Upper Coosa Conservation Summit

Program and Abstracts

October 25-26, 2019
Kennesaw State University

Upper Coosa Conservation Summit: Program

Friday, October 25, 2019
KSU Carmichael Student Center, Student Activity Room B

8:00 Registration/Sign-in
9:00 Welcome and introduction
9:15 Session 1: Partners and Projects

- Katie Owens, the Nature Conservancy. *An overview of the Nature Conservancy's Work in Northwest Georgia*
- Ruth Stokes, US Forest Service. *Overview of US Forest Service Management Activities in the Coosa Basin.*
- Jesse Demonbreun-Chapman, Coosa River Basin Initiative. *Overview of the Coosa River Basin Initiative's work and programs.*
- John Lugthart, Dalton State College. *Conasauga River Clean Up: 25 years.*
- Adam Kennon, Limestone Valley RC&D. *An overview of Limestone Valley's work in Northwest Georgia.*
- Anakela Popp, Department of Natural Resources. *An Overview of Aquatic Conservation Projects in the Coosa Basin.*

10:30 Break/Student Posters
10:50 Session 2: Research

- Shawna Mitchell, Tennessee Aquarium Conservation Institute. *Monitoring for the Blue Shiner (Cyprinella caerulea) in the Mobile Basin.*
- Jace Nelson, UGA River Basin Center; Jeffrey Garnett, GDOT. *Enhancing and Streamlining Aquatic Organism Protection for Transportation Projects.*
- Zack Taylor, Berry College. *The potential for environmental reconstruction in the Coosa Basin.*
- Matthew J. Troia, University of Texas at San Antonio. *Monitoring, modeling, and mapping stream temperature regimes in the Conasauga and other Southern Appalachian river systems.*
- Bernie Kuhajda, Tennessee Aquarium Conservation Institute. *Some federally threatened darters we have known: Goldlines and Trispots in the upper Coosa.*
- Janet Genz, University of West Georgia. *Physiological comparisons between juvenile lake sturgeon (Acipenser fulvescens) reared in captivity vs. simulated natural recruitment.*

12:00 Lunch (on your own)
13:30 Session 3: Outreach and Habitat Restoration

- Brenda Jackson, Murray County Extension. *2019 Georgia Tennessee 4-H2O Camp.*
- Chris Welty, Kennesaw State University. *Cross Pollination – an academic success story.*
- Catherine Magee, NRCS. *A brief overview of the Environmental Quality Incentives Program, Conservation Stewardship Program, Working Lands for Wildlife, and National Water Quality Initiative Program.*
- Tina Jerome, NRCS. *The 2018 Farm Bill and Source Water Protection Areas*

- Stuart Duncan and Neeley Keaton, Dalton State University. *Assessing the Passability of Culverts in the Holly Creek Watershed- a Sub-basin of the Conasauga*.
- Katherine Lanyon and Thomas Kessler, Berry College. *Environmental Education Materials for the Coosa River Basin.*

15:00 Break/Student Posters

15:20 Session 4: Monitoring

- C. Keith Ray, Reinhardt University. *Reinhardt University and the Heart of the Etowah.*
- Edward Stowe, UGA River Basin Center. *Heterogenous fish declines in the Conasauga and Etowah rivers from 1996 to 2018.*
- Phillip M Bumpers, UGA River Basin Center. *Monitoring fish and mussel populations in Holly Creek to inform future restoration activities.*
- William Commins, Cobb County Water. *Using instream stationary antennas to monitor the movements of warm water fishes in a reach of stream bisected by a culvert.*

Closing Remarks

Saturday, October 26, 2019
Clendenin Building

9-12 Working groups

- Conasauga Basin Conservation Priorities (CL1009)
- Education and Outreach in the Coosa Basin (CL1007)
- Terrestrial and Aquatic Conservation and Research within the Etowah (CL1005)

Oral Presentation Abstracts

Monitoring fish and mussel populations in Holly Creek to inform future restoration activities

Phillip M Bumpers[1], Anakela Popp[2], Mary C. Freeman[3], and Seth J Wenger[1],
1. River Basin Center, Odum School of Ecology, University of Georgia,
2. Wildlife Resources Division, Georgia Department of Natural Resources,
3. Patuxent Wildlife Research Center, US Geological Survey,

The Conasauga River is a major tributary to the Coosa River and serves as an upstream refuge for many species that were likely more widespread historically but have been extirpated from downstream reaches. The Conasauga system is biodiverse and harbors thirteen federally protected species and six state protected species. Long-term studies suggest that the Conasauga fauna is increasingly imperiled. Holly Creek is a major tributary of the Conasauga River that drains the southern Cohutta Mountains. The upper portion of this tributary is known to be one of a few remaining strongholds of several mussel species and may have robust populations of protected species or species thought to be declining in the mainstem Conasauga. However, much of Holly Creek is impaired or and improper land use activities are common. In collaboration with the National Fish and Wildlife Foundation we are monitoring fish and mussel populations in the upper Holly Creek watershed to establish baseline conditions of these communities. The monitoring will be used to inform future restoration and management practices and then track the efficacy of future actions. We have conducted two years of baseline sampling, beginning in 2018. We encountered two federally-listed and one state- protected fish species during our surveys. Initial sampling suggests that species presence did not differ among survey sites. However, species composition, accounting for abundances, was different at sites upstream of Chatsworth compared to sites at or downstream of Chatsworth. Our initial surveys provide baseline information to inform future management decisions and may identify areas in the watershed to target future restoration and best management practices. This project will also help inform regional patterns in fish population trends in conjunction with long-term monitoring at other locations in the upper Coosa watershed.

Using instream stationary antennas to monitor the movements of warm water fishes in a reach of stream bisected by a culvert

William Commins,
Cobb County Water

In this study I investigated the differences in the non-migratory movement patterns of six fish species in a 280m reach of stream bisected by a culvert (impeded), and a 300m reach of stream with no movement barriers (unimpeded). This study took place between July 1, 2018 and November 14, 2018 in Raccoon Creek, Paulding County, Georgia. I used 12mm passive integrated transponder tags and four instream stationary antennas to monitor the movements 429

fishes. The antennas redetected 262 of the 429 individuals (61.1%), and 48% of fishes were redetected more than 10 times. The proportion of tagged individuals detected by species ranged from 53.3% (Lepomis auritus) to 90% (Hypentelium etowanum). The proportion of detected fishes that moved at least 150m in the unimpeded reach ranged from 41% for L auritus to 100% for Moxostoma duquesni. A multi-state model was implemented to estimate the probability of weekly upstream and downstream movement in the unimpeded reach (upstream= 0.11, 95% CI = 0.08 - 0.16, downstream= 0.07, 95% CI = 0.04 - 0.10), and in the impeded reach (upstream= 0.01, 95% CI = 0.001 -0.04, downstream= 0.01, 95% CI = 0.004-0.02). The patterns of movement observed in this study suggest that conservation managers should consider movements of 150m as a potentially frequent weekly occurrence for the species monitored, and other closely related fishes. This study demonstrates the potential long-term impact a culvert can have on the natural movement patterns of stream fishes.

Overview of the Coosa River Basin Initiative's work and programs

Jesse Demonbreun-Chapman

Assessing the Passability of Culverts in the Holly Creek Watershed- a Sub-basin of the Conasauga

Stewart Duncan[1], Neeley Keeton[1], Alex Lamle[2],
1. Dalton State College
2. The Nature Conservancy

The Conasauga River basin is an incredibly diverse system (with 77 extant native fishes) and ranks nationally among high priority watersheds for aquatic conservation. Hundreds of road crossings throughout the basin incorporate undersized and improperly designed culvert structures, fragmenting and degrading habitats within this diverse system. Using a methodology developed by the Southeastern Aquatic Resources Partnership (SARP), 200 road crossings in the Holly Creek basin were assessed for "passability". Barriers receive a score on a scale from severe barrier (0) to no barrier (1). These data will be used to prioritize crossings across the watershed for future culvert replacement projects, allowing partners like The Nature Conservancy to determine where resources could most effectively be allocated.

Physiological comparisons between juvenile lake sturgeon (Acipenser fulvescens) reared in captivity vs. simulated natural recruitment

Janet Genz,
University of West Georgia

Lake sturgeon (Acipenser fulvescens) are at-risk throughout their range, including in the Coosa River. A stocking program has been ongoing for nearly 20 years with the goal of re-establishing this extirpated population to its historical levels as a self-recruiting fishery. The growth and

survival of stocked juveniles is dependent on their nutritional and energetic condition, determining their response to changes in environmental parameters experienced during transition from the hatchery to the river. Recent studies on juveniles reared in captivity have attempted to compare physiological outcomes between these habitat types. We reared lake sturgeon from eggs until 40 days post-hatch in water from the Warm Springs National Fish Hatchery and the Coosa River. Each environment maintained similar, stable pH and temperature throughout the experiment, but differed substantially in the environmental concentrations of Ca^{2+}, Mg^{2+}, and Zn^{2+}. These same ions were quantified by ICP-OES in the tissue of A. fulvescens sampled weekly over the course of their early development. Overall growth and the rate of development of protective bony structures were decreased in fish reared in Coosa River water. In a later experiment, hatchery-reared 6-month-old juveniles of the same cohort were exposed for 3 weeks to the same two environmental treatments, and fed a standard diet. Proximate composition analysis of intestinal contents collected 6 h after feeding indicated significant differences in nutritional absorption. Intestinal mass and length also differed between treatment groups, indicating a strong influence of water chemistry on overall gastrointestinal anatomy in this species. These data clearly indicate that environmental factors are important drivers of ionic regulation, as well as energy use and allocation during this period. Furthermore, changes to these factors at the time of stocking may influence rate of regulatory adjustments to essential physiological processes, and potentially impact survival of hatchery-reared lake sturgeon.

2019 Georgia-Tennessee 4-H2O Camp

Brenda Jackson,
Murray County Extension

The 2019 4-H2O summer camp started different from past years. It started with a conversation at the 2018 National Association of County Agricultural Agents AM/PIC between the Murray County Agriculture and Natural Resources Agent, UT Extension agent for Polk County and UT Extension area specialist for McMinn County. This year's camp was planned to give Georgia and Tennessee 4-H'ers an opportunity for experiential learning to expand and enhance the science-based education they receive in the classroom. This summer camp additionally provided an opportunity for 4-H'ers to expand their network of friends and work cooperatively in an environment conducive to learning with adult leaders and their peers. Agents from Murray and Whitfield County Extensions as well as Polk and McMinn County Extensions collaborated for a three-day residential 4-H2O camp at Camp McCroy in Reliance, TN. Several curricula were combined to create a fun, experiential learning water science camp for Georgia and Tennessee 4-H'ers.

The 2018 Farm Bill and Source Water Protection Areas

Tina Jerome
Natural Resource Conservation Service

An overview of Limestone Valley's work in Northwest Georgia

Adam Kennon
Limestone Valley RC&D

An overview of 319 projects in the Holly Creek, Oostanaula River, Coahulla Creek, Salacoa Creek, and Pine Log Creek watersheds.

Some federally threatened darters we have known: Goldlines and Trispots in the upper Coosa

Bernie Kuhajda and Shawna Mitchell,
Tennessee Aquarium Conservation Institute

Goldline Darters (Percina aurolineata) and Trispot Darters (Etheostoma trisella) are federally threatened species endemic to the Alabama River drainage above the Fall Line in Alabama, Georgia, and Tennessee. Both species were widespread before the impoundment large rivers in the eastern Mobile Basin, which fragmented habitat, eliminating gene flow, and likely reducing genetic fitness. Populations are also threatened with urbanization, non-point source pollution, and alterations to remaining habitat. Despite these challenges, summer 2019 surveys found Goldline Darters present at 14 of 15 sites sampled in the Coosawattee River system above Carters Reservoir, although catch per unit effort (0.17) was low, approximately one-half that of Goldline Darters in the Cahaba River in Alabama (0.28). Trispot Daters were found at 4 of 7 sites in summer 2019 surveys of the Holly/Rock Creek system in the Conasauga River drainage. Number of individuals ranged from 1-4 per site, but large numbers (35+) are only encountered at spawning sites in ephemeral seeps and streams during the spawning season in February-March.

Environmental Education Materials for the Coosa River Basin

Katherine Lanyon, Thomas Kessler, Moriah Braswell
Berry College

Georgia's current science education system currently consists of environmental concepts applied to "universal" problems. In recent years the concept of place-based education has become increasingly popular in the eyes of educators and administrative staff. The goal of this project is to create a set of localized lesson plans for the Coosa River Basin to include its native, endemic species and comply with Georgia Education Standards to allow for more place-based lesson plans for local middle and high schools via "plug-ins" which will allow for individual lesson plans to be adapted to different grade levels. These lessons will serve dual purposes of teaching the basic lessons, creating pride and knowledge of local protected species in their waterways.

Conasauga River Clean Up: 25 years

John Lugthart
Dalton State University

A brief overview of the Environmental Quality Incentives Program, Conservation Stewardship Program, Working Lands for Wildlife, and National Water Quality Initiative Program.

Catherine Magee

Monitoring for the Blue Shiner (Cyprinella caerulea) in the Mobile Basin

Shawna Mitchell and Bernie Kuhajda,
Tennessee Aquarium Conservation Institute

The Blue Shiner (Cyprinella caerulea) is a federally threatened minnow endemic to the Mobile Basin in Alabama, Georgia and Tennessee. This species was formally widespread in the Cahaba and Coosa river basins, but has not been seen in the Cahaba River since 1971. Decline has been attributed to degraded water quality from urbanization, pollution and sedimentation. From 2016-2019, Blue Shiners have been found in 11 of 13 sites in the Coosa River watershed in Alabama, 5 of 8 sites in the Conasauga River watershed in Georgia and 6 of 8 sites in the Conasauga River watershed in Tennessee. While populations remain locally stable, genetics studies have found that the loss of connectivity between these populations will likely limit recovery of the species due to the lack of gene flow.

Enhancing and Streamlining Aquatic Organism Protection for Transportation Projects

Jace Nelson[1] and Jeffrey Garnett[2],
1. University of Georgia
2. Georgia Department of Transportation

The State of Georgia is rich in freshwater biodiversity, and many of these species are listed under the Endangered Species Act (ESA). Georgia Department of Transportation (GDOT) works with its federal and state agency partners to ensure compliance with the ESA during bridge construction and other projects that could affect these protected aquatic species. In addition to carefully managing erosion and sedimentation, GDOT generally prohibits its contractors from working in rivers and streams during the spawning season of protected animals, which can

greatly extend construction time and costs. However, there has been no comprehensive review of the extent to which these timing restrictions are beneficial and necessary, or whether other actions (such as improving stormwater management) would provide greater benefits. GDOT has contracted with the University of Georgia's River Basin Center (RBC) and Institute for Resilient Infrastructure Systems (IRIS) to conduct a holistic review of the requirements of all 115 imperiled and vulnerable aquatic species in the state to determine the most appropriate management practices for each. The RBC/IRIS team includes biologists, engineers, landscape architects, and environmental lawyers, who work closely with GDOT and partnering agencies, including US Fish and Wildlife Service and Georgia Department of Natural Resources. The final report will include recommendations for a programmatic agreement covering GDOT activities, which, if adopted, would substantially streamline the ESA consulting process and ensure consistent, effective protection of aquatic species. The goal is a win-win in which protection for aquatic species is enhanced while construction time and costs are reduced.

An Overview of the Nature Conservancy's Work in Northwest Georgia

Katie Owens
The Nature Conservancy

An Overview of Aquatic Conservation Projects in the Coosa Basin

Anakela Popp
Georgia Department of Natural Resources, Wildlife Conservation Section

This will serve as an update on activities of GADNR's Wildlife Resources Division, Wildlife Conservation Section in the Coosa Basin. We have multiple projects focused on the conservation of state and federally protected species. These include an environmental DNA survey for the Trispot Darter, a mussel monitoring program in Holly Creek, and potential mussel restorations in tributaries to the Conasauga and Etowah rivers. We are also partnering with or supporting other groups on various restoration and research projects in the Coosa.

Reinhardt University and the Heart of the Etowah

C. Keith Ray,
Department of Biological Sciences, Reinhardt University

Reinhardt University, located in Waleska, has a long history of being centered in the heart of the Etowah River Valley and active in its communities. Our academic mission is centered on efforts to study, understand, and celebrate the Etowah, which shows in our biological research and conservation efforts.

Overview of US Forest Service Management Activities in the Coosa Basin

Ruth Stokes,
US Forest Service

Heterogenous fish declines in the Conasauga and Etowah rivers from 1996 to 2018

Edward Stowe[1], Seth Wenger[1], Bud Freeman[2], and Mary Freeman[3],
1. River Basin Center, Odum School of Ecology, University of Georgia
2. Georgia Museum of Natural History, University of Georgia
3. Patuxent Wildlife Research Center, U.S. Geological Survey

The fish assemblages of the Conasauga and Etowah rivers are highly diverse but threatened by urban development, hydrologic alteration, and agricultural runoff. We have conducted annual or near-annual surveys at 23 shoal sites in these rivers for two decades, and a previous analysis of presence-absence data indicated that four shoal-dependent fish species declined dramatically in the Conasauga River during this time, whereas no taxa declined in the Etowah River. To further investigate population trends in these rivers, we used regression models to assess temporal changes in count data for 26 species in the Conasauga River and 28 in the Etowah River. As expected, negative trends in count data were strongest for the four taxa in the Conasauga River with declining occupancy. However, our analysis indicated that 11 additional species may be declining in the Conasauga, while two species may be increasing in abundance. In the Etowah River, 12 species appear to be declining, while four species may be increasing in abundance. Analyses of count data have revealed some interesting patterns: first, while some species exhibited similar trends in counts across basins (e.g., Amber Darter Percina antesella, and Riffle Minnow Phenacobius catostomus), other species (e.g., Tricolor Shiner Cyprinella trichroistia) displayed strongly divergent trends between rivers. Furthermore, count data for some species in the Conasauga suggest a longitudinal gradient in river degradation, with downstream sites showing lower abundances. Spatial patterns in counts are less apparent in the Etowah River. Our study demonstrates that regional factors affecting both rivers—as opposed to strictly watershed phenomena—may be contributing to the declines of some species, underscores the extent to which fishes are imperiled in the Upper Coosa, and highlights the value of long-term monitoring data.

The potential for environmental reconstruction in the Coosa Basin

Zack Taylor,
Berry College

Sediments from lakes, ponds, wetlands, caves, and floodplains can contain valuable records of past environments. Analysis of sediment microfossils (pollen grains and charcoal fragments), sediment composition, and sediment geochemistry can yield detailed records of vegetation,

climate, human activities, floods, and other environmental parameters. While the Coosa region has few or no natural lakes, it is possible that are other untapped archives of paleoenvironmental information. Though paleoenvironmental records often extend hundreds or thousands of years in the past, the same techniques can provide insight into more modern processes such as sedimentation in reservoirs and sediment accumulation in floodplains. Through this talk, I hope to foster collaborations with scientists working in the upper Coosa and look for ways paleoenvironmental analysis can complement existing research and conservation efforts.

Monitoring, modeling, and mapping stream temperature regimes in the Conasauga and other Southern Appalachian river systems

Matthew J. Troia[1] and Xingli Giam[2],
1. Department of Environmental Science and Ecology, University of Texas at San Antonio
2. Department of Ecology and Evolutionary Biology, University of Tennessee

Temperature regimes are key components of water quality in flowing freshwaters. Understanding the natural drivers of temperature variation, and the impact of anthropogenic land use change and climate change are essential to predicting biological impairment and enacting restoration and mitigation measures. Since May of 2017, we have been monitoring water temperatures at 15-minute intervals at 160 locations in the southern Appalachian region, including 20 locations in the Conasauga River system. This monitoring network encompasses natural gradients in elevation, stream size, and ecoregion, as well as anthropogenic gradients of urbanized and agricultural land cover. To date, we have used summer temperature metrics to assess vulnerability of fishes to climate change in two contexts. First, we mapped climate change velocity and identified which species are unlikely to keep pace with upstream shifts in thermally-suitable habitat. Second, we used air-water temperature relationships to simulate the magnitude and frequency of extreme heat events. Projections of these heat waves, in combination with thermal tolerance and acclimation information of endemic fishes, identified which species are at risk of experiencing lethal heat events and where these events might occur. Future plans for this monitoring effort include: (1) continued monitoring through year 2021, (2) further analysis of seasonal temperature regimes and their influence on fishes and other stream-dwelling taxa, (3) and expanded collaboration with researchers, natural resources managers, and stakeholders.

Cross Pollination – an academic success story

Chris Welty,
KSU Architecture Department, College of Architecture and Construction Management

The Racoon Creek Environmental and Education Center (RCEEC) is envisioned as a facility would be a hub for development of science curriculum focused on unique local natural resources providing teachers, students and citizens with outdoor educational experiences. It is being established with a vision to support education and research that enables the surrounding

community to understand, appreciate, and value the influence of the natural environment in their daily lives. The facility would offer formal and informal environmental education programs and foster research activities that promote understanding and appreciation of and promote stewardship for the unique biological and cultural resources of Paulding County and the Raccoon Creek Watershed.

Through a collaboration between the Department of Ecology, Evolution and Organismal Biology (EEOB) and the Department of Architecture at KSU students enrolled in third year architecture studio, were challenged to develop conceptual ideas and design strategies for the RCEEC. The third-year architecture studio emphasizes the importance of conceptual architectural thinking, materiality and building technologies are introduced within the architectural design process. Architectural thinking encompasses the designer's cultural tradition, philosophical position and design sensibility. Students are encouraged to integrate passive strategies such as natural day lighting within their design solutions.

The presentation will share the process and outcomes and aims to discuss our learning processes and experiences as well as to reflect on possibilities of the collaboration between all stakeholders. It will include examples of the student work and the development of final design solutions for the RCEEC. The studio students will also be presenting poster of their individual work at the summit as well.

Student Poster Abstracts

A two-year study monitoring macroinvertebrate assemblages and leaf litter breakdown rates to assess the impact of Dalton State College campus on College Creek

Cody Beavers, Michael Cuprowski, and Dr. John Lugthart,
Dalton State College

Headwater streams are often heavily vegetated, allowing little light for instream photosynthesis and making leaf litter an important source of energy. Macroinvertebrate feeding behaviors play a key role in the processing of leaf litter and cycling of nutrients. Stressors associated with urbanization have been shown to decrease macroinvertebrate abundance and diversity. A stream's ability to process organic matter and retain nutrients may thereby be affected. This is the second year of a study investigating whether the Dalton State campus has had an effect on the macroinvertebrate community and leaf litter breakdown rate in the stream which passes through it. Potential stressors include non-point source pollutants, channelization, and reduction of riparian vegetation. Sampling was conducted at an undisturbed reference site upstream of campus and a site downstream of campus. Data were collected using a standard leaf-pack sampling method with leaf masses being tracked and all macroinvertebrates that colonize the packs collected and identified to family. In year 2, the amount of leaf matter was increased and the time between pulls decreased to accommodate the high rate of breakdown observed in the previous year. Temperature loggers were also added at each site to account for the effect of temperature on breakdown and ash free dry mass was determined to account for mineral deposits that may have accumulated while in the stream. In 2017, our first sampling year, higher macroinvertebrate abundance, better water quality parameters, and a higher leaf breakdown rate were observed upstream. 2018 results are presently being analyzed.

Current Plant Community Composition at the Sheffield Wildlife Management Area

Noah Brown[1], Tyler Arnold, Maya Nelson[1], Dylan Lemonds[1], Rebecca Vera[1], Victoria Romero[1], Chris Waters[1], Aliya Donnell Davenport[2], and Heather Sutton[1],

1. EEOB Department, Kennesaw State University
2. Department of Biology, Reinhardt University

The Sheffield Wildlife Management Area (WMA), located within the Piedmont ecoregion, was established to provide important wildlife habitat and ensure the protection of the Raccoon Creek watershed. It is currently a mosaic of forests that have experienced relatively light management. However, due to exclusion of fire, the rare montane longleaf pine ecosystem that used to be present in some areas is no longer in good health. The goal of this study is to provide baseline

data on plant community structure across the Sheffield WMA (and eventually also the adjoining Paulding WMA) to aid in planning and monitoring future restoration efforts as well as help determine the success of those efforts.
Thirty-six plots were set up near the top of ridge lines on either North facing or South facing slopes. Plots were clustered near the West end as well as the Northeast end (Pine Mountain area) of the Sheffield WMA. Each plot was composed of three adjacent 10 x 10 m squares parallel to the fall line. In each plot, each tree species was identified and its diameter was measured. Cover of herbaceous species and seedlings/saplings was determined in six 2 x 2m plots within each larger plot. From this data we have calculated relative density, dominance, and frequency, average percent cover and other metrics. Diameter size class frequencies of select tree species will be presented. We intend to compare the communities on the two slope aspects as well as the top and bottom of the plots, and between the two overall areas where the plots are clustered. We will present the beginning of a comprehensive species list for the whole Sheffield WMA. Results thus far indicate a lack of Longleaf Pine in the smaller diameter size classes, along with clear differences in the frequency of various tree species between the two slope aspects.

Possible Applications of Drone Usage for Regional Researchers and Nature Resource Managers

Kendall Byrd,
Reinhardt University

The purpose of this poster is to examine whether drones can be used to assist regional researchers and natural resource managers in meeting their objectives. A drone is defined as any type of unmanned aircraft, and these aircrafts can either be piloted remotely, or flown autonomously through unique software that is coupled with GPS capabilities. The ability for drones to be purchased and put to commercial use is a relatively new idea, which means that there are a plethora of real-life applications for drones that are not being put into use. These applications range from simple tasks such as aerial photography to more difficult tasks, such as 3D mapping. Some fields for which these applications are useful include crop management, surveying property, aerial mapping, forestry, land protection, and data collection for biological research. Drone usage is beneficial to all of these areas because it allows tasks to be completed in an efficient and systematic manner. Indeed, research shows that drone usage is effective in reducing the amount of time and money it requires to complete many tasks relative to manual completion by a human. Companies like Scope Drone Services LLC are trying to educate the public about drones, apply these new ideas, and help the public gain a better understanding of the world around them.

High-resolution mapping of fish conservation priorities within the Mobile River basin

J. Robbie Carl[1], Thomas C. McElroy[1], Heather Sutton[1], and Matthew J. Troia[2],
1. Department of Ecology, Evolution, and Organismal Biology, Kennesaw State University
2. Department of Environmental Science and Ecology, University of Texas at San Antonio

Identifying potential conservation areas is increasingly important as freshwater fishes and associated aquatic organisms are under increasing peril. Human population growth and subsequent landscape alteration is degrading water quality and changing the physical characteristics of streams, potentially threatening aquatic species. Our goal was to assess the capacity for protected areas to maintain diverse stream fish communities within the Mobile River Basin, including the upper Coosa River basin, by overlaying projections of fish species distributions and footprints of protected areas. We developed environmental niche models (ENMs) using the Maximum Entropy (MaxEnt) algorithm to map the distributions of 180 species over 67,420 reaches using open-source species occurrence records from the IchthyMaps dataset and stream-reach environmental predictors from the StreamCat dataset. To date, ENMs have been fit for 17 of the 180 target species, with generally high model accuracy (mean AUC = 0.89 range 0.65 to 0.99). The most important predictor variables were watershed area (WsAreaSqKm), elevation (ElveWs), and capacity for soil erosion (KffactWs). Additional geospatial analysis will be used to evaluate how well protected areas overlap with diverse and unique reaches. Finally, potential future protected areas for conservation planning and land acquisition will be identified.

Where did you find that? New Records of Mussels in Shoal Creek (Etowah River, Cherokee Co., GA)

C. Keith Ray, Trent Blankenship, Zach I. Felix,
Department of Biological Sciences, Reinhardt University

Mussels are not common in the Upper Etowah River Basin. In 2017, mussel shells were discovered downstream of Cline Lake on Shoal Creek. The mussel species identified include Hamiota altilis and Villosa nebulosa and V. umbrans. Subsequent trips and snorkel surveys revealed their distribution throughout other parts of the basin. Directly downstream of Cline Lake, mussel densities are highest, while many survey hours are needed to detect the mussels in other locations. We share our survey plans for the rest of the stream and discuss the other diversity within this area and efforts for conservation.

Changing importance of xerophytic and pyrophytic tree species within a north Georgia forested watershed.

Christopher Waters, Heather Sutton, and Matthew Weand,
Kennesaw State University

Upland forest within the Raccoon Creek watershed was historically dominated by longleaf pine (Pinus palustris Mill.). Due to the introduction of fire suppression policies in the early 20th century, longleaf pine dominated systems like these experienced significant declines across the historic range. Fire suppression typically induces a compositional shift from predominantly xerophytic and pyrophytic species to mesophytic and fire-intolerant species; however this shift is often dependent upon landscape features such as slope and aspect. We examined changes in forest composition within the watershed, comparing historic witness tree data to modern surveys. The species composition of thirty-six 300 m2 plots on north and south facing slopes was compared to historic composition as determined from 1832 Georgia Land Lottery survey maps. The importance of xeric and pyrophytic species in the modern forest was determined from relative dominance, frequency, and density among the plots. We found a general shift from xerophytic and pyrophytic species such as Quercus marilandica Münchh. and Pinus spp. L., toward increased dominance of mesophytic and fire-intolerant species including Acer rubrum L. and Oxydendrum arboreum (L.) DC. Modern south facing slopes retain a higher importance for pyrophytic and xerophytic species when compared to modern north facing slopes. Longleaf pine primarily persists on south facing slopes as mature canopy dominants with no evidence of regeneration in the understory. These changes are likely driven by historic fire suppression but changes in climate may also play a role. Further research will investigate fire history using preserved longleaf pine stumps and dendrochronological techniques to determine the historic average fire return interval.

The following posters are from students in the KSU Architecture Program. As part of the exercise, "Learning from Nature," students developed a poster on a rare species from Georgia. This poster is accompanied by an object created by the students and inspired by the species or related ecological phenomenon.

Fernando Asamoa: The artifact explores the idea of organic growth in nature. The smaller branches illustrate the surrounding support organisms or structures and the thread shows the visual connection of those supporting pieces to one another.

Ortensia Cerda: These bats are commonly found in eastern parts of America and lower Canada. The bat is named tri-color due to its multi-colored haired shaft which is unique to this bat. The bats' population is severely threated due to disturbance of natural habitats, low repopulation rate, and a white spread fatal disease across North America. White-nose syndrome (WNS) is an emerging disease in North American bats which by 2018 has killed millions of bats in the United States and Canada. Bats also have one pup a year and cannot sustain its population at this rate... The disease is caused by the fungus Pseudogymnoascus Destructans, which colonizes the bat's

skin. The decrease in bat populations has a direct relationship to us. Bats play an important role in many environments around the world. Some plants depend partly or wholly on bats to pollinate their flowers or spread their seeds, while other bats also help control pests by eating insects.

Mariana Corredor: Structural Flutter - This artifact studies the relationship between the Northern Long-Eared Bat's wings and the structural composition of leaves. The connection between the Long-Eared Bat and the components of nature through the observations of leaves inspired the creation of the artifact. When establishing a relation between these two realms of nature, I concentrated on the structural mechanisms of each variable.

Helen Dymek: Erosion - The artifact takes inspiration from impact Nancy Creek has had on the Blue Heron Nature Preserve. While walking through the preserve, one will notice the way the creek has carved through the tall banks that flank its sides, or the breaks in the creek that give way to the small islands at its center. In this artifact, I wanted to celebrate this throughout its form, with the central structure directing the flanking designs. The glass in the artifact was pulled directly from the creek. It was curious to observe the impact the current had on the glass. The newer, less eroded pieces of glass give way to the smoother, opaque pieces that the creek has worn down. The wire creates identity and structure to each component, allowing for vertical manipulation between the separate forms.

David Feregrino Rodriguez: Forests are dominated by tall trees that cover the sky and only a few plants at ground level adapt to live below these tree canopies. In spaces where the tree foliage is scarce and sun light covers a large area, the ground is densely populated by plants that benefit from daylight. The Missouri Rockcress is a plant that enjoys shady surfaces and it is very sensitive to long periods of sun exposure. This artifact is inspired by the battle for light as it is filtered through surfaces placed at different heights. The most crucial part of this plant is where the taproot, the stem and the basal leaves meet because this location is the boundary between the resources that are absorbed below ground and the resources that are absorbed above ground. The Voronoi surfaces are clustered and supported at five different points like the plant's stem, leaves and root that concentrate at one single point.

Gabriela Hernandez-Delgado: The artifact explores the growth of Lichen. After dissecting one of the pieces of the Lichen found in the woods, and discovering the way the lichen forms, came the thought of ribs shown in the first three iterations. The last iteration took from the first three the sense of excitement but left the uniformity. The artifact creates an implied enclosure, leaving exposed ribbing.

Moritz Meditz: These artifacts explore shading strategies inspired by the plant Veratrum Woodii. Both studies explore different aspects of the plant, the first one focusing more on the verticality of plant, while the second one focuses more on the large leaves at the bottom. The goal of the exploration was to see how the objects can play with the light as it passes through different layers in a similar manner as light trickles through the canopies of trees in a forest. The second model also starts to incorporate topography and experiment with how such an object could engage with the site.

Ana Mendoza: The Art of Deception - This artifact explores the space on the inside of the Labellum flower and the way we perceive the depth of space. The deception comes from individual interpretations of the space in relation to the solid and the void. The entry and exit points also become an illusion within the space.

Sergio Nino De Rivera: For the design of the artifact, I began by looking at the anatomy of the Slender Glass Lizard's tail. The tail is made up of modular bones that lock in and are held by a pin of muscle tissue that runs through the bones. This connection makes up the length of the tail. The ability for the tail to grow in length using modular bone is the scheme used to create the artifact. The section of the bone is mirrored on itself. This shape then gets rotated 90 degrees and pinned to another on its corner.

Tania Rodriguez: The series of artifacts study the growth pattern of the Self-pollinating Oval Ladies tresses. Focusing on the connection system between each segment, the artifact grows with a shareable connection while also creating a series of color effects with the introduction of anomalies in its growth.

Citlali Rosas: The artifact focuses on the structure of the Silky Bindweed. The vine has a fluid growth with a recurring system. The artifact enunciates a similar structure as the plant itself but uses unalike components created with recycled plastic which represent the different parts of the Silky Bindweed.

Tj Rottenberg: While collecting seed pods of multiple species of trees within a plant community and taking macro photography pictures of each pod, a study was compiled of the individual features and similarities between them. Some common traits and patterns were recognized and combined into a set of rules. Out of the modularity, symmetry and radial growth pattern of these seed pods a tile was modeled. This tile is modeled from a combination of the bubble-like structure of the Osage Orange, the bean shape of a hog peanut seed and the scaling pattern of the Acorn. The intent of this pattern is to create a façade or skin system of a building that can be manipulated to follow a curved structure.

Eunji You: Inspired by nature, the Woodland Muhly is a rare plant that has a unique spikelet that spirals at its reproductive phase. During the middle to the end of its growth phase, several nodes and internodes are sprung to develop the spikelet. In this artifact, the internodes of the plant become the connecting rods of the space frame while the nodes represent the joints. Lastly, the skin that rests on the space frame represents the shading device to follow the curvature of the leaves.

Doron Zarur: The artifact is inspired by the Short Leaf Pine Tree, looking at the needle leaves of the tree to construct a module that represents a structural system. The artifact is constructed as two parts: the structure and the connection. The main structure representing the branches while the connections recall the growth of the pine needles.

Working groups: Saturday, Oct 26

Conasauga Basin: The Conasauga Basin working group will focus on impacts, needs, and potential conservation actions in the Conasauga basin. We will identify areas of the Conasauga that face the greatest impacts, discuss the efficacy and practicality of potential conservation actions, and have a more general discussion about trends in the basin. We will also discuss historic and current objectives in the basin, and how to shift strategies to address changing needs. Additionally, a follow-up discussion will focus specifically on the Holly Creek watershed. The group will discuss current monitoring efforts and will also work to identify potential data gaps and restoration projects moving forward. **Meets in Clendenin Building Room CL 1009.**

Facilitator: Stephen Bontekoe, Limestone Valley RC&D

Education and Outreach in the Coosa Basin: The Education and Outreach in the Coosa Basin working group will focus on mechanisms for disseminating Coosa Basin conservation information to the public in both formal and informal ways. The central proposition for this group is that the public cannot value a resource if they are not aware of it. Attendees who wish to participate in this working group should be willing to discuss both traditional and nontraditional ways of reaching out to citizens who may not be aware of the unique nature of the flora and fauna found in the Coosa Basin. **Meets in Clendenin Building Room CL 1007.**

Facilitator: Bill Ensign, Kennesaw State University

Terrestrial and Aquatic Conservation and Research within the Etowah: The goal of the Terrestrial and Aquatic Conservation and Research within the Etowah group is to assess ways that terrestrial and aquatic conservation and research activity can link together for mutual benefit within the Etowah. Participants will discuss historical and current research and conservation efforts. We will review existing partnerships and aim to create new partnerships that further research and conservation across the landscape. **Meets in Clendenin Building Room CL 1005.**

Facilitators: Heather Sutton and Matthew Weand, Kennesaw State University.

Note: The Amber Darter Recovery Actions working group has been assimilated into the Conasauga Basin working group.