

Minutes of the AFS Southern Division Trout Committee Meeting
February 18, 2016
Oglebay Resort, Wheeling, West Virginia
DRAFT

The 2016 meeting of the American Fisheries Society Trout Committee (Southern Division) was called to order at 08:35 by John Damer (Committee Chair). The following members and guests were in attendance: John Damer (GA), Matt Kulp (GSMNP), Dave Kazyak (USGS), Tim King (USGS), Jacob Rash (NC), Tom Whelan (MO), Jim Habera (TN), Jason Henegar (TN), David Thorne (WV), Justin Spaulding (KY), Matt Sell (MD), Alan Heft (MD), Kyle Hartman (WV), Mark Hudy (Retired/EBTJV), Jeff Williams (VDGIF), Bill Kittrell (VDGIF), Jack Van Deventer (Microfish), Steve Owens (VDGIF), Steve O'Donnell (ODWC), Dustin Wichterman (TU), Chad Landress (USFS), Casey Weathers (Penn State), Seth Coffman (TU),

Chair Damer passed out the sign-in sheet and asked members to check their information on the membership list for accuracy. John extended his thanks to the West Virginia committee members for organizing and hosting the meeting at Oglebay Resort.

With 14 Trout Committee members in attendance, Chair Damer determined sufficiency of a required quorum of ten voting members.

Old Business

Approval of the 2015 Meeting Minutes: Chair Damer asked if committee members present had the opportunity to review the minutes from the previous year's meeting at Unicoi State Park and Lodge in Helen, Georgia. After a brief review, Matt Kulp made a motion to approve the minutes and Jim Habera seconded the motion. The motion passed unanimously without further discussion.

Membership List Update: Chair Damer passed around the current membership list and asked attendees to review and update the list, as necessary. John mentioned that the membership list had several changes including the retirements and removal of Tom Oldham, Dr. Ray Morgan and Monte Seehorn. Monty was one of the founding members of the trout committee and had received the distinguish service award in the past. **The committee discussed the possibility of recognizing Monty with some type of resolution or honorarium in the future.** Jim Habera made the suggestion that the committee needed to decide on a dollar amount to set aside for this type of recognition. John mentioned the promotions of Frank Fiss, Dave Dreves and Mike Mitchell. All three are still on the committee list but will not be as active as in the past. New members Kyle Hartman, Mike Joyce, Dave Kazyak, Tim King, Justin Spaulding and David Thorne have been added to the list. Introductions were made and a total of 24 were in attendance for the first day of the meeting.

Trout Committee Website Update: Jim Habera gave a brief update on the Committee's website (sdafs.org/trout) and stated there is information on how to join the committee on the site. Jim stated the website was up to date as of the commencement of the meeting. Jim solicited membership for additional photos and archived pages to add to the site. Jim added that if anyone had any comments or suggestions, feel free to contact him. Chair Damer thanked Jim for his service and continued excellence with keeping the website up to date.

Outreach: Chair Damer stated there were currently 31 members on the committee. John mentioned the fact that in order to be a member of the TC committee, you had to be in good standing with the Southern Division of AFS and/or appointed by your state agency. If anyone wanted to be a member they needed to send him a request by e-mail. John thanked David Thorne for recruiting some of the locals to join the committee. He mentioned the committee still does not have a lot of participation from academia. He also asked the membership to feel free to make contacts within their states with anyone at the local universities and colleges they feel would be a good addition to the committee.

MICROFISH Update: Jack Van Deventer updated the Committee on the status of the latest version of MICROFISH software package. For the last 8 years Jack has worked in the private sector. Prior to that, Jack worked in academia for many years. Jack's relationship with the TC started 15 years ago while he was a professor at Washington State University. The new version is MICROFISH 4.0, based in Excel, and Jack has put over 2 years of work into this version. MICROFISH is now being used in 54 different countries. The software package is useful for depletion, mark-recapture, condition factors, length-weight regression, error checking and many other functions. The software allows easy exports of data to other Microsoft Office database programs. There are three components that fisheries biologists can take advantage of: 1. the fisheries data entry facility, 2. dash boarding and reporting, and 3. fisheries functions in Excel. The new version of MICROFISH will accommodate all fisheries sampling types and strategies. The latest version is modifiable and expandable. Jack would like to see the program to be able to tie this information to economic data in the future. The expected release date is April 30, 2016 and will only allow for a single site. Efforts will be made to keep the onetime purchase price under \$500.

Southern Appalachian Brook Trout Genetics Project: Dave Kazyak and Tim King gave an update on the Southern Appalachian Brook Trout Genetics Project. This work stems from the 2005 TC committee position statement on Southern Appalachian Brook Trout Management. Currently, there is a very large data set with 21,000 genotyped brook trout representing 800 collections. Most of the analysis discussed was for brook trout south of the Mason- Dixon line. Almost all fish sampled have a unique genotype. The vast majority of collections are behaving as a single population. Most brook trout collections do not look like hatchery collections. There are roughly 17 North Atlantic Slope hatchery collections that have been genotyped. Across the southern range, most streams have shown little to no hatchery influence. There are a few exceptions in this range where it looks as though hatchery fish have influenced the population, such as in southwestern North Carolina. For the most part, hatchery collections are very genetically distinct from the other southern wild collections. Wild collections can also be separated out geography by watersheds. The objective of this project was to get a multi-locus perspective from this data. There is always going to be populations where hatchery strains were stocked over wild strains and some of those fish have persisted. Those populations could be a false negative.

Using FST value information, the genetic diversity within populations appears to be low to moderate. The genetic diversity among populations appears to be high. Most of the streams appear to have very little to no hatchery influence at all.

In summary, using hierarchical data, most of the populations are behaving as interbreeding populations are expected to. Hatchery influence is not wide spread and extensive, although it may

be very important locally. There is a tremendous amount of genetic variation among populations within water sheds.

Looking at landscape characteristics, there is no direct correlation between genetics and hatchery influence. There is a very strong correlation between latitude, longitude and elevation which could reflect other influences such as climate change and even glaciation.

Next steps moving forward involve DNA, siblings (sibship ?) and landscape analysis. The TC could then move forward with an update position statement.

Treasurer's Report: Treasurer Christy Graham (AR) called in and reported on the Committee's financial status as of February 18, 2016. The balance after the last meeting was \$5,755.77. There were two checks written for a total of \$356.60 made in disbursements yielding a balance of \$5,399.17. John Damer made a motion to approve the Treasurer's Report and Tom Whelan seconded the motion. The motion passed unanimously without further discussion.

New Business

Nomination and Election of New Trout Committee Officers: Chair-elect Tom Whelan (MO) will become the new Chair following the meeting. A motion was made to nominate Justin Spalding (TN) as the new Chair-elect and was seconded by John Damer. The motion was approved unanimously. Christy Graham will remain as Treasurer.

2017 Trout Committee Meeting: The Committee discussed potential options for the 2017 Trout Committee Meeting. Chair Damer mentioned the 2017 SDAFS meeting was going to be in Oklahoma and suggested the TC meeting be held separate. There were no objections from the members present. It was decided the 2017 meeting be held at the Lake Cumberland State Park Resort in May. The meeting was held there in 2002. Chair Damer made a motion to approve and Jim Habera seconded the motion. The motion was approved unanimously.

Regional Biosecurity Issues: Chair Damer led a discussion on current biosecurity issues with several states.

Arkansas (Christy Graham): State fish hatchery tested positive for IPN. All areas stocked by the state hatchery also tested positive IPN. Only waters stocked by the federal hatcheries were not positive. Stocking was postponed and the hatchery was quarantined for a period of time. Administration decided to resume stocking while making changes in areas stocked and stocking rates to protect water supplies of other hatcheries and management areas. Biosecurity measures were also revived and improved. This hatchery tested positive back in the 1980's.

North Carolina (Jacob Rash): All hatchery systems have tested positive for IPN. Infection was possibly spread by the transfer of fish from one facility to another. Whirling disease has been found in wild stream populations but not in the hatcheries. Two strains of gill lice (*Salmincola californiensis* *Salmincola edwardsii*) have been found on brook trout and rainbow trout. Didymo has also been found in their systems. They have begun testing their trout waters to identify where whirling disease and gill lice are present and how widespread

they are. This has served as a wakeup call to the issues of biosecurity. They want to have a clear message that is not contradictory to their neighbor's message pertaining to biosecurity issues.

Georgia (John Damer): They have not experienced a lot of problems yet. They are stepping up their biosecurity protocol and have tested their hatcheries for viruses and disease (all currently negative). They are testing their streams and waiting on the results. So far they have tested 7 of 15 streams.

Virginia: They tested positive for whirling disease 12 to 13 years ago in some of their streams but their populations have not shown any clinical signs. They have found gill lice in two streams on rainbows (one hatchery stocked stream and one wild stream). They are developing biosecurity protocols and doing preliminary testing in their facilities.

Tennessee (Jim Habera): Several of their larger wild trout streams have previously been screened and were negative for WD. Several of their private producers were also negative. They plan to test some of their tail water fisheries for whirling disease. There is not any evidence of gill lice in any of their fisheries. They do have didymo in some of their eastern Tennessee tail water fisheries. Jim stated there is some research that illustrates the upper temperature limit for didymo survival is 14 degrees centigrade and the lower pH limit is 6.0. Mat formation occurs under conditions of higher calcium, lower sulfate, and low dissolved phosphorus. This could be reason it is prevalent in tail water fisheries because the water is depleted in nutrients. It also appears the macroinvertebrates are not eating the didymo. Jim stated there have not been a lot of complaints from anglers pertaining to didymo, so far.

Jacob Rash (NC) led a discussion on the TC committee producing a position statement pertaining to biosecurity measures and concerns. Jacob would serve as the chair of the new subcommittee. The committee could include state veterinarians and others from the aquaculture industry. One of the first tasks of the committee would be to come up with a general status of what level all states are at concerning biosecurity issues, disease, regulations, etc.

Missouri (Tom Whelan): There are two things in Missouri that are on the radar, didymo and parasitic copepods. Maramec Hatchery has done some work using brook trout and brown trout as a biological filter that has shown some promise. Brown trout are used now, primarily due to MO not stocking brook trout (other committee members spoke highly of brook trout in their states). Our fish go through disease certification every year. To date, our results have been negative for whirling disease, IPN, IHN and other major disease concerns. Didymo has not been found in Missouri (although it is in Arkansas), but we continue to educate the public on potential spread of didymo. We do have regulations in place banning felt soled waders in our cold water streams and reservoirs.

Southern Division President, Dennis Riecke (Fisheries Coordinator at Mississippi Department of Wildlife, Fisheries and Parks) spoke to the TC committee on attending the AFS business meeting and on the promotion of native trout stocks. Dennis mentioned the important work Trout Unlimited does for wild trout populations. Dennis spoke on the benefits of using the parent society to benefit the TC committee in its operation.

Miscellaneous Biosecurity Items:

Big Picture—Develop a consistent approach to how everyone operates. There may be a need to conduct conference calls periodically. A subcommittee was mentioned and was discussed later.

USFWS Hatchery Assessments—These assessments could be used as a guide for protocols or watershed management.

Public and Interagency Cooperation—Public education is important and may need to be expanded. Cooperation with other agencies will be vital as well.

Future Issues/Feedback from upper management—Some states have done more with biosecurity protocols than others. All states need to be thinking of future issues and respond in kind with mentions and requests to upper management. These issues need to be pushed forward and taken seriously.

State Coordination of Regulations—States need to be consistent with each other in relation to biosecurity.

The committee might consider a publication submission to Fisheries Magazine advocating biosecurity measures.

The group was asked for volunteers for the biosecurity subcommittee. Jacob Rash volunteered to lead the committee. Jacob suggested the committee reach out to the aquaculture industry also.

It was suggested the committee produce a position statement.

There was a discussion on who are the primary targets with this information.

It was suggested the committee should contact the states to see where they are at with their biosecurity measures, who has jurisdictional control of regulations regarding biosecurity recommendations, and move forward after gathering this information.

Spread the message using grassroots and volunteer efforts.

Involve the Department of Agriculture by invitation to TC meeting.

Discussion related to the economic impact of invasive species to states.

East Coast Trout Meeting—Held approximately every 5 years. The last meeting was in 2012. There may be an opportunity in 2018 for this meeting to materialize.

Roundtable Discussion

Georgia DNR

Brook Trout Sampling

Ongoing brook trout sampling continued in Georgia to explore the relationships of population density and recruitment in association with the addition of large woody debris. Previous habitat enhancements (log structures) have been successful in boosting adult brook trout densities, but not young-of-year abundance. Future habitat enhancements should also incorporate measures to increase overhead cover for young-of-year habitat. We have plans to work with the US Forest Service to do large scale tree felling into three brook trout streams in 2016.

Brook Trout Genetics

Nearly 1,000 fin clips were collected from 30 brook trout streams across north Georgia and submitted to Dr. Tim King. Dr King's work will help determine the heritage (southern, northern or hybrid) of these brook trout populations. Results are pending.

Monitoring for Gill Lice

With the recent finding of gill lice in North Carolina, fisheries staff examined a representative sample of brook trout gills from all streams sampled. No evidence of gill lice was observed in Georgia in 2015.

Whirling Disease Monitoring

GA DNR sampled all 3 trout hatcheries for Whirling Disease and through a cooperative effort with the USFWS Warm Springs Lab have been deemed "whirling disease free." Also, trout sampled from 7 GA/NC border streams have been collected & prepped by GA DNR staff and await analysis by Warm Springs staff later this spring. The next step (progress pending) is to "partner" with north Georgia's private trout farms and through cooperative effort with Auburn University, sample and analyze those trout for whirling disease. Plan to work closely with neighboring states to understand/manage the WD threat.

Delayed Harvest Waters Update

A strong El Nino atmospheric/oceanic pattern in the winter of 2015/2016 has meant a very wet DH season in Georgia. Regularly scheduled DH stockings have still taken place, but those fish have been largely unavailable to anglers due to high flows. Anglers have been particularly vocal about the lack of DH fishing opportunities on the Chattahoochee River DH section below Morgan Falls Dam, and have asked if fish could be redirected to other locations (upper tailwater, small lakes). Previously, there has been little flexibility in annual stocking plans, but the draft stocking list for 2016 has been modified to give managers more options for a portion of DH fish (30% or 15,000 of Hooch DH fish).

Toccoa Tailwater Update

After acute thermal impacts occurred in 2010 (due to dam repair), recovery of this trout fishery was progressing well through 2014. However, monitoring in 2015 showed that trout abundance had declined. Plan to increase stocking rate and change timing of stocking to more closely resemble the stocking regime that was in effect prior to 2010.

Change to a Year-Round Trout Season

In the past, approximately 40% of Georgia's trout streams had been designated as seasonal. Fishing was only allowed from the end of March through the end of October each year. After a thorough biological assessment using data from Georgia and surrounding states, it was determined that the closed season was not biologically necessary to protect Georgia's trout resources. Extensive public scoping efforts found strong support for removing the closed season and making all designated trout

waters fishable year-round. The DNR Board Rules were amended to accept this change, and the new rule is now in effect. This winter is the first where all streams are open to fishing.

UGA Trout Angler Survey

GA DNR has contracted with UGA Coop Unit (2 MS students) to perform a comprehensive review of our trout program. Study will focus on determining who is fishing for trout, what they want from their angling experience, and are we doing the best we can to meet expectations with available resources. Study should begin in 2016.

License Restructuring

Georgia's resident hunting and fishing license prices have not increased in 24 years, are amongst the lowest in the nation, and are significantly below Southeast averages for the same privileges. Georgia DNR is proposing changes to recreational hunting and fishing license fees and structure. More than 5,000 Georgia stakeholders provided feedback at public forums and online surveys and there is 85% support among affected constituents for recreational hunting and fishing license prices set at, or above, the Southeast averages. Proposed legislation (HB872) would simplify the recreational hunting and fishing license structure, adjust resident recreational hunting and fishing licenses fees to more closely align with Southeast averages, adjust non-resident hunting and fishing licenses to minimize fee impacts to resident sportsmen and generate additional revenues, and return significantly more federal aid. Example: Trout stamp would increase from \$5 to \$10, and resident fishing license would increase from \$9 to \$15.

TENNESSEE (TWRA)

1. Statewide:

- *Statewide Trout Management Plan revision (for 2016-2026)*: This effort will include:
 - Development of a Southern Appalachian brook trout (SABT) management plan with goals focusing on:
 - a. Maintaining and expanding Tennessee's current SABT populations. We are currently developing a list of 10-12 restoration/enhancement projects with other SABT management partners.
 - b. Developing/enhancing protections for existing SABT populations.
 - c. Promoting angling opportunities for SABT.
 - Development of management plans for remaining tailwater trout fisheries (currently have plans for 5 of the 13 tailwaters).
 - Development of biosecurity guidelines, particularly for private trout producers and landowners managing private trout fisheries.
- *Licenses*: New license fees became effective July 1, 2015

2. Wild Trout:

- *2015 Beaverdam Creek creel survey*: Regulations changed in 2013 from 9" minimum size limit and 3-fish creel to 5-fish creel with no size limit (single-hook artificial only in both cases). Overall, 60% supported the current regulations, 76% had not changed the number of fish kept per trip, and 65% did not keep trout <9 in. (n=38). Only two anglers indicated they now regularly kept fish <9". Majorities did not change when stratified by angler group (wild trout \ stocked trout).
- *Potential wild trout stream surveys*: Qualitatively sampled 38 previously unsurveyed (or inadequately surveyed) streams during 2015 to check for wild trout or candidates for brook

trout restoration. Wild trout were found in 16 streams, 7 of which have brook trout. Three of the brook trout streams are in one subwatershed and had never been documented. There are now 111 brook trout streams with 146 mi. of distribution in TN.

- *Southern Appalachian brook trout propagation research*: Studies to evaluate propagation options using surface water, groundwater, and a municipal re-circulating systems, as well as in-stream performance of the fish produced (excluding groundwater system) are nearing completion.

3. Tailwaters:

- *Boone drawdown*: The Boone Lake was drawn down (10' below winter pool; 30' below summer pool) continued through 2015 and is expected to last to another 3-4 years (optimistically). The drawdown is to facilitate TVA's work to eliminate leakage associated with the earthen part of the dam. TVA monitored water temperature, DO, and several other parameters in the tailwater throughout 2015 and will continue to do so. There were no water quality issues in 2015.
- *Didymo*: Dr. Justin Murdock (TN Tech) is studying *Didymo* in TN waters (including GSMNP). None detected in Park, but eDNA samples positive for Cumberland Ri. and Obey TW, which are outside of where it was already known in east TN. Generally, 14° C seems to be the upper thermal limit and 6 is the lower pH limit. Mats form under conditions of higher Ca, low sulfate and dissolved P (<2 µg/L or ppb). Lakes serve as sinks for these, thus levels are favorable in TWs. Biomass decreases downstream as nutrient levels increase. Mats equate to higher benthic biomass, which shifts from EPT to midges/scuds. Macroinverts. are not eating *Didymo*, but other algae growing on the stalks. Acting more like an invasive than responding to a change to favorable conditions (not detected in the few historic algae surveys available).
- *Whirling disease screening*: Will be collecting rainbow and brown trout samples from the Wilbur (Watauga River) and South Holston tailwaters for WD screening. No plans yet to screen wild trout from smaller streams, but will be alert for (and asking anglers to report sightings of) potentially affected fish (e.g., with cranial deformities). WD test results for trout from two private producers in Carter Co. in cooperation with NC were negative.

Missouri

Wader Wash Stations at Trout Parks: Trout parks in Missouri are still using the wader wash stations as an educational tool to inform anglers about *Didymo* in Missouri. While there have been no confirmed cases of *Didymo* in Missouri, the wash stations provide the opportunity to educate anglers on the importance of being a possible vector in spreading this invasive algae. Missouri also uses the campaign of "Check, Clean and Dry" to remind anglers of the importance of equipment maintenance when using Missouri's varied fishing opportunities.

Biosecurity: Missouri hatcheries all have biosecurity plans in place to help prevent the spread of invasive species within Missouri. These plans help to identify activities that may spread invasive species, provide isolation areas at each facility (when possible), give guidelines on how disinfection of equipment is to be done, provide guidance on dealing with sick fish, and policies on fish transfers between hatchery facilities within the state.

Parasitic Copepod Study at Maramec: Maramec Hatchery staff has conducted studies using brown trout as a biological filter for parasitic copepods. Brown trout seem to have the ability to interrupt the life cycle of this parasite. This experiment comes on the heels of an earlier study with brook trout.

Eleven Point River strain evaluation: This study continues as staff look to improve the trout fishing experience on the Eleven Point River. Thus far in this multiyear study it appears that the Erwin fish lake strain is performing the best of the four strains being evaluated.

A “Plan for Missouri Trout Fishing” update: Missouri’s plan for trout fishing is approximately ten years old, and some of the action points have been addressed. An update to the plan will continually provide evaluation opportunities of the trout program in Missouri.

Kentucky

Hatchery Creek Update: This project is complete and set to open to the public on May 1, 2016. Hatchery Creek is a mitigation project with Wolf Creek National Fish Hatchery that uses the hatchery effluent to create over a mile of immaculately engineered trout habitat and fishing opportunities.

Brook Trout Reintroduction: Brook Trout are not native to Kentucky; however, streams have been stocked for over 100 years by various agencies and the public (albeit illegally). A handful of populations became established and naturally reproducing. These streams provide Kentucky anglers a unique opportunity to target Brook Trout in these remote and pristine streams. Parched Corn Creek was initially established in the 1960s by a gentleman that would haul Brook Trout in the back of his station wagon over 400 miles from Pennsylvania. Brook Trout thrived in Parched Corn and it was not uncommon to catch several fish over 8” per trip. However, Parched Corn Creek populations were eliminated or reduced to extremely low densities after a combination of summer drought and winter ice storms about 15 years ago. The canopy has since grown back over the stream and water temperatures are again at suitable levels for trout to holdover. In October 2015, 300 fingerling Brook Trout (Owhi strain) were stocked with the help of Eastern Kentucky University, Bluegrass Trout Unlimited, and other groups. If these stocking efforts are successful, other streams that have lost their Brook Trout will be re-stocked in parts of Kentucky.

Virginia

Stocked Trout Management Plan - The Virginia Department of Game and Inland Fisheries (VDGIF) recently completed drafting a management plan for its statewide stocked trout program. Key to this effort was research contracted through Virginia Tech as well as an intensive public involvement effort led by the university. Efforts at obtaining input from trout anglers and other interested stakeholders included public meetings and formation of a Stakeholder Advisory Committee. Research projects involved in the management plan effort included on-site surveys of anglers on various stocked trout waters throughout the state over a 2-year period. During the on-site surveys anglers were asked about their catch and harvest of trout during the trip as well as questions pertaining to their preferences and attitudes toward various aspects of the stocked trout program. Additionally, the Virginia Tech researchers surveyed lapsed trout permit buyers by mail to identify motivations and possible constraints to their trout angling activities. Based on the input provided by the public and the research projects, a Trout Technical Committee within VDGIF developed the

draft management plan, which is currently in the process of going before the Virginia Board of Game and Inland Fisheries. The draft plan and additional information regarding the process can be found at the following link:

<http://www.dgif.virginia.gov/fishing/trout/management-plan/>

Fish Health Issues – Shortly after the discovery of gill lice on trout in North Carolina, VDGIF received two unconfirmed reports of gill lice on rainbow trout, one from a creek in the New River drainage and one from a creek in the upper Tennessee River drainage. However, examinations of trout during VDGIF annual sampling in summer 2015 did not reveal the presence of gill lice on any fish.

Following the discovery of whirling disease affected fish in North Carolina, the NC Wildlife Resource Commission tested trout from a private hatchery in Virginia that provides trout for stocking in private waters in NC. These fish tested positive for whirling disease. This private facility also stocks trout into waters in Virginia, but future stocking authorizations will not be approved given test results. VDGIF staff have had a preliminary discussion on the need to revise the current stocking authorization process to address the fish health concerns.

North Carolina Wildlife Resources Commission

Salmincola spp.

Since September 2014, NCWRC biologists have documented new biological threats to salmonids within the State. Gill lice (Copepoda: Lernaeopodidae: *Salmincola*) have been found on Brook Trout and Rainbow Trout populations. Further taxonomic evaluations of copepod collections are ongoing; however, elsewhere within the United States, *S. edwardsii* and *S. californiensis* are known to parasitize salmonids of the genera of *Salvelinus* and *Oncorhynchus*, respectively. Taxonomic and molecular analyses of copepods are ongoing. In addition, anglers have been asked to report observations of gill lice during recreational outings, while the NCWRC will continue to sample Brook Trout populations across the mountains of North Carolina to document the distribution and status of gill lice.

Whirling Disease

On July 27, 2015, whirling disease was confirmed in Rainbow Trout collected from Watauga River – the first occurrence of the disease in North Carolina. Subsequent testing has identified the disease within Elk River. In addition, the NCWRC collected *Tubifex tubifex* (the worm host of the parasite) from its Delayed Harvest Trout Waters to test for the presence of *Myxobolus cerebralis* (the parasite that causes whirling disease); *T. tubifex* from Mill Creek and Watauga River were found to be positive. In addition, infected *T. tubifex* were collected above the NCWRC's Marion State Fish Hatchery. Currently, this facility is under renovation and biosecurity measures have been incorporated into the facility design. Trout have also been tested from NCWRC's trout production facilities – all were found to be negative. The NCWRC will begin testing of self-sustaining wild trout populations in spring 2016 for the presence of *Myxobolus cerebralis* and whirling disease. This effort will focus on collecting representative samples across a wide spatial extent.

Didymo

Researchers from Tennessee Tech University collected cells of the microscopic algae in Tuckasegee River while conducting regional surveys in late 2015 – the first time the organism has been documented in North Carolina. Additional research is needed to determine its prevalence in Tuckasegee River and throughout the State.

Trout Socioeconomic Evaluation

The NCWRC worked with Responsive Management to collect information from resident and nonresident license holders that fished for trout in North Carolina during 2014. Data generated from this study described angler preferences and expectations for trout fisheries management, while estimating the total economic impact and contribution of trout fishing to North Carolina's economy. In short, nearly 149,000 trout anglers fished in North Carolina in 2014, and the economic effects of the Commission's trout management program exceeded \$383 million.

Landowner Access Evaluation

Responsive Management contacted landowners during 2015 to collect data concerning landowners' views toward the NCWRC's Public Mountain Trout Waters program and angler access. Study results indicated the majority of respondents approve of fishing, but there is a considerable amount of landowner confusion regarding the NCWRC's Public Mountain Trout Waters program and their role as landowners. Opportunities exist to lessen this confusion to help maintain and obtain public fishing access.

Trout Distribution

The NCWRC continues its efforts to document the distribution of North Carolina's wild Brook Trout, Brown Trout, and Rainbow Trout populations. To date, over 600 Brook Trout populations have been identified. The NCWRC continues sampling efforts to identify new populations and evaluate assemblages associated with legacy data. In 2016, the NCWRC will have a two-person crew focused on these collection efforts.

Brook Trout Genetics

The NCWRC has been collecting genetic information for the State's Brook Trout in conjunction with trout distribution efforts. Results from allozyme testing indicate 38% of populations are of Southern Appalachian origin, 10% are of northern origin, and 52% are of mixed genetic origin. In 2011, the NCWRC began obtaining genetic information via the use of microsatellite DNA analysis, and currently, tissue samples from approximately 400 populations (> 7,000 individuals) are being analyzed. This approach will help to provide further insight regarding the State's Brook Trout and develop a genetically-based restoration framework. Summary information concerning contemporary molecular data will be provided in 2016.

Public Mountain Trout Waters Search

The NCWRC developed the Public Mountain Trout Waters Search to help anglers locate places to fish and/or learn more about the rules and regulations of trout fishing. This search helps anglers locate Public Mountain Trout Waters and display which regulatory classifications apply. Anglers can open a map and zoom to the selected water once they have made a list of locations or save lists as a PDF document to read at a later time. These interactive regulations can be found at www.ncwildlife.org/troutsearch. In addition, the NCWRC continues to update its trout webpage to

provide pertinent information concerning its trout management program in one place to help facilitate information exchange. The page can be found at www.ncwildlife.org/fishing/trout.

Eastern Brook Trout Joint Venture

NCWRC has continued to be actively involved with the Eastern Brook Trout Joint Venture (EBTJV). Currently, Doug Besler acts as Chair of the EBTJV Steering Committee and Jake Rash serves as the Co-Chair of the Conservation Strategy / Habitat Subcommittee.

Long-term Trout Monitoring

In 2012, the NCWRC initiated efforts to obtain routine data on wild trout populations. Initial long-term monitoring efforts were completed in 1996; however, recent data are desired to gain a greater understanding of wild trout population dynamics in waters managed by the NCWRC. As appropriate, the NCWRC will continue to seek to partner with fellow resource agencies to develop more robust data sets.

Persistence and Movement of Stocked Trout

NCWRC is working with North Carolina State University to investigate the persistence and movement of stocked trout. NCWRC manages approximately 1,000 miles of lotic resources via intensive, seasonal stockings of catchable-size trout. Anglers and managers perceive that catch rates significantly decline through time following a stocking event. This trend is expected in Hatchery Supported Trout Waters, where harvest is encouraged; however, declining catch rates are also observed in Delayed Harvest Waters during the period when harvest is not permitted. Increased understanding of stocked trout movement and survival after stocking events will allow managers to improve their management of stocked-trout resources. Field collections have concluded, and summary information will be provided in 2016.

Contribution of Stocked Brown and Rainbow Trout in Apalachia Reservoir

Located in the far western portion of North Carolina, Apalachia Reservoir has suitable trout habitat year-round and a clupeid forage base. Thus, the impoundment is a candidate for put-grow-and-take trout stockings and has the potential to produce large fish. NCWRC will evaluate the best size and species of trout for put-grow-and-take stockings in the impoundment. Initial trout stockings for this evaluation occurred in 2012. Additional information about this project can be found within the March-April 2015 issue of [Wildlife in North Carolina](#).

Evaluation of Advanced Fingerling Brown Trout Stockings in Bridgewater Tailrace

NCWRC has worked to establish a put-grow-and-take Brown Trout fishery in Bridgewater Tailrace since 1995. These efforts have been successful in establishing a fishery; however, recent NCWRC surveys and angler reports indicate that success has been intermittent. Long-term water quality data suggests that thermal bottlenecks in the system may limit trout survival. Alterations to the hydropower facility regulating this reach will allow the NCWRC to explore an alternate management regime for Bridgewater Tailrace: stocking approximately 10,000 advanced Brown Trout fingerlings (180–205 mm total length) following the period of a potential thermal bottleneck.

Use of Trail Cameras to Assess Angler Use of Two Remote Trout Streams in North Carolina

Journal of Southeastern Association of Fish and Wildlife Agencies (in press)

Abstract.— North Carolina Wildlife Resources Commission (NCWRC) manages approximately 6400 km of self-sustaining, wild trout streams, and recent trout angler opinion data indicated that

most trout anglers fish these waters. Given the popularity of wild trout angling, increasing understanding of angler use of these resources would benefit NCWRC. However, gathering this information can be labor intensive and costly, and as a result, very little is known about angler usage of wild trout resources in North Carolina. Recent advances in digital camera and motion detection technology provide a potential low-cost alternative to typical manned-creel surveys. In an effort to obtain angler use information for wild trout resources in North Carolina, trail cameras were stationed along two wild trout streams with only one or two access points. From 1 June 2013 through 31 May 2014, 225 and 129 angler trips occurred on the two streams, resulting in fishing effort estimates of 593.4 (SE = 15.3) and 491.5 (SE = 21.3) h. Mean angler group size was 1.4 (SE = 0.04) and 1.3 (SE = 0.05), and mean trip lengths were 2.6 h (SE = 0.2) and 3.8 h (SE = 0.2) for the two streams. Angler usage was highest during the summer months, with most daily activity occurring on weekends and holidays. Most anglers (> 90%) on both streams appeared to be adult, Caucasian males that used fly-fishing gear; in contrast, 36.4% of youth anglers used spin-fishing gear. Trail cameras provided a low-cost method of obtaining angler use and demographic information from these wild trout resources. Data obtained will aid NCWRC staff in making future management decisions regarding wild trout resources.

Trout Population and Temperature Monitoring within Nantahala River Bypass Reach, North Carolina, in Response to Recreational Flow Releases

Journal of Southeastern Association of Fish and Wildlife Agencies (in press)

Abstract.— Recreational flow releases were established within the Nantahala Bypass Reach through the Federal Energy Regulatory Commission relicensing of Duke Energy’s Nantahala Project. In 2012–2013, the North Carolina Wildlife Resources Commission, in conjunction with other resource managers, attempted to monitor the influence of recreational flow events on wild rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) populations within Nantahala Bypass Reach and Nantahala Tailwater. Monitoring included temperature loggers, fish population sampling, and fish held in live cages during the flow events. Temperature effects of release events were most pronounced during late summer and fall. Densities and standing crop estimates of wild trout >100 mm TL did not vary substantially among the sample dates; however, rainbow trout ≤100 mm TL were not present during the last sample date at either site. Although recreational releases have the potential to affect wild trout populations, and further wild trout monitoring is warranted, stocking trout in the bypass reach remains a viable management approach.

Collaborating with Stakeholders to Revise a Statewide Trout Management Plan in North Carolina

Journal of Southeastern Association of Fish and Wildlife Agencies (in press)

Abstract.—Diverse groups of anglers fish the variety of trout waters managed by the North Carolina Wildlife Resources Commission (NCWRC), and in 2008, these trout anglers contributed approximately US\$174 million to North Carolina’s economy. Given the importance of these coldwater resources and the anglers that utilize them, the NCWRC initiated a management planning process in 2010 that relied upon collaboration with trout anglers and resource management partners to revise its original Trout Management Plan adopted in 1989. Input meetings were held with staff representing multiple NCWRC divisions and other state, federal, and non-governmental resource management partners to review coldwater management topics. Five focus groups were held May–June 2011 prior to the revision of the Trout Management Plan to uncover, identify, and discuss key issues and concerns related to North Carolina trout management and obtain detailed information

about trout angler opinions. The themes that emerged from the focus groups included the importance of maintaining diverse trout fishing opportunities, the need to clarify existing regulations, the importance of accessible trout fishing information, the need to seek opportunities to secure and improve angler access, and the importance of regulations enforcement. Focus group participants represented trout anglers affiliated with organized angling groups, anglers unaffiliated with organized angling groups, and trout angling guides. Following the focus groups, the NCWRC convened an advisory committee to provide input throughout the development of the document to avoid conflict after the plan's completion. Ultimately, five critical program areas were identified including trout management, resource protection and habitat enhancement, research, angler access, and education and communications. Through this collaborative revision process the NCWRC was able to obtain a suite of qualitative data that provided rich, in-depth information early and often throughout the revision process that would not have been captured otherwise. As a result, these data were integrated successfully with existing scientific survey data (biological and socioeconomic) to craft five critical program areas and specific goals for each within the NCWRC's new Trout Management Plan. We recommend that similar processes to engage stakeholders early in the planning process be considered by fisheries managers to provide transparency to the management planning process, ensure that stakeholder views are represented, and foster a sense of ownership of the resource.

GREAT SMOKY MOUNTAINS NP

Restoration of Anthony Creek and Little Cataloochee Creek – We will use multiple electrofishing removals to restore 2.0 miles of Anthony Creek in 2016 with the assistance of TWRA staff and TU volunteers. Restoration of Anthony Creek will restore SABT back to the watershed for the first time since the 1950's. GRSM staff will also begin the prep work to restore 4.0 miles of Little Cataloochee Creek (NC) in 2017 using the piscicide antimycin. We will seek funding from the EBTJV to support this restoration effort.

Brook Trout Distribution Revisit Study – Between 1995 and 2002, GRSM staff mapped the distribution of trout throughout 42 of the 56 parks major watersheds. Thirty of the 42 watersheds surveyed had viable reproducing populations of SABT. In 2008, 12 GRSM streams were listed on the TN 303d Impaired Streams List due to low stream pH associated with acid rain. Revisits to the upper distributions of 35 streams indicated 17 streams (49%) lost >50m of range, 11 streams (31%) gained >50m of range and 7 streams (20%) indicated no change (\pm <50m). Eight of the 17 streams (47%) that lost range were 303d streams (loss of 54m-660m), versus 3 of the 11 streams (27%) that gained range were 303d streams (136m-389m).

Assortative Mating Study – Positive assortative mating appears to be occurring with Brook Trout in Leconte Creek due to any combination of mate preference based on phenotype, courting behavior, redd site preference and/or instream chemical cues and thresholds. We therefore hypothesize that intra-stream crossings will yield greater quantities of viable young of year compared to inter-stream crossings. In 2015, working with TWRA, USGS and the TN Aquarium brook trout were collected from each source stock. Each individual was PIT tagged to identify source and ID when crossed. Crosses began in October 2015 and continued through January 2016. Crossing success was highly variable due to low fecundity, differential male/female timing and low numbers of females. The aquarium will hold the fish an additional year to improve fish size and subsequent fecundity and try and complete remaining crosses on the fall of 2016. Very preliminary results to date indicate within stream fertilization rates (54-100%) are similar to those for crosses (70-100%). Eyed egg rates were

much lower for within (35-100%) and among (15-81%) stream crosses but so far appear to be similar.

Investigating the Occurrence of Metapopulation Structure within GRSM – Brook trout (*Salvelinus fontinalis*) genetic connectivity across two 4th-order headwater networks in GRSM provide a unique natural laboratory to investigate species level population dynamics among watersheds. Geographic, chemical and thermal constraints and competitive exclusion interactions within watersheds are thought to hinder successful migration among *S. fontinalis* populations. Fin clips were collected along 29 stream reaches in 2 sub-watersheds to determine if metapopulation structure were present. The presence of barriers throughout both systems provided an opportunity to compare metrics within and among streams with/without barriers. Preliminary results indicate a high rate of molecular variance within populations (77%) compared to among populations (23%). Although there is evidence of very limited gene transfer ($N_m < 3$), there is no preliminary evidence to indicate a strong metapopulation is present.

Developing Critical Loads of Nitrate and Sulfate in Watersheds of GRSM - Long-term impacts of acidic deposition on Great Smoky Mountains National Park include elevated inputs of sulfate and nitrate, the depletion of available base cations from soil, acidification of high elevation streams and extirpation of trout. Critical Loads and dynamic critical loads (CLs/DCLs) are useful tools to evaluate ecosystem response to controls on acidic deposition and help guide future air quality management. We evaluated the application of CLs/DCLs of nitrate and sulfate deposition for 30 streams in Great Smoky Mountains National Park (GRSM) using the hydrochemical model, PnET-BGC. Twelve of the streams studied are listed by the state of Tennessee as impaired due to low stream pH, and have acid neutralizing capacity (ANC) ranging from -14 $\mu\text{eq/L}$ to 60 $\mu\text{eq/L}$. Model results indicate a significant reduction (>40%) is still necessary to protect GRSM resources within the next 60 years. GRSM has recommended a resource protection goal (DCL), which is currently being vetted through the NPS and partner air/water agencies (i.e. EPA, NC DENR, TDEC). The reduction goal will be released in a formal letter to NC and TN air/water chiefs, which can then be cited by the EPA and other regulatory agencies when setting new air emission in the future. These emission reductions will not only benefit GRSM, but air, aquatic and terrestrial resources in the entire eastern United States.

GRSM Didymo Inventory and Disinfection Protocols - This research will provide an assessment of *Didymosphenia geminata* (Didymo) distribution in streams and tailwaters in/around GRSM, assess Didymo colonization potential based on habitat suitability and establish gear sanitization recommendations based upon bioassays. Stream water quality, channel physical characteristics, and hydrology will be used to rank streams on invasion susceptibility, and thus give a scientific basis to decisions regarding where efforts are best focused to limit its introduction and proliferation. This research will compare stream habitat within uninfected streams to regional streams that currently contain substantial Didymo accumulation. Preventing the spread of Didymo is the best defense against this invasive species. Currently there are no known methods to eradicate or control Didymo once it becomes established.

- To date, no Didymo cells have been found in >20 GRSM streams or within the Chilhowee Reservoir watershed.
- Didymo cells were found in Chilhowee Reservoir, Tuckaseegee River and Nantahal River – no mats were observed in these areas.
- We have confirmed Didymo presence nearby in the Clinch, Holston, South Holston, and Watauga rivers. The highest cell abundance and stream bottom mat coverage was in South Holston and Watauga.
- We assessed the efficiency of several readily obtainable chemicals to kill Didymo cells.

- Bleach - 100% death rate at 2% solution for 1 minute.
- Virkon – 100% death rate at 4% solution for 1 minute (test strips).
- Dawn liquid soap – 100% kill rate at 5% for 20 minutes.
- Salt – not effective.
- Low pH – not effective.

GRSM Online Creel Surveys Form – Each year, approximately 800,000 park visitor’s fish for brook, brown or rainbow trout in the park's 2,000 miles of streams. We invite anglers to use our Angler Creel Survey form to tell us about your experience while fishing in the park. The purpose of this survey is to provide information on the numbers and sizes of fish caught and harvested here. For more information, please check out the link provided below. (Link: <http://www.nps.gov/grsm/planyourvisit/creel-survey.htm>)

Evaluating the Success of Brook Trout Population Restoration Using Rainbow Trout Removal in GRSM – In this paper, we evaluated the success of BKT population restoration techniques via RBT removals in GRSM by examining BKT population responses. We analyzed three-pass electrofishing data collected before and after restoration at ten sites in seven streams. The success of BKT population recovery was evaluated based on the following three criteria. First, density and biomass of BKT YOY and adults during post-restoration years were compared to pre-restoration RBT populations. Although population size and structure of BKT and RBT may differ in GRSM (Larson and Moore 1995), we considered that a before-and-after assessment provides the most direct measure of population recovery. Second, density and biomass of BKT in restored streams were compared to other naturally allopatric BKT streams within the park. We considered that these allopatric populations represent the best available conditions against which to compare the success of restoration efforts. Finally, we examined a density-dependent effect on individual growth of BKT size classes (i.e. YOY and adults). The presence of density-dependent growth rates would indicate intra-specific competition (i.e. resource limitation) and that populations have recovered to a point near carrying capacity of the habitat.

The meeting adjourned following these presentations.