EBTJV 2022 ANNUAL MEETING

April 20-21, 2022 National Conservation Training Center
Shepherdstown, WV

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Attendees and presentation links

Name	Affiliation	Title	Email	Presenter	Presentation Link	State panelist?	In Person
Abbott, Alex	USFWS - Gulf of Maine (Cooperator)	Stream Restoration Specialist	Alex_Abbott@fws.gov	Y	https://youtu.be/acfzLGVvt8Y		
Collenburg, Scott	NJ DEP Fish and Wildlife	Senior Biologist	scott.collenburg@dep.nj.gov	Y	https://youtu.be/5eSPV_8zf2k		
Coombs, Jason	US Fish and Wildlife Service	Geneticist, decision support tool developer	jason_coombs@fws.gov	Y	https://youtu.be/3MuYUMfuMWw		Y
Faulkner, Stephen P	USGS -Eastern Ecological Science Ctr	Supervisory Biologist	faulkners@usgs.gov	Y	https://youtu.be/i1z6qlBCJYU		
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Huntsman, Brock	USGS - California Water Science Center	Fish Biologist	brockhunts@gmail.com	Y	https://youtu.be/8YI94jh1R2s?t=2740		
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Lemon, Jake	Trout Unlimited	Monitoring and Community Science Manager	jacob.lemon@tu.org	Y	https://youtu.be/3EG99fKOGZA		
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Summary

Eastern Brook Trout Joint Venture 2022 Annual Meeting
National Conservation Training Center, April 20-21.

Summary items:

- The need for states to update Catchment Mapper by end of 2022 so we can gauge the status of brook trout populations and determine where patches have been reduced or extirpated.
    - Jason will keep the online update portal as access-restricted, and updates will be pushed out at set date with timestamp, likely via Ecosheds.
    - For future updates not all states need to update at the same time, but for the first full update we would like all states to input data through at least 2020.
    - Jason and the Forest Service might be able to help some states enter their data for the most upcoming release to assist in a complete update in 6- 12 months.
- Importance of Groundwater for brook trout conservation
    - Paired air-water temperature monitoring
    - Drone and thermal infrared identification
    - Movement and aquatic organism passage
- Some states are seeing losses of brook trout populations in the past 5 years, and to a lesser extent, some states are continuing to find new populations.
- State management plans for brook trout have been successful and forward-thinking. A number of states are currently undergoing brook trout management plans.
- Nearly 200 brook trout restoration projects have occurred in the past 5 years across the eastern range. The public is generally very supportive of these projects.
- Chesapeake Bay Basin needs better data on brook trout conservation projects. A template will be developed to track non-EBTJV funded projects (which are many). This template could serve as a model for the larger range.
- The group agreed that we should continue to focus on and implement EBTJV's key conservation actions:
    1. Increase recreational fishing opportunities
    2. Conserve the best of the best
    3. Restore and reconnect suitable habitats
    4. Conserve genetic diversity
    5. Conserve life history strategies
    6. Minimize threats
- Benefits of collaborating with TU's Conservation Portfolio and other stakeholders on identifying:
    - Landscape metrics associated with largest allopatric patches in each state
    - Identification of sympatric or unoccupied catchments with similar landscape metrics for future brook conservation efforts.
    - Continued progress on population of more accurate stream barrier data within allopatric brook trout patches.
- Stormwater impacts/retrofit options and stream temperature impacts an emerging issue.

Potential future workshop topics of interest

- eDNA applications and protocols
- Non-native fish competition (behavior, growth) of allopatric vs. sympatric brook trout

- Genetic impacts from reintroduction and genetic rescue restoration projects
- Temperature modeling/groundwater influences

Action Items:

1. Science Committee discuss facilitating Catchment Mapper state updates by December 2022.
2. Form work group and develop template for brook trout conservation project tracking.
3. Infrastructure funding by various agencies in FY22 and planning for future.

Issues to approach in the longer term:

1. culvert data used in range-wide bkt assessment: ability to crosstalk between data sets and compare between data sets General interest seems to be in updating to NAACC
2. When to update to NHD+ v 2 Hi-Res, may need to run assessment both ways to allow comparison.

Day 1 April 20, 2022

Nat Gillespie – USDA Forest Service Assistant Fisheries Lead and EBTJV S.C. Chair opens with

introduction and background

Lori Maloney, EBTJV coordinator with Canaan Valley Institute– Introductions

What excites you about being here and what is your motivation for this meeting?

Responses:

- people love BKT and it motivates people to be better stewards for environment
- excited about pops that have been restored and restoration efforts. Excited about passing along to future
- excited about hearing everyone's work
- Loves fish and knows that reintroduced and conserved populations are a clear success. Also likes the regional approach
- Wants to conserve coldwater resources for future generations
- hearing experiences of anglers resulting from restoration efforts
- Human impacts – we are responsible for protecting and mitigation. Interesting in hearing other states' actions
- Working towards developing and improving the tools for conservation efforts
- incredible assemblage of efforts and is inspiring. Excited to hear about where we are going to go.
- excited to see the evolution of EBTJV. Driving force of restoration. Nothing more gratifying than seeing the changes on the ground.
- This is year ten with TU and EBTJV, and we have absolutely documented the recovery of brook trout populations in places they had been extirpated. One of the last fish on the screen from West Virginia, a 15 plus inch fish, was in my hands and from a TU project in Pendleton County, WV. There is little more gratifying than seeing more and larger fish on more frequent basis. Also, this work will benefit the many forthcoming generations of our people.
- Learning about previous restoration efforts (successful and unsuccessful) to inform our future efforts.

- Excited to compare notes with colleagues working on the shared challenges of conserving native brook trout.
- To hear the stories of a young person catching their first wild brookie or a seasoned angler catching more or bigger fish following conservation work that we do.
- Build on our relationships to further brook trout science and conservation
- I'm excited about the BKT populations we've restored, I'm excited about those we are working to restore in the future, and it excites me to pass this passion onto future fisheries biologists and partners.
- To learn from others and bring all of the great work back to CT
- Tracking brook trout population status and change in distributions
- 1. excitement, love to fish for brook trout and meet others who care about them. 2. here in a professional capacity with MDE
- Something about those blue halos
- Restoring and enhancing native species and their habitats is why I do what I do.
- to help an animal that means so much to so many people
- I have always had a passion for wild brook trout. They are strong, resilient and restoring their habitat and educating people on this fantastic species is fun and positive. We have lots of great successes with habitat, populations and people. It is so great to maintain/restore a species that has been around since the beginning! 😍
- Most fish that are important to people (e.g. bass, perch) don't really need any help. Brook trout are a species that many people love and that we can actually do something to restore and enhance.
- Driving force for protocols. Gave motivation for data collection and prioritization.
- I like that there is so much information available about the species that we can translate into management actions. The research we have and continue to conduct isn't just hypothetical - it helps guide actual on-the-ground work

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Maryland updates

Dan Goetz Freshwater Fisheries Program, Statewide Operations Manager, MD DNR
Video link: https://youtu.be/5yi4WnWdFws

- Continuing to work with MDE/coldwater regulatory protection
- Passed catch and release regs for BT – No harvest east of I-81. No harvest in P&T
- BKT reintroductions ongoing
- Developed new conservation framework
    - Resiliency – Identifying strongholds
    - Protection – Coldwater designation policies and environmental review
    - Restoration – reintroduction/introduction. Identifying candidate streams
- Delineating watersheds upstream of temp loggers to model summer temperatures. Based on forest cover, stream characteristics. Etc. Anyone else working on this?

West Virginia updates

David Thorne – State Trout and Stream Habitat Biologist, WV DNR
Video link: https://youtu.be/unx6Fqo3u38

- Finding new BKT pops and reevaluating existing pops since 2015
- Focusing on Ohio basin
    - Over 4000 fin clips at 102 sites
- Seeing some dramatic range reductions, particularly in southern range
- Population restoration work – Mostly in eastern panhandle. Reymann farm aquaculture facility. Reared from wild stock
- Limestone sand improvements – Red Creek. Modest pop but needs additional restoration
- Mill Run – Moving fish over barriers
    - Good habitat but no fish. Not sure why. Moved fish over a perceived barrier. Will follow up with surveys this year.
- West Fork Glady Fork – headwaters grazing allotment restoration project. Degraded and beaver impounded. No BKT in restoration area. Hopefully restoration project will result in occupation.
- First Fork – 2 miles of wood additions and bank stabilization. Increase nitrogen cycling in system
- AOP Planning – not sure what's coming and how to prepare for it.
- West Virginia Trout Management Plan – Now complete. 7 focal issues
    - Enhancing native and wild trout fisheries – largest section with most action items.
    - WV trout steam classifications to protect/conserve/enhance wild and native trout pops
    - Favors BKT over all other species
    - Improve BKT where present without detriment to other trout species
    - Looked at wildness and developed spectrum from pristine to stocked impoundments
    - Objective: get one no kill patch in each HUC 10 watershed
    - Considering length restrictions. May try experimental slot.

Maine updates

Merry Gallagher, Native Fish Conservation Biologist, and **Matt Lubjeko**, Fisheries Biologist, Maine DGIF
Video link: https://youtu.be/EnLUQf3IBOw

Strategic Management Plan- 2015 – 2021. Now in implementation phase

- Included angler surveys and 12 member steering committee
- Developed objectives and content
- Identified species specific goals
- Formed 8 subcommittees including public and staff
- Identified general division and hatchery goals – internal. Management and infrastructure
- Staff survey to prioritize goals
- Drafted plan
- Contracted professional copywriter and designer
- Held a 30 day public comment period
- Completed plan

- Brook trout specific goals in management plan
    - Goal 1 – maintain healthy self-sustaining pops statewide
    - Elevates conservation of trout as a state objective
    - Conserve BKT habitat statewide – high priority
    - IDed highest priority areas where collaborative conservation is a goal
        - Most areas are privately owned – requires collaboration
    - Minimize threats from invasive species – high priority
    - Complete inventory and map occurrence statewide – moderate priority
    - Increase public awareness and stewardship of BKT resource – moderate priority
    - Examine hatchery stocking practices to minimize impacts to wild BKT – moderate priority
    - Goal 2 – Monitor, enhance, and create desirable BKT fisheries
    - Monitor wild and stocked BKT waters to enhance angling opportunities – high priority
    - Improve public access – high priority
    - Manage wild populations and stocked pops with consideration for public use and harvest – high priority
    - Develop additional stocked fisheries for additional opportunities – moderate priority

State Management Plans Panel

Panelists: Mike Beauchene – CT; Fred Henson – NY; Jim Habera – TN, Merry Gallagher and Matt Lubjeko – ME; David Thorne – WV; Jason Detar – PA

- Jim H. TN – has statewide conservation management plan – 10 years. Will run through 2027. 6 different focus areas, including native BKT. Appended BKT management plan
- Mike B CT – Statewide salmonid action plan with wild trout management plan. Working on implementing that modeled after ME and MD. Focusing on conservation – statewide survey. Loss of occupancy and of existing populations. First maintain then restore.
- Mary G ME – see above notes for Maine
- David T WV – Developing wild trout plan since 2015. Became comprehensive trout management plan. No public comment yet but that will be soon
    - Part of state wildlife action plan as well – elevated status
    - Can add benefits for BKT
- Jason D PA – On third trout management plan. Each aligned with statewide strategic plan. Important for getting funding. Wild trout, stocked trout, and steelhead components
- Fred H NY – Second year of implementation of trout stream plan. Kicked off with angler meetings in 2017. Released draft in spring of 2020. Finalized in November of 2020. 500 public comments
    - Consistent categories for streams – 3 for wild management and 2 for stocked
    - Update reach category listings annually
    - Working on a more comprehensive annual report card. Will cover the range of goals in the plan and provides status annually.

- Lessons learned – what would you do differently?
    - Don't do it through pandemic
    - Plans can be too specific. Avoid getting too specific. When needed, develop additional plans for specific resources

    - Difficult to get diversity of representation of anglers. Organizations participated, but most members aren't members of organizations.
    - Rollover incomplete objectives into next plan.
    - Link objectives to statewide management plan to assist with funding. Unlinked objectives tend to be underfunded.

- Balancing recreational harvest with conservative regulations
    - ME – comes up all the time. Conservation minded vs. reality
        - Limiting factor is rarely angling/harvest
        - In some cases, encouraging harvest
        - Habitat, water quality, invasive spp are major problems
    - NY – agrees.
    - PA – Same for PA. Most waters don't have enough harvest pressure to be limiting factor.
    - TN – Same. Harvest impacts are negligible. Limits have been reduced with no impacts
    - ME – Stream and Lake management are very different. Encourages harvest in some cases. PFAS becoming an issue and is under consideration

- Matt K. – cost benefit for the management plan?
    - NY – a lot of effort. 3 years. Public involvement was particularly involved. Has been able to lean on plan to get things done rather than circular fighting. This is because of transparency and outreach. Benchmarks are helpful.
    - TN – Benefits outweigh costs. All laid out for questions about management.
    - ME – helps focus work activities. Easier to target and prioritize needs
    - PA – Been worthwhile for funding and with implementing thorny issues. Ex. Reduction of stocking of hatchery BKT.
    - WV – Fisheries are highly politicized. Trout management plan gives more powerful tool to resist politics.

mike.beauchene@ct.gov would love to hear from folks who have either made or are pondering making recreational fishing regulations for WBK more conservative (C and R) and how that was met with traditional anglers who want to harvest

Links to state plans (likely an incomplete list)

https://www.vttucouncil.org/wp-content/uploads/2018/02/Trout-Plan-2018-final.pdf

https://www.dec.ny.gov/docs/fish_marine_pdf/troutstreammp.pdf
https://www.njfishandwildlife.com/pdf/fwfisheries/wildtrout.pdf
https://www.fishandboat.com/Fish/Fisheries/TroutPlan/Documents/TroutPlan2020.pdf

https://dwr.virginia.gov/wp-content/uploads/media/Virginia-Wild-Trout-Management-Plan-2019-2028.pdf
https://www.ncwildlife.org/Portals/0/Fishing/documents/TroutManagementPlan.pdf
https://www.tn.gov/content/dam/tn/twra/documents/fishing/trout/Tennessee-Trout-Management-Plan-2017-2027.pdf
https://www.dnr.sc.gov/swap/supplemental/freshwaterfish/easternbrooktrout2015.pdf

National Fish Habitat Partnership Update

Ryan Roberts, NFHP Program Manager, AFWA
Video: https://youtu.be/uZZQCVoFG_8

- Mission: protect, restore and enhance fish and aquatic communities for public.
- 20 partnerships country wide. Most regional with overlap
- Why? Healthy habitats are essential for sustainable fish populations. Habitat loss is most common reason for losses.
- Concept was developed through the Sportfishing and Boating Partnership Council
- First habitat action plan signed in 2006. 2nd action plan started in 2012. Completed in 2016
- ACE acted signed in 2020. Codified the partnership.
- Built on science and data.
- Action plans have 5 objectives.
    - Achieve measurable results
    - Establish consensus for strategies
    - Develop community of support
- Goal: To demonstrate that habitat projects make a difference and to involve communities

www.fishhabitat.org

Brook trout occupancy database – history and context

Nat Gillespie, Assistant Fisheries Lead, USDA FS and EBTJV Chair
Video link: https://youtu.be/SCMEqgsZUuE

- 2006 – status assessment
- 2008 – Modeled predictions
    - Trout Unlimited Conservation success index
- 2015 – Catchment and patch level analysis
    - Subwatershed vs catchment analysis
    - Better refinement of BKT populations
- Catchment scale assessment – Color code catchments based on occupancy
    - Presence/absence based – contiguous catchments = patch
    - Patches are assumed to be genetically isolated populations
    - Data gap – are pops in a patch truly connected
- 2018 EBTJV Action Strategy – pulled together catchment assessment

TU's conservation portfolio

Shawn Rummel, Lead Science Advisor for Trout Unlimited

- Planning tool that TU is using – prioritizes where and what work is performed.
- Identifies strategic conservation opportunities
- Conservation success index is the roots of the work

- For each EBTJV patch: Conservation portfolio, habitat integrity, and future security
    - Generates strongholds
- Conservation Portfolio + Range wide assessment used to develop conservation strategies
- Dominant attribute – small pops in small habitat patches, sympatric populations, isolated in headwaters, high to moderate impairment, high to moderate climate change vulnerability. Would like to reverse all of this.
- Strategies – Protect existing strongholds, create new strongholds, restore impaired habitat in existing strongholds, etc.
- 2019 – Kettle Creek, PA assessment. New population patch delineation using local/state data
    - PA pulled all density data. New patch delineation developed
- Finer scale of analysis over time
- Information available through GIS based web tools
- Will be available late 2022
- Data is available to expand outside of PA and increase stronghold ID and information
- Dan G- With habitat data and modeling (CART), do we have ability to predict occupancy region wide. Could be used to identify more candidates for reintroductions.

EBTJV Catchment Assessment – Web Updater Tutorial

Jason Coombs, US FWS
Video link:
https://youtu.be/3MuYUMfuMWw

- 2015 catchment assessment
- Collected data from all states, tribes, and federal gov
- NHDPlus V2 layers – catchment flowline, flow direction
- Barrier layers – NABD, TNC, state
- All data placed in ruleset
    - Classified by salmonid species present in most recent survey year
    - Unsampled upstream segments inferred from downstream samples
    - No downstream inference
    - Catchment codes developed –
        - No salmonids, presence of rainbow/brown/brook etc, allopatric/sympatric
    - Inferred catchments
        - Only applicable to PA and north
        - Southern states – assigned based on p
    - Downstream terminus – absence of target, presence of barrier, end of stream
- 9964 patches. Mean size of 1898 HA
- 2022 catchment analysis
    - Continues to use NHDPlus V2 (TU uses high res where available)
    - Create a web platform that allows the states to self update
    - Allows multiple users to work on a state (ex. Region specific)
    - Layer is updated in real time through web browser
    - Updates can be made manually or by uploading bulk data (file)
    - Data can be downloaded as csv files
- Proposing that states should register for accounts.

    - One month “sandbox” period to familiarize, find bugs, streamline
    - After month – fix bugs and reset then go live
- When do we want to release a timestamped version to public?
- How often should a patch layer be updated from catchment layer?
- Where to release data?
- Restrict viewing access of updater catchment layer to registered users that have been vetted?
- When transition to NHDPlus HR?
- When/how to expand beyond presence/absence?
- Potential synergisms with other efforts?

- Brandon K - What about catch effort data, etc? Jason – can be done but how difficult and how useful will it be?
- Steve R – would prefer a more useful metric. Catch effort isn’t as useful.
- Jacob R. – pulling together abundance data. To come. Would help to address Jason’s questions with a path forward

https://ecosheds.org/geoserver/www/index.html
Interactive map for BKT in Vermont
https://maps.vermont.gov/ANR/Html5Viewer/Index.html?configBase=http://maps.vermont.gov/Geocortex/Essentials/ANR/REST/sites/FishDigest/viewers/FishDigest/virtualdirectory/Resources/Config/Default

Discussion:

How soon to get state data updated?

Most states can update within 6 months, some need 12, a few need more (Nat and Jason have offered to help these along so that we can keep to a timeline of 12 mo)

Patch layer creation: should we use existing barrier data or update to the NAAC data?

Largest response is to use both in order to properly compare between iterations of the database

How often to update the patch layer?

Most folks think 2 yrs is sufficient, but Jason says it can happen more frequently with timestamp released of catchment. Annual seems to make sense

Should we restrict viewing access:

Jason will make the web update site access only, but the finished database will be accessible to anyone

Add more functionality?

Push on regulatory side (especially stormwater/transportation routes) conjunction with land owner efforts.

Permit inclusion of some measure of abundance (if available)

I would recommend not to add a bunch of other functionality as it would seemingly evolve into a monster that would be hard to manage and keep relevant.

Synergy is great and welcomed, but we need to ensure that this always remains EBTJV's product as it is something that has set us apart from other efforts...

complete this assessment with presence absence/data, start planning for how to incorpate abundance, biomass, genetics, data, etc

Chesapeake Bay Brook Trout Work Group Update and BMP Tracking Tool

Steven Faulkner, USGS Supervisory Biologist, and CB BTWG Co-Chair
Video link: https://youtu.be/i1z6qlBCJYU

- Not on the track to achieve outcome
- Need more resources, etc.
- Has been focused on large scale action items and greatest impairment
    - Maintaining 75% forest cover in BKT watersheds
    - Working with landowners to achieve goals
- Priority needs
    - Expand groundwater influence modeling
    - Determine interactions between climate change and land use
    - Develop genetics metrics to determine health and resiliency of populations
    - Determine progress – both expected and actual progress
    - Work group has no capacity to develop metrics to quantify conservation actions
    - No framework to collect and quantify all restoration activities
    - Pursued funding to identify opportunities for cross GIT collaboration and strengthen communication
    - Work with the CBP EPA data center team for tracking/reporting application
    - Build stronger collaboration with other CBP teams
    - How can states track BMPs etc? Not a lot of action at state level
        - Nat G – information is limited but there is some there
    - Steve F – this is one year project but intended to jump start work rather than be a one-off. Will build relationships that will sustain the development of application

https://www.chesapeakebay.net/who/group/brook_trout_action_team
www.chesapeake.usgs.gov/fishforecast

Day 2 -April 21

USFWS Stream SMART training and Train the Trainer Events

Alex Abbott – Stream Restoration Specialist and FWS Cooperator
Video link: https://youtu.be/acfzLGVvt8Y

- FWS version of the USFS program, half day, accessible to many.
- Challenge: trainings have been major commitment – 5 days
- Pilot training attempting to move forward
- Half day workshops
- Message: Protect roads and public safety while they maintain fish and wildlife habitat
- Key parts: tech guidance, stream table, discussion about regs
- Only about 3% of surveyed culverts allow passage

- Outcome: train the trainers. Attendees will hold sessions to train relevant staff, agencies, developers etc.

Material referenced:
Stream Smart Phase 1 Stream Table video: https://youtu.be/xCh1l5unRVI
Maine Audubon barrier survey: https://maineaudubon.org/wp-content/uploads/2021/05/StatewideSurveyStatusMap2021.pdf
Maine Audubon brook trout survey https://maineaudubon.org/projects/brook-trout/
USFS Stream Simulation manual: https://www.fs.fed.us/eng/pubs/pdf/StreamSimulation/

Strategic Wood Addition and Low-Tech Process-Based Stream Restoration

Erin Rodgers, Trout Unlimited – Erin leads habitat restoration and connectivity work in Vermont, western Massachusetts, and western New Hampshire for Trout Unlimited

Video link: https://youtu.be/ImSsyw4qfoA

- New England streams lack instream woody debris
- Putting large wood into channel and connecting riparian and lotic system
- Increases microhabitat diversity, improves sediment transport, and influence macros
- Use chop and grip method. – small teams and hand tools (chainsaw and grip hoist)
- Work with stream's natural features
- Build from bottom up
- At least 500 ft from instream infrastructure
- Avoid cutting bank trees and wildlife trees (cavity trees)
- Start in water, active channel
- Use strainer trees- will be up over banks to catch mobilized wood and protect downstream structures
- Vary tree types when possible
- Spread out tree selection to retain canopy (each bank, upstream/downstream, etc)
- ½ ml or more on any property. Triggers USACE permitting
- Easier to stay away from culverts, etc.
- Place strainers at the downstream end to protect infrastructure

Strategic wood addition, why and where

Judd Kratzer, fisheries biologist with Vermont Fish and Wildlife Department and the AFS liaison to the EBTJV
Video link: https://youtu.be/jduMpTr4HNY

- Vermont strategic wood addition handbook for methods/info. https://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/VT_SWA_Handbook.pdf
- VT streams lack woody debris. No old growth forests on stream banks
- Prioritize riparian forest protection. Leave wood in the stream

- Tags structures and follows annually. Most are functioning in some way
- Woody debris that mobilizes tend to settle downstream and continue to function
- BTK may initially decline but will increase after a generation or 2
- Where is it the right tool for the job?
    - Will adding wood improve aquatic habitat?
        - Must have enough trees so you can cut and not lose shading.
        - This is a long-term plan. It jump starts the process
    - Will large wood benefit fish populations?
        - Make sure water temps are right and it should work
    - Can large wood be added safely and effectively?
        - Are the people implementing the project competent?
        - Learn with monitoring. – fish, longevity, function
- User conflicts – paddlers, etc. VT hasn't had this problem because streams aren't paddling streams. Paddling streams are steep with large boulders – woody additions are needed
- Best case: trees are about 2 times length of the channel
- Maximum number of additions: if getting to numbers of debris observed in old growth system, good stopping point. Strategic additions don't usually get to that point

Literature Cited

https://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/VT_SWA_Handbook.pdf
Oregon. 2010. Guide to Placement of Wood, Boulders and Gravel for Habitat Restoration. https://digital.osl.state.or.us/islandora/object/osl:14170
Kratzer, J. F. 2018. Response of Brook Trout biomass to strategic wood additions in the East Branch Nulhegan River watershed, Vermont. North American Journal of Fisheries Management 38:1415-1422.

Trends in Biomass and Relative Weight of Brook Trout in Response to Introduction of Non-native Brown Trout in an Appalachian Mountain Stream

John Odenkirk and Mike Isel, VA Department of Wildlife Resources

Video link: https://youtu.be/8YI94jh1R2s

– Primary threats to brook trout – invasive sp/brown trout

- Most anglers happy with multispecies fisheries
- VA long-term study – Conway R and Rapidan R. No decline in abundance or condition in sympatric system
- At higher elevations with pristine conditions – enough resources for both BKT and BNT?

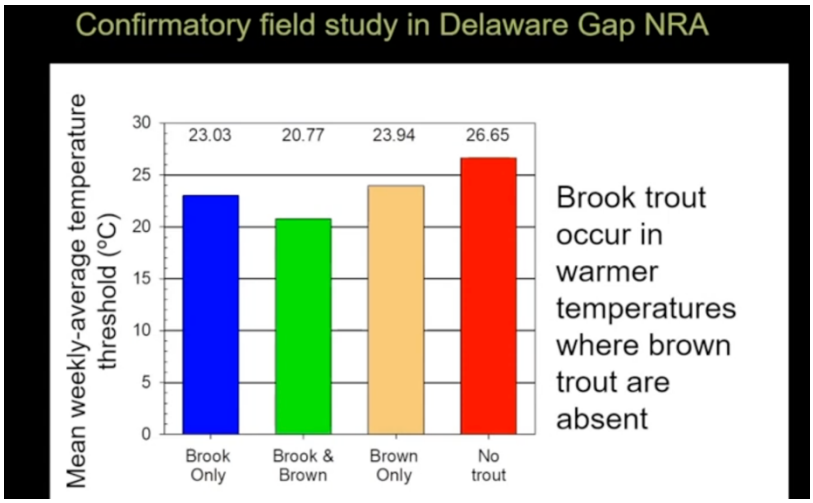
Literature cited:

Odenkirk, J. and M. Isel. 2022. Trends in Biomass and Relative Weight of Brook Trout in Response to Introduction of Non-native Brown Trout in an Appalachian Mountain Stream. Journal of the Southeastern Association of Fish and Wildlife Agencies 9: 67–72

Effects of introduced species on BKT, considering temperature

Than Hitt, Research Biologist, USGS Eastern Ecological Research Center

Video link:
https://youtu.be/8YI94jh1R2s?t=1198



- Thermal threshold for use of thermal refugia
- BKT increased use of warmer water when BNT weren't present
- BKT were able to do better in warmer water where BNT weren't present.
- Experimental removal of BNT should lead to downstream expansion of BKT
    - Increase in size also expected
- Big Hunting Creek study – no BKT response to BNT removals
    - Competition doesn't matter when you can't breathe

More info: https://www.usgs.gov/news/national-news-release/usgs-study-reveals-interactive-effects-climate-change-invasive-species

Literature cited:

(review) https://www.usgs.gov/centers/chesapeake-bay-activities/science/effects-introduced-species-native-brook-trout-guide

Fausch, K. D., and R. J. White. 1981. Competition between brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) for positions in a Michigan stream. Canadian Journal of Fisheries and Aquatic Sciences 38:1220-1227.
DOI: https://doi.org/10.1139/f81-164

> The authors demonstrated changes in brook trout microhabitat selection for resting positions following the removal of brown trout from a Michigan stream. This study provides experimental evidence for competition between native brook trout and introduced brown trout.

Wagner, T., J. T. Deweber, J. Detar, and J. Sweka. 2013. Landscape-scale evaluation of asymmetric interactions between brown trout and brook trout using two-species occupancy models. Transactions of the American Fisheries Society 142:353-361.
DOI: https://doi.org/10.1080/00028487.2012.734892

The authors used occupancy modeling techniques and demonstrated that brook trout occurrence probability decreases where introduced brown trout are present. They also demonstrated that the probability of brook trout occurrence decreases with increasing impervious surface area and decreasing forest cover.

Trego, Merriam, Petty. 2019. Non-native trout limit native brook trout access to space and thermal refugia in a restored large-river system.
https://onlinelibrary.wiley.com/doi/10.1111/rec.12925

Snorkeling surveys in restored pool habitats
Evidence that non-native brown trout displace bkt from thermal refugia and resting microhabitats

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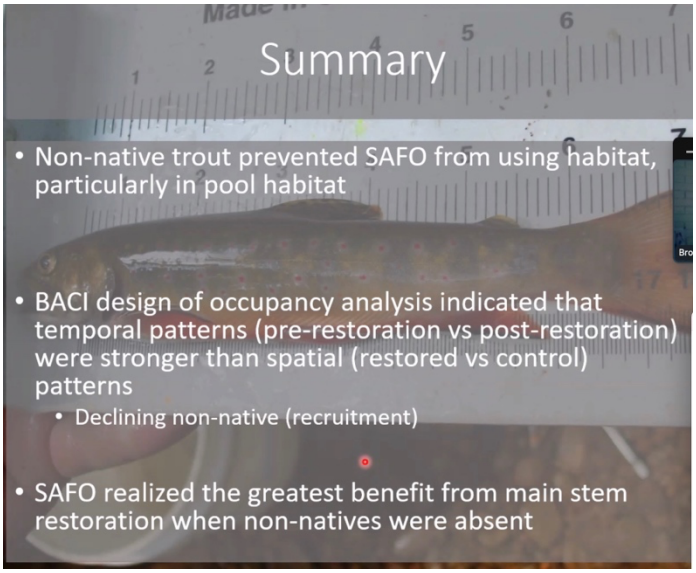
Trout competition in restored habitat.

Brock Hunstman, Fish Biologist with the USGS at the California Water Science Center in Sacramento.
Video link: https://youtu.be/8YI94jh1R2s?t=2740

- Background (Trego et al. 2019): In-stream restoration performed to improve habiatat; x vanes etc: stream narrowed, intent to increase velocity scour and intercept water table. Result: water temperatures in restored area were reduced in summer months. BKT who used restored corridor benefited in terms of growth (confirmed by tagging and stable isotope analysis). It's more than just movement through the corridor, it is actual use of the mainstem itself for foraging. Context: rainbow and brown trout are also there, so what does competition look like in restored habitat?

- How does presence of BNT influence ability of BKT to use restored habitat?
- Used a joint species occupancy model within a BACI sampling design
- Higher occupancy of BKT in riffle habitat while BNT and RBT occupy pool
    - Consistent in all treatments

- Temporal pattern in occupancy for all 3 species more so than spatial effect. BKT occupancy tended to increase post restoration in both ref. and restored sites. Non native fish showed the opposite: nonnatives decreased post-restoration
- Restoration may not have had as strong an effect on use of mainstem by BKT as did the decline of non-native species in mainstem (lack of interaction of spatial/temporal in BACI design)
- Conditional occupancy: no real use of any channel units when brook trout are occupying that habitat. But when bkt are not there, brown trout really like pool habitat. Interpretation brown trout present smaller brook trout from using same channel units and esp. pool habitat in mainstem.



- **Habitat restoration was only beneficial for native brook trout when non-native trout were absent from the restored sampling area**

Literature cited:

Hunstman, Merriam, Rota, and Petty. 2022. Non-native species limit stream restoration benefits for brook trout https://onlinelibrary.wiley.com/doi/abs/10.1111/rec.13678

Merriam, E.R. and Petty, J.T. (2019), Stream channel restoration increases climate resiliency in a thermally vulnerable Appalachian river. Restor Ecol, 27: 1420-1428. https://doi.org/10.1111/rec.12980

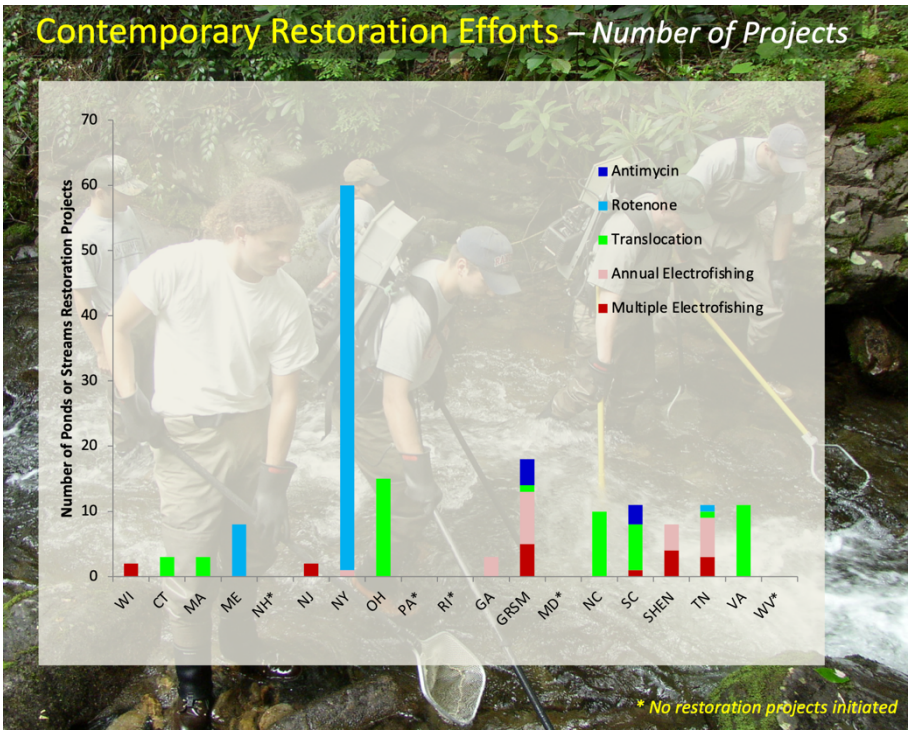
Trego, Merriam, Petty. 2019. Non-native trout limit native brook trout access to space and thermal refugia in a restored large-river system. https://onlinelibrary.wiley.com/doi/10.1111/rec.12925

Wood, D.M., Welsh, A.B. and Todd Petty, J. (2018), Genetic Assignment of Brook Trout Reveals Rapid Success of Culvert Restoration in Headwater Streams. North Am J Fish Manage, 38: 991-1003. https://doi.org/10.1002/nafm.10185

Restoration of brook trout across their native range using fish toxicants, electrofishing, and translocation: are we successful ecologically and socially?

Matt Kulp – Supervisory Fishery Biologist, Great Smoky Mtns National Park
Co-authors: Matt Kulp, Marcia Carter, David Demarest, Brian Eltz, Jim Habera, Patricia Hamilton, Fred G. Henson, Adam R. Kautza, Matthew Mitro, Anthony Rabern, Dan Rankin, Jacob M. Rash, Stephen Reeser, Jason Seiders, Curtis Wagner

Video link: https://youtu.be/8YI94jh1R2s?t=4220



- Survey and summary of removal and reintroductions performed.
- As of 2022, most eastern US states have attempted brook trout restoration, 5 have not.
- Rotenone was most used method followed by translocation to fishless.

Public perception generally favorable.

- Encourages agencies to publish the results
- Reeser – Introducton of YY non-natives for removal efforts?
- Kulp – may work in certain places
- J. Rash – needs a location that will grow YY fish

Pdf and excel file at:
https://easternbrooktrout.org/science-data/brook-trout-restoration

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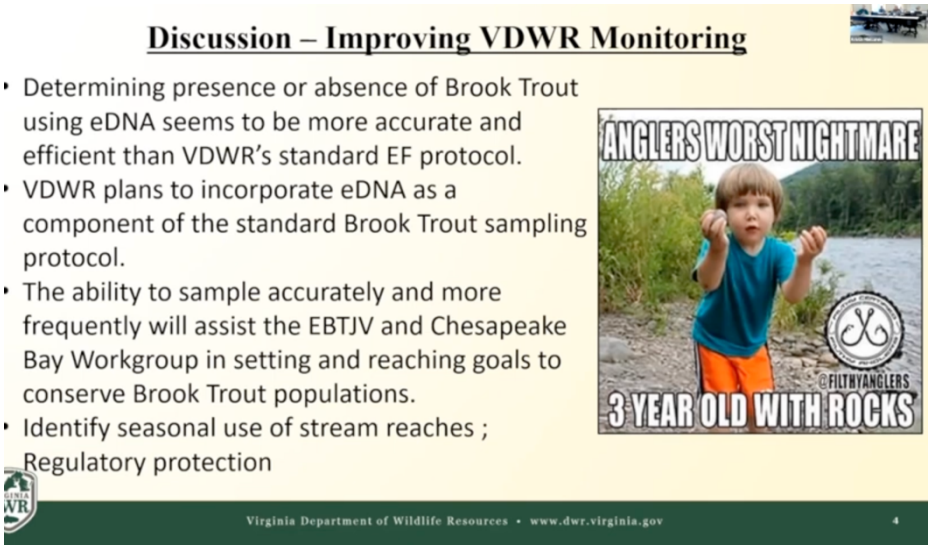
Application of eDNA w/ electrofishing methods to improve management of wild brook trout populations

Steve Reeser and Brad Fink Virginia Department of Wildlife Resources
Ashley Walters, Craig Roghair, and Colin Krause, US Forest Service

Video link: https://www.youtube.com/watch?v=4piQuIiKpGU

- Streams were sampled across the native range of Brook Trout in Virginia using both the electrofishing protocol and eDNA sampling to determine if the electrofishing protocol was accurate.
- Additionally, data from the VDWR Coldwater Stream database was examined to determine where Brook Trout populations may have been extirpated.
- Used Rocky Mountain Research Station Protocol
- Filter at least 5 l of water and freeze within 24 hours
- Looked for 3 markers
- 8 of 36 streams thought to have lost populations were positive with Brook Trout DNA
- Paired 41 sites – eDNA and electrofishing survey

- All 41 sites were positive for eDNA. However, standard electrofishing sampling only collected Brook Trout at 37 of these sites
- eDNA appears to be more efficient than standard electrofishing practices
- VA incorporating eDNA into survey program
- Will be used to detect population loses due to climate change
- Individual sample cost range: $50-$100
    - In ME $25 (Geof Day) Reach out to Tennyson(?)
- NCTC is running an eDNA course
- Group interest in more training/info



Barry Baldigo presented an excellent review of eDNA monitoring compared to electrofishing monitoring results as related to relative abundance.
https://www.tandfonline.com/doi/full/10.1080/00028487.2016.1243578

NCTC eDNA course 5/2/2022 5/6/2022 NCTC FWS-CSP2000a Emerging Topics in Conservation Science Workshop - eDNA DOI Talent Contact: emily_santamaria@fws.gov

Towards joint flow/temperature models for the northeast.

Ben Letcher, USGS population ecologist focusing on stream habitats and science communication.
Co authors Ben Letcher, Jenn Fair, Jeff Walker, Amrita Gupta, Tony Chang, Xiowei Jia
Video link: https://youtu.be/nhzYd-DgNcc

Question: how would your work improve if you had estimates of flow for tributaries/headwaters?
FLOW Is super important for growth of adult bkt (explaining variance in bkt growth?)
Can't use watershed area to predict flow. Ton of differences across tributaries and through time, and variability in runoff increases during drought. Better to use both flow and temperature –
Can we develop models for flow and temperature together?

Overall: improved characterization of climate refugia with temp and flow, help understand heterogeneity. Portfolio approach, having multiple kinds of habitats.

- Delaware River flow/temp deep learning model
- Temperature database – ecosheds
- Flow – no regional database

    - Using images to estimate flow
    - Need at least 1 year of images taken at least hourly
- How to get flow data from small streams?
    - Game cameras – relatively cheap
- Database – ecosheds flow photo explorer
- Without flow data – manual image pair ranking
    - Model score – adjustable relative flow (not absolute flow)

www.usgs.gov/apps/ecosheds/fpe
www.db.ecosheds.org
description of the brook trout occupancy model (not discussed) is here

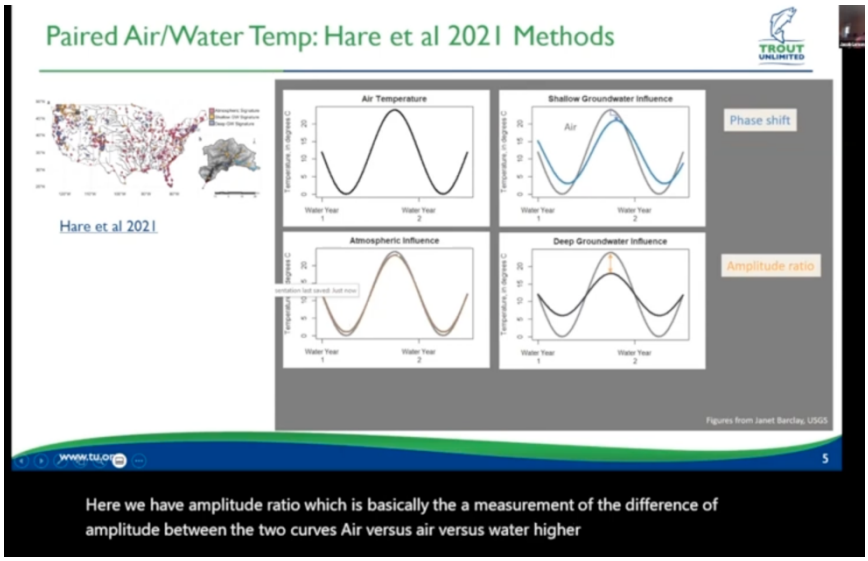
Literature cited:

Letcher BH, Hocking DJ, O'Neil K, Whiteley AR, Nislow KH, O'Donnell MJ. 2016. A hierarchical model of daily stream temperature using air-water temperature synchronization, autocorrelation, and time lags. PeerJ 4:e1727 https://doi.org/10.7717/peerj.1727

Air/water modeling of groundwater temps using infrared imaging

Jacob Lemon – Monitoring and Community Science Manager, Trout Unlimited
Video link: https://youtu.be/3EG99fKOGZA

- Where are thermal refugia?
- Paired air/water temp data – based on Snyder et al 2015
- Paired air and stream temperature analysis (PASTA)



https://cuahsi.shinyapps.io/pasta/

- Deeper gw may be more resilient to climate change. shallow groundwater is more vulnerable to temperature increase and depletion
- Paired air/water pilot study underway
- Thermal imaging to map coldwater inputs
    - Drone based data collection ($6500 + camera rental)

Literature cited:

Hare, D.K., Helton, A.M., Johnson, Z.C. et al. Continental-scale analysis of shallow and deep groundwater contributions to streams. Nat Commun 12, 1450 (2021). https://doi.org/10.1038/s41467-021-21651-0

Snyder C, Hitt N, Young J. 2015. Accounting for groundwater in stream fish thermal habitat responses to climate change. *Ecological Applications* **25**:1397-1419

Monitoring temp changes in BKT streams during stormwater events

Scott Collenburg, Senior Biologist, New Jersey DEP
Video link: https://youtu.be/5eSPV_8zf2k

- Stream temp monitoring – 242 sites
- 2018- 2020 20% of sites documented stormwater impacts
- Stormwater predictors – higher frequency of stormwater events predicted lower BKT occupancy
- Vaccarro and Malloy 2006 method to identify potential groundwater discharges
- Uses levelogger and GPS
    - Webinar is available on NCTC website

Literature cited:

Vaccaro, J.J., and Maloy, K.J., 2006. A thermal profile method to identify potential ground-water discharge areas and preferred salmonid habitats for long river reaches: *U.S. Geological Survey Scientific Investigations Report* 2006-5136, 16 p.
https://pubs.usgs.gov/sir/2006/5136/pdf/sir20065136.pdf

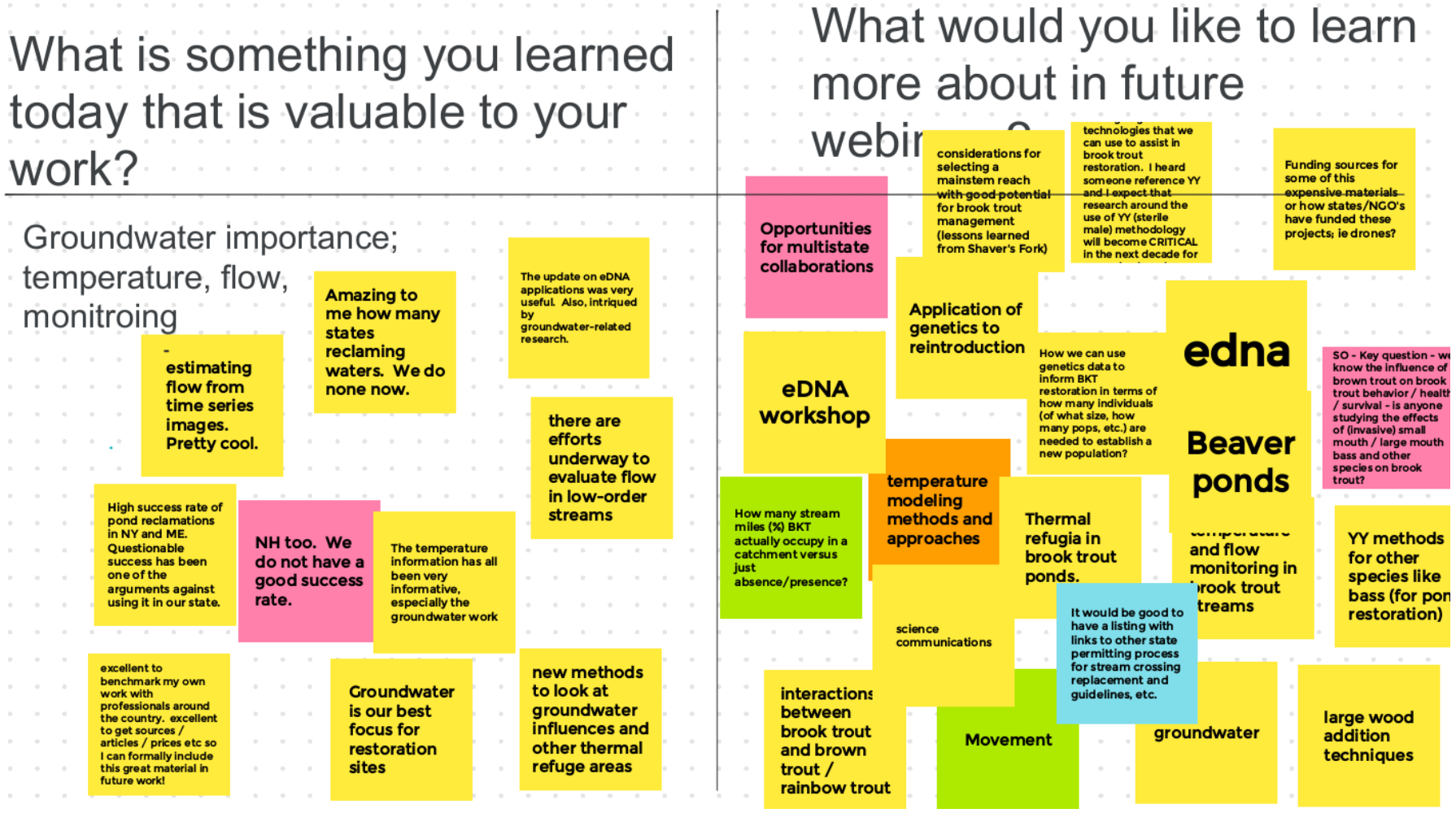
Snyder C, Hitt N, Young J. 2015. Accounting for groundwater in stream fish thermal habitat responses to climate change. *Ecological Applications* 25:1397-1419

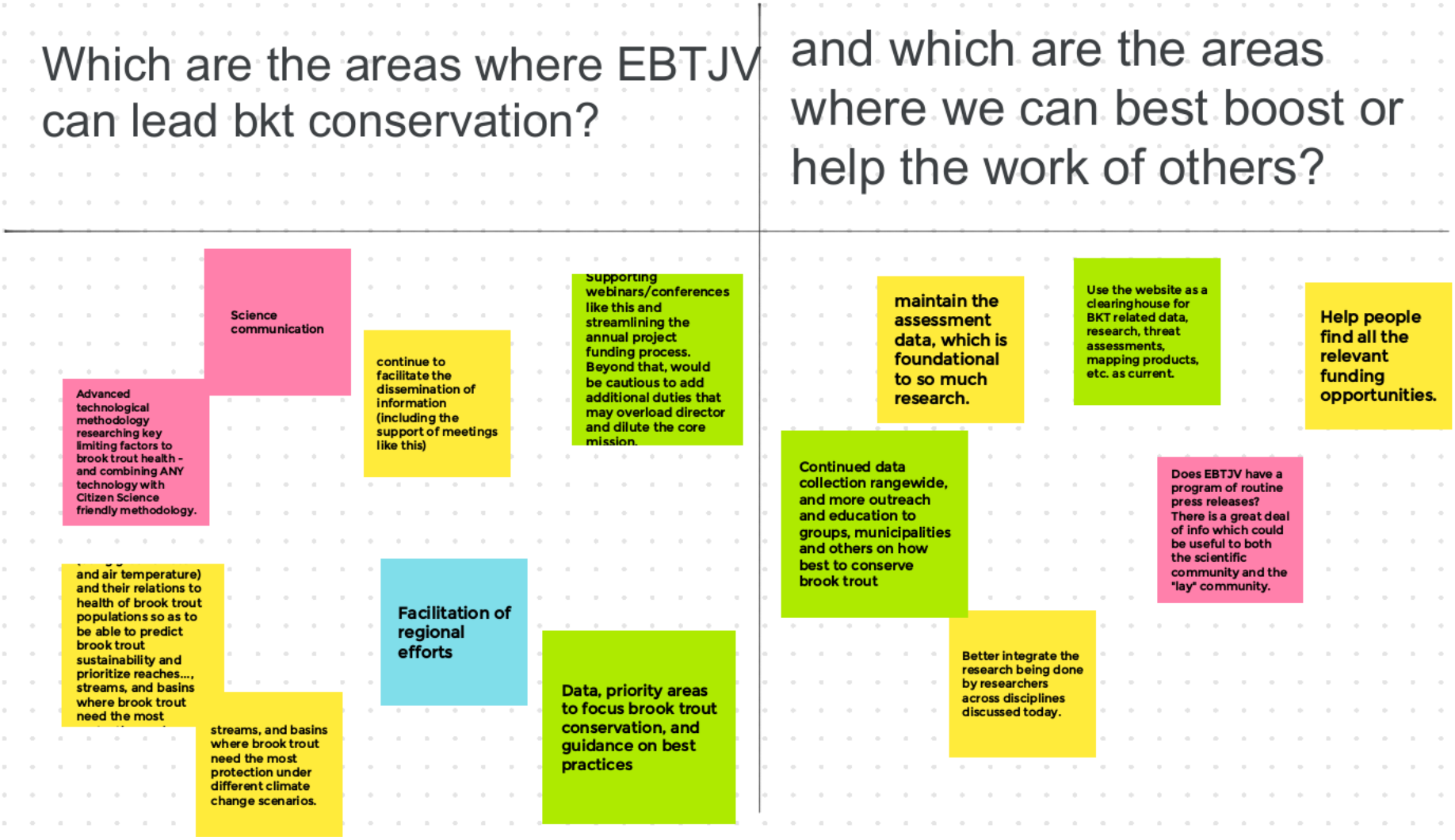
Johnson, Z. C., C. D. Snyder, and N. P. Hitt (2017), Landform features and seasonal precipitation predict shallow groundwater influence on temperature in headwater streams, Water Resour. Res.,53, 5788-5812,doi:10.1002/2017WR020455.
https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1002/2017WR020455

Kanno, Y, SE Climate Adaptation Science Center: Brook Trout Population Responses to Climate Variation Across the Southeast: https://secasc.ncsu.edu/science/brook-trout/

Jamboard: Lessons learned and future planning

https://jamboard.google.com/d/1Gys-OrNNwHlxeE_oA0f_gBgWESJkuA9H6gHn2-TzhhM/viewer?f=0




Which are the areas where EBTJV can lead bkt conservation?
and which are the areas where we can best boost or help the work of others?
Science communication
Advanced technological methodology researching key limiting factors to brook trout health - and combining ANY technology with Citizen Science friendly methodology.
continue to facilitate the dissemination of information (including the support of meetings like this)
Supporting webinars/conferences like this and streamlining the annual project funding process. Beyond that, would be cautious to add additional duties that may overload director and dilute the core mission.
and air temperature) and their relations to health of brook trout populations so as to be able to predict brook trout sustainability and prioritize reaches..., streams, and basins where brook trout need the most
streams, and basins where brook trout need the most protection under different climate change scenarios.
Facilitation of regional efforts
Data, priority areas to focus brook trout conservation, and guidance on best practices
maintain the assessment data, which is foundational to so much research.
Use the website as a clearinghouse for BKT related data, research, threat assessments, mapping products, etc. as current.
Help people find all the relevant funding opportunities.
Continued data collection rangewide, and more outreach and education to groups, municipalities and others on how best to conserve brook trout
Does EBTJV have a program of routine press releases? There is a great deal of info which could be useful to both the scientific community and the "lay" community.
Better integrate the research being done by researchers across disciplines discussed today.

What do we hope “we” can say about wild brook trout in 2122?

That they continue to persist as they have for millions of years prior.

RESTORATION WORKS

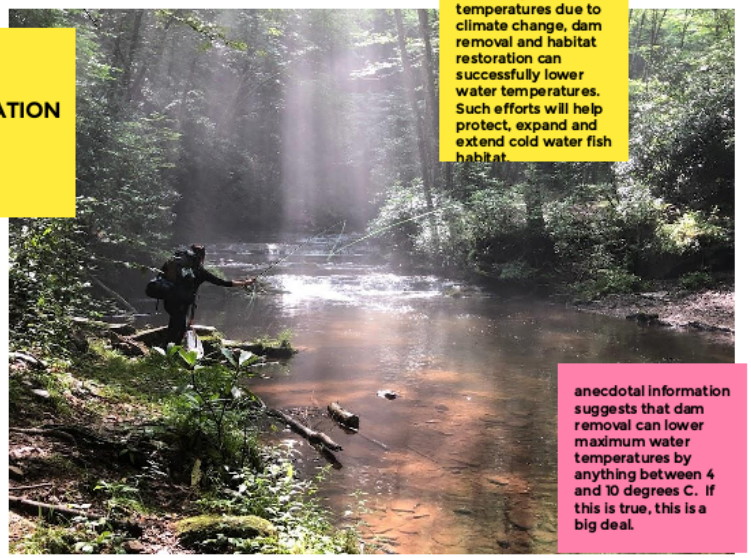
even in the face of increasing water temperatures due to climate change, dam removal and habitat restoration can successfully lower water temperatures. Such efforts will help protect, expand and extend cold water fish habitat

How many stream miles (%) BKT actually occupy in a catchment versus just absence/presence?

People value and protect them like they do deer, eagles, loons, etc.

Good for them is good for everyone-Promoting further restoration!!

successes of sea-run brook trout restoration on Cape Cod, it appears this has kicked off a whole bunch of additional restoration efforts in Massachusetts, and it is increasingly affecting programs in other states (coastal



anecdotal information suggests that dam removal can lower maximum water temperatures by anything between 4 and 10 degrees C. If this is true, this is a big deal.

These are tough fish that have hung on!

The best one...

They have increased their populations

that even more members of the general public are vested in this answer

They are still here and provide their history showing their resilience!!

Photo: D. Kazyak