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Q1

Chapter Number & Name (Example: 123 - Smith Creek Chapter)

#013 Greater Boston

Q2

State

Massachusetts

Q3

First Name

Mike

Q4

Last Name

Yeomans

Q5

Email Address

myeomans@gbtu.org

Q6

Phone Number

508-309-9980

Q7

Chapter Volunteer Role

President and Interim Conservation Committee Chair

Q8

Project Title

Urban and Suburban Threats to Trout: Lessons from the Northeast

Q9

Project Location (stream, watershed, GPS coordinates if possible)

This study will be performed on Traphole Brook, Pine Tree Brook, and Germany Brook within the Neponset River Watershed. The Neponset River Watershed includes roughly 130 square miles of land southwest of Boston spanning 14 towns and cities in Eastern Massachusetts.

Q10

Salmonid Species Impacted and Threatened/Endangered Status (if applicable)

Wild, Native, Brook Trout (*Salvelinus Fontinalis*)

Q11

Please indicate which conservation strategy your project best fits:

Protect (Public lands policy, land trust partnerships, defense from development etc...)

Q12

Amount Requested from Embrace A Stream

\$9971

Q13

Project Timeline

Anticipated Start Date **01/01/2024** ,
Anticipated Completion Date **11/30/2025**

Q14

Has chapter received EAS funds before?

Yes

Q15

In 300 words or less, please note the project name and location, name of the applicant to chapter or council, amount requested, matching funds available, background or purpose of the project, goals and objectives, proposed actions or methods, anticipated scope of impact, and partners. The executive summary should be brief and to the point. The EAS committee will refer to it frequently during the review process.

Urban landscapes pose a significant and increasing impact to the health of coldwater streams, and expanding impervious surfaces magnify the warming threats posed by climate change.

The Greater Boston Chapter (GBTU) is pleased to submit our proposal, "Urban and Suburban Threats to Trout: Lessons from the Northeast", designed to quantify the influence of high temperature stormwater runoff on the physical and chemical properties of streams and their influence on stream organisms, focusing on 3 brook trout streams within Greater Boston.

We will investigate temperature and dissolved oxygen downstream of significant road crossings and high-volume outfalls using continuous data loggers. We will use infrared cameras to identify temperature differentials between incoming stormwater and stream base flow. Macroinvertebrate studies will be used to assess overall stream health and to compare the health above and below major outfalls.

Scientific data does nothing in a vacuum. Our project includes substantial outreach to raise awareness of the impact humans have on stream health. We will also produce classroom materials to encourage youth engagement with their freshwater resources and instill a stewardship perspective towards these critical resources.

This project will culminate in a stormwater impairment report, presented to municipal conservation commissions and planning departments. We will advocate for temperature to be included alongside other mandatory pollutant limits when prioritizing stormwater best management practices. Combined with the outreach materials, this low-cost project serves as a roadmap for similar urban watersheds to protect their coldwater species, threatened by climate change and urban expansion.

We request \$9,971, for loggers, IR cameras and microscopes and for technical and macroinvertebrate identification oversight. Our match is \$10,080 and 704 volunteer hours.

All data will be collected by volunteers, supervised by the Neponset River Watershed Association (NepRWA)'s River Restoration Director, Sean McCarty, PhD., who was integral to the development of this proposal.

Q16

In 1000 words or less, describe the issue or opportunity being addressed. If applicable describe project location, including name of water body and salmonid species. Please show how this issue or opportunity has other regional or national significance. If the project is part of a TU national initiative, please explain the extent of coordination with TU national staff. If this project has received EAS funding in previous years, please provide a brief update on progress to date.

Urban and suburban landscapes have a significant impact on trout streams that flow through their regions. Land development increases the quantity and type of pollutants entering the waterways and often results in groundwater being removed for municipal and commercial water supplies. Impervious surfaces, such as roads, driveways and parking lots prevent rain from recharging groundwater. Stormwater is often diverted directly into local rivers and streams without being filtered through riparian vegetation. Large areas of unshaded concrete and tarmac also produce urban heat islands, creating thermal pollution to these coldwater refuges.

Our proposed study will address the elevated temperatures from impervious surface runoff during the summer months, one of the major threats to trout survival in urban and suburban waters.

Our study will be performed on three streams in the Neponset River Watershed: Traphole Brook, Pine Tree Brook and Germany Brook. These streams were identified as having the highest populations of wild, native brook trout of those surveyed by our Embrace-A-Stream project, completed in 2021.

The Neponset River Watershed, that GBTU has adopted as our home waters, includes roughly 130 square miles of increasingly urbanized land spanning 14 cities and towns southwest of Boston. Over 330,000 people live in the watershed and more than 120,000 depend on groundwater drawn from within its boundaries.

Road crossings and other stormwater outfalls result in a significant quantity of warm, polluted water entering these streams. Traphole Brook, one of the best remaining trout streams in Eastern Massachusetts, flows through the Norwood "Automile," under I-95 once and under Route 1 twice during its short 3.9-mile journey from its source to its confluence with the Neponset River. Pine Tree Brook does not cross any major roads or highways, but has over 10 road crossings in its 4.7 miles to the Neponset River through the highly residential town of Milton. Germany Brook has 5 road crossings, with no major roads or highways along its short 2 miles from its source in Westwood before it empties into Ellis Pond in Norwood. The streams flow through diverse communities from which we hope to engage volunteers, especially from those Environmental Justice populations through which the three streams flow (see maps provided).

There have been some recent positive developments improving trout habitat in the watershed, the most noteworthy being the removal of the Mill Pond dam and the restoration of the stream bed of Traphole Brook in Norwood in 2022. Unfortunately, we continue to see significant urban development upstream that has the potential to worsen water quality and reduce or eliminate trout populations despite this improvement.

The continuous expansion and urbanization of watersheds with additional roads and parking lots will increase the addition of warm water to our trout streams. Climate change will only elevate this concern, with warm temperatures and greater likelihood of extreme storm events.

Our project will collect data from three brook trout streams in the Neponset River Watershed in Massachusetts, but this study is designed to become a model for the protection of coldwater streams in any urbanizing watershed. Our focus is on the health of trout streams in an urban and suburban environment and uses methods to ensure it can be replicated across the country.

Our project is not part of a TU national initiative, but we would welcome the opportunity to coordinate our efforts with other chapters or TU national projects that are performing similar investigations.

In 2021 we completed our Embrace-A-Stream study of the trout in our home-waters, the Neponset River watershed. Fifty-four volunteers collectively donated over 1000 volunteer hours to this effort. Along with our partner, the Neponset River Watershed

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Association, we surveyed over 60 sites, assessed over 113 culverts for fish passage, and monitored water temperature, dissolved oxygen, and habitat quality.

We used eDNA testing to confirm the presence of brook trout in five of the eight streams they occurred in historically: Beaver Brook, Ponkapoag Brook, Traphole Brook, Germany Brook, and Pine Tree Brook. Although we don't know why brook trout are no longer present in the other three streams, urban development has undoubtedly had a significant impact on their ability to support wild populations.

We did find that water temperature was a major factor determining where trout were and were not found. Not surprisingly, streams where brook trout were present had cooler temperatures in the spring and summer. The highest summer average in streams with trout was 24.2°C and in streams without trout was 27.8°C, a difference of over 3°C.

We also found that undersized culverts and dams pose a major problem in our watershed, disrupting stream connectivity and artificially warming downstream reaches.

On our prior project we also partnered with the Neponset River Watershed Association and have continued to work with them closely since completion of that project. We were proud supporters of the recent Mill Pond Dam removal on Traphole Brook, where we were able to help secure the necessary funding to allow this work to begin.

Based on our findings, we compiled a series of recommendations that inform the design and funding request for this present EAS grant.

Prior EAS Recommendations

- Restoration efforts implementing strategies for reducing water temperature.
- Removal of barriers to migration between tributaries. The subsequent removal of the Mill Pond Dam on Traphole Brook was a major accomplishment toward this goal.
- We identified a total of 1,784 acres of riparian area as potential sites for land conservation and an additional 209 acres of land were identified as potential sites for riparian restoration projects.

Our proposed Embrace-A-Stream project addresses our prior project recommendation of reducing water temperature. By targeting the issue of storm water runoff from impervious surfaces., we will address both water temperature and water quality as determined by our dissolved oxygen loggers and macroinvertebrate studies.

Sean McCanty PhD, NepRWA's River Restoration Director will oversee the detailed implementation of this project. Sean holds a PhD in Environmental Biology from the UMass Boston, where his doctoral work was focused on assessing stream restoration through water quality, including macroinvertebrate surveying.

Q17

In 350 words or less, briefly describe the purpose of the project, resulting benefits for cold water conservation and the TU organization, including scope of impact. Also describe any economic benefits that will result from your work. Please be sure to note: The overall goal of the project (e.g. restore critical habitat for a certain species of endangered salmonid, build a local constituency to promote protection of a certain resource, improve the scientific understanding of an issue to improve river or fishery management etc..) List the specific conservation objectives for the project (e.g. restore X amount of habitat by Y method, educate X number of people through Y means, fill X information gap through Y research methods, influence local or state governing body to adopt X policy/law to protect Y habitat or fish etc...) List the specific TU strengthening objective for the project (e.g. recruit X new leaders or members by method Y, develop an actionable plan for a conservation campaign, increase TU coverage in local media by X% etc...)

The purpose of our project is to understand the impact of stormwater runoff on coldwater streams. We will identify warm water sources and quantify the impact on water temperature, dissolved oxygen, and overall health of the streams. Technical goals for this project include: Filling temperature, dissolved oxygen, and macroinvertebrate community data gaps through continuous logging, infrared imaging, and net collection and identification, to demonstrate the chemical and biological impacts (when compared to upstream samples).

The data collected on this project will allow us to document stormwater impairment in a report that will be presented to municipal decision makers to evaluate temperature concerns in cold water streams in addition to mandated stormwater regulations for prioritization of interception, infiltration, and detention structures.

This project will enable both the protection of the streams that we are studying and enable development of a methodology and roadmap to be used across similar urban watersheds to help preserve their threatened coldwater species in the face of climate change and urban expansion.

With a goal of engaging 50 volunteers in citizen science on our project, we expect to encourage existing and new members to engage with GBTU with the aim of developing future GBTU leaders.

Our outreach and education plan includes working with middle school teachers in our community to develop a lesson plan about brook trout and the ecology of their local streams, providing a self-contained instructional unit. However, we intend to distribute the material widely across the watershed, including the densely urban areas of Boston and Quincy where coldwater streams are not present.

NepRWA works with municipalities within their watershed to reduce the costs, and increase the effectiveness, of stormwater management and outreach programs. Our project will provide important data on the impacts of stormwater, enabling data-supported decision-making across multi-municipal strategies and interventions for stormwater management.

GBTU is also a member organization of the Massachusetts Rivers Alliance, a state-wide non-profit whose mission is to protect and restore the Commonwealth's rivers and streams. Data from this study will support our shared efforts for improved environmental regulations including stormwater management.

Q18

In 500 words or less, describe the actions or methods you will use to implement your proposal. Make sure to include plans for implementing both the conservation and strengthening TU objectives. If applicable explain the scientific or technical methods utilized in the project. Note if the project uses innovative or unique solutions to address fisheries problems or if the results can be transferred elsewhere. Please also include: A timeframe or schedule of when major activities will occur, including a list of any permits that will be obtained. The role of TU leaders, volunteers, or staff in the project and the names and qualifications of key participants. EAS projects require TU volunteers have significant involvement. An outreach plan to disseminate project results to TU, project partners, and especially the general public. A description of how you will measure or evaluate project outcomes. Explain the scientific or technical methods used to evaluate project results, including the indicators (an indicator is a specific, measurable target or goal) for project success. Grant recipients will be required to evaluate the outcomes of their projects by measuring these indicators before and after their project.

This project is proposed to start January 2024 and end November 2025.

We will deploy six dissolved oxygen data loggers below major storm water entry points to measure both dissolved oxygen and water temperature. We will deploy an additional 18 low-cost, temperature-only loggers owned by GBTU to collect data above and within major storm water entry points (outfall pipes) and at minor entry points along the streams. Loggers will be programmed to collect data at a 15-minute interval and deployed on the three streams from April to October in each year of the study, spanning a total stream length of approximately 10 miles.

We will use handheld thermometers and infrared FLIR cameras to survey the entire length of the streams, to locate the sources of cold water (i.e. groundwater), document mixing of warm and cold water at entry points, and determine the relative thermal difference between base flow temperature and incoming stormwater.

Macroinvertebrate (MI) studies will be performed at various points above and below major stormwater entries. MI taxa provide a long-term assessment of stream health in a localized area and can be used to determine specific impairments, including low dissolved oxygen, thermal stresses, and poor flow. They will be collected following EPA methodology for multi-habitat sampling, and sorted/identified to the lowest practicable taxa (order/family). Evaluation of macroinvertebrate assemblages will be conducted by NepRWA scientists. Analysis will take advantage of MassDEP's recently developed index of biotic integrity for macroinvertebrates and several published functional metrics for flow, temperature, and oxygen assessment.

Logger deployment, data collection and retrieval along with macroinvertebrate collection, sorting and identification will all be performed by volunteers, trained and overseen by NepRWA scientists.

Equipment purchased on this project will be owned by GBTU.

We will follow Massachusetts state guidelines for scientific collection of macroinvertebrates, including obtaining a collection permit from MassWildlife and retaining the collection for educational purposes. No other permits are required.

Preliminary Schedule

2024

Purchase equipment: January

Deploy Loggers: April

Collect Logger Data: Monthly, May – October

Macroinvertebrate Collection: July

Macroinvertebrate Processing: July - October

Retrieve Loggers: October

Pilot Classroom Material: November

2025

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Redeploy Loggers: April
Collect Logger Data: Monthly, May – October
Macroinvertebrate Collection: July
Macroinvertebrate Processing: July - October
Retrieve Loggers: October
Final Report: November

Key Personnel

Project Lead: Mike Yeomans, GBTU President
Project Scientist: Sean McCanty PhD, NepRWA Restoration Director
Sterling Worrell, GBTU Communications Chair
Matt Murphy, GBTU Vice President and Member Outreach Leader

Outreach Plan

We will develop material for middle school students, and disseminate project results to TU, partners, the general public, and municipal decision-makers. Full details are in the communications section of this proposal.

Metrics

We will measure our project against the following goals

Dissolved Oxygen data set* goal: 72
Water Temperature data set* goal: 216
Macroinvertebrate Studies: 2 sites per stream per year
Volunteers Engaged: 50
Total Volunteer Hours: 704
Social Media Outreach Posts: 24
School District adoptions of developed course materials: 5
Presentation attendance: 60

* Data set = 1 month of samples at 15 minutes intervals.

Q19

List at least 3 local media outlets you will contact (print, tv, radio online, social)

The Boston Globe (print/online), WBUR (radio/online), The Milton Times (print/online; Milton, MA), The Norwood Record (print/online; Norwood, MA), Norwood Community Media (TV; Norwood, MA).

Middle school and municipal social media managers.

GBTU email, website, Facebook, Instagram, Twitter and Threads.

NepRWA email, website, Facebook, Instagram and Twitter.

The number of subscribers and followers for GBTU and NepRWA are detailed in the Communications section below.

Q20

In 500 words or less, provide a brief outline for how the applicant will broadcast information about the project and EAS awards to their local community. A robust communications plan will include press releases, social media posts, website updates, project location signage (temporary and permanent) and more. We ask that successful applicants submit no fewer than two updates through the course of the EAS funded project to TU suitable for sharing in our social media and emails.

GBTU's communications team use a wide range of online and social media to inform and engage our members and supporters. GBTU's online presence includes email, our website, Facebook, Instagram, Twitter and our YouTube Channel all using the handle @greaterbostontu. As of July 14, 2023, GBTU email subscribers and social media follower numbers were as follows. Email: 1,254 subscribers, Facebook: 739 followers, Instagram: 1,148 followers and Twitter: 208 followers. We will communicate all aspects of this project, including grant award, project plans, calls for volunteers, progress and results via all of these tools. We also expect, as the project plans, community volunteer involvement, and results are broadcast, GBTU media platforms will gain more followers.

NepRWA also has a strong online presence and will provide communications about the project to their members and supporters, including calls for volunteers and details of the project's progress and results. As of July 14, 2023, NepRWA email subscribers and social media follower numbers were as follows. Email: 3,755 subscribers, Facebook: 2.7k followers, Instagram: 814 followers and Twitter: 1,975 followers.

The GBTU's communications lead, Sterling Worrell, will work closely with NepRWA Outreach and Education Director, Nancy Flyer on all aspects of project communications.

At key milestones of the project, we will provide community interest updates to local newspapers in the communities where the study is taking place, specifically the towns of Westwood, Milton, Norwood and Walpole. As this project revolves heavily around stormwater, GBTU and NepRWA will coordinate messaging to highlight the lesser-known impacts of stormwater runoff that specifically threaten coldwater species such as brook trout, namely temperature and road salting (in addition to bacteria, oil, heavy metals, and excessive nutrients). This project is aimed at quantifying temperature impacts, and dovetails with NepRWA and other area watershed associations' close examination of road salt as a chronic stressor to our streams and sensitive species. GBTU and NepRWA will jointly share outreach material on temperature and road salt impacts, and encourage municipal resharing through their Neponset Stormwater Partnership. In addition to increased awareness, these same municipal departments are the end users of this project's findings, and key implementers of stormwater best management practices to include reducing high temperature flash flows to these coldwater refuges.

A key component of this project is developing a shareable and scalable framework to other Trout Unlimited chapters in urbanizing watersheds. By prioritizing volunteer effort in key areas of impact (road overpasses on coldwater streams) we can provide a low-cost method for other chapters to address thermal protection. Equipment purchases for this grant are relatively inexpensive, easy to use by volunteers, and can multiply the effort of a trained water scientist. GBTU will share all developed training and classroom materials, municipal and general outreach materials, and project feedback for other groups seeking to engage their local government on these issues.

We will provide at least 4 project updates (approximately every 6 months) to TU national, in formats suitable for social media and emails.

Q21

In 500 words or less, provide a brief description of community awareness and education events the chapter will host at the project site or related to the project. Examples of community awareness and engagement events include: A public site visit before and/or after construction A Zoom program with partners inviting the public to learn more about the work and the resource being restored PowerPoint presentations made to local civic organizations such as garden clubs, land trusts, Kiwanis, Rotary, Lions and others etc

GBTU holds chapter meetings throughout the year, open to the public, with speakers on a range of fly fishing and environmental topics. Our prior Embrace-A-Stream project resulted in three presentations throughout the project. We will use a similar approach here, with meetings highlighting project details, and geared towards younger audience members. Our recent meetings were held as hybrid meetings with the presentation also being recorded. For our future Embrace-A-Stream presentation we will use a hybrid format, to engage both live and virtual audiences, and record the presentations for subsequent posting to our YouTube channel.

Other outreach will also be included at local events around environmental and water issues, providing opportunities for personal engagement with members of the public, including those from diverse backgrounds and younger members. GBTU and NepRWA will continue to table at events geared towards the broader public, including family events like NepRWA's Neponset Day, town days and others.

While this project is focused within our Neponset home waters, GBTU has connections across Massachusetts and other environmentally minded groups providing a wider audience for these informational postings to be shared. As our project is designed to be a potential model for other urban and suburban watersheds, our ultimate audience goes well beyond the stream communities themselves.

Recently, GBTU partnered with the Bitterroot Chapter in Montana, on a presentation exchange of details of our conservation efforts. We plan to continue this partnership and look for opportunities to do similar conservation presentation sharing with other chapters. We have also shared outreach about our prior Embrace-A-Stream success with the Cape Cod TU chapter, with NepRWA and MassDER (Massachusetts Department of Ecological Restoration] speakers planning on a fall presentation at their chapter meetings.

Educational outreach is a key component of this project, through the direct engagement of middle school aged students, using the lesson plan developed on this project to increase their awareness of coldwater issues and the environment around them. We intend to distribute the material widely across the watershed, including the densely urban areas of Boston and Quincy where coldwater streams are not present.

While we develop this course material, uptake by schools is a critical component. Outreach to individual teachers will take place both on social media (through tagging of relevant school districts social media platforms), and direct emailing to potential instructors. By making a self-contained educational module, we can make adoption of the material as seamless as possible for busy educators, ensure it meets educational objectives, and provide quality ecological and water quality education to young investigators.

This project builds on our prior successes with improving coldwater streams and our partnership with our home waters, the Neponset River Watershed. By leveraging GBTU's passionate volunteers and experience in data collection with NepRWA's municipal connections and curriculum development, our study will not only help preserve Massachusetts' imperiled Eastern Brook Trout but develop a scientific and educational pathway for similar work across the U.S.

Q22

Upload Your EAS Budget (Budget template available at www.tu.org/eas - be sure to save your final budget as a PDF before uploading.)

GBTU%20Embrace-A-Stream-2023-Budget.pdf (73.6KB)

Q23

Letters of Support (Upload all letters of support as one merged PDF file. At the LEAST you MUST have a letter of support from 1) the chapter president, 2) the council chair, 3) the sponsoring professional, 4) the landowner of the property where the work is taking place. Chapters are encouraged to have letters of support from partner organizations, state and local agency partners and TU staff involved in the project.)

GBTU%20EAS%20Letters%20of%20Support.pdf (1.2MB)

Q24

Supporting Documents (Upload all supporting documents as one combined PDF file. These may include site images and descriptions, final or conceptual project plans etc...)

GBTU%20EaS%20Grant%20Proposal%20Supporting%20Documents.pdf (3.3MB)
