

Minutes of the AFS Southern Division Trout Committee Meeting
13 May 2014
Bennett Spring State Park, Missouri

DRAFT

The 2014 meeting of the Southern Division of the American Fisheries Society Trout Committee was called to order at 0832 by Matt Kulp, chair. In attendance: Jim Habera (TN), Jake Rash (NC), Tom Whelan (MO), Dave Dreves (KY), Spence Turner, James Civiello (MO), Bruce Drecktran (MO), Mike Mitchell (MO), Mike Shingleton (WV), John Damer (GA), Christy Graham (AR) and Craig Fuller (MO).

Following introductions of all those present, Chair Matt Kulp addressed general housekeeping items, including extending thanks to Tom Whelan and the Bennett Spring State staff for organizing and hosting the meeting.

With Alan Heft (MD) participating by conference call, Chair Matt Kulp determined that the required quorum of ten voting members was present.

Old Business

Chair Matt Kulp distributed copies of the minutes of the 2013 meeting in Nashville, TN. After a brief review, Tom Whelan made a motion to approve the minutes as written and Dave Dreves seconded. The motion passed unanimously without further discussion. The 2013 meeting minutes will be posted to the Committee's website.

Treasurer's Report: Jeff Williams (AR) recently accepted a new position in VA and has resigned as Treasurer. Christy Graham (AR) gave the report prepared by Jeff on 8 April 2014. Total income for the previous year was \$95.58 and disbursements were \$10.00, yielding a balance of \$5,810.77. Mike Shingleton made a motion to approve the report and John Damer seconded. The motion passed unanimously without further discussion.

Membership List Update: Chair-elect Jim Habera passed around the current membership list for attendees to update.

New Trout Committee Website: Jim Habera gave a brief update on the Committee's new website and requested any comments or suggestions for further improvement (e.g., additional photos or pages). The Committee's Proceedings document has been updated through 2013 and is posted on the site. An old version of the Committee's Procedures document is currently on the site and will be replaced with the most recent version.

MICROFISH Update: Matt Kulp advised that Jack Van Deventer has a beta-version of the EXCEL MICROFISH package ready and wants the Committee to test it. It can handle CPUE and mark-recapture data, as well as removal depletions. The final version would have a \$50-100 fee and several members expressed interest.

New Business

Nomination and Election of New Trout Committee Officers: A motion nominating Christy Graham as Treasurer was made by Spence Turner and seconded by Mike Shingleton. Christy was elected unanimously. Chair-elect Jim Habera will be the new Chair following the meeting. A motion nominating John Damer (GA) as the new Chair-elect was made by Tom Whelan and seconded by Dave Dreves. John was approved unanimously.

2015 Trout Committee Meeting: A discussion was held on whether to join with the 2015 Southern Division Spring meeting in Savannah, GA or meet separately. Potential alternative locations in NC, KY, and GA were mentioned. The Committee favored a separate meeting and a tentative location in north GA in May was agreed upon, with John Damer to provide details.

Southern Appalachian Brook Trout Position Paper Update (Genetics): The Committee discussed the need to update the genetics portion of its 2005 position paper on southern Appalachian brook trout management published in *Fisheries*. Continuing technological advancements and their applications to population genetics issues, along with more complete brook trout genetic inventories would make such an update beneficial to brook trout managers in the region. Rash, Habera, T. King (USGS), Kulp, Heft, and R. Morgan (UMCES) will work on this.

Southeast Monitoring Network (SEMN): Matt Kulp reviewed this aquatic monitoring effort, which includes some sites in GSMNP, and noted that duplication of effort with other monitoring programs would preferably be avoided. WV DEP also has some of this network's monitoring sites.

SDAFS Website Updates: Suggestions should be sent to John James. It is now somewhat convoluted to get to the Trout Committee website from the SDAFS site.

Miscellaneous: On behalf of the Committee, Matt Kulp recognized Steve Moore's retirement and thanked him for his many years of service. He also thanked Jeff Williams for his service to the Committee as Treasurer and Christy Graham for her service as interim Treasurer. Christy will replace Jeff on the Committee as AR's representative. Mike Mitchell (MO) will replace Tom Whelan on the Committee next year. There is also a new fish ecologist at Clemson University (Dr. Yoichiro Kanno) who wants to join the Committee. Spence Turner initiated a discussion about getting more attendance/participation at Trout Committee meetings by academic members and other governmental agencies and NGOs (e.g., USFWS, USFS, Eastern Band of Cherokees, WVU, VA Tech., etc.). It was suggested that a summary of Trout Committee status and happenings be prepared and sent to representatives of these groups to see if there is any interest in connecting/re-connecting with the Committee. It was also suggested that biologists and managers from the host state where the Trout Committee meeting is being held should be officially invited to attend.

Roundtable Discussion

Tennessee

Brook trout distribution

Tennessee's brook trout distribution survey was completed in 2013. There was a net loss of 6% (14.1 km) since the previous (1990s) survey, including 10 entire populations (12.7 km), only 2 of which were replaced by nonnative salmonids.

There was a net loss of 14.7 km (13%) in 48 streams open to nonnative salmonid invasion and with no restoration or enhancement efforts since the 1990s.

Thirty-seven of these 48 streams were also common to an earlier survey completed in the 1980s and sustained a smaller (5%) decrease in distribution. Only 5 streams (14%) consistently lost distribution during the intervals among the 3 surveys, while 8 (22%) had consistent gains and most (54%) exhibited a combination of losses, gains, and no change (i.e., distributional ebbs and flows) which appear to be flow related.

There has been no systematic loss of brook trout distribution; including recent restoration/enhancements, brook trout currently inhabit 228.9 km in 103 Tennessee streams, which is similar to the distribution totals from the 1990s survey (106 streams, 237 km).

Brook Trout will be listed as a species of greatest conservation need (GCN) in Tennessee's forthcoming State Wildlife Action Plan revision, primarily because of their sensitivity to potential habitat loss from climate warming.

Brook trout propagation (Sycamore Creek and Left Prong Hampton Creek)

- Currently have 2,048 fry at Tellico Hatchery (837 from Sycamore; 1,112 from Hampton), 1,614 fry at the TN Aquarium (1,064 from Hampton; 550 from Sycamore), and 89 at Erwin
- VIE tag fingerlings on ventral surface near anal fin (July 2014)
- Pre-stocking 3-pass depletion survey (July 2014)
- Stock fingerlings (August 2014)
- Begin post-stocking electrofishing surveys (late August 2014)
- Collect more broodstock (October 2014)

Tailwaters

The 14" – 20" protected length range (PLR) or "slot" on the Norris tailwater (Clinch River) continues to provide impressive results. The management goal there is to alter the population size structure to produce and maintain a mean electrofishing catch rate of at least 28 fish/h in the PLR. The catch rate for fish in the PLR reached 90 fish/h in the 2014 sample—the highest since monitoring began in 1996—and has averaged 48 fish/h since the establishment of the PLR in 2008 (pre-PLR mean is 22 fish/h). Over half (52%) of the 2014 catch was in the PLR and the catch rate for fish above the PLR (≥ 20 ") has finally responded, increasing to 9.5 fish/h—also the highest observed to date. Overall catch rate for fish ≥ 7 " has been relatively stable at between 150 and 200 fish/h for the past 5 years.

Results for the 16" – 20" PLR on the South Holston tailwater (S. Fork Holston River) have been more variable. The PLR was established in 2000 and the current management plan objective of ≥ 25 fish/h in the PLR (mean electrofishing catch rate) was achieved during 2005-2007. However, the catch rate fell to 8.5 fish/h by 2013, likely as a result of reduced growth and recruitment of some very large year classes (this is predominantly a wild brown trout fishery). The PLR catch rate increased to 15 fish/h in 2014, as did the proportion of 13" – 15" browns, indicating better growth and potentially better recruitment into the PLR in the next 1 – 2 years.

Georgia

Blue Ridge Tailwater (Toccoa River)

The Blue Ridge Tailwater trout fishery continues to recover from impacts resulting from TVA's Blue Ridge Dam Rehabilitation Project (2010 - 2012). The recovery of this fishery was again hampered by warm water in 2013, but not as a result of any dam repair work. Last year was one of the wettest on record. Because of high volumes of hypolimnetic water released from Blue Ridge Lake, coldwater storage was reduced. Temperatures never reached acutely lethal levels in the tailwater, but long-term stress probably limited potential recovery. Annual fall electrofishing samples saw catch rates and individual sizes that were similar to 2012. Brown trout continue to dominate what was once a rainbow-heavy fishery, perhaps because they are more tolerant of high temperatures. Anecdotal reports also suggest that landowners are no longer feeding at the high levels they were before 2010, limiting recovery of larger fish.

Lanier Tailwater (Chattahoochee River)

O'Rourke published a paper in 2013 SEAFWA Proceedings entitled Diet Composition of Wild Brown Trout and Stocked Rainbow Trout in a Coldwater Tailwater Fishery in North Georgia. Patrick is currently working on a manuscript dealing with growth and movement of brown trout during the same study on the Chattahoochee River.

Morgan Falls Tailwater (Chattahoochee River)

Due to high flows during the fall and winter of 2013/2014, anglers complained of low catch rates in the delayed harvest section of the Chattahoochee River near Atlanta. Electrofishing surveys were used to assess dispersal of stocked trout in this river section. Surveys showed sparse trout abundance even near stocking points. More research will be needed in the coming year for this section.

Wild Trout Monitoring

Relative abundance of wild trout in 13 streams has been monitored annually since 2009.

In 2013, the relative abundance of brook and brown trout was below average due to low contributions from a weak 2012 year class. The 2013 year-class of brook trout was about average and total population abundance should return to normal in 2014 as sub-adults recruit into adults. Rainbow trout abundance was about average in 2013. Although a recent EBTJV project (log structures) concluded in 2012, large woody debris continues to increase in both enhanced and reference sections of monitored BKT streams, possibly due to HWA influence (?).

Small Impoundments on Trout Streams

GADNR staff are providing technical assistance to a Trout Unlimited initiative which will assess thermal impacts of select small impoundments on trout streams. Many of the dams of interest were built before permitting was necessary, and do not include bottom-release structures. Surface water releases are clearly impacting trout streams to varying unknown degrees, but this effort will help prioritize future potential retrofit projects. However, funding for retrofits has yet to be identified.

Virginia (submitted by Steve Reeser)

Hatchery Trout

In July 2013 VDGIF contracted researchers at Virginia Tech to evaluate our stocked trout program and help prepare a management plan for our program. There is a PhD student and a Masters student

working on this three-year project. The project will involve public meetings, focus groups, mail surveys, and on-water angler creel surveys. VT along with VDGIF will be conducting angler creel surveys over two stocking seasons on several PNT stocked impoundments and streams in different geographic regions of Virginia. We will also be surveying our Delayed Harvest and Urban stocked waters. Focus will be on return to creel, angler's values, catch rates, and how stockings are announced. We will also be doing some electrofishing surveys of waters being creeled to determine retention rates of stocked trout. We hope to be able to make changes to the program that will increase angler satisfaction, participation, and license sales.

In late 2009 VDGIF began a steelhead stocking program in the Jackson River/Lake Moomaw system in western Virginia. Lake Moomaw is a two-story impoundment that has harbored a viable brown and rainbow trout fishery for 30+ years. We lost our source of McConaughy rainbow eggs from the western U.S. so have been trying steelhead (Chamber's Creek WA strain from Vermont) as a surrogate. One goal is also to create a steelhead "run" fishery in the Jackson River upstream of the reservoir. There is roughly 20 miles of river upstream of Lake Moomaw. To date we have stocked four cohorts of steelhead in the system. All fish have had their adipose fin removed to help distinguish them from other wild or hatchery rainbow trout living in the system. Steelhead smolts have been stocked directly in the reservoir and also dispersed upstream in the river. Cohort numbers have averaged 30K. Our monitoring has revealed very limited survival. We have been changing stocking location and size of fish at stocking to see if we can increase survival. We have seen some survival from the 3rd cohort that we stocked the greatest distance up-river from the reservoir. Intensive monitoring by our staff will continue in 2014 and the 5th cohort is currently in our hatchery system.

VDGIF has two pressure chambers in our coldwater hatchery system to produce triploid trout. We have plans to purchase two additional chambers and hopefully move toward 100% triploid trout in our coldwater hatchery system. We are currently stocking triploids (rainbow, brook, brown) in watersheds around the Shenandoah National Park, watersheds with known populations of SA brook trout, and in waters with wild brook trout populations (we are only stocking hatchery trout over a few marginal wild brook trout populations).

Wild Trout

The past two years VDGIF has been working with the USFS and researchers at the University of Massachusetts in using genetics to determine effective population size wild brook trout. This method is being developed and tested as a way of determining brook trout population strength and health. VDGIF is interested in this new technique as a way to monitor Virginia's wild brook trout populations. Current monitoring efforts only provide presence/absence and distribution information for wild brook trout.

VDGIF continues to be an active member of the Eastern Brook Trout Joint Venture. Work is currently underway with the EPA Chesapeake Bay Program and consultant, Downstream Strategies, on distribution and assessment project for brook trout in the Chesapeake Bay Watershed. Part of this effort will help build a tool/model that can determine where restoration or management efforts might have the most positive impact.

In 2011, VDGIF started collecting long-term stream temperature data from coldwater streams across Virginia. HOBO temperature loggers have been deployed in 50+ streams and are recording

temperature every hour. There is a mix of streams on public and private land, a different elevations and latitudes, and freestone and groundwater spring creeks. Many of these streams have also been monitored for water quality, macroinvertebrates, and fish for many years.

VDGIF is excited to have the opportunity to assess the physical habitat changes from in-stream habitat improvement in a wild brook trout stream. In-stream habitat structures were first installed in North River (western Virginia) in 2005. Working downstream more log/rock cross veins and J-hooks have been several times up to 2013. Over 40 structures have been constructed to date. Everyone's good fortune is that the U.S. Forest Service CATT conducted a BVET survey on this entire reach of North River in 2005 prior to any of the habitat work starting. The FS CATT will re-survey the same reach again in 2014. This is a golden opportunity where we will have actual physical habitat data to evaluate how this work has improved habitat. We also have a several-mile reach to use as a "control" that no in-stream work has been conducted that was surveyed in 2005. In 2012, VDGIF began some fish population monitoring in the restored reaches and the "control" reaches of North River.

North Carolina

Trout Distribution

The NCWRC continues its efforts to document the distribution of North Carolina's wild Brook, Brown, and Rainbow Trout populations. To date, over 600 Brook Trout populations have been identified. The NCWRC continues to finalize sampling efforts to identify populations; plus, populations identified within legacy data will be revisited to maintain current records.

Brook Trout Genetics

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 (> 6,000 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.

Trout Management Plan

NCWRC completed revisions to its trout management plan. Revisions were obtained via collaborative process involving staff, management partners, and a diverse group of stakeholders. The document can be found at the following address:
<http://www.ncwildlife.org/Portals/0/Fishing/documents/TroutManagementPlan.pdf>.

Trout Fishing Website

NCWRC began developing a webpage that provides 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 or
<http://www.ncwildlife.org/Learning/Species/Fish/Trout/TroutFishing.aspx>.

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 2013, 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 lentic 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.

Contribution of Stocked Brown and Rainbow Trout in Apalachia Reservoir

Currently, Apalachia Reservoir supports cool- and warm-water species but does not provide any significant recreational fisheries. 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.

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.

Assessment of Angler Use on Two Wild Trout Streams

Recent NCWRC trout angler opinion data indicated that a majority (68%) of trout anglers fish wild trout waters. However, little is known about angler usage of these waters primarily because obtaining angler use information from remote streams can be labor intensive and costly. Recent advances in digital camera and motion detection technology provide a potential, low-manpower alternative to more intensive creel surveys. In an effort to obtain angler use information for wild trout streams in North Carolina, two limited entry streams in Wilkes County were identified and angler use is being determined via trail cameras stationed along each stream.

Great Smoky Mountains National Park

Steve Moore's Retirement

Steve retired January 10, 2014 after 31 years of service. Thanks to all the TC members who attended his retirement party. Matt Kulp is now the Supervisory biologist and hired Alan Beach has been hired as a permanent technician to fill Matt's previous position.

Brook Trout Morphometrics Study

Casey Weathers finished his thesis analyzing the affects sex, elevation, and flow aspects have upon morphometrics and meristics to brook trout populations from 19 streams in the French Broad/Pigeon Watershed. Weathers examined 23 morphometric and 10 meristic characters looking for unique phenotypic polymorphisms. Results indicate significant evidence that the observed shape variation of unblocked brook trout analyzed is an artifact of sexual dimorphism coupled with phenotypic plasticity, thus resulting in brook trout from geographically isolated streams retaining similar but measureable divergent phenotypes presumably derived from no more than two common ancestral forms.

Assortative Mating Study (Dr. Jay Stauffer, Penn State University)

Positive assortative mating might 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. Underwater video analysis is being examined to assess whether each population exhibits courting behavior unique to its source population. Redd site locality, dimensions, habitat and chemical parameters are currently being modeled to determine the likelihood of assigning redd site preference. If assortative mating is not occurring, then perhaps crossings of populations from different streams do not have the same viability as instream crossings (intra-stream crossings will yield greater quantities of viable young of year compared to inter-stream crossings).

Detecting Environmental Barrier Effects to Genome Evolution of Metapopulations

Depleted aquatic habitat connectivity for brook trout in Great Smoky Mountains National Park is providing researchers with a natural laboratory setting to detect landscape barrier effects to gene flow. The overall objectives of the proposed research are to 1.) determine if brook trout from Goshen Prong and Little River sub-watersheds are functioning as a metapopulation; 2.) elucidate the effect barriers have upon landscape genetics in brook trout populations within the Little River watershed; 3.) assess the adaptive potential of brook trout by comparing near virgin against over logged watershed populations; 4.) identify novel genetic markers from high throughput sequencing to detect signatures of adaptation; and 5.) develop models to delineate appropriate management units, restoration stock source founders, nonnative species removal priorities, and populations genetics monitoring. We hypothesize that punctuated brook trout populations are compressed by environmental barriers which hinder gene flow and further decrease potential adaptive gene variation.

Physiological Effects of Low Stream pH on Brook Trout

Dr. Sue Edwards at Appalachia State University is working on a project looking at how low pH and associated pH declines during storm events affects the physiology of brook trout in mountain streams. Fish are highly sensitive to alterations in environmental pH with alterations as small as 0.1 pH unit having a detrimental effect on key enzyme functions. It has been suggested that fish

inhabiting streams with naturally low pH values may possess the ability to alter their physiological set points and adapt to those conditions, which may present a limitation when restocking streams with fish from alternate sites. By determining the environmental conditions and examining the animal's ability to regulate blood pH we can determine the threshold of environmental acid tolerances of this fish species. Understanding how stream acidification events affect their viability will assist to develop more effective stocking practices. For example stocking juvenile Southern brook trout into a stream that does not have similar environmental conditions could result in a physiological stress response leading to downstream migration, reduced growth, decreased reproductive successes and an impairment of swimming performance. Each of these factors, along with the initial pH shock, could lead to mortality.

Brook Trout Restoration Source Stock Effective Population Size Trends

The effect of multiple removals of SABB from the same location in a source stream has not been assessed, but do these removals affect the genetic integrity (i.e. effective population size) of the brook trout in these streams? The effective population size is defined as the number of individuals in a population that pass genetic information on to the next generation. Research on bull trout in the west has shown that if the effective population size is <50, biologist need to be concerned about the long term well-being of the population. Previous genetics research in GRSM has demonstrated that many of the brook trout populations already have an effective population size less than 50. GRSM fishery managers want to insure that brook trout restoration efforts do not have a detrimental impact of the effective population size of restored or source streams. Fishery biologists in GRSM are incorporating genetics information into future restoration efforts to bolster the chances of long term survival. The planned research will provide information that will help biologist in the park determine how to best insure that the effective population size of source streams and of restored streams is not negatively affected.

Relating Al concentrations in GRSM streams with accumulation of Al in fish otoliths to enhance management of brook trout in streams impacted by acid deposition

Dr. Michelle Connely at the University of TN is examining otoliths to decipher the complex relationship between water chemistry and Al as they pertain to biologically relevant environmental exposure. The assessment of metals in fish otoliths is a well-established technique, but has never been applied to investigate the accumulation of trace Al in fish exposed to elevated metal concentrations associated with atmospheric acid deposition. Results indicate that young trout living at high elevations in the Park are particularly susceptible to the physiological (e.g., reduced growth) and morphological effects of acid deposition. Preliminary data indicate that Brook Trout show greater levels of Al in their bones (otoliths and gill arches) relative to Rainbow Trout and may be exposed to Al levels that would otherwise be deadly to Rainbow Trout. Monitoring changes in otolith morphology and measuring trace Al in Rainbow Trout can be used as an early indicator of environmental toxicity for Brook Trout living in common watersheds.

GRSM Biotic Effects Report

Legacy water quality (1993-present), fish (1990-2009), and benthic macroinvertebrate (1990-2003) data from numerous sites were analyzed to investigate the effects of stream acidification on aquatic biological communities in GRSM. About 13% of GRSM monitoring sites over the 16-year monitoring period were below the regulatory pH limit of 6.0, which provides a general idea of the extent of stream acidification across the park. Although the literature reports an Al threshold of 0.2 mg L⁻¹, no adult brook trout were found in GRSM streams with Al levels above 0.09 mg L⁻¹, and

adult rainbow trout were not found in streams with levels above 0.13 mg L⁻¹. These concentrations may reflect a more precise water quality threshold target specifically for GRSM streams. Locations of stream survey sites in GRSM that exceeded pH, ANC, and total Al toxicological thresholds occurred at higher elevations. <https://irma.nps.gov/App/Reference/Profile/2207909>

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. We evaluated the application of CLs/DCLs of nitrate and sulfate deposition for 12 watersheds in GRSM using the hydrochemical model, PnET-BGC and reconstructed historical meteorological, atmospheric deposition and land disturbance data for study watersheds for the period 1850 to present for model hindcasts. Model hindcasts indicate that watersheds in GRSM are inherently sensitive to acidic deposition. Future model projections for GRSM show that decreases in sulfate deposition result in smaller increases in stream ANC compared with equivalent decreases in nitrate deposition. The timescale of watershed recovery to decreases in acidic deposition is multiple decades to centuries. Increases in soil pH associated with decreases in atmospheric nitrate deposition results in desorption of sulfate from soil to drainage water, delaying watershed recovery for decades from acidic deposition. Simulations suggest that simultaneous reductions of nitrate and sulfate deposition are essential to limit ongoing acidification to GRSM watersheds and they are more effective than individual reductions of nitrate or sulfate.

GRSM Didymo Inventory and Disinfection Protocols

This research will provide an assessment of *Didymosphenia geminata* (Didymo) distribution in streams within the Chilhowee Reservoir watershed and assess Didymo colonization potential based on habitat suitability. The project will also develop a field disinfection protocol based upon laboratory bioassays using a variety of disinfection products.

GRSM Online Creel Surveys Form

GRSM staff is in the final stages of an online angler creel form for trout anglers. Anglers will be able to fill this out after every trip with the completed form sent directly to a GRSM email box.

Kentucky

Cumberland Tailwater Update

Wolf Creek Dam repairs are nearing completion and related impacts to water levels at Lake Cumberland are now over. The lake is currently at top of power pool which is 723 feet. The Corps will monitor instrumentation to see how the dam responds to the higher lake level through but the expectation is that it will be operated normally from here on out.

As previously reported, the impacts of the dam remediation on the trout fishery over the last 5 years was dramatic, with declines in quality and number of both brown and rainbow trout. The water level of Lake Cumberland was partially brought back up in 2013 so conditions for trout in the tailwater were better than what we had observed in the previous six years. In addition to the normal brook, brown and rainbow trout stocking, extra trout were stocked in 2013 in an effort to boost the recovery of the trout population. These extra stockings consisted of 7,650 catchable-size brown trout and 12,930 15-18 inch rainbow trout (about 2/3 of these were triploid). The better water quality and extra stockings in 2013 were reflected in our fall nocturnal trout survey. The brown trout catch rate was back to a level equal to the long-term average and the rainbow trout catch rate

was above average. Most encouraging is that the extra stocking of large rainbows showed up well as electrofishing catch rates for 15-18 in. rainbow trout were the highest observed since 2008 and 3rd highest ever.

Brook trout, first stocked in the Cumberland tailwater in fall 2010, are doing well. The brook trout state record of 1 lb. 5 oz. that had stood since 1982 has now been broken three times in the last 10 months. The most recent record was caught on May 1st and weighed 3.05 lbs.

A manuscript was prepared on the effects of the 20 in minimum size limit/1fish creel limit regulation on brown trout in the Cumberland tailwater and will be submitted to the Journal of Fish and Wildlife Management.

2013 Trout Angler Survey

A Trout Angler Attitude Survey was conducted in summer 2013. This was a repeat of a similar survey last conducted in 2003. The survey results were double-key punched in-house, which has taken some time, but is currently ready for error resolution and analysis. This should be completed this summer. The response rate was somewhat disappointing at just under 50%, however the 781 completed surveys is more than adequate.

Seasonal Rainbow Trout Fishery in Cedar Creek Lake

Cedar Creek Lake is a 784 acre KDFWR-owned reservoir impounded in 2002. The lake is located in central Kentucky (Lincoln County). From conception, Cedar Creek Lake was designed and intended to be primarily a sport fishing lake as there is no swimming or water skiing and no jet skis are allowed. The lake has a 300 ft. buffer zone around the shoreline which is also owned and managed as a Wildlife Management Area by KDFWR. The lake already has tremendous fishing pressure during warmer months of the year. In fact, a 2009 creel survey showed that the lake had more pressure than at any other lake in Kentucky of a similar size or larger. Since Cedar Creek Lake is promoted and managed as a “fishing lake”, the KDFWR wanted to also provide anglers a winter-time fishing opportunity. Beginning in October 2012, Cedar Creek Lake became the largest reservoir that KDFWR has stocked with rainbow trout exclusively for a seasonal fishery. So, it is expected that the stocking of rainbow trout will extend the quality fishing at the lake throughout the winter months and hopefully spur increased fishing license and trout permit sales.

Previous temperature and dissolved oxygen profiles at Cedar Creek Lake have shown that suitable water quality conditions exist to support trout from about the beginning of October to about early May. A total of 21,000 harvestable-size (9 in) rainbow trout are stocked during the season at Cedar Creek Lake, with 12,000 fish being stocked in October and 9,000 fish in February.

This experimental seasonal rainbow trout fishery will be evaluated for three seasons. The primary objective of this study is to evaluate the angler utilization of rainbow trout and angler satisfaction with this new seasonal fishery. An exploitation study and a creel survey were conducted in the first year of the project to evaluate rainbow trout angling pressure and harvest. The exploitation study involved tagging 600 fish in each of the two stockings and then tracking angler return of tags. Anglers targeting rainbow trout in the initial season was low and the exploitation study showed only about 13.5% of the 21,000 stocked rainbow trout were caught and about 9% were harvested. The exploitation study and creel surveys will be repeated again in 2014-15 to determine if angler use of rainbow trout has increased. The results of this study will be used to make the determination of a

continuation of the rainbow trout stocking program at Cedar Creek Lake and whether this type of fishery could be successful in other warmwater reservoirs in the state or to cease stockings of this type.

Hatchery Creek Update

- Project funded through KDFWR Wetland and Stream Mitigation Program
- Partnering with Wolf Creek National Fish Hatchery
- Located on U.S. Army Corps of Engineers property
- \$1.95 million project cost
- ~6,000 linear feet of natural channel design
- Focus on trout spawning habitat
- Encountering permitting delays. Now expect to break ground in summer 2014
- Fishable in 2015
- The KDFWR commission passed artificial baits and catch and release only regulations for this new section of Hatchery Creek.

Questions

Any other states experiencing declining popularity and fishing pressure on once popular year round reservoir trout fisheries?

Missouri

Eleven Point River (Blue Ribbon Trout Management Area) Strain Study

We are currently working through step 3 (of Phase 1) of the project plan. The two main objectives of the study are:

1. Maintain a fishery of catchable-sized Rainbow Trout (RBT) within the Eleven Point River Blue Ribbon Trout Area (BRTA). This will be accomplished by increasing the current estimated first-year survival of 5% to at least 10% first-year survival of stocked fish within the BRTA.
2. Provide a “wild-type” fishing experience in the BRTA of the Eleven Point River through catch of fish with a long residence time. By stocking different strains of trout or smaller trout in higher numbers, fish surviving to a catchable size will more closely mimic wild fish in appearance and behavior. This will provide anglers with a better experience while saving MDC rearing costs.

Phase 1: Experimental strain evaluation using catchable-sized fish.

1. During 2010, 5,300 catchable-size (12-14”) RBT were stocked into the Eleven Point BRTA as in previous years. These fish were the Eagle Lake strain. The Eagle Lake strain originates from a single site, Eagle Lake (CA), and is considered long-lived and tolerant of alkaline conditions.
2. Catchable-sized RBT (5,500 total consisting of 3,500 MO fall RBT and 2,000 NF♂ × MO♀ crosses) were stocked in 2011.
3. The strain evaluations began with the initial stocking in 2012 and again in 2013. The final stocking will be July of 2014. The strains were selected after extensive literature review, both peer-reviewed and gray (incl. state and federal reports), speaking with several trout

biologists and hatchery managers around the country. The strains suggested for the initial evaluation (2012 – 2014) were:

- a. Fish Lake (Erwin National Fish Hatchery, Erwin, TN)
- b. Eagle Lake (Erwin National Fish Hatchery, Erwin, TN)
- c. McConaughy (Ennis National Fish Hatchery, Ennis, MT)
- d. North Fork (North Fork of the White River males will be used to cross with MO RBT females, dependent on availability). Milt from males will be collected from the field, with no transfer of male broodstock.

To date, results have been mixed at best. Earlier results show the Fish Lake strain seems to fare a little better than the other three strains. If the evaluation of different RBT strains fails to provide a strain for stocking that exhibits first-year survival rates of $\geq 10\%$ in the Eleven Point River, we will request fingerling RBT (3-4" TL) to be stocked annually beginning in late May 2016 according to Phase 2 of the Eleven Point River trout evaluation. Since "hatchery conditioning" of RBT may be decreasing survival of stocked catchable sized RBT, stocking fingerling RBT may reduce this conditioning and increase survival in the river.

Maramec Spring Hatchery Parasitic Copepod Study

Maramec Spring Hatchery has been plagued with an infestation of the parasitic copepod, *Salmincola californiensis* for many years. Although usually not fatal in the wild this parasite is very prolific and detrimental in hatchery situations. The high density culture techniques used in our cold-water hatcheries lead to severe outbreaks at Maramec Hatchery causing chronic mortalities. Highly infected fish with 50 copepods or more are weak and also aesthetically unpleasing to anglers. The number one goal of the Missouri Trout Plan is to provide anglers with quality trout fishing. Transferring fish infected by this parasite to uninfected waters is now illegal. Fish from Maramec Hatchery can only be stocked in the Maramec drainage. Attempts made in the past to remove the parasite from the hatchery were unsuccessful. Laboratory and commercial hatchery trials done by John C. Modin and Teresa M. Veek on the Lower Merced River demonstrated that Brook Trout *Salvelinus fontinalis* effectively removed the copepodid larvae from the water and reduced the infestation by more than 89%. Maramec Hatchery staff conducted a study modeled after the one done by Modin and Veek using a population of Brook Trout as a biological filter to remove the copepodid larvae. The results showed that the use of Brook Trout as a filter to be effective in keeping Rainbow Trout relatively copepod free. Brown Trout have also exhibited the same capabilities as Brook Trout and Maramec Hatchery staff is now in the process of using Brown Trout as the filter. Brown Trout are stocked in the management area below Maramec Park; therefore these fish can be utilized and stocked whereas the Brook Trout could not.

Didymo

The Missouri Department of Conservation (MDC) continues to encourage trout anglers and others to help prevent the spread of "didymo" (*Didymosphenia geminata*) or "rock snot," to Missouri's cold-water streams and rivers. The Missouri Conservation Commission approved a regulation change banning the use of porous-soled waders or footwear when fishing in trout parks and other specific trout waters back in March of 2012.

To help reduce the spread of didymo, MDC has also been reminding anglers to: **Check**, then **Clean** or **Dry** their waders and fishing gear.

- **Check** all gear and equipment and remove any visible algae. Dispose of algae by placing it in the trash, not by putting it down a drain or into bodies of water.
- Then **Clean** all gear and equipment with a solution of 2-percent bleach, 5-percent saltwater, or dishwashing detergent. Allow all equipment to stay in contact with the solution for at least three minutes. Soak all soft items, such as felt-soled waders and wader boot cuffs, neoprene waders and life jackets, in the solution for at least 20 minutes.
- Or then **Dry** all gear and equipment for at least 48 hours by exposing it to sunlight.

To help anglers clean their waders before entering Missouri trout streams, MDC installed wader wash stations at Missouri's five cold-water trout hatcheries: Bennett Spring State Park near Lebanon, Montauk State Park near Salem, Roaring River State Park near Cassville, Maramec Spring Park near St. James and Shepherd of the Hills Hatchery by the upper portion of Lake Taneycomo near Branson.

These stations have also proven to be a good educational tool in spreading the word about didymo.

Zebra Mussels

Zebra Mussels are present in Missouri waters. MDC continues to use the protocols put in place several years back to reduce the chance of contamination to our hatchery facilities or spreading to uninfested waters.

A Plan for Allocation and Stocking of Trout in Missouri

Fisheries Management Biologist Craig Fuller gave a brief summary of the Department's "Plan for Allocation and Stocking of Trout in Missouri". The main propose of this document is to provide a consistent framework and overall guidance for trout stocking conducted by the MDC. Managers should utilize, in a consistent, efficient and equitable manner, these stocking rates to distribute the limited number of trout available for stocking in Missouri. The result will be improved trout fishing for Missouri's anglers, furthering our goal of providing ... *the highest quality trout fishing experience that can be offered.*

Arkansas

Personnel

The AGFC Trout Management Program has recently undergone some personnel changes. Jeff Williams recently left AGFC to pursue another job opportunity in Virginia and Christy Graham was promoted into his position. The TMP also had a vacancy in the assistant biologist position (which was Paul Port's position) that has now been filled by Kyle Swallow.

Bull Shoals and Norfolk Tailwater Minimum Flows

Minimum flow on Bull Shoals and Norfolk Tailwaters has been implemented. A target minimum flow of 300 cfs was authorized at Norfolk and involves an increased release of 185 cfs on top of the current minimum flow of 115 cfs resulting from the house unit, dam leakage, and outflow from the Norfolk National Fish Hatchery. The target minimum flow at Bull Shoals is 800 cfs and requires an additional release of 590 cfs on top of the existing 210 cfs from the house unit and dam leakage. The reallocation of storage for minimum flow increased the conservation pool elevation on Norfolk

Lake by 1.75 feet and on Bull Shoals Lake by 5 feet. (More detailed descriptions of the minimum flow projects can be found in the SDAFS TC 2013 meeting minutes, Arkansas Round Table).

Greers Ferry Growth and Survival Study

AGFC initiated a growth and survival study early last year on the Greers Ferry Tailwater to aid in evaluating the success of management strategies implemented in 2006 as a management plan for this fishery was drafted. The study involves the marking of seasonal cohorts of catchable rainbow trout and catch-curve analysis to estimate survival and growth parameters. Unlike most of our other fisheries in Arkansas, the brown trout fishery in Greers Ferry Tailwater is a totally self-sustaining. Therefore, brown trout have been collected and implanted with PIT tags in the field seasonally. The robust design in Program MARK will be used to analyze subsequent recapture data. We hope to be able to present these results at the 2015 committee meeting.

Greers Ferry Creel Survey

The AGFC recently completed a creel survey on the Greers Ferry Tailwater and has two creel surveys ongoing at the southwest Arkansas tailwaters (Little Missouri River and Ouachita Rivers). The TMP is also getting ready to conduct a survey of Arkansas Trout Permit holders, the results of which will be used when re-visiting the statewide trout management plan next year. We are also in the early stages of developing a management plan for our Spring River trout fishery, which is the only trout water managed by AGFC that does not currently have a management plan.

West Virginia

Limestone Treatment Program

WVDNR's limestone treatment program continues with good success. Both native/wild trout fisheries and streams that are part of the catchable stocking program benefit from this effort.

Mill Creek Stream Restoration Project

Mill Creek is a moderate size native brook trout stream, located in Kumbrabow State Forest in Randolph County, WV. Mill Creek has been treated with limestone sand since 1996. Heavy, wet snow from Super Storm Sandy caused many trees to fall into and across Mill Creek. A project to remove some of the trees and place some of the trees in the stream to improve habitat is planned for summer, 2014. A project proposal was submitted and approved for funding through the EBTJV Fish Habitat Partnership. Work will begin in June and be completed in August. Structures to improve fish habitat will include deflectors, cross vanes and digger logs (placed a foot or so above normal low flow stream level). Work is being accomplished with personnel from WVDNR-Wildlife, WVU, and WV Division of Forestry (interagency agreement). WVDNR is providing expert logging skills. Approximately 50-60 structures will be constructed in 4 miles of Mill Creek.

A similar habitat restoration project was planned for Big Run and Laurel Fork in Holly River State Park. A funding proposal submitted to the Ohio River FHP was turned down. This project is on hold until additional funding can be secured.

Hatchery Compliance

The WV Department of Environmental Protection issued the WVDNR a Consent Order in April 2014. At issue were 2 hatcheries – Reeds Creek for not having its settling pond cleaned, and Edray Hatchery for not having a NPDES discharge permit. Due to purchasing problems, a purchase order for the pond cleaning was not issued until December 2014. (The settling pond was cleaned July 7-12, 2014 as specified in the purchase order). A paper application for Edray’s NPDES permit was submitted to DEP July 31, 2007 – but was never reviewed. The consent order specified an electronic application needed to be submitted. (As of July 29, 2014, DEP acknowledged they had the paper application and would process it for the necessary permit).

Meeting Adjournment

The business meeting adjourned at approximately 1630.

Presentations

The 2014 Trout Committee concluded with the following presentations on 14 May:

- Current Brook Trout Distribution in Tennessee – Jim Habera
- Eleven Point River Rainbow Trout Strain Evaluation – Andy Turner (MO)
- North Carolina Brook Trout Genetics Summary—Comparison of Historic and Contemporary Molecular Methods to Assess North Carolina’s Brook Trout – Jake Rash
- Brook Trout Restoration Challenges – Matt Kulp
- West Virginia Stream Restoration (Shaver’s Fork video) – Mike Shingleton