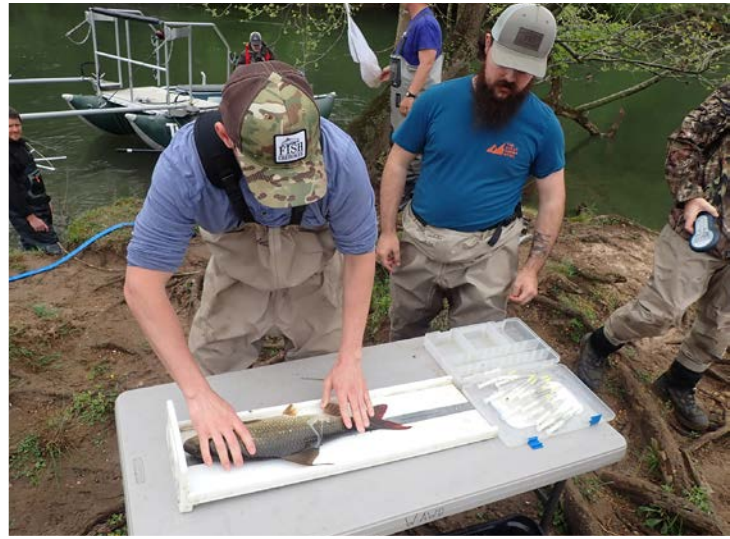




NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

WILDLIFE DIVERSITY PROGRAM QUARTERLY REPORT

APRIL-MAY 2022





The North Carolina Wildlife Resources Commission's (NCWRC) Wildlife Diversity (WD) Program is housed within the agency's Wildlife Management and Inland Fisheries 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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Bog turtle (Jay Ondreika)



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Cover photos from top left clockwise: PARC Biologist Jeff Hall measuring a juvenile Spotted Turtle during surveys (Kabryn Mattison); Sicklefin Redhorse collected from the Little Tennessee River (NCWRC); After being fitted with a transmitter, this Brown Pelican quickly rejoined the colony. (Constance Powell); Wildlife Diversity Technician Clifton Avery and WD Biologist Chris Kelly band and take measurements from a Golden-winged Warbler. (Anthony Squitieri); Biologists setting bucket-camera traps in a wetland in May 2022 (NCWRC)



Biologists Assist with Multi-State Brown Pelican Tracking Project

by Carmen M. Johnson, Waterbird Biologist, John Lynch and Constance Powell, Waterbird Technicians

During summer 2022, N.C. Wildlife Resources Commission (NCWRC) staff helped researchers outfit adult Brown Pelicans with high-resolution GPS satellite transmitters. Previously, Dr. Patrick Jodice (Clemson University) and Dr. Brad Wilkinson (Duke University) captured and fitted 45 birds with these transmitters in South Carolina, and they are now expanding efforts into North Carolina, Georgia and northern Florida. Begun in 2017, the project

examines habitat use patterns, foraging behaviors, and migratory corridors of Brown Pelicans in the South Atlantic Bight.

Pelicans from a colony near Oregon Inlet were tagged during a two-day effort in early June. A snare-pole was used to secure the pelicans from the outskirts of the colony to minimize disturbance. During attachment of the transmitters, birds were weighed, and measurements of culmen (the upper ridge along a bird's

beak) and tarsus (the part of the bird's leg between what appears to be the backward-facing 'knee' and the 'ankle') were recorded. Blood and feather samples were also collected. Three pelicans were captured, tagged, and successfully released during this effort, and we look forward to seeing the maps that will be created from the data collected, showcasing breeding ranges, migratory pathways, wintering locations and site fidelity.



Left: Attaching transmitter harness to the bird as NCWRC Biologist Kimberly Smith looks on; After being fitted with a transmitter, this Brown Pelican quickly rejoined the colony. (Constance Powell)



Four Leatherback Sea Turtle Nests Found on North Carolina Shores So Far this Summer May Be Attributed to One Female

by Dr. Matthew Godfrey, Sea Turtle Biologist

Sea turtles deposit their eggs on North Carolina beaches between May and August each summer. The overwhelming majority of sea turtle nests observed in North Carolina are laid by loggerhead sea turtles, followed by small numbers of nests laid by green turtles, Kemp's ridleys and, more rarely, leatherback sea turtles. To date this summer, four leatherback nests have been found on North Carolina beaches. The first nest occurred on Cape Lookout National Seashore, and National Park Service staff were able to observe the

female as she nested in the late afternoon. The second nest was found on Oak Island, over 100 miles away; the turtle was also observed nesting during daylight hours. The third nest was found on Caswell Beach, adjacent to Oak Island, but the turtle nested during the cover of darkness. The fourth nest was found on Cape Hatteras National Seashore, again laid during nighttime hours. Each nest was separated by 10 days, which is the average number of days between successive nests laid by individual females for this species, leading

to speculation that all nests belonged to a single female. To test for identity of the mother, a DNA sample was collected from each nest. The samples came from the eggshell of one of the small albumen-filled "eggs" that contain no yolk or embryos, which typically number between one and three dozen in each leatherback sea turtle nest. The ecological benefit of these "yolkless" eggs remains a mystery, although some hypothesize that they may serve a deterrent to predators or help maintain humidity in the nest cavity during incubation.



An adult leatherback sea turtle nesting on North Core Banks, Cape Lookout National Seashore, during the afternoon May 5, 2022. The turtle is being checked for tags (it had none). (Cape Lookout National Seashore)



Small "yolkless" eggs in a leatherback sea turtle nest (Dr. Matthew Godfrey)



NC Bird Atlasers Had Busy Spring Season

by John Carpenter, Eastern Land Bird Biologist, Scott Anderson, Science Support Coordinator

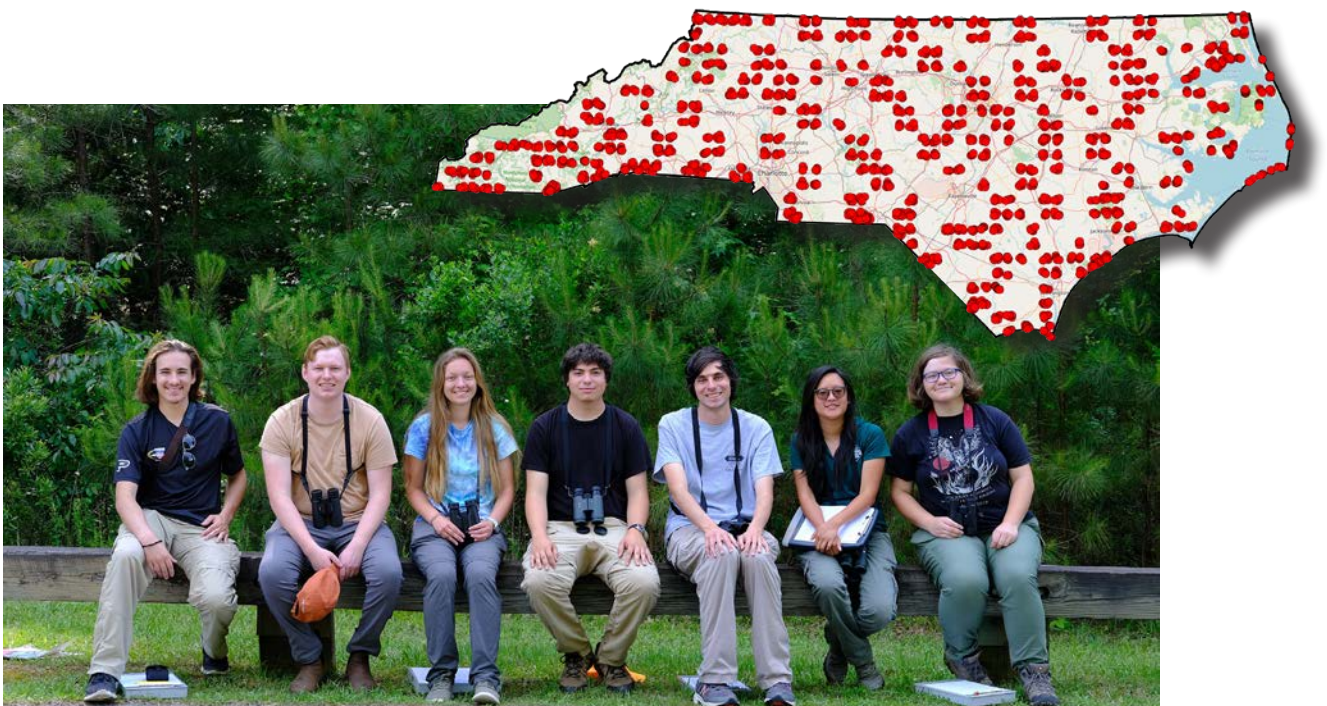
The North Carolina Bird Atlas had many accomplishments from April through June 2022. The Wildlife Diversity program’s field staff conducted over 1,100 standardized avian point count surveys, which brings the total number completed (including those from 2021) to over 2,200. The data obtained from these surveys will be used to develop density estimates and detection probabilities for many bird species. In addition, North Carolina — along with three other states (Maine, New York, and Maryland/DC) and two Canadian provinces (Newfoundland and Ontario) — participated in the 2nd Annual Big Atlas

Weekend Competition. All of our results — including total number of participants and hours dedicated to atlasing — increased significantly compared to last year’s event. During the early mornings and evenings from June 24-26, 2022, more than 190 atlasers contributed 490 hours and identified 162 species in 362 atlas survey blocks. As of early July, we have data from almost 90% of our priority blocks and 193 species confirmed as breeding in our state! This huge accomplishment has been made possible by

the efforts of 1,442 atlasers (most of whom are volunteers) who have submitted 80,381 checklists since the project began last year. As this summer winds down, we

Atlasers have been busy! As of early July, NCWRC biologists have data from almost 90% of their priority blocks and 193 species confirmed as breeding in the state.

will remain busy preparing for the atlas’s second winter season, organizing data, and engaging with our volunteers to encourage their continued participation in this growing citizen science project.



North Carolina Bird Atlas field technicians (left to right: Davis Balsler, Dan Watson, Adrianna Nelson, Clayton Gibb, Matt Janson, Elsa Chen, and Martina Nordstrand) with map of completed avian point count survey locations (NCWRC)



Staff Create Burrows around Wetland in Hopes of Increasing Survival of Released Juvenile Gopher Frogs

by Dr. Jeff Humphries, Eastern Amphibian and Reptile Biologist

The State Endangered Gopher Frog is extremely rare in North Carolina, currently found in only seven populations in the southeastern portion of the state. On the Sandhills Game Land, in Scotland County, only one natural wetland is reliably used by Gopher Frogs for breeding. Because of the precarious nature of only having one small population on the property, the NCWRC has teamed up with the North Carolina Zoo for six years to “headstart” juvenile frogs in an attempt to increase the number of animals on the landscape and increase survival of juveniles. Headstarting has involved collecting small portions of egg masses from the natural wetland and raising tadpoles in large plastic tubs until they metamorphose into young frogs. They are then released back to the wild.

In 2022, Gopher Frogs did not breed anywhere on the game land for the first time in nine years because of low water levels and possibly other factors. Therefore, biologists did not have an opportunity to continue the headstarting program this year using eggs from the natural wetland.

Instead, North Carolina Zoo biologists were successful in breeding captive frogs that originated from the Sandhills Game Land and raising tadpoles to metamorphosis. Over 110 juvenile Gopher Frogs were released to a wetland that NCWRC biologists have been restoring in order to add another wetland where Gopher Frogs may grow up and breed in the future. Previous studies of released juvenile frogs have shown that most released frogs don’t find shelter in burrows very quickly after release at the wetland and succumb to

predators such as Black Racers, non-native fire ants, and a few other predators. With that in mind, this year NCWRC biologists created burrows around the release wetland by using metal poles to bore holes in the sand several feet deep and about an inch in diameter. Staff are monitoring the use of these burrows by juvenile frogs, and so far, the technique appears to be successful. They check burrows with flashlights and have mounted camera traps on some burrows nearby to observe burrow use, behavior, and possible interactions with predators. Staff will continue to monitor this site to measure the effectiveness of headstarting Gopher Frogs and to determine whether these artificial burrows can help increase survival of frogs in these pine woods that the captively raised frogs have never seen before.



Left: A juvenile Gopher Frog using a burrow created by NCWRC biologists. These burrows should provide protection from predators, giving them a better chance of survival. Right: Juvenile Gopher Frog released to a restored wetland (photos Michael Martin)



Staff Conduct Host Fish Surveys for Tar River Spiny mussel

by Michael Fisk, Eastern Region Aquatic Wildlife Diversity Coordinator

In May and June, Wildlife Diversity Program staff in the Eastern Region conducted host fish surveys for the Tar River Spiny mussel. Mussels have parasitic larvae called glochidia that they attach to the gills and fins of fish for several weeks before they drop off into the substrate. Although lab studies have identified several fish species as suitable hosts, determining host fish under natural conditions can help gain a better understanding of the Tar River Spiny mussel's life history, which will lead to enhanced conservation strategies. A long-term augmentation site in Little Fishing Creek (Halifax County), a tributary of the Tar River, was used for this project.

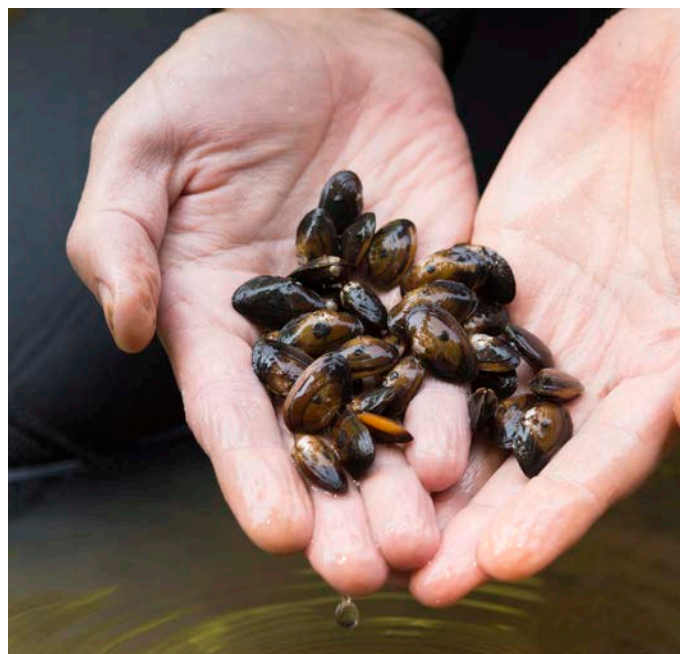
Staff used a combination of seining and backpack electrofishing to collect host fish in the vicinity of the augmentation site. White Shiner, Pinewoods Shiner, Bluehead Chub and Satinfish Shiner were targeted based on previous lab and hatchery trials where Tar River Spiny mussel glochidia successfully attached and transformed into juvenile mussels.

From the first collection in May, staff found glochidia on four of the 13 White Shiners and five of the 44 Pinewood Shiners collected. No glochidia were collected on the Bluehead Chubs. Two White Shiners held two glochidia each while all other fish only had single individuals. Four of the 10 glochidia collected

were preserved and appear to be Tar River Spiny mussels based on visual assessments. The other glochidia collected may be common *Elliptio* species and one glochidia from the federally listed Atlantic Pigtoe. To confirm the identity of each species, staff will measure, photograph and genetically analyze the glochidia. Host fish collections were completed in June, and the fish are currently being processed. The results of this study will help identify host fish for the Tar River Spiny mussel as well as other native mussels within Little Fishing Creek. These findings will help gain a better understanding of native mussel life history and lead to more informed conservation strategies.



Above: Tar River Spiny mussel conglutinates. Conglutinates are packages of glochidia that the female mussel releases. Often, the conglutinates will mimic prey and food items to attract host fish and increase the likelihood of infestation = attachment to the host. Host fish will attempt to eat the conglutinates, and the glochidia are expelled and attach to the gills of the host fish. (Sierra Benfield)



Tar River Spiny mussels (NCWRC)



Bird Crew Conducts Rangewide Golden-winged Warbler Survival Study

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

In late April and May, the Western Wildlife Diversity bird crew captured and color-banded 22 Golden-winged Warblers in the Cheoah Mountains (Graham County) for a study led by the University of Maine. The objective of the study, “Estimating the survival rate of Golden-winged

Warblers for a range-wide integrated population model” is to better understand annual survival of this rapidly declining migratory bird. That is, do they make it from one breeding season to the next? In particular, how are the under-studied females faring?

Between jaunts to western North Carolina to nest in brushy old field habitat or patches of recently logged forest, Golden-winged Warblers make a 2,000-mile trip to their wintering grounds in the Andes Mountains of northern South America. Quality habitat is needed at each leg of the journey that comprises their full annual life cycle.

To fill in these knowledge gaps, the principal investigators enlisted nearly a dozen state, federal, and non-governmental partners in the eastern U.S. to study golden-wings in their states. The data that the NCWRC helps collect will be plugged into the population model that will inform the U.S. Fish and Wildlife Service’s decision about whether to federally list the species.

The NCWRC team fitted 12 of the birds (five females, seven males) with nanotags, a type of coded radio transmitters that

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Clifton Avery attaches a nanotag to a male Golden-winged Warbler (Anthony Squitieri)



Wildlife Diversity Technician Clifton Avery and Wildlife Diversity Biologist Chris Kelly band and take measurements from a Golden-winged Warbler they captured in the Cheoah Mountains. (Anthony Squitieri)



University of Maine graduate student Emily Filiberti (left) helps Clifton Avery and Chris Kelly of the NCWRC and Aimee Tomcho of Audubon NC learn to use the Lotek receiver. (Anthony Squitieri)



are detectable on the growing Motus Wildlife Tracking Network of fixed radio telemetry receiver stations. Partners in the University of Maine Golden-winged Warbler study met in April for practice

attaching the nanotags and using the tracking equipment. Biologists hope that some of these tagged birds are picked up on Motus receiver stations during migration and at their overwinter-

ing sites in Colombia and Venezuela. The bird crew will search for the tagged and color-banded golden-wings via ground tracking next spring when they return to nest in the Cheoah Mountains.



Video clip of a slow motion release of a nanotagged female Golden-winged Warbler (Clifton Avery)



Golden-winged Warbler habitat, consisting of a six-year-old harvest unit surrounded by forest (Anthony Squitieri)



A tiny nanotag sits on the back of a male Golden-winged Warbler (Anthony Squitieri)



A mist net deployed at first light to capture Golden-winged Warblers nesting in a six year old logging unit on the Nantahala National Forest. (Anthony Squitieri)



Northern Saw-whet Owls and Other Species Use Nest Boxes Built and Erected by Staff and Students in 2021

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

Regular readers of the Wildlife Diversity Quarterly Reports may recall reading about a nest box project for Northern Saw-whet Owls in the [first quarter 2021 report](#). Haywood Community College students built and posted 10 wood nest boxes on the William H. Silver Game Land (Haywood County) with NCWRC biologists in March 2021. We are pleased to report that a pair of the tiny owls took to one of the boxes this year. An adult saw-whet owl peered out of the box during quick box checks in late March and mid-April 2022. Nesting was confirmed in May

2022 when a nestling poked its head out of the box. Two other owl boxes were claimed as den sites by small mammals. A Red Squirrel's moss nest occupied one box, and another was filled to the brim with the characteristic finely shredded Yellow Birch bark of a Carolina Northern Flying Squirrel nest. These are just some of the bird and mammal Species of Greatest Conservation Need (SGCN) that call the William H. Silver Game Land home. NCWRC biologists are working with the staff forester to restore red spruce forest for these species on the game land.



Video of an adult Northern Saw-whet Owl peering out of a nest box



Above photos: An adult Northern Saw-whet Owl peers out of its nest box in mid-April; Left: Clifton Avery celebrates after discovering that a Northern Saw-whet Owl took up residence in a relatively new owl box. (All photos: Anthony Squitieri)



Sicklefin Redhorse Conservation

by Luke Etchison, Western Region Aquatic Wildlife Diversity Coordinator

It was a successful year for Sicklefin Redhorse monitoring and egg collection in the Little Tennessee River Basin. Western Region Aquatic Wildlife Diversity biologists teamed up with colleagues from the U.S. Fish & Wildlife Service, Eastern Band of Cherokee Indians, Duke Energy and Tennessee Valley Authority to capture this state threatened sucker species that is endemic to the Little Tennessee and Hiwassee river basins in western North Carolina and Northern Georgia. The Sicklefin Redhorse can only be caught in high numbers during its spring spawning run, when males and females congregate in shallow, swift shoals. The spawning period is very brief, so biologists must attempt to time their sampling efforts when temperatures and water levels are just right.

This year, biologists used boat electrofishing surveys to collect 146 Sicklefin Redhorse from the Little Tennessee River Basin. Survey locations included the Little Tennessee River downstream from Lake Emory Dam, the Oconaluftee River downstream from Ela Dam, the Tuckasegee River near Cullowhee, and the Tuckasegee River between the Oconaluftee River and Bryson City. The Little Tennessee River ended up being the most productive site and biologists were able to collect an estimated 12,000 eggs from just one female. The eggs were fertilized on site before being transported to Warm Springs National Fish Hatchery in Georgia. After hatching there, the propagated Sicklefin Redhorse will be fed until they reach sizes suitable for stocking. Stocking efforts will take place later in the summer/fall 2022 and will focus on areas in their native range where dams currently prohibit the Sicklefin Redhorse from occupying.



Sicklefin Redhorse collected from the Little Tennessee River (NCWRC)



Partners with the Eastern Band of Cherokee Indians measuring a Sicklefin Redhorse (NCWRC)

Biologists are also conducting a long-term Mark/Recapture study, which requires each fish to be implanted with a unique Passive Integrated Transponder (PIT) tag. This monitoring effort provides additional insights into some of the Sicklefin Redhorse's basic biology such as population size, movement patterns and lifespan. Fifteen of the fish captured in 2021 had been caught and tagged in previous years.



Staff Team with U.S. Forest Service and Specialists to Repair Gates at Caves and Mines on the Nantahala National Forest

by Katherine Etchison, Mammalogist

The NCWRC and the U.S. Forst Service (USFS) worked collaboratively to restore working order to three gates in caves and mines on the Nantahala National Forest in April. These sites serve as bat hibernacula during winter, so preventing unauthorized human entry is key to conservation. Human disturbance often causes bats to wake from hiber-

nation, which can deplete vital fat reserves needed for surviving white-nose syndrome infection.

At a Macon County mine, a new gate was created because the mine has records of hibernating northern long-eared bats and is currently used by hibernating tricolored bats. Populations of these species have undergone severe population

reductions because of white-nose syndrome. The NCWRC and USFS worked alongside a team of cave gate specialists over three days to repair and fabricate these gates. Staff from the Land and Water Access Division and the Wildlife Diversity Program provided much of the labor for this effort.



Nantahala National Forest Wildlife Biologist, Johnny Wills, Conservation Technician, Brandon Allen, and Franklin Depot Team Leader, Mike Parks, prepare to cut steel for a mine gate. (Katherine Etchison)



A tricolored bat documented the winter before gate installation in the Macon County mine (Katherine Etchison)



A Macon County mine entrance on the Nantahala National Forest after gate installation (Johnny Wills/USFS)



Robust Redhorse Sampling and Population Monitoring Continue

by Brena Jones, Central Aquatic Wildlife Diversity Research Coordinator

Staff continued annual cooperative sampling and population monitoring for Robust Redhorse in the Pee Dee River downstream of Blewett Falls dam, alongside partners in the Yadkin-Pee Dee Technical Working Group, including Duke Energy, S.C. Department of Natural Resources (SCDNR) and S.C. Aquarium.

During targeted spring surveys, there were 58 Robust Redhorse captures in 20.3 hrs of electro-fishing, a catch rate of 2.85 fish per hour. These captures represent:

- 50 unique individuals of which 25 were previously untagged fish
- 16 recaptures from previous years, a recapture rate of 32%
- 8 Phase II juveniles, spawned in spring 2015, stocked in November 2016
- One Phase III individual, spawned in spring 2015, stocked at age 5 in March 2020

Fish ranged in size from 17 to 29 inches (425 to 748 mm) in total length (TL), representing multiple age classes. Continued successful recruitment of captively reared fish into the wild population was documented once again this year. Eggs from two females were crossed with one male for captive propagation this year. The resulting fry will be grown out in ponds at the NCWRC's McKinney Lake Fish Hatchery and the SCDNR's Dennis Center for population augmentation stocking.

Duke Energy biologists had 12 more captures near Blewett Falls dam, including four previously untagged fish. This brought the total number of Robust Redhorse captured in North Carolina in 2019 to 60 fish.

Fin clips were collected from all animals in North Carolina, and genetic analysis conducted by SCDNR this summer will determine whether the new fish are products of previous augmentation efforts.



Brena Jones collects a fin clip from a sedated adult male Robust Redhorse. (NCWRC)



Innovative New Monitoring Techniques Show Promise for Evaluating the Status of Bog Turtles in North Carolina and Throughout the Species' Range

by Gabrielle Graeter, Conservation Biologist/Herpetologist

Bog turtles and their habitat — mountain bogs — are a high priority for conservation in North Carolina. The bog turtle, *Glyptemys muhlenbergii*, is both federally (S/A) and state threatened. The NCWRC monitors this species to understand population status and trends. However, studying rare or elusive species like the bog turtle presents a unique challenge. They are often very difficult to find, and it can take a lot of effort to find even one turtle at a known population. In the past year, through a collaboration with multiple conservation partners, including the U.S. Fish and Wildlife Service (USFWS), Tangled Bank Conservation and Clemson University, we have been testing new innovative techniques for estimating bog turtle occupancy and abundance in bog habitat, in the hopes that we will be able to find ways to more effectively monitor this species.

With our partners, we have tested two passive sampling techniques. A sampling technique is passive if the animal does not need to be physically captured, reducing stress and habitat disturbance. One of the two sampling techniques is also a remote sampling method. A sam-

pling method is considered remote if the researcher does not need to be present during data collection, which can save time and resources. The passive and remote method is a modified camera-trap technique, where a wildlife camera

is mounted in an upside-down 5-gallon bucket that has openings cut out on opposite sides and is placed on the ground within the wetland in places we would expect turtles to travel (Figure 1).

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Figure 1. Biologists setting bucket-camera traps in a wetland in May 2022 (NCWRC)



The bucket-camera traps were set for three to four weeks, with traps removed and photos evaluated afterwards (Figure 2). We also evaluated the use of testing for the presence of environmental-DNA, also known as “e-DNA”, in water samples. Environmental DNA originates from cellular material shed by organisms (via skin, excrement, etc.) into aquatic or terrestrial environments. Multiple water samples were collected at each bucket camera-trap location and subsequently tested for the presence of bog turtle DNA via quantitative PCR in the lab.

Our conservation partner, Tangled Bank Conservation, evaluated the accuracy and utility of these two methods at 11 sites that were known to have bog turtles. Preliminary findings indicate that both meth-

ods can provide a quick and comparatively inexpensive method of estimating occupancy and relative abundance of bog turtles. Bog turtles were positively identified as present in each of the 11 sites evaluated using both techniques! We were able to determine the number of days that the camera traps must be deployed to have a high chance (95%) of documenting a bog turtle if they are present, as well as how many water samples are needed to accomplish the same goal. One of the most difficult parts of the project is reviewing and organizing all the photos generated from the camera trapping. We are in our second season of setting the camera traps and, as we learn more, we are learning and adjusting our methodologies, including our approach to photo review!



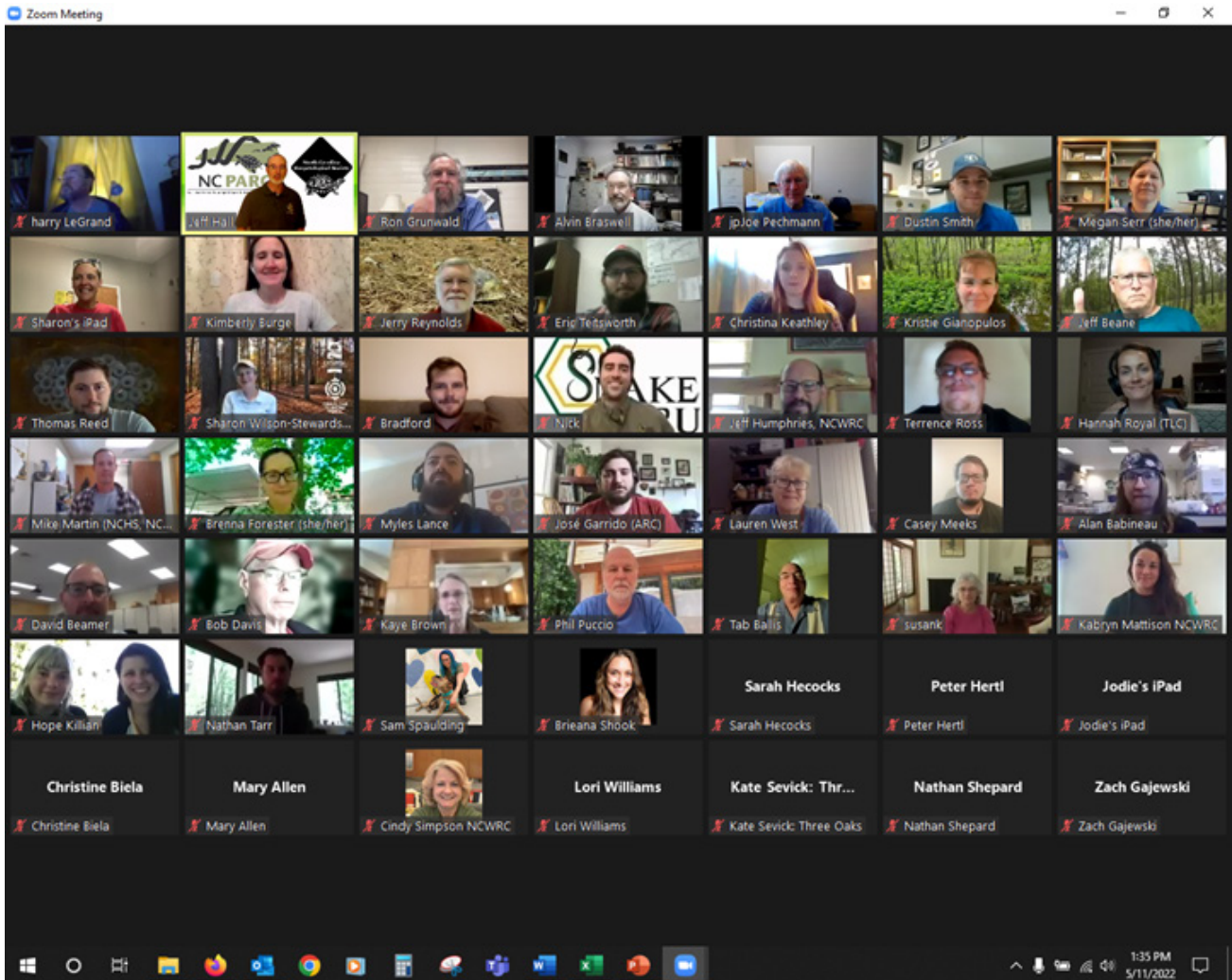
Figure 2. Example of a photo captured from a bucket-camera trap. This one shows a juvenile bog turtle traipsing through. (Mike Knoerr)



N.C. Partners in Amphibian and Reptile Conservation News

by Jeff Hall, Partners in Amphibian and Reptile Conservation Biologist

NCPARC held its annual meeting jointly with the N.C. Herpetological Society in May, the 4th North Carolina Congress of Herpetology. The meeting was a successful virtual event covering four days, with 141 registrants averaging 60-80 attendees each session. The meeting included a diversity of opportunities such as presentations, workshops, networking sessions and a trivia night! All presentations and activities were well received. We hope next year's meeting will be held in person.



Screenshot from Day 1 of the 4th NC Congress of Herpetology (Jeff Hall)



N.C. Partners in Amphibian and Reptile Conservation Other News

AMPHIBIAN AND REPTILE SURVEYS

Amphibian and reptile surveys during this quarter involved many staff from the NCWRC, partner agencies and volunteers from the public. Sites assessed ranged from game lands to state parks to national forests. Species targeted included Mabee's Salamander, Pine Barrens Treefrog, Spotted Turtle, Pigmy Rattlesnake, and Timber Rattlesnake. Two new sites were documented for Mabee's Salamander including a new county of occurrence: Beaufort County.

Timber Rattlesnake surveys were again significantly assisted by community science records sent to us on rattlesnake@ncwildlife.org. Already, we have received well over 100 sightings for 2022. These records have been incredibly helpful in identifying key areas of conservation significance for rattlesnakes, as well as leading staff to promising sites for tissue collection, in the form of shed skins, for an ongoing genetic assessment.



Among the species staff found during amphibian and reptile surveys this quarter included (clockwise from top left) Mabee's Salamander larva in Beaufort County; Timber Rattlesnake in western North Carolina; Timber Rattlesnake in western North Carolina; Spotted Turtle (Photos: Jeff Hall)



Salamander Surveys Continue in Western North Carolina

by Lori Williams, Western Amphibian Biologist

Wildlife Diversity staff had a productive spring salamander season, surveying for at least 13 of the 30 salamander Species of Greatest Conservation Need (SGCN) found in the mountain region in a variety of upland, wetland, riparian and rock outcrop habitats. We discovered new sites for some and updated old records for others. One highlight of the quarter was successful stream surveys for state threatened Junaluska Sal-

amanders (*E. junaluska*), a rare and poorly studied species in Graham County. Staff were able to update historical records from three streams, where Junaluska Salamanders had not been documented in the past 10, 25, and 30 years, respectively, and increase the extent of known distribution in one stream by 6 km.

Another exciting event was finding the species in a previously unknown stream in the Joyce Kilmer Wilderness.

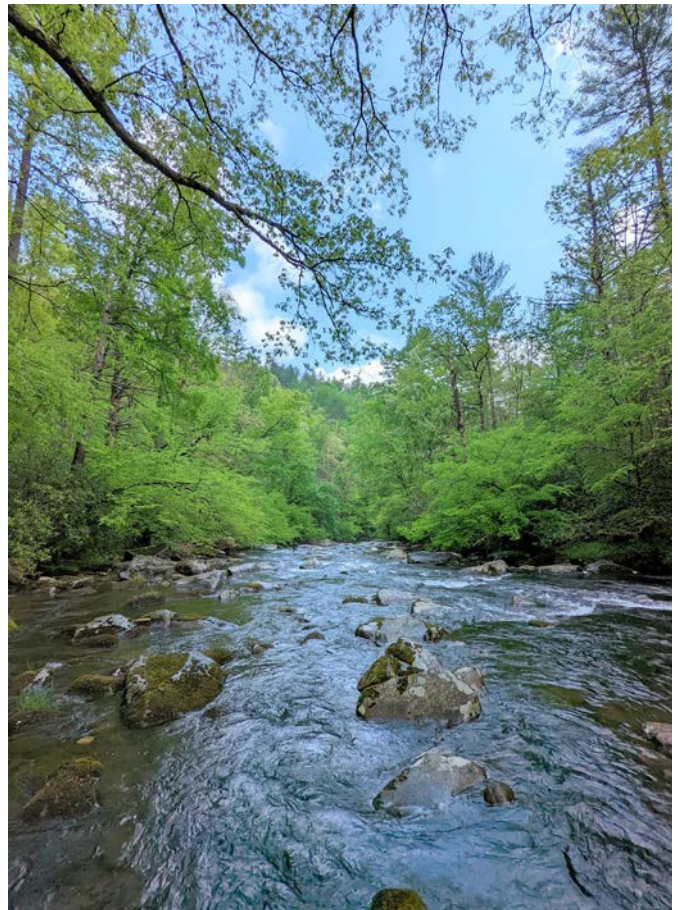
Juvenile Junaluska Salamanders are particularly difficult to identify and distinguish from the common Blue Ridge Two-lined Salamander. However, the use of descriptions and diagrams in published literature, as well as online photos from confirmed records, was of significant help when larvae were encountered. Future work will include continued efforts to document new streams for the species.



State threatened juvenile Junaluska Salamander (Ben Dalton)



Adult Junaluska Salamanders are easier to identify but can be elusive in field surveys (Lori Williams)



Junaluska Salamander stream habitat, Graham County, NC (Ben Dalton)



Staff Collect Cape Fear Shiner Broodstock from Deep River

by Brena Jones, Central Aquatic Wildlife Diversity Coordinator

The Cape Fear Shiner is federally listed as endangered. This minnow species is endemic to the upper portion of the Cape Fear River basin, living in complex run/riffle/pool habitats found across the North Carolina Piedmont region. In May 2022, staff collected 39 Cape Fear Shiners from the Deep River, which were then transported to the U.S. Fish & Wildlife Service Edenton National Fish Hatchery. These animals will be allowed to spawn in captivity, to maximize the survival of their eggs and offspring. The resulting juveniles will then be stocked back into portions of the species' range where population levels are lower, with the goal of augmenting numbers and increasing chances of future reproductive success in the wild. The USFWS and NCWRC will continue to work in partnership to produce multiple year-classes of Cape Fear Shiners in the future.



Cape Fear Shiners (Brena Jones)

Staff Continue Cape Fear Basin Crayfish Surveys in Guilford County

by Katharine DeVilbiss, Central Region Aquatic Wildlife Diversity Biologist

As part of ongoing efforts to update distributional records of native crayfish species, staff biologists visited 13 sites in Guilford County in April and June specifically targeting the known geographic area of the Greensboro Burrowing Crayfish (special concern). One reproductively mature male was found in a burrow in an unnamed tributary of South Buffalo Creek. Other species found during the digging efforts included the Carolina Ladle Crayfish, Sickle Crayfish, and the *Cambarus* species *C acuminatus* complex.



Reproductively mature Greensboro Burrowing Crayfish (Katharine DeVilbiss)



Staff Find No Broadtail Madtoms during Surveys this Quarter

by Katharine DeVilbiss, Central Region Aquatic Wildlife Diversity Biologist

Staff conducted site visits in the Lumber River and two tributaries, Shoe Heel Creek and Joes Creek, for the state listed special concern Broadtail Madtom a rare, undescribed native catfish. Staff checked 42 small, artificial cover structures, informally named “madtom motels” that were previously deployed at four localities for occupancy. They also deployed additional motels to replace lost units. No Broadtail Madtom were detected. Several other fish found utilizing the motels were juvenile native catfish species: Margined Madtom and Snail Bullhead. During the most recent visit in June, individuals of these species were found occupying 11 of 42 motels. One non-native species,



While not utilized by Broadtail Madtoms, these “Madtom motels” made suitable housing for other aquatic species, including the non-native Red Swamp Crayfish (Katharine DeVilbiss)

the Red Swamp Crayfish, was found occupying a motel. Staff will continue to check motel occupancy for this ongoing project and additional future deployments and surveys are planned.

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Whether you hunt, fish, watch, or just appreciate wildlife, you can help conserve North Carolina’s wildlife and their habitats and keep North Carolina wild for future generations to enjoy.

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- 1 Donate to the Nongame and Endangered Wildlife Fund by checking Line No. 30 on your N.C. State Tax Form.
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- 3 Donate to the Wildlife Diversity Endowment Fund, a special fund where the accrued interest — not the principal — is spent on programs that benefit species not hunted or fished. ncwildlife.org/donate





Staff Continue Mussel Surveys for Unknown, New-to-Science Species

by Brena Jones, Central Aquatic Wildlife Diversity Coordinator

NCWRC staff continued mussel surveys from May through June for an unknown, new-to-science species in the Little River and tributary waters of the Pee Dee River drainage, to supplement surveys performed since the species discovery in May 2019. The undescribed species is known to be a narrow-ranged North Carolina endemic, located in only 8 km (~5 mi.) of the Little River mainstem in Randolph County to date. Twelve surveys were performed in the Little River at previously surveyed localities as part of an occupancy and de-

tection study. This was the third visit to these repeat sites. Six individuals of the undescribed species were detected over four sites, all of which were untagged and not found during previous visits. Those four sites were within the known range. Search effort totaled 46 person-hours (p-h), for an average catch per unit effort of 0.13 individuals per p-h. In other words, it took over 7.5 hours to locate one individual of this unknown species.

Four additional surveys were conducted in tributary waters of the Uwharrie Mountain re-

gion in Hannahs Creek and Barnes Creek. No individuals of the undescribed species were located. Species of Greatest Conservation Need (SGCN) species detected in these surveys included Brook Floater (state endangered), Carolina Creekshell (state endangered), Notched Rainbow (state threatened), and Savannah Lilliput (federal species of concern, state endangered). Staff biologists plan to continue surveys and studies to further their understanding of this undescribed freshwater mussel species.



Undescribed mussel species from Little River, Pee Dee basin (Katharine DeVilbiss)