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# Surveys for the Alabama Map Turtle (*Graptemys pulchra*) in the Coosa River, Georgia

## **Cover Page Footnote**

Rebecca Byrd, Greg Greer, Todd Schneider, and Amber Young assisted with surveys. The map of the study area was created by Dylan Severens. David Bechler kindly provided the statistical analyses.

## **SURVEYS FOR THE ALABAMA MAP TURTLE (*Graptemys pulchra*) IN THE COOSA RIVER, GEORGIA**

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### **ABSTRACT**

The Alabama Map Turtle, found only in Mobile Bay drainages, is state-listed in Georgia as *rare* and has been petitioned for federal listing as *threatened*. Because this species has been poorly studied in Georgia, and in the Coosa River especially, a survey was undertaken to determine its status in the Coosa to help inform the federal listing decision. The 2014-2015 survey involved counting basking turtles from a motorboat with the aid of binoculars. The Alabama Map Turtle was the third most abundantly observed turtle species during the survey, preceded by only the Slider and River Cooter. All size/age classes were observed. The species' abundance and age distribution suggest a healthy, reproductive population in the Georgia portion of this river. It is unlikely that federal listing of the Alabama Map Turtle is warranted based on the results of this study and a 2003 survey of inhabited Alabama streams.

**Keywords:** Alabama Map Turtle, *Graptemys pulchra*, Coosa River, status, survey, conservation.

### **INTRODUCTION**

The Alabama Map Turtle (*Graptemys pulchra*) is a decidedly riverine species that has a specialized invertebrate-based diet. Males and females are strongly sexually dimorphic in head and overall size. The enlarged (megacephalic) and muscular heads of females have powerful jaws that allow them to crush the mussels and snails they prefer (Ernst et al. 1994). Males, with much smaller heads, likely eat softer-bodied invertebrates such as crayfish and aquatic insects. During warm weather, both sexes frequently bask on logs and rocks near the stream bank or within the channel. Females nest on sandbars and in sandy streambanks (Moulis 2008). In Georgia, the species is restricted to streams within the Coosa River drainage.

*Graptemys pulchra* is state listed in Georgia as *rare* (Jensen 1999) and has been recently petitioned for federal listing as *threatened* (CBD 2010). Threats in Georgia include illegal collection for the pet trade, stream perturbations, and population declines of prey items, particularly mussels and snails (Jensen op. cit.). However, the primary reason for state listing was the occurrence, at that time, of only a few documented records of the species in Georgia, from the Conasauga and Oostanaula rivers (Santhuff and Smith 1990). However, a previously unknown, but not unexpected, population of *G. pulchra* was discovered in the Coosa River near Rome in 2011 (Brown et al. 2011).

The purpose of this survey was to evaluate the health of this newly found Coosa River population and provide the results to the United States Fish and Wildlife Service to inform their listing decision.

### **MATERIALS AND METHODS**

Because map turtles have a specialized invertebrate diet, they are not easily sampled by baited hoop traps, as is done for most other emydid turtles. However, because they frequently bask on logs and rocks, visual searches can be effective. The Coosa River in Georgia is wide and deep enough to easily travel by motor boat and search for basking turtles using binoculars. Other portions of this drainage (the Conasauga, Coosawattee, Etowah, and Oostanaula rivers) are too narrow or shallow to fully sample by motor boat and thus were not included in this survey.

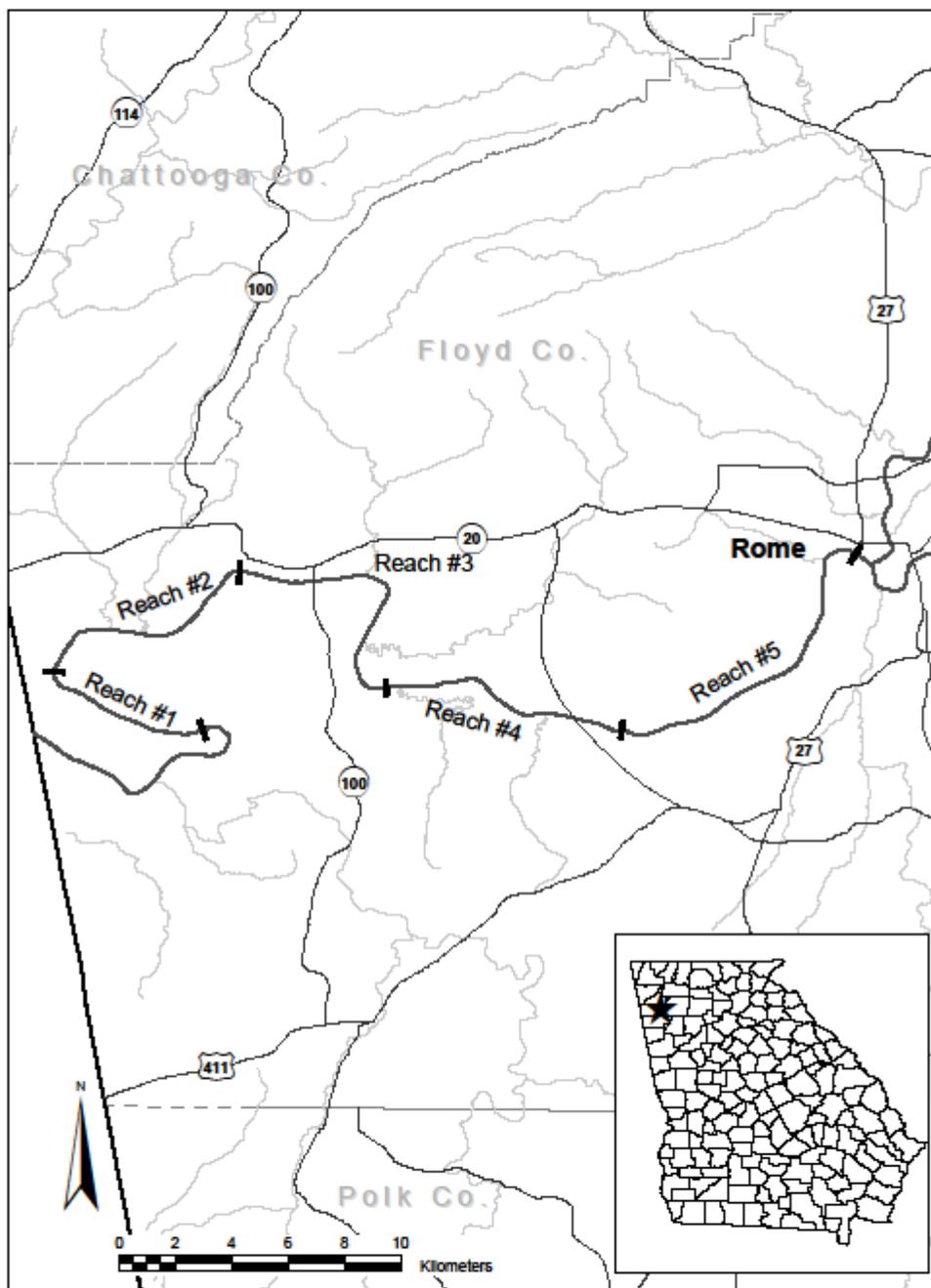
Surveys were conducted in five reaches (ranging in river length from 4.6–10.8 km) of the Coosa River from near its origin in Rome where the Oostanaula and Etowah rivers converge (34.25613°N, 85.18118°W), and downstream to where the water flow dramatically slows (34.19922°N, 85.39496°W) above the Lake Weiss impoundment (Figure 1), for a full study river length of 39.5 km. The entirety of the Coosa River in Georgia lies within Floyd County. The river is approximately 90 m wide on average and the median daily discharge and depth taken at the Mayo's Bar gage station is 60 m<sup>3</sup>/sec and 3.4 m, respectively. A mixed hardwood-forested riparian zone exists on both banks along most of the river's length, but its width is highly variable.

Each reach was surveyed twice, once in 2014 and again in 2015. Surveys were conducted mid-day (range: 11:01 – 14:49) to take advantage of the sun at its highest point and limit shading along the river banks. One person would steer and slowly motor the boat up- or downstream approximately halfway between basking logs along one of the banks and the mid-channel while one or two others in the front of the boat would spot, identify, and enumerate basking turtles using binoculars. Once the end of the reach was completed on one bank, the surveyors stopped and tied the boat along the bank above or below the reach being surveyed and paused for at least 20 min before beginning the survey along the other bank of the reach.

All surveys took place in late summer-early fall (range: 28 August – 21 October) when air (range: 24-34°C) and water (range: 19-27°C) temperatures, and cloud-cover (partly cloudy – sunny), were conducive to aerial basking (Jensen pers. obs.).

Water discharge, level (gage height), and temperature data were obtained from the United States Geological Survey's National Water Information System website (USGS, 2015) for the Coosa River (USGS 02397000: Mayo's Bar) gaging station at the 12:00 reading for each survey. This station is located approximately at the boundary between survey reaches 4 and 5, at the Coosa Lock and Dam Park. Air temperature was obtained from The Weather Channel (2015) website for the Rome area at the 12:00 reading for each survey date.

The river was accessed for reaches 1-3 at the public boat ramp on Old River Road near the town of Coosa, and at the Coosa Lock and Dam Park boat ramp for reaches 4 and 5. All surveys were conducted on weekdays to avoid heavy boat traffic that may disturb turtles from their basking perches. The number of boats encountered during each survey was recorded.

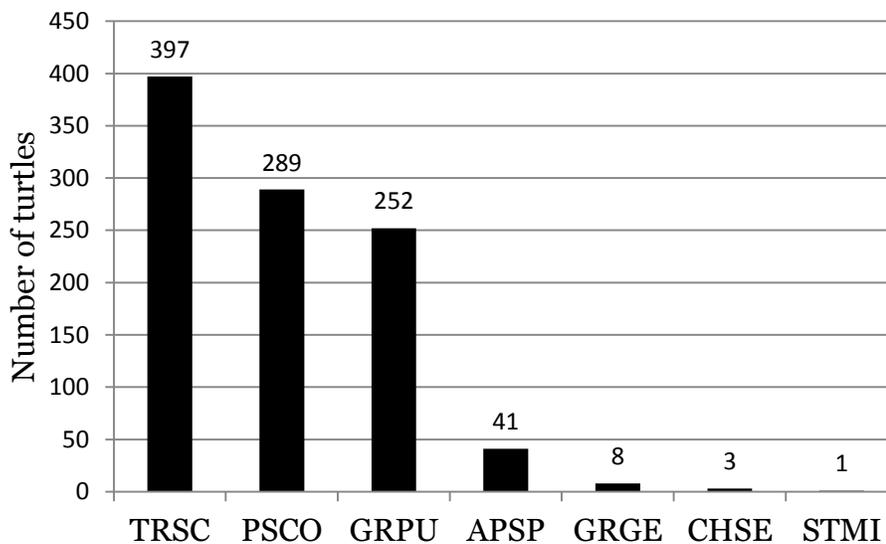


**Figure 1.** Survey reaches of the Coosa River. Map services and data available from U.S. Geological Survey, National Geospatial Program.

Statistical analyses were conducted with StatsDirect (2016) using Version 3.0.165. Analyses involved both parametric and non-parametric analyses on the number of turtles observed and potential controlling variables during the study.

## RESULTS

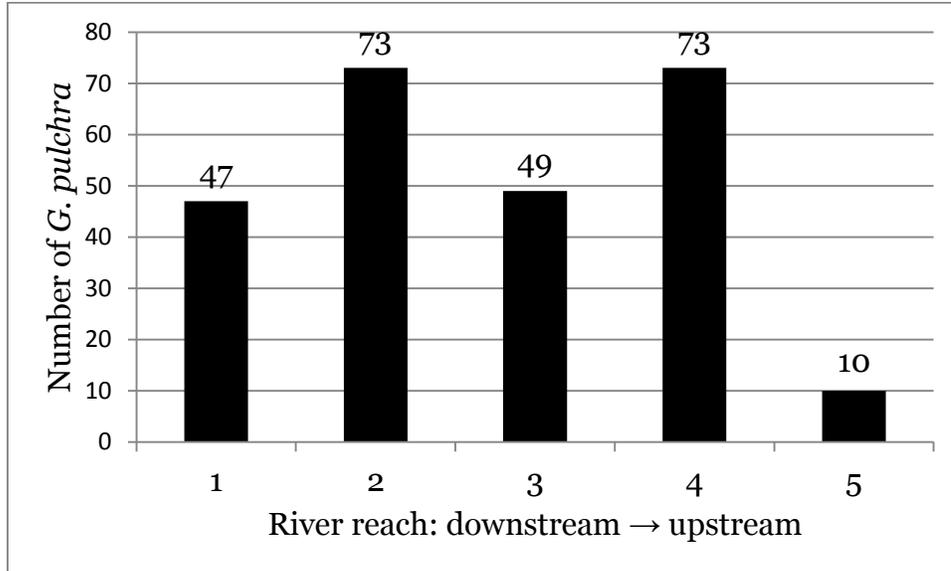
Nine hundred and ninety-one turtles, which could be identified to species, were observed throughout the survey area over the two year period. It is estimated that this number represents less than half of the total number of observed turtles, but many others were scared from perches by the boat and escaped to the water before positive identifications could be made. *Graptemys pulchra* was the third most often observed turtle species with 252 individuals (Figure 2), preceded by *Pseudemys concinna* (River Cooter; 289), and, most abundant, *Trachemys scripta* (Slider; 397). Also observed in decreasing abundance were *Apalone spinifera* (Spiny Softshell; 41), *Graptemys geographica* (Northern Map Turtle; 8), *Chelydra serpentina* (Common Snapping Turtle; 3), and *Sternotherus minor* (Loggerhead Musk Turtle; 1). While accurate ratios of juveniles to adults and males to females could not be made due to the limited amount of time turtles remained out of the water and the priority to use that fleeting time for species identification, all age classes and both sexes of *G. pulchra* appeared well represented.



**Figure 2.** Number of turtles per species identified during the survey. TRSC = *Trachemys scripta*; PSCO = *Pseudemys scripta*; GRPU = *Graptemys pulchra*; APSP = *Apalone spinifera*; GRGE = *Graptemys geographica*; CHSE = *Chelydra serpentina*; STMI = *Sternotherus minor*.

*Graptemys pulchra* was abundant in all survey reaches except the upstream-most, reach 5 (Figure 3). In this reach, *G. pulchra* averaged (combining both years) 0.5 turtles/km. In contrast, 5.1 turtles/km were observed in reach 1. However, a non-parametric analysis of variance showed no correlation with the number of Alabama Map Turtles observed per kilometer when compared to the sequential order of reaches surveyed (Kendall's rank correlation coefficient tau b = -0.471405, two-sided P = 0.0828).

*Pseudemys concinna* and *T. scripta* were abundant in all five reaches. A chi-square analysis of the three most abundant species shows that significant differences exist in the number of these species that could be observed and quantified (chi-square = 36.309168, df = 2, P < 0.0001).



**Figure 3.** Number of *Graptemys pulchra* observed in each study reach.

Air and water temperatures and water flow (discharge) showed no correlation with the number of Alabama Map Turtles observed per kilometer of the five reaches surveyed when analyzed by a multiple linear regression (Table I):

$$G. pulchra/km = 21.619 - 0.116 \text{ air temp } ^\circ\text{C} - 0.514 \text{ water temp } ^\circ\text{C} - 0.001 \text{ discharge (CFS)}.$$

These results are confirmed by an analysis of variance ( $R^2 = 36.502$ ,  $F = 1.150$ ,  $P = 0.403$ ; Table II) which shows no significance.

**Table I.** Multiple Linear Regression. Results for individual variables.

<u>Variable</u>	<u>b-value</u>	<u>r-value</u>	<u>t-value</u>	<u>P-value</u>
Intercept	b0 = 21.618		1.622	0.156
Air Temp °C	b1 = -0.116	r = -0.068	0.167	0.873
Water Temp °C	b2 = -0.514	r = -0.186	0.464	0.659
Discharge (CFS)	b3 = -0.001	r = -0.219	0.551	0.602

**Table II.** Analysis of Variance for Multiple Linear Regression. Sq = of squares

<b>Source</b>	<b>Sum Sq</b>	<b>DF</b>	<b>Mean Sq</b>
Regression	13.617	3	4.539
Residual	23.683	6	3.947
Total	37.301	9	

## DISCUSSION

*Graptemys pulchra* is an abundant turtle in the Coosa River of Georgia; only *T. scripta* and *P. concinna*, two very common turtles in Georgia (Jensen et al. 2008), were observed more often. The relative scarcity of *G. pulchra* in the upper Coosa seems consistent with similar scarcity in the two rivers that converge to form the Coosa, the Oostanaula where they are rarely observed (Jensen pers. obs.; G. Brown pers. comm.) and the Etowah where no documented observations have been made. It is unclear why *G. pulchra* appears less abundant in the upper Coosa and smaller drainages upstream, but it may be attributable to the possibility that the species prefers larger water bodies, as has been documented with many well-studied *Graptemys* spp. (Ernst et al. 1994). In an Alabama *G. pulchra* population, Carl Ernst observed that while males can be found in shallow sections, females seemed restricted to deep pools or impoundments (Ernst et al. op. cit.), which may lend support to why few *G. pulchra* are found in the shallower upper reach of the Coosa and its tributaries. Although Shealy (1976) published life history research on the “Alabama Map Turtle (*Gaptemys pulchra*),” this study was conducted in the Conecuh River where it has since been determined that the map turtle there is instead a different, cryptic species, the Escambia Map Turtle (*Graptemys ernsti*; Lovich and McCoy 1992). In fact, life history research on *G. pulchra* is virtually non-existent, yet sorely needed.

In addition to general abundance, all age classes of *G. pulchra*, including numerous juveniles, were observed during these surveys, suggesting healthy demographic representation with significant recruitment. Because the species has a very restricted range in Georgia and thus may be vulnerable to illegal collection, stream perturbations, and water quality degradation, it is recommended that *G. pulchra* remain a state protected species in Georgia. However, *G. pulchra* is much more common in Georgia than was known previous to this study. In Alabama, where the vast majority of this species’ range is found, a state-wide survey there revealed *G. pulchra* to be the second-most observed species and apparently stable with all age classes represented (Godwin 2003). Therefore, it would be difficult to argue that its status is dire enough to be deserving of federal threatened species designation, which is applied to species that are “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (The Endangered Species Act of 1973 [ESA; 16 U.S.C. § 1531 et seq.]).

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