented despite substantial flooding concerns.
- Continued "Unassessed Waters Program" to identify new wild trout populations.
- Expanded large wood additions and habitat improvement efforts.
- Active partnerships with TU (Trout Unlimited), WPC (Western Pennsylvania Conservancy), and others for habitat projects.
- Exploring pre- and post-project monitoring with VI E tagging and analyzing recapture rates.
- Eli Long: We've begun over the past couple of years working on an expansive partnership with the game commission in PA. They own a significant acreage with much of which overlaps BT areas of interest in the commonwealth. Our work is similar to what Jason was saying with large wood additions, but we are also working a lot with AOP restoration replacing culverts with bridges. Able to do a lot of this work through grants, and part of those efforts includes pre- and

post-monitoring as a part of the grant agreement. We are doing VIE tagging of captured fish both before and afterwards and analyzing our success of recapture. We have done this on 20-30 sites so far. Hoping to continue to grow this to be recognized as a valid and useful way of understanding the usefulness of these projects.

- Shawn Rummel: TU will continue to work with PA Fish and Boat on the Unassessed Waters Program, a lot of stream surveys this year. Habitat crews are busy with large wood additions, AOP, and riparian plantings. Monitoring a lot of those sites for fish response and habitat response. Currently working on long-term restoration plans for a few key watersheds in cooperation with Western PA Conservancy, NFWF, and Fish and Boat Commission.

VA (3 minutes) - Brad Fink

- Deep analysis planned for 10 years of data from consistent monitoring of streams. Virginia Trout Sensitivity Streams Survey started back in the early 90s.
- Planning reintroductions of brook trout using genetic diversity recommendations.
- Completed restoration in Dry Run (SW Virginia).
- Exploring drought impacts on Brook Trout populations in North Western Virginia.

WV (3 minutes) - David Thorne, Karli Rogers

- Severe drought affected monitoring and Brook Trout populations, with significant adult fish losses. Recruitment was good, smaller fish had more places to hide in extremely low flows.
- Monitoring areas couldn't be monitored because streams had completely dried up.
- Joined the SARP (Southeast Aquatic Resources Partnership) to address issues like acid mine drainage in the North Branch Potomac.
- Statewide Aquatic Connectivity Team formed to deal with Fish Passage through SARP.
- TU received a small watershed grant for ongoing projects.
- Reintroduction "slam dunks" potential limiting.
- Proposed a monitoring plan covering 120 sites, rotating annual subsets.
- Dan Goetz: Dave and Brad did Hurricane Helene cause any devastating flooding to your Brook Trout streams?
- David Thorne: We would've liked to have had more rain.
- Brad Fink: There was a little damage. We will revisit these populations next summer to see the impacts. Droughts in North West Virginia, floods in South West Virginia.

- Karli Rogers shared MP4 of hurricane effect on stream health in Shenandoah National Park which was significantly affected. Brook Trout populations have been very negatively impacted.

NY (3 minutes)

- **No update given**

12:50 – DEBRIEF (10 minutes)

- Topics for next meeting.
  - STAC Debrief
  - Querying states on long term data sets and priority watersheds
  - Beyond2025
  - Possible interim outcome brainstorm after we gain more guidance
- Action Items before Spring Meeting.
  - Send out membership list and make sure it was encompassing those who should be involved in the workgroup.

1:00 – MEETING ADJOURNED.

Main Action Items:

1. Inquire with workgroup members about whether their state/organization is properly represented within the membership spreadsheet. Is there anyone else that should be added?
2. Send Workgroup a copy of the revised Management Strategy, STAC Proposal, and Trout Unlimited Project Report.
3. Send out a when2meet to the workgroup for the Spring meeting in April.
4. Current Action Items for Brook Trout Workgroup as it relates to the habitat tracker process (From Appendix I slide 27 of Trout Unlimited Project):
   a. Review Data Contact Lists.
   b. Appoint Liaison(s) for data acquisition process and point of contact responsibility.
   c. Review Report Needs.
   d. Setup Report Framework.
5. Consider Trout Unlimited's Recommendations about Cross GIT-Collaboration
   a. Dedicated landing page for Brook Trout
   b. Brook Trout and Fish Passage Workgroups could get a demo on how to utilize TNC's Fish Passage Prioritization tool's Brook Trout functionality.

c. Maryland Stream Crossing Guidelines for AOP is being expanded to a Chesapeake bay-wide application. BT Workgroup could give recommendations to this.
d. Development of Brook Trout monitoring plans for watersheds of shared interest.

6. Consider discussion around how we track Brook Trout Outcomes, what are the outcomes?
    a. Shawn Rummel and others mentioned that BT response is not necessarily the best metric to track for each project type. Should we have associated metrics under each project-implementation type that goes above and beyond BT response?
    b. Lori Maloney was mentioning that there are a lot of things being done on the landscape for other reasons by other workgroups. Things that affect Brook Trout. Should a new outcome be focused more around monitoring?
    c. Dan Goetz: I want occupancy to still be an outcome. A new population is a new population. Could occupancy, resiliency, and abundance be three outcomes? Under each of those there are different ways to count towards progress, but still achieving more BT populations. I think there should be three ways to measure success.

APPENDIX I: Slides - Facilitating Brook Trout Outcome Attainability through Coordination with CBP Jurisdictions and Partners

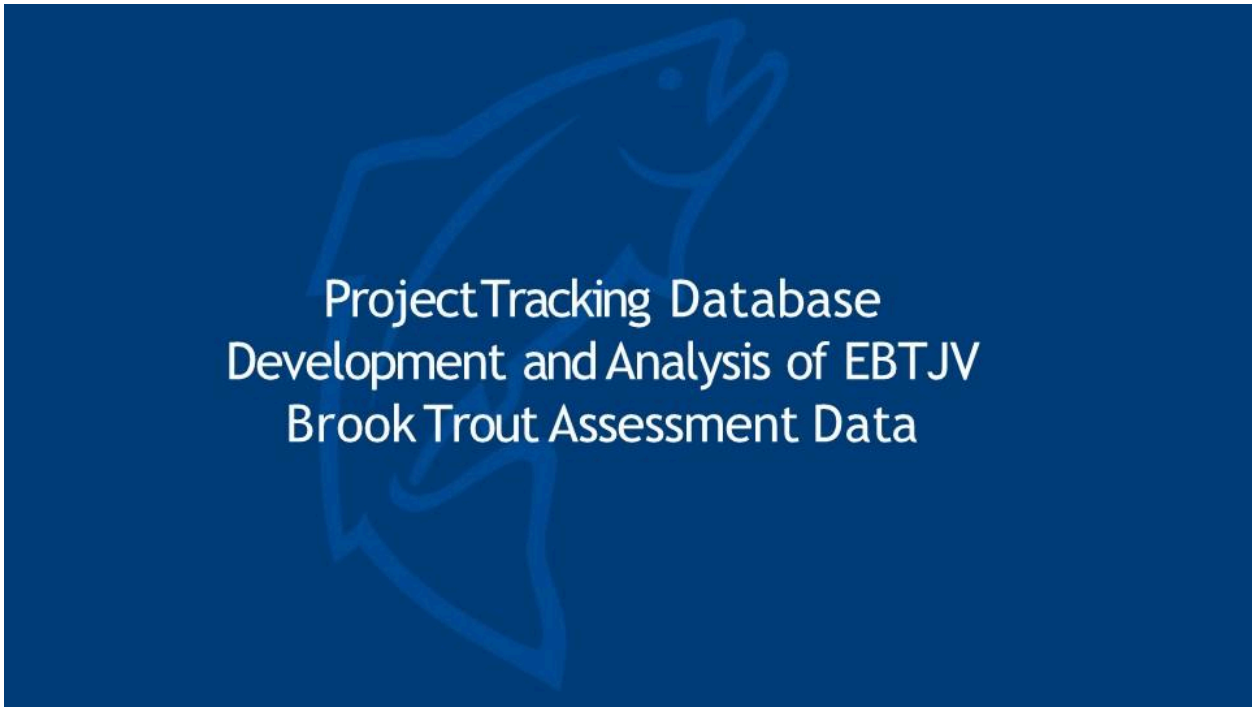
Project Objective

The objective for this project was for Trout Unlimited (TU) and the Eastern Brook Trout Joint Venture (EBTJV) to work with the EPA Data Center Team, The Brook Trout Work Group (BTWG), and other partners and stakeholders currently collecting data to populate a database to better evaluate progress on the Chesapeake Bay Program Brook Trout Outcome.

- Brook Trout Outcome:
  - to "restore and sustain naturally reproducing brook trout populations in the Chesapeake Headwater streams with an **eight percent increase** in occupied habitat by 2025."

Project Goals

- Identify opportunities for cross-GIT collaborations with other CBP teams (Healthy Watersheds, Fish Passage, Riparian Buffers, Stream Health) on connected actions, e.g., reforestation, aquatic connectivity, land conservation.
- Strengthen communication and coordination with other stakeholders (e.g., non-DNR state agencies, other NGOs).
- Collect and compile existing data from stakeholders and analyze monitoring and implementation data necessary to adequately track progress.
- Work with the CBP EPA Data Center Team to develop a tracking/reporting application.



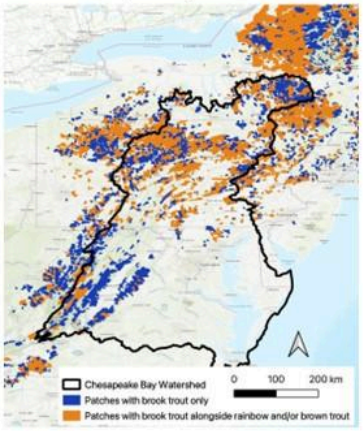
Intro/Preview

- Broad summary results: Between 2016 and 2023, 0.5% increase in occupied brook trout habitat.
- We will cover important caveats to this analysis and the EBTJV data.
- How do habitat restoration projects and the Habitat Tracker fit into the picture?
- How do priorities of the Brook Trout Workgroup align with other workgroups and Goal Implementation Teams?
- As we go, we will offer recommendations.

EBTJV Data

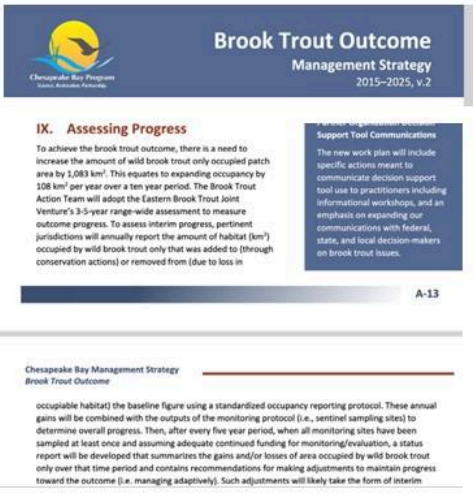
- 2016 EBTJV data were used to establish a baseline of brook trout occupancy based on NHD medium-resolution catchments.
  - 33,213 km² occupied by brook trout
    - 19,402 km² are allopatric
    - 13,811 km² are sympatric
- In order to interpret changes in BKT occupancy it's important to understand factors influencing the occupancy data- we'll look at these in more detail.

EBTJV wild brook trout patches, 2016
Chesapeake Bay Watershed



EBTJV Data Background

- The 2015-2025 Management strategy identified the EBTJV assessment as both the baseline for and the mechanism for tracking the Outcome.
- This assumed:
  - States had a way to report bkt occupancy changes to EBTJV, annually, and that EBTJV would have a way to incorporate the data
  - A standard protocol would be developed
  - The protocol could identify gains due to conservation actions and occupancy losses due to loss of habitat.


Brook Trout Outcome
Management Strategy
2015–2025, v.2

IX. Assessing Progress

To achieve the brook trout outcome, there is a need to increase the amount of wild brook trout only occupied patch area by 1,083 km². This equates to expanding occupancy by 108 km² per year over a ten year period. The Brook Trout Action Team will adopt the Eastern Brook Trout Joint Venture's 3-5-year range-wide assessment to measure outcome progress. To assess interim progress, pertinent jurisdictions will annually report the amount of habitat (km²) occupied by wild brook trout only that was added to (through conservation actions) or removed from (due to loss in

Support Tool Communications

The new work plan will include specific actions meant to communicate decision support tool use to practitioners including informational workshops, and an emphasis on expanding our communications with federal, state, and local decision-makers on brook trout issues.

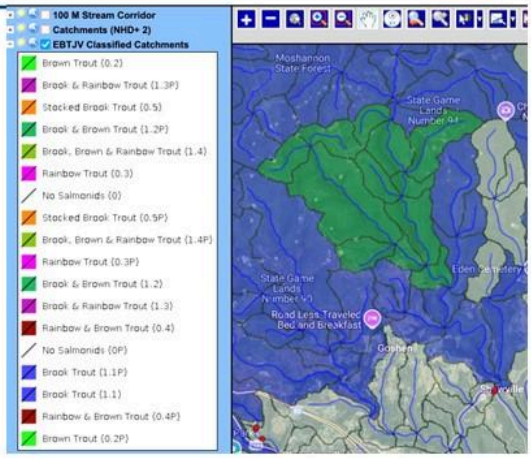
A-13

Chesapeake Bay Management Strategy
Brook Trout Outcome

occupiable habitat) the baseline figure using a standardized occupancy reporting protocol. These annual gains will be combined with the outputs of the monitoring protocol (i.e., sentinel sampling sites) to determine overall progress. Then, after every five year period, when all monitoring sites have been sampled at least once and assuming adequate continued funding for monitoring/evaluation, a status report will be developed that summarizes the gains and/or losses of area occupied by wild brook trout only over that time period and contains recommendations for making adjustments to maintain progress toward the outcome (i.e. managing adaptively). Such adjustments will likely take the form of interim

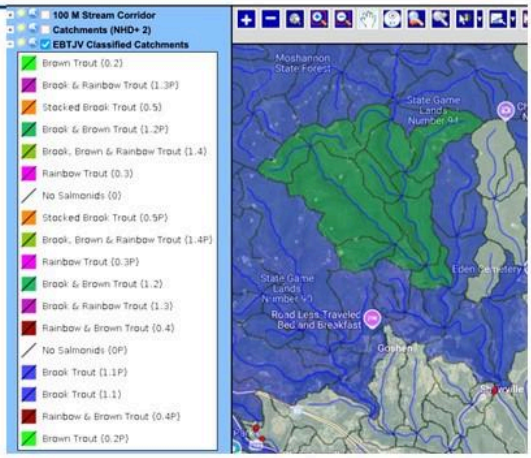
EBTJV Data Background

- EBTJV's assessment is a model
- Data sources:
  - Sample data with species, date, GPS
  - Medium resolution NHD
  - Basic barrier data
- Algorithm in GIS predicts occupancy in upstream catchments from downstream samples and hydroline. (This was hand-coded in southern states.)

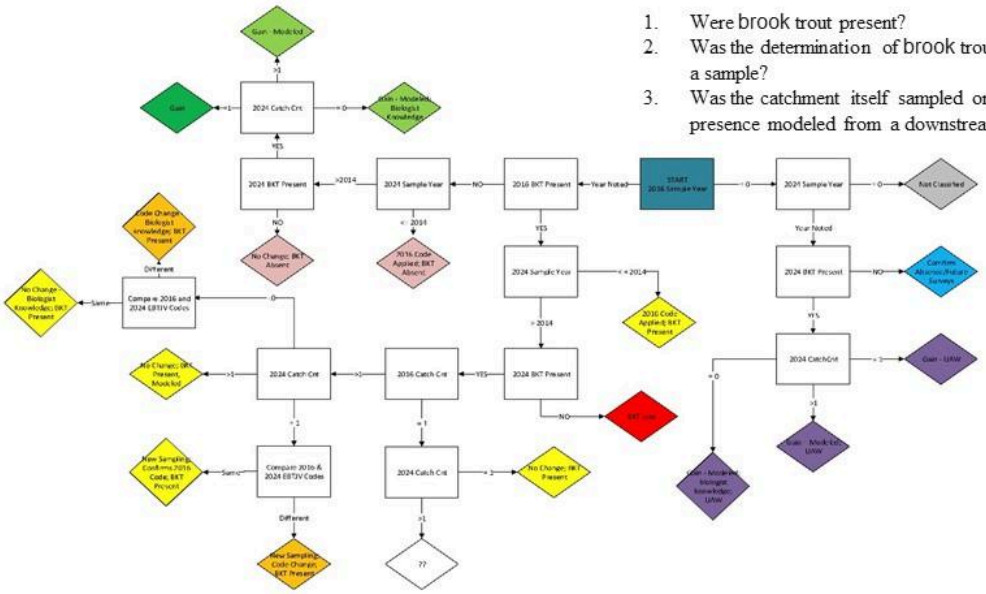


EBTJV Data Background

- EBTJV repeated this analysis for data through 2023
- FWS created a web interface for state data upload
- Comparison of time periods requires that we can correctly identify changes due to actual vs. predicted gains or losses
- EBTJV data will continue to improve with future updates, addressing some of the data limitations outlined in the report.



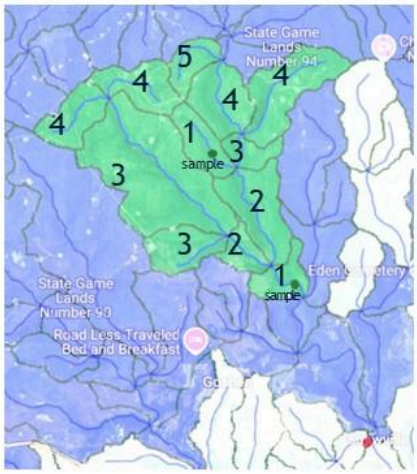
Northern (NY and PA) Region Logic Flow Model



1. Were brook trout present?
2. Was the determination of brook trout presence based on a sample?
3. Was the catchment itself sampled or was brook trout presence modeled from a downstream catchment?

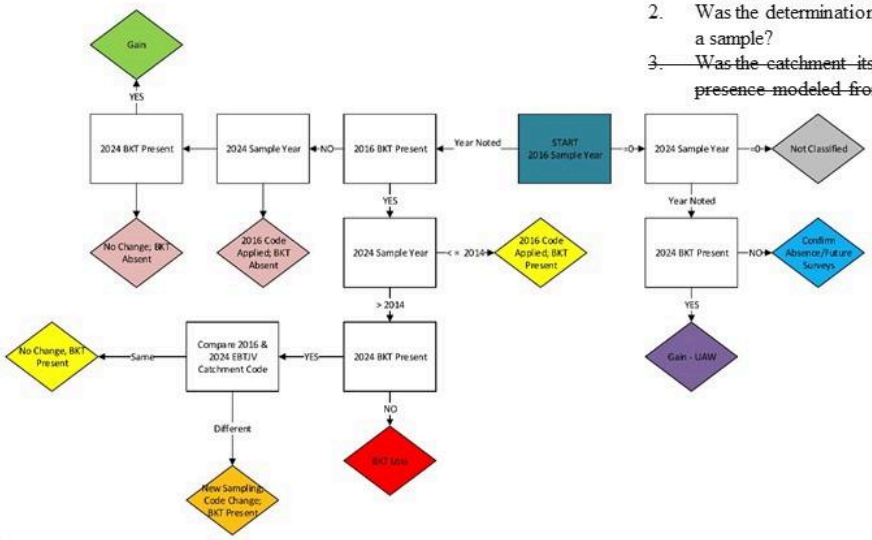
Data Limitations

- **Catchment Count Attribute**
  - Allows us to determine whether a catchment was directly sampled or if its species code was modeled from a downstream catchment.
  - Not valid for states south of PA - required a simplified logic flow model



Southern Region (MD, WV, and VA) Logic Flow Model

1. Were brook trout present?
2. Was the determination of brook trout presence based on a sample?
3. ~~Was the catchment itself sampled or was brook trout presence modeled from a downstream catchment?~~



Review with State Biologists

- Unable to review all 78,292 catchments
- Reviewed all assessed gains and losses in MD, several gain or loss catchments in NY, and all gain or loss catchments in the Upper West Branch Susquehanna subbasin in PA (total 284 reviewed catchments.

Data Review Issues	% reviewed catchments affected
Catchment scale	13.0%
Catchment precision	1.1%
Unassessed waters/new sampling	26.4%
Incorrect 2016 code	29.9%
Incorrect 2024 code	16.2%
Reviewed catchments with a correct gain or loss assessment	13.7%

Data Limitations

- **Catchment delineation scale**
  - Small, unnamed tributaries included in catchment.
  - Multiple fish samples within a single catchment can produce inaccurate species coding results.
- **Catchment delineation precision**
  - Misalignment of some catchment polygons with the stream lines whose collection area they are meant to depict.
  - Can cause a catchment boundary to intercept a portion, usually the mouth, of an adjacent tributary.
  - Causes sampling points to be assigned to wrong catchment.

Data Limitations

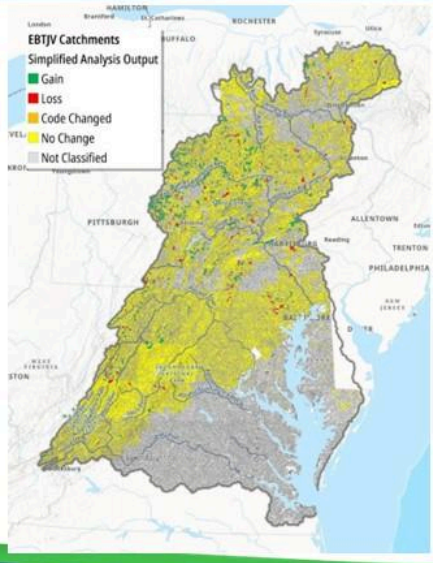
- **Species Coding Errors**
  - Species coding in either the 2016 or 2024 assessment are entered incorrectly
- **Inconsistency in sampling methods and reporting in historical samples**
  - Review of assessment results with state biologist leads revealed catchments that, for instance, were coded as having brook trout in the 2016 assessment while the expert attests that no wild brook trout would have occurred there within the 2016 assessment window.
    - Stocked trout being counted toward wild brook trout presence
    - Anomalous occurrence of a single brook trout in a catchment known to not support a population
  - Generally present as an overestimation of brook trout habitat loss.

Results - EBTJV Data Comparison

- Apparent net gain (total gain minus total loss) is **2,955 km² (8.9% increase)**
  - A large portion of that increase can be explained by new sampling of previously unassessed waters (**2,212 km²**).
- Removing unassessed waters sampling yields a **net gain of 742 km² (2.2% increase)**
  - This figure include catchments that were modeled from downstream sampling and thus cannot be confirmed as "true gains".
- Removing catchments with a modeled brook trout presence yields **167 km²** of habitat that was shown to be unoccupied in the 2016 assessment and is occupied in the 2024 assessment, a **0.5% gain**.

Results - EBTJV Data Comparison

Logic Flow Model Output	Square Kilometers
BKT Loss	1,373
Total Loss	*1,373*
Gain	1,539
Gain - Modeled	568
Gain - Modeled; Biologist Knowledge	8
Total Gain; not UAW	*2,115*
Gain - Modeled; Biologist Knowledge; UAW	232
Gain - Modeled; UAW	1,115
Gain - UAW	865
Total Gain; UAW	*2,212*
Code Change; Biologist Knowledge	19
New Sampling; Code Change; BKT Present	455
Total Code Change	*474*
No Change; BKT Absent	*C,077*
201C Code Applied; BKT Absent	*53,0C1*
Total No Change; BKT Absent	*52,138*
Confirm Absence/Future Surveys	4,637
Total Confirm Absence/Future Surveys	*4,C37*
2016 Code Applied; BKT Present	22,163
New Sampling; Confirms 2016 Code; BKT Present	550
No Change; Biologist Knowledge; BKT Present	5
No Change; BKT Present	6,253
No Change; BKT Present, Modeled	2,275
Total No Change; BKT Present	*31,247*
Not Classified	62,077
Total Not Classified	*C2,077*
Grand Total	*1C3,273*



More detailed results of logic flow models by HUC6 watershed provided in Appendix 6.

Project Tracking Database

- Framework for database used the initial stakeholder survey as starting point.
- Objective of database was to serve as a template for the development of an online tracking system (Goal 4) and to initially populate that database.
- Data compiled into database included **projects that were completed between 2016 and 2022 only.**

Project Types	
Abandoned Mine Drainage	Instream Habitat Improvement
Brook Trout Reintroduction	Land Protection
Dirt and Gravel Road Improvement	Riparian Restoration
AOP	"Other"

Project Specific Information/Metrics

- Lead Org. Name
- Organization Type
- Contact Info
- Project Name
- Implementation Start/End Dates
- Latitude/Longitude
- Stream Name
- Project Type
- Project Objective
- Partners
- Funding Source
- Total Cost
- Land Ownership
- Presence of Brook Trout
- Project Notes
- Additional Comments
- Uploads (Pictures/Reports)

Instream Habitat Projects
- Project Goal
- Structure Type(s)
- LWA Types
- Project length (ft)

Riparian Restoration Projects
- Includes Livestock Fencing?
  - Acres Excluded
- Type of Riparian Planting
- Acres Restored

AOP Projects
- NAACC Survey Before/After
- Upstream Miles Opened
- Longitudinal Profile Completed?
- Bankfull width
- Existing and Replacement Structure Type/Opening Width

Land Protection
- Type
- Acres Protected

AMD Projects
- Treatment type

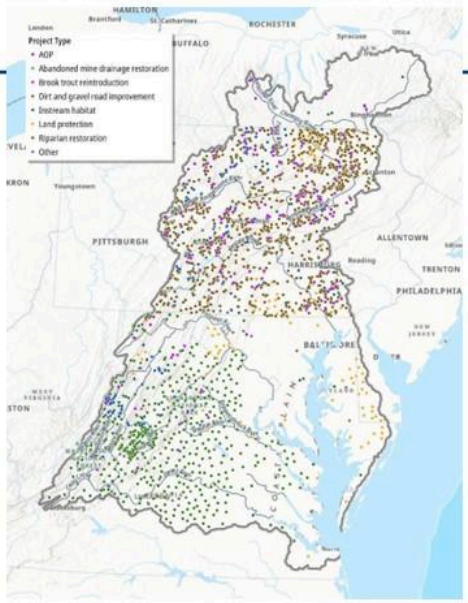
Dirt and Gravel Rd. Improvement
- Road Name
- Project Length
- # Instream Structures

Brook Trout Reintroduction
- Restoration Type
- Source of BKT
- Monitoring completed?
- Documentation of successful reproduction

Project Tracking Database

- 7,490 total projects - 5,419 within Chesapeake Bay watershed
- 2,115 (39%) of projects were submitted with only a HUC12 code
  - Does not allow for knowing which catchment project occurred in.

Project Type	Total Number of Projects
Abandoned Mine Drainage Restoration	5
Aquatic Organism Passage	233
Brook Trout Reintroduction	3
Dirt and Gravel Road Improvement	1,566
Instream Habitat Enhancement	678
Land Protection	157
Riparian Restoration	2,555
Other	222
Total	**5,419**



Project Tracking Database

- Report details specific analysis of each project type.

Table 8: Summary of key metrics associated with the type of project for the entire Chesapeake Bay Watershed.

Project Type	Metric	# Projects reporting/Total Projects in Database
Aquatic Organism Passage	232.28 UPS miles opened	161/233 (69%)
Instream Habitat Enhancement	78 miles improved	411/678 (61%)
Riparian Restoration	3,421 acres	430/2,555 (17%)
Dirt and Gravel Road Improvement	729.6 miles of road improved	1557/1565 (99%)
Brook Trout Reintroduction	3 reintroduction projects	--
Abandoned Mine Drainage Mitigation	5 total projects	--
Land Protection	13,881 acres protected	100/157 (64%)

Data Limitations - Project Tracking Database

- Numerous "optional" metrics included in database were under-reported, but we feel they are useful metrics that would enhance the understanding of implementation projects and their benefits for brook trout in the future.
- Exact project location not always reported – HUC12, County etc. rather than exact latitude/longitude coordinates – can be due to data privacy issues (NRCS).
- Only projects completed between 2016-2022 were included in the database. Projects completed prior to 2016 may also be contributing to current gains in brook trout habitat.
- The database is not meant to be a complete dataset of all projects completed, but rather used a template for future project tracking.
- Not all projects may have been designed or implemented with the goal of eliciting a brook trout response.

Results - EBTJV Data and Project Tracking Data

- AMD, AOP, and brook trout reintroduction most likely to lead to gains in occupancy.
- Other projects more likely to enhance current population
- 73% projects located within catchments that do not contain brook trout or are unclassified
- 21% projects occur in catchments with brook trout present in both the 2016 and 2024 assessments
  - Enhance current populations and increase resilience to future stressors.

Project Type	Total # Projects	No Change – BKT Present	No Change – BKT Absent	Gain	UAW	Loss	Not Classified
Abandoned Mine Drainage Restoration	5	1	4	0	0	0	0
Aquatic Organism Passage	233	106	51	10	17	5	44
BKT Reintroduction	3	0	2	1	0	0	0
Dirt and Gravel Road Improvement	1566	420	619	56	57	27	382
Instream Habitat Enhancement	678	200	266	23	8	17	164
Land Protection	157	12	52	2	0	1	75
Other	222	88	80	7	3	8	36
Riparian Restoration	2555	329	1320	17	6	16	864
TOTAL (% Total)	**5419**	**1156 (21%)**	**2394 (44.2%)**	**116 (2.14%)**	**91 (1.68%)**	**74 (1.3%)**	**1565 (28.9%)**

Recommendations

- Currently, the EBTJV data should be considered preliminary.
- Results should be interpreted cautiously, with data limitations in mind.
- There was general agreement that the logic flow model correctly assigns catchments to gains/losses. It should be re-run once the EBTJV data is finalized.
- The logic flow model presented in this project should also be used as an initial step to identify where gains/losses in brook trout habitat may have occurred in the watershed. A more thorough data review with state biologists to identify areas where actual gains have occurred and what projects may have been completed in those areas is recommended.
- Given the low response rate to metrics that were not required in the database template, it is recommended that the BTWG evaluate which metrics should be required with the habitat tracker database moving forward.
- Additional Recommendations within Final Report.

Using the Habitat Tracker Reporting Application

Habitat Tracker for Brook Trout

Habitat Tracker

TROUT UNLIMITED

- This tool was developed by Devereux Consulting Inc.; it also tracks projects related to wetlands and black duck outcomes including associated co-benefits.
- Devereux Consulting worked with TU and EBTJV to develop the framework for pulling data (following this project's database fields), and for creating meaningful reports from the Habitat Tracker.
- The Habitat Tracker will allow for quantification of progress in terms of amount of brook trout habitat improvements, classified by several project types and geographic location over time.
- Additional data analysis outside of the tool will be required to assess functional gains.

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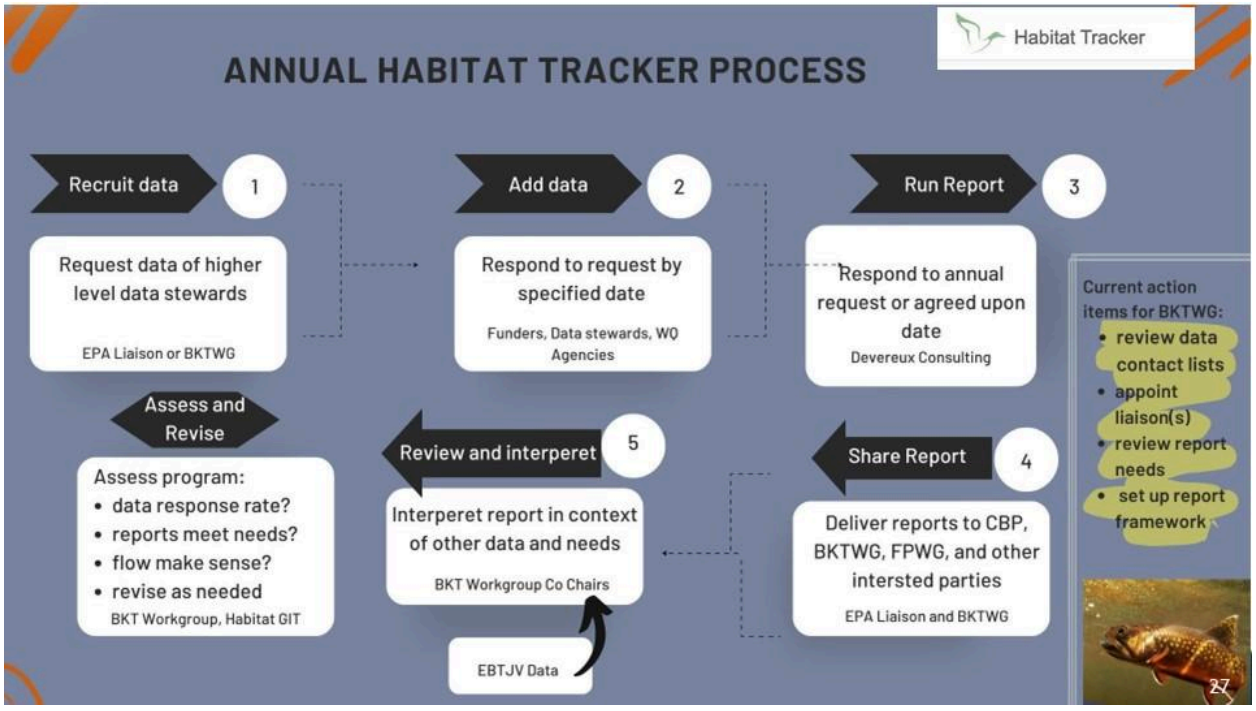

Recommendations for Implementation of Habitat Tracker

- **Brook trout workgroup should work proactively and collaboratively with higher-level organizations for data reporting**
  - Higher level agencies and NGOs should be the primary point of contact for future data requests
  - Determine which data at agencies are bound by agreements or are sensitive
  - May be able to work with project funders to require data input to habitat tracker
- **Help partners help you: be precise about types of data you request. Soliciting a well-designed experimental study with pre- and post-project monitoring will help better understand which project types are expected to benefit brook trout.**
- Annual data updates solicited via BTWG chairs using the contact list and regular updates and maintenance of contact list.
  - Important to report to stakeholders and partners how their data were used and to request feedback.

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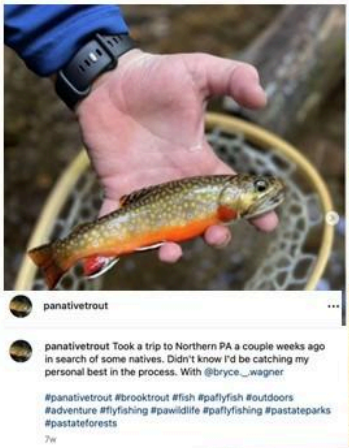
Identification of Cross-GIT Collaborations

Cross- GIT Priorities Related to Brook Trout



https://www.flickr.com/photos/nicholas_t/

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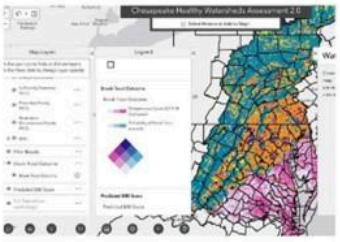
Brook trout as public icon: Motivate and inspire conservation actions

Forestry WG
Maintain Healthy Watersheds
Fostering Chesapeake Stewardship
Climate Resiliency WG

Brook trout as an **indicator** for healthy watersheds and water quality (inform assessments)



Maintain Healthy Watersheds (HWA)
Forestry WG
Fish Habitat WG (possibly interested for links to WQ, mussels)

Brook trout as the **target** of conservation (understand drivers of species response)

Forestry WG (Rising Temps report)
Maintain Healthy Watersheds
Fish Passage WG
Stream Health WG (STAC Report on stream restoration outcomes)

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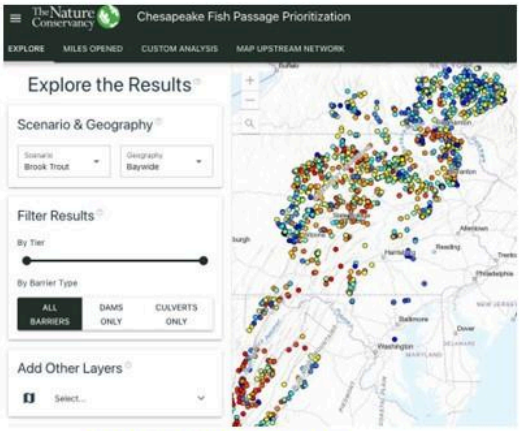
Outreach to Other GITs and Workgroups - Fish Passage

- FP goal: 1,000 miles opened for fish passage (2025)
- TNC Tool
  - "severe" barriers from NAACC database
  - Brook Trout priority score (EBTJV; DeWeber and Wagner)
- The Brook Trout Workgroup should provide annual data updates to Fish Passage Workgroup:
  - Fish passage projects (from Habitat Tracker)
  - EBTJV Catchment classifications (from EBTJV Coordinator)
  - Monitoring data (from Habitat Tracker)

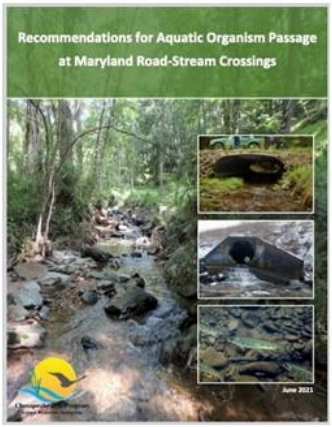


https://www.maps.tnc.org/chesfpp

Outreach to Other GITs and Workgroups - Fish Passage

- Other items for Fish Passage and Brook Trout Workgroup:
  - Maryland Stream Crossing Guidelines for Chesapeake Bay-wide application
  - Development of brook trout monitoring plan(s) for watershed of shared interest
  - Share communications needs

Workgroup chairs should keep a list of action items and set a date to meet on an annual basis.



https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/recommendations_for_aquatic_organism_passage_at_maryland_road-stream_crossings_june_2021.pdf

Brook Trout and the Chesapeake Bay Landscape

Bellefonte, PA

State Game Lands 133 Trout Run, PA

https://www.flickr.com/photos/nicholas_t/

Emerging Themes: Maximizing Stream Restoration Outcomes

STAC Stream Restoration Workshop (2023)

- Restoration outcomes summarized at the workshop showed a mix of positive and negative outcomes
- Avoid harming intact habitat during project implementation, especially on higher quality streams
- If biological uplift is the goal, make that the goal, and use appropriate approaches for that goal
- Target in-stream work to more degraded streams
- Design for the location
- Use scientifically driven monitoring plans

Noe, G., N. Law, J. Berg, S. S. Filoso, Drescher, L. Fraley-McNeal, B. Hayes, P. Mayer, C. Ruck, B. Stack, R. Starr, S. Stranko, and T. Thompson. 2024. The State of the Science and Practice of Stream Restoration in the Chesapeake: Lessons Learned to Inform Better Implementation, Assessment, and Outcomes. STAC Publication Number 24-006, Edgewater, MD. 96 pp.

GITs and Workgroups - Emerging Themes on Targeting Work

- Scientifically-based and watershed-specific monitoring: Promote scientifically sound monitoring methods to track the progress of restoration efforts.
- Added focus on Abandoned Mine Drainage: Work within the Habitat GIT to plan and track the benefits to fish and macroinvertebrate populations and local water quality from AMD restoration.
- Focus on protecting areas that are relatively healthy: This is important for brook trout, and additionally, brook trout are often cited as an indicator of these 'intact' watersheds.

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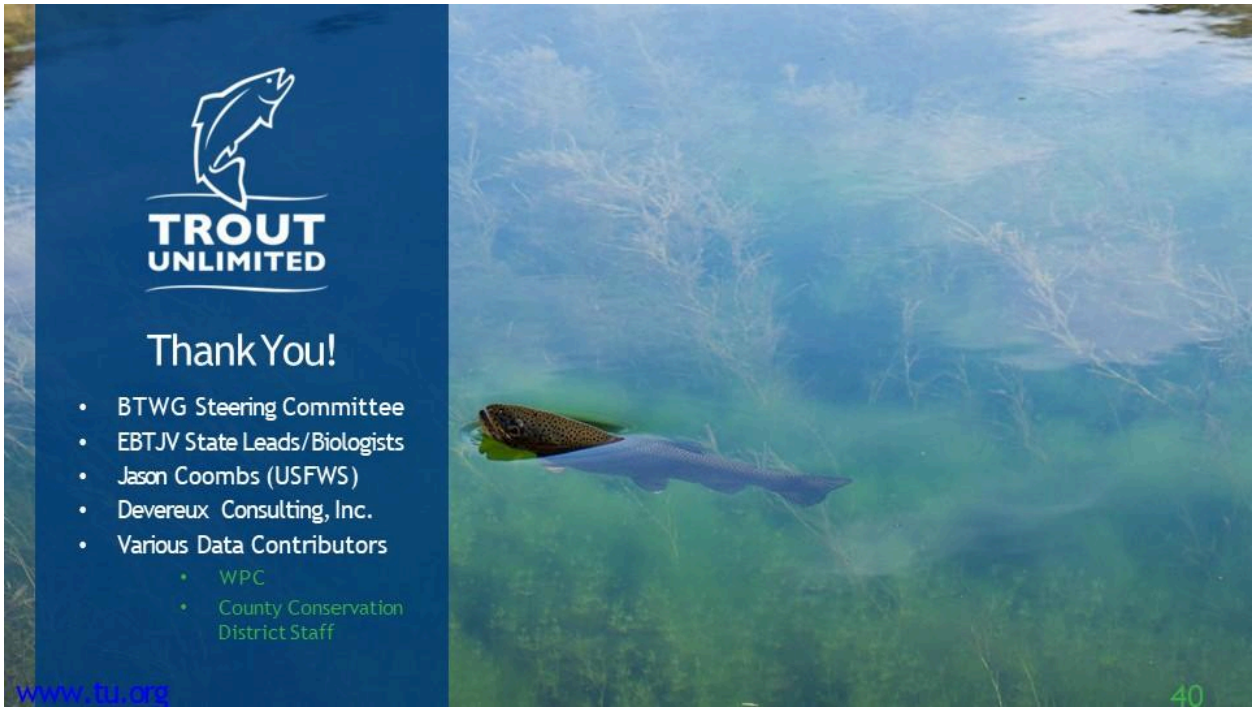
Additional Recommendations

Additional Recommendations - Future Projects and Monitoring

- **Focus on protecting areas that are relatively healthy:** Several teams identify the urgent need to conserve land and prevent further loss of forest cover. This is important for brook trout, and additionally, brook trout are often cited as an indicator of these 'intact' watersheds.
- **Prioritization of brook trout conservation in watershed restoration projects:** Prioritize projects that are likely to increase population health, occupancy, or that conserve strongholds. Prioritize work done "for brook trout", but be precise about what types of projects are done where.
- **Scientifically-based and watershed-specific monitoring:** Promote scientifically sound monitoring methods to track the progress of restoration efforts.
- **Fund or otherwise support pre- and post-project monitoring that is specific to outcome.**

Additional Recommendations - Goal Setting (Beyond 2025)

- New goals should be clear, concise, and most importantly, quantifiable.
- Alignment of goals with other agencies and conservation groups.
- Consider brook trout conservation a priority, in addition to its use as an icon or indicator.
- Focus on the restoration and protection of resiliency in existing populations with potential expansion of occupied habitat limited to appropriate areas through removal of AOP barriers, brook trout reintroductions, and improvement of water quality and habitat.
- Development of focal areas for pre- and post-project monitoring.



Additional Recommendations - Goal Setting (Beyond 2025)

- New goals should be clear and concise and most importantly, quantifiable by easily tracked metrics. Careful consideration should be given to the development of any new goals/outcomes by the BTWG.
- The results of this project demonstrate that more attention could be given to setting and tracking goals for biological uplift and water quality gains from AMD remediation.

Under a warming climate scenario, the current outcome of increasing occupied habitat area significantly in the Chesapeake Bay watershed may not be feasible. Furthermore, simply expanding habitat as a goal may not be a wise investment of limited conservation resources and may direct work to more marginal habitats.

- We recommend that the BTWG consider focusing on the restoration and protection of resiliency within existing populations, with potential expansion of occupied habitat limited to appropriate areas through removal of AOP barriers, brook trout reintroductions, and improvement of water quality and habitat.
- The BTWG should also consider partnering with other relevant agencies and groups involved in brook trout conservation and align goals with those organizations (ex: TU, EBTJV, USFWS, state agencies, etc.). For example, one of TU's long-term conservation goals is to "maintain existing large, interconnected populations with limited non-native trout, minimal habitat impairments, low vulnerability to climate change, and access to diverse habitats ("strongholds") and use restoration techniques to create new strongholds (improve existing habitat and populations and reconnect and combine existing isolated brook trout populations" (Fesenmyer et al. 2017).
- We recommend that the results of this project along with other decision support tools available be used to develop focal areas for the BTWG where thorough pre- and post-project monitoring may be implemented to adequately track progress towards brook trout outcomes.

Extra slide: context within coldwater restoration work

- Reminder that the CB Brook Trout Outcome and the EBTJV data are based on brook trout *occupancy*.
- Decades of brook trout and cold water restoration have worked to increase occupancy and to strengthen existing populations.
- Our analysis shows that the structure is there to repeat and improve an analysis of brook trout occpancy in the future. However, the assumptions of the outcome should be re-examined.

Restoring a Spring on Family Land
SEPTEMBER 6, 2024
Motivated by memories of the past and the desire to leave a legacy for the future, a West Virginia landowner's decision to restore a spring that starts on his family's farm has revived the brook trout population and made the water there and downstream cleaner in the present.

Bringing Back Brook Trout
AUGUST 29, 2024
How restoring West Virginia's native brook trout also restores water quality, and the critical partnerships making this important work happen.

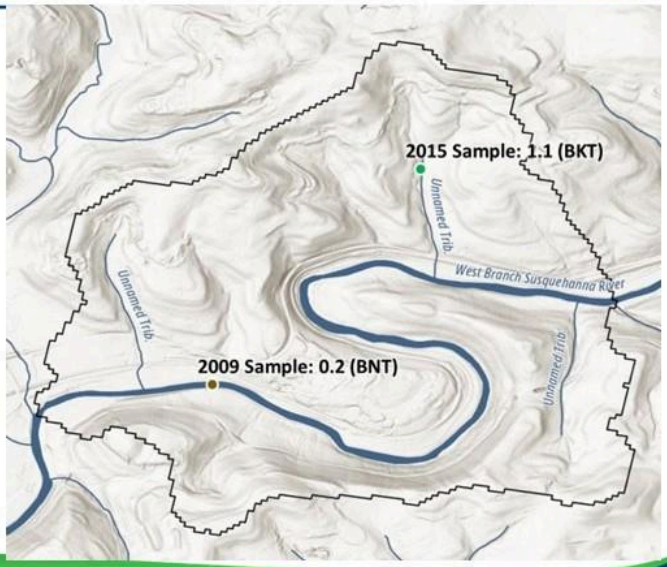
Keeping West Virginia's Water Wild, Woolly, and Wonderful
AUGUST 15, 2024
A West Virginia couple's dedication to protecting the headwaters of the Lost River and reforesting part of their farm are helping downstream brook trout and improving water quality from the headwaters of the Potomac River to the Chesapeake Bay.

Press release series, Chesapeake Bay Foundation, Aug-Sept 2024

Q & A Resources Section

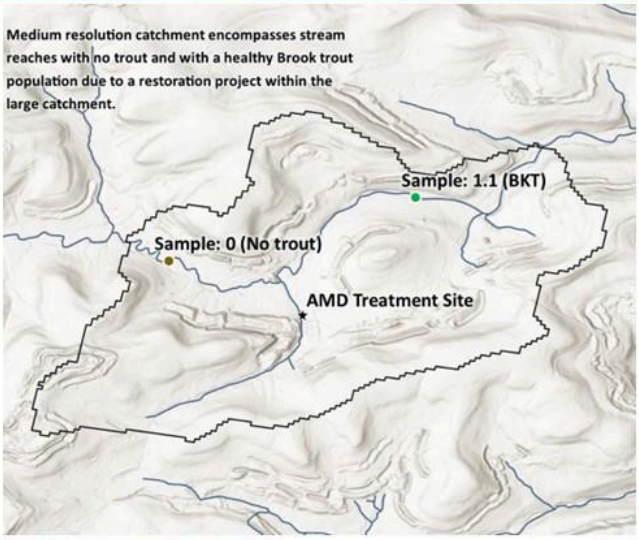
Data Limitations

- **Catchment delineation scale**
  - Both EBTJV assessments use NHD medium resolution (1:100,000 scale)
  - Small, unnamed tributaries included in catchment.
  - Multiple fish samples within a single catchment can produce inaccurate species coding results.



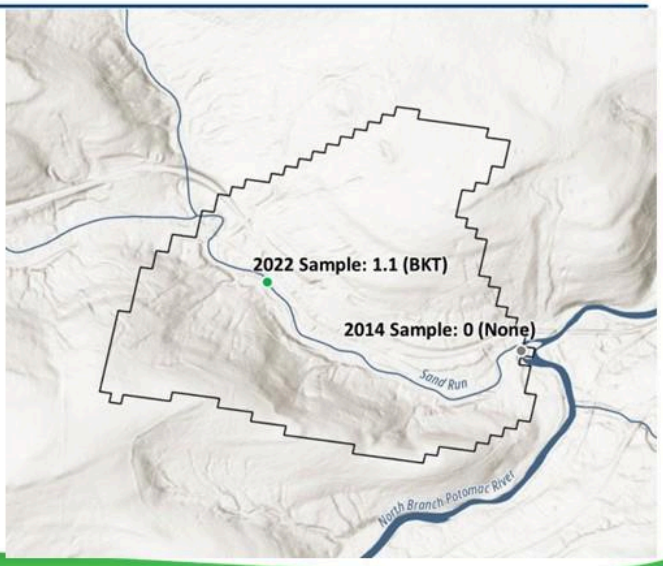
Data Limitations

- **Catchment delineation scale**
  - Significant brook trout populations in a portion of mainstem but not entire reach
  - May be erroneously assessed to be a brook trout loss, gain, or no change.



Data Limitations

- **Catchment delineation precision**
  - Misalignment of some catchment polygons with the stream lines whose collection area they are meant to depict.
  - Can cause a catchment boundary to intercept a portion, usually the mouth, of an adjacent tributary.
  - Causes sampling points to be assigned to wrong catchment.



Data Limitations

- **Species Coding Errors**
  - Species coding in either the 2016 or 2024 assessment are entered incorrectly
  - Additionally, we observed some locations where a species change occurs between two catchments while the catchment count attribute continues to increment with no apparent new sample to explain the species change.

Data Limitations

- **Inconsistency in sampling methods and reporting in historical samples**
  - Review of assessment results with state biologist leads revealed catchments that, for instance, were coded as having brook trout in the 2016 assessment while the expert attests that no wild brook trout would have occurred there within the 2016 assessment window.
    - Stocked trout being counted toward wild brook trout presence
    - Anomalous occurrence of a single brook trout in a catchment known to not support a population
  - Generally present as an overestimation of brook trout habitat loss.

Communication and Coordination with Other Stakeholders

Outreach to Other Stakeholders

- Compiled list of **102** additional stakeholders and contact information (see Appendix 2)
  - Included regional biologists, fish passage coordinates (state and federal agencies), individuals managing funding programs that include a brook trout focus, watershed organizations, and managers or watershed specialists at County Conservation Districts
  - Outreach to these stakeholders included an initial survey to all stakeholders, a more detailed survey to a narrower group of 15, a webinar introduction to project and data compilation, and direct emails and phone calls for data requests and feedback.
  - Plan to follow-up in fall 2024 with group webinar to describe how data were used and show results and recommendations from project.

Initial Stakeholder Survey

- 19 total questions (see Appendix 3) with goal of obtaining contact information and relevant information related to brook trout projects within the watershed
- Used to narrow stakeholder list to groups responsible for roughly 80% of on-the-ground projects

Project Type	Total Number of Projects
Instream Habitat	657
Riparian Buffers	935
Aquatic Organism Passage	145
Land Protection	81
Water Quality	501
Upland Agriculture	822
Dirt and Gravel Road Improvement	448
Brook Trout Reintroduction	18
Competing non-native species removal	5
Total	***3,612***

Core Stakeholder Group:
- Trout Unlimited
- Headwaters SWCD
- Western PA Conservancy
- NRCS
- PFBC
- Various CCDs
- Friends of the Rappahannock

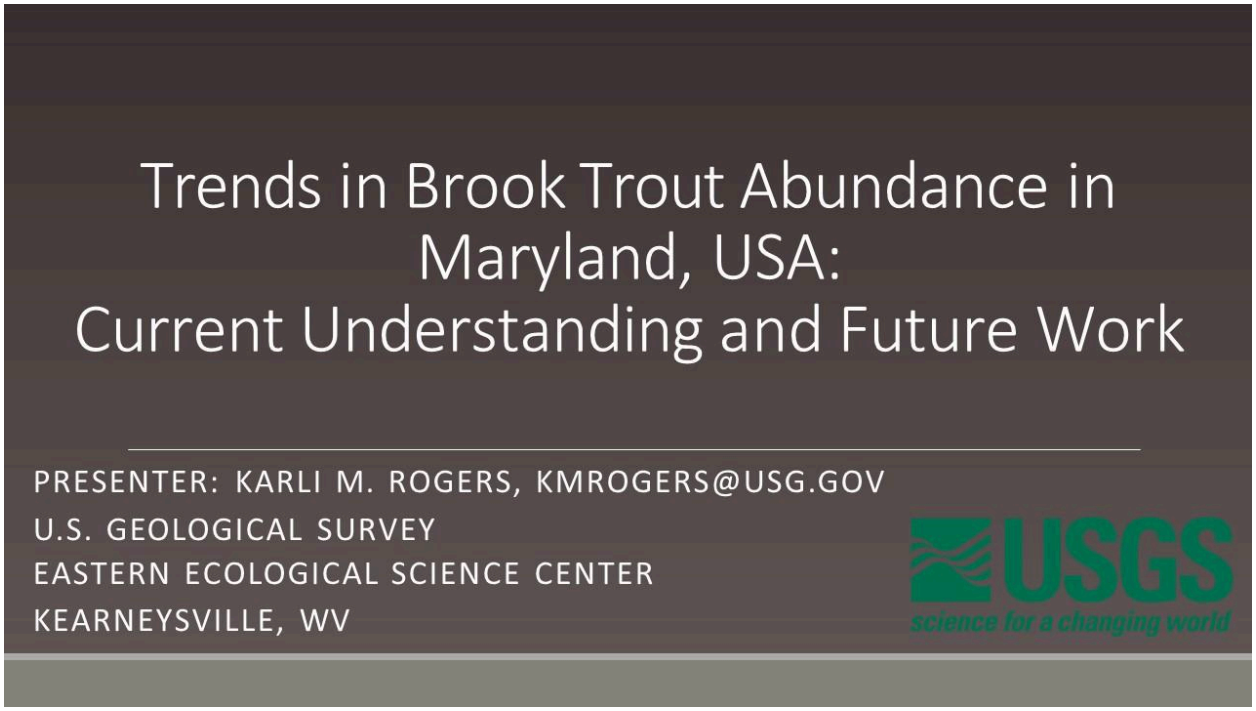
Continued Outreach to Stakeholders

- Communicated request for data via email, phone, and webinar
- Project Update Presentations
  - EBTJV steering committee - project overview and objectives
  - EBTJV fall meeting 2023 - preliminary analysis
- Dissemination of Final Results
  - Fall 2024 - webinar for interested stakeholders - project overview/results
  - Copy of final report to EBTJV and relevant Chesapeake Bay Program GITs and workgroups

Recommendations

- Maintain contact with stakeholder groups that submitted data
- Early engagement with relevant stakeholders is important
- **Brook trout workgroup should work proactively and collaboratively with higher-level organizations for data reporting**
  - Higher level agencies and NGOs should be the primary point of contact for future data requests
  - Determine which data at agencies are bound by agreements or are sensitive
  - May be able to work with project funders to require data input to habitat tracker
- **Help partners help you: be precise about types of data you request. Soliciting a well-designed experimental study with pre- and post-project monitoring will help better understand which project types are expected to benefit brook trout.**
- Annual data updates solicited via BTWG chairs using the contact list and regular updates and maintenance of contact list.
  - Important to report to stakeholders and partners how their data were used and to request feedback.

APPENDIX II: Slides - Trends in Brook Trout Abundance in Maryland, USA: Current Understanding and Future Work



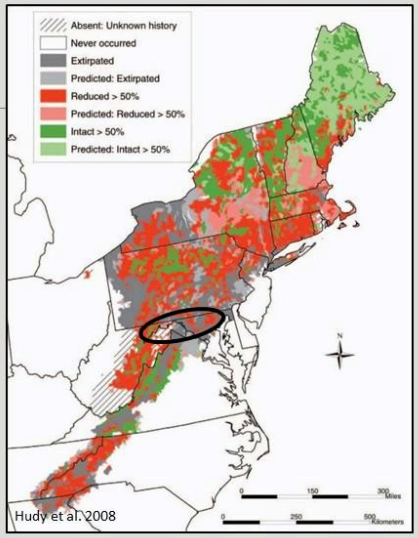
Background

Eastern brook trout (*Salvelinus fontinalis*) threats and concerns

- Climate change decreasing thermal habitat
- Competition with non-native salmonids (brown trout/rainbow trout)
- Reduced habitat connectivity
- Habitat loss through land use practices
- Mining activity and acid rain

Study objectives

- Estimate temporal trends of brook trout density in streams across Maryland
- Explore the relative importance of environmental covariates to explain observed trends at the watershed level
- Discuss the implications for conservation and restoration planning



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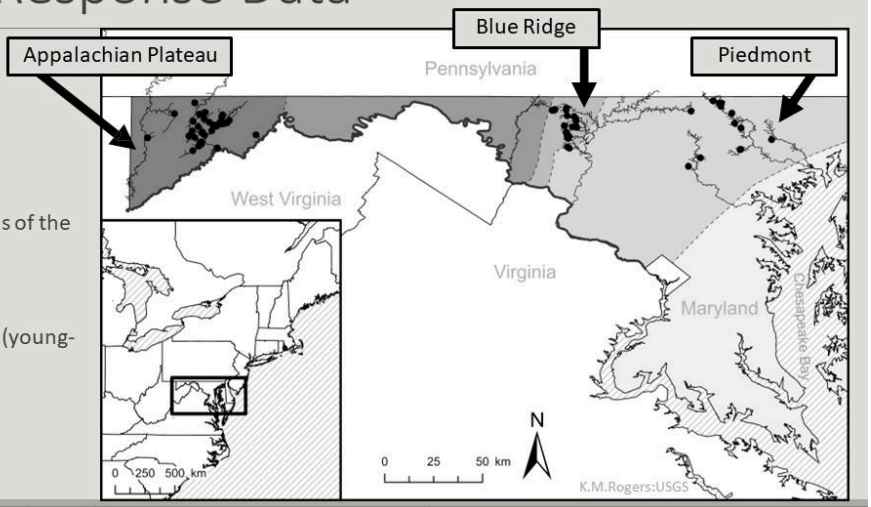
Methods: Response Data

Fish abundance data

- 70 stream sites across Maryland
- 36-year period (1988 to 2023)
- Spans over 3 physiographic regions of the Eastern US
- Primarily forested watersheds (mean = 78%, sd = 17.5%)
- Separated by adults and juveniles (young-of-the-year/YOY)



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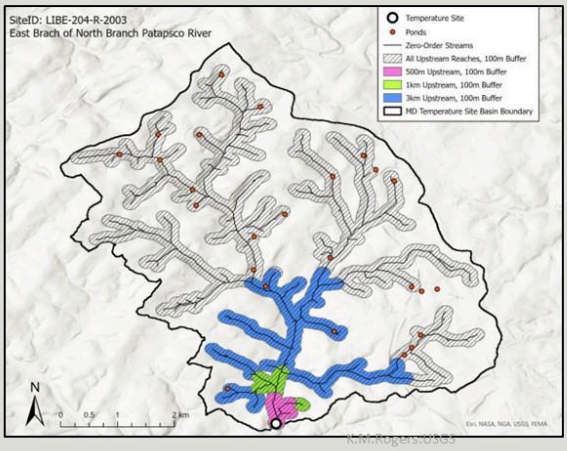
Methods: Explanatory Data



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Geophysical
- Elevation
- Basin Area
- Baseflow index
- Mean depth to bedrock

Non-native trout
- Adult brown trout presence
- Juvenile (YOY) brown trout presence

Air temperature
- Mean annual air temperature trend

Land use change (National Land Cover Database, or NLCD)
- Change in % of Agriculture (71, 81, 82)
- Change in % of Developed areas (21, 22, 23, 24, 31)
- Change in % of Forests (41, 42, 42)

Pond points (MD DNR personnel observed on 4-band near-infrared spectral data at 15 cm spatial res)
- Ponds within 1km upstream of sample locations

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Methods: Analysis

Non-parametric Analysis (fish abundance data only)
- Estimated the probability of non-random monotonic temporal trends in fish density from Mann-Kendall *S*
  - Sum of signed ranks of all pairwise comparisons over the time series.
  - Significance determined by an alpha level of 0.1 after *S* was calculated with a continuity correction for tied pairs.
- Estimate the magnitude of temporal trends using Sen's slope
  - Evaluates all pairwise combinations of observations in the time series, but calculated as the **median** of all pairwise slopes

Environmental Analysis (fish abundance data + explanatory variables)
- Non-parametric correlations of fish abundance and environmental conditions evaluated

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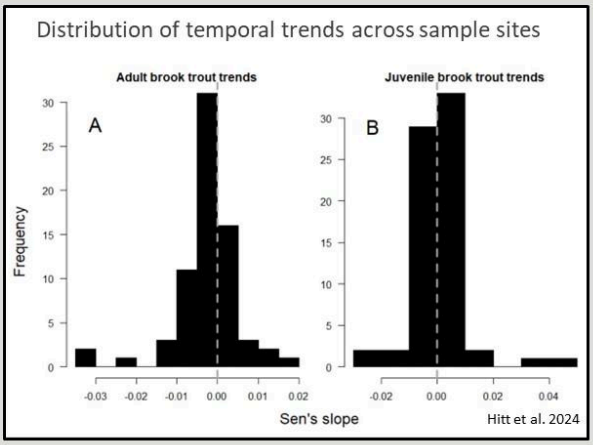
Results: Fish Abundance Trends

Adult Brook Trout

- Show a significant declining trend as indicated by a negative, asymmetric distribution of Sen's slope values
- 19 sites decreasing (27% of sites)

Juvenile (YOY) Brook Trout

- No major trends overall
- 10 sites (14%) showed significant increases in densities, only 4 sites (6%) showed decreases



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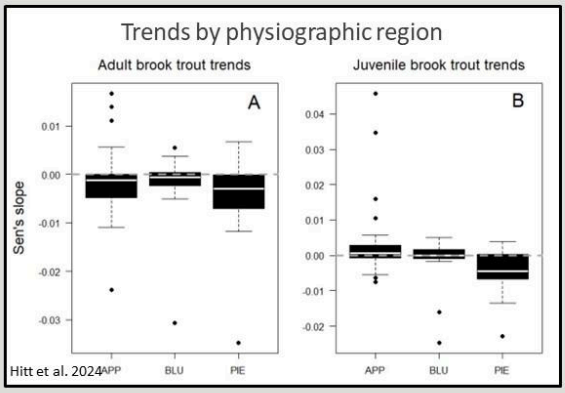
Results: Environmental Analysis



Adult Brook Trout

- Physiographic region: Trends did not vary among regions (ANOVA; $p > 0.05$)
- Brown Trout presence/absence: No significant correlation (t-test; $p > 0.05$)

Juvenile (YOY) Brook Trout

- Physiographic region: Trends varied among regions (ANOVA; $p < 0.05$), with strongest negative trend in Piedmont region ($p < 0.05$)
- Brown Trout presence/absence: No significance correlation (t-test; $p > 0.05$)

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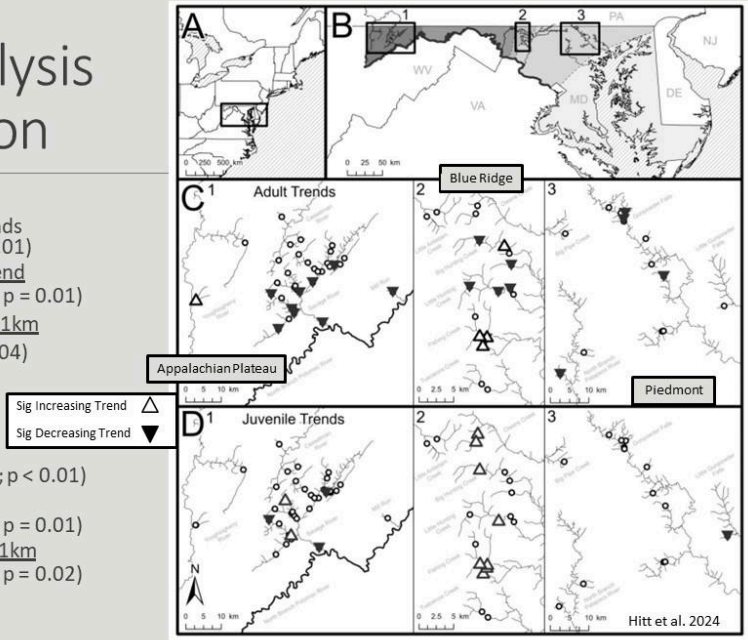
Results: Envir. Analysis and Site Distribution

Adult Brook Trout

- Positively associated with YOY abundance trends (Spearman correlation coefficient +0.45; p < 0.01)
- Negatively associated with air temperature trend (Spearman correlation coefficient -0.31; p = 0.01)
- Negatively associated with pond count within 1km (Spearman correlation coefficient -0.25; p = 0.04)
- No correlation with land use change

Juvenile (YOY) Brook Trout

- Positively associated with elevation (Spearman correlation coefficient +0.34; p < 0.01)
- Negatively associated with baseflow index (Spearman correlation coefficient -0.32; p = 0.01)
- Negatively associated with pond count within 1km (Spearman correlation coefficient -0.28; p = 0.02)
- No correlation with land use change



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Discussion: Implications and Research Needs

Although important and associated, most of the variation in adult brook trout trends was unexplained by air temperature trends. This is an opportunity to explore further research questions at sites with significant trends.

- Stream Temperature Data
- Further explore sympatric populations
- Understand localized groundwater processes
- Repatriation efforts – where to focus?
- Angling Pressure

Adult abundance trends were more associated with air temperature warming trends, but ponds still show a significant correlation.

- Understanding how pond retrofitting efforts impact water temperature and local brook trout populations

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Looking forward

Chesapeake Bay Program Task for FY25 - Brook Trout Research Review and Synthesis

- Literature Review:
  - Controls on brook trout distributions
  - Current understanding of brook trout population trends
  - Controls on brook trout trends
- Identify Research Needs:
  - Incorporation of streamflow in temperature-only climate refugia
  - Genetic analysis to better understand thermal tolerances
  - Rapid assessment toolbox to target reintroduction and repatriation efforts

Questions?

Contact information: Kmrogers@usgs.gov

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