



NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

WILDLIFE DIVERSITY PROGRAM QUARTERLY REPORT

OCTOBER-DECEMBER 2022



NORTH
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Wildlife

RESOURCES
COMMISSION





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

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Cover photos from top left clockwise: Kendrick Weeks, Western Wildlife Diversity Program Supervisor solders a connector to a coaxial cable. (Chris Kelly); Wildlife Technician Mike Martin holding an adult Eastern Coachwhip (Jeff Hall); Wildlife Diversity technician, Reed Rossell, in the lab, processes river water samples with a vacuum flask, special filters to trap DNA, and an electric pump. (Lori Williams); Cape Lookout National Seashore ranger responding to a cold stunned loggerhead sea turtle (NCWRC)



Staff Conduct Fall Survey for SGCN in Lake Mattamuskeet Prior to Large-scale Carp Removal in 2023

by Michael Fisk, Eastern Region Aquatic Wildlife Diversity Coordinator

Aquatic Wildlife Diversity staff surveyed Lake Mattamuskeet in Hyde County in October for fish and mussel Species of Greatest Conservation Need (SGCN). Historically, Lake Mattamuskeet has provided suitable over-wintering habitat for waterfowl because of abundant submerged aquatic vegetation (SAV) in the lake. Due to impacts of the non-native

Common Carp, degraded water quality, and other factors, SAV is at an all-time low. The objective of these surveys was to collect baseline data for the lake before a large-scale carp removal is initiated in 2023. The carp removal is part of a long-term aquatic vegetation management plan to restore SAV in the lake. Thirteen species of fish were collected in

the lake, and several fish species associated with SAV were absent from these collections. Mussel surveys found only the Rangia clam, a species associated with brackish water present in the lake. Future surveys after the carp removal will be conducted to document changes in diversity, abundance and SAV.



This bowfin was one of 13 species staff collected in Lake Mattamuskeet during a fish and mussel survey in October.

(Photo: Michael Fisk)



Dwarf Wedgemussels Released into Swift and Little Shocco Creeks to Augment Populations

by Michael Fisk, Eastern Region Aquatic Wildlife Diversity Coordinator

Aquatic Wildlife Diversity staff released 500 federally endangered, Dwarf Wedgemussel into Swift Creek in the Neuse River basin and in Little Shocco Creek in the Tar River basin in November. These efforts were to augment existing populations of Dwarf Wedgemussel in Swift Creek in Johnston County and Little Shocco Creek in Warren County. All mussels were tagged with Hallprint (alpha-numeric) and passive integrated transponder (PIT) tags to aid in relocating and identifying individual mussels. Habitat types were characterized for each mussel released to help gain a better understanding of habitat impacts on overall success. Additional Dwarf wedgemussels will be released in these sections in spring 2023. Each augmentation reach will be evaluated each year to determine growth, survival and movement.



Some of the 500 Dwarf Wedgemussels released into Swift and Little Shocco creeks (Michael Fisk)

How YOU Can Support Wildlife Conservation in North Carolina

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

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

- 1 Donate to the Nongame and Endangered Wildlife Fund by checking Line No. 30 on your N.C. State Tax Form.
- 2 Purchase a Wildlife Conservation Plate, which features an illustration of a Pine Barrens Treefrog, for \$30, with \$20 going to the agency's Nongame and Endangered Wildlife Fund.
- 3 Donate to the Wildlife Diversity Endowment Fund, a special fund where the accrued interest — not the principal — is spent on programs that benefit species not hunted or fished. ncwildlife.org/donate





296 Live and 206 Dead Sea Turtles Recovered during Cold-Stunning Events in December

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

The North Carolina Sea Turtle Stranding and Salvage Network, coordinated by NCWRC biologists, monitors sea turtle strandings along North Carolina’s coast. During winter months, when inshore water temperatures drop below 50°F, sea turtles begin to strand due to cold-stunning (similar to hypothermia). Historically, cold stuns in North Carolina aggregate in two main hotspots: Cape Hatteras and Cape Lookout National Seashores. The 2022-23 cold-stun season in North Carolina began on Dec. 19 and lasted through the end of the year. The peak of cold stunning occurred between Dec. 24-26 (Fig 1). To date, 296 live and 206 dead turtles were recovered during this cold-stunning event. Live turtles were taken to rehabilitation facilities: the STAR Center at NC Aquarium Roanoke Island, NC Aquarium at Pine Knoll Shores, and the Karen Beasley Sea Turtle Rescue and Rehabilitation Center in Surf City. Several turtles that entered rehabilitation were released following brief treatment thanks to help from UNCW R/V Seahawk, NCSU CMAST, and warm water adjacent to shore at Cape Lookout. As air temperature moderates, inshore water temperatures will rise above the threshold for cold-stunning. However, if turtles remain in inshore waters, another wave of cold-stunning can occur with the next cold snap.

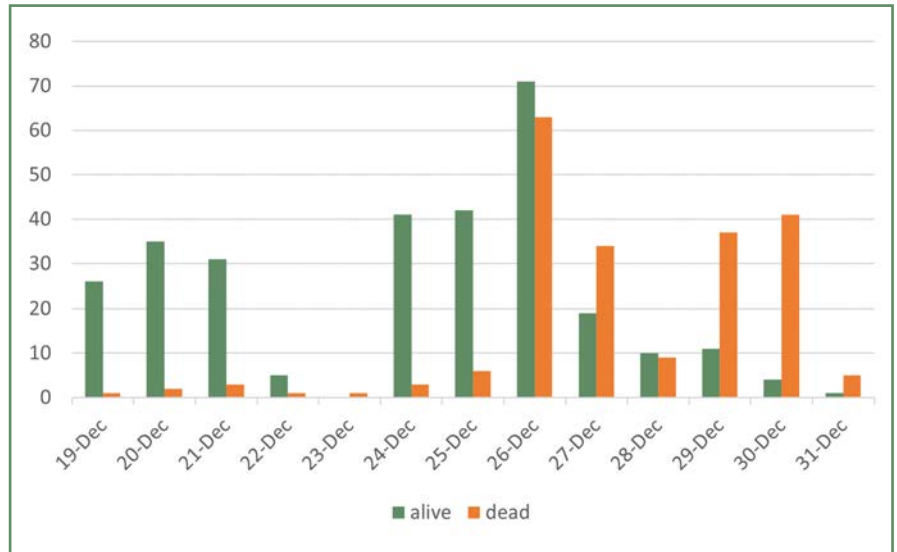


Fig. 1 Preliminary totals for the cold-stunning event that began Dec. 19, 2022



Cape Lookout National Seashore ranger responding to a cold stunned loggerhead sea turtle



Staff Conduct Breeding Surveys on Oystercatchers and Plovers

by Carmen Johnson, Waterbird Biologist, John Lynch, Constance Powell, Wildlife Diversity Technicians



Between late April and mid-June, the Waterbird Team took part in the North Carolina coast-wide breeding survey of American Oystercatchers and Wilson's Plovers, both species of special concern in North Carolina. Breeding surveys are conducted every three years and divide the coast into plots defined by management jurisdiction and ownership, habitat and size. Surveyors visited each plot within a 4-hour window around high tide, surveying by boat, foot or kayak to record detections of pairs and single, nonterritorial birds. Where nesting activity was occurring, surveyors noted nest location and the number of eggs or chicks (if found). They also documented any banded birds seen during the surveys. Final numbers are still being tallied but preliminary results from this year's survey found 343 territorial pairs, 31 non-territorial pairs, and 89 individual American Oystercatchers. For Wilson's Plovers, 278 territorial pairs, 7 non-territorial pairs, and 37 non-paired birds were detected. All data collected from this multi-agency effort will be compiled and used to help monitor the status of the two species in North Carolina and throughout their ranges.

Staff detected many American Oystercatchers during surveys in April through June, including pairs (below), nesting chicks and eggs (right) and tagged birds (above)

(John Lynch)





Manuscript Published on Ranking Wetland Quality and Functionality Based on Amphibian Species Habitat Preferences

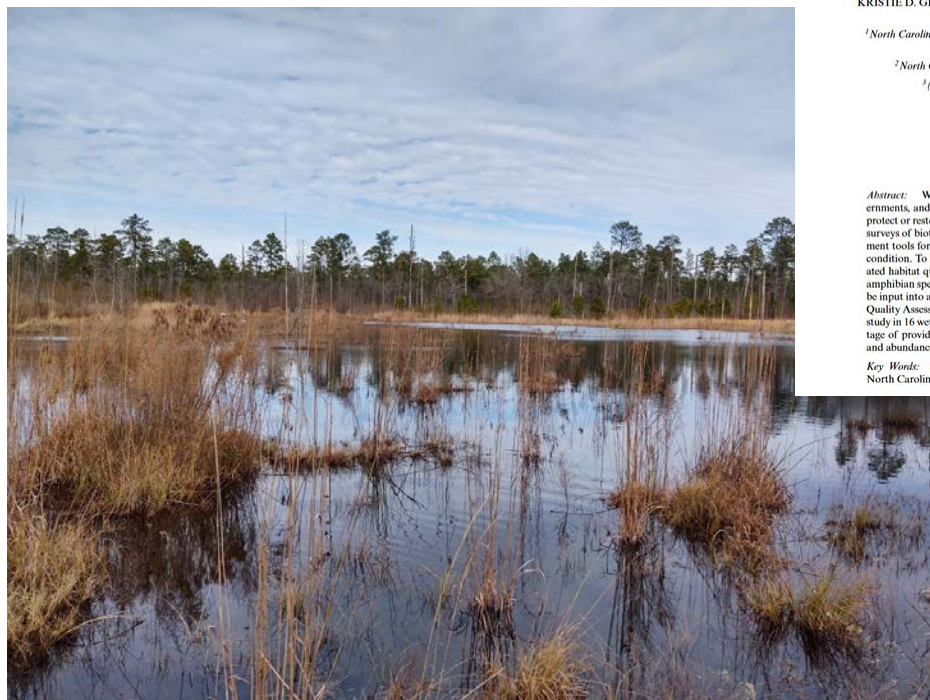
by Dr. Jeff Humphries, Eastern Amphibian and Reptile Biologist

In the 4th quarter, NCWRC biologists and partners published a journal manuscript regarding the use of amphibian species ranking scores to estimate the relative health of wetland and aquatic communities in North Carolina. This is the first time in North Carolina where amphibian wetland use data and expert opinion have been synthesized to measure wetland habitat quality in addition to using species richness and abundance alone. For example, on the North Carolina Coastal Plain, wetlands that have a higher number of habitat specialists such as Gopher Frogs, Tiger

Salamanders, etc., would rank higher in quality than wetlands that only contain habitat generalists such as Southern Leopard Frogs or Spring Peepers. This is a much more comprehensive way of assessing wetlands than using species richness alone, and it is a way of including amphibians in ranking wetland quality in addition to plant communities or other measures that have traditionally been used. We cite an example of using this ranking method based on real-world data from a 3-year research collaboration between the NCWRC and NC Department of Environmental

Quality. We hope that this quantitative method of ranking wetland quality and functionality based on amphibian species habitat preferences will be used by other entities in preserving and restoring high quality wetlands in North Carolina.

The citation for this manuscript is: Gianopulos, K.D., J.C. Beane, A.L. Braswell, J.G. Hall, W.J. Humphries, and N.A. Shepard. A new database for facilitating evaluation of wetland and aquatic amphibian communities in North Carolina. *Journal of the North Carolina Academy of Science*. 136(1)-137(1), 2020-2021, pp. 32-41.



A NEW DATABASE FOR FACILITATING EVALUATION OF WETLAND AND AQUATIC AMPHIBIAN COMMUNITIES IN NORTH CAROLINA

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Abstract: Wetland condition assessment is often performed by land managers, federal and local governments, and conservation organizations to document current condition and potentially take action to protect or restore valuable wetland resources. These condition assessments often include data collection or surveys of biotic communities such as vegetation, macroinvertebrate, and amphibian communities. Assessment tools for gauging quality of these communities are needed to allow scientists to understand overall condition. To facilitate a better understanding of amphibian communities found in wetlands and associated habitat quality, we created ratings of anthropogenic disturbance sensitivity for wetland and aquatic amphibian species in North Carolina. With adequate surveys of amphibian communities, these ratings can be input into an index of amphibian wetland habitat quality for North Carolina wetlands, the Amphibian Quality Assessment Index (AQAI). Comparison of the AQAI against amphibian species richness in a 3-yr study in 16 wetlands showed the two indices to be correlated but not strongly so. The AQAI has the advantage of providing additional habitat quality information beyond indices based solely on species richness and abundance.

Key Words: amphibian; wetland; aquatic; habitat; assessment; coefficient of conservatism; C-value; North Carolina.

A wetland restoration project on Sandhills Game Land that was studied and used as an example in the published manuscript (inset). (Dr. Jeff Humphries)



N.C. Partners in Amphibian and Reptile Conservation News

by Jeff Hall, Partners in Amphibian and Reptile Conservation Biologist

Field highlights for the final quarter of 2022 included upland snake surveys, placement of automated recording devices, winter amphibian habitat assessments, and pond restoration activities. Several Species of Greatest Conservation Need were encountered during snake surveys including Carolina Pigmy Rattlesnake, Timber Rattlesnake, Southern Hognose Snake, Northern Pine Snake, and Eastern Coachwhip. Surveys were conducted at numerous sites along the Coastal Plain and Sandhills. At one of the sites, NCWRC staff were able to assist NC Museum

of Natural Sciences staff in locating and exhuming a Northern Pine Snake nest to determine how many eggs were laid and how many hatched successfully. Seven eggs were unearthed, and all had hatched. Data on survival and fecundity in snakes can be difficult to come by so observations like this are very valuable.

Over a dozen automated audio recording devices (aka frogloggers) were deployed for detection of winter-breeding anurans such as Southern Chorus Frog, Ornate Chorus Frog,

and Gopher Frog. Many of these species have shown declines in recent years. Staff participated in ongoing restoration work in ponds at several game land sites in hopes of helping these and other amphibians.



Above: NCWRC and NC Museum staff dig up Northern Pine Snake nest. Left: hatched Northern Pine Snake eggs recovered from excavated nest (Jeff Hall)



N.C. Partners in Amphibian and Reptile Conservation News



During fall surveys in the Coastal Plain and Sandhills, staff encountered several Species of Greatest Conservation Need including (clockwise from top left): Carolina Pigmy Rattlesnake, Timber Rattlesnake, Eastern Coachwhip, Southern Hognose Snake, and Northern Pine Snake (Jeff Hall)



Staff Use eDNA Methodology to Detect Presence of Listed Salamanders in Western North Carolina Rivers

by Lori Williams, Western Amphibian Biologist

Since 2012, western region staff and project partners have successfully used environmental DNA (eDNA) methodology to help inventory and monitor populations of giant aquatic salamanders, Eastern Hellbender and Mudpuppy, both of which are

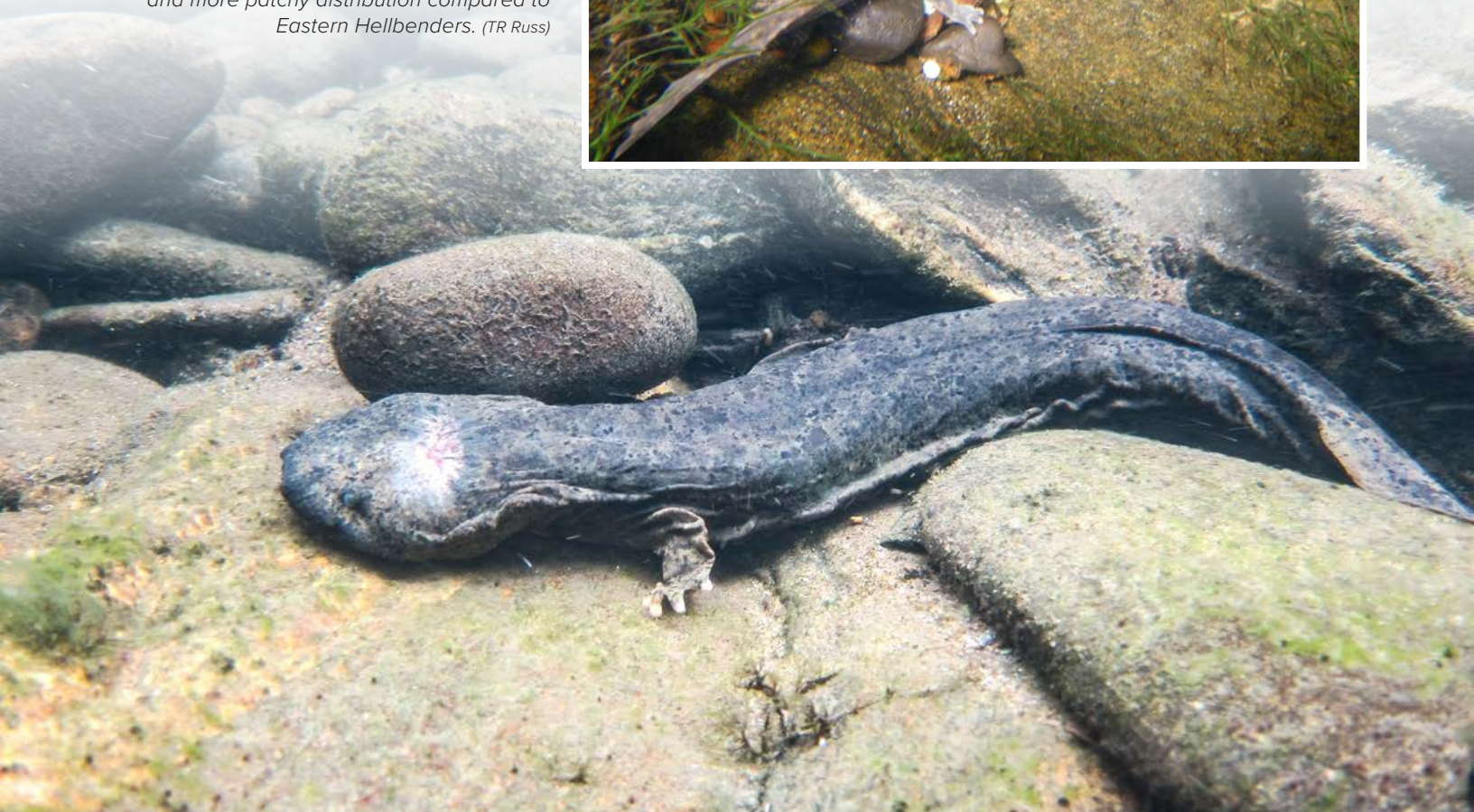
state listed as Special Concern. By collecting, filtering and analyzing samples of river water, biologists can determine the presence of these target species, thus providing a type of rapid assessment tool to help inventory and monitoring efforts. A major benefit

of eDNA sampling is the detection of target species in new waterways that were previously unknown in terms of species distribution. Since 2012, biologists have discovered 38 new hellbender streams in 15 counties with eight new streams found

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Below: An adult Eastern Hellbender during breeding season with fight wounds; breeding season is the best time to use eDNA sampling for hellbenders as there is more DNA in the water. (Lori Williams)

Right: An adult Mudpuppy; eDNA sampling is more challenging for this species due to their smaller size, different activity patterns, and more patchy distribution compared to Eastern Hellbenders. (TR Russ)





this fall season in the latest round of sampling. Out of 681 hellbender eDNA samples over the years, 304 have been positive (44.6%; Fig. 1). For mudpuppies, out of 640 samples, 42 have been positive (6.6%; Fig. 2), but staff have documented 17 new waterways in nine counties and expanded the mudpuppy distribution to all river basins within the species' range in western North Carolina. The next step with this eDNA project for both species is to follow-up with field surveys to pair physical captures or confirmed observations with positive eDNA locations. Staff also have a field study underway to examine how far downstream eDNA might travel from source animals and still be detected. The next phase of that study will be completed in spring 2023. Ultimately, staff hope to develop a survey methodology that will result in more efficient occupancy surveys and monitoring.

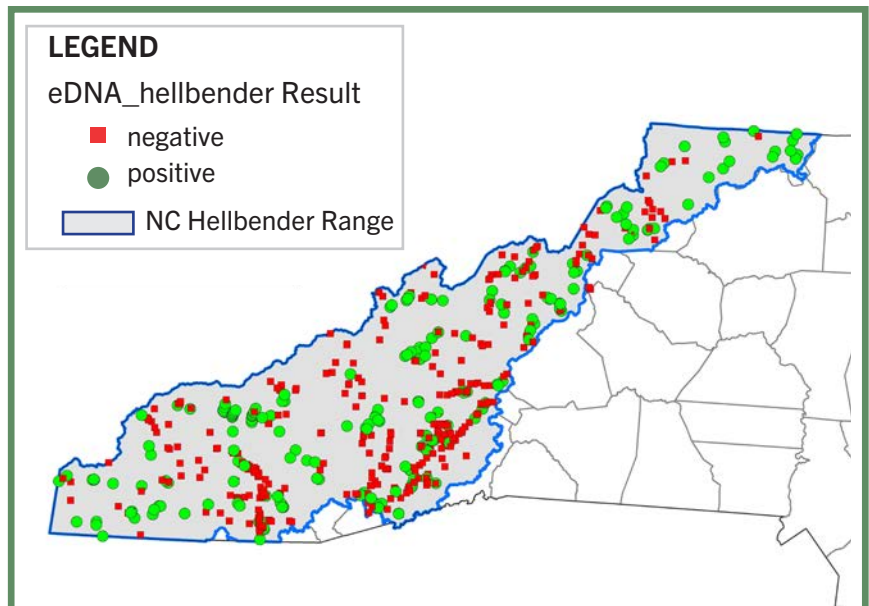


Fig. 1 Eastern Hellbender (*Cryptobranchus a. alleghaniensis*) environmental DNA (eDNA) sampling to date

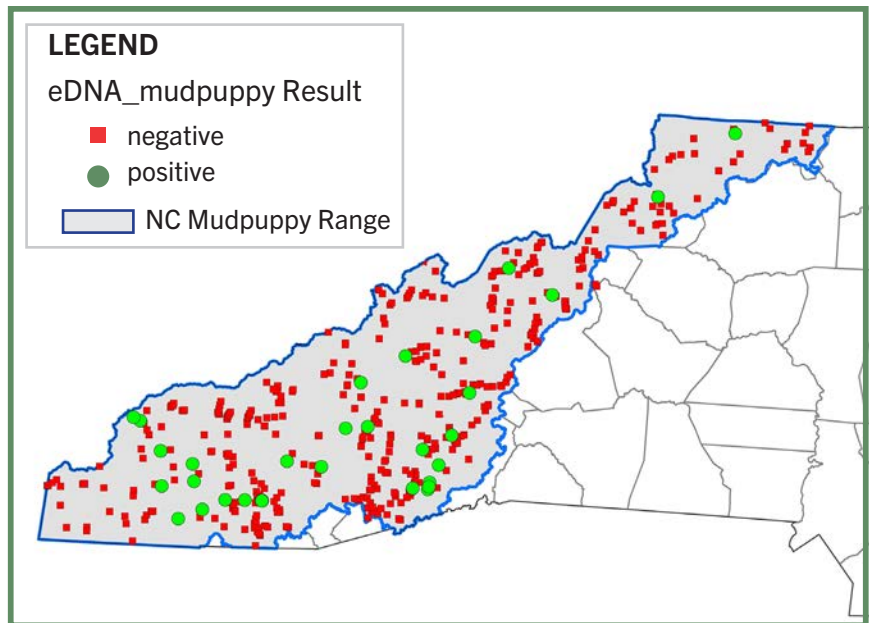


Fig. 2 Mudpuppy (*Necturus maculosus*) environmental DNA (eDNA) sampling to date



Wildlife Diversity technician, Reed Rossell, in the lab processing river water samples with a vacuum flask, special filters to trap DNA, and an electric pump. (Lori Williams)



Staff Install First Motus Receiver Wildlife Tracking System in Western North Carolina

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

Right before the Thanksgiving holiday, the NCWRC installed its first mountain-region Motus receiver station. The Motus Wildlife Tracking system is described by Birds Canada as “an international collaborative research network that uses coordinated automated radio telemetry to facilitate research and education on the ecology and conservation of migratory animals.” Motus radio technology is an especially good fit for tracking the movements of species such as songbirds, bats, and even insects, whose small size does not allow them to carry

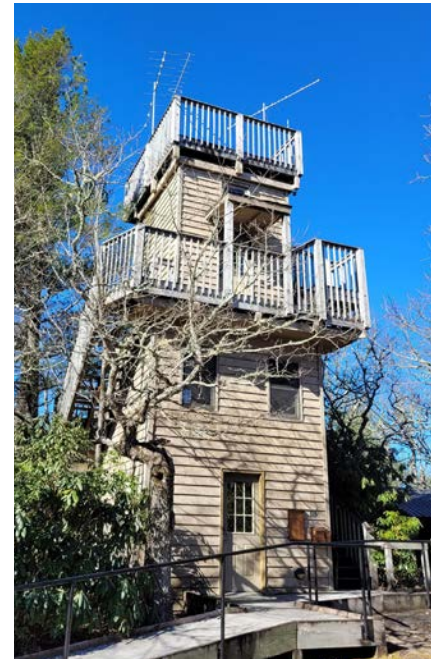
larger tracking technologies, such as GPS tags. For these species, Motus supports two types of uniquely coded radio transmitters (often referred to as nanotags) operating on the 166.380 MHz or 434 MHz frequencies. The Motus network is only as strong as the network of receiving stations across the landscape. Western North Carolina, as well as some other parts of the interior Southeastern United States, presents a big gap in coverage that the NCWRC intends to fill! To do this, the NCWRC has identified locations across the mountain

region to install receiver stations consisting of a small computer (receiver) and directional antennas. Ideally, adjacent stations will complement one another in their antennas’ coverage span. This is referred to as a Motus Fence. The analogy is that each receiver station is a fence post; the antennas’ signal ranges (up to 15km) are the railings. The first post in the Motus Fence was installed on Little Scaly Mountain in Macon County in November. Highlands Cashiers Land Trust connected NCWRC to The Mountain Retreat and Learning Center.

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A “dual mode” Motus station. The large yagi antenna (right) is tuned to 166.380 MHz while the smaller yagi antenna (left) is tuned to 434 MHz. (Christine Kelly)



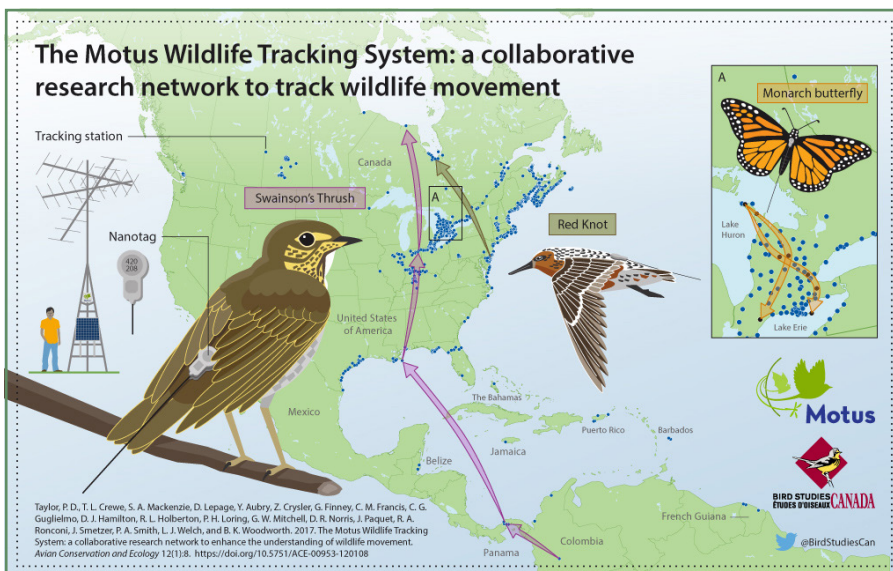
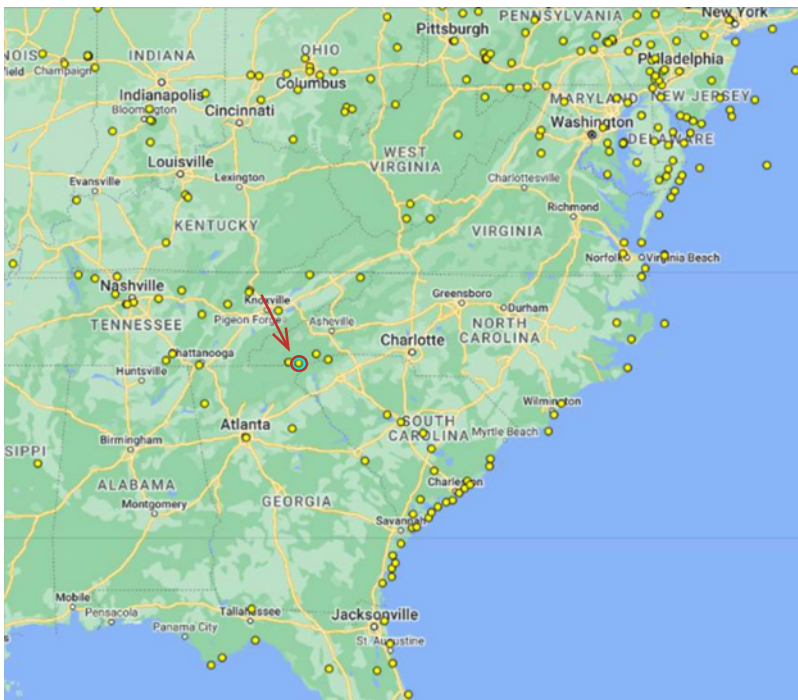
Directional antennas atop The Parry Family Tower at The Mountain Retreat and Learning Center (Christine Kelly)



Director Steph Anderson offered the use of the Center’s 40-foot Parry Family Tower — a perfect base for our Motus station. This new station is a “dual mode” Motus station, meaning its four antennas are listening for signals

from both 166.380 and 434 MHz frequency radio tags. The receiver on Little Scaly complements an existing Motus receiver at the Pisgah Astronomical Research Institute in Balsam Grove. Biologists are planning the next posts in the

Motus Fence at key points to the west of Little Scaly. We can hardly wait for spring migration to see what tagged birds, some traveling from as far away as South America, ping our new Motus station upon returning to North Carolina!



Clockwise from top left: The NCWRC is on the Motus map. Motus station at the Mountain Retreat and Learning Center on Little Scaly Mountain is circled in red (Motus.org). Kendrick Weeks, Western Wildlife Diversity Program Supervisor solders a connector to a coaxial cable. (Christine Kelly). An infographic from Birds Canada about the Motus Wildlife Tracking System (Motus.org)



Northern long-eared Bats Elude Capture at Nantahala National Forest Mine

by Katherine Etchison, Mammalogist

NCWRC biologists teamed up with U.S. Forest Service (USFS) staff in an attempt to catch a northern long-eared bat at an inactive Macon County mine in early October. Populations of this species have severely declined due to White-nose Syndrome, which recently caused the U.S. Fish and Wildlife Service to reclassify the bat from Threatened to Endangered. Nantahala National Forest Wildlife Biologist Johnny Wills acoustically monitored this Macon County mine for the last three years and detected northern

long-eared bat calls on multiple occasions. This find is noteworthy because northern long-eared bats have not been found in a cave or mine in North Carolina since 2014.

Attempts to access the mine for visual confirmation of hibernating northern long-eared bats have been abandoned because the mine's deteriorating condition makes human entry unsafe. This early October mistnetting survey was the next best method to confirm northern long-eared bat presence in the mine. Bats move to

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Wildlife Diversity Technician Joey Weber and Wildlife Diversity Biologist Katherine Etchison prepare to set up a mistnet at a mine entrance. (Johnny Wills/USFS)



their winter hibernation sites in early autumn and tend to forage for insects outside the site on warm nights. This behavior presents a key opportunity to catch bats at the entrances of caves or mines to determine which species hibernate in the site.

NCWRC and USFS biologists blocked off the entrance to the mine with a tarp and mistnet in an attempt to funnel entering or exiting bats into the net. Though weather and other conditions were favorable, no bats were caught during the survey. Additionally, tricolored bat calls were recorded on the nearby acoustic detector, but no northern long-eared bats were detected that night. It's uncertain whether northern long-eared bats use the mine and simply were not present that night or whether they're using the mine at all. For now, the mystery of northern long-eared bat presence in the mine continues.



The final mistnet and tarp set up at the mine entrance (Katherine Etchison)



The vertical shaft at the mine entrance (Katherine Etchison)



Populations of the northern long-eared bat have declined severely due to White-nose Syndrome. (Katherine Etchison)



The Value of Collaboration in Non-Native Invasive Plant Species Management in North Carolina's Mountain Bogs

by Emily Nolan, Wildlife Diversity Technician

Non-native invasive species (NNIS), particularly plants, are just one of many threats to Southern Appalachian bogs. These bogs are some of the most rare and unique wetlands in North America and are home to numerous threatened and endangered species. However, mountain bogs are vulnerable to degradation from climate change, habitat loss, and NNIS. Non-native invasive plants can choke out or shade native species, which in turn may leave other wildlife without proper habitat or food sources. Examples of NNIS commonly found in mountain bogs include Oriental bittersweet, Multiflora rose, Chinese/European privet, and Marsh dayflower. Each species comes with unique challenges to management and removal. There are many different methods available to treat NNIS, including use of hand tools, chainsaws and brush cutters, herbicides, and hand pulling. Deciding which method is best depends on a suite of factors such as the plant characteristics itself, the extent of invasion, the habitat they are found in, and the time and resources available for removal.

In 2021, NCWRC staff found the highly invasive Marsh dayflower in a western North Carolina bog with a known bog turtle population. The qualities that make this plant uniquely invasive are its abilities to reproduce vegetatively, seed dispersal by aquatic wildlife, and formations



Marsh dayflower (Brin Lalime)



of large mats that prevent other plant species from growing. Initially, it was thought to be contained to a small section of stream just outside the main bog. However, after further inspection it was found to be much more widespread throughout the bog including a large portion in the main bog turtle nesting habitat. Beginning in spring 2022, NCWRC staff began removing Marsh dayflower in the bog. Although mechanical removal is not advised due to the plant's vegetative growth and easy seed dispersal, staff chose to use this method over herbicide treatment to avoid spraying harsh chemicals in sensitive turtle nesting habitat. At least once per month from April-October, NCWRC staff and other volunteers pulled Marsh dayflower by hand, bagged, and disposed of it. With each visit, they found fewer plants, and by the end of fall, they had nearly cleared the main bog of this highly invasive plant. Despite staff making significant progress eradicating Marsh dayflower in 2022, it is likely much will resprout in spring 2023.

In 2023, staff plan to continue to hand-pull again but are also looking to learn more and refine their methods by discussing and sharing information with conservation partners that have dealt with Marsh dayflower in bogs. Fortunately, the Bog Learning Network (BLN), a consortium of scientists and land managers working to advance the restoration and management of Southern Appalachian bogs, is holding a meeting in March 2023 (<https://boglearningnetwork.com>). This in-person meeting will provide an excellent opportunity to share ideas and discuss how best to manage Marsh dayflower in these sensitive wetlands. Staff hope that through the BLN they can tackle what would otherwise be a tremendous task for the NCWRC to accomplish alone in managing Marsh dayflower in this imperiled mountain bog.



A mat of invasive Marsh dewflower, taking over a wetland (iNaturalist)



NCWRC Wildlife Diversity Technician Emily Nolan hand-pulls the non-native plant Marsh dayflower in a mountain bog. (NCWRC)



Staff Continue Robust Redhorse Stockings into Pee Dee River

by Brena Jones, Central Region Aquatic Wildlife Diversity Coordinator

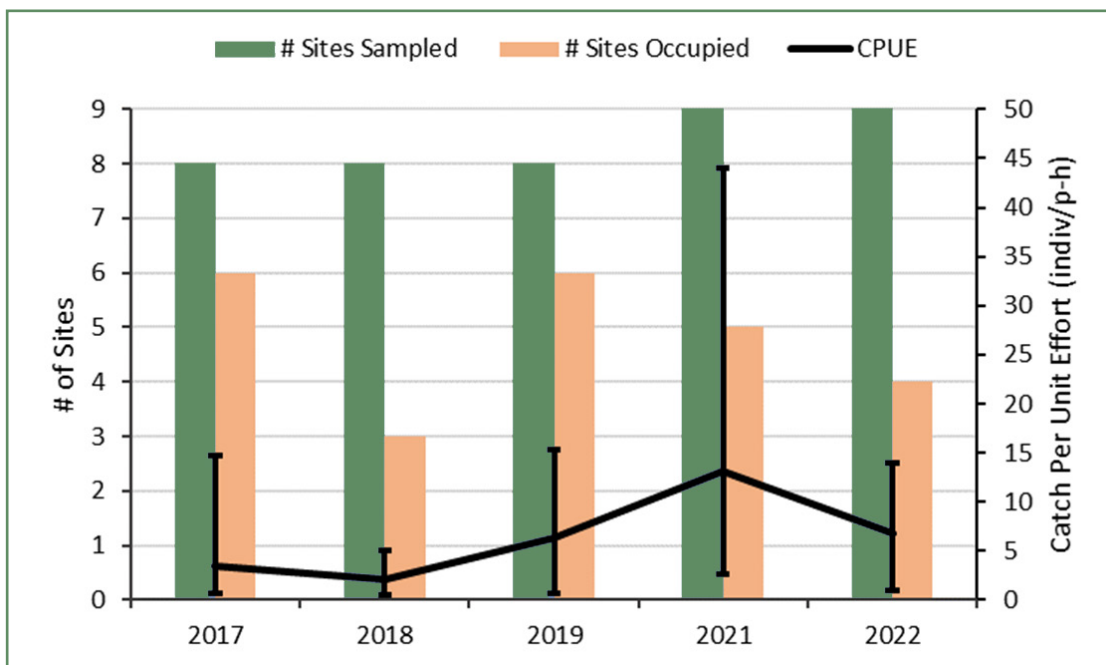
In November, 7,404 Phase I (6 months old) Robust Redhorse fingerlings raised at the South Carolina Department of Natural Resources Dennis Center and the NCWRC’s McKinney Lake Fish Hatchery were stocked into the Pee Dee River in North Carolina. These fish were the progeny of adults collected in the Pee Dee River spawning shoals in North Carolina in spring 2022. Another 915 were held back at McKinney Lake Hatchery to grow out to Phase II (18 months old), which will be stocked in the winter 2023.

Staff Continue Carolina Pygmy Sunfish Monitoring in Southeastern NC

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 North Carolina and small portions of the coastal plain in South Carolina.

Of nine previously occupied localities sampled in October, Carolina Pygmy Sunfish were collected at four locations. Carolina Pygmy Sunfish are persisting and catch per unit effort (CPUE) ranged from 1 to 14 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.