

## Community Inventory of Freshwater Turtles in the Lake James Watershed – Final Report

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### *Background*

One ecological tragedy of the last hundred years has been the rise of silent extinctions: the death of species before humans know where they exist. These extinctions— which are particularly prevalent in reptiles and amphibians— are often caused by human actions or negligence (Barbour, 1997). Turtles have been hunted by humans for ~20,000 years, but unsustainable harvesting practices and habitat destruction have brought many species to the brink of extinction in just the last century (Moll & Moll, 2004). Within their habitats, turtles contribute to several integral ecosystem services including biomass production, nutrient cycling, macroinvertebrate population control, and seed dispersal (Lovich et al., 2018; Barbour, 1997). Thus, when a turtle species is identified in a new area, it is important to delineate the extent of its new range, the relative size of its population, and its local natural history and ecology. More comprehensive knowledge of these factors enables us to better understand our part in preserving and interacting with these species.

Prior to our research, other researchers identified an Eastern Spiny Softshell Turtle (*Apalone spinifera spinifera*) in the Catawba river (Holbrook, 2021, see previous report). Similarly, McDowell County citizens had reported seeing Eastern River Cooters (*Pseudemys concinna concinna*) along the Catawba River

Greenway. These two turtle species have heretofore not been documented in Burke or McDowell Counties nor the surrounding counties (Aardema et al., 2016). To investigate a possible range expansion for these species, and better understand the freshwater turtle community as a whole, we conducted the first community inventory of freshwater turtles in the Lake James watershed.

### *Methods*

Throughout Spring and Summer 2023 we repeatedly sampled at 4 sites along the Catawba River Greenway, 4 sites in western Lake James at the confluence of the Catawba River, and 4 sites below the dam in the Old Catawba River (12 total sites in three general areas, See Map 1). These sites were chosen because of our previous experience sampling nearby for other fauna, and because sampling sites needed to be <75cm deep to allow traps to be partially exposed to the air. Heavy rain conditions delayed some of trapping efforts but allowed us to collect visual survey data of turtles. For our trapping efforts we used a large fyke and n=12 turtle traps (Memphis Net and Twine, Memphis, TN) to sample the variety of turtle species in each community. Traps were baited and left for approximately 18-24 hours before we returned to assess their contents. Upon capture, each turtle was marked on their carapace using a clockwise alphabetical scute filing method (see original proposal) and their markings were recorded according to Graeter et al. (2013). This marking

process did not harm the turtles and all animals were released as soon as marking was completed. After >1 week passed to allow turtles to return to typical behavior patterns, sites were trapped again using the same methods, and all new captures as well as recaptures were recorded.

### *Analysis of Findings*

We recorded the species richness of each study area and estimated population size of each species of turtles that we survey with the Schnabel Mark-Recapture Method (Gardner and Galante, 2014), using the equation:

$$N = \frac{\sum_{i=1}^m M_i C_i}{\sum_{i=1}^m R_i}$$

where  $M_i$  = the total number of previously marked animals at time  $i$ ,  $C_i$  = the number of new animals caught at time  $i$ , and  $R_i$  = the number of marked animals recaptured at time  $i$ .

### *Results*

We captured 104 individual turtles of five species in the Lake James Watershed. While we did not capture any Eastern Spiny Softshell Turtles, we did verify the presence of a robust Eastern River Cooter population. Although our estimates for this population were 34 individuals, our recapture efforts were hindered by unexpected difficulties (trap theft by humans, bait theft by raccoons), and during a visual basking site survey, we identified at least 73 individual River Cooters at the Catawba Greenway. (See Tables 1-3 for more information on species population estimates).

### *Notable Records*

As previously mentioned, we encountered Eastern River Cooters (*Pseudemys concinna concinna*) during our surveys. Their presence represents a significant range expansion for this species, which has not previously been recorded in the western Piedmont (Aardema et al., 2016). This apparent gap in the turtle's range (see fig. 2) is likely due to insufficient sampling in the past, but also could be due to natural range expansion in the species. Whatever the origin of this population, River Cooters are clearly well established in the region.

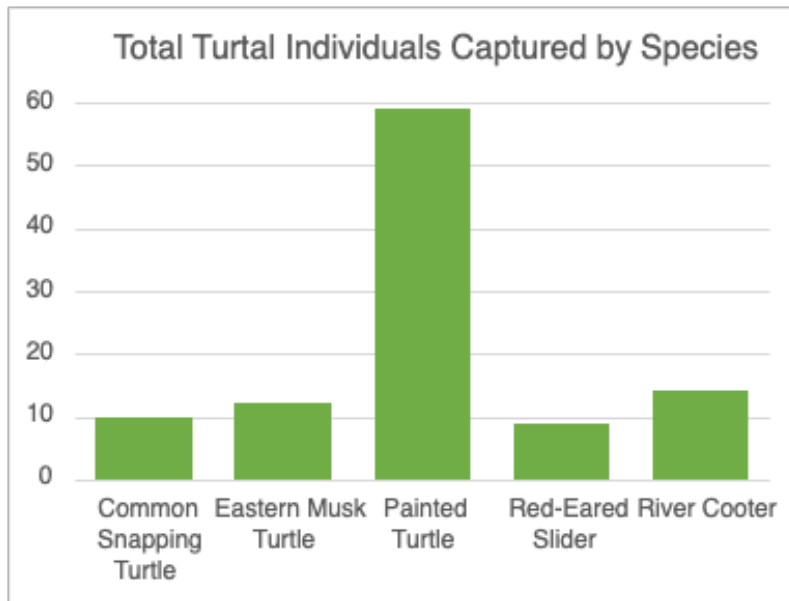


Figure 1: A graph identifying the number of each turtle species captured at all sites combined.

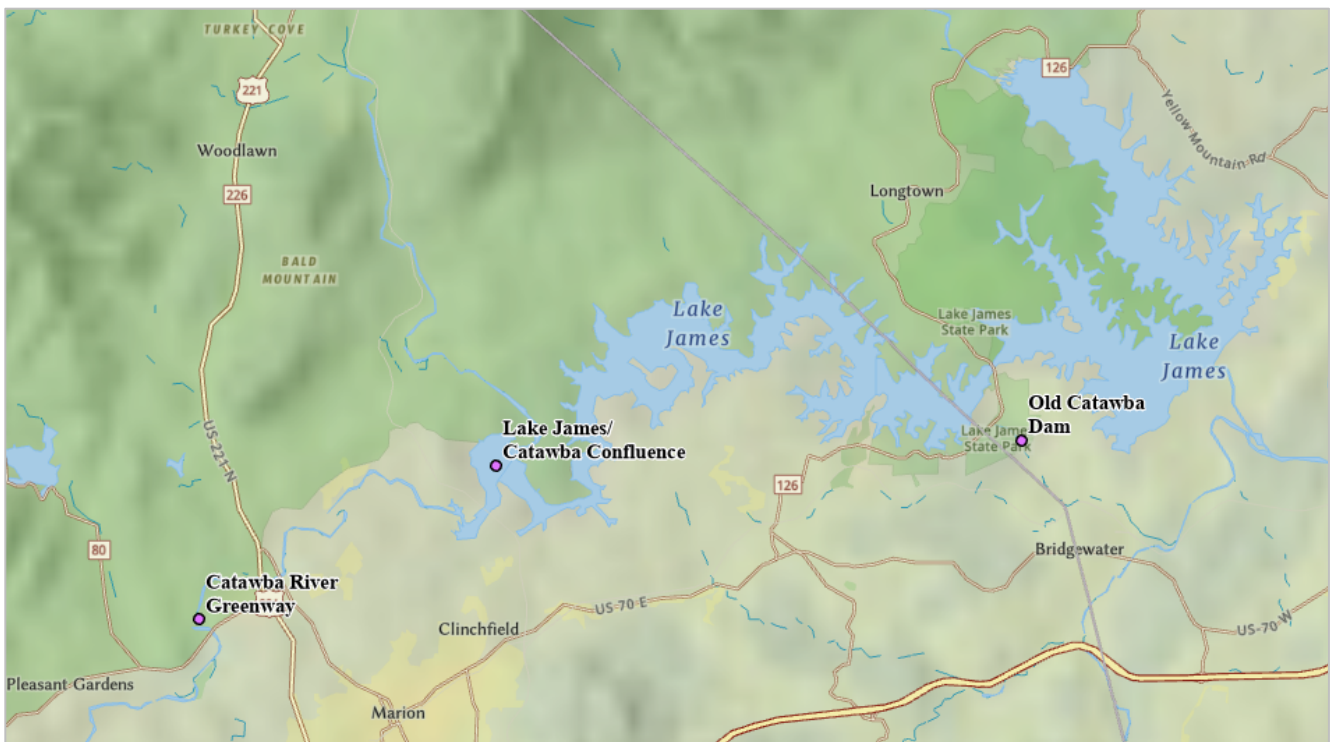


Figure 1: Map of three turtle sampling locations across the Lake James Watershed. We sampled four sites at each sampling location with 1-4 traps at each site.

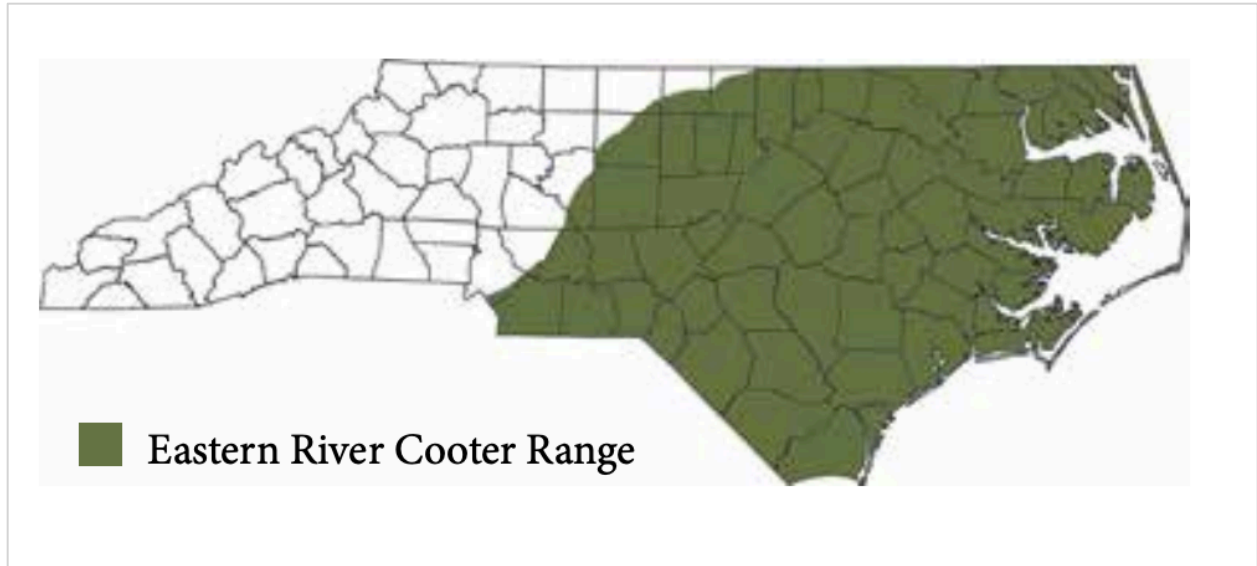


Figure 2: The currently published range of River Cooters in North Carolina (According to Ardema et al., 2016 in collaboration with NC Wildlife.)

Species	New Captures, Sample 1	New Captures, Sample 2	New Captures, Sample 3	Recaptured Individuals	Total Population Estimate
Common Snapping Turtle ( <i>Chelydra serpentina</i> )	0	1	4	0	Data Insufficient
Eastern Musk Turtle ( <i>Sternotherus odoratus</i> )	2	0	1	0	Data Insufficient
Painted Turtle ( <i>Chrysemys picta</i> )	5	8	0	1	45
Red-Eared Slider ( <i>Trachemys scripta elegans</i> )	1	0	0	0	Data Insufficient
River Cooter ( <i>Pseudemys concinna</i> )	10	1	3	2	34
<b>Community Totals:</b>	<b>18</b>	<b>10</b>	<b>8</b>	<b>3</b>	<b>79</b>

Table 1: Turtle captures at Catawba River Greenway sites, including individual samples, total recaptures (e.g. individuals encountered more than once) community totals and total population estimates where data were sufficient. Each numeric column represents an individual sampling event.

Species	New Captures, Sample 1	New Captures, Sample 2	Recaptured Individuals	Total Population Estimate
Common Snapping Turtle ( <i>Chelydra serpentina</i> )	4	0	0	Data Insufficient
Eastern Musk Turtle ( <i>Sternotherus odoratus</i> )	1	0	0	Data Insufficient
Painted Turtle ( <i>Chrysemys picta</i> )	3	8	0	Data Insufficient
Red-Eared Slider ( <i>Trachemys scripta elegans</i> )	3	5	0	Data Insufficient
River Cooter ( <i>Pseudemys concinna</i> )	0	0	0	Data Insufficient
<b>Totals:</b>	<b>11</b>	<b>13</b>	<b>0</b>	<b>Data Insufficient</b>

Table 2: Turtle captures at Lake James/Catawba confluence sites, including individual samples, total recaptures (e.g. individuals encountered more than once) community totals and total population estimates where data were sufficient. Each numeric column represents an individual sampling event.

Species	New Captures, Sample 1	New Captures, Sample 2	New Captures, Sample 3	Recaptured Individuals	Total Population Estimate
Common Snapping Turtle ( <i>Chelydra serpentina</i> )	0	0	1	0	Data Insufficient
Eastern Musk Turtle ( <i>Sternotherus odoratus</i> )	3	4	1	1	23
Painted Turtle ( <i>Chrysemys picta</i> )	9	20	6	2	206
Red-Eared Slider ( <i>Trachemys scripta elegans</i> )	0	0	0	0	Data Insufficient
River Cooter ( <i>Pseudemys concinna</i> )	0	0	0	0	Data Insufficient
<b>Totals:</b>	<b>12</b>	<b>24</b>	<b>8</b>	<b>3</b>	<b>229</b>

Table 3: Turtle captures at Old Catawba Dam sites, including individual samples, total recaptures (e.g. individuals encountered more than once) community totals and total population estimates where data were sufficient. Each numeric column represents an individual sampling event.

### *Discussion and Conclusions*

Overall, our data demonstrate several thriving communities of freshwater turtles throughout the Lake James watershed. Of the encountered species, we found that Painted Turtles were the most abundant and thus likely contribute to secondary biomass production and macroinvertebrate control. Red-Eared Sliders are a non-native species and may compete for resources and transmit disease to native turtle species (Pearson et al., 2015). However, these effects are more limited in larger, lotic water systems like the ones we studied and efforts to eradicate this species are often unsuccessful (García-Díaz et al., 2017). Since some of the individual Red-Eared Sliders we captured had shell wear indicating significant age, it can be assumed that this species has been present in the watershed for multiple decades. Turtle Species richness (n=5) and number of total recaptures (6) was slightly less than initially anticipated, although much of this discrepancy can be contributed to abnormally cool weather and heavy rain events at the start of our trapping efforts leading to lower capture rates, and perhaps reduced activity among turtles. The lack of Spiny Softshell Turtle (*A. s. spinifera*) could be the result of low population size, seasonal turtle movement, lack of a resident population, or trap avoidance. More concentrated trapping efforts would be needed to rule out a local population of the species. We intend to publish the presence of River Cooters in McDowell County as a Geographic Distribution note in the peer-reviewed Herpetological Review.

### *Management Recommendations and Avenues for Further Research*

Although our effort was extensive, multiyear efforts provide a clearer picture of turtle population status and could be beneficial. The Mark-Recapture methods we utilized would become more accurate with additional trapping

efforts, however alternative methods such as N-Mixture Models which only require visual counts of individuals over repeated sampling events may be more practical for some of the basking turtle species (e.g. River Cooters, Red-Eared Sliders).

Turtles are flagship species with the potential to garner public interest in the conservation of the Lake James Watershed as a whole – especially Common Snapping Turtles, as some individuals we encountered were >20lbs. Future efforts could integrate public education and include social media posts with updates on the health of individual turtles, our hometown ‘river monsters’. Red-Eared Sliders are invasive, but eradication efforts are often unsuccessful. However, attempts to reduce their population in the Lake James watershed could prove beneficial for maintaining native species populations and biodiversity. Several individual turtles we encountered had large masses of leeches and other parasites on them. Follow up research could focus more heavily on the impact of these parasites and their influence on community health.

### *Acknowledgements*

The investigators wish to thank Jack Racker for assistance with site access, Marshall Taylor for logistical support, and the Lake James Environmental Association for investing in this project and knowledge of the flora, fauna, and ecology of the Lake James watershed.

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