



NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

WILDLIFE DIVERSITY PROGRAM QUARTERLY REPORT

APRIL-JUNE 2021





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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Cover photos from top left clockwise: Wildlife Technician Kabryn Mattison (left) and Sea Turtle Biologist Dr. Matthew Godfrey process a Spotted Turtle during a monitoring project (Jeff Hall); Wildlife Diversity Biologist, Katherine Etchison, carries materials up to the mine entrance (Ed Corey, NC State Parks); Wildlife Technician Kabryn Mattison holds a Mole Kingsnake (Jeff Hall); Macroinvertebrate casings attached to a mussel found during a survey (Michael Fisk); Deploying an automated recording device next to an oxbow along the Lumber River in Robeson County (Dr. Jeff Humphries)



Biologists Deploy “Frogloggers” to Search for River Frogs

by Dr. Jeff Humphries, Eastern Amphibian and Reptile Biologist

During the second quarter of 2021, N.C. Wildlife Resources Commission (NCWRC) biologists deployed automated recording devices (“frogloggers”) in a continued effort to detect the breeding calls of River Frogs in eastern North Carolina. This species was last found in the state in 1976, along the Lumber River near Maxton, and reasons for the apparent extirpation of the species are still unknown. River Frogs inhabit backwaters, sloughs and oxbows of black-water rivers along the Atlantic and Gulf Coast throughout the Southeast. In North Carolina, they were historically known

from several river systems in southeastern North Carolina, though records were sparse, and the extent of their range before 1976 was poorly understood. Intensive surveys were performed in the 1980s and 90s using canoe and spotlight surveys, driving roads looking for frogs, and looking for schools of tadpoles at bridge crossings, but no River Frogs were found. This spring, NCWRC staff deployed 13 frogloggers in remote locations along three rivers systems: the Black River, Lumber River and the Waccamaw River. The frogloggers are programmed to record 5 minutes every hour

from sunset until sunrise from May or June through early September. Analysis of calls from the recorders will be conducted in the fall of 2021.

Staff are also coordinating with South Carolina Department of Natural Resources biologists to determine whether River Frogs still exist near the North Carolina border, which can be used to inform future survey locations in North Carolina. Collaborators have also discussed possible re-introduction of the River Frog to North Carolina riverine systems if work fails to detect the species after multiple years of exhaustive surveys.



Deploying an automated recording device next to an oxbow along the Lumber River in Robeson County (Dr. Jeff Humphries)

Ideal river oxbow habitat along a remote part of the Waccamaw River in Brunswick County (Dr. Jeff Humphries); inset photo: River Frog (Todd Pierson)



Will 2021 Set Record Season for Sea Turtle Nests? Time Will Tell.

by Dr. Matthew Godfrey, Sea Turtle Biologist

The nesting season for sea turtles in North Carolina spans early May through the end of August, with a peak in late June/early July. Although the start to the 2021 season was delayed relative to other years, by the end of June, 628 known sea turtle nests had been laid across the state's ocean coastline. This suggests there could be more than 1,200 nests laid for the whole season, making it one of the bigger seasons on record. The majority of nests have been

laid by loggerhead sea turtles, although to date there have been four nests laid by green turtles and six nests by Kemp's ridley sea turtles. Leatherbacks have not nested in North Carolina since 2018, and various nesting sites across the northwest Atlantic have reported a decline in nests laid by this species in the past several years.

The peak time for nesting sea turtles in North Carolina also marks the start of the emergence of hatchlings from nests

laid earlier in the season. The volunteers and cooperators who patrol the beaches daily to mark and protect sea turtle nests will now begin to keep watch for hatchling emergence events. When the nesting season finishes at the end of August, the volunteers and cooperators will continue to monitor nests throughout their incubation. This may require working into November, if late summer tropical storms have not interrupted the incubation of incubating nests.



Photo of nesting crawls made by two different loggerhead turtles during a single night on June 24 at Wrightsville Beach (Robert Kaess)



(Jodie Owen)



Unoccupied Aerial Vehicles Assist Biologists with Wood Stork Nests Count

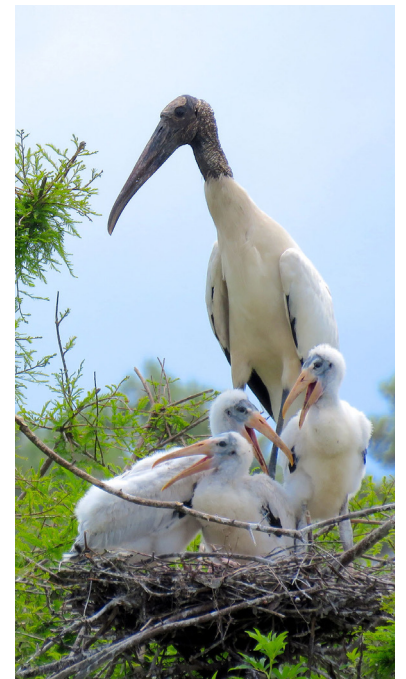
by Carmen Johnson, Waterbird Biologist

Each year, Wood Storks nest in the southeastern part of North Carolina, building large nests with sticks high in the trees of wooded swamps. The NCWRC's Waterbird Team annually conducts both ground and aerial surveys of these Wood Storks. This May, the team once again partnered with the Coastal and Estuarine Studies Lab from University of North Carolina Wilmington (UNCW) to complete UAV (unoccupied aerial vehicle) surveys of each colony.

Mariko Polk, a PhD student, piloted the UAV, flying transects above the Wood Stork nests and taking photos at predetermined intervals. Once all the photos were collected, they were stitched together to provide a unique aerial view, allowing the Waterbird Team to detect nests not visible from the ground. Information gained from the UAV imagery and ground counts will be shared with landowners of the sites where these colonies are found, including Audubon NC, NC State Parks, and private individuals to aid management decisions.



Mackenzie Taggart, Ed Corey, Lane Garner, Carmen Johnson, Katie Sullivan, and Mariko Polk pose with UNCW's UAV, dubbed Moira Rose, after surveying the Wood Stork colony at Warwick Mill Bay in late May (UNCW CES Lab)



High resolution images are mosaiced together to give a complete view of the site. Photos can then be enlarged in order to count individual nests (UNCW CES Lab); Wood Stork with chicks in nest (Annika Andersson)



NC Bird Atlas Off to Great Start with More Than 16,000 Checklists Submitted

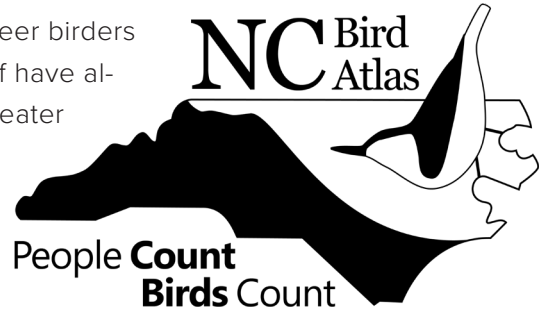
by John Carpenter, Eastern Landbird Biologist

During the first few months of the NC Bird Atlas, over 600 volunteer birders submitted more than 16,000 checklists of bird surveys. NCWRC staff have already confirmed breeding for 166 species with data collected for greater than half of priority survey blocks.

A few highlights so far include the first record of a Cerulean Warbler for Person County, the first breeding record of Swallow-tailed Kite in Brunswick County, and a rare, confirmed nesting record for Loggerhead Shrike in Carteret County.

In addition, experienced seasonal technicians spread out across the state and conducted nearly 1,000 point count surveys. This separate dataset will allow the NCBA team to estimate densities for many species that breed in North Carolina.

As staff head into the fall, the NCBA team will review data and prepare for the winter. Most atlas projects focus on just the breeding season; however, staff will also examine the distribution and abundance of birds that spend the winter months in North Carolina. Visit ncbirdatlas.org to learn more!



Seasonal technicians for the NC Bird Atlas meet for training in Raleigh (above). Highlights from submissions thus far include a rare, confirmed nesting for Loggerhead Shrike (top right) in Carteret County and a first-ever breeding record of a Swallow-tailed Kite in Brunswick County. (Photos by John Carpenter)



New Study on Relationship Between Macroinvertebrates & Mussels Begins

by Michael Fisk, Eastern Region Aquatic Wildlife Diversity Coordinator

Wildlife Diversity Program staff have initiated a new study to gain a better understanding of the relationship between aquatic macroinvertebrates and the success for imperiled, propagated mussel species. Macroinvertebrate communities are good indicators of long-term water quality. The augmentation of existing populations and the reintroduction of propagated mussels back into their historical range depend on suitable physical habitat and water quality. Physical habitat can be visually assessed but water quality can fluctuate throughout the year and be impacted by acute events that can go undetected in periodic monitoring events. Macroinvertebrates can recolonize habitats at a faster rate than mussels and can be used to describe current conditions within a given reach of water. By using a biological measure of site integrity and water quality, biologists would have a better understanding of long-term stream conditions and would be able to make more informed decisions on mussel augmentations.

The objectives of this study are to 1) describe macroinvertebrate assemblages in sites that support rare, imperiled mussels and sites that do not and 2) determine if any association between groups of insects (feeding group or taxonomic group) and rare mus-

sels exists to help guide future augmentations and surveys for imperiled mussel species.

In May and June, 12 sites were surveyed with suber samplers in reaches that have experienced declines in mussel diversity and abundance and in reaches where imperiled species still occur along with more diverse mussel assemblages. Samples were preserved in ethanol and will be identified down to the lowest taxonomic level. Once samples

are identified and enumerated, indices will be developed to compare between sites.

The anticipated results for this study are to develop indices that describe and rank mussel habitat over a wide range of habitats and conditions. Future surveys will be conducted to capture mussel sites under varying habitat and biological conditions to help determine the impacts of habitat and water quality on macroinvertebrate and mussel assemblages.



Macroinvertebrate casings attached to a mussel found during a survey (Michael Fisk)



Sierra Benfield and Mike Walter sorting through contents from a suber sample for macroinvertebrates (Michael Fisk)



Staff Install Mine Gate to Minimize Human Disturbance to Bats at Crowder's Mountain State Park

by Katherine Etchison, Mammalogist

An abandoned mine at Crowder's Mountain State Park is sporting a new bat gate this spring thanks to a team of cave gate installers, NC State Parks staff, and NCWRC staff. Bat gates are essential for providing passage for bats while preventing unauthorized human entry to a hibernaculum. Tricolored bats hibernate in the state park mine but are frequently subjected to human disturbance as evidenced by a well-worn unsanctioned footpath to the mine entrance. Hibernating bats often abandon a hibernaculum if disturbed frequently, so NC State Parks and the NCWRC recognized the need for a bat gate at this important site.

Building the gate when bats were not present was key to avoiding disturbance, so the team was careful to schedule construction after bats exited the mine in early spring. Biologists also surveyed the mine immediately before the survey to confirm the bats' absence. The gate was fabricated on site over two days and required multiple on-foot trips carrying heavy equipment, iron and other materials.

Tricolored bat populations in western North Carolina have

been greatly reduced by the fungal disease White-nose Syndrome and this species is now under review by the US Fish and Wildlife Service for potential listing. To make matters worse, the fungal pathogen that causes this deadly disease has been found in six Piedmont sites including the mine at Crowder's Mountain State Park. Preventing

unauthorized entry into the mine will help reduce the likelihood of human-mediated transmission of fungal spores from this site.

Now that the bat gate is in place, only authorized entry using a key is possible. This hibernaculum will be monitored by NC State Parks and the NCWRC to provide vital tricolored bat population trend data.



Entrance to a mine on Crowder's Mountain State Park before and after gate installation (Photos by Katherine Etchison)



Wildlife Diversity Biologist, Katherine Etchison, carries materials up to the mine entrance. (Ed Corey/NC State Parks)



Biologists Add New Tool to Conservation Tool Box to Help Bog Turtles

by Gabrielle Graeter, Conservation Biologist/Herpetologist

The bog turtle is listed as Federally Threatened due to Similarity of Appearance (T(S/A)) to the northern population and state listed as Threatened in North Carolina. It has become evident in recent years that the species is as rare as the northern population and faces the same threats in the southern United States. An estimated 80-90% of bogs have been lost in North Carolina because of decades of land-use conversion. Relatively few bog turtle populations remain, and most of those are small and appear to be in decline. North Carolina is in danger of losing populations and genetic diversity.

Bog turtles are slow to rebound after detrimental impacts because they do not start breeding until they are 6 or 7 years old and only produce 1-4 eggs each year, if any. Unfortunately, the threats this species and their habitat — bogs — face are numerous. Major threats to bog turtles include vegetative succession, vehicles, habitat loss and degradation, predation, development and changes in the watershed, and barriers to movement.

Conservation of bog turtles is multi-faceted, can be site specific, and includes habitat management and restoration,

land protection, collaboration with private landowners, and protection from unnaturally high predation levels. NCWRC staff have recently added an additional tool to the conservation toolbox for helping this species — population augmentation via head-starting. Head-starting is the act of rearing wild hatchlings in protective enclosures before release at a less susceptible size, thereby reducing the high mortality of young age classes in the wild. Agency conservation partner Zoo Knoxville will incubate the eggs then rear the hatchlings for nine months before NCWRC staff release them back to their natal wetland.

NCWRC is initially focusing on a handful of conservation-owned lands that have had low nesting success. The goal is to stabilize and potentially grow these populations as part of a long-term, multi-faceted strategy to achieve species viability. Staff have been busy in the last month collecting egg clutches at these populations for head-starting (Figure 1). Thus far, staff have 17 clutches (total of 56 eggs) from five North Carolina sites that will be incubated at Zoo Knoxville from 2021-2022. Although this technique can augment the population, habitat management,

removing or mitigating barriers to movement, and addressing other threats will be necessary for the conservation of North Carolina's smallest and most habitat-specific turtle.



Figure 1. View into a bog turtle nest in the wild that has been partially uncovered (Gabrielle Graeter)



Bog turtle (Jay Ondreicka)



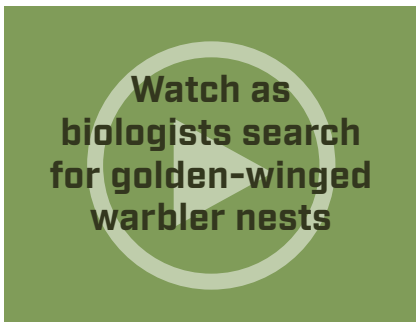
Nests in the West

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

Golden-Winged Warblers

In the far western Cheoah Mountains (Graham County), biologists found nine gold-winged warbler nests while conducting annual monitoring, mist-netting and banding within a regenerating forest. Gold-en-wings constructed nests on the ground adjacent to logged areas, which ranged in age from 4.5 to 15.5 years post-harvest. Two nests were on the brushy edges of fields that were former logging decks, and seven were along the brushy edges of interior roads bordering the logging units. Pictures of the nest sites and surrounding habitat will be added to a photo library guide that the Southern Appalachian Golden-winged Warbler Partners is developing to illustrate nesting and other habitat features. Biologists will complete nest monitoring, including vegetation sampling, at the nest sites next quarter.

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Top right: Golden-winged warbler nest with eggs;
Top left: A female golden-winged warbler incubating eggs;
Bottom: A male golden-winged warbler (Photos by Christine Kelly)



Eastern Whip-poor-wills

In the central western mountains at DuPont State Recreation Forest (Henderson and Transylvania counties), biologists and NCWRC volunteer Alan Cameron found two Eastern whip-poor-will nests and several roost sites. This year's pilot nest-searching project grew from Cameron's 2020 season contribution of trail camera footage showing whip-poor-will activity around the granitic domes in DuPont. The incredible footage, compiled by NCWRC into a [short video](#) (right), prompted further investigation in 2021. The whip-poor-will is listed in the NC Wildlife Action Plan as a Knowledge Gap species. The Partners in Flight Road to Recovery bird conservation effort to reverse avian declines lists the Eastern whip-poor-will as a priority due to a steep population decline (69% range wide since 1970). This decline translates to a loss of about 4.5 million birds over the past 50 years. Bird Conservation Region 28 (BCR28), which encompasses the Appalachian Mountains from southern New York to northern Alabama, has lost about 360,000 whip-poor-wills with approximately 90,000 birds remaining. Causes of decline are not entirely known but threats



Male whip-poor-will (Christine Kelly)



An incubating whip-poor-will simply closes her eyes to complete her camouflage (Clifton Avery)

include habitat loss and changes in private and public lands management on breeding, migration and wintering grounds. Eastern whip-poor-wills breed in eastern North American temperate forests and woodlands and winter

in tropical evergreen forests and dry forests. Biologists conducted this spring's pilot survey to familiarize themselves with this species' habits and habitats, to fill in knowledge gaps, and assess feasibility of research in

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the future. Although the number of nests found was lower than hoped for, the crew learned about nest phenology and habitat use, such as open areas with leaf litter and abundant cover nearby, and began honing a search image for nest and roost sites. Cameras and searching confirmed that the whips indeed timed their first nest with the moon phase so that eggs hatched eight days before the May 26 full moon. This timing

ensures optimal brightly moonlit hunting conditions when whips are foraging for moths and beetles to feed the growing fledglings. Once fledged at just seven days of age, the semi-precocial chicks stayed under the vigilant care of the adult male while the female incubated a second clutch of two eggs. On several occasions, searchers found a trio of a dad with two fledglings roosting in thick vegetation not far from their nest sites.



A speckled, white whip-poor-will egg on leaf litter adjacent to a granitic dome (Alan Cameron)

Peregrine Falcons

Across the western mountains, biologists completed routine annual monitoring of peregrine falcon nests. One highlight this year was the first documented successful nesting attempt at Grandfather Mountain since 2008. Overall, biologists found pairs on territory at 15 sites in western North Carolina. Seven pairs nested successfully, rearing 12 nestlings.



A peregrine falcon perched after a meal. Note the blood on its bill and face. (Christine Kelly)

Right: Remains of a peregrine falcon nestling that died at approximately 3 weeks of age, just as its juvenile feathers were emerging. The cause of death is unknown. (Christine Kelly); Far right: Fortunately its two siblings survived. (Clifton Avery)





Fledgling Barn Owl in Southern Piedmont, NC (Daniel Gettis)

Barn Owl Project Update

by: Allison Medford, Piedmont Eco-Region Wildlife Diversity Biologist

Thanks to a recent press release, the Barn Owl Project has almost a dozen confirmed nests across the state. Young barn owls are currently fledging, and nest box installation will continue once structures are built and nesting has ceased. Biologists are excited about the influx of nest reports and appreciate the help from the public with this project. The barn owl project was launched to learn more about the distribution and abundance of barn owls throughout the state and how private landowners may be able to help

conserve the species and enjoy their ecological benefits. Barn owls are particularly associated with open areas like those found in agriculture. They also eat a lot of rodents, especially when they are feeding a nest full of hungry chicks. And, they may not just be breeding in the winter and spring like most other owl species. Biologists are learning that they may nest year round depending on the availability of prey. Biologists have a lot to learn about barn owls in North Carolina, and they could not do it without an engaged public.



Water tote nest box (Allison Medford)



Biologists Find Elusive Salamander During Rainy Night Surveys this Summer

by: Lori Williams/ Western Amphibian Biologist

In June 2021, Wildlife Diversity staff conducted rainy night surveys for surface active salamanders, specifically targeting the Long-tailed Salamander, a Species of Greatest Conservation Need and newly proposed for state threatened status. Long-tailed Salamanders are arguably one of the rarest and most challenging salamander species to find in North Carolina, which may be due to small population sizes, a very patchy, fragmented distribution within the state (and

North Carolina being at the southern end of their range), and their reclusive behaviors and hard-to-reach habitats, often occupying rock outcrop and stream riparian zones within river corridors and gorges. Staff were not able to find the species at a known site in Watauga County where imminent bridge and road construction will destroy much of the habitat, but they were able to update species records at another Watauga County site farther downstream in the Watauga River corridor. In

northern Haywood County, nighttime surveys at a historical site in the Pigeon River corridor continued to be unsuccessful; staff have made several attempts to find the species in recent years, as the last confirmed observation was in 2009. However, the oldest Long-tailed Salamander record for the state is from museum collections in 1919, also in the Pigeon River corridor of northern Haywood County. There has been minimal effort to update that record, as the estimated location was

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Long-tailed Salamander (Ben Dalton)





assigned to the nearest town at that time and is in a developed area where habitat is not found. Staff spent time this spring scouting possible rock outcrops that were as close to the 1919 record as possible (within a few miles), and in two nighttime survey attempts, they were able to find an adult Long-tailed Salamander each time. Photographs of the

splotch patterns on the body and tail confirmed the individuals were different. The find is significant not only because they documented a new site for a rare species, but also because it represents the closest they may ever come to updating the oldest known record. It is encouraging to know the species has persisted in the general area for the last 100 years and counting!

Wildlife Diversity technician, Reed Rossell, searches rock outcrop habitat at night for the elusive Long-tailed Salamander in Haywood County. (Lori Williams)

How YOU Can Support Wildlife Conservation in North Carolina

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.

How? It's as easy as 1, 2, 3.

- 1 Donate to the Nongame and Endangered Wildlife Fund by checking Line No. 30 on your N.C. State Tax Form.
- 2 Purchase a Wildlife Conservation Plate, which features an illustration of a Pine Barrens Treefrog, for \$30, with \$20 going to the agency's Nongame and Endangered Wildlife Fund.
- 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





N.C. Partners in Amphibian and Reptile Conservation News

by Jeff Hall, Partners in Amphibian and Reptile Conservation Biologist

One NCPARC group met virtually during this quarter — the Education and Outreach working group. Applications such as Zoom and Teams continue to prove invaluable for facilitating meetings and presentations. Numerous in-person educational events were canceled, but staff provided many presentations on the conservation of reptiles and amphibians to several groups, including: Wingate College, UNC-Wilmington, NC State

University, Croatan chapter of the Society of American Foresters, and the Eco Explorers group. Additionally, staff visited several landowners during this quarter and provided technical guidance on management of lands to benefit reptiles and amphibians. One of these landowner visits was to assess the property as habitat for the Carolina Pigmy Rattlesnake for possible enrollment in



the Wildlife Conservation Lands Program. Staff were able to find one adult rattlesnake while on the property and are working with the landowner to provide management recommendations.



Carolina Pigmy Rattlesnake seen during visit on private land in Hyde County. (Jeff Hall)



NCPARC News: Spring Reptile Surveys Yield Several Listed Species

by Jeff Hall, Partners in Amphibian and Reptile Conservation Biologist

Spring reptile surveys included target species such as Bog Turtle, Spotted Turtle, Diamondback Terrapin, Mole Kingsnake, Carolina Pigmy Rattlesnake, Timber Rattlesnake, and Eastern Diamondback Rattlesnake. Staff conducted these surveys and some monitoring of known sites across the state. Additionally, trail cameras were retrieved from several locations targeted at rattlesnake hibernation sites. These images will be reviewed over the coming months.



From top left clockwise: Mole Kingsnake found in Carteret County; Wildlife Technician Kabryn Mattison with Mole Kingsnake. Kabryn Mattison (left) and Sea Turtle Biologist Matthew Godfrey processing a Spotted Turtle during a monitoring project (Jeff Hall)



Sicklefin Redhorse Conservation

by: Dr. Luke Etchison/ Western Region Aquatic Wildlife Diversity Coordinator

It was a successful year for Sicklefin Redhorse, *Moxostoma* sp. (State Threatened), monitoring and egg collection in the Little Tennessee River Basin. Western Region Aquatic Wildlife Diversity biologists teamed up with colleagues from the US Fish & Wildlife Service, Eastern Band of Cherokee Indians, Duke Energy, and Tennessee Valley Authority to capture this 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 attempt to time their sampling efforts when temperatures and water levels are just right.

This year biologists used boat electrofishing surveys to collect 99 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 was the most productive site, and biologists collected an estimated 30,000 eggs from just five females. 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 2021 and will focus on areas in their native range where dams currently prohibit the Sicklefin Redhorse from occupying.

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. Nearly one-fifth of the fish captured in 2021 had been caught and tagged in previous years, including two fish that were originally captured in 2012.



NCWRC biologists collect data on a male Sicklefin Redhorse caught in the Little Tennessee River (Dylan Owensby)



Biologists with NCWRC and US Fish & Wildlife Service capture Sicklefin Redhorse on a raft equipped with an electrofishing unit (Dylan Owensby)