NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

WILDLIFE DIVERSITY PROGRAM ANNUAL REPORT 2024

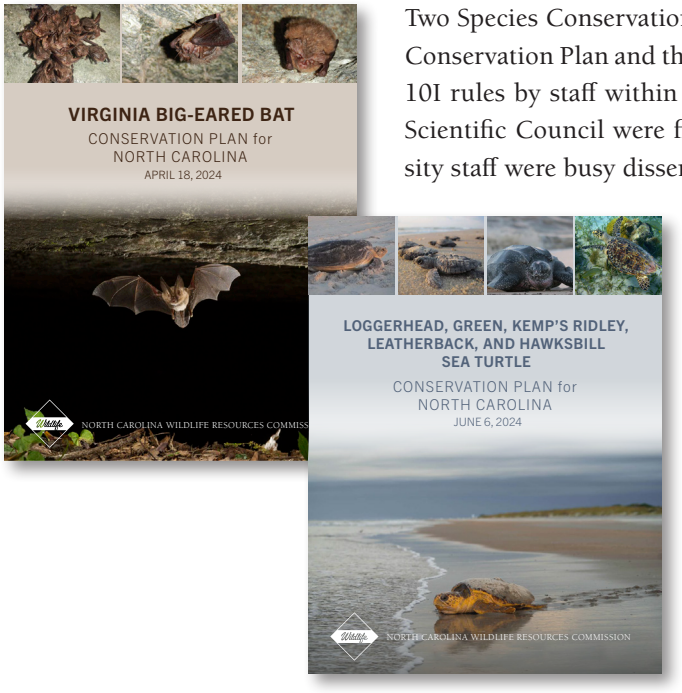
Table of Contents

Cover photos from top left clockwise: The NCWRC reintroduces the Roanoke Logperch, an endangered species, to the upper Mayo River in Rockingham County, photo by Jonathon Gruenke; Wildlife Technician Kabryn Mattison holds an adult Tiger Salamander found during winter amphibian surveys, photo by Jeff Hall; A Black-throated Green Warbler in Dare County, photo by Gerry Lebing; A northern long-eared bat caught in a 2024 mist-net survey in Haywood County, photo by Katherine Etchison.

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

Program Updates - 2024

The Wildlife Diversity Program experienced staff changes and much progress for Species of Greatest Conservation Need in 2024. Allison Medford, special projects biologist, stepped down from her position to pursue new opportunities with her community and family. We hope to fill the vacated position in 2026. The Aquatic Wildlife Diversity Program welcomed two new staff members, Langston Rimmer and Amber Olson, to the program as the Eastern Listed Species Biologists. T.R. Russ promoted from the Foothills AWD Coordinator to a newly created AWD Survey and Monitoring Supervisor position which supervises the AWD biologists.



Two Species Conservation Plans were approved in 2024 — the Virginia Big-eared Bat Conservation Plan and the Sea Turtles Conservation Plan. Proposed changes to NCAC 10I rules by staff within NCWRC and the Nongame Wildlife Advisory Committee's Scientific Council were finalized and published on October 1, 2024. Wildlife Diversity staff were busy disseminating their work through webinars, interviews, and publications (see the list at the end of this publication). Dr. Sara Schweitzer, Assistant Chief, Wildlife Diversity, received the 2024 Leadership Award from the International Partners in Flight initiative. The details of our work with various taxa are outlined in this annual report.

Wildlife Diversity Program Staff

Dr. Sara Schweitzer
Assistant Chief, Wildlife Management Division
Wildlife Diversity Program
sara.schweitzer@ncwildlife.gov
Wake County

Rachael Hoch
Assistant Chief, Inland Fisheries Division
Aquatic Wildlife Diversity Program
rachael.hoch@ncwildlife.gov
Wake County

Scott Anderson
Science Support Coordinator
scott.anderson@ncwildlife.gov
Wake County

Kacy Cook
Waterbird Biologist
kacy.cook@ncwildlife.gov
Wake County

John P. Carpenter
Eastern Landbird Biologist
john.carpenter@ncwildlife.gov
New Hanover County

Katherine Etchison
Mammalogist
katherine.etchison@ncwildlife.gov
Buncombe County

Karen Clark
Science Support Specialist
karen.clark@ncwildlife.gov
Coastal Region

Dr. Luke Etchison
Western Region Aquatic
Wildlife Diversity Coordinator
luke.etchison@ncwildlife.gov
Haywood County

Michael Fisk
Eastern Region Aquatic Wildlife Diversity Coordinator
michael.fisk@ncwildlife.gov
Lee County

Carmen Johnson
Waterbird Biologist
carmen.johnson@ncwildlife.gov
Craven County

Sarah Finn
Coastal Wildlife Diversity Biologist
sarah.finn@ncwildlife.gov
New Hanover County

Brena Jones
Central Region Aquatic Wildlife Diversity Coordinator
brena.jones@ncwildlife.gov
Granville County

Gabrielle Graeter
Conservation Biologist/ Herpetologist
gabrielle.graeter@ncwildlife.gov
Buncombe County

Chris Kelly
Western Bird and Carolina Northern Flying Squirrel Biologist
christine.kelly@ncwildlife.gov
Buncombe County

Dr. Matthew Godfrey
Sea Turtle Biologist
matt.godfrey@ncwildlife.gov
Carteret County

CC King
Science Support Specialist
cc.king@ncwildlife.gov
Piedmont Region

Aubrey Greene
Wildlife Diversity Biologist, Herpetologist
aubrey.greene@ncwildlife.gov
Moore County

Allison Medford
Wildlife Diversity Biologist
allison.medford@ncwildlife.gov
Montgomery County

Jeff Hall
Partners in Amphibian and Reptile Conservation Biologist
jeff.hall@ncwildlife.gov
Pitt County

Emilia Omerberg
Central Region Aquatic Wildlife Diversity Biologist
emilia.omerberg@ncwildlife.gov
Granville County

Dylan Owensby
Western Region Aquatic Wildlife Diversity Biologist
dylan.owensby@ncwildlife.gov
Haywood County

Hope Sutton
Eastern Wildlife Diversity Supervisor
hope.sutton@ncwildlife.gov
New Hanover County

Michael Perkins
Foothills Region Aquatic Wildlife Diversity Biologist
michael.perkins@ncwildlife.gov
McDowell County

Mike Walter
Eastern Region Aquatic Wildlife Diversity Biologist
michael.walter@ncwildlife.gov
Alamance County

Chantelle Rondel
Western Aquatic Listed Species Biologist
chantelle.rondel@ncwildlife.gov
Haywood County

Alicia Davis Wassmer
Alligator Biologist
alicia.wassmer@ncwildlife.gov
Wake County

TR Russ
Foothills Region Aquatic Wildlife Diversity Coordinator
thomas.russ@ncwildlife.gov
McDowell County

Kendrick Weeks
Western Wildlife Diversity Supervisor
kendrick.weeks@ncwildlife.gov
Henderson County

Lee Sherrill
Science Support Specialist
lee.sherrill@ncwildlife.gov
Mountain Region

Lori Williams
Western Amphibian Biologist
lori.williams@ncwildlife.gov
Henderson County

Andrea Shipley
Mammalogist (shared staff with Surveys & Research)
andrea.shipley@ncwildlife.gov
Nash County

BIRDS

Eastern Black Rail Surveys Begin in Spring 2024

by Kacy Cook, Waterbird Biologist, and Carmen Johnson, Waterbird Biologist

The Waterbird Investigations and Management Project of the NCWRC Wildlife Diversity Program embarked on a new project to monitor and conserve the federally threatened Eastern Black Rail (right photo). The Black Rail monitoring project will also allow staff to collect data relevant to the conservation of other marsh bird species. This monitoring is one action within the draft Eastern Black Rail Conservation Plan that will be reviewed during the next quarter. Staff began field work on the Salters Creek and Turnagain Bay tracts of the Carteret County Game Lands to monitor water levels and to detect Black Rails and other marsh birds. Water level monitoring is important to identify potential Black Rail high salt marsh habitat because Black Rails, which have a tarsus length of less than 3 cm, cannot tolerate water levels above 3 cm. Staff are employing game cameras to monitor water levels and take photos of wildlife by motion-sensors. One of the game cameras detected a Sora from March 20th to 31st, 2024. Sora use the same habitats as Black Rail. Staff are also deploying Autonomous Recording Units in potential Black Rail habitat to detect their calls. Black Rail and marsh bird callback monitoring surveys in high salt marsh will begin May 1st, at the start of the nesting season.

Sora captured on a game camera in high salt marsh area

Year 4 of 5 for the NC Bird Atlas!

by John Carpenter, Eastern Landbird Biologist and Scott Anderson, Science Support Coordinator

Bachman's Sparrow carrying food (CF), one of the many behaviors that can confirm breeding in a location.

Wildlife Diversity staff continue work on the 5-year Bird Atlas Project. From Hiwassee to Hatteras, volunteers (atlasers) and staff have been scouring fields, forests, and city parks - identifying birds and recording behaviors. Observations of behaviors help confirm breeding in each of the 937 survey blocks spread across the state. Our goal is to adequately survey each of these blocks by the end of the project. To date, atlasers have contributed 197,739 checklists, confirming breeding for 203 species spread over 820 blocks. Collectively, these 2,584 atlasers and other birders have made a staggering 11,276,863 species observations since the project started in 2021!

In addition to volunteers, each year we hire skilled staff to canvass hard-to-reach corners of the state. These data will be critical to gaining a comprehensive map of distribution and habitat preferences for ~200 bird species at the end of the project.

Because North Carolina is positioned squarely in the mid-Atlantic region, many bird species only occur here in winter. Departing from most other Atlases, volunteers and staff collect observations during both the breeding and wintering seasons. In just the past winter (Nov-Feb), atlasers, staff, and other birders recorded 1,169,772 species observations.

In the coming months, we'll welcome more temporary staff to collect data and assist atlasers during the 2024 breeding season. We are closely monitoring the status of all 937 blocks using the Block Explorer (https://blockexplorer.ncbirdatlas.org) ; see also Wildlife Diversity Program Fourth Quarter Report, p. 7).

Once all the data have been collected, we will continue a rigorous process to validate records and develop range maps for each bird species. These data will be crucial to monitoring changes in bird populations and distributions into the future.

STAY UP TO DATE!

If you want to stay up to date on the progress of this project, visit ncbirdatlas.org or subscribe to our monthly newsletter at news.ncbirdatlas.org

Motus Noise Tests by the American Bird Conservancy

by Chris Kelly, Western Bird and Carolina Northern Flying Squirrel Biologist

In June, Garrett Rhyne, Southeast Motus Station Coordinator for the American Bird Conservancy, visited western NC to conduct noise tests and design installation plans at several sites under consideration for Motus stations. Before his visit, NCWRC staff had tentatively selected these sites based on prominent topography and clear viewsheds, which are a proxy for maximizing potential antenna range. Our first task was to assess background noise. The noise in question is local noise close to the Motus station that could interfere with detection of a coded radio tag (nanotag) worn by a passing bird or bat. Typical sources of noise are powerline distribution transformers, sometimes other communications equipment, and even the hum of a fan or lightbulb. Nanotags produce a quiet signal that is drowned out against a noisy background. Analogous to trying to hear one raindrop in a downpour. Next, we evaluated options for the station base. This is where Motus installation requires some creativity because each site is unique, ranging from lattice towers to fire towers, wood utility poles, or buildings. Likewise, power and connectivity vary at each site. Motus stations at several U.S. Forest Service sites may tie into A/C power and/or wifi for data transmission, while some sites will require battery power with a solar panel recharge and GSM cellular data transmission. Finally, we evaluated the needs for grounding each installation from lightning strikes.

Above: The distribution transformer on the small powerline pole to the left of the fire tower at Cowee Bald (Macon County) produced some noise interference, leading us to slightly shift the aim of our antennas. Top right: Anthony Squitieri (left) Regional Coordinator of Southern Appalachians for Wild Bird Research Group discusses the Mount Mitchell Motus station with Garrett Rhyne. This station will support WBRG's future tagging projects in the Black Mountains.

NC Bird Atlas Update

by John Carpenter, Scott Anderson, Lee Sherrill, CC King, Karen Clark, Wildlife Conservation Biologists

From the saltmarshes of the Outer Banks to the tallest peaks scattered across our rugged mountains, the 2024 NC Bird Atlas (NCBA) summer field staff—consisting of 18 temporary technicians—has been very busy this quarter!

Along the coast, our team has braved hordes of hungry horse flies and sweltering heat to find as many bird species as possible. Swainson's Warbler, Yellow-breasted Chat, Prairie Warbler and Chuck-will's-Widow were found in good numbers across the forests, swamps, and scrubby thickets. In the agricultural fields, we were often serenaded by singing Eastern Meadowlarks and Horned Larks. Even rare birds—a pair of roosting Barn Owls, a Black-billed Cuckoo, and a Scissor-tailed Flycatcher—revealed themselves. With the help of Law Enforcement officers from the WRC and the Environmental Affairs Department of MCAS Cherry Point, we Atlased remote marshes in Pamlico County that were accessible only by boat. As the end of June drew near, our whole team relocated to the Outer Banks to search hard-to-reach spots for species like Seaside Sparrow, Marsh Wren, and Clapper Rail. We conducted over 3,500 survey checklists this quarter and still have one more month of Atlasing to go!

The Piedmont team has spent the first half of the summer collecting data across many of the unique habitat types that make up this ecoregion and confirmed breeding by over 100 species, such as Swainson's Warblers, Loggerhead Shrikes, Bachman's Sparrows, Barn Owl, and Green Heron. Many mornings were spent paddling kayaks through swamps and creeks, and with the help of WRC Law Enforcement yet again, staff hitched a boat ride to cruise the shores of Lake Gaston. Across the region, the team efficiently distributed effort and increased recognition of our agency by coordinating closely with dedicated volunteer Atlasers.

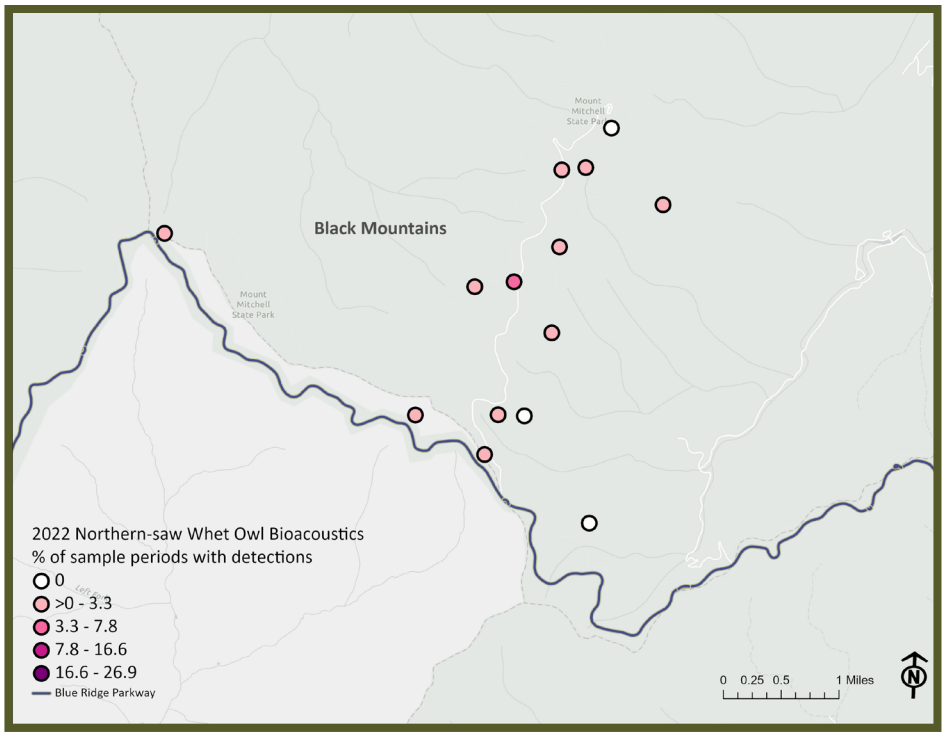
The mountain team has been tearing through their region this summer! Many days have been spent traveling long distances on sketchy mountain roads to survey isolated sites. Our reward has been confirmation of breeding by species such as Worm-eating Warbler and Ovenbird, and even the first nesting record of the Black-capped Chickadee. One technician hiked 14 miles in a single day to cover an entire trail system in the Smokies and added 19 new species that had not been detected from the public road system. The entire mountain team wrapped up the month of June by camping in the remote Nantahala Wilderness, where we confirmed Canada Warbler, Yellow-bellied Sapsucker, and Rose-breasted Grosbeak.

By reaching the places few volunteers can or are willing to go, our summer technicians are continuing to help move the NCBA towards completion!

Spring Bioacoustics—Flying Squirrels, Owls, and Warblers!

by Chris Kelly, Western Bird and Carolina Northern Flying Squirrel Biologist

Once a project's objectives have been clearly defined, bioacoustics work boils down to three main steps: deploying equipment, retrieving equipment, and processing data. This quarter, we tackled all three. In April we retrieved AudioMoths from the March 2024 saw-whet owl survey. In May, Virginia Tech researchers deployed ultrasonic detectors for the launch of NCWRC's long-term Carolina northern flying squirrel bioacoustic monitoring program. Also in April and May, partners, such as Southern Appalachian Highlands Conservancy and USFS, deployed AudioMoths to listen for golden-winged warblers. Bioacoustics effectively allowed us to blitz more locations for this declining warbler even if we couldn't be there in person during the peak May survey window. Deployment and retrieval of autonomous recording units are arguably the easiest and most enjoyable phases of a bioacoustics survey. Equipment miniaturization allows for easier deployment into even more remote, un-surveyed areas. Plus, volunteers and partner organizations like the U.S. Forest Service and Southern Appalachian Highlands Conservancy love to assist with equipment deployment. Now for the tough part: data processing. Bioacoustics surveys generate terabytes of .wav files. For flying squirrels and saw-whet owls, call classifiers filter out the junk, producing a spreadsheet of possible detections that require post-processing by a biologist. Our owl research partners in the Kitzes lab at University of Pittsburgh scrubbed the 2022 saw-whet owl dataset for us. NCWRC technicians spent rainy days this spring completing the review of possible saw-whet owl "hits" from the 2022 dataset. The 2022 results alone will vastly increase the number of records for this species in the NC Natural Heritage Program database. Now on to the 2023 and 2024 owl data and the new batch of golden-winged warbler data.



NCWRC sampled five massifs for Northern saw-whet owl in 2022. Results from the Black Mountains show a gradient of percent of sample periods with detections of owl toots. Darker purple = more toots! A saw-whet(s) was particularly active around the Mt. Mitchell State Park office.

Above left: NCWRC staff prepared a fleet of Pettersson D500 ultrasonic detectors for Virginia Tech researchers to deploy for the Carolina northern flying squirrel occupancy monitoring program. Autonomous recording units have been shrinking from the hefty Petterssons housed in 50 caliber ammo boxes to deter bear damage to tiny AudioMoths, above right (they're even wearable!). Miniaturization of equipment makes it feasible to haul more ARUs farther into the backcountry. Regardless, staff and partners make it happen (below).

Creative New Signs Protect Nesting Areas

by Karen Clark, Community Science Specialist and Carmen Johnson, Waterbird Biologist

This year Wildlife Diversity staff and the North Carolina Waterbird Stewards at Emerald Isle, a volunteer group coordinated by NCWRC, joined forces with the Town of Emerald Isle and nearby Sand Ridge Elementary to promote sharing the shore with nesting waterbirds through new signage placed along paths leading to the beach. The west end of Emerald Isle, known locally as The Point, hosts a large number of nesting Least Terns, Wilson's Plovers, and Willets each spring and summer. For nearly 20 years, NCWRC and the town have partnered to protect the nesting birds.

The volunteer stewards group has grown in numbers and support of on-the-beach monitoring of nesting birds and maintenance of a posted area that protects nesting habitat. In January 2024, stewards, Carrie Lang, Kim Henry, and Adrienne Doughty visited Sand Ridge Elementary School in Onslow County to tell students about the birds and the work being done to protect them. Emily Rivers, Sand Ridge's art teacher, asked her fourth grade students to draw pictures to illustrate ways that beachgoers can help the birds: remain outside posted areas, give space, don't litter, keep dogs on a leash, and don't feed gulls. The top ten drawings were selected to be featured on the signs that would appear along walking paths in 2024. Signs were placed on the beach and a ribbon "busting" ceremony was held where students were able to visit The Point, meet town officials, and officially launch the new signage. The creative signs have proved popular, with locals and visitors alike stopping to admire the artwork and read the messages. We hope to continue the project next year with a new group of students.

Top: Sand Ridge Elementary students bust rather than cut the ribbon at the sign dedication in April. Below: Least Tern sitting on a nest.

CARMEN JOHNSON /NCWRC

Above: Students stand next to their signs, teaching beachgoers how to share the shore with nesting waterbirds.

Restoring Waterbird Habitat

by Carmen Johnson, Waterbird Biologist

If you build it, they will come—nesting waterbirds that is. For more than a year, Commission staff have coordinated with the U.S. Army Corps of Engineers and other partners in the state on a project to restore an important waterbird nesting island near Cape Lookout National Seashore. The island, known as Sandbag Island, is owned and managed by NCWRC, and provides greatly needed nesting habitat for several species of waterbirds. Unfortunately, recent storms led to rapid erosion, causing the island to shrink from roughly two acres in 2019 to under a 1/10 of an acre this winter.

The Corps already had plans to dredge the neighboring channel that runs from Harkers

Above: The hydraulic dredge pumping material from the channel to nearby Sandbag Island.

CONTINUED ON PAGE 16

Island to the ocean, which had become challenging to navigate due to heavy shoaling. They needed a location to dispose of the dredged material and agreed that Sandbag Island was an excellent option - maintaining navigability of the channel and restoring nesting habitat had the potential to be a win-win situation. Plans were developed to remove material from the channel via a pipeline and pump it to what remained of Sandbag Island. Nearby submerged aquatic vegetation (SAV), important for fisheries and as foraging habitat for waterbirds, also needed to be protected, so Corps staff and the dredging contractor placed turbidity curtains in the water surrounding the work area, as well as developing a careful strategy for releasing the material on the island to protect the SAV.

As development on the coast continues to increase, waterbirds, many of which need open sandy habitat to nest, have fewer places to raise their young. While dredged-material islands are not suitable habitat for all waterbirds, they provide excellent nesting habitat for many species including terns and skimmers. Staff were excited to find that within days of the project's completion two pairs of American Oystercatchers, a state species of special concern, had established territories on the island and soon laid eggs in shallow nests. National Park Service staff, whose office looks out on Sandbag Island, are helping NCWRC to monitor the nests and staff hope that even more birds will nest on the new, larger island next year.

From top: Dean Hill with the US Army Corps of Engineers monitors the quality of sediment being pumped onto Sandbag Island as an excavator works in the background. Dr. Andrea Currylow and John Policarpo with the US Army Corps of Engineers celebrate the restoration of Sandbag Island with Carmen Johnson. A unmanned aerial vehicle (drone) image of Sandbag Island just before completion of the restoration project. One of the American Oystercatcher nests on Sandbag Island.


CARMEN JOHNSON /NCWRC

ANDREA CURRYLOW/US ARMY CORPS OF ENGINEERS


NEXT GENERATION LOGISTICS

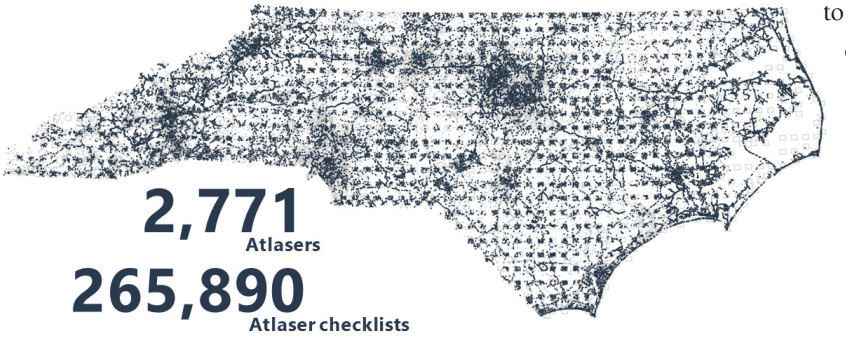

NCWRC

NC Bird Atlas 2024 Third Quarter Update

by Scott Anderson, Science Support Coordinator

The NC Bird Atlas has completed its fourth of five breeding seasons. We have two wintering seasons and one breeding season of data collection to complete. This volunteer-based effort to document breeding and wintering birds has mobilized 2,771 birders (Atlasers) and staff to collect 265,890 checklists with over 3.5 million observations since 2021.

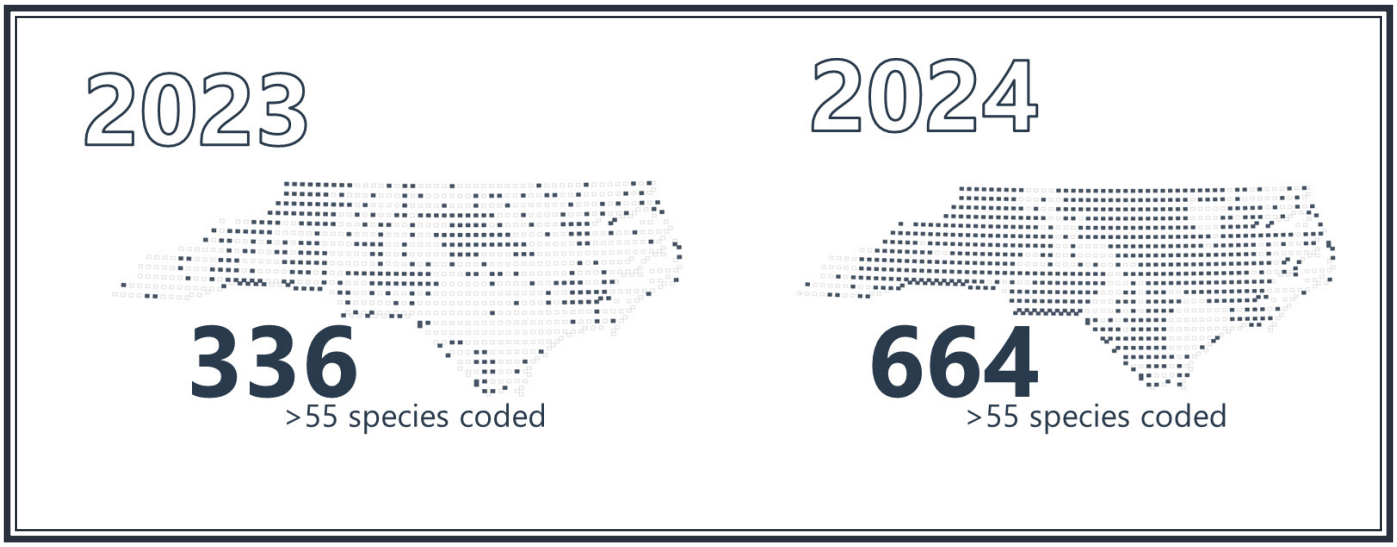
Key to this endeavor is spreading survey effort equally across the state, which means collecting data in evenly-distributed priority blocks across the state. This map shows the extent to which "Atlasers" have prioritized these blocks.



But when do we know if we have enough data in a block? We have developed several guidelines to determine if a block is complete, but we will highlight one criterion as an indicator of progress—minimum number of species recorded with observed breeding behaviors. To date, 664 (71%) of our priority blocks have met this criterion, almost doubling the number that met it in 2023, when only 336 priority blocks met this criterion.

In the coming months, we will not only survey for wintering species, but we will also review the collected data to strategize our approach during the last breeding season of the project. In addition, we will start plans for developing a menu of products to come out of this unprecedented collection of data! We are on track to completing the most comprehensive dataset of breeding and wintering birds in North Carolina—a valuable resource that will benefit conservation many years into the future.

2023–2024 CODED SPECIES COMPARISON MAP



Where is Wayne's World? Continued Efforts to Detect the Wayne's Black-throated Green Warbler in North Carolina's Coastal Region

by John Carpenter, Coastal Region Landbird Biologist and Silas Hernandez, Landbird Technician

Building on our recent genetic study that validated the status of the Wayne's Black-throated Green Warbler as a distinct subspecies breeding along the Atlantic Coastal Plain from South Carolina to Virginia, we dedicated effort this quarter to compiling results from spring 2024 surveys aimed at locating additional breeding sites for this rare Species of Greatest Conservation Need in North Carolina. We developed a habitat suitability model based on relationships between known Wayne's Warbler locations and various ecological spatial data, such as canopy height and land cover classification. We conducted nearly 150 standardized point count surveys in March and April within areas predicted to contain habitat features most associated with Wayne's Warbler presence.

Four singing males were found: two in Hyde County (New Lake on 10 April) and one in Tyrrell County (Alligator River Game Land on 9 April). The fourth individual was detected opportunistically on 27 March at Pettigrew State Park while traveling between survey points. We attribute our low number of detections to the assumption that this is truly a rare, declining species, but also acknowledge that our habitat models may be based on spatial data that are too broad or outdated to accurately predict or understand the species' habitat selection at various scales. Looking forward, we plan to revise our models using additional spatial data, including sub-canopy structure LiDAR and NC Natural Heritage Program's natural community themes. We will resume our surveys in spring 2025 with renewed confidence and hope that more Wayne's Warblers are out there waiting to be observed and counted.

GERRY LEBING

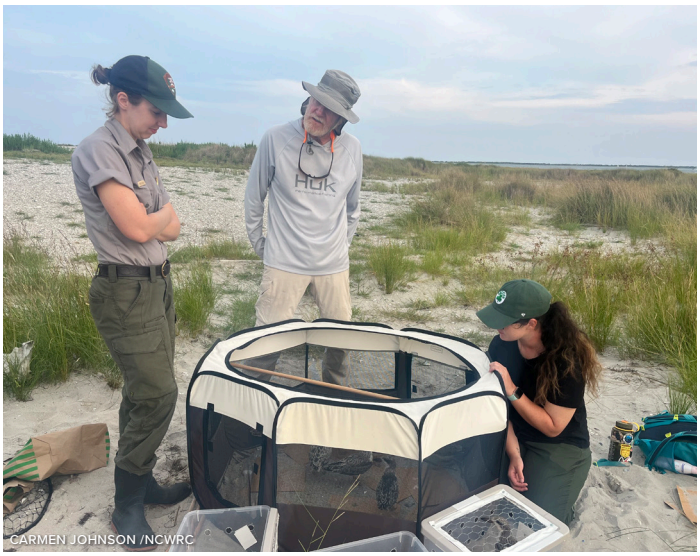
Above: A Black-throated Green Warbler.

You Are What You Eat – New Collaborative Project to Assess Tern and Skimmer Diets

by Carmen Johnson, Waterbird Biologist and Claire Reilly, Waterbird Technician

During summer 2024, Wildlife Diversity staff took part in a study to learn about the diets of Common Terns and Black Skimmers (state endangered and state threatened species, respectively). The study, humorously referred to as Project Poop, is a multistate effort to learn about the availability of forage fishes, monitor changes in the birds' diets throughout the nesting season, and better understand a potential factor affecting chicks' survival to fledgling age.

With the help of volunteers, WRC staff collected fecal samples from chicks multiple times between hatching and fledging. To collect the samples, chicks were carefully picked up either from their nest or nearby beach and placed in a holding area where they were monitored until they pooped. Once the sample was deposited, chicks were returned to their original location. The fecal sample was then scooped and placed in a vial to preserve it for processing. Careful records were kept of location, date, and chick age to see how diets may vary by site, time of year, and chick age. At the end of the field season, the samples were sent to the Cornell Lab of Ornithology for analysis by Dr. Gemma Clucas, who will use a DNA metabarcoding technique she developed to determine what forage species the birds have been eating. The results from North Carolina will be compared with those from other states to see how the diet of chicks varies across the region. This research will continue in the 2025 breeding season.



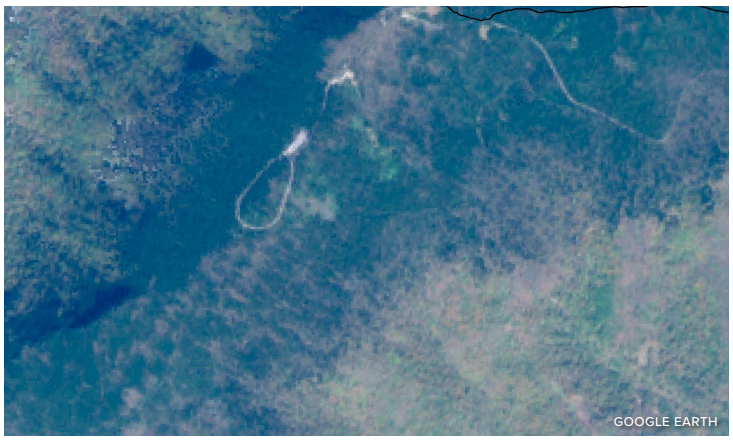
Top: Black Skimmer chicks are monitored in a holding area waiting for them poop. Bottom: Community science specialist, Karen Clark, returns a Common Tern chick to its nest. Common Tern chicks are easily distinguished from other tern species by a dark brown throat patch.

Hurricane Recovery in the Roan Highlands

by Chris Kelly, Western Region Bird and Carolina Northern Flying Squirrel Biologist

Roan Mountain and its unique inhabitants took a direct hit from Hurricane Helene, and natural resource managers are worried. In early December 2024, forest managers, wildlife biologists, and botanists from the U.S. Forest Service, North Carolina Wildlife Resources Commission, Southern Appalachian Highlands Conservancy, and Appalachian Trail Conservancy visited Roan Mountain to assess the damage. Winds of up to 100 miles per hour had leveled patches of forest, especially on ridge tops and east and south-facing slopes. Unfortunately, high quality older Fraser fir stands toppled in the storm, while younger firs sustained less damage. Numerous federally and state listed animal and plant species inhabit the cool, moist, dark conifer forests at Roan Mountain. The extensive canopy loss could change the face of Roan for centuries. Blowdown areas will be prone to soil desiccation and wildfire. Shaded, mossy rock outcrops inhabited by the endangered spruce-fir moss spider now sit under direct sunlight. Carolina northern flying squirrels lost den trees as well as a reliable food source: the truffles that grow symbiotically with the roots of Roan's conifer trees.

Just how much is too much for an already imperiled species? It is hard to measure, but biologists can conduct bioacoustic or radio-telemetry surveys of the flying squirrels, bioacoustic surveys for northern saw-whet owls, and rock outcrop surveys for the spiders. Initially, the team is focused on abating short-term risk of intense wildfire in this ecosystem. Unlike oak forests, spruce-fir forests are not adapted to fire. In fact, intense fires can inhibit germination of conifer seeds. Managers may enact burn bans around developed and undeveloped camp sites and the Appalachian Trail, construct fire control lines, and manually remove some of the fallen timber. The local land trust, Southern Appalachian Highlands Conservancy, is looking into wildfire risk reduction options on its land holdings and on private lands situated downslope of Roan's conifer forests. Where possible, some fallen trees may be limbed to bring tree trunks into contact with the forest floor, creating coarse woody debris and moist microhabitat for salamanders, small mammals, and invertebrates. Biologists will post artificial dens (wood boxes) for flying squirrels and eventually plant conifer seedlings. Recovery from Helene will be the primary topic of the annual Roan Mountain Stewardship Committee meeting in Asheville in January 2025. Though it will take an enormous amount of work and require novel solutions, partners are committed to the recovery of Roan Mountain's unique forests.



Top: Extensive blowdown in the spruce-fir forest along the trail to Roan High Bluff. Middle: Satellite imagery of Roan Mountain, October 2023. Note extensive conifer forest south/southwest of the "loop road", this image is oriented north. Bottom: Satellite imagery of Roan Mountain, October 2024, post-Helene. Note the patchwork pattern of blowdowns in the conifer forest south/southwest of the "loop road".

Growing Red-cockaded Woodpeckers, One Cluster at a Time

by John Carpenter, Coastal Landbird Biologist

On a clear November morning, I headed towards Craven County in search of the Bern Preserve, a 923-acre tract owned by the NC Coastal Land Trust (NCCLT) and situated between the northern boundary of the Croatan National Forest and Brice's Creek. Several of the preserve's dense pine stands were recently thinned in the hopes of enticing Red-cockaded Woodpeckers (RCW)—a federally threatened species that lives in family groups called clusters—to excavate a cavity and eventually nest inside. However, it can take a woodpecker several years to do that laborious work manually, so NCCLT staff requested help from North Carolina Wildlife Resources Commission (NCWRC) biologists to install artificial cavity boxes. This process, which usually takes an hour or two, involves using Swedish tree ladders and a chainsaw to cut a rectangular slab out of the tree where the cavity box will be inserted. If all goes as planned, an interested woodpecker could move into its brand-new home that very night!

At a designated meeting spot, I was greeted by former NCWRC eastern Wildlife Diversity Program supervisor David Allen (inventor of the RCW insert cavity technique), several NCCLT staff, and a surprisingly large assortment of volunteers and other folks all curious to learn about our plans for the day. Dave and I quickly found suitable pine trees—ideally mature Longleaf Pines—and scaled the 20-ft. climbing ladders to begin our work. We eventually carved out three new cavities, and as if staged for our audience, a vocal RCW suddenly appeared in the stand! It avoided us and our loud equipment, but its presence was a hopeful sign that it or other RCWs might return to inspect our work once we were gone.

The Croatan National Forest, along with Holly Shelter Game Land and Marine Corps Base Camp Lejeune, collectively represent the Coastal North Carolina Primary Core RCW Recovery Population, which has yet to reach its desired size as outlined in the federal RCW Recovery Plan. The proximity of these populations to the coast and its increased hurricane activity, coupled with continued human population growth and associated development in southeastern NC, represent additional obstacles to reaching the specific goals for recovery.

We will coordinate with NCCLT to access the Bern Preserve again during the next breeding season to determine if any RCWs did officially accept our artificial housing offer as their permanent residence. We are anxious to continue to work with other partners across the state to expedite RCW growth and recovery.

Left: An artificial cavity box ready to be installed. Center: The finished product - an inserted artificial cavity box camouflaged to look as natural as possible. Right: Retired eastern Wildlife Diversity Program supervisor, Dave Allen, high on a pine tree, carving out a cavity with a chainsaw.

Resighting Bird Bands Provides Valuable Data on Black Skimmers

by Carmen Johnson and Kacy Cook, Coastal Waterbird Biologists

October is a great time to see Black Skimmers along the North Carolina coast. Large flocks, often numbering in the hundreds, are spotted loafing and foraging on beaches, especially near inlets. North Carolina provides important habitat for these birds during nesting and migration, but the number of skimmer nests documented in the state has declined in recent years, prompting the North Carolina Wildlife Resources Commission (NCWRC) to uplist the species from a species of Special Concern to State Threatened.

To learn more about the birds and why their numbers have been declining, biologists along the Atlantic and Gulf Coasts have begun banding some of the chicks that hatch each year. In summer 2024, staff from Audubon NC banded 225 chicks in the state including 40 at one of NCWRC's Waterbird Islands as part of the effort.

Once the chicks could fly, they began dispersing to new sites. Then, as part of autumn migration surveys, biologists and volunteers used binoculars and scopes to examine the legs of each skimmer hoping to spot one of the plastic bands, known as a field readable band, with an alphanumeric code on it. Any bands identified are reported to the USGS Bird Banding Lab where the data are compiled and shared with biologists. The color of a Black Skimmer's band indicates where the bird was banded. Orange bands are from Massachusetts, yellow are from New York, blue is New Jersey, white is Virginia, green bands mean the bird was banded in Florida, and red is from Texas. Birds banded in North Carolina have black bands with white text and are the most commonly resighted in the state. The next time you are at the beach keep an eye out for banded birds. You can report them to reportband.gov, where you'll learn when and where the bird was banded, as well as receive a certificate of appreciation for providing data that help biologists understand the dispersal, migration, and survival of this species.

CARMEN JOHNSON/NCWRC

Above: A National Park Service staff member carefully holds a young Black Skimmer chick as Audubon NC biologist, Lindsay Addison, fits a black field readable band around the bird's leg. Below: Unbanded Black Skimmers stand in a puddle during a recent survey.

JONATHON GRUENKE/NCWRC

REPTILES

Response to Sea Turtle Cold-stun Events Along the North Carolina Coast in Winter 2024

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

Sea turtles are ectothermic and susceptible to becoming cold-stunned when they encounter cooler water temperatures along the North Carolina coast in winter months. There were several hundred cold-stunned sea turtles found along the coast between November 2023 and March 2024 by the North Carolina Sea Turtle Stranding and Salvage Network. The variety of cooperators and volunteers who participated in the cold stun response this winter demonstrates how extensive the network is across the coastal region. Participants included: National Park Service at Cape Hatteras and Cape Lookout National Seashores, Pea Island National Wildlife Refuge, US Coast Guard at Hatteras Island and Fort Macon, NOAA-NMFS (Beaufort), NC Aquariums (Roanoke Island, Pine Knoll Shores, Fort Fisher), Fort Macon State Park, NC Division of Marine Fisheries, NCSU College of Veterinary Medicine, Duke University Marine Lab, University of North Carolina Institute of Marine Sciences (Morehead City), University of North Carolina Center for Marine Science (Wilmington), Network for Endangered Sea Turtles (N.E.S.T.), Emerald Isle Sea Turtle Project, Karen Beasley Sea Turtle Rescue and Rehabilitation Center, and dozens of private citizens who responded when they directly encountered cold-stunned sea turtles. NCWRC biologists coordinate all activities involved in response, rehabilitation, and release of these sea turtles, and maintain the sea turtle stranding and salvage database.

NC Sea Turtle Stranding and Salvage Network cooperators from the NC Aquariums and NOAA-NMFS Beaufort respond to a cold-stunned juvenile green turtle on Shackleford Banks in Carteret County, NC in February 2024.

Investigating Head-start Bog Turtle Movements and Habitat Use

by Gabrielle Greater, Conservation Biologist/Herpetologist

The bog turtle, Glyptemys muhlenbergii, is both federally (S/A) and state Threatened. The NC Wildlife Resources Commission (NCWRC) monitors this species to understand population status and trends. NCWRC staff have been releasing head-started turtles into a few select populations to augment declining populations. Our head-starting program is carried out in close collaboration with our conservation partners at Zoo Knoxville. First, we collect eggs from the wild and the Zoo incubates them in captivity. Once the eggs hatch, Zoo Knoxville staff rear the turtles and keep them in an artificial bog throughout their first winter. This "head start" allows the turtles to grow larger than they would if hatched in the wild, giving them a much-improved chance of surviving to adulthood. About one year after the eggs are collected, we return to the same bog and release the young turtles back into their home. Head-starting is one of many conservation tools we use to help this species, including habitat management and restoration, land protection, and collaboration with private landowners.

This spring we began a new initiative to learn more about the behaviors and habitat uses of these head-started turtles via radio-telemetry. We lacked information on what head-started turtles did after release, including where they dispersed within the bog and what conditions they prefer. The illusive nature of bog turtles, coupled with the miniscule size of juvenile individuals means that most head-started turtles are not seen again until they are several years old. This makes it difficult to track the success of these turtles as they integrate into their new environment. With the use of radio-telemetry this summer, we have been able to observe head-started turtles consistently over six weeks, throughout various environmental conditions, to record information about their movement patterns and habitat use. This work has also allowed us to affirm that they are moving into unsuitable habitat or leaving the bog.

On June 5th, six 9-month-old individuals were released into three separate sections of a bog with a radio-transmitter attached to their carapaces. WRC staff tracked these individuals three times a week for six weeks. Along with their location, environmental conditions and microhabitat data were recorded. Several times throughout the monitoring period, the head-starts were weighed to determine if they were growing at the same rate as in captivity. This new information will provide useful information for the future. The tracking is ongoing, but thus far, we have learned that they are moving more than anticipated. Their short-term movements show much more activity than was expected for a yearling. In addition, the tracking period has been hot and dry, providing us with an opportunity to observe their response to this extreme change post captivity. We hope to repeat this work in future years to increase our sample size and learn more!

NCWRC Wildlife Diversity Technician using a receiver and antenna to track a bog turtle (2024).

Identifying Sea Turtle Crawls on NC Beaches

by Dr. Matthew Godfrey, Sea Turtle Biologist

During the summer along the North Carolina coast, volunteers and cooperators with the NC Sea Turtle Project conduct beach patrols each morning to look for fresh sea turtle crawls. Being large, sea turtles leave deep and distinctive tracks in the sand when they emerge from the ocean making it relatively easy to find them. Once a new crawl is identified, the volunteers and cooperators must determine if the sea turtle crawl resulted in eggs being laid, and if so, mark off the nest cavity site with wooden stakes, string and informational signs, to protect the eggs from being disturbed during their 7-week or longer incubation period.

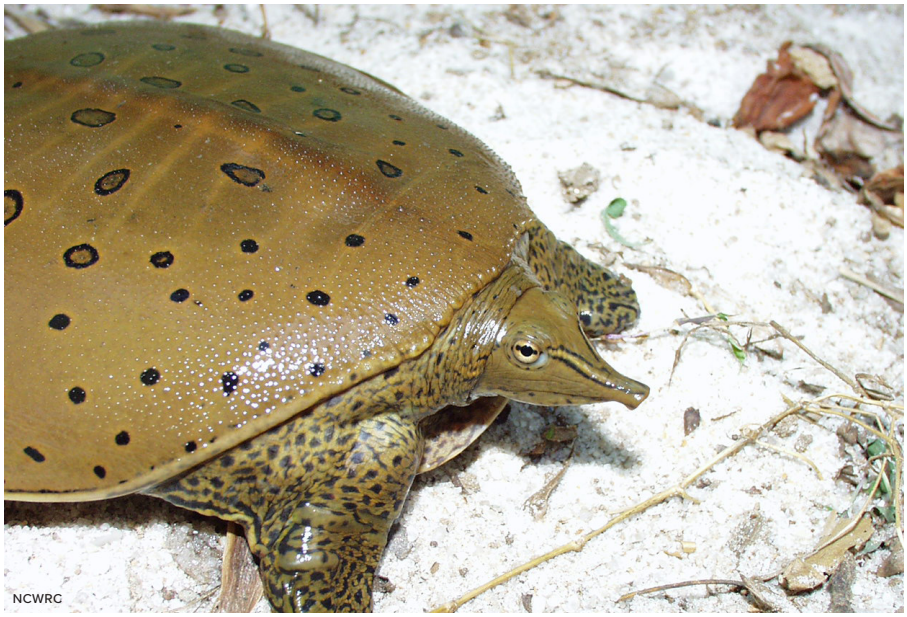
Some turtles that crawl up the beach at night will return to the sea without laying eggs; these events are termed "false crawls." For loggerhead sea turtles nesting in North Carolina, the ratio of false crawls to new nests is about 1:1, which is similar to reports from other nesting locations around the world. In some cases, false crawls seem to be related to anthropogenic activity, such as when a turtle is accidentally frightened by nighttime beach walkers, or when a turtle's access to nesting sites higher up the beach is effectively blocked by beach furniture left overnight on the strand. But false crawls are also documented on remote beaches with minimal human activity and no apparent disturbance factors. Why loggerhead sea turtles crawl so often on the beach during the nesting season without laying eggs is not fully understood and is just one of many mysteries about sea turtle behavior.

Above: A false crawl made by a loggerhead turtle on Shackleford Banks, Carteret County. Note that she returned to the ocean without any signs of digging a nest cavity. Right: A loggerhead false crawl on Shark Island, off of Cape Lookout Point.

WANTED: Softshell Turtle Sightings

by Aubrey Greene, Wildlife Diversity Biologist/Herpetologist

Have you seen a softshell turtle in North Carolina? We want to hear about it! We developed a new reporting tool for softshell turtles so the public can share sightings and help us better understand where this species occurs in North Carolina. The reporting tool activated in mid-September, and we already have 28 reports representing 18 counties —thanks to those who have already contributed! If you see one of these cool critters, please remember to take a picture and report your sighting!


NCWRC

Using Predator-Exclusion Cages to Monitor and Protect Bog Turtle Eggs

by Gabrielle Graeter, Western Region Herpetologist – Reptiles and Rosie Ronca, Herpetologist Technician

The southern lineage of bog turtles *(Glyptemys muhlenbergii)* is both federally threatened (S/A) and state threatened, though currently not fully listed under the Endangered Species Act. With recent additional funding from a Competitive State Wildlife Grant, NCWRC staff and project partners have been working to collect additional data to provide a more comprehensive understanding of the species' population status. One part of this project is quantifying recruitment of juvenile bog turtles into each population, while also improving the hatch success of eggs and survivorship of juveniles.

For this effort, we must search for bog turtle nests, and at some bog sites, we collect eggs for our head-start program with Zoo Knoxville, and at other sites, we install predator exclusion cages to protect nests during incubation. The caging method allows eggs to develop on site with a reduced threat from predators, thereby giving them a better chance of hatching in the wild. Both head-starting and caging methods enable us to conservatively estimate the number of hatchlings entering a population each year. However, bog turtle nests are very difficult to find, so there may be more nests than we are detecting at some bog sites.

In June and July 2024, to increase our detection effort, NCWRC contracted Tulpehocken Habitat Management LLC to conduct bog turtle nest searches with us and other conservation partners. This assistance provided 4 weeks of consistent daily effort and resulted in 35 nests being found in 11 bogs, located in Alleghany, Ashe, Henderson, McDowell, and Wilkes counties. Eggs were collected for head-starting at 7 of the bogs, and cages were used at 5 of the bogs (at one site half of the nests are collected for head-starting and half are caged, for the purpose of evaluating the program in the future). From our 5 caged sites, we were able to release 43 hatchling bog turtles; there were 14 eggs that did not develop or died during hatching.

Through the caging and monitoring of these nests, we are not only ensuring that the eggs have a higher chance of survival to hatch but also gaining valuable information regarding nesting habitat selection and recruitment of juveniles into these populations. While surviving to adulthood is a challenging time for bog turtles, and many won't make it through the first few years of life, we were able to ensure more eggs hatched by reducing predation. As we are unable to head-start hatchlings from every population, the use of predator exclusion cages is highly valuable in helping these populations grow. We are excited to hopefully re-encounter some of these individuals in the future and have evidence of their survival!

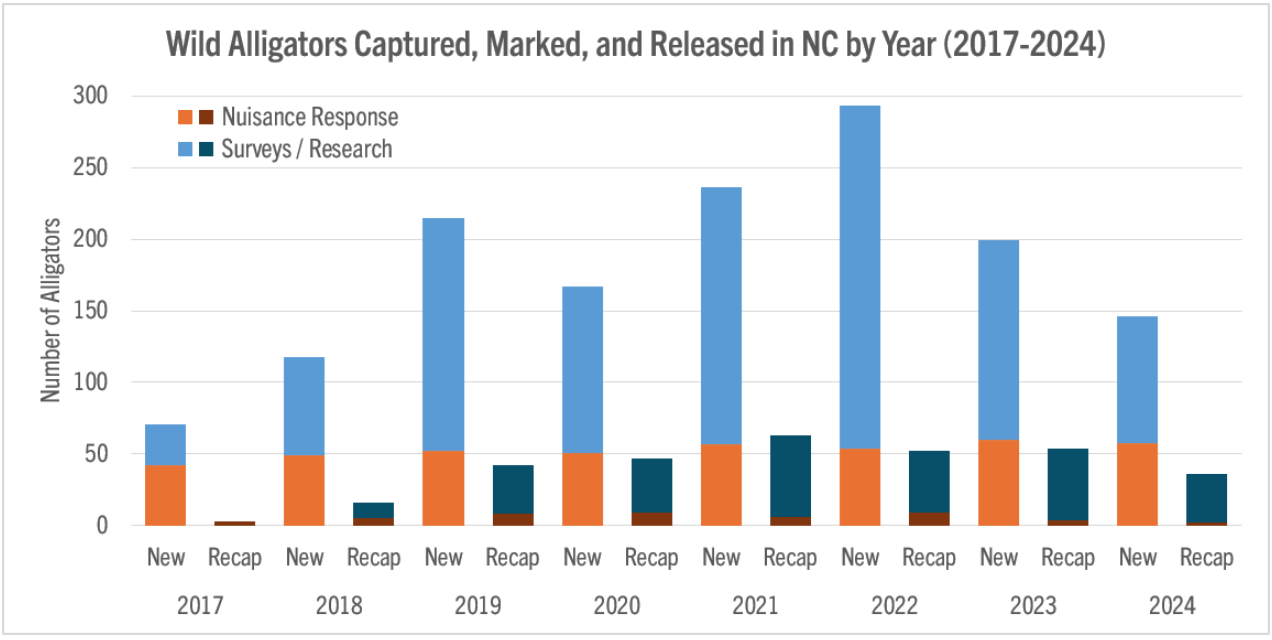
Top: After finding a nest, a predator exclusion cage is built around the tussock microhabitat to protect the eggs from predators during incubation. It is removed after the eggs have hatched and the hatchlings have had time to absorb their yolk sac. Bottom: After hatching, every individual received a unique mark via a small notch on the shell to aid identification and monitoring. Individuals were then weighed and measured before release.

Alligator Marking and Data Collection in NC

by Alicia Wassmer, Alligator Biologist

In Spring 2017, NCWRC implemented 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. 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 can be applied to a wide range of agency initiatives that support alligator conservation and management efforts in the state. For example, this information helps biologists 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. Numbers of alligators captured and marked during nuisance responses and surveys/research projects from 2017 to 2024 are shown in the figure below.

At only a few days old and inches in length, each hatchling in this pod awaits its turn for a tag —the same type of microchip used by veterinarians in dogs and cats. These permanent tags are injected under the skin and a handheld scanner is used to read the number from within close range (a few inches) of a tag.



These numbers are inclusive of research subjects of all sizes. During nest-site surveys, dozens of hatchlings may be tagged on one day. Approximately 46% of the alligators marked since 2017 were still in vulnerable juvenile stages with high mortality rates. Only about 16% of the alligators marked in NC since 2017 were large enough to be reproductively mature adults. In some years shown, permitted scientific researchers have included Dr. Stephen Dinkelacker and Dr. Scott Belcher. Only partial data are currently available for 2024.

Field Days with Foresters, Rattlesnakes, and Hellbenders

by Jeff Hall, NC Partners in Amphibian and Reptile Conservation

Wildlife Resources Commission staff held a workshop on September 18th for foresters with Weyerhaeuser Company to discuss management of timber lands with the primary focus of conservation of reptiles and amphibians within managed forest landscapes. The day included a field outing so foresters would get hands on experience with various trapping techniques while also having the opportunity to evaluate different habitat types and discuss management of isolated wetlands and associated amphibians. Workshop participants were treated to captures of several turtle, frog, and snake species during the day. Staff look forward to continuing further collaborative efforts with forestry companies on management actions that benefit reptiles and amphibians.

Field work during this quarter focused on several SGCN reptiles and amphibians across the state including Carolina Pigmy Rattlesnakes, Timber Rattlesnakes, and Eastern Hellbenders. Timber Rattlesnake site assessments were particularly successful in yielding shed skins for use in future genetic analyses. Working collaboratively with National Parks staff at a site in Dare County, staff were able to locate four Timber Rattlesnake sheds and three live rattlesnakes in one field day! Late August and late September yielded record amounts of rainfall. After each storm, staff visited as many amphibian breeding sites as possible to check for out-of-cycle breeding by Gopher Frogs and other SGCN amphibians. On September 23rd, staff were treated to finding five hatching Gopher Frog egg masses at a site in Brunswick County. This discovery was an important breeding event as the pond at this site had last held enough water to induce breeding in 2021.


JEFF HALL/NCWRC


JEFF HALL/NCWRC


JEFF HALL/NCWRC

Top right: foresters at workshop with large Snapping Turtle. Middle: Image of an adult Timber Rattlesnake encountered in Dare County during surveys. Bottom: A Gopher Frog breeding pond in Brunswick County.

A Light Bulb Moment – Successful Solutions to Impacts of Artificial Coastal Lighting on Sea Turtles

by Matthew Godfrey, Sea Turtle Biologist and Sarah Finn Coastal Herpetologist

Sea turtles crawl onto sandy beaches as nesting females or as hatchlings that emerge from nests. When adult or hatchling sea turtles are on the beach at night, they rely on visual cues to find their way back to the ocean. They move toward the brightest area of the horizon, which on undeveloped beaches is almost always over the ocean because the darker silhouette of dunes and vegetation on the landward side of the beach contrasts with the lighter horizon over the water. The light horizon is caused by the reflection of stars or light-colored wave crests.

Beaches with human development can interrupt this natural process of sea turtles finding their way to the ocean. The illuminated artificial lights of homes and other development that are visible from the beach cause hatchling turtles to become misoriented. Artificial lights are often associated with parking lots, walkways, decks, and even indoor spaces of ocean-facing homes when window curtains are not drawn.

Volunteers and cooperators with the NC Sea Turtle Project work to identify sources of nighttime lighting visible from the beach, with the goal of reducing the impact of these lights through shielding, redirecting, or replacing problem lights with bulbs that emit wavelengths that are less likely to attract sea turtles. At Jennette's Pier in Nags Head, biologists with NCWRC and staff at the NC Aquariums identified lighting on the pier as a source of nighttime light that could affect sea turtles. Following extensive planning and research, Aquarium staff retrofitted the pier's outdoor lighting array to prevent nearly all visible light from being attractive to sea turtles on the beach in the Nags Head area. The project was so successful that other piers in North Carolina have expressed interest in working with the NC Aquariums staff to undertake similar retrofitting efforts to minimize impacts to sea turtles on NC beaches.

Top: Bright lights with shorter wavelengths visible from Jennette's Pier in Nags Head in 2022. Bottom: Warmer lights with longer wavelengths visible from Jennette's Pier in Nags Head in 2024.

Monitoring Species of Greatest Conservation Need

by Aubrey Greene, Wildlife Diversity Biologist/Herpetologist

October 2024 started off with surveys for SGCN snakes on Sandhills Game Lands, particularly Southern Hognose Snakes, as this is a period of peak activity for this species. Hatchling snakes (and the occasional adult) are on the move during this time and often have to cross roads. Their small size and slow movement make them especially vulnerable to being hit in the process, so high road mortality is a major concern for this State Threatened snake. We continue to monitor this species to ensure the population isn't declining over time.

During this quarter we also deployed acoustic recording devices (aka frogloggers) at 11 wetlands across the Sandhills to monitor winter-breeding SGCN frogs and toads like the Carolina Gopher Frog and Ornate Chorus Frog. These devices are set to record for 5 minutes every hour for 6 hours, beginning at sunset each night and will remain in the field until the end of April. That means we will have over 70 hours of recordings for each wetland!

Fall rains often trigger salamanders to begin their trek across the landscape to their breeding wetlands, which triggers us to survey roads on rainy nights and start monitoring wetlands for egg masses. One warm rainy night in November was particularly active for amphibians (15 species documented) in Moore and Lee counties, including State Threatened Eastern Tiger Salamanders. Egg mass surveys on Sandhills Game Lands in late December even revealed Tiger Salamanders have already started laying eggs in wetlands still full from late summer rains. However, more winter rains will be needed to ensure those wetlands stay full long enough for Tiger Salamanders and other SGCN amphibian species to have a successful breeding season.

Top: Young Southern Hognose Snake found in Sandhills Game Land. Bottom: A Tiger Salamander egg mass found in Sandhills Game Land.

Initial Assessments of Hurricane Helene on Bog Turtle Habitat and Wetlands in Western NC

by Gabrielle Graeter, Western Region Herpetologist, and Rosie Ronca, Western Region Technician

The southern lineage of bog turtles *(Glyptemys muhlenbergii)* is federally threatened (S/A) and state threatened in North Carolina. This species occurs in mountain bog habitats in the Southern Appalachian Mountains from Virginia to northern Georgia. At the end of September 2024, Tropical Storm Helene hit western North Carolina, causing historic flooding, many landslides, and thousands of downed trees. It was an unprecedented disaster in terms of both human and ecological impacts.

After the storm, North Carolina Wildlife Resources Commission (NCWRC) Wildlife Diversity staff visited bogs to assess impacts to habitat. Staff developed a standardized questionnaire on Survey123 to quantify overall impact, flood damage, fallen trees, sediment/rock/debris deposits, erosion, and deceased wildlife. In October and November, our team assessed 24 sites across six counties, with a focus on bogs within the areas hit hardest by the storm. Eight of the bogs had impacts across at least 50% of the bog. The main effects we documented were sediment and rock deposits, scoured areas from erosion, and extreme flooding. Of the five best bog turtle populations in NC, the habitat at four of them was significantly impacted by the storm. This damage to bog turtle habitat is a huge setback for conservation of this species.

We are using the information from the assessment survey to create a plan for addressing damages from the storm at these bogs, including immediate needs before turtles are active in spring 2025, and longer-term restoration needs. This planning will be done in partnership with other conservation groups, including the U.S. Fish and Wildlife Service, The Nature Conservancy, the Amphibian and Reptile Conservancy, as well as private landowners. In the short term, we have a number of bogs with sediment, rocks, and other debris deposited on top of the wetland that needs to be removed by mid-March. In the longer term, we have identified areas that need to be stabilized due to scouring and erosion, adjacent stream banks that need attention, and restoration of hydrology. Beginning in Spring 2025, when turtles are active again, we will begin assessing the effects of this storm on the most-impacted populations through various survey methods, including trapping and active searches.

Top: NCWRC Commission Biologist Gabrielle Graeter walks through an Alleghany Co. bog to assess damages from Hurricane Helene. Debris deposits from flood water flow are evident against fallen logs. Bottom: Evidence of sediment deposits and flood flow in the priority nesting habitat at one of the more stable bog turtle population sites in NC. This sediment will need to be removed due to the amount and location, and potential impacts to bog turtle behaviors and activities in spring 2025.

Cold Winter Temperatures Lead to Major Cold-Stunning Season

by Matthew Godfrey, Sea Turtle Biologist, and Sarah Finn, Coastal Diversity Biologist and NC Sea Turtle Stranding Network Coordinator

The North Carolina Sea Turtle Stranding and Salvage Network, coordinated by North Carolina Wildlife Resources Commission (NCWRC) biologists, monitors sea turtle strandings along North Carolina's coast year-round. During winter months, sea turtles can strand in mass numbers due to a condition called cold-stunning. Cold-stunning occurs when water temperatures fall below 10°C (50° F), causing sea turtles to become lethargic and unable to swim. We see some level of cold-stunning in North Carolina every winter, primarily in shallow sounds where the water temperature can drop dramatically with seasonal cold snaps. Though we can predict with some certainty when we may begin to see cold stunned turtles (based on monitoring inshore water temperatures), we can never really know how many turtles we may see in a given season. Winter 2024/2025 has produced the second-highest cold-stun season on record in North Carolina, with nearly 900 live sea turtles recovered since 1 December 2024. NCWRC biologists work closely with rehabilitation partners, including NC Aquariums, the Karen Beasley Sea Turtle Rescue and Rehabilitation Center, and the NC Museum of Natural Sciences, to facilitate successful rehabilitation of live-stranded sea turtles. Thanks to their hard work, by the end of December, more than 600 turtles had already been released to warmer waters in partnership with the U.S. Coast Guard and private charter boats.


MATTHEW GODFREY/NCWRC


MATT JANSON

Top right:Juvenile green turtles wash in due to cold-stunning on Barden Beach, Cape Lookout National Seashore. Right: A Cape Hatteras National Seashore ranger collects live cold-stunned sea turtles on Ocracoke.

AMPHIBIANS

Sandhills Winter-breeding Amphibian Monitoring

by Aubrey Greene, Wildlife Diversity Biologist/Herpetologist

A wet winter in the Sandhills has been keeping WRC biologists busy monitoring winter-breeding amphibians. The rains began in late December 2023 and spurred Eastern Tiger Salamanders (photo below) to begin migrating to ephemeral wetlands to breed. After two winters of drought conditions with minimal (if any) breeding activity, this was exciting news! Tiger salamanders are listed as a State Threatened species in North Carolina, so we monitor their populations closely. We do this by counting the number of egg masses laid in each wetland. Each female tiger salamander lays around 3 egg masses, so we can use the total number of masses to estimate the number of breeding females in the population. This year, we documented eggs at 16 wetlands throughout the Sandhills region, some of which had 100s of egg masses, indicating these wetlands house robust populations!

Wetlands are surveyed on public and private lands throughout the Sandhills region. The exciting news for tiger salamanders this year was the discovery of a new population on private lands in the Sandhills! It was reported (via HerpMapper) by a citizen who found adult tiger salamanders crossing the road on a rainy night. The adjacent landowners were kind enough to allow access to the wetlands we thought these salamanders might be using, and egg masses were found in three ponds. This finding highlights the importance of citizens reporting sightings of rare wildlife; we can't be everywhere at once and can only cover so much ground on those few warm, rainy, winter nights we get each year.

The Carolina Gopher Frog, another winter-breeding amphibian, is State Endangered, so it is important that we monitor and manage its populations. Similar to tiger salamanders, we survey for gopher frog egg masses in

PLEASE NOTE:
Our State Listed species are protected from take and harassment so if you see them, please observe these animals respectfully, help them cross the road if needed (and if it's safe for YOU!), and leave them be.

AUBREY H. GREENE/NCWRC

continue on next page

ephemeral wetlands starting in late winter through early spring. No egg masses were found on WRC lands in the Sandhills the past two years, so we were glad to find the first egg masses of the season on January 29th, 2024 (the earliest breeding activity ever documented in North Carolina!). To give these Sandhills frogs a leg up, we work with our partners at the North Carolina Zoo to collect part of each egg mass to be headstarted by their staff. Headstarting gopher frogs means raising the eggs and tadpoles until they metamorph into froglets which we will release back to their source locations later in 2024.

Gopher frog headstarting efforts started in 2015 in the Sandhills. With few occupied ponds in the region, WRC biologists decided to reintroduce gopher frogs at one Sandhills Game Land pond. It has been 3.5 years since the first metamorphs were released at the reintroduction pond, and we are thrilled to announce the first calling males were observed and three egg masses were found in March! This is a huge win for the Carolina Gopher Frog and we hope for continued success as more frogs are released at the site.

AUBREY H. GREENE/NCWRC

Gopher Frog egg mass (right)
Ephemeral wetland (below)

AUBREY H. GREENE/NCWRC

Biologists Conduct Species Status Assessment for Hellbenders

by Lori Williams, Western Amphibian Biologist

In the first quarter of 2024, Wildlife Diversity staff participated in the second federal Species Status Assessment (SSA) for special concern Eastern Hellbender (Cryptobranchus a. alleganiensis). The first SSA was conducted in 2017 and did not result in federal protection for the subspecies within its range in the Eastern United States. Currently, only the Ozark Hellbender (C. a. bishopi) and the Ozark disjunct population of Eastern Hellbender are listed under the Endangered Species Act.

In fall 2023, a lawsuit by environmental organizations and a subsequent court decision, instructed the U.S. Fish and Wildlife Service (USFWS) to redo the 2017 SSA, mainly because of a flaw in how proactive conservation measures were evaluated. The expert panel of state representatives and researchers was reconvened to redo the SSA process. Each state and native tribal land was tasked with evaluating population statuses for individual streams in their jurisdiction that have had an Eastern Hellbender record since the year 2000.

By far, North Carolina has the most hellbender streams than any other state. We likely have the best of what is left of historical populations. In 2017, we assessed 155 streams, and now in 2024, the number has increased to 179, thanks in large part to the help of anglers, recreationists, and the public for sharing hellbender encounters, some of which reveal new streams. The increase in streams with hellbender presence is also due in part to continued success of environmental DNA testing to detect new populations in the state.

Although North Carolina has more hellbender streams than any other state, the long-term outlook for the species, even here, is not guaranteed. For example, the number of North Carolina hellbender streams where the population is judged to be failing has increased since the 2017 SSA. From 2017 to 2024, the state has seen a 10% increase in the number of streams presumed to have zero hellbenders left (an "extirpated" status) and/or presumed to have so few and isolated adults left that breeding is highly unlikely ("functionally extirpated"). We will continue to assist the USFWS in reviewing the draft SSA report when it's ready, likely in December 2024.


An important part of the federal Species Status Assessment is population structure, essentially whether all age classes are represented in a population including gilled larva (left; John Groves, 2016); older juveniles and subadults (middle; Steve O'Neil, 2012); and mature adults (right; Lori Williams, 2008).

Pine Barrens Treefrog Surveys

by Aubrey Greene, Wildlife Diversity Biologist/Herpetologist

This spring we started our first year of a standardized long-term monitoring effort for Pine Barrens treefrogs to assess the status of this species and learn more about their ability to colonize/recolonize habitats over time. To do this, we developed driving routes with pre-determined sites where we conduct night surveys by listening for calling males. We are working with conservation partners and interested private landowners to conduct surveys across the Sandhills region. Pine Barrens treefrogs are our target species, but we also record other species we hear to help us better understand the frog communities inhabiting these areas. So far this year we surveyed 18 different routes on 25 nights; our goal is to survey each route 1–2 times/year from April–July.

Above left: A Pine Barrens treefrog. Right: a Pine Barrens treefrog tadpole, and a pickerel frog (below) we encountered out and about during our night surveys.

MEETINGS:

Sandhills herp staff attended and presented on reptile and amphibian conservation at The Wildlife Society—North Carolina Chapter annual meeting in Black Mountain, NC and the North Carolina Herpetological Society Spring Meeting at South Mountains State Park.

Staff also assisted with the NCWRC booth at Party for the Pine at Weymouth Woods State Park in April and provided reptile and amphibian management guidance during the Sandhills Game Lands Field Tour held in June.

Releasing Gopher Frogs

by Aubrey Greene, Wildlife Diversity Biologist/Herpetologist

Early summer brings new beginnings for the head-started gopher frogs our NC Zoo partners have been taking such good care of since late January. As the tadpoles start to metamorphose, we prep for their release back to the Sandhills Game Lands. To do this, we dig starter burrows to help the released frogs adjust to their new surroundings. We also coordinate with the Zoo to release frogs in the evenings when it is not so hot. Before release, Zoo staff mark each newly metamorphosed frog using VIE (Visible Implant Elastomer) Tags, so we can distinguish head-started frogs from non-head-started frogs in the future. We started releasing juvenile frogs on June 14, and we have released ~300 gopher frogs back onto the landscape so far this year! Releases will wrap up by the end of July.

Top right: Head-started gopher frogs. Bottom: A head-started gopher frog in a starter burrow.


AUBREY H. GREEN/NCWRC


AUBREY H. GREEN/NCWRC

Saving Hellbenders is All in a Dam Day's Work

by Lori Williams, Western Amphibian Biologist

A highlight of the second quarter was the effort by Wildlife Diversity staff and project partners, Appalachian State University, MountainTrue, and American Rivers to scuba dive in a deep pool at the base of the 100+ year-old, derelict, Shulls Mill dam in the Watauga River (Watauga County, NC) scheduled to be taken down this summer. Removing the remnant dam, which was breached in the 1940s in a massive flood and is a growing safety hazard to this day, will help restore connectivity for aquatic species, among other benefits.

Our objective, however, was to catch Eastern Hellbenders (*Cryptobranchus a. alleganiensis*), a state Special Concern species, directly in harm's way of the demolition work, give them a unique identifying, internal PIT tag (like a microchip), and release them in suitable habitat downstream. Other partners not already mentioned, including Wildland Engineering and the U.S. Fish and Wildlife Service, designed a plan to safely deal with many feet of sediment that had built up behind the structure over decades and to remove the dam piece by piece. Work began at the end of June and was to last for a few weeks.

As for the resident Hellbenders that were at risk, the scuba team was able to rescue eight, seven of whom were adults who will, hopefully, breed and nest in their new section of the river and continue contributing to the population for generations to come. Post-removal, we will have a lot of monitoring work to do to see how Hellbenders, other species, and even the river itself, respond to their new life without a barrier.

Several reporters and media outlets were present for the Hellbender surveys, and there are a number of articles, videos, and audio clips online about the project. For example, two that feature Wildlife Diversity staff, particularly technician Ben Dalton who was part of the scuba team are: https://www.wfae.org/energy-environment/2024-06-27/n-c-biologists-mount-search-and-rescue-operation-for-americas-largest-salamander-before-dam-removal; and, https://insideclimatenews.org/news/04072024north-carolina-hellbenders-threatened-by-climate-change/


LORI WILLIAMS/NCWRC


BEN DALTON/NCWRC


MOUNTAIN TRUE

Top: Part of the old Shulls Mill dam with scuba divers at the base preparing to submerge to look for Eastern Hellbenders. Andy Hill (MountainTrue) scuba dives with a light in search of Eastern Hellbenders below the old Shulls Mill dam. Bottom: One of the first adult Eastern Hellbenders rescued from the base of the old Shulls Mill dam before its demolition, in June 2024, Watauga County.

Wetland Restoration Partnership

by Aubrey Greene, Wildlife Diversity Biologist/Herpetologist

Some of the seasonal wetlands on Sandhills Game Lands are getting a much-needed facelift thanks to our partners at The Nature Conservancy (TNC). Using grant money from the Department of Defense (Readiness and Environmental Protection Integration (REPI) Challenge Grant), TNC hired a Conservation Corps North Carolina (CCNC) crew to manually remove unwanted woody vegetation and invasive plants from wetland basins. Historically, fire would have maintained Sandhills wetlands as grassy depressions with few if any shrubs or trees. Over time, fire suppression in wetland basins allowed for extreme overgrowth of woody species which suck up a lot of water, causing wetlands to dry faster. When this happens, larval amphibians can't develop before the pond dries, and eventually fewer species use the wetland to breed. This summer the CCNC crew completed woody, invasive vegetation removal at five of the eleven wetlands WRC identified as priority restoration sites. The REPI grant will provide the necessary funding to complete the work at all eleven wetlands over the next two to three years. After restoration is complete, the Sandhills Game Lands fire crews should be able to maintain the desired grassy state with regular prescribed fires when the wetlands are dry.

In conjunction with these efforts, we began monitoring amphibian populations at the restoration ponds by dipnetting for tadpoles and larval salamanders. We plan to monitor seasonally for the next five years to determine if the restored ponds are providing suitable habitat for amphibians of interest like tiger salamanders, little grass frogs, and/or oak toads, to name a few.


MIKE MARTIN


CASON VERHINE

Top: Duke West Pond before restoration. Bottom: Duke West Pond after restoration.


ADOBESTOCK

Breeding Gopher Frogs: Then and Now

by Aubrey Greene, Wildlife Diversity Biologist/Herpetologist

The hot summer months are a good time to do some desk work analyzing acoustic (froglogger) data from the winter monitoring season. This past winter we had frogloggers deployed at eleven seasonal wetlands across the Sandhills from December through part of April. To analyze the data, we use specialized acoustic software that allows us to visually see in addition to hearing the recordings, which aids identification of the calls of species of interest like the Carolina gopher frog and ornate chorus frog. This year we detected gopher frogs at seven ponds and ornate chorus frogs at four! In comparison, gopher frogs were only detected at three of the six monitored wetlands the previous year. This past winter started off much wetter than recent years which helped increase breeding activity across the region.

Sandhills gopher frogs are getting an early start this year with multiple heavy rain events filling ponds in August and September and spurring breeding activity that has already resulted in 12 egg masses! Two egg masses were found at the reintroduction wetland which is a great sign for the continued survival and success of this State Endangered amphibian.


JEFF HALL/NCWRC

Data Collection for an Eastern Hellbender Nesting Ecology Study

by Lori Williams, Western Region Conservation Biologist focusing on Amphibians

The Eastern Hellbender *(Cryptobranchus a. alleganiensis)*, a harmless, crayfish-eating, giant, aquatic salamander and bio-indicator of water quality in Appalachia, is a North Carolina state special concern species and now, a proposed federally endangered species. In early September 2024 (and blissfully, pre-Hurricane Helene) for hellbender breeding season work, Wildlife Diversity staff, partners, and volunteers targeted specific sites and streams in the upper French Broad River drainage as part of our collaborative research with Clemson University. The project focuses on hellbender nesting ecology and is led by Wildlife Diversity technician and Ph.D. student, Ben Dalton.

One objective was to examine characteristics of hellbender nest rocks that may contribute to nest success, so we focused on finding "den master" hellbenders, or the resident, adult males who were "posturing" and in defensive mode at the entrance of their nest rock. We then made return visits with an underwater borescope (camera) to try to detect eggs. We carefully extracted animals for workup, including giving them a unique identifier like a microchip, called a PIT-tag (Passive Integrated Transponder), that we can use to keep track of individuals in the future. Not disturbing the valuable nest rocks was a top priority, so surveyors honed their skills with a novel field method to coax or "noodle" animals out into the open so they could be netted, worked up, and quickly returned. For the breeding season in total, 8 sites in 5 streams were surveyed by 26 people. The number of confirmed nests was 26, which was the most ever recorded in a single season! Additionally, 29 posturing, den master males never did have a nest, and another 62 hellbenders were seen roaming around, out and about, on the stream bottom (juveniles, sub-adults, and females).

[Sadly, as we are all too aware, on September 27th, 2024, the world changed in western North Carolina, for people, for animals, for landscapes, and for many of our beloved mountain streams. We have yet to begin to assess the real damage Hurricane Helene caused for things like river habitat and hellbender populations, and will start that work in 2025. However, in the weeks and months since the storm, we have received many reports of a few to several dozen to over 100 dead hellbenders documented in the worst flooded areas, so the outlook may be dire for some streams. Will we see another successful hellbender breeding season like we did in 2024? Maybe…in some places that escaped the brunt of the floods…. but the special places that remain for this species are all the more rare, precious, and in need of protection today than they were a year ago.]

Top: NCWRC Wildlife Diversity technicians, Ben Dalton and Clifton Avery, observing a den master male Eastern Hellbender under a nest rock. Bottom: A happy finish to the day when a very large, very old (~30+ year old) female Eastern Hellbender was found (pictured in measuring board); Ben Dalton (NCWRC, foreground), Ivanna Knox (U.S. Forest Service, left), Lori Williams (NCWRC, center), Clifton Avery (NCWRC, right).

NCPARC

N.C. Partners in Amphibian and Reptile Conservation News

by Jeff Hall, Partners in Amphibian and Reptile Conservation Biologist

NCPARC held its annual meeting virtually online through Zoom, in March of 2024 with 114 registered attendees. Talks were given by four speakers during two hour-long sessions on back-to-back days and included themes of landscape scale conservation and disease and invasive species. Additionally, the NCPARC Steering Committee, and two working groups met during this quarter. During the annual SEPARC regional meeting, staff gave an update on NCPARC activities for the past year. Staff also gave talks on herp conservation to Pfeiffer University and the Croatan chapter of the Sierra Club.

SPECIES OF GREATEST CONSERVATION NEED SURVEYS - AMPHIBIANS

Happily, numerous winter precipitation events yielded positive results for winter amphibian breeding efforts. Surveys for SGCN amphibians such as Gopher Frog, Eastern Tiger Salamander, and Mabee's Salamander yielded the largest number of egg masses detected at several sites in over 3 years. In the case of the Gopher Frog, two populations showed the largest number of egg masses ever detected. Head-starting efforts are well underway in partnership with the NC Zoo, the NC Aquariums, NCSU CMAST, Carteret Community College, and the USFWS Edenton National Fish Hatchery. These results are particularly exciting for the Holly Shelter game land population, which has seen significant restoration efforts over past two years. Over 50 egg masses were detected among 3 different ponds on the game land, each receiving some level of restoration from either Land and Water Access staff or Wildlife Management staff, or a combination of both.

Tiger Salamander egg mass

Wildlife Diversity Biologist Aubrey Greene holds an adult female Gopher Frog captured during winter surveys.

N.C. Partners in Amphibian and Reptile Conservation News

Wildlife Diversity Technician Kabryn Mattison with portions of Gopher Frog egg masses collected for head-starting efforts (left); Female Gopher Frog

SPECIES OF GREATEST CONSERVATION NEED SURVEYS - REPTILES

Warmer weather in March sent staff into the field searching for SGCN snakes and lizards. Staff often target areas that have recently received prescribed fire as tree stumps are more readily visible and thus more easily assessed in these more open landscapes, along with the snakes and lizards that often reside within them. Species detected during surveys included Carolina Pigmy Rattlesnake, Timber Rattlesnake, and Mole Kingsnake.

Carolina Pigmy Rattlesnake sheltering under a small log after a prescribed fire

NC Partners in Amphibian and Reptile Conservation

by Jeff Hall, Wildlife Diversity Biologist and NCPARC Coordinator

The Wildlife Diversity Herp team has been busy with outreach activities. NCPARC sponsored two events focused on backyard snakes. Events were held at public parks in Apex and Cary, where several hundred people had the opportunity to learn about local snakes and see many live local species. Around twenty volunteers assisted with these events, spearheaded by former WRC photographer Melissa McGaw. NCPARC also hosted a booth at the Longleaf Fest at Harris Lake County Park in Wake County. The NC Chapter of The Wildlife Society met during the quarter and Wildlife Diversity staff gave a talk focused on the "Rattlesnake Sightings Wanted" community science project. Between the years 2020–2023, staff have received 939 sightings yielding 769 rattlesnake records through this project. These records can be used to assess species distribution and help identify important habitat conservation areas. Staff also provided field workshops for North Carolina State University, Camp Chestnut Ridge, and a training for incoming WRC Law Enforcement officers. In addition to these field meetings, staff gave talks on herp conservation at the Cradle of Forestry, UNC Wilmington, Pamlico Public Library, and to the Nongame Wildlife Advisory Committee.

Due to terrific success in detecting Gopher Frog egg masses at Holly Shelter Game Land over the winter season, head-starting efforts were conducted with partners, including the NC Aquariums, NCSU CMAST, Carteret Community College, and the USFWS Edenton National Fish Hatchery. Rearing tadpoles to metamorphosis from eggs collected over the winter takes 3-5 months, depending on temperatures and weather patterns. These efforts resulted in the release of


JEFF HALL/NCWRC

JEFF HALL/NCWRC


JEFF HALL/NCWRC

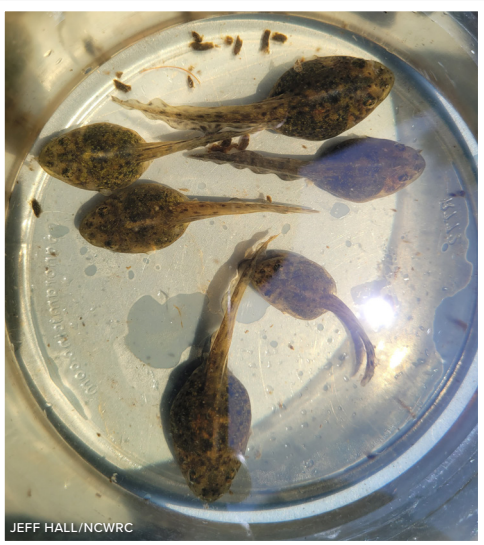
Top: People at a Backyard Snakes event. Middle: A sign used to help generate rattlesnake sightings. Bottom: NC Aquariums staff and partners releasing Gopher Frogs at Holly Shelter game lands.

continue on next page

over 1,200 juvenile Gopher Frogs back to Holly Shelter during this quarter. Staff also detected Gopher Frog tadpoles in the Croatan National Forest, confirming successful breeding at that location. These results are exciting for the future of the Gopher Frog in NC!

Staff continued field work on several SGCN reptiles and amphibians across the state, including projects involving Spotted Turtles, Timber Rattlesnakes, and Bog Turtles. Incidental observations were also recorded for many additional SGCN amphibians and reptiles such as Eastern Chicken Turtle, Mole Kingsnake, and Carolina Pigmy Rattlesnake.

Top: Gopher Frog tadpoles found in Croatan National Forest. Middle: A hatchling Bog Turtle found during surveys. Bottom: An adult Timber Rattlesnake. Below: Partners ready to release Gopher Frogs.


JEFF HALL/NCWRC


JEFF HALL/NCWRC


JEFF HALL/NCWRC


JEFF HALL/NCWRC

Learning and Connecting

by Jeff Hall, NC Partners in Amphibian and Reptile Conservation

During this final quarter of 2024, two North Carolina Wildlife Resources Commission (NCWRC) staff held a one-day workshop on herp field techniques for graduate students in the Environmental Sciences field from UNC Wilmington. Participants met at Carolina Beach State Park to learn about minnow and turtle trapping, the use of artificial cover boards, drift fencing, and other sampling methods to increase the probability of detecting various herp species. Many species were found during the workshop with highlights including a juvenile American Alligator, 3 feet in length, a Striped Mud Turtle, several Eastern Newts, and a Barking Treefrog.

Above: biologist Jeff Hall demonstrating trapping techniques for the herp field techniques workshop for UNCW at Carolina Beach State Park.

Later in the quarter, staff had the opportunity to visit several private lands in Hyde County with conservation targets of the Spotted Salamander, Wood Frog, and Carolina Pigmy Rattlesnake. Several rattlesnakes were seen during visits and although none of the target amphibians were found, staff deployed three automated audio recording units (ARUs). These ARUs will run through the first quarter of 2025 and will hopefully record vocalizations of Wood Frogs in the area.

Finally, NCWRC and Natural Heritage staff met at Halyburton Park in Wilmington to provide wetland management and restoration recommendations to park staff. Several ephemeral wetlands are on-site there and have the potential to support SGCN amphibians and reptiles including Oak Toads and Eastern Chicken Turtles.

From the Field

by Jeff Hall, NC Partners in Amphibian and Reptile Conservation

Focused on upland SGCN snake surveys, staff conducted road-cruising and visual encounter surveys across many counties in the Sandhills and Coastal Plain. Species recorded included the Southern Hognose Snake, Mole Kingsnake, Mimic Glass Lizard, Timber Rattlesnake, and Carolina Pigmy Rattlesnake.

Above: An adult Carolina Pigmy Rattlesnake from Hyde County

To prepare for the upcoming breeding season and this year's Gopher Frog head-starting efforts, WRC staff and partners from the NC Aquariums and NCSU CMAST participated in collection of plant substrate materials for use in the mesocosms where tadpoles will hatch and develop before release. Three different facilities will assist with head-starting the Gopher Frog from Coastal Plain populations, including the NC Aquarium at Fort Fisher, NCSU CMAST, and the USFWS National Fish Hatchery in Edenton.

Road-cruising during rainy nights in November 2024 yielded a new location for the state threatened Mabee's Salamander in Bladen County as well as sightings from a known population in Pitt County.

During December 2024, staff deployed 18 ARUs at target wetlands across the Coastal Plain. Primary species of interest include the Gopher Frog, Ornate Chorus Frog, Southern Chorus Frog, and coastal populations of Wood Frog. Analyses of these recordings will take place during summer and fall 2025.

MAMMALS

Tricolored Bats Continue to Be Found in Winter on Coastal Plain Bridges

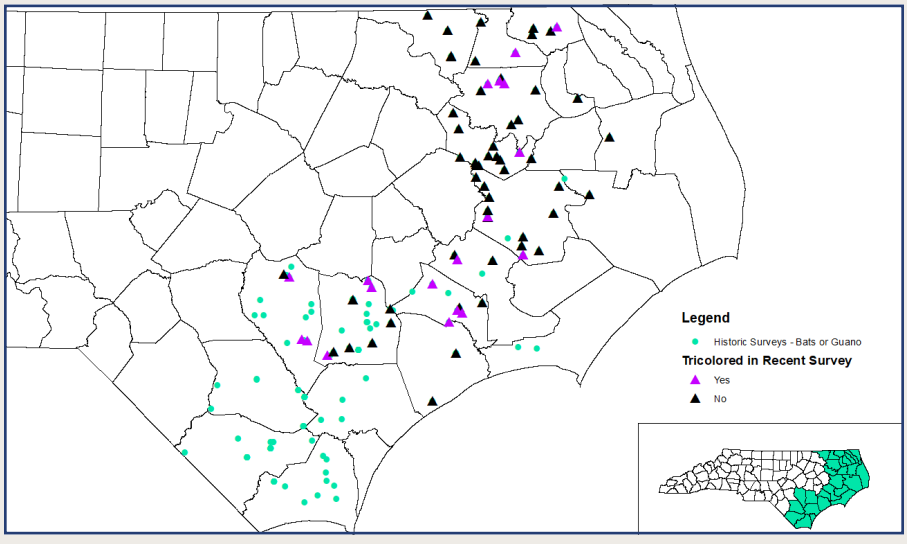
by Katherine Etchison, Mammalogist

In January, NCWRC biologists conducted bat roost surveys at 48 bridges within the Coastal Plain region. This work is part of an effort to re-survey 120 bridges that showed presence of bats or guano in the late 1990s and early 2000s. These winter 2024 surveys mark the halfway point of the project, the objective of which is to survey all historic bridges in both the winter (January) and the active season (May) to determine if bats still use these bridges as roosts and to understand basic roosting patterns (e.g., species and number of bats present, seasonality of use, bridge types used, etc.).

During the 2024 winter surveys, tricolored bats (Perimyotis subflavus), a species proposed for listing as endangered by the U.S. Fish and Wildlife Service, were found roosting under seven bridges. The surveys occurred during an unusually cold period where nightly temperatures were in the 20°F to 30°F range, so it was surprising to see tricolored bats roosting on bridges where they are relatively exposed to ambient conditions. Tricolored bats typically hibernate underground throughout much of their range, but subterranean habitats like

continue on next page

A tricolored bat roosting under an "old" bridge in January 2024 (Katherine Etchison)



Map of historic bridges with bats or guano and NCWRC tricolored bat findings

caves and underground mines are lacking in the Coastal Plain region, so it is assumed that this bat roosts primarily in trees, culverts, and bridges in the winter on the Coastal Plain.

This project has reached the halfway point with surveys during two winter seasons and one active season completed, and one winter season and two active seasons remaining. Twenty-four percent of the bridges surveyed have yielded tricolored bat presence (23% in winter, 27% in the active season). Tricolored bats are the species most often encountered during these bridge surveys, but bats other than tricoloreds have been found at 5% of bridges and include the state special concern Rafinesque's big-eared bat (Corynorhinus rafinesquii), and common species like the big brown bat (Eptesicus fuscus), and evening bat (Nycticeius humeralis). Forty-two percent of bridges surveyed show roosting bats or evidence of bats in the form of guano. Bridges with presence of bats or guano are most often "old" bridges (70%), meaning the structure has not been replaced since the historic survey, and only 30% of bat or guano presence has occurred at replaced bridges. Of the bridges found with tricolored bat presence, 60% are "old" bridges and 40% are replaced bridges.

Now that the project is halfway through, patterns in the results are beginning to emerge, particularly with tricolored bats. Current results show tricolored bat presence at about one-quarter of bridges surveyed, tricolored bat presence during winter and during the active season, and tricolored bat presence at "old" bridges more often than replaced bridges. This project will continue until all historic bridges are surveyed, which should conclude in May 2025.

A tricolored bat roosting under a replaced bridge in January 2024 (Katherine Etchison)

Wildlife Diversity Biologist, Katherine Etchison, searches for roosting bats under an "old" bridge on the Coastal Plain (J. Weber)

Bat-friendly Cave Gate Installed at Boone's Cave

by Katherine Etchison, Mammalogist

An important bat cave is now outfitted with a bat-friendly gate, which will allow bats to freely enter and exit the cave, while preventing unauthorized human access. Boone's Cave in Davidson County is one of a handful of caves known in the Piedmont and is used by tricolored bats (Perimyotis subflavus) as a hibernaculum each winter. The tricolored bat has undergone substantial population declines resulting from White-nose Syndrome (WNS) in parts of its range and is proposed to be listed as endangered by the U.S. Fish and Wildlife Service. Because Boone's Cave is a key site for tricolored bats, funding was provided by the U.S. Fish and Wildlife Service through a White-nose Syndrome Grants to States and Tribes program to provide protections for bats in this cave.

Boone's Cave receives frequent visitation due to its location along a popular trail in a Davidson County park, which can have negative effects on hibernating bats. Bats in hibernation regulate their body temperatures based on ambient temperatures in the hibernacula, so humans entering a cave can bring bats out of hibernation by heating up the space with their body heat. Arousing from hibernation has a high energetic cost for bats, resulting in lower fat reserves which must last through winter until insect prey become available in Spring. Additionally, the fungal pathogen responsible for WNS was detected in Boone's Cave in 2022 and bats suffering from WNS tend to arouse more frequently and burn through fat reserves more quickly than healthy bats, so repeated human visits to the cave could have dire consequences for these bats.

The NCWRC worked with the Davidson County Parks and Recreation Department and a cave gate fabricator to provide increased protections for bats hibernating in the cave by preventing access to the primary area where bats hibernate, while allowing public visitation in the front room of the cave. This cave is a major draw to the county park of its namesake, so continuing partial visitation of the cave was an objective of this project. The NCWRC will continue biennial winter surveys of this cave and we hope the cave gate protections will have a significant impact on survival of these WNS-affected bats.

Above left: Land Conservation Biologist, Brooke Massa, and Western Piedmont Habitat Conservation Coordinator, Olivia Munzer carry angled iron to Boone's Cave. Center: View of Boone's Cave with bat-friendly gate installed. Right: A tricolored bat hibernating in Boone's Cave.

Capture of Northern Long-eared Bat at Historic Net Site

by Katherine Etchison, Bat Biologist and Joey Weber, Bat Technician

Throughout summer 2024, across western NC, we surveyed mist-net sites with historic captures of Indiana bat *(Myotis sodalis)* or northern long-eared bat *(Myotis septentrionalis)*. Populations of these species have declined substantially since White-nose Syndrome (WNS) was detected in the state in 2011. These species are now rarely encountered in western NC, so efforts to survey historic sites are necessary to detect WNS survivors. Additionally, we surveyed new mist-net sites where 2023 acoustic detections of northern long-eared bat or Indiana bats throughout western NC indicated the species may be present.

Efforts to catch one of these rare bats paid off with the capture of a northern long-eared bat at a Haywood County mist-net site! The individual was a healthy adult female. The last capture of this species at the site occurred in 2014 despite attempts in 2015 and 2016. This is the first capture of this species in western NC since 2022 and may signify presence of a survivor population in the immediate area. A mist-net survey will occur in 2025 to start learning more about this potential population and radio-telemetry efforts may be undertaken in the future.

KATHERINE ETCHISON/NCWRC

Right: Wildlife Diversity Technician, Joey Weber and US Fish and Wildlife Service Biologist, Sue Cameron, mark a northern long-eared bat caught in a mist-net survey. Below: A northern long-eared bat caught in a 2024 mist-net survey in Haywood County.

Assessing Impacts to Gray Bat Roosts from Hurricane Helene

by Katherine Etchison, Western Region Mammalogist

North Carolina Wildlife Resources Commission (NCWRC) biologists conducted surveys to assess impacts to bats from Hurricane Helene throughout November 2024. Determining effects to bats will be a long-term effort due to the scope and severity of the storm. The first objective in this effort was to visit bridge and culvert roosts used by the federally endangered gray bat to determine how high floodwaters rose. It is unknown whether bats would have left before the storm, so this first step helps us understand what level of risk bats faced if they were present at the time of the storm.

Forty bridges and 8 culverts are known to be used by gray bats throughout western NC. Assessments were made at 39 bridge roosts and all 8 culvert roosts. Two of the three most important bridge roosts, which support between 1,000 and 1,500 gray bats each, were completely flooded from Helene. Additionally, 7 of the 8 culvert roosts were flooded, including a culvert that supports over 200 gray bats. Out of all 47 roosts surveyed, 24 roosts completely flooded, 4 roosts experienced severe flooding but we could not determine if the water reached the roosting area, and 19 roosts did not flood to the area where bats roosted. Based on previous counts near the time of the storm, there could have been as many as 1,200–1,600 gray bats present in roosts that fully flooded during Helene. We will survey gray bat roosts in summer 2025 to compare with pre-Helene counts to better understand impacts to gray bats.

Wildlife Diversity Technician, Joey Weber, surveys a gray bat bridge roost after Hurricane Helene.

KATHERINE ETCHISON/NCWRC

FISHES

Cape Fear Shiner Broodstock Collection

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

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 NC piedmont region. In April of 2024, staff collected 85 Cape Fear Shiners from the Deep River, which were then transported to the US Fish & Wildlife Service Edenton National Fish Hatchery. These animals will spawn in captivity in order 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. This is the third year of this effort.

Many partners came together to help collect Cape Fear Shiner broodstock. Pictured here in the Deep River are staff from US Fish & Wildlife Service, NC Dept. of Transportation, Dewberry Inc, and TranSystems.

Robust Redhorse Sampling and Propagation

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

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, SC Department of Natural Resources (SCDNR), and SC Aquarium.

During targeted spring surveys, there were 62 Robust Redhorse captures in 24.6 hrs of electrofishing, a catch rate of 2.52 fish per hour. These captures represent:

- 60 unique individuals of which 23 were previously untagged fish
- 29 recaptures from previous years, a recapture rate of 47%
- Eight Phase II juveniles, which were stocked at 18 months of age

Fish ranged in size from five to 29 inches (133 to 742 mm) in total length (TL), representing multiple age classes. Continued successful recruitment of captively reared fish released into the wild population was documented once again this year. Eggs from four females were crossed with eight males for captive propagation in 2024. The resulting fry will be grown out in ponds at NCWRC's McKinney Lake Fish Hatchery for population augmentation stocking.

Duke Energy biologists had 17 more captures near Blewett Falls dam, including eight previously untagged fish. This brought the total number of Robust Redhorse captures in NC in 2024 to 79. Fin clips were collected from all animals in NC and genetic analysis conducted by SCDNR this summer will determine whether the new fish are progeny of previous augmentation efforts.

Central Region AWD Coordinator Brena Jones (left) and Biologist Emilia Omerberg (right) with an adult male Robust Redhorse, who is approximately 10 years old, based on size and previous capture data. Robust Redhorse can live over 25 years in the wild. Right: Measuring the length of a robust redhorse.

Rare Coastal Fishes Surveys

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

Staff conducted 21 surveys for NC Species of Greatest Conservation Need in Bladen, Brunswick, Hoke, Moore, Richmond, Sampson, and Scotland counties,. Staff from the Central Aquatic WIldlife Diversity region focused on surveys for rare coastal fish species to update historical population data. The methods used for these surveys included backpack electrofishing, boat electrofishing, seining, and kick seining. The target species for these surveys included Ironcolor Shiner, Taillight Shiner, Banded Sunfish, Blackbanded Sunfish, Thinlip Chub, and Broadtail Madtom.

Ironcolor Shiner, a state threatened species, was found in three locations: the mainstem Lumber River in Scotland County, Pinch Gut Creek in Brunswick County, and Red Run Creek in Brunswick County. Thinlip Chub, a state special concern species, was found in three locations: two sites on the mainstem Lumber River in Scotland County and in the mainstem Black River in Sampson County.

Taillight Shiner, Banded Sunfish and Blackbanded Sunfish were not detected during these surveys. These surveys will continue throughout the rest of 2024.


EMILIA OMERBERG/NCWRC


LAURENS VERMEULEN/NCWRC

Top: Ironcolor Shiner and Thinlip Chub found together in the mainstem Lumber River in Scotland County. Above: Biologist Emilia Omerberg records data during kick seine surveys in the Lumber River.

Broadtail Madtom Surveys

by Emilia Omerberg, 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. Sites were visited 1-3 times during this period. Forty small, artificial cover structures, informally named "madtom motels", that were previously deployed at four localities, were cleaned of sand and silt that had fouled entrances and buried some structures and redeployed. Five additional motels were added at two localities, one site on the Lumber River, and one site on Shoe Heel Creek. A total of fifty motels are currently deployed in Scotland and Robeson counties.

No Broadtail Madtom were found in any of the motels but other native fishes and crayfish were found in the artificial structures including Flat Bullhead, Pirate Perch, and the White River Crayfish. During checks in the month of June, some of the motels were out of the water due to low water conditions. When this was the case, the motels were relocated to deeper water.

Staff will continue to check motel occupancy for this ongoing project throughout the year. Additional deployments and surveys are planned for 2024.

In addition to checking motels, staff conducted kick-seining surveys at each site. No Broadtail Madtom were located using kick seining, however other native fishes such as the Margined Madtom, Tadpole Madtom, and Flat Bullhead were captured. Staff also found Pinewoods Darter, which is a North Carolina Species of Greatest Conservation Need.


EMILIA OMERBERG/NCWRC


EMILIA OMERBERG/NCWRC

Top: Madtom motels in the Lumber River were out of the water due to low water in June. Bottom: Technician, Laurens Vermeulen, sets a seine in preparation for a kick-seine survey.

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), long-term monitoring in the Little Tennessee and Hiwassee river basins. 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 must attempt to time their sampling efforts when temperatures and water levels are just right.

This year biologists used boat electrofishing surveys to collect 51 Sicklefin Redhorse from the Little Tennessee River Basin and 31 from the Hiwassee River Basin. Survey locations in the Little Tennessee River Basin included a small section of the Oconaluftee River downstream of Ela Dam and several long stretches in the Little Tennessee River and Tuckasegee River. Survey locations in the Hiwassee River Basin were conducted in the Hiwassee and Valley rivers near Murphy, NC. All Sicklefin Redhorse collected are tagged, weighed, measured, and have their health and reproductive condition evaluated.

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. These PIT tags give each tagged fish a unique identifying code that is scanned when a fish is recaptured. This monitoring effort provides additional insights into some of the Sicklefin Redhorse's basic biology such as population size, movement patterns, and lifespan. Twelve of the fish captured in the Little Tennessee River Basin surveys this year had been caught and tagged in previous years.

Top: NCWRC Biologist Chantelle Rondel scans a female Sicklefin Redhorse collected from the Little Tennessee River. Bottom: Biologist Chantelle Rondel injects a PIT tag into a juvenile Sickle fin Redhorse.

Rare Coastal Fishes Surveys

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

Staff conducted 13 surveys in Bladen, Cumberland, Hoke, Jones, Onslow, Robeson, Sampson, and Scotland counties looking for rare coastal fishes. The methods used for these surveys included backpack electrofishing, seining, and kick seining. The target species for these surveys included Ironcolor Shiner, Taillight Shiner, Banded Sunfish, Blackbanded Sunfish, Thinlip Chub, and Broadtail Madtom.

Two Banded Sunfish were found in one location in the White Oak River on the border of Jones and Onslow counties.

Thinlip Chub were found at a location on the border of Hoke and Scotland counties on the mainstem Lumber River. Multiple age classes were noted at this location which indicates successful recruitment.

Ironcolor Shiner, Taillight Shiner and Blackbanded Sunfish were not found during this time period, but Ironcolor Shiner have been captured in previous 2024 surveys.

Top right: Banded Sunfish from The White Oak River on the boarder of Onslow and Jones counties. Right: Multiple age classes of Thinlip Chub from the Lumber River on the border of Hoke and Scotland counties.

Broadtail Madtom Surveys

by Emilia Omerberg, 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.

There are currently 55 madtom motels (artificial habitats described in previous quarterly reports) deployed at 5 locations in Scotland and Robeson counties.

All five sites were visited at least one time during the period of July 1st to September 31st. The mainstem Lumber River site at Highway 401 was visited multiple times but not sampled due to high water levels which made the site unreachable. The two sites on Joes Creek were visited twice each. Due to the small nature of the creek the sites were reachable even with high water levels from summer storms. No Broadtail Madtoms were found to be occupying the motels on any of these visits.

Broadtail Madtom from Gum Swamp Creek in Scotland County.

In addition to checking motel occupancy, staff conducted kick seining surveys to find the elusive fish.

Four Broadtail Madtoms were located in Scotland County at two distinct localities via kick seining efforts. Two were found near the motels deployed in 2019 at a site on Joes Creek and two more were located at a new site on Gum Swamp Creek. This is the first record of Broadtail Madtom in Gum Swamp Creek.

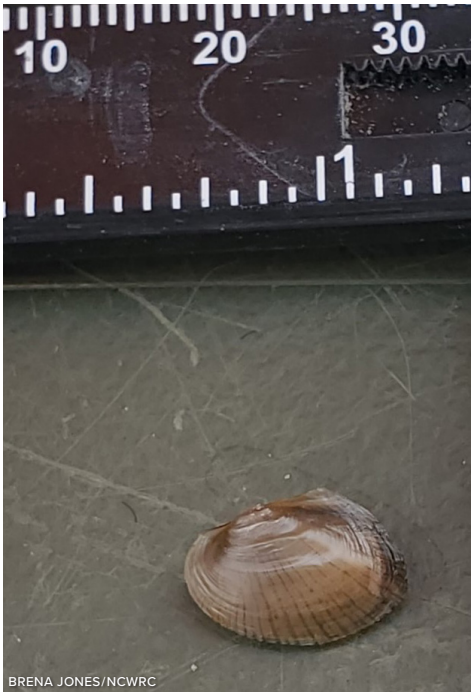
Staff will continue to check motel occupancy for this ongoing project throughout the year and additional deployments and surveys are planned.

Lake Waccamaw Fish and Mussel Monitoring Surveys

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist and Brena Jones, Central AWD Coordinator

Wildlife Commission staff, in partnership with NC State Parks, has conducted annual standardized surveys since 2009 for three fish Species of Greatest Conservation Need (SGCN) at multiple sites in Lake Waccamaw, including the endemic, federally Threatened Waccamaw Silverside. The mean number of Waccamaw Silversides collected per minute of seining (catch rate) at all sites combined has been highly variable over ten sampling years and was 2.3 fish per minute (fpm) of seining in 2024. This value has ranged from 1.82 fpm in 2017 to 23.5 fpm in 2009. Variability is expected due to the fish's schooling behavior, preference for open waters of the lake, and varied sampling conditions. The highest catch rate at a single site in 2024 was 7.1 fpm. Waccamaw Killifish and Waccamaw Darters were also successfully collected, showing that populations persist within Lake Waccamaw.


EMILIA OMERBERG/NCWRC



BRENA JONES/NCWRC

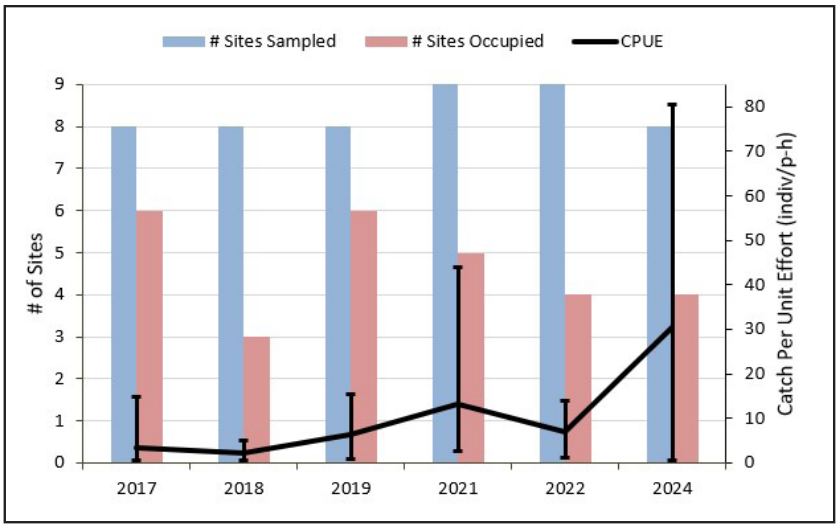
Above: A Lake Waccamaw Broadtail Madtom. Right: A young Tidewater Mucket.

Staff also conducted quantitative mollusk surveys in Lake Waccamaw, which are completed biennially since 2009. Data analysis from this survey is ongoing, but the Waccamaw form of Elliptio congarea and Tidewater Mucket remain the most abundant mollusk species, composing over 90% of the individuals at each study site. In exciting news, a Broadtail Madtom was also incidentally collected during the mussel surveys! This is only the 4th individual of this very rare native catfish collected from the lake's genetically distinct population since 2002.

Carolina Pygmy Sunfish Monitoring

by Brena Jones, Central Region Aquatic Wildlife Diversity Coordinator

Staff continued annual monitoring surveys for the Carolina Pygmy Sunfish, a State Threatened species endemic to Columbus and Brunswick counties in NC and small portions of the coastal plain in SC. Of eight previously occupied localities sampled in October, Carolina Pygmy Sunfish were collected at four. Carolina Pygmy Sunfish are persisting and 2024 catch per unit effort (CPUE) ranged from 0.5 to 80.5 individuals per person hour. This maximum CPUE exceeded any previous year's value and was nearly double the former record of 44 individuals per person hour.



Carolina Pygmy Sunfish monitoring results by year. Black line indicates average CPUE values, with vertical black bars indicating maximum and minimum CPUE for each year. 2018 sampling was conducted two months after Hurricane Florence.

Robust Redhorse Population Augmentation

by Brena Jones, Central Region Aquatic Wildlife Diversity Coordinator

In October of 2024, 13,650 Phase I (6 months old) and 24 Phase II (18 months old) Robust Redhorse fingerlings raised at the NCWRC's McKinney Lake Fish Hatchery were stocked into the Pee Dee River in NC. These fish were the progeny of adults collected in the Pee Dee River spawning shoals in NC in the spring of 2023 and 2024. In November of 2024, another 2,702 Phase I fingerlings raised at the SCDNR Dennis Center were stocked in the same location.

Broadtail Madtom Collections

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

A few populations of Broadtail Madtom persist in the Lumber River basin, albeit in apparently low abundance. This species has been found in the mainstem Lumber River, Shoe Heel Creek, and Joes Creek. This year biologists added a new locality to the map for these unique catfish. In July 2024, staff located two individuals in Gum Swamp Creek. Also in July, biologists located two individuals in Joes Creek in association with some of our deployed motels (motels described in previous quarterly reports).

In December, biologists located another three individuals from the same site in Gum Swamp Creek. Two of these individuals were brought into the Yates Mill Aquatic Conservation Center in Raleigh to research their life history requirements and hopefully develop a propagation program in the future.

Top Right: Staff from left, Bryn Tracy NCDEQ retired, Laurens Vermeulen NCWRC and Craig Lawson NCSU; collecting Broadtail Madtom using backpack electrofishing and seining. Bottom Right: A Broadtail Madtom from Gum Swamp Creek in the Lumber River basin.

Uwharrie Mussel and Host Fish Collections

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

In order to successfully propagate freshwater mussels, staff must collect host fish for the mussel larvae, called glochidia; the larvae live in the fish's gills as benign parasites until they are ready to transform to juveniles. Host fish trials need to be conducted to discover which species of fish are the prefer host for this rare mussel. Different mussel species use different fishes as hosts. In initial trials last year, none of the species tested showed promising results for hosting this unique mussel. Another round of trials with different fish species is planned for winter 2024–2025.

In November, staff also collected a variety of fish species from Wolf Island Creek in Rockingham County to use in these trials. The species collected for this trial included Bluehead Chub, Crescent Shiner, Eastern Creek Chubsucker, Fantail Darter, Redlip Shiner, Rosyside Dace, and White Sucker. A separate host fish collection effort, targeting Carolina Darters, was completed in December at Johnson Creek and Grassy Creek in Granville County.

An individual of the undescribed mussel species

Host Fish Collection for Greensboro Science Center

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

In November of 2024, staff collected 64 Fantail Darters from Wolf Island Creek in Rockingham County. These fish were transported to the Greensboro Science Center to aid in the propagation of the state threatened Notched Rainbow mussel. The goal is to use these animals to repopulate a stream mitigation site after habitat work is completed.

A Fantail Darter from Wolf Island Creek in Rockingham County.

Roanoke Logperch Stocking

by TR Russ, Foothills Region Aquatic Wildlife Diversity Coordinator

The North Carolina Wildlife Resources Commission's (NCWRC) Aquatic Wildlife Diversity program is tasked with conservation, monitoring, and management of nongame fish, mollusks, and crayfish. Since 2015, one primary goal of the program has been to re-establish Roanoke Logperch (RLP), *Percina rex*, populations in the upper sections of the Dan and Mayo rivers in North Carolina. The "King of the Darters" is worthy of our efforts in NC. Stocking Roanoke Logperch will add to the redundancy of Dan River populations, decrease the chances of extinction, and aid in the federal de-listing of the species.

Since the Fall of 2023, with partnerships through Piedmont Land Conservancy and Mayo River State Park, 485 Roanoke Logperch have been stocked in the Upper Mayo River via the NC Programmatic Safe Harbor Agreement. On November 1, 2024, NCWRC and Mayo River State Park stocked 156 juveniles through accessing state park property. The event was well attended by the public and several people were able to see the release of a federally endangered fish. Roanoke Logperch have been absent from the upper Mayo River since the construction of Avalon and Washington Mill dams circa 1890s.

Top Right: A propagated juvenile Roanoke logperch before being released into the Mayo River. Center: Numerous partners joined NCWRC biologist to stock Roanoke Logperch in the Mayo River at Mayo River State Park. Right: NCWRC Biologist TR Russ and Rockingham County Tourism Manager Lindsay Pegg release Roanoke Logperch into the Mayo River.

Hurricane Helene Updates

Foothills Region Aquatic Wildlife Diversity biologists assessed hurricane impacted reaches throughout the Fall and Winter of 2024. Primary counties impacted in the Foothills Region include: Polk, Rutherford, McDowell, Burke, Avery, and Caldwell. Within these counties certain priority areas with SGCN and state listed aquatic species may be heavily affected. Primary rivers affected in the region include: Green, Broad, Catawba, Linville, Warrior Fork and Wilson Creek.

In order to better understand the impacts of Hurricane Helene on aquatic species and habitats, the Foothills Region Aquatic Wildlife Diversity biologists set out to assess 10 fish and mussel sites in some of the impacted areas, primarily in the Catawba and Broad. Initial observations were somewhat positive for some SGCN fish species, like Seagreen Darter. In order to better understand the impact to aquatic nongame species, a more rigorous, focused survey regime is planned for 2025.

Wilson Creek upstream of Adako Road, Caldwell County, before and after Hurricane Helene.

Initial Assessments from Hurricane Helene Flood Damage in Portions of Western North Carolina

by Dylan Owensby, Luke Etchison, and Chantelle Rondel, Western Region Aquatic Wildlife Diversity Biologists

Excessive rainfall from Hurricane Helene brought catastrophic flooding to areas of western North Carolina. Biologists with the Western Region of the Aquatic Wildlife Diversity Program surveyed some of the damage during October and November of 2024 to get an initial idea of flooding impacts to the region's fish, mussel, and crayfish species. Although extensive flooding occurred throughout western North Carolina, the most significant flooding occurred in the Broad, Catawba, French Broad, Nolichucky, and Pigeon river basins. Western Region biologists focused their assessment efforts on small streams to larger, mainstem rivers in the Pigeon, French Broad, and Nolichucky basins. Aside from traveling around these basins to see some of the impacts firsthand, biologists also completed semi-quantitative fish surveys at 19 sites and qualitative mussel surveys at 5 sites.

Methods used for the majority of the fish surveys targeted a range of species that might be present, with emphasis placed on catching benthic (bottom dwelling) species. Although results varied widely, biologists found that species richness and abundance was similar to previous surveys at a majority of the sites.

Of the locations surveyed, streams that appeared to fare well included a majority of the upper French Broad basin, the lower French Broad River, most of the Pigeon basin, and the upper North Toe River (Nolichucky basin). Streams that had noticeably fewer species present included the South Toe River (Nolichucky basin), upper and lower Cane River (Nolichucky basin), and Ivy River (French Broad basin).

Although definitive data is lacking for mussel populations, biologists did find surviving mussels in areas of the upper French Broad and Pigeon river basins. No live mussels were seen in the limited surveys within the Nolichucky basin. Biologist are planning to conduct surveys at longterm monitoring sites in impacted areas of western North Carolina for the next several years.

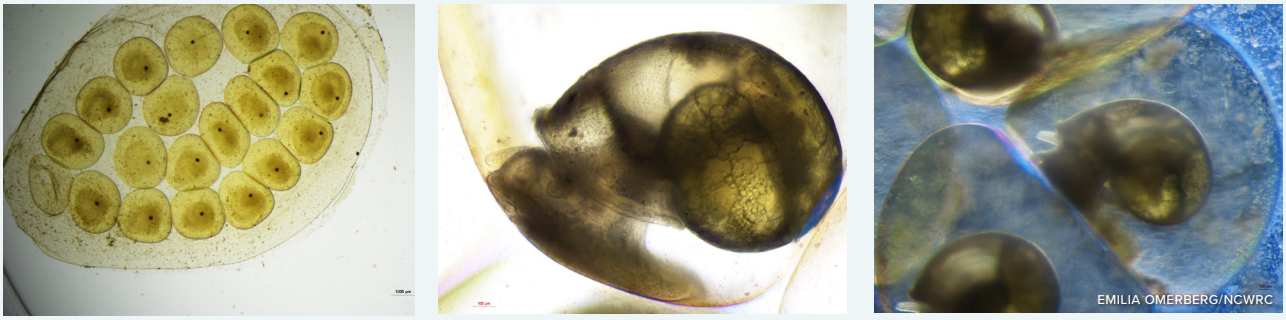
Top Right: North Toe River upstream from Spruce Pine along Bent Rd on 10/23/2024. Although the river far exceeded the banks at this site, the instream habitat was still intact and survey results indicated typical fish abundances. Center: One of several Gilt Darters caught during a survey on the North Toe River outside of Bakersville. Total numbers of fish and number of fish species caught during a quick fish survey were surprisingly high despite extensive flood damage at this site. Bottom: Greenway bridge at Veterans Park along the upper Swannanoa River on 10/29/2024. Although there was extensive damage to the park, survey results indicated typical fish abundances for this site.

MOLLUSKS

Magnificent Ramshorn Snail Project

by: Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

A new study is underway at Yates Mill Aquatic Conservation Center in Raleigh to study the development of Magnificent Ramshorn snail eggs and embryos. Trials were run at room temperature as well as experimental cold treatments at (a) a constant 4 degrees C and (b) fluctuating outdoor winter temperatures for 2, 4, 8 and 10 weeks' exposure. Photos of each egg clutch as well as individual eggs were photographed weekly for the duration of the project and measurements will be taken of embryo growth rates, hatch rates, and juvenile survival.



From left to right: Clutch of snail eggs; developing Magnificent Ramshorn inside an egg; another view of developing Magnificent Ramshorn inside an egg

Deep River Mussel Propagation

by: Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

Staff collected Margined Madtoms, which were transported to the Yates Mill Aquatic Conservation Center in Raleigh. There, the fish will serve as hosts for the glochidia larvae of Brook Floater mussels that were collected from the Deep River in the fall of 2023. The young mussels will be grown out for stocking to help boost native mussel populations in the upper Cape Fear River basin.

Brook Floater with glochidia, which look like grains of rice

Biologists Work to Learn Impacts of Lyngbya on Native Mussels

by: Michael Fisk, Eastern Region Aquatic Wildlife Diversity Coordinator

Aquatic Wildlife Diversity staff are working with NC State University to determine the impacts of lyngbya and the treatment of lyngbya on native mussels. Lyngbya is a noxious, filamentous blue-green algae that forms dense mats along the bottom primarily in lakes and reservoirs. These mats persist all year long but can proliferate in the summer forming dense mats from the surface to the bottom. These mats become a nuisance to lake front homeowners as they are visibly unappealing and can inhibit aquatic recreational activities. To help manage this nuisance species, the lyngbya is treated with algaecides. Lyngbya has dermatoxins and it's also unclear how these dense mats alter water chemistry and affect benthic organisms like mussels. To better understand the interactions between lyngbya and mussels, the Commission is using propagated tidewater mucketts, Atlanticoncha ochracea in areas with and without lyngbya as well as areas where lyngbya is being treated with algaecides. The mussels have been placed in cages and will be monitored throughout the summer to document growth and survival. These findings will help guide management of this noxious species.

Lyngbya topping out in Lake Gaston.

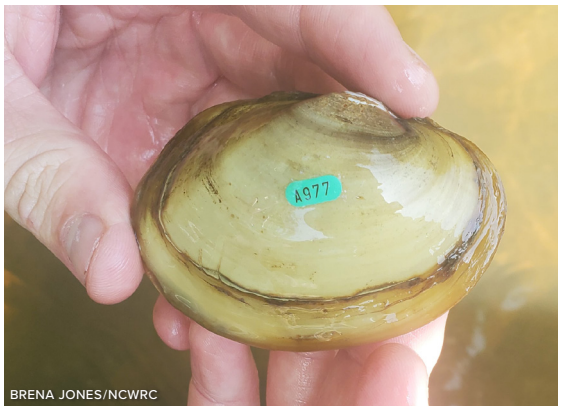
From left to right: Eastern Region Aquatic Wildlife Diversity Coordinator Michael Fisk with technicians Dorian Hayes and Laureen Riggins installing mussel cages for an experiment

Deep River Mussel Monitoring

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

A batch of state listed mussels were translocated in October of 2023 from the tailrace of Highfalls Dam at the Hwy 22 crossing of the Deep River to a site downstream of Ramseur Dam near the Brooklyn Avenue crossing of the same river. Highfalls Dam has been proposed for removal, so an effort was made to move a portion of the diverse and abundant mussel community in this location out of harm's way. The translocation of these species will help avoid potential impacts from sediment releases if the dam is removed. A subset of the animals were PIT- (Passive Integrated Transponder) and Hallprint- tagged to aid biologists in monitoring and detecting the animals in the future.

Staff from the Central Region Aquatic Wildlife Diversity program visited the Ramseur site in early June of 2024 to check on the relocated mussels. Eight of 13 tagged Yellow Lampmussels were detected and ~13 of 84 Brook Floaters were detected. All located animals were alive, with the exception of one Brook Floater shell. The fate of the remaining mussels is currently unknown; due to the short detection range of a PIT tag, it is extremely difficult to locate animals if they have moved outside of the original placement area. Further snorkel surveys are needed to search a larger area at this site to see if additional animals can be found.



Yellow Lampmussel (top) and Brook Floater (bottom) showing Hallprint tags.

Carolina Creekshell Stocking

by Mike Perkins, Foothills Region Aquatic Wildlife Diversity Biologist

The Carolina Creekshell is a small mussel endemic to the Carolinas. It is state listed as Endangered in NC, and since 2019, NCWRC has focused on propagating this mussel and restoring populations where possible. In the Catawba River basin, few remnant populations remain near the SC Stateline. In October of 2024, NCWRC was able to augment existing populations in Waxhaw and Price Mill creeks in Union County. Foothills Region Aquatic Wildlife Diversity biologists and the Marion Conservation Aquaculture Center released 2,641 juveniles to help boost populations.

Top Right: NCWRC Biologist Michael Perkins holds a hand full of propagated Carolina Creekshell. Bottom Right: NCWRC biologists Sierra Benfield and Kelsey Mansell stock Carolina Creekshell in Waxhaw Creek.

Haw River Land Acquisition Parcel Surveys

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist

In June, staff visited two parcels proposed for purchase under Land and Water Fund grants to investigate whether rare aquatic species may be present. One site, located on an unnamed tributary of to the Haw River, was mostly dry, so no rare species were detected in seine surveys of the remaining pools and no evidence of mussel populations were seen. The other site, located on the mainstem of the Haw River, was both seined and snorkeled. A thriving community of mussels and fishes was detected; of particular interest among the mussel were six Triangle Floaters (State Threatened; a new species record for the Haw River sub-basin) and one Creeper (State Threatened). All data was shared with the purchasing entities (Triangle Land Conservancy and Alamance County) as well as the NC Natural Heritage Program, the latter of which requested the surveys.

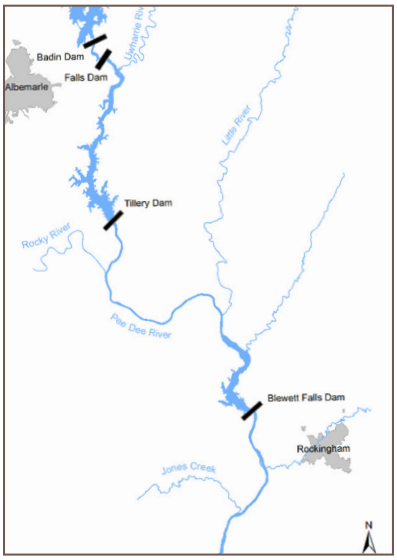
NCWRC

Pee Dee River Mussel Surveys

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist and Brena Jones, Central AWD Coordinator

Beginning in 2009, three long-term mussel population monitoring sites were established in the lower Pee Dee River, near the state border in south-central North Carolina. In 2024, with help from partners including Duke Energy/Progress, staff conducted the eighth biennial survey for priority mussel species downstream of Blewett Falls and Tillery dams. Monitoring at the third site, below Falls Dam, has been turned over to Cube Hydro as part of their Federal Energy Regulatory Commission (FERC) license requirements. These data provide an opportunity to document the potential changes in mussel diversity and abundance due to the improved dissolved oxygen levels and minimum flows downstream of these dams implemented under new FERC licenses for Duke Energy/Progress. In addition, this long-term dataset may provide insights into population responses to other events such as extreme floods from large hurricanes.

Data analysis from this survey is ongoing. Species richness at both sites was similar to that found in 2022, with 11 species downstream of Blewett Falls Dam and 14 species below Tillery Dam. SGCN species of mussels collected include the Yellow Lampmussel, Eastern Lampmussel, Eastern Pondmussel, and Carolina Creekshell.



Above: A male Eastern Lampmussel. Above right: Mussel Monitoring Area Map–Pee Dee River, NC.

New Hope Creek Mussel Surveys

by Emilia Omerberg, Central Region Aquatic Wildlife Diversity Biologist and Brena Jones, Central AWD Coordinator

Staff conducted mussel surveys in search of rare species in New Hope Creek, located in Durham in the upper end of the Cape Fear River basin. Four reaches were surveyed in Orange County over three days. SGCN mussel species detected included Notched Rainbow and Carolina Creekshell. In addition, staff conducted monitoring of stocked Notched Rainbow in a reach in Duke Forest where 2,000 individuals were released in November of 2023. Nearly one year later, the stocked mussels are still alive and are now three years of age. We detected 53 tagged animals and observed that overall, animals appeared to be healthy and doing well.

Three-year-old Notched Rainbow in New Hope Creek. One has a Hallprint tag (left), as well as a PIT tag (not visible on the other side of the same animal) and one has a black dot paint tag (right).

HABITAT MANAGEMENT

Design Features of NCWRC's Motus Stations in Western North Carolina

by Christine Kelly, Wildlife Diversity Biologist

The big gap in Motus coverage in the Southern Appalachians is being filled quickly with new receiver stations. The Mountain Wildlife Diversity crew installed its third Motus receiver station in February 2024 and its fourth station in April 2024. Each station entailed designing an installation customized to each site's limitations and infrastructure. The team found that learning about details of other Motus partners' installations was helpful. This report provides a brief summary of design elements for NCWRC's four mountain region Motus stations.

The Pond Mountain Motus Station in Ashe Co, NC. Antennas are mounted on a wood utility pole and the station's battery is charged by a solar panel. The receiver box and battery are housed inside this old airplane hangar.

The Mud Creek Motus Station is co-located on a platform with NCWRC Muskellunge (fish) tracking equipment

The Pond Mountain Game Land Motus Station, located in the very northwest corner of the state, was operational by mid-April 2023. This is an off-the-grid dual-mode station, meaning there is no AC power, and the antennas are tuned to detect tags on both 166 MHz and 434 MHz frequencies. An old airplane hangar on-site houses the electronics but was not used for mounting antennas due to potential interference from the metal roof material. Instead, a wood utility pole was installed adjacent to the hangar by NCWRC's Land and Water Access Division staff. This is a quiet, long-range station that has sweeping views of Grandfather Mountain to the southeast and Whitetop Mountain, VA to the north. It is subject to extreme cold, wind, and ice. A

continue on next page

solar panel is bracket-mounted to the hangar, and coaxial cables are suspended between the antennas and the hangar. The receiver (CTT Sensor Station), a 12 Volt battery, and a charge controller are housed inside the hangar, alongside tractors and other game lands equipment.

The Mud Creek Motus Station, located near Asheville Airport, was constructed in February 2024. This is another off-the-grid, dual mode station. However, given the low topography along the French Broad River, the team installed shorter antennas with fewer elements. This station is built on a raised wooden platform to clear floodwaters. It shares the platform with NCWRC's Muskellunge PIT tag reader station. The Sensor Station, 12 Volt battery, and charge controller are housed inside a locked steel box that is bolted to the floor of the platform to prevent theft.

The WH Silver Game Land Motus Station is located in the central mountains, west of Asheville. The station sits within meters of the game land's border with Great Smoky Mountains National Park and will provide coverage into the Park. This is another dual mode, off-the-grid station with all components, including the receiver and battery, mounted on a wood utility pole. This installation required elk-proofing and bear-proofing. Subsequent trips to check the receiver or battery will require climbing the pole.

These three stations join NCWRC's first Motus station installed at The Mountain Retreat and Learning Center near Highlands, NC in late 2022. Staff are preparing detailed summaries of the design elements for each station for future reference and posting QR codes that take visitors to more information on the Motus website.

Kendrick Weeks connects the antennas to the receiver at WH Silver Game Land. The battery and charge controller are housed inside a battery box, mounted on a shelf bracket. The solar panel has its own mast.

The Sensor Station, 12 V battery, and charge controller are housed inside a locked steel box, which is bolted to the platform.

Road to Recovery

by Christine Kelly, Wildlife Diversity Biologist

In January 2024, Scott Anderson and Chris Kelly attended the Road to Recovery meeting at the National Conservation Training Center in Shepherdstown, WV. The Road to Recovery (or R2R) is a movement that was developed as a response to the 2019 publication in the journal Science about "3 billion birds lost". It is a call to action for ornithologists who are finding that business as usual as not been as effective as it needs to be considering the rate of decline for some species. R2R names arises from acknowledgment that each species is at its own point along the road to recovery.

R2R has four guiding principles. First, focus on proactive recovery, much like biologists do for recovering federally listed species. Second, integrate social and biological sciences. The social element in wildlife conservation is often overlooked. Integration of our understanding of a species' biology and our understanding of the human dimensions involved is the goal and the path to species recovery. Third, co-production of solutions is essential. Co-production is an approach to produce actionable science through collaboration among diverse partners from the very start of a project. Fourth, engage and empower species working groups. The Golden-winged Warbler is one Tipping Point Species that was selected as a case study for a deep dive using the R2R process and principles. NCWRC was an active partner in this work, contributing to a rangewide golden-winged warbler survival study in 2022 and 2023. In the case of Neotropical-Nearctic migratory species, the pool of partners is international in scope. Breakout sessions dug into how to make international collaborations successful and how to overcome the language barrier in meetings, workshops, gray literature, and peer reviewed literature.

Scott Anderson called a breakfast meeting among partners to discuss state Wildlife Action Plans.

Esmeralda Bravo Hernández, an International Fellow for the Road to Recovery initiative, led a breakout session on Making International Collaborations Successful.

Training Opportunities to Enhance Bog Conservation

by Gabrielle Graeter, Wildlife Conservation Biologist

NCWRC staff recently participated in a couple training opportunities that will ultimately help improve our ability to restore and monitor mountain bogs. Bog turtles and their habitat — mountain bogs — are a high conservation priority in North Carolina. The bog turtle, Glyptemys muhlenbergii, is federally threatened (S/A) and state threatened. As part of our conservation efforts with this species, the NCWRC manages wetlands with known bog turtle populations. Unfortunately, many of these wetlands have more woody vegetation and more canopy closure than they had historically. Various factors have played a role in this change, including increased nutrient input, changes in land-use, development in the surrounding landscape, and changes from historical levels of beaver activity, and perhaps grazers and fire in some cases. Habitat management in these wetlands often consists of removing some trees and thinning the woody vegetation to create a mosaic of habitat types, with some areas as shrub-scrub and others dominated by herbaceous vegetation. Bog turtles lay their eggs on the ground within the wetland and thus, require areas with full sun so the eggs can incubate properly.

To conduct this habitat management in mountain bogs, we must have training to operate chainsaws and other power tools. Two new temporary staff members involved in this project took a 2-day chainsaw training course provided by NCWRC staff, and Gabrielle Graeter, NCWRC Conservation Biologist, also attended the field training day to gain additional hands-on experience. These new skills will help us accomplish more on the ground as we work to restore these mountain bogs.

NCWRC staff also attended drone training in February 2024 provided by NCDOT's Unoccupied Aircraft Systems (UAS) Program unit. The UAS and its camera will document wetland conditions pre- and post- bog habitat management activities. Previously, we took photos at ground-level to document our work, but ground-level photographs do not adequately illustrate what has been accomplished. In addition to better and more efficient site coverage by UAS, its images and other data collected by its software programs can be used with GIS applications. Another practical use of UAS is to monitor the extent of wetland hydrological and erosion changes within a bog seasonally and over time. Staff who attended the training and want to be drone operators must each obtain a Remote Pilot Certificate. Likewise, there are logistics to be sorted out within NCWRC about equipment and procedures with drone usage, but we are hopeful that we will be able to use this incredible technology soon!

Top: NCWRC Biologist, Gabrielle Graeter, practicing flying a drone during a 2-day training session with NC DOT's Unoccupied Aircraft Systems (UAS) Program staff in February 2024. Bottom: NCWRC staff members after attending the field portion of a two-day NCWRC chainsaw training course.

Partners for Green Growth

• Pender County has held a project kick-off meeting and continues to develop a preferred development guide and model ordinances for incorporating wildlife conservation into their land use and development planning process. Partners for Green Growth cost-share funding is being used to evaluate the county's current regulations pertaining to open space, the creation of conservation-based incentives and ordinances, outreach to landowners, developers, and staff, and the drafting of a preferred development guide.

• Union County has selected a steering committee and has held a project kick-off meeting for their rural land use plan project funded through Partners for Green Growth cost-share. The steering committee plans to hold regular monthly meetings throughout the project and Catawba Land Conservancy has begun assessing habitats and land uses.

• Chatham County has held kick-off meetings for the development of their county conservation plan. The plan will provide detailed implementation steps and metrics for guiding action on the numerous conservation goals identified in the Chatham County Comprehensive plan.

Green Growth Toolbox Training

• Due to the devastation caused by Hurricane Helene, the November Green Growth Toolbox Workshop was postponed until February 2025.

• A full-day workshop is planned for the Charlotte area for January.

• Staff presented the Green Growth Toolbox to NC Chapter of the Audubon Society's Urban Forestry Committee.

• Staff are providing technical assistance on land use plans for the town of the towns of Cameron and Southport, and counties of Orange and Harnett, on Durham's Unified Development Ordinance and the development of a conservation zoning overlay, on Brunswick County's Unified Development Ordinance, the Durham-Chapel Hill- Carrboro Metropolitan Planning Organization's Wildlife Crossings Plan, with the City of Durham, Statesville, and Yadkin County on proposed rezonings, and lastly, with a developer (M/I Homes) to integrate Green Growth Toolbox concepts into their planning and site design activities.

• Staff are working with a developer in Orange County to certify a new development as a Wildlife Friendly Development.

Cooperative Land Conservation

• Over the past quarter, staff led and coordinated the Chatham Conservation Partnership (CCP) and Triangle Connectivity Collaborative (TCC). This included providing a presentation on habitat connectivity at the CCP quarterly meeting and coordinating with TCC partners over land use and transportation planning, and land conservation opportunities in Durham and Orange counties.

• Staff contributed to and coordinated NCWRC's additions to the state's Natural and Working Lands Action Plan Progress Report, as required by EO 305.

• Staff continued to coordinate NCWRC's Climate Resiliency Strategy, including updates on progress and preparation for including the Law Enforcement Division, the Communications, Marketing, and Digital Engagement Office, the Office of Conservation Policy and Analysis, and the Conservation Research Office into the updated strategy.

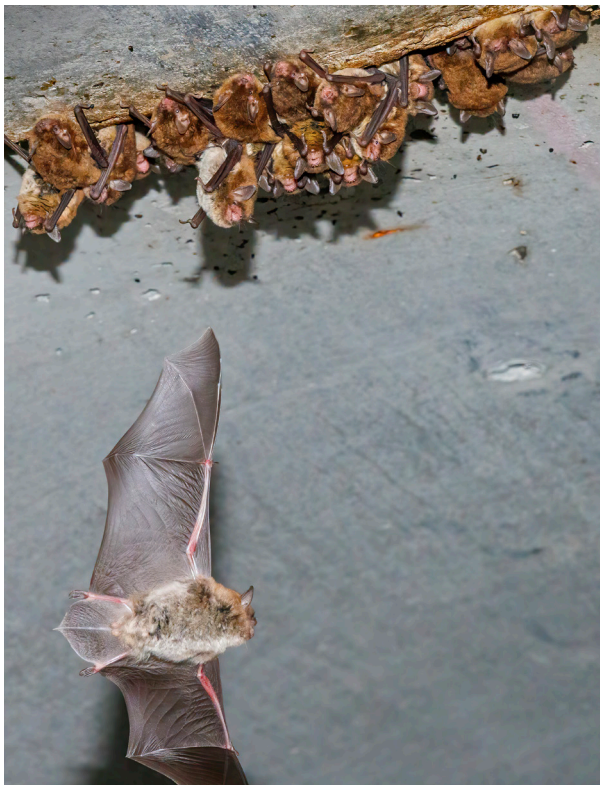
• Staff continue partnering with the Eastern North Carolina Sentinel Landscapes to promote conservation and working land uses in communities adjacent to military installations.

Training for Partner Agencies

HabCon staff were invited by US Army Corps of Engineers (USACE) - Wilmington District to speak to the USACE South Atlantic Division Regional Leadership Development Program (RLDP) Team during their visit to Wrightsville Beach, NC. USACE Wilmington wanted to emphasize the importance of agency communication, especially with state resource agencies, during large scale Civil Works projects. HabCon staff discussed the importance of pre-project, during, and post project discussions and site visits to ensure necessary project conditions are appropriate and upheld to minimize impacts to environmental resources. The site visit in Wrightsville Beach looked at inlet dredging with beneficial placement of material on the ocean shoreline, problematic shoreline responses, and installation of shoreline management measures. The RLDP team was comprised of representatives from Caribbean, Charleston, Jacksonville, Mobile, Savannah and Wilmington Districts.

Wildlife Surveys

Habitat Conservation staff confirmed the discovery of a large colony of southeastern myotis bats in an underground stormwater system in a Raleigh neighborhood. They were reported to NCWRC by a City of Raleigh Stormwater crew, after staff lifted a manhole cover and observed numerous bats inside. Upon further survey by Habitat Conservation staff, it was discovered to be the largest known colony of southeastern myotis bats in North Carolina, with more than 1000 individuals. Staff will be monitoring the bats to determine the actual size of the colony and to better understand their behavior.



Hurricane Helene Recovery—Stream Impacts

Hurricane Helene roared into western North Carolina on September 27, 2024, impacting a large area with catastrophic wind damage, flooding, landslides, and debris flows. Winds reached up to 100 miles/hour in some high elevation areas (Figure 1). Many streams (from headwater streams to large rivers, such as the Cane River in Yancey County) have been severely impacted by scour and erosion, and preliminary assessments of aquatic wildlife have demonstrated a range of impacts (see Photos 1-3). In many streams, efforts to rebuild roads and restore access to homes have resulted in additional stream impacts. NCWRC staff will continue to assess stream habitat and aquatic community status over the next year, and they anticipate developing a plan for restoration of habitat and aquatic wildlife for the affected area.

Many large streams and river systems in Ashe, Avery, Buncombe, Haywood, Mitchell, Yancey, and several adjoining counties experienced severe flooding and erosion due to Hurricane Helene. There were numerous debris flows that scoured small streams as well. Western Region NCDOT Habcon staff have been working with NCDOT and regulatory agencies in their responses to Hurricane Helene damage. Extensive repair work has already been undertaken, including stream channel modifications that NCDOT has indicated is temporary and that later may be modified with permanent, more stable and/or bioengineered approaches. For storm repair emergencies, the NCWRC has waived the October 15-April 15 trout moratorium, which is a measure included in US Army Corps Permits to protect developing trout eggs from stream disturbance and siltation.

Current Development Projects

The USACE Wilmington Harbor 403 (WH 403) proposal is progressing through the technical workgroup committees. NCWRC staff from HabCon, Inland Fisheries, and Wildlife Management divisions serve on the Wetlands, Aquatic Habitat, and Beneficial Use of Dredged Material committees. Currently the USACE is considering a No Action Alternative (currently permitted -42' MLLW), Action Alternative 1 (-47' MLLW) and Action Alternative 2 (-46' MLLW). The new action alternatives each have a 9.1-mile channel extension from Bald Head Reach 3 and widened areas identified in the WH 203 process with a +2' overdredge. Workgroup committees are involved to make sure model inputs are appropriate, all necessary wetland classes and species are noted, unique environmental conditions are identified, important model scenarios are considered, and mitigation opportunities are explored. The Draft Report and EIS are expected 2025.

Publications by Wildlife Diversity Staff and Partners in 2024

Publications, 2024

Schweitzer, S.H., and C.M. Gillin, editors. 2024. Toolkit to address free-ranging domestic cats on agency lands managed for native wildlife and ecosystem health. Human-Wildlife Interactions Monograph 4:1-56. "Toolkit to Address Free-ranging Domestic Cats on Agency Lands Managed " by Sara H. Schweitzer and Colin M. Gillin

Sumaiya, S., J.A. Czuba, **W.T. Russ**, and **R.A. Hoch**. 2024. Potential for juvenile freshwater mussels to settle onto riverbeds from field investigation. Journal of Ecohydraulics, 10(2): 216-233.

Tracy, B.H., F.C. Rohde, **M.A. Perkins**, L.M. Lee, **K.B. Carlson**, M. McCutcheon, **B.K. Jones**, and **H.K. Evans**. 2024. A Long recognized but undescribed new species of Cyprinella (Cypriniformes: Leuciscidae) from North Carolina and South Carolina, United States. Southeastern Fishes Council Proceedings 1:64.

Tracy, B.H. and **B.K. Jones**. 2024. First report of Robust Redhorse Moxostoma robustum serving as host for Sea Lamprey Petromyzon marinus. American Currents Vol. 49 (2):16-19.

Awards and Recognitions, 2024

Schweitzer, S.H. Leadership Award from Partners in Flight, International Landbird Initiative.

Webinars, interview, news articles

https://www.wwaytv3.com/wildlife-agency-seeks-kayaking-volunteers-for-turtle-counting-event/
https://www.mydailyrecord.com/news/wildlife-agency-seeks-kayaking-volunteers-for-turtle-counting-event/article_40b2d874-6700-4401-86b0-b024fc671602.html
https://www.newsbreak.com/the-richmond-observer-513357/3948205447941-wildlife-agency-seeks-kayaking-volunteers-for-turtle-counting-event
https://newbernlive.org/the-plight-of-the-diamondback-helping-nc's-cutest-turtle-p5783-174.htm
https://coastalreview.org/2024/09/cape-lookout-dredge-material-restores-vanishing-island/
https://www.publicradioeast.org/2024-09-12/transforming-dredged-materials-into-a-sanctuary-for-north-carolina-waterbirds
https://www.dredgingtoday.com/2024/09/13/using-dredge-material-to-create-bird-sanctuary/
https://www.wral.com/story/dredged-materials-used-to-restore-nc-waterbird-nesting-island/21613541/
https://thebackyardnaturalists.libsyn.com/saving-species-insights-into-the-endangered-species-process-with-sara-schweitzer
https://asleecocast.podbean.com/e/fighting-extinction-in-the-field-a-conversation-with-two-north-carolina-extinction-biologists/

The Wildlife Diversity Program

The Wildlife Diversity Program was established in North Carolina in 1983 to prevent nongame species from becoming endangered by maintaining viable, self-sustaining populations of all native wildlife, with an emphasis on species in decline.

More than 700 nongame animals call North Carolina home. Many nongame species, including mammals, birds, amphibians and reptiles, freshwater mussels and fish, are common and can be seen or heard in your own backyard. Other nongame animals, such as bald eagles and peregrine falcons, were, at one time, considered endangered, but now soar high in the sky, thanks to the work conducted by wildlife diversity biologists.

The staff who work for the Wildlife Diversity Program are dedicated to conserving and promoting nongame wildlife and their habitats through a variety of survey and monitoring programs, species management, and habitat conservation or restoration projects. These programs and projects target nongame animals and their habitats, but game species — such as deer, turkey, mountain trout, and black bass — also benefit because they share many of these same habitats.

You can learn more about the many projects and programs conducted by wildlife diversity personnel on behalf of nongame and endangered wildlife by visiting www.ncwildlife.org/wdp.