



Logic and Action Plan: Post-Quarterly Progress Meeting

Brook Trout Outcome – 2022-2023

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

Two-year Target: 137 km² of restored brook trout habitat per year.

Factor	Current Efforts	Gap	Actions	Metrics	Expected Response and Application	Learn/Adapt
<i>What is impacting our ability to achieve our outcome?</i>	<i>What current efforts are addressing this factor?</i>	<i>What further efforts or information are needed to fully address this factor?</i>	<i>What actions are essential (to help fill this gap) to achieve our outcome?</i>	<i>What will we measure or observe to determine progress in filling identified gap?</i>	<i>How and when do we expect these actions to address the identified gap? How might that affect our work going forward?</i>	<i>What did we learn from taking this action? How will this lesson impact our work?</i>
Scientific and Technical Understanding: Monitoring	Eastern Brook Trout Joint Venture catchment assessment conducted every five years. Other stakeholders have various programs contributing to conservation of high-	Current monitoring through the Eastern Brook Trout Joint Venture’s 5-year assessment does not capture of all the brook trout restoration and conservation projects being done in the watershed. A systematic process to collect, collate, and analyze all stakeholder brook	4.2 Streamline progress reporting process for Partners.	Development of a database framework that tracks all of the projects benefiting brook Trout in the watershed. Once the database framework is developed, we can track progress through an increase in the number of projects recorded annually or semi-annually.	These actions will establish a framework for more accurate and complete long-term tracking of activities benefiting brook trout in the watershed. The framework will be established by the end of 2023. Going forward, this will help stakeholders prioritize brook trout activities throughout the watershed.	
			4.3 Track progress for partner specific activities.			
			4.2.2 Work to identify a common set of brook trout metrics to be used across the watershed.			
			1.3 - Identify and increase engagement with local government and non-profit work			

	quality brook trout habitat	trout restoration and conservation projects is needed.	benefiting brook Trout conservation.			
Scientific and Technical Understanding: Habitat Stressors	USGS, NPS, USFS, and academic institutions have active research programs. Other stakeholders have various programs to reduce stressors and/or mitigate their impacts.	Better understanding of spatially explicit linkages between brook trout populations and stressors is needed to inform restoration and conservation decisions.	2.1 Interactive effects of temperature and brown trout removal on brook trout.	Increased knowledge of factors affecting groundwater inputs to streams and an expanded model to predict where groundwater inputs are most likely to occur. Increased knowledge of brown trout – brook trout dynamics and how this affects brook trout populations.	Results will provide natural resource managers new tools and information to identify potential restoration sites, high quality habitat for conservation, restoration approaches (including practices to address and/or reduce stressors), and effects of brown trout by better understanding the stressors affecting brook trout.	
			2.2 - Model groundwater influence on stream temperature at the reach-scale across the Chesapeake Bay headwaters.			
Scientific and Technical Understanding: Climate Change	USGS, NPS, USFS, and academic institutions have active research programs. Other stakeholders have various programs to reduce stressors.	Understanding of effects of drought on brook trout population viability.	2.2 - Interactive effects of temperature and brown trout removal on brook trout.	Increased knowledge across a suite of scientific metrics including flow, precipitation, evapotranspiration, brook trout abundance and body size.	Results will provide natural resource managers new tools and information that account for how climate change and other stressors interact; improved conservation decisions that consider adaptive potential of brook trout populations and location of vulnerable habitats.	
			2.3 - Understand effects of drought on brook trout population viability.			

<p>Scientific and Technical Understanding: Genetics and Genomics</p>	<p>USGS, NPS, USFS, and academic institutions have active research programs. Stakeholders have various programs to reduce stressors.</p>	<p>Better understanding of population genetics and functional genomics, and their role in informing conservation and restoration decisions.</p>	<p>3.1.1 Evaluate if reintroduction efforts have been successful at transferring genetic diversity from source stocks and the implications for genetic rescue of small, isolate populations of brook trout.</p> <p>3.1.2 Publish report on Brook Trout Genetics Workshop for managers.</p>	<p>Progress towards the Outcome goal could be measured in a variety of ways including an increase in the number of programs using genetics information in conservation and restoration decisions, the amount of traffic to the genetics portal, and by surveying managers after the genetics workshop.</p>	<p>Projects evaluating the population genetics of brook trout and genetic evaluation of reintroductions are currently underway and anticipated to be completed in 2023.</p>	
<p>Partner Coordination: Coordination with restoration groups to target opportunities to increase habitat and presence</p>	<p>Trout Unlimited Home Rivers Initiative (restoration); various state efforts.</p>	<p>Better coordination among state, NGO, and BTWG partner engagement in brook trout restoration/monitoring efforts.</p> <p>Identifying stronghold populations (the largest, most interconnected, most resilient populations) and additionally identifying smaller, threshold populations that could be moved up into the “stronghold” category.</p>	<p>4.3 Track Progress of Partner Specific Activities.</p> <p>4.4 Improve Monitoring of Restoration activities and existing populations.</p>	<p>Identify key points of contact and maintain regular communication/engagement.</p>	<p>Better coordination and communication will help identify restoration opportunities and reporting.</p>	

ACTIONS – 2022-2023

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
Management Approach 1: Identify and Communicate Priority Focal Areas for Brook Trout Conservation					
1.1	Develop cache of outreach/communication products for quick response to requests.	1. Specific lessons learned and best practices for communicating with stakeholders.	USGS, BTWG, EBTJV, State partners, NGO partners.	Chesapeake Bay Watershed	Continuous efforts through December 2023
		2. Facilitate coordination across relevant agencies (in each state) to enhance collaborative restoration efforts.			
1.2	Collaborate with other Action Teams on communication strategies and products.	Meet and coordinate with other Action Teams.	USGS, BTWG, CBP Workgroups, CBP Communications Team, LGAC.	Chesapeake Bay Watershed	Continuous efforts through December 2023
1.3	Identify and increase engagement with local government and non-profit work benefiting brook Trout conservation and restoration.	Work to identify groups outside of governmental agencies that are conducting brook trout restoration and conservation projects in order to better capture all of the activities in the watershed affecting progress toward the Outcome Goal.	USGS, BTWG, MD DNR Fisheries	Chesapeake Bay Watershed	June 2023
Management Approach 2: Consider Climate Change and Emerging Stressors in Determining Restoration Priorities					
2.1	Model groundwater influence on stream temperature to forecast future change scenarios at the reach-scale across the Chesapeake Bay headwaters.	1. Collect and analyze environmental covariates for landscape modeling based on geomorphic features associated with groundwater-surface water.	USGS, MDE	Chesapeake Bay Watershed	December 2023.
		2. Apply multiple modeling techniques to evaluate covariate relationships to observed			

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		<p>mean-daily temperatures and evaluate model predictive performance.</p> <p>3. Summarize observed temperatures for observed and predicted stream sites based on known thermal thresholds for native brook trout, especially in karst stream systems.</p> <p>4. Evaluate state groundwater management programs to better understand approaches for implementing science and modeling recommendations.</p>			
2.2	Interactive effects of temperature and brown trout on brook trout.	Effects of temperature and brown trout removal on brook trout.	USGS, MD DNR, NPS	Chesapeake Bay Watershed	December 2023
2.3	Understand effects of drought on brook trout population viability.	<p>1. Assess flows within wadable stream networks.</p> <p>2. Evaluate brook trout body size (growth) and demographic responses to low-flow conditions</p>	USGS	Chesapeake Bay Watershed	December 2022
2.4	Better understanding of how interactions between climate change and land use impact brook trout.	Develop joint flow-temperature models at relevant scale and understand management implications.	USGS, Trout Unlimited	Chesapeake Bay Watershed	December 2023
Management Approach 3: Refine and Apply Decision Support Tools					

ACTIONS – 2022-2023

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
3.1	Determine genetic metrics/functional genomics necessary to determine brook trout population health and resiliency and evaluate their role in informing conservation and restoration decisions.	1. Evaluate if reintroduction efforts have been successful at transferring genetic diversity from source stocks and the potential for genetic rescue to support small, isolated populations and boost resiliency.	USGS, EBTJV, TU	Chesapeake Bay Watershed	December 2023
		2. Publish report on STAC Brook Trout genetics.			Report: June 2022
		3. Investigate how adaptive variation to temperature is spread across the landscape.			Adaptive variation: December 2023
3.2	Work with partners to identify stronghold populations and smaller threshold populations and prioritize restoration efforts.	Identify possible prioritization approaches for culverts and riparian reforestation.	BTWG, EBTJV, TU	Chesapeake Bay Watershed	December 2023
Management Approach 4: Continue and Expand Brook Trout monitoring efforts					
4.1	Explore monitoring brook trout using eDNA as a cost saving measure.	Evaluate eDNA approaches to develop methodology/protocols, determine costs, potential to predict abundance, etc.	BTWG, USGS, EBTJV, State partners, NGO partners	Chesapeake Bay Watershed	December 2023
4.2	Streamline progress reporting process for Partners.	1. Canvas EBTJV, State, and NGO representatives with regard to obstacles to reporting progress/restoration tracking, possible solutions.	BTWG, USGS, CBP Staff.	Chesapeake Bay Watershed	December 2022
		2. Develop and maintain a database framework for all partners (including NGOs) to report on their work using a common set of brook trout attributes/metrics.			April 2023

ACTIONS – 2022-2023

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
4.3	Improve monitoring of restoration activities and existing populations.	1. Help coordinate efforts among partners to incorporate new information into monitoring and restoration programs and identify funding opportunities.	BTWG, USGS, EBTJV, State partners, NGO partners.	Chesapeake Bay Watershed	Ongoing through December 2023