2024 Tennessee Coldwater Meeting Highlights

“Preparing for Change”

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Tennessee Council

2024 Tennessee Coldwater Meeting Summary Highlights

"Preparing for Change"

The meeting, convened by the Tennessee Council of Trout Unlimited (TCTU) and hosted by the Great Smoky Mountain Chapter of Trout Unlimited (GSMTU), was held at in the Community Meeting Room of Lawson McGee Library in Knoxville, Tennessee on Saturday, February 24, 2024 from 10:20 a.m. to 4:00 p.m.

The meeting was opened with welcoming remarks by John Reinhardt, President of GSMTU and Ryan Turgeon, Chairman of TCTU. The meeting agenda consisted of a series of formal presentations followed by a Round Table Discussion and Question/Answer session with the speakers. The meeting agenda and presentations given at the meeting are available on the Tennessee Council of Trout Unlimited's website at www.tctu.org.

The titles, presenters, and their organizational affiliations of the speakers are listed in Table 1.

Table 1. 2024 Tennessee Coldwater Meeting Presentations and Presenters.

Presentation Title	Presenter	Presenter Affiliation
Preparing for Change (Keynote Address)	Sherrell Greene, PhD	Science and Technology Advisor **Tennessee Council Trout Unlimiited (TCTU)**
Preparing for Change	Matt Kulp	Supervisory Fishery Biologist **Great Smoky Mountains National Park (GRSM)**
Preparing for Change	Brandon Simcox	Rivers & Streams Program Coordinator **Tennessee Wildlife Resources Agency (TWRA)**
Sustainability & Fisheries	Jon Mollish	Fisheries Biologist **Tennessee Valley Authority (TVA)**
Tennessee Coldwater Meeting	Jeff Wright	Southern Appalachians Project Manager **Trout Unlimited (TU-SE)**

The ***Theme*** for the 2024 Coldwater Meeting was "***Preparing for Change***" – potential changes associated with **Tennessee's Two Principal Coldwater Challenges** as defined in Greene's presentation**:**

Tennessee Two Principal Coldwater Challenges

1. *Climate Change*
2. *Population Growth and Tourism*

KEYNOTE PRESENTATION HIGHLIGHTS (Greene)

Concerning Past and Future Annual Coldwater Meeting Focus: The Tennessee Coldwater Meeting (TCM) has been held on an ~ annual basis since 1991. The meeting was the first of its kind in the nation and has served as a prototype for other Trout Unlimited Councils and their Partners in other states. The TCM has served as the primary venue for Tennessee's Coldwater Stakeholders to convene for joint discussion and information exchange. The focus of the Coldwater Meeting in recent years has evolved to something approximating an annual update of the participants' activities since the last meeting. Emerging realities and understandings of 21st Century challenges – particularly Climate Change and Regional Population Growth – create a need for, and provide an opportunity to realign the annual meeting to enhance its value and impact as a *strategic* tool for dialog, consensus building, problem solving, decision making, and planning. It is with these realities in mind that future annual coldwater events will be rebranded "***Tennessee Coldwater Summits***". This change in name is consistent with the shift to a more *strategic* focus, as well as a heightened commitment to realizing meaningful *impact* from the event. Beginning this year, the program for each event will be structured around an explicit **Coldwater Summit Theme**, one or more **Coldwater Summit Framing Question(s)**, and one or more **Coldwater Summit Round Table Discussion Focus Question(s)**

Concerning Tennessee Climate Change – Past and Future: *Historical* data from the National Oceanic and Atmospheric Administration (NOAA) for the period 1900-2020 indicate annual average temperatures across Tennessee cooled slightly during that period. Annual average precipitation increased 10-20%, across Tennessee and Western North Carolina during that same period. The 2018 National Climate Assessment presented data for 1950-2016 depicting a significant trend toward fewer days each year with maximum temperatures above 95 °F, a significant trend toward more days each year with a minimum night time temperature above 75 °F, slightly longer freeze-free seasons each year, and a significant increase (~ 40-60%) in the number of extreme precipitation events each year. However, there is significant geospatial variability in the data from ~ three dozen data logging locations across Tennessee and ~ another

dozen monitoring stations across Western North Carolina. The frequency of episodic droughts in our region has also increased over several decades. Data from several dozen monitoring stations across the mid-South depict similar historic trends and variability patterns. Predictions for *future* regional climate change dynamics in the Mid-South Region of the U.S. appear to be converging to agreement that Tennessee's weather will be characterized by small increases in average temperature, but more frequent extreme peak daily temperatures; slightly increased frost-free growing season durations, more frequent extreme precipitation events and periods of drought. All of these predictions might be summarized (Greene's characterization) as: *modest changes in averages, but greater volatility in extremes*. Note: other speakers provided similar information and conclusions.

Concerning Regional Human Population and Tourism Growth: Tennessee is experiencing significant human population and tourism growth. Several of the fastest growing counties (up to ~ 5%/year population growth in some cases) are in East Tennessee. However, population growth is not uniform. The population of some counties is stable, while a few are experiencing modest population decreases. Note: Other speakers provided similar and consistent information in their presentations.

PARTNER AGENCY PRESENTATION HIGHLIGHTS

Each of the speakers who followed Dr. Greene were requested to address three specific ***Framing Questions***:

2024 Tennessee Coldwater Meeting Framing Questions:

1. *What is your organization's current view of the likely impacts over the next 25 years of the Two Principal Coldwater Challenges on the Coldwater resources your agency stewards?*

2. *How is your organization mobilizing to understand and respond to the Two Principal Coldwater Challenges?*

3. *What will you do differently than you have done in the past and how will you do it?*

Framing Question #1:

What is your organization's current view of the likely impacts over the next 25 years of the Two Principal Coldwater Challenges on the Coldwater resources your agency stewards?

GRSM (Kulp)

- Climate change and population growth/tourism dynamics will be similar to those presented by Greene in Keynote Presentation.
- "*Climate change impacts on stream fish distributions may have been over-predicted in previous studies*."
- The impact of Climate Change and Human Population/Tourism Growth on Great Smoky Mountains National Park (GRSM) Coldwater resources over next 25 years is expected to be "*Minimal to none*".
- Drivers for high-elevation Brook Trout fishery health are spatially *heterogeneous*, appearing to be dominated by stream elevation and bedrock morphology.
    - Higher elevation streams have been stable over past 25 years.
    - Siliciclastic streams show signs of improving water quality and increasing Brook Trout populations.
    - Brook Trout populations in basaltic and granitic watersheds have sharply declined.
    - "*Groundwater plays a pivotal role in creating fine-scale thermal heterogeneity within water sheds*."

TWRA (Simcox)

- Climate change and population growth/tourism dynamics will be similar to those presented by Greene in Keynote Presentation.
- More frequent and severe precipitation and drought events will negatively impact stream flows and hatchery performance.
- Climate change may induce changes in host-pathogen dynamics, stressor interactions pathogen and fish range expansion, invasive species populations, and fish susceptibility to aquatic diseases.
- Drought and temperature variations are already impacting hatchery operations, stocking programs, and the cost of hatchery/stocking programs.
- Flooding is already beginning to impact hatchery infrastructure and operations.
- Population growth and associated secondary impacts (e.g., development-driven habitat loss and fragmentation, increased runoff, and water withdrawals) have the potential to negatively impact stream flows, habitat quality and accessibility, and water chemistry.
- Per 2015 SWAP, Brook Trout are extremely vulnerable to the issues itemized in the previous bullet point.
- "*Thermal refugia is more likely to occur at higher elevation, higher baseflow, smaller watersheds, lower channel gradient.*"
- "*Population heterogeneity compels landscape prioritization.*"

TVA (Mollish)

- Climate change and population growth/tourism dynamics will be similar to those presented by Greene in Keynote Presentation. One hundred and thirty-two year record of rainfall in Tennessee Valley suggests amplitude of annual precipitation oscillations (i.e., variation in annual precipitation relative to long-term norms) are growing in frequency and amplitude.

TU-SE (Wright)

- DeWeber & Wagner model indicates significant loss of Coldwater is expected.
- New models (e.g., Kanno – see https://secasc.ncsu.edu/science/brook-trout/ and https://cascprojects.org/#/project/4f8c6557e4b0546c0c397b4c/5f62407d82ce38aaa236148b) indicate high-elevation streams in S.E. may be more resilient than originally predicted.
- Much Coldwater habitat exists on public lands faced with diverse multi-use pressures as population grows.

Framing Question #2:

How is your organization mobilizing to understand and respond to the Two Principal Coldwater Challenges?

GRSM (Kulp)

- Continuation of legacy Fish Population, Water Quality and Index of Biotic Integrity (IBI) data collection across Park.
  - Trout Population Abundance (since 1980s), Condition, Distribution
  - Water Quality Trends Across Elevation Bands (since 1993)
  - Primary sites have IBI sampling on 3-yr rotating basis; Secondary Sites have IBI monitoring on 5-yr rotation.
  - Bolstering data collection for future (more Onset HOBO monitors)
  - Publishing Data from above monitoring activities to support establishment of Resource Protection Goals & to inform scientific studies. (A typical study requires $30-40K/yr of funding for 2-3 years.)

TWRA (Simcox)

- TWRA's Coldwater Monitoring Program currently consists of electrofishing, creel surveys and temperature monitoring of 11 tailwaters and 20+ wild trout streams on an annual basis.
- TWRA's Brook Trout Restoration Program includes sampling of Brook Trout distributions, reintroductions (~14 stream miles in 6 years), and multiple stream connectivity projects. Reliance on historical conditions will no longer be sufficient basis for conservation decisions.
- Agency budgets could be constrained as result of shifting population value systems, posing resource allocation and program execution.

- TWRA recognizes the importance of maintaining relevancy among Tennessee's growing urban population. Agency continues to evaluate and grow its urban trout fishing programs to maintain relevancy.

TVA (Mollish)

- TVA has five ongoing efforts to understand climate change and respond to it:
  - Climate Resiliency for Aquatic Species (ongoing since 2014) – $4M spent on stream habitat enhancement since 2014.
  - Improvement of TVA's internal Climate Adaptation and Resilience Literacy (ongoing since 2011) – TVA internal effort to update guiding environmental policies, expand disclosure of information relevant to climate adaptation and resiliency, and continuous process improvement relative to environmental management processes.
  - River Management Climate Change Impact Assessment (ongoing since 2020) – utilization of inflow forecast modeling using data from 4th National Climate Assessment, and collaboration with Oak Ridge National Laboratory to proactively assess likely climate impacts on six key river management areas and associated mitigation options. The study will inform dialog and actions regarding tailwater fishers below TVA hydropower facilities.
  - Investment in low-carbon (nuclear & renewable) energy generation options.
- TVA is monitoring over 600 stream sites across all of its monitoring programs.
- In addition to above, TVA's water management actions are being informed by the results of a Flood Hazards and Water Reliability Study completed in 2020. The study provided insights regarding the scope and impacts of record historical droughts and extreme weather.
- TVA's (and their partners) "Climate Change Sentinel Monitoring Program" annually collects data on fish community (IBI), benthic macroinvertebrate, diatom community habitat, water quality, water temperature and height, air temperature and flow at 23 locations across Tennessee River and adjacent watersheds.
- In addition to the Climate Change Sentinel Monitoring Program, TVA has three other monitoring programs in place: Stream and Tailwater Monitoring Program, Reservoir Release Improvements Biological Monitoring, and Reservoir Vital Signs Fisheries and Assemblage Index.

TU-SE (Wright)

- TU-SE is working with Tennessee and North Carolina Councils have identified "Priority Waters" in both states as aid to focusing attention and resources for wild and native trout preservation.
- TU-SE is focusing efforts to restore stream connectivity by removing/replacing obstructive culverts.
- TU-SE is focusing on wood-loading of streams to improve trout habitat.

Framing Question #3:
What will you do differently than you have done in the past and how will you do it?

GRSM (Kulp)

- Monitoring regime will remain relatively unchanged except for placement of HOBO samplers to identify groundwater driven steam segments.
- GRSM will pursue more aggressive strategy for "*soliciting analyses of datasets*".
- Increased focus on indirect drivers (i.e., winter/spring floods)
- Increased focus on protecting groundwater quality and quantity
- Challenge will be keeping National Park Service leadership and public engaged and informed on issues and activities.

TWRA (Simcox)

- TWRA's Trout Management Plan will need to be proactively revisited.
- TWRA's partnerships will need to be expanded and strengthened.

TVA (Mollish)

- Question was not explicitly addressed in his presentation

TU-SE (Wright)

- Question was not explicitly addressed in his presentation

ROUNDTABLE DISCUSSION HIGHLIGHTS

Following the presentations, the four presenters, joined by Jim Habera (TWRA Region IV Fisheries Program Manager) participated in a Round Table Discussion moderated by Ryan Turgeon and a question/answer session with other meeting participants. The Round Table Discussion focused on three additional **Round Table Discussion Focus Questions**:

2024 Round Table Discussion Focus Questions:

1. *What do you view as your agency's most important challenges in developing a robust understanding of the Coldwater resource dynamic under your stewardship and in responding effectively to the **Two Principal Coldwater Challenges**?*

2. *What are the obvious "Next Steps" in collaborative planning, resource management, and "muddy boots" action to enhance the resilience of Tennessee's Coldwater ecosystems and fisheries in the face of the **Two Principal Coldwater Challenges**?*

3. *How can TCTU's 3100+ members assist you in preparing for and responding to the **Two Principal Coldwater Challenges**?*

Round Table Focus Question #1:

What do you view as your agency's most important challenges in developing a robust understanding of the Coldwater resource dynamic under your stewardship and in responding effectively to the Two Principal Coldwater Challenges?

GRSM (Kulp)

- Understanding the role of groundwater in Coldwater ecosystem resilience
- Accessing and assimilation of non-traditional data types and sources
- Integration of non-traditional subject matter expertise (SME) community integration

TWRA (Simcox)

- Public support
- Understanding the problem – specifically, the likely future impacts of climate change
- Time and funding constraints (only 7 staff members to cover all bases)
- Maintaining relevance in a world of changing values

TVA (Mollish)

- Public support
- Understanding the problem – specifically, the likely future impacts of Climate Change

TU-SE (Wright)

- SE Region resource allocation/competition with TU for limited resources
- Tapping various sources of "Climate Change Funding" while it is available

Round Table Focus Question #2:

What are the obvious "Next Steps" in collaborative planning, resource management, and "muddy boots" action to enhance the resilience of Tennessee's Coldwater ecosystems and fisheries in the face of the Two Principal Coldwater Challenges?

GRSM (Kulp)

- Maintaining legacy and ongoing activities discussed in presentation
- Greater focus on restoration
- Increasing utilization of volunteers

TWRA (Simcox)

- Already doing a lot of the right things. Need to accelerate efforts
- Bringing a greater focus on Valley Wild Trout Streams

TVA (Mollish)

- Enhancing the ability to be flexible and reorient programs and activities as results come in and knowledge is gained

TU-SE (Wright)

- Stream fragmentation due to roadway crossings and poorly installed culverts is a major issue in Tennessee's mid- and high-elevation Coldwater streams.
- Working more effectively to connect our members with TU Volunteer Coordinators

Round Table Focus Question #3:

How can TCTU's 3100+ members assist you in preparing for and responding to the Two Principal Coldwater Challenges?

GRSM (Kulp)

- More volunteers!

TWRA (Habera)

- TCTU could provide a Volunteer Coordinator for collaboration with TWRA as it does for collaboration with GRSM

TU-SE (Wright)

- TCTU could provide a Volunteer Coordinator for collaboration with TU-SE as it does for collaboration with GRSM

Miscellaneous Round Table Discussion Points:

- **Buffalo Spring Creek** – The reach of Buffalo Spring Creek below the hatchery mill dam that flows through Buffalo Springs WMA (~ 0.6 mi?) has untapped potential as unique trout fishery if sufficient resources were available to affect the necessary improvements. Similarities exist to Hatchery Creek near Jamestown, KY. Several issues related to operation of the hatchery, diversion of water at the mill dam overflow, habitat improvement, and fishery regulation enforcement would have to be addressed. Habera noted he has given the matter some thought. However no formal feasibility study has been conducted.

MAJOR OBSERVATIONS AND AGREEMENTS

1. Future annual Coldwater events will be rebranded the *Tennessee Coldwater Summit* commensurate with a shift to greater emphasis on collaborative strategic dialog, planning, action, and impact.

2. A *Tennessee Coldwater Summit Steering Committee* will be formed. The Steering Committee for the 2025 Tennessee Coldwater Summit will consist of: the TCTU Science and Technology Advisor (Chairman), TCTU Chairman (*ad hoc* member), TU National Southern Appalachians Project Manager, and one representative (each) from the GRSM, TWRA, and TVA. The 2025 Tennessee Coldwater Summit Steering Committee will consist of: Sherrell Greene, PhD (TCTU/Steering Committee Chair), Ryan Turgeon (TCTU Chairman/ad hoc member), Jeff Wright (TU/SE), Matt Kulp (GRSM), Jim Habera (TWRA), and a TVA Representative to be determined [**ACTION: TVA**].

3. TCTU requested and TVA (Mollish) agreed to explore opportunities for TCTU to engage with ongoing TVA-ORNL climate study.

4. The TCTU's Great Smoky Mountain National Park "Volunteer Coordinator" initiative has worked will. TWRA (Habera) and TU-SE (Wright) both expressed interest in the possibility of establishment of such a position for TWRA and TU-SE regional activities. TCTU will engage with both parties to further explore how a value-added position of this type can be established and staffed by TCTU Volunteers.

5. All parties can, and should strive to do a better job of enhancing the visibility of, and accessibility to information about and data generated by their relevant Coldwater activities (e.g., stream monitoring and sampling, studies and evaluations, etc.). This observation relates both to communications targeted at the General Public, as well as professional publications that might be of particular interest to Tennessee's Coldwater stakeholders such as TCTU's 3100+ members.

6. There is value to be gained by GRSM, TWRA, TVA, TCTU, and TCTU's individual Chapters providing links on their websites (i.e., a "web ring") to relevant Partner Agency documents. (See, for example, ADDITIONAL RESOURCES section below). This could be an idea for the Steering Committee to explore.

7. Potential future Coldwater Summit agenda items include: (1) the role of groundwater in Coldwater stream/river resilience; (2) Citizen Science Case Study from Clinch River Chapter.

8. A copy of these meeting highlights, along with copies of the five presentations given at the meeting, will be posted on TCTU's website, www.tctu.org.

ORGANIZATION ACTION ITEMS AND DUE DATES

TCTU

1. **Greene:** Coordinate with 2024 Coldwater Meeting Presenters to generate meeting highlights [***by Late April 2024***]
2. **Turgeon:** Upload 2024 Coldwater Meeting Minutes to TCTU website [***by Early May 2024***]
3. **Greene**: Convene 2025 Coldwater Summit Steering Committee Meeting [***by Mid-June 2024***]
4. **Turgeon**: Work with TCTU Executive Committee and Chapter Presidents to identify a TCTU Volunteer Coordinator to work with TWRA (Habera) and TU/SE (Wright) [***ASAP – no due date set***]

TVA

1. **Mollish:** Engage with Greene (TCTU) to coordinate TCTU observational access to TVA-ORNL climate study [***Mid-May 2024***]
2. **Mollish:** Inform Greene who will be TVA's 2025 Coldwater Summit Steering Committee Representative [***Mid-May 2024***]

ALL 2025 Tennessee Coldwater Summit Steering Committee Members

1. Give thought to candidate 2025 Tennessee Coldwater Summit Themes and Framing Questions [***Mid-June 2024***]

SOME ADDITIONAL RESOURCES AND RECOMMENDED READING

Great Smoky Mountain National Park Action Plan:
https://www.nps.gov/subjects/climatechange/upload/GRSM-CFP-Action-Plan-508compliant.pdf

TWRA Trout Management Plan for Tennessee 2017 – 2027:
https://www.tn.gov/content/dam/tn/twra/documents/fishing/trout/Tennessee-Trout-Management-Plan-2017-2027.pdf

TVA 2020 Natural Resource Plan:
https://www.tva.com/environment/environmental-stewardship/environmental-reviews/natural-resource-plan

Brook Trout Population Responses to Climate Variation Across the Southeast, Southeast Climate Adaptation Science Center, https://secasc.ncsu.edu/science/brook-trout/ and
https://cascprojects.org/#/project/4f8c6557e4b0546c0c397b4c/5f62407d82ce38aaa236148b

Restoring Southern Appalachian Brook Trout, U.S. Fish & Wildlife Service,
https://www.fws.gov/carp/story/2023-09/restoring-southern-appalachian-brook-trout