



NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

WILDLIFE DIVERSITY PROGRAM QUARTERLY REPORT

July-September 2020



NORTH
CAROLINA

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 (clockwise from top): Wildlife Diversity technician Clifton Avery conducting a passive snorkel survey for hellbender breeding season; Myles Lance, former NCWRC Wildlife Technician, with a Timber Rattlesnake; Wildlife Diversity staff count red knots at the Drum Inlet shoals (photo: Carmen Johnson); and Western Wildlife Diversity Technician, Kristi Confortin, removes mud from the cave gate.



Restored Sandhills Game Land Wetlands Attract Numerous Wildlife Species

Dr. Jeff Humphries, Eastern Amphibian and Reptile Biologist

During the third quarter, N.C. Wildlife Resources Commission (NCWRC) biologists continued to monitor numerous wetlands being restored on Sandhills Game Land. Efforts focused on surveying amphibians and reptiles as well as monitoring the vegetation response multiple years after restoration work began. In cooperation with foresters and land managers, staff are able to apply the best possible management actions to improve the quality of these wetlands over

time. Overall, wetlands are quickly colonized by many species of amphibians and reptiles, even just a few years post-restoration. On the other hand, it is becoming clear that some of these wetlands take more effort and attention to appropriately apply fire and reduce invading hardwood trees than others. Staff have been sharing the outcomes of NCWRC's work with partners in other states and learning from them as well. Overall, wetland restoration efforts on Sandhills Game Land have certainly increased populations of many focal species and provided more connectivity for isolated wetland species across the landscape. ◀



An isolated wetland created “from scratch” by NCWRC staff in 2013 is now becoming a high-quality wetland, supporting over 19 species of amphibians and reptiles that colonized the site. This site has been colonized by Gopher Frogs and Tiger Salamanders, two focal species of agency efforts (inset photos).

(Photos: Gopher Frog, Tiger Salamander-Jeff Hall; Wetland on the Sandhills Game Land-Dr. Jeff Humphries)



Over 200 Sea Turtle Nests Lost Due to Hurricane Isaias

Dr. Matthew Godfrey, Sea Turtle Biologist

Hurricane Isaias made landfall near Ocean Isle Beach on Aug. 4, causing heavy overwash and sand loss along many islands in Brunswick County and elsewhere along the North Carolina coast. Most of the signs and poles used to mark the location of incubating nests were washed away, and initial estimates were that nearly 300 sea turtle nests in Brunswick County had been lost to the hurricane. However, subsequent careful inspection by various sea turtle volunteer groups in the county resulted in the rediscovery of many remaining eggs, whose locations were marked and observed until the end of expected incubation. Nevertheless, dozens of sea turtle nests were completely washed out by the hurricane, particularly in locations where the hurri-

cane removed several feet of sand from the beach. The volunteer groups also worked closely with their respective towns during efforts to remove debris and reinforce dunes, specifically to ensure that all work with heavy equipment avoided marked areas with known sea turtle eggs. While the sea turtle hatching season is not yet finished, to date, the volunteer groups have determined 203 sea turtle nests had 0% success, either because they were washed away by heavy waves or the eggs stopped development due to excessive inundation from storm surge. Several dozen sea turtle nests that survived the storm have produced hatchlings in late August and September, and nests laid after the hurricane's landfall continue to incubate. ◆



Before (left) and after (right) photographs of the location of a loggerhead sea turtle nest in Ocean Isle Beach, relative to Hurricane Isaias. Wave action and storm surge from the hurricane removed several feet of sand (and incubating eggs) from this part of the beach (Photos: Ocean Isle Beach Sea Turtle Protection Organization)



Tracking of Two Imperiled Sparrow Species to Begin in 2021

John Carpenter, Eastern Landbird Biologist

Sparrows can often be dismissed by many as just little brown birds, but these species and the habitats they require to survive are undeniably unique parts of the natural world. The Saltmarsh Sparrow, as the name suggests, inhabits salt marshes throughout its life, and is predicted to become extinct by mid-century. The Henslow's Sparrow breeds in the increasingly rare grassland habitat and is on track to lose half its entire global population in ~ 50 years. Both species are of Greatest Conservation Need in North Carolina, and the NCWRC has undertaken research projects to help increase their numbers in the state and contribute what biologists learn to the wider conservation community.

One focal aspect of these studies is to better understand habitat use and survivorship using radio telemetry. More traditional applications of this technology would require an individual to use a hand-held antenna to follow birds on foot throughout a study site, which is not always an option in the dense, submerged, or simply inaccessible habitats where staff need to work.

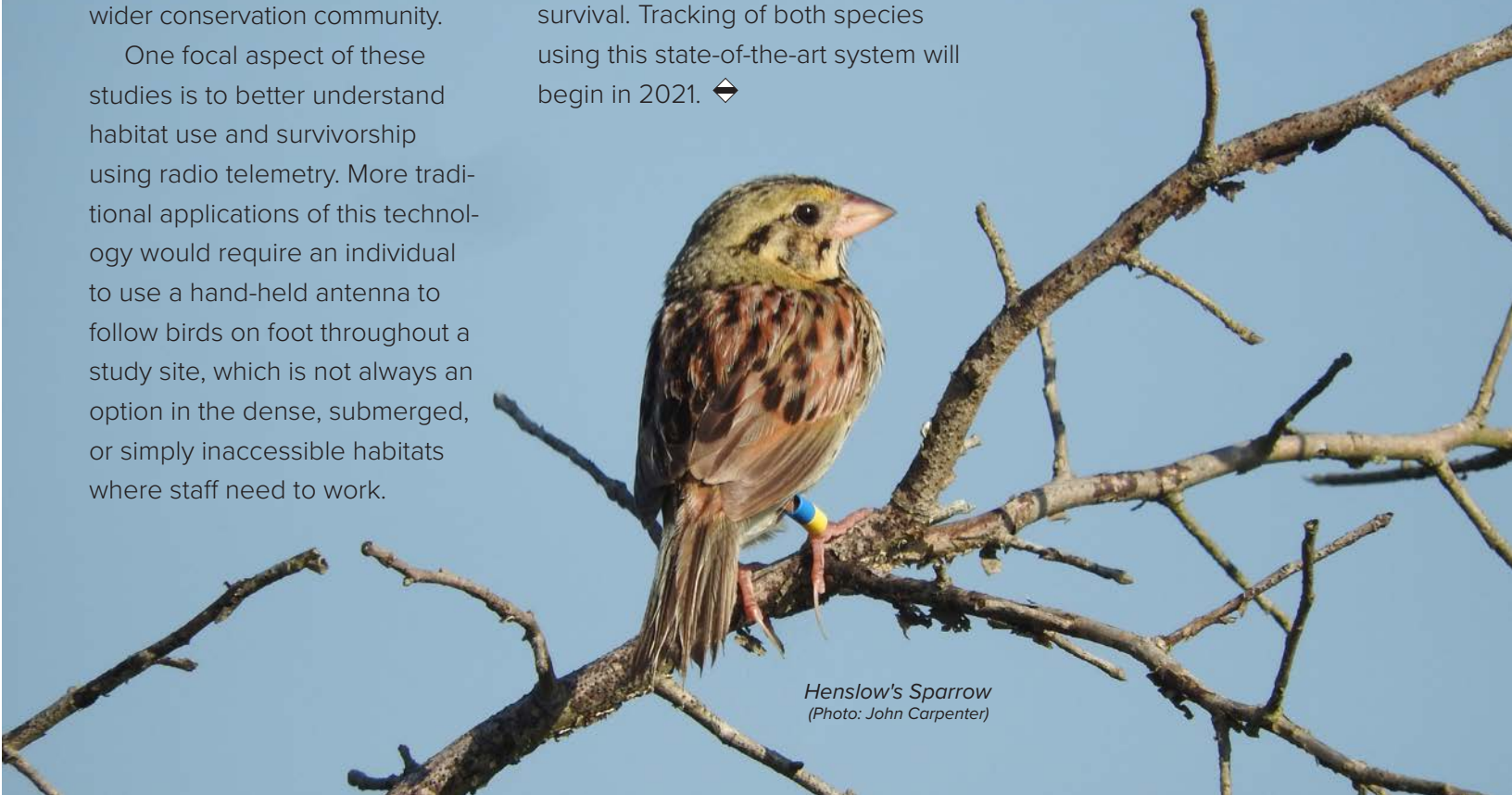
Through collaborations with N.C. State University and UNC-Wilmington, NCWRC staff will deploy several mobile, cellular tracking arrays to continuously monitor movements of birds wearing solar-powered transmitters. These tracking stations will cover approximately 1 km² each and can collect a bird's location every two seconds. The transmitters also are compatible with other networks, such as Motus, which are deployed across the continent, thereby providing the opportunity for birds to be tracked even after they leave North Carolina. This will allow biologists to delineate space and habitat use at an extremely fine scale, know when birds are migrating to and from study sites, and more accurately understand mechanisms driving annual survival. Tracking of both species using this state-of-the-art system will begin in 2021. ◆



Saltmarsh Sparrow (Photo: John Carpenter)



Migratory bird wearing a solar-powered cellular tracking device. (Photo: celltracktech.com)



*Henslow's Sparrow
(Photo: John Carpenter)*



N.C. Partners in Amphibian and Reptile Conservation News

Reports of Rattlesnake Sightings Increase Dramatically this Summer

by Jeff Hall, Partners in Amphibian and Reptile Conservation Biologist

This summer proved to be very productive for surveys and monitoring of rattlesnakes. In 2009, NCPARC developed a brochure called “Rattlesnake Sightings Wanted” and began handing them out at hunting and fishing expos. While a few accounts have trickled in over the years, during spring and summer 2020, staff received over 100 sightings from the public. These reports have led to over 70 new rattlesnake locations for both

Timber and Pigmy Rattlesnakes, as well as several new gestation sites. A gestation site (sometimes also called a rookery) is an area where multiple pregnant rattlesnakes, as well as other snake species exhibiting live birth such as Eastern Garter Snake, Northern Water Snake, and Copperhead, gather so that they can bring their litters to term (i.e., grow their babies). These sites have optimal thermal qualities as well as plenty of areas for protection from predators. NCWRC staff have been



conducting rattlesnake surveys in both the Coastal Plain and in the Mountains, with work focused on locating new gestation sites, as well as monitoring known sites, so these citizen reports have been particularly helpful.



Clockwise from left: Two Timber Rattlesnakes at a gestation site; Timber Rattlesnake at a gestation site; two Timber Rattlesnakes at a gestation site. A second snake under the rock is nearly undetectable; female Pigmy Rattlesnake that gave birth to three babies the day after the photo was taken. (All photos: Jeff Hall)





N.C. Partners in Amphibian and Reptile Conservation News



NCWRC staff partnered with herpetologist John Sealy as well as NC State Parks to conduct a radio-telemetry study on Timber Rattlesnakes at Hanging Rock State Park. In addition to staff testing out a new technique for transmitter attachment, this project is focused on learning about behaviors of snakes in areas of high human traffic within the park. Snakes will be tracked until they reach their win-

ter denning sites for brumation (called hibernation in warm-blooded animals) so that appropriate management techniques can be considered for rattlesnakes and their habitats in the area. Interesting behaviors are often discovered during tracking of snakes including hunting (snakes found in ambush postures), feeding events, and courtship. ◆

Clockwise from top: John Sealy conducting radio-telemetry; telemetered Timber Rattlesnake in ambush mode at the base of a tree; telemetered Timber Rattlesnake consuming a Grey Squirrel (Photos: Jeff Hall)





N.C. Partners in Amphibian and Reptile Conservation News

In some exciting staff news during this quarter, Law Enforcement Division Lt. Mark Cagle received the NCPARC Achievement Award from the NCPARC Steering Committee. The award stated, “This award is presented to Mark Cagle on behalf of North Carolina Partners in Amphibian and Reptile Conservation in recognition of outstanding contributions through law enforcement and education to the conservation and protection of North Carolina’s reptiles and amphibians.”

Congratulations Mark on a well-deserved honor! ◆



Lt. Mark Cagle with NCPARC Achievement Award (Photo: Jeff Hall)



Myles Lance with a Black Racer (left) and Timber Rattlesnake (Photo: Jeff Hall)

The third quarter also saw the transition of former wildlife technician Myles Lance into graduate school at Western Carolina University (WCU). Myles worked as a technician with NCWRC for over three years and has been a terrific worker and colleague. He will be sorely missed by NCWRC staff, but a great addition to WCU. We wish you much luck Myles! ◆



Waterbird Team Conducts Semi-Annual Surveys on Stopover Habitat

by Carmen Johnson, Waterbird Biologist

Once a month, during spring and autumn, the Waterbird Team contributes to Manomet's International Shorebird Survey (ISS). Implemented in 1974, the ISS gathers information on shorebirds and the wetlands they depend on from biologists and volunteers all over the world. Conducted March through May, and late July through October, these surveys help conservationists understand more about species populations and trends.

The Waterbird Team surveys two sites each month: New Dump Island and the New Drum Inlet Shoals. These sites

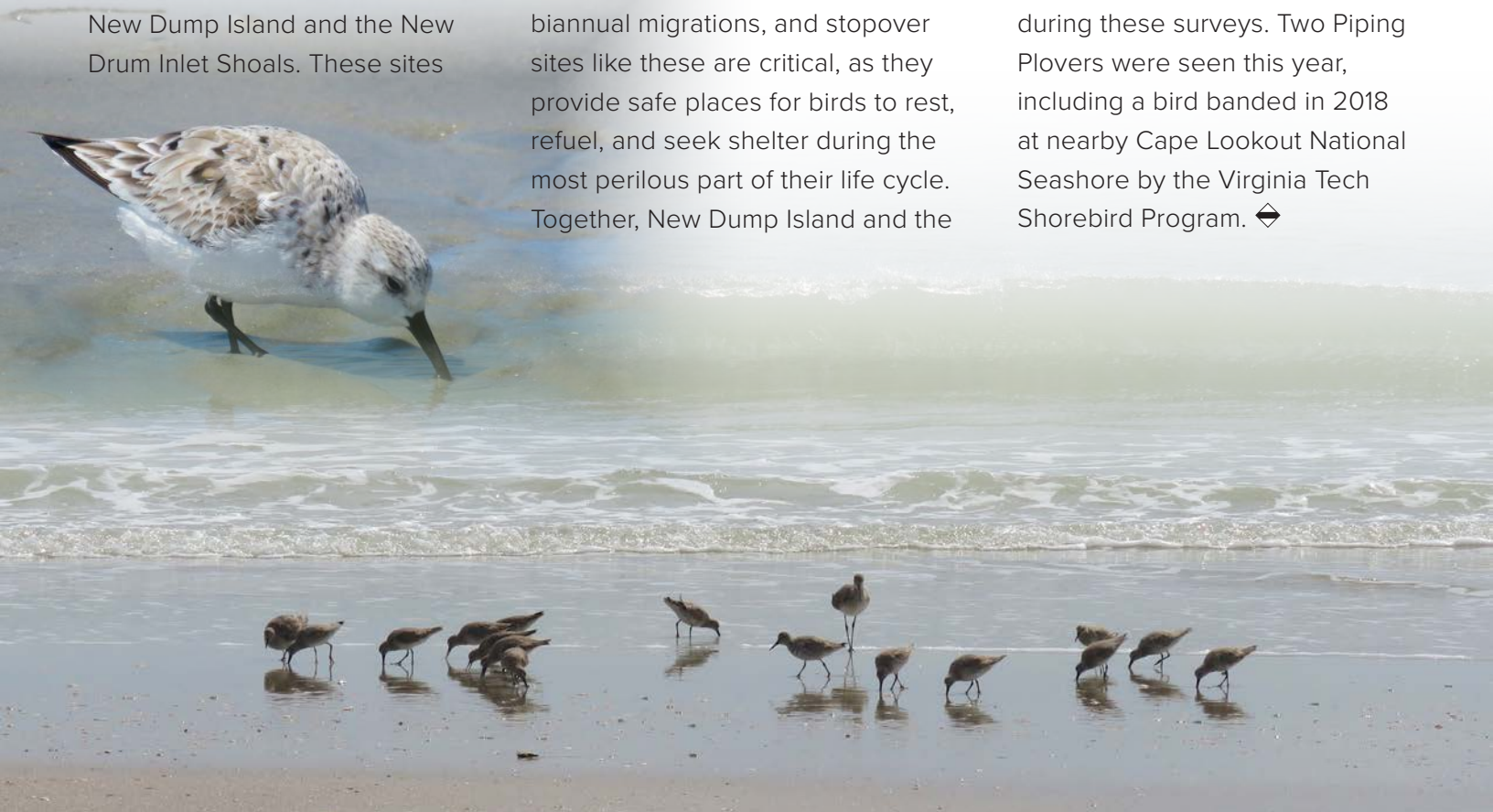
are located in Carteret County and were chosen because of their importance as stopover habitat for shorebirds during migration. Shore-

Staff detected 321 Red Knots during their May survey, the second highest count of the species at the site, and an exciting observation since the species, which is listed as federally threatened, has declined by 75% since the 1980s.

birds travel thousands of miles on biannual migrations, and stopover sites like these are critical, as they provide safe places for birds to rest, refuel, and seek shelter during the most perilous part of their life cycle. Together, New Dump Island and the

New Drum Inlet Shoals provide high concentrations of intertidal habitat full of invertebrates and roosting areas that remain above water during high tide that are necessary to meet these needs. Species richness (number of species) is highest during spring.

During the 2020 surveys the most frequently observed species were Black-bellied Plovers and Sanderlings, followed by American Oystercatchers and Semi-palmated Plovers. Federally Threatened Red Knots and Piping Plovers are also occasionally detected during these surveys. Two Piping Plovers were seen this year, including a bird banded in 2018 at nearby Cape Lookout National Seashore by the Virginia Tech Shorebird Program. 



Top photo: Sanderling foraging; Red Knots and a Willet foraging (Photos: Annika Andersson)



Priority Mussel Surveys and Management Actions by Foothills Aquatic Diversity Staff

by TR Russ, Foothills Region Aquatic Wildlife Diversity Coordinator

Foothills Aquatic Wildlife Diversity staff participated in a number of projects related to freshwater mussel conservation in the Mountains and Piedmont of North Carolina. Biologists continued to monitor propagated individuals of the state-listed Yellow Lampmussel, Green Floater and Notched Rainbow that were stocked into several reaches of the Dan River in 2019. Biologists conducted a

series of dive surveys throughout the Catawba River lake-chain and documented new localities of the state-listed Eastern Pondmussel and Rayed Pink Fatmucket in Lake Wylie. Additional surveys were also conducted in the Old Catawba River channel, where a new population of the state-listed Creeper mussel and propagated individuals of the state-endangered Brook Floater were re-introduced after a century-long ab-

sence. Foothills biologists collaborated on surveys with the Central Wildlife Aquatic Diversity staff and U.S. Fish and Wildlife Service for rare mussel species in the Uwharrie River basin. Foothills biologists are currently engaged with several collaborators on numerous conservation genetics projects that will benefit federal and state listed freshwater mussels throughout the state. ◆

Roanoke Logperch and Dan River Restoration at Lindsey Bridge Dam

by TR Russ, Foothills Region Aquatic Wildlife Diversity Coordinator

Five years of focused surveys, science and partnerships are paying off for the Roanoke Logperch population in North Carolina. Since 2015, NCWRC has conducted ongoing distributional surveys and found a wide range of the Roanoke Logperch existing in the Dan, Mayo and Smith rivers, including smaller tributaries Big Beaver Island, Cascade and Wolf Island creeks. What started out as two known Roanoke Logperch locations in 2008 is, in 2020, the knowledge that Roanoke Logperch occupy ~50 river miles in North Carolina. Although, NCWRC did not find Roanoke Logperch in the Dan River in

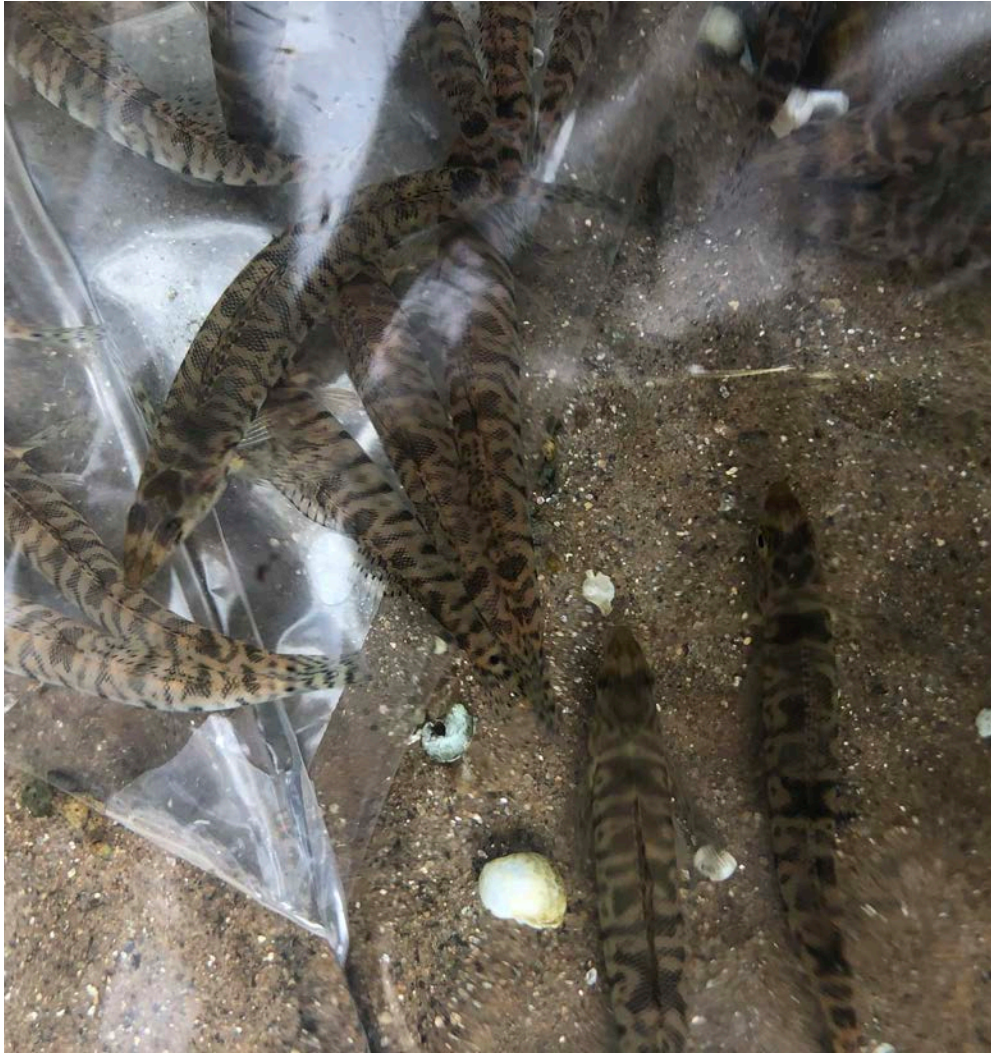
Stokes County during these surveys, staff believed that the Lindsey Bridge Dam in Madison, North Carolina had cut off historic upstream migration. In 2017, a partnership with Georgia Southern University and Dr. Jamie Roberts provided key insights into the Roanoke Logperch population genetic structure and discovered a large, genetically distinct metapopulation in the state stretching from the dam in Madison, downstream past Eden to the Virginia state line. The entire size of the population in North Carolina was likely over 11,000 individuals. Following these insights, biologists began management plans in earnest to restore the Roanoke Logperch to its native waters in Stokes County.



continued on page 13



Previous page: Roanoke Logperch being released into Big Beaver Island Creek; Top left: Lindsey Bridge Dam before retrofitting; Bottom left: Work on Lindsey Bridge Dam begins to allow for Roanoke Logperch passage; Roanoke Logperch await release into Big Beaver Island Creek (Photos: TR Russ)



Over the past three years an extraordinary partnership among governmental, private and nonprofit organizations has pulled together to help the Roanoke Logperch. These partners include: the Town of Madison, Kris Bass Engineering, LKC Engineering, The Conservation Fund, U.S. Fish and Wildlife Service, NCWRC, Rockingham County Education Foundation, Conservation Fisheries Inc. and the Dan River Basin Association.

In September 2020, Conservation Fisheries Inc. and the NCWRC released 114 propagated Roanoke Logperch into Big Beaver Island Creek. These fish will augment the low population in this creek and supplement the Dan River population. The biggest news in 2020, despite uncertain state budgets and

Covid-19, came in late September when the USFWS stream restoration crew began retrofitting the Lindsey Bridge Dam to allow Roanoke Logperch passage over the dam and the ability to migrate upstream into at least ~50 river miles of historical habitats.

Over the next five years the partnership has secured enough funding to propagate more Roanoke Logperch in order to restore the population in the upper Mayo River, upstream of two barriers in Mayodan. Additionally, more juveniles will be stocked in the upper Dan River to supplement the newly established population. By 2025, the ultimate goal for the Roanoke Logperch in North Carolina is to occupy over 100 river miles throughout Stokes and Rockingham counties. ◆



Staff Construct New Prototype Nest Boxes for Barn Owls

by Allison Medford, Piedmont Eco-Region Wildlife Diversity Biologist

Despite the setbacks in field work and landowner meetings due to the COVID-19 related restrictions, the Barn Owl Project is moving forward. Outreach by the public has been sincerely appreciated, and new Barn Owl sites have been identified. Three new prototype nest boxes are ready to be installed on properties of willing landowners. These nest boxes are made from used water totes and provide more floor space for the owl nests. Staff hope to see these boxes get used at a higher rate than the previous plywood style, which is much smaller. ◆



These water tote nest boxes will be installed on 8-10 foot platforms
(Photo: Allison Medford)

Staff Continue Augmentation Efforts of Yellow Lance in the Tar River Basin

by Michael Fisk, Eastern Region Aquatic Wildlife Diversity Coordinator



Yellow Lance being tagged (Photo: Sierra Benfield)

This summer, Wildlife Diversity Program staff continued their augmentation efforts by releasing Yellow Lance into the Tar Basin in Halifax, Franklin and Nash counties. The augmentations are part of ongoing efforts to bolster existing populations of mussels. The Yellow Lance is a federally threatened mussel found in the Tar, Neuse and Chowan river basins in North Carolina. The Yellow Lance's historical range extends from the Neuse River Basin in North Carolina north to the Patuxent River Basin in Maryland. Yellow Lance distribution and abundance are a fraction of historical populations resulting in fragmented contemporary populations. Population declines are associated with habitat degradation resulting from reduced water quality, quantity and instream habitats. In 2020, staff released over 5,000 age-2 Yellow Lance into eight different sites into Fishing and Shocco creeks as well as the Tar River. Augmentations will be monitored annually to document survivorship, growth, and reproduction to evaluate augmentation success. ◆



Staff Conduct Successful Passive Snorkeling Surveys for Hellbenders, Despite COVID-19

by Lori Williams, Western Amphibian Biologist

Due to COVID-19 restrictions, Wildlife Diversity staff were unable to conduct summer surveys for Eastern Hellbender, which is a state-listed species of Special Concern, as well as a Species of Greatest Conservation Need. These surveys have been conducted each year since 2007. However, in late August and early September, staff and partners

were able to complete three weeks of socially distant, passive snorkeling surveys to monitor hellbender populations active during their breeding season. Surveys consisted of using a dive light and underwater cameras to document animals without disturbing them or their habitat. Despite missing some days due to poor conditions from heavy rain, staff completed a record number of

surveys, and noted more hellbenders than in any year prior. Staff conducted 47 surveys, at 41 individual sites within 20 different streams, across 12 western North Carolina counties. Staff observed 186 hellbenders during this breeding season, making it the most successful hellbender monitoring season to date. ◆



Clockwise from top left: Wildlife Diversity technician Clifton Avery conducting a passive snorkel survey for hellbender breeding season; Hellbender eggs found dislodged from of a nearby nest rock; A “denmaster” adult male hellbender; Adult hellbender on the move during breeding season (Photos: Lori Williams)



Lake Waccamaw Fish Monitoring Surveys Continued this Quarter

by Brena Jones, Central Region Aquatic Wildlife Diversity Coordinator

NCWRC staff, in partnership with N.C. State Parks, has conducted annual standardized surveys since 2009 for three fish Species of Greatest Conservation Need 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 nine sampling years and was 10 fish/minute (fpm) of seining in 2020. 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. Waccamaw Killifish and Waccamaw Darters were also collected, suggesting that populations persist within Lake Waccamaw. Lake water levels were very high this year. ◆

Cape Fear Crayfish Surveys Ongoing

by Brena Jones, Central Region Aquatic Wildlife Diversity Coordinator

Staff biologists visited six sites in September 2020 as part of ongoing efforts to update distributional records of native crayfish species. The sites were in Randolph and Guilford counties, specifically targeting the known geographic area of the state listed Special Concern Greensboro Burrowing Crayfish. Although the target species was not found, three species were excavated from burrow pits including the Carolina Ladle Crayfish, Sickle Crayfish, and individuals of the native *Cambarus* species. Additionally, young Sickle Crayfish were found with their mothers in two separate burrows. No exotic crayfish species were collected.

Additionally, two of the five individuals of an unknown, potentially new-to-science spe-

cies from the Little River of the Pee Dee drainage that were collected and sent to the N.C. Conservation Aquaculture Center (CAC) in September 2019 became gravid this fall. Staff are studying the structure of the glochidia (mussel larvae), monitoring if a host attraction strategy, such as producing a lure, occurs in the gravid females. Staff are also testing which host fish species, if any, are utilized by the mussel to host glochidia, providing food and oxygen until the glochidia are ready to transform into juveniles and drop off in suitable habitat. Central Aquatic Wildlife Diversity staff collected numerous fish species in September to be used in the host infestation trials at the CAC. These efforts are providing additional details on the unknown mussel species taxonomy and life history. ◆



Carolina Ladle Crayfish (Photo: Katherine DeVilbiss)



Young Sickle Crayfish (Photo: Katherine DeVilbiss)



Lumber River Surveys Yield No Broadtail Madtoms

by Brena Jones, Central Region Aquatic Wildlife Diversity Coordinator

Staff conducted site visits in the Lumber River and its tributary, Shoe Heel Creek, for the state listed Special Concern Broadtail Madtom, a rare, undescribed native catfish. Twenty small, artificial cover structures, informally named “madtom motels,” which were previously deployed at three localities were checked

for occupancy. Two native catfish species, Flat Bullheads and Margined Madtom, were found occupying three of the motels; however, no Broadtail Madtoms were present. No other fish species were found utilizing the structures. Staff will continue to check motel occupancy for this ongoing project and additional future deployments are planned.



Field gear at a Madtom Motel site in the Lumber River; Inset photo: Broadtail Madtoms found during a previous survey (Photos: Katherine DeVilbiss)



Staff Excavate Cave Gate After Landslide; Cave Yields Disappointing Results

by Katherine Etchison, Mammalogist

A landslide buried the entrance to a cave that offers important winter refuge to bats in the Nantahala Gorge last February. Mud and debris were removed from a small section of the entrance to allow bats to exit during spring emergence, but efforts to fully unearth the entrance were postponed due to COVID-19 restrictions. In July, a crew of NCWRC staff, U.S. Forest Service personnel, and local cave grotto members was assembled to excavate the entrance to the cave. Over three days, approximately 3-4 cubic yards of mud, rocks, and woody debris were removed from the cave gate and adjacent area by hand tools. Surveys for the endangered Noonday Globe Snail were conducted prior to digging efforts each day and one snail was found and moved out of the work area.



Noonday Globe Snail

This cave, like other bat hibernacula in the Mountains, has experienced sharp population declines resulting from white-nose syndrome. Over 1,000 hibernating bats were documented in this cave in 2010, but only 21 bats were observed in the most recent hibernaculum survey in 2018. Historically, five bat species hibernated in this cave including the now federally threatened Northern Long-eared Bat and rare Little Brown Bat and Tricolored Bat. Though no Little Brown Bats or Northern Long-eared Bats have been seen in the cave since 2013, a few surviving Tricolored Bats remain. Tricolored Bats are the first species to return to their hibernation sites in the fall, so fully uncovering the cave entrance during the summer was critical. ◆



The top right corner of the cave gate is barely visible behind landslide debris.



Western Wildlife Diversity Technician, Kristi Confortin, removes mud from the cave gate.



Western Wildlife Diversity Supervisor, Kendrick Weeks, and U.S. Forest Service Wildlife Biologist, Johnny Wills, remove the remaining mud from the cave gate. (Photos: Katherine Etchison)



Staff Conduct Night Surveys on Nightjars

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

A [map](#) recently shared by the Nightjar Survey Network shows North Carolina as a leader in nightjar surveys and monitoring. In the western foothills and mountain region, data collected along driving routes by volunteers for 10 years were analyzed by Dr. Scott Pearson of Mars Hill University to develop a model predicting where Eastern Whip-poor-wills are likely to occur. The analysis found that whip-poor-wills were associated with lower elevations and rural landscapes (less developed) with conifer forest. NCWRC biologists began to ground-truth the model. Five survey routes were established using the same protocols as the monitoring program, but with routes selected from among predicted “hot spots” and “cool spots.” The model performed well for predicted hot spots along two routes in Burke County, one in Rutherford County, and one in Cherokee County, but not for a route in Madison County. Field staff were pleased to be met with a cacophony of not just whip-poor-will calls but also calls of Chuck-will’s Widows along the survey routes in Burke and Rutherford counties.

While biologists were completing the night surveys, long-time volunteer Alan Cameron captured footage of whip-poor-wills calling, courting and nesting on and around granitic domes at DuPont State Recreational Forest. North Carolina citizens have shared their stories with NCWRC biologists



Female whip-poor-will and one 3-day-old nestling (Photo: Christine Kelly)



Granitic dome at DuPont. Arrow marks location of nest on edge of dome and woods (Photo: Christine Kelly)

of “whips” calling from natural amphitheaters such as gentle, bowl-shaped terrain and from the stage of artificial amphitheaters, such as a barn built into a hillside. Biologists suspect the granitic dome topography at DuPont amplifies the whip-poor-will’s call in a similar manner. In addition, the domes create a break in the tree canopy, providing an opening for this

visual hunter to spot and forage on moths and beetles. Whip-poor-wills synchronize their nest cycle with the lunar cycle. Young hatch approximately 10 days before a full moon, such that ample moonlight aids hunting when the adults have additional mouths to feed. Indeed, the first nestling hatched on June 30th and its sibling hatched the next day, while the moon was waxing gibbous, ~80% full. ◆



Success and Limitations with Using Predator Excluder Cages to Protect Bog Turtle Nests

by Gabrielle Graeter, Conservation Biologist/Herpetologist

With the Bog Turtle in decline in North Carolina, NCWRC biologists and their conservation partners have been busy trying to help the species in every way possible. Conservation of this species, which is state listed as Threatened and federally listed as Threatened (S/A), requires a multi-faceted approach, including addressing numerous threats (e.g., vegetation succession, road mortality, human subsidized predators, poaching, etc.), by implementing habitat and species management and restoration projects. One method recently employed in conjunction with other efforts has been nest protection from predators.

Bog Turtles lay their eggs in vegetation on the ground within the wetland in early summer, typically mid-to-late June, followed by hatching in August or September. When Bog Turtle nests are located, NCWRC biologists and their partners have been installing predator excluder cages over the nests soon after the eggs are laid. This is very similar to the way biologists protect sea turtle nests on beaches, though on a much smaller scale, as bog turtle nests are very difficult to find. In a recent study in several bog turtle sites

in North Carolina, only 28 percent of eggs hatched when nests were located but left unprotected (Knoerr 2018). Similarly, the percent of eggs that hatched at Bog Turtle sites in the

northeast United States was low, ranging from 13 to 33 percent (Macey 2015, Whitlock 2002, Zappalorti et al. 2017).

In summer 2020, NCWRC biologists, in collaboration with conservation partners, protected nests at five known Bog Turtle populations. Most females lay two to four eggs. Through extensive searching efforts, staff found and protected 24 nests across these sites, for a total of 85 eggs. From those eggs, 64 (80 percent) hatched and were subsequently released adjacent to their nest in the wetland after a brief data collection period. Although there are examples of natural nest success this high (e.g., Whitlock 2002, Zappalorti et al. 2017), it appears to be uncommon; an 80 percent hatch success with the predator excluders is certainly much higher than was documented by Knoerr (2018) when nests were left unprotected. When biologists find a Bog Turtle nest and protect it, this technique has resulted in an increased proportion of eggs successfully hatching, an obvious conservation win.

Although the use of predator excluders has proven to be of great value, this method has



Bog turtle nest in North Carolina after a biologist has exposed the eggs for examination. (Photo: Ben Dalton)



A hatchling bog turtle being held during the data collection process. (Photo: Ben Dalton)

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limitations and is not effective in every circumstance or at every site. For instance, at sites with a small Bog Turtle population, it can be very difficult to visually find nests since Bog Turtles do a thorough job of hiding their eggs within the vegetation. Despite extensive surveys for nests this year, staff were able to find only two or three nests at most sites, and unable to find any nests at two sites. Therefore, the number of nests protected was quite small, and at the two sites where they were unable to find any nests, biologists were not able to improve egg survivorship at all. In this situation, other methods may be more effective. For example, biologists have found that radio-telemetry on gravid female turtles yields a greater number of located nests at the sites with few turtles and allows for immediate nest protection or collection of the eggs for captive incubation and head-starting, by releasing the hatched turtles back into the bog.

Another limitation of the predator excluder is that it does not address other issues that decrease nest success. For example, nests can flood due to storm events, which may result in egg failure. With an increase in extreme storm and flood events due to climate change, this will likely continue to be a threat to Bog Turtle nests in the future. Similarly, if weather conditions are less than ideal for egg incubation (e.g., cool, wet weather in spring and/or summer), incubation rates can be slowed to the point that the turtles are unable to hatch before cold weather in the fall. This, in fact, has occurred at a couple of bog turtle populations in fall 2020, with

hatching occurring into early-mid October and some eggs failing to hatch. NCWRC biologists are considering alternate conservation strategies, such as head-starting, to address these types of additional risks and improve nest and nestling survivorship in the future. ◆



A predator excluder cage can be installed in a bog to cover and protect a bog turtle nest from predators. (Photo: Gabrielle Graeter)

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Pigeon River Mussel Population Growth Update

by Dr. Luke Etchison, Western Region Aquatic Wildlife Diversity Coordinator

Western Region Aquatic Wildlife Diversity biologists spent much of the summer snorkeling in the Pigeon River in Haywood County, where they were conducting mussel surveys to update antiquated population records. They were thrilled to find that the Federally and State Endangered Appalachian Elktoe population has been increasing in abundance throughout most of its distribution in the West Fork, East

Fork and main-stem Pigeon River upstream of Canton, N.C. For the 20 surveys that were conducted in the species' previously known range, an average of 39 Appalachian Elktoe were found at each site. This is a notable increase from surveys conducted between 1999 and 2018, when an average of seven Appalachian Elktoe were found per site. Biologists also found a healthy population of the state Special Concern Wavy-rayed Lampmussel. More Wavy-rayed

Lampmussels were found at a single site in 2020 (129) than at any site previously (50). Biologists hope to take advantage of these findings by augmenting or reintroducing mussel populations in other water bodies in the French Broad River basin. This process will involve collecting broodstock from the Pigeon River and propagating juveniles at the Conservation Aquaculture Center in Marion, N.C. ◆



Representatives from a healthy Appalachian Elktoe (and one Wavy-rayed Lampmussel) population found in the West Fork Pigeon River in Haywood County (Photo: Dylan Owensby)



Blotchside Logperch Reintroduction and Population Assessment Surveys

by Dr. Luke Etchison, Western Region Aquatic Wildlife Diversity Coordinator

Reintroduction

The State Endangered Blotchside Logperch is one of the rarest freshwater fish species in western North Carolina. Blotchside Logperch populations have been declining across their range for over a century due to their sensitivity to pollution and habitat alteration.

This August, Aquatic Wildlife Diversity biologists began reintroduction efforts in the Cheoah River near Robbinsville, N.C. by stocking 76 hatchery-bred Blotchside Logperch. These animals were propagated by Conservation Fisheries Inc., a non-profit partner located in Knoxville, Tenn., which specializes in rare fish propagation across the Southeast. This is the first

time in over a century that Blotchside Logperch have been in the Cheoah River. Biologists are planning to continue annual stockings and will eventually conduct snorkel surveys to determine how successful these efforts have been in creating a viable population.



Blotchside Logperch finding its new home in the Cheoah River (Photo: Dr. Luke Etchison)



A healthy adult Blotchside Logperch found during snorkel surveys in the South Toe River (Photo: Dr. Luke Etchison)

Surveys

Blotchside Logperch's small size, relatively low abundance and solitary lifestyle make it a difficult fish to study: even in its known range, biologists might survey an entire reach and not encounter a single individual. Aquatic Wildlife Diversity biologists recently conducted snorkel surveys to update their understanding of Blotchside Logperch distribution and abundance throughout its range in North Carolina (which, aside from the recent Cheoah River introduction, is thought to be entirely limited to the South Toe River). They were able to complete 16 surveys, where they saw 38 Blotchside Logperch (approximately 2.4 fish per site). Findings this year are fairly consistent with previous efforts, indicating that a stable, yet still rare, population remains viable in the South Toe River. Biologists were also able to home in on the Blotchside Logperch's highest density sites and are hopeful to use these areas to capture fish during future propagation efforts that will lead to additional stockings in the Cheoah River and throughout much of western North Carolina. ◆



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 men and women 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.



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