



NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

WILDLIFE DIVERSITY PROGRAM QUARTERLY REPORT

JULY-SEPTEMBER 2023



NORTH
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Wildlife

RESOURCES
COMMISSION



The North Carolina Wildlife Resources Commission's (NCWRC) Wildlife Diversity (WD) Program is housed within the agency's Inland Fisheries (Aquatic Wildlife Diversity) and Wildlife Management divisions. Program responsibilities principally include surveys, research and other projects for nongame and endangered wildlife species. Nongame species are animals without an open hunting, fishing or trapping season.

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Painted Bunting (Jonathon Gruenke)



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Cover photos from top left clockwise: Mike Walter, Eastern Region Aquatic Wildlife Diversity Biologist and NC State University students swab mussels in Swift Creek in Johnston County (NCWRC); Wildlife Diversity technician Clifton Avery holds an adult Eastern Hellbender after data collection, before release back to its capture location (Ben Dalton); Wildlife Diversity Biologist, Katherine Etchison, tracking radio-tagged little brown bats (NCWRC)



Henslow's Sparrow Studies on Voice of America Game Land

by John Carpenter, Wildlife Diversity Biologist

Over the last three summers, through a Cooperative Agreement with NC State University, the Wildlife Diversity Program has studied the state endangered Henslow's Sparrow in eastern North Carolina. The primary study site was at the Voice of America Game Land (VOAGL) where we estimated a current population of 90-140 singing males from 2021-2023. Genetic samples were obtained from VOAGL and VOA Site B and will be used to address migratory connectivity with other

Henslow's Sparrow populations across North America. We color banded males and attached transmitters to measure site fidelity, space use, and determine over-wintering locations. We witnessed a minimum of 22-38% of males returning to VOAGL each summer and discovered that two males migrated to northern Florida/southern Georgia to spend the winter. Lastly, 27 nests were found in 2022 and 2023: 67% of eggs hatched with 93% of those chicks surviving to fledge. Final analyses, including grassland



Frode Jacobsen

vegetation response to current management practices (e.g., controlled burns) will be delivered to NCWRC in July 2024.

Emily Nastase



Emily Nastase



Two of 27 nests with eggs (left) and chicks (right) found by staff during surveys on VOA Game Land in 2022, 2023.



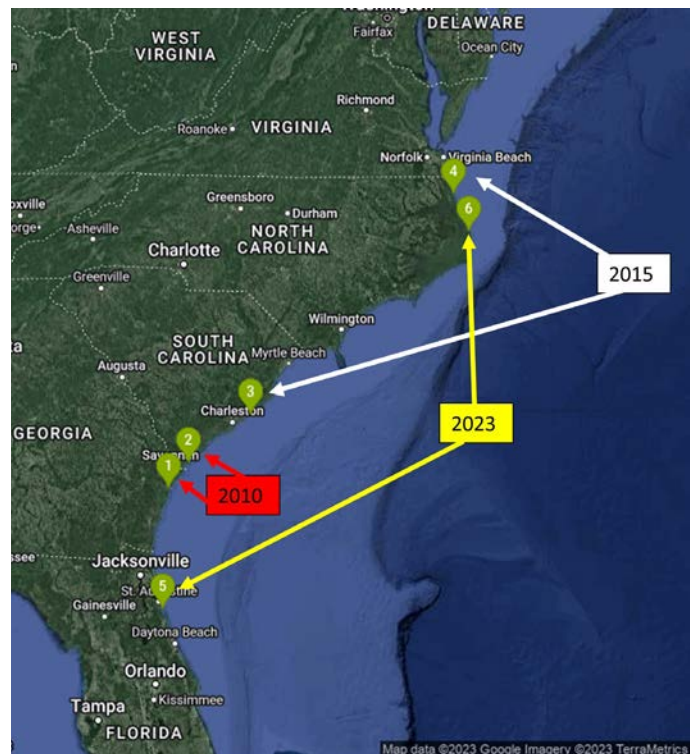
DNA Fingerprints of Female Sea Turtles Reveal New Nesting Behavior

by Dr. Matthew Godfrey, Sea Turtle Biologist and Sarah Finn, Coastal Wildlife Diversity Biologist

Historically, adult female sea turtles were thought to return to their natal beaches to lay their eggs. With the advent of molecular tools and phylogeographic analyses, it became clear that “natal homing” of sea turtles occurred at a broader regional scale. Nevertheless, observations of sea turtles bearing physical flipper tags suggested that nesting sea turtles remained relatively faithful to a bounded stretch of coastline, even if they hadn’t been produced there as hatchlings. Since 2010, North Carolina has partnered with other states along the east coast of the U.S. to collect eggshell samples from all nests laid by loggerhead sea turtles from Virginia to northern Florida. The samples provide unique DNA fingerprints for each adult female loggerhead that laid eggs in the area, providing previously undiscovered insights into the spatial distribution of nests laid by different individuals over time. While most female loggerheads tend to place their nests within a 35 to 45-mile range of one another, there are some individual turtles that select nesting beaches hundreds of miles apart, even within the same nesting season. Other turtles show a mixed approach, as seen in the map to the right. In this case, the turtle nested twice in 2010 within a 35-mile range near the SC/GA border. She nested twice again in 2015, once near Charleston, SC and once near Nags Head, NC, which are separated by more than 300 miles. In 2023, she nested twice again, laying the first nest in northern Florida and the second on Hatteras Island, NC, traveling over 500 miles between nesting events. Not only is this plasticity remarkable, but it also suggests that some sea turtles will be able to colonize new nesting sites to the north of their current range, which may be one way sea turtles compensate for the negative impacts predicted to occur with climate change and sea level rise.



A nesting female loggerhead seen on the beach after sunrise.



All known nesting locations along the SE USA of a single adult female loggerhead since 2010.



Genetic Analyses on Listed Mussels Will Help with Future Propagation and Augmentation Strategies

by Mike Walter, Eastern Region Aquatic Wildlife Diversity Biologist

Eastern Region Aquatic Wildlife Diversity staff have been collecting genetic material from several species of mussels within the Tar, Neuse and Roanoke River basins in cooperation with Georgia Southern University. The focus is on the federally endangered Tar River Spiny mussel and Dwarf Wedgemussel, as well as the federally threatened Yellow Lance and Atlantic Pigtoe. The main objective of the study is to gain a better understanding of the genetic diversity of these species within and among river basins and management units.

Biologists collect genetic material by gently opening the mussel a few millimeters and swabbing the foot and visceral mass. In 2023, staff collected 233 swabs from these species in nine management units across three river basins. These samples have been combined with previous year's collections for a total of 365 samples. Collections will continue until June 2024. Once field collections are complete, single nucleotide polymorphism genotyping will be used to elucidate population structure, define population boundaries, estimate effective population sizes, identify cryptic populations, and analyze genetic diversity within and between populations.

These results will help biologists make more informed decisions about propagation and augmentation strategies and aid in conservation efforts that benefit these species.



Mike Walter, Eastern Region AWD Biologist and NC State University students swabbing mussels in Swift Creek in Johnston County.



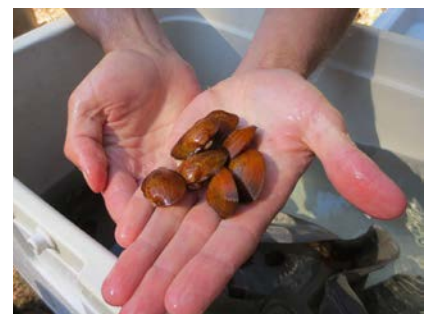
Tar River Spiny mussel (NCWRC)



Dwarf Wedgemussel (USFWS)



Yellow Lance (NCWRC)



Atlantic Pigtoe (USFWS)



NC Bird Atlas Focuses on Fall Outreach

by CC King, Science Support Specialist

With fall migration underway, the NC Bird Atlas team turned its attention to outreach events, preparation for winter atlasing, and hiring the new round of technicians. Inviting more people to participate in counting birds works well in the fall season. Recording presence often comes easier than documenting breeding behaviors, making this time of year a gentler introduction for those just getting started with atlasing. Outreach efforts introduce participants to the work of NCWRC, and the tools of community science in terms of birds. Program participants learn to use the phone apps of Merlin and eBird to record their observations. From there, the most engaged choose to participate in data collection

through the NC Bird Atlas portal, following protocols to help record bird diversity, abundance, and breeding status across the state.

Upcoming winter atlasing efforts will soon be augmented by the return of long-term technicians who reach under-birded priority blocks and help with land-owner outreach. North Carolina hosts many overwintering birds. As we document these species, we simultaneously gear up for the arrival of the breeding season, the returning migratory species, and the summer technicians who come to help count them. After three years of data collection, the atlas has touched over 96% of the priority blocks. Now we face the high bar of completing 20 hours in every block during the breeding

season and 5 hours in the winter—for hundreds of blocks. That goal drives the ongoing recruitment and support of volunteers and explains our request to hire additional technicians this summer. We are two-thirds through the project with many rural areas still in need of significant effort. Most volunteers tend not to leave their comfort zones to bird, increasing the need for skilled technicians in less populated areas. Through the tiered entry approach to the project, the NC Bird Atlas makes room for anyone to participate at any level; this partnership of volunteers and technicians allows the recording of both presence and breeding confirmations while ensuring that we reach every area of the state.



Outdoor Afro and Let's Go Birding Together: Beginning Birder Program - a partnership among Wake Audubon, Field Inclusive, Walnut Creek Wetland Center, and the NC Bird Atlas.



A Rare Find — A Great Lakes Piping Plover in North Carolina

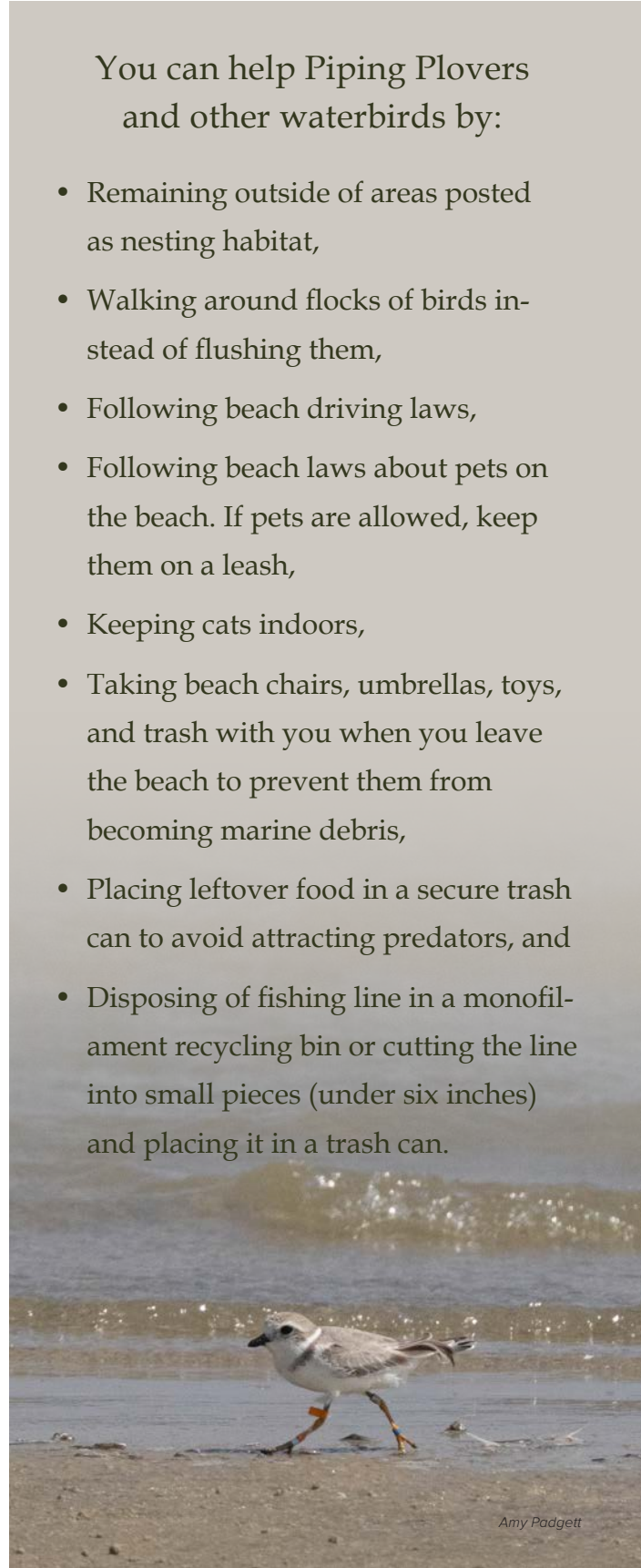
by Carmen Johnson, Waterbird Biologist, Kacy Cook, Waterbird Biologist, Doug Rouse, Waterbird Technician

During a recent International Shorebird Survey in Core Sound, NCWRC staff and volunteers spotted a banded Piping Plover from the species' Great Lakes population. There are three populations of Piping Plovers: Atlantic, Northern Great Plains, and Great Lakes populations. Most Piping Plovers found in North Carolina are part of the federally threatened Atlantic population, but birds from the federally endangered Great Lakes population migrate through and winter along the North Carolina coast. Staff reported the band combination to the Great Lakes Piping Plover Conservation Team and learned that this was a particularly rare bird. Most chicks are raised by one of the approximately 70 pairs of nesting adults that make up the Great Lakes population; however, this bird was captive-reared from an egg during the 2023 nesting season after the female that laid the nest was preyed on by a Merlin. While wild rearing is best, a single Piping Plover is not able to successfully incubate a clutch of eggs, so the eggs were taken to the Conservation Team's captive-rearing facility to give them a second chance. After learning to fly, the chick was released on the east end of Lake Ontario at Montario Point. During August, it was observed in New Jersey, and by early September, the juvenile plover had reached North Carolina. Staff and volunteers will continue to keep an eye out for this Piping Plover during autumn and winter surveys to see whether the young bird overwinters in North Carolina or continues south.

At one time, the Great Lakes population consisted of nearly 800 pairs, but due to disturbance around nesting sites, predation, and loss of high quality nesting habitat the population fell to a low of 13 pairs in 1990. The Great Lakes Piping Plover Conservation Team is working to recover the population through increased nest monitoring, providing information about the plovers to beach goers, predator management, habitat protection, and captive-rearing of eggs and chicks that would otherwise not survive. North Carolina's barrier islands, shoals, and inshore islands provide necessary foraging and roosting habitat that is helping to recover the Great Lakes Piping Plover population outside of the nesting season.

You can help Piping Plovers and other waterbirds by:

- Remaining outside of areas posted as nesting habitat,
- Walking around flocks of birds instead of flushing them,
- Following beach driving laws,
- Following beach laws about pets on the beach. If pets are allowed, keep them on a leash,
- Keeping cats indoors,
- Taking beach chairs, umbrellas, toys, and trash with you when you leave the beach to prevent them from becoming marine debris,
- Placing leftover food in a secure trash can to avoid attracting predators, and
- Disposing of fishing line in a monofilament recycling bin or cutting the line into small pieces (under six inches) and placing it in a trash can.





Hellbender Surveys Conducted in the Upper French Broad River

by Lori Williams, Western Amphibian Biologist

Partnerships and collaborations continue to be vital for state Special Concern Eastern Hellbender (*Cryptobranchus a. alleghaniensis*) conservation efforts in western North Carolina. A main objective for the summer included collaborating with Clemson University to model hellbender population status and investigate population structure in the upper French Broad River drainage, where surveyors made repeat visits at sites to look for all age classes of hellbenders and

mark adults with a permanent tag. This work will continue in the coming years. Another objective of the collaboration involved hellbender breeding season surveys during this quarter. Each year, our breeding season work spans an intensive 3-week period of daily field surveys. We try to locate sites, count individuals, document where hellbender breeding activity occurs, and record the presence of “den master” males, the individuals responsible for defending nest rocks and egg

continue on next page



Ben Dalton

Kabryn Mattison



Top right photo: Wildlife Diversity technician Clifton Avery holds an adult Eastern Hellbender after data collection, before release back to its capture location. Wildlife Diversity technician and Clemson University PhD student, Ben Dalton, snorkels over a male Eastern Hellbender den master in a nest rock (red arrow points to the den master).



clutches within. Starting this year, working with Clemson University, we tried to identify what makes used nest rocks different from other, available rocks. We made repeat visits to monitor the outcome at potential nest rocks and record field data on available rock shelters. Seven sites in four streams in the upper French Broad drainage were targeted. In those sites, we identified 44 potential nest rocks based on the presence of a den master male hellbender exhibiting defensive behavior. However, only 12 (27%) of potential nest rocks actually had confirmed nests, across all sites. This result was rather surprising, as we did not expect it to be so low. As we continue this research going forward, we will gain a better understanding of whether nest presence is inherently low, even for our “best” populations, or if lack of nesting may be a sign of more serious population threats.



Ben Dalton

Ben Dalton



Top right photo: Wildlife Diversity biologist Lori Williams inserts a permanent marker, a PIT-tag (Passive Integrated Transponder), in an adult Eastern Hellbender. The tag is like a microchip to detect and identify individual animals on subsequent visits. Above photo: Under a nest rock, a male Eastern Hellbender den master guards his nest of eggs (red arrows point to the hellbender on the left and eggs on the right).



Ben Dalton

Underwater camera (borescope) images inside nest rocks: a male Eastern Hellbender den master (on left) and a clutch of eggs (on right).



N.C. Partners in Amphibian and Reptile Conservation News

by Jeff Hall, Partners in Amphibian and Reptile Conservation Biologist

NCPARC members were involved in several important webinars, presentations, and meetings during the third quarter. This included a joint presentation with staff from the N.C. Museum of Natural Sciences on Snakes of the Piedmont to the Chatham Conservation Partnership, a virtual meeting with North Carolina and South Carolina partners to facilitate discussion about Gopher Frog conservation, a virtual meeting with North Carolina and Virginia partners

to discuss future Tiger Salamander collaboration, and a presentation given about the NCWRC community rattlesnake project to a regional meeting about Timber Rattlesnakes.

Additionally, staff visited with a landowner in Columbus County to conduct surveys for rattlesnakes, as well as assess the property for potential rattlesnake habitat. Through these visits, NCWRC staff can determine whether a landowner might



be eligible to enroll in the Wildlife Conservation Lands Program. These sorts of site visits are wonderful opportunities for NCWRC staff to collaborate with private landowners and learn more about rare species in our state.

Gopher Frogs

Several management actions took place on Holly Shelter game land during this quarter by NCWRC staff and partners directed at Gopher Frog conservation. These activities included releases of head-started juvenile frogs, as well as preparation and restoration of ponds. Partner head-starting agencies, including the NC Aquarium at Fort Fisher, NCSU CMAST, Carteret Community College, and the USFWS Edenton National Fish Hatchery were able to release all remaining juvenile frogs during July. Then later in August and September, pond restoration efforts kicked into full gear. Building on previ-

Jeff Hall



ous work with several ponds on the game land, staff used water pumps to fully dry down a man-made pond to enable the addition of higher quality soils and appropriate herbaceous vegetation

(right photo). These additions to the pond will bolster the local population of Gopher Frogs (left photo) by giving them additional places to lay eggs and better habitat for tadpoles to develop, both hopefully leading to more recruitment of adults.



Jeff Hall



N.C. Partners in Amphibian and Reptile Conservation News

Timber Rattlesnakes

During this quarter, staff conducted surveys for a long-term genetics project focused on conservation of the Timber Rattlesnake. Staff visited sites in Pisgah National Forest, along the Blue Ridge Parkway, and at several state parks. During surveys, tissue samples in the form of shed skins were acquired for future analysis, along with clipped scales and/or muscle tissues taken from road-killed specimens. Staff continued to receive reports from the public as part of our community rattlesnake project with over 200 sightings documented in 2023.



Clockwise from top left: gravid female Timber Rattlesnakes; a shed skin from a Timber Rattlesnake; and a Timber Rattlesnake neonate (Jeff Hall)





Alligator Marking and Data Collection

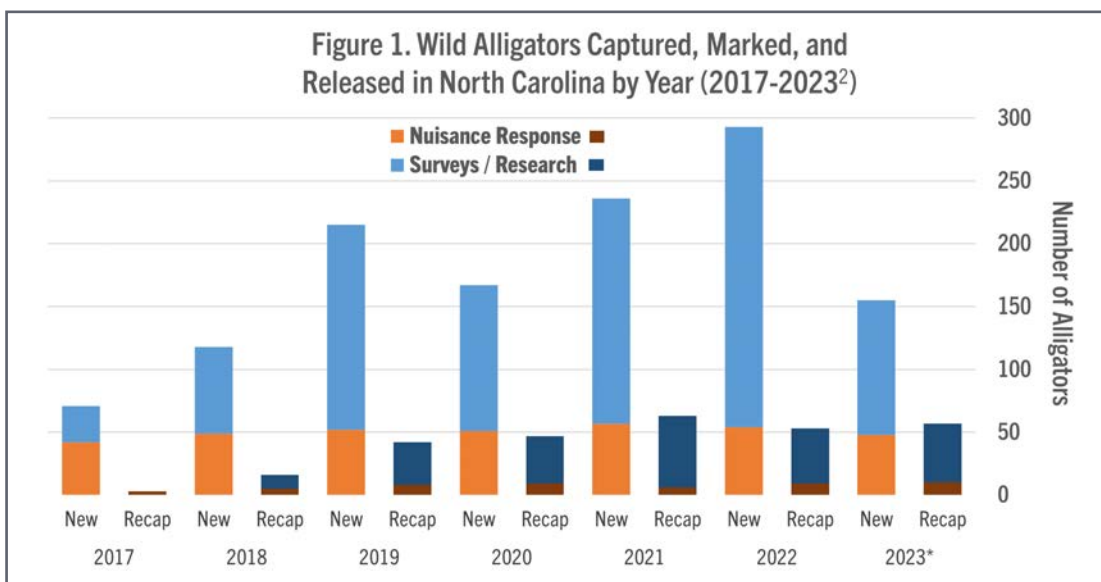
by Alicia Wassmer, Wildlife Diversity Biologist

In Spring 2017, the NCWRC initiated a new marking and data collection protocol for all alligators handled by agency staff and permitted external handlers, including Alligator Control Agents, Jurisdictional Alligator Handlers, and scientific researchers. Permitted scientific researchers include Dr. Stephen Dinkelacker of Framingham State University and Dr. Scott Belcher from NC State University.

Handlers mark all new captures with an internal Passive Integrated Transponder (PIT) tag, collect two tissue samples from tail scutes, determine sex, take body size measurements, and record GPS coordinates of locations of capture and release. These data are of great benefit to the agency’s alligator conservation efforts. Equipped with this information, biologists are able to learn more about growth rates and movements of individuals at different life stages, evaluate the effectiveness of various management practices, and identify communities that could benefit most from outreach programs with guidance on coexisting with alligators.



Juvenile alligators



These numbers are inclusive of research subjects of all sizes, such as nest site surveys over the years in which dozens of individuals may be tagged at once. Approximately 46% of the individuals marked since 2017 were still in vulnerable juvenile stages with high mortality rates. In fact, only about 16% of the alligators marked in NC since 2017 were large enough to be reproductively mature adults. Only partial data are available for 2023.



Biologists Conduct Rare Mussel Surveys in Rockingham, Davie Counties

by TR Russ, Foothills Region Aquatic Wildlife Diversity Coordinator

Exceptionally low water levels through the late summer and fall allowed Foothills Aquatic Wildlife Diversity (AWD) biologists to conduct surveys in areas where sampling has often been difficult. Biologists focused on two areas with noteworthy populations of rare mussels — the Dan River in Rockingham County and the Dutchmans Creek watershed in Davie county.

Draper Landing on the Dan River, just southeast of the town of Eden, supports a unique and relatively diverse group of mussels. This reach of river is notoriously difficult to sample because of high flows and depth, and also is complicated by hydrologic releases from the Smith River in Virginia. Foothills biologists, along with Eastern AWD staff and Virginia Department of Wildlife Resources biologists, put in a successful effort to locate the federally threatened Atlantic Pigtoe for an ongoing genetic cataloguing project in collaboration with researchers at Georgia Southern University and NC State University. Biologists recovered two individuals, including a juvenile, which indicates reproduction is still occurring in this reach of the river. Biologists also found the federally endangered James Spiny mussel and the proposed federally threatened Green Floater. Dutchmans Creek in Davie County is a direct tributary of



Federally protected mussels from the Dan River. Top left and center - Atlantic Pigtoe; top right - James River Spiny mussel; bottom left - Green Floater. (Michael Perkins)



Foothills AWD coordinator TR Russ grubs for mussels in Dutchmans Creek in Davie County (Michael Perkins)

the Yadkin River and had somehow evaded proper surveys for freshwater mussels over the last 30 years. The watershed is noteworthy because it was the focus of an intense flood management program in the mid-20th century, culminating in the construction of numerous flood-control dams by Natural Resources Conservation Service. Staff conducted several surveys and discovered a robust assemblage of nine mussel species, including the

state-endangered Eastern Lampmussel and state-threatened Creeper mussel, all of which are new records for the county. Staff believe the abundance of low-head dams stabilizes stream habitat as well as boosts the food supply and quality for the mussels downstream, a trend that has been well-documented in other dammed mussel streams in North Carolina and throughout the Southeast.



Resighting Returning Golden-wings

by: Christine Kelly, Western Bird and Carolina Northern Flying Squirrel Biologist

Each spring, ornithologists have a narrow window of about 5 weeks to cram in surveys for Golden-winged Warblers (GWWAs) in the mountains. The window is made even narrower by the duration of the dawn chorus. Exuberant singing - and therefore, a biologist's odds of hearing one - drops off markedly by around 10 AM. Throw curvy mountain roads and long commute times into the mix and field staff can only cover so much survey ground. Commission biologists visit a network of monitoring points where they broadcast the species' song over a speaker and then watch and listen carefully for about 15 minutes before dashing off to the next survey point. This standardized survey protocol using an audiolure is widely used by partners in the Golden-winged Warbler Working Group.



Clifton Avery

But biologists feel constraints when it comes to expanding survey coverage to other areas. This is where Autonomous Recording Units come in to play. Autonomous Recording Units (ARUs) are small electronics that passively record ambient sounds. They can be custom programmed to record during certain hours of the day or night and can even be programmed with a delayed start of several days or weeks. ARUs offer biologists a means of expanding survey coverage when they can't be in two places at once. They also increase survey coverage by recording continuously, long beyond what field staff can complete in one morning through a rushed series of 15-minute audiolure surveys. Once retrieved, it's a matter of reviewing the audio recordings using song recognizers or manual review.

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Chris Kelly



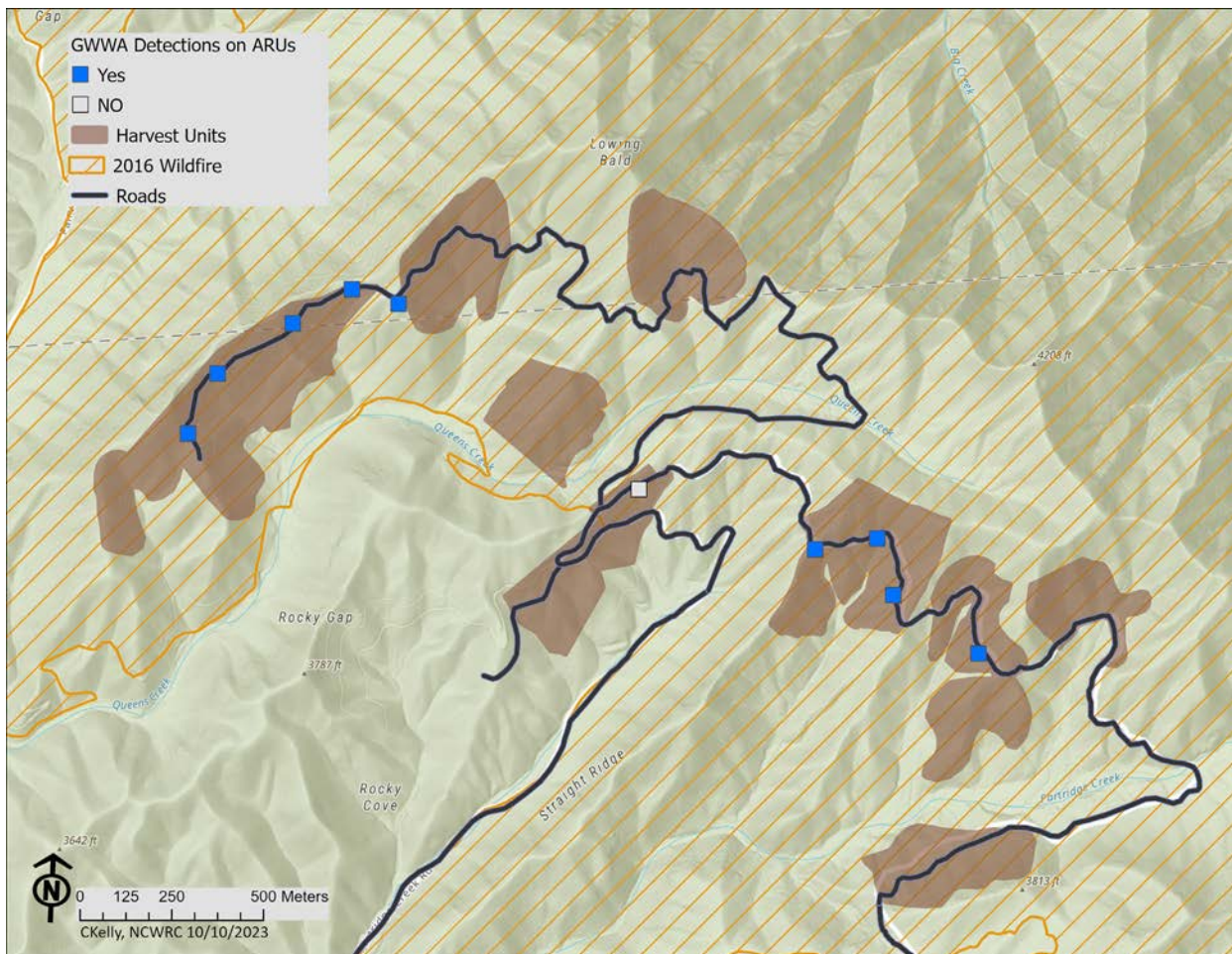
Autonomous Recording Units were aimed at the harvest units. Golden-winged Warblers and other birds nest along the edges of the logging roads adjacent to harvest units. Pink flag marks a nearby Wild Turkey nest on this logging road. An AudioMoth Autonomous Recording Unit, by Open Acoustic Devices (Chris Kelly)



This quarter, we finished reviewing a set of recordings from ARUs that Commission biologists used to survey a section of the Nantahala National Forest during the breeding season without having to actually go there during the busy month of May. In mid-April, before the GWWAs had even returned from their wintering grounds in South America, 10 ARUs were deployed (programmed with a 2-week delayed start to save battery) at what

looked like promising GWWA habitat. The project site, Partridge Creek, consisted of several young logging units that had burned in a severe wildfire in autumn 2016. The wildfire set vegetation succession back, effectively extending the useability of this part of the forest for species like the GWWA. Commission biologists had documented GWWA in one part of the project area, but time and logistics prevented field staff from reaching other sections for breeding

season surveys. With the ARUs, biologists confirmed the presence of GWWAs at 9 of 10 survey sites. By sub-sampling the raw recording files from early May and mid-May, they found evidence that GWWAs had remained on territory and weren't just passing through the area on migration. In addition, they documented other species of interest to the Commission and the U.S. Forest Service, including the Eastern Whip-poor-will and Wood Thrush.



Detections of Golden-winged Warblers on Autonomous Recording Units in a forest management area on the Nantahala National Forest that burned in the 2016 wildfires.



Little Brown Bat Radiotelemetry Pays Off for Second Year in a Row

by Katherine Etchison, Mammalogist

Captures of little brown bats have become a rarity in NCWRC's long-term mistnetting surveys in the wake of White-nose Syndrome (WNS) except at one site in Avery County. Little brown bats are still reliably caught at this net site each summer and a total of 54 little brown bats have been caught since WNS was detected in 2011. Efforts to understand this survivor population began in 2022 with a radiotelemetry survey that led to the discovery of a large roost 2.5 miles from the net site. NCWRC staff are working closely with the landowner to monitor the roost and to learn more about this survivor population.

Because the 2022 efforts were so successful, a second round of radiotelemetry was conducted in 2023. In August 2023, NCWRC biologists radio-tagged two (2) little brown bats from a bridge roost in Watauga County. The radio-tagged bats were tracked 11.2 miles away to a cellar beneath a home in Avery County. This was surprising because the bats radio-tagged in 2022 roosted less than three (3) miles from their capture site and because the cellar is underground and somewhat cave-like. NCWRC biologists are working closely with the landowner to understand the number of bats roosting in the cellar and how often bats are



A radio-tagged little brown bat in Watauga County
Katherine Etchison

present. Additionally, the cellar will be monitored this winter to determine if bats use it as a winter roost. WNS is established in caves and mines in the area, but this cellar could offer a WNS-free refuge if bats are using it as a hibernaculum.

Joey Weber



Katherine Etchison



Left: Wildlife Diversity Biologist, Katherine Etchison, tracking radio-tagged little brown bats. Right: The entrance to a cellar where little brown bats were found roosting



NCWRC and Partners Monitor Bog Turtle Populations for Poaching in Real Time

by Gabrielle Graeter, Conservation Biologist/Herpetologist

When the bog turtle was originally federally listed in 1997, one of the primary concerns was poaching of turtles from the wild. Unfortunately, there is international pressure from the illegal turtle trade on most wild North American turtle species, including the bog turtle. More information about the severity of this threat can be found on the Partners in Reptile and Amphibian Conservation's website at <https://parcplace.org/species/collaborative-to-combat-the-illegal-trade-in-turtles/>. Given the threat of illegal collection and that the bog turtle is declining in North Carolina, we wanted to add another level of protection and information gathering to our current efforts to deter poaching. To monitor bog turtle populations in North Carolina, NCWRC and the USFWS have set cellular cameras at numerous sites

across western North Carolina, on both public and private lands, with permission of the landowner. These cameras submit real-time images to staff so enforcement officers can respond immediately if needed (Fig. 1). This operation has been planned and initiated in collaboration with state and federal law enforcement officials.

A side benefit of having these cameras deployed is that over time, they will produce a thorough inventory of the meso-predator species present at each location (Fig. 2). Through this data set, we are learning about both the predator diversity and relative abundance of mid-sized predator species at each wetland complex. This provides valuable information about the degree of threat posed to a particular population by increased predator abundance from human-based subsidies.

With bog turtle populations spread out across the western part of the state, these cellular cameras have proven incredibly helpful at providing a method for biologists and law enforcement to remotely monitor multiple sites simultaneously. In conjunction with these cellular cameras, NCWRC Law Enforcement are stationed in every county of the state, and that allows for close monitoring of each of these important bog turtle populations. Given the utility of these cameras, we plan to deploy cameras at more populations in 2024.



Figure 1. These photos demonstrate some of the types of real-time images we are getting of people and vehicles on these cellular cameras.



Figure 2. An example of images captured of mid-sized predators that could prey on bog turtles and bog turtle eggs.



Big Mussel News on the Little River

by Chantelle Rondel, Aquatic Listed Species Biologist

In May 2023, Western Region Aquatic Wildlife Diversity staff and U.S. Fish and Wildlife Service biologists surveyed the Little River of the French Broad River Basin for a federally threatened species, the Longsolid. The goal of these surveys was to collect individuals to take to the Marion Conservation Aquaculture Center (MCAC) for broodstock. In 2022, when propagation of this species started, only 14 individuals were found with over 25 hours of effort. Although the first few 2023 surveys for Longsolid broodstock only resulted in four individuals found in 11 ½ hours, during the third day of surveys, 17 individuals were

found in 8 ½ hours during one day of sampling with 15 of those coming from one small reach in four person-hours. Seven of these Longsolids were transported to the MCAC for propagation while the others were tagged with PIT and Hallprint tags and returned to the reach where they were found.

In June 2023, staff from Western Region Aquatic Wildlife Diversity, U.S. Fish and Wildlife Service and Madi Polera, a Ph.D. candidate at NC State University conducted additional mussel surveys on the Little River to obtain a sizeable sample of each of the five mussel species that call this river home. Madi swabbed mul-

tle individuals of each species to assess health based on their microbiome. A survey in the same reach where most of the Longsolid broodstock was collected in May resulted in 15 Longsolids, with only two of those being recaptures from earlier in the year. Additionally, four Tennessee Clubshells were found, breaking previous records for the species in the Little River. The Tennessee Clubshell is under review by the U.S. Fish and Wildlife Service and considered state endangered in North Carolina. There were also over 100 Appalachian Elktoe, which is state and federally endangered, found during these surveys. One of the Appalachian Elktoe found was the largest known individual in the world measuring in at 119.05mm found by biologist Dylan Owensby. Other species found during these surveys include the Creeper and Slippershell.

The Little River remains a stronghold for the Longsolid and Appalachian Elktoe in the French Broad Basin of western North Carolina. However, less than 5 river miles of the Little River is currently suitable enough to support this rich freshwater mussel fauna. Monitoring and propagation efforts will continue for the preservation of this population and establishment of other populations throughout the basin.



Clockwise from top left: Western Region Aquatic Wildlife Diversity Biologist Dylan Owensby with a Appalachian Elktoe; Longsolids; smallest and largest Appalachian Elktoe found in a day (Photos: NCWRC)