

STATUS AND DISTRIBUTION OF BARBOUR'S MAP TURTLE (*GRAPTEMYS BARBOURI*) IN THE FLINT RIVER, GEORGIA

Report to Georgia Department of Natural Resources

By:

Benjamin P. Hepler, Rachel L. King and Lora L. Smith

Joseph W. Jones Ecological Research Center

20 December 2015

Introduction

Barbour's map turtle (*Graptemys barbouri*) occurs in drainages of the Apalachicola, Chattahoochee and Flint Rivers in Georgia, Florida and Alabama (Ernst et al. 1994). The species has been reported from the Ochlockonee River, which is outside the Apalachicola drainage, and may have become established there as a result of recent human introductions (Enge et al. 1996). Barbour's map turtle is most abundant in wide, clear streams with limestone or granite substrate, and exposed wood debris and rocks are important as basking sites for this species (Moulis 2008). Barbour's map turtle exhibits extreme sexual size dimorphism with adult females attaining a size of >30 cm carapace length, whereas adult males are generally <12 cm in length. Large individuals feed primarily on bivalves and gastropods and juveniles and adult males feed primarily on smaller, soft-bodied invertebrates. Juvenile and adult male Barbour's map turtles are often associated with rocky shoals, while large adult females are more often associated with deep, sandy pools, sites with large woody debris, in addition to shoals (Sanderson 1974, Moulis 2008, Sterrett 2009). Barbour's map turtles are common in portions of the Flint River and Spring Creek, in Georgia (Moulis 2008, Sterrett et al. 2010), but the species is reportedly much less common in the Chattahoochee River (Moulis 1997).

Barbour's map turtle was included in a recent multi-species petition for federal listing under the U.S. Endangered Species Act (Center for Biological Diversity 2010). The petition cited population declines in this species due primarily to habitat loss and over-exploitation as justification for listing. The species is listed as "Threatened" in Georgia, (www.georgiawildlife.com); however, current information is needed to evaluate the status of the

species. Hence, surveys to assess the status of Barbour's map turtle in southwestern Georgia were conducted in 2014-2015.

Methods

Basking surveys for Barbour's map turtles were conducted May-September 2014 and in June-July 2015 on the Flint River (approximately 330 km from Lake Seminole in Decatur County to Salem in Upson County) and on navigable sections of four of its major tributaries, Chickasawhatchee Creek (4.5 km), Ichawaynochaway Creek (57 km), Kinchafoonee Creek (32 km), Muckalee Creek (23 km), as well as Spring Creek (9 km). Surveys were attempted on the Ochlockonee River in Thomas County in August 2015 (7.7 km from Hwy 19 to Hwy 84); however, low flows and abundant downed woody debris precluded our ability to survey the remainder of this river. Surveys on the Chattahoochee River (approximately 305 km from the Fairchild Boat Ramp on Lake Seminole in Seminole County to West Point in Troup County) were carried out in June-August of 2015 and included the Walter F. George Lake and two of its largest branches as well as the portion of the Chattahoochee River through Fort Benning. The section of the Chattahoochee River north of the Fall Line, near Columbus, including Lake Oliver and Lake Harding (17 km) was surveyed, although this section lies outside of the known range of the species. All streams surveyed for Barbour's map turtles are depicted in Figure 1.

We divided all waterways into sections that were approximately 7-9 km long so that surveys could be completed in 2-4 hours. In some instances, these sections were shorter because they were divided by obstacles such as dams or shoals. A Trimble Nomad® was used to navigate and to record the start and end points for each survey section. Surveys were generally conducted between 1100 and 1700 h, with each survey taking approximately 70-110 minutes. On navigable sections of the Flint River and Chattahoochee River, a flat-bottomed jon boat was used to carry a navigator and an observer. During each survey, the navigator maintained a slow speed (8-16 km/hr) along a randomly chosen bank of the river, while the observer used binoculars (Nikon Monarch®, 8 x 42 magnification) to identify and count all basking turtles within approximately 140 m of the boat. Upon reaching the end of a section, we waited 5-10 minutes to allow turtles that may have dropped into the water to re-emerge on basking sites. A survey of the remaining bank was then completed using the same protocol described above. In tributaries of the Flint

River and the Ochlockonee River, which were not navigable by jon boat, surveys were conducted from kayaks using a single downstream pass. Both banks were surveyed simultaneously, with the lead person being the primary observer and the rear person recording data and scanning for turtles missed by the lead observer.

Turtles were identified to species wherever possible. We differentiated between adult male and female Barbour's map turtles; females were identified by their large broad heads, smooth shells, and typically large body size. Males greater than approximately 7 cm in carapace length (CL) were identified by keeled carapace and long tails. Individuals with $CL < 7$ cm were considered juveniles. In surveys conducted in 2015, to eliminate uncertainty in differentiating adult males from immature females, any small Barbour's map turtle whose sex was unclear was placed into the category of "male-juvenile." Similarly, because the river cooter (*Pseudemys concinna*) and the yellow-bellied slider (*Trachemys scripta*) could be confused from a distance, individuals that could not be identified as one or the other were placed into a separate category of "*Pseudemys/Trachemys*." In 2014, turtles that entered the water before the observer could identify them were not recorded. In 2015, unidentifiable turtles were listed as "unknown."

Variables that might influence basking activity during surveys were also recorded. These included air temperature ($^{\circ}C$), an estimate of cloud cover (0-25%, 25-50%, 50-75%, and 75-100%), river gage height, and discharge [cubic feet per second (CFS)], which were taken from the USGS gage station (<http://waterdata.usgs.gov/ga/nwis/>) located closest to the respective survey section. Basking habitat within each section was subjectively categorized as "High, Medium, or Low," or a combination of these, according to the relative number of exposed rocks and coarse woody debris. The start and end time of each survey was also recorded. Data are reported in turtles observed per river km surveyed for comparison of relative abundance among streams.

Results and Conclusions

We observed Barbour's map turtles on all of the streams surveyed (Table 1). Five additional turtle species were observed during surveys including the river cooter (*Pseudemys concinna*),

yellow-bellied slider (*Trachemys scripta*), spiny softshell (*Apalone spinifera*), Florida softshell (*A. ferox*), and loggerhead musk turtle (*Sternotherus minor*; Table 1).

Barbour's map turtle was the most commonly observed turtle species on the Flint River (n= 3323; Table 1, Fig. 2). The Flint River also had the highest observation rate of Barbour's map turtles among the streams surveyed (9.7 turtles/km); males were observed most frequently, followed by adult females and juveniles, respectively (Fig. 3). Barbour's map turtles were observed in all sections of the Flint River, but the observation rate was highest in Dougherty and Lee/Worth County, and lowest in Decatur County and southern Baker/Mitchell County (Fig. 4). Map turtles were abundant in Lake Blackshear on the Flint River.

The second highest observation rate for Barbour's map turtles (behind river cooters) occurred on Spring Creek (5.4 turtles/km), where we observed a total of 79 individuals on 14.5 km of stream. Males were the most frequently observed sex/age class.

Barbour's map turtle was the second most frequently observed species on the Chattahoochee River (n= 731) behind the river cooter (*Pseudemys concinna*; n= 983; Table 1, Fig. 2); however, the observation rate for map turtles on the Chattahoochee River was only 2.4 turtles/km. Most map turtles were observed on the lower portion of the Chattahoochee River in Seminole County and south of Fort Benning (Stewart County; Fig. 5). No Barbour's map turtles were observed in Walter F. George Lake (Figs. 5 & 6, sections 13-18). Surveys above the Fall Line near Columbus, which is outside of the known range for the species did not yield any observations of Barbour's map turtles.

We found no relationship between air temperature, stream flows or relative number of basking sites on Barbour's map turtle observation rates on Flint River or Chattahoochee River (Tables 2 and 3). It is not surprising that air temperature was not related to observations of turtles, since surveys took place from May - September, when day time temperatures were consistently high and relatively stable. However, stream flows were variable, ranging from 607-8,690 CFS on the Flint River and 187-3,310 CFS on the Chattahoochee River. Our subjective categorization of basking site abundance was likely not an adequate measure of true abundance of this habitat feature. However, it appears that basking sites may not be a limiting resource for this species on the streams surveyed.

Our survey results were vastly different from those of Moulis (1997), who confirmed occurrence of Barbour's map turtles at only 11 sites in nine counties surveyed (8.03%) on the Flint River and found no map turtles on the Chattahoochee River. However, Moulis (1997) searched for turtles at bridge crossings rather than conducting surveys by boat. More recent anecdotal accounts suggested the species was common in streams in southwestern Georgia (Moulis 2008, Sterrett et al. 2010). Our data indicate that Barbour's map turtle is still common on the Flint River and Spring Creek. The species was also detected in all major tributaries of the Flint River, although observation rates were lower in these streams than in the river. Although Barbour's map turtle was less common on the Chattahoochee River than on the Flint River, it was still the second most frequently observed species. However, the species was apparently rare or absent from Walter F. George Lake on the Chattahoochee River. We did not detect Barbour's map turtle above the Fall line on the Chattahoochee River, including the impoundments that form Lake Harding and Lake Oliver; however, this section of the river is outside the known range of the species.

Literature Cited

- Center for Biological Diversity. 2010. Petition to list 404 aquatic, riparian and wetland species from the southeastern United States as threatened or endangered under the endangered species act. <http://www.fws.gov/cookeville/pdfs/sepetitionfinal.pdf>. 1145 pp.
- Enge, K. M., R. L. Cailteux, and J. J. Nordhaus. 1996. Geographic distribution: GRAPTEMYS BARBOURI. *Herpetological Review* 27:150-151.
- Ernst, C.H., J.E. Lovich, and R.W. Barbour. 1994. *Turtles of the United States and Canada*. Smithsonian Institution, Washington, D.C.
- Moulis, R. 1997. Unpublished report on the status of *Graptemys barbouri*. Georgia DNR.
- Moulis, R. 2008. Barbour's map turtle *Graptemys barbouri*. Pp. 478-480 in J. B. Jensen, C. D. Camp, J. W. Gibbons, and M. J. Elliott (eds.), *Amphibians and Reptiles of Georgia*. University of Georgia Press, USA.
- Sanderson, R. A. 1974. Sexual dimorphism in the Barbour's map turtle (Carr and Marchand). M.S. thesis, University of South Florida.

Sterrett, S.C. 2009. The ecology and influence of land use on river turtles in southwest Georgia. MS thesis, University of Georgia.

Sterrett, S.C., L.L. Smith, S.W. Golladay, S.H. Schweitzer, and J.C. Maerz. 2010. The conservation implications of riparian land use on river turtles. *Animal Conservation* 2010:1-9.

Table 1. Turtles observed during basking turtle surveys on southwestern Georgia streams in 2014-2015.

Stream	Length Surveyed (km)	<i>Graptemys barbouri</i>	<i>Pseudemys concinna</i>	<i>Trachemys scripta</i>	<i>Apalone ferox</i>	<i>Apalone spinifera</i>	<i>Sternotherus minor</i>	Unid. turtle
Chattahoochee River	305	731	983	228	0	11	0	139
Flint River	342	3,323	1,929	83	2	63	29	115
Chickasawhatchee Creek	4.5	4	5	2	0	0	0	2
Ichawaynochaway Creek	57	37	118	3	0	4	0	1
Kinchafoonee Creek	32	9	67	7	1	10	2	0
Muckalee Creek	23	10	109	0	1	15	4	1
Ochlockonee River	7.7	4.0	12	4	0	0	0	9
Spring Creek	14.5	79	124	23	0	2	2	0
Total	785	4,197	3,347	350	4	105	37	267

Table 2. Correlation coefficients for survey variables (flow rates in cubic feet per second, CFS, and air temperature in °C) versus observation rates of Barbour’s map turtle on the Flint River and Chattahoochee River during basking surveys, 2014-2015.

	Flow rate (CFS)	Air Temperature (°C)
	r	r
Flint River (n = 45)	0.01	-0.15
Chattahoochee River (n = 40)	0.13	-0.05

Table 3. Mean (standard deviation) observation rate (Turtles/km) of Barbour’s map turtle at sites with low, medium, and high relative abundance of potential basking sites on the Flint River and Chattahoochee River, 2014-2015.

	Flint River	Chattahoochee River
Relative abundance of basking sites	Turtles/km	Turtles/km
Low	12.9 (8.7)	0.57 (0.9)
Medium	7.6 (6.0)	4.03 (4.69)
High	9.7 (6.1)	1.32 (2.47)

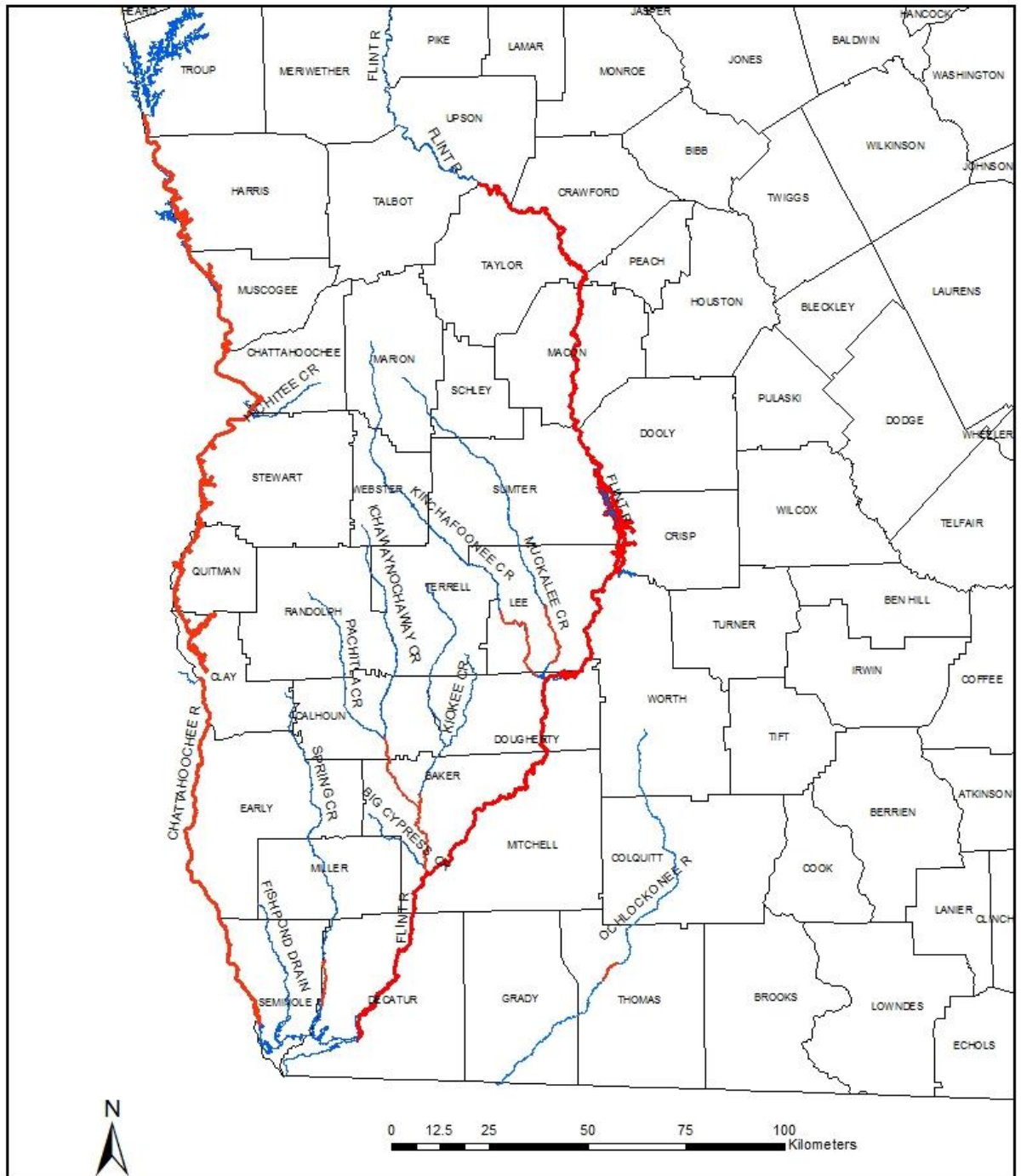


Figure 1. Survey locations (in red) for Barbour's map turtle, *Graptemys barbouri*, on the Flint River, Muckalee Creek, Kinchafoonee Creek, Ichawaynochaway Creek, Spring Creek, Ochlockonee River, Chattahoochee River, and Chickasawhatchee Creek in 2014 and 2015.

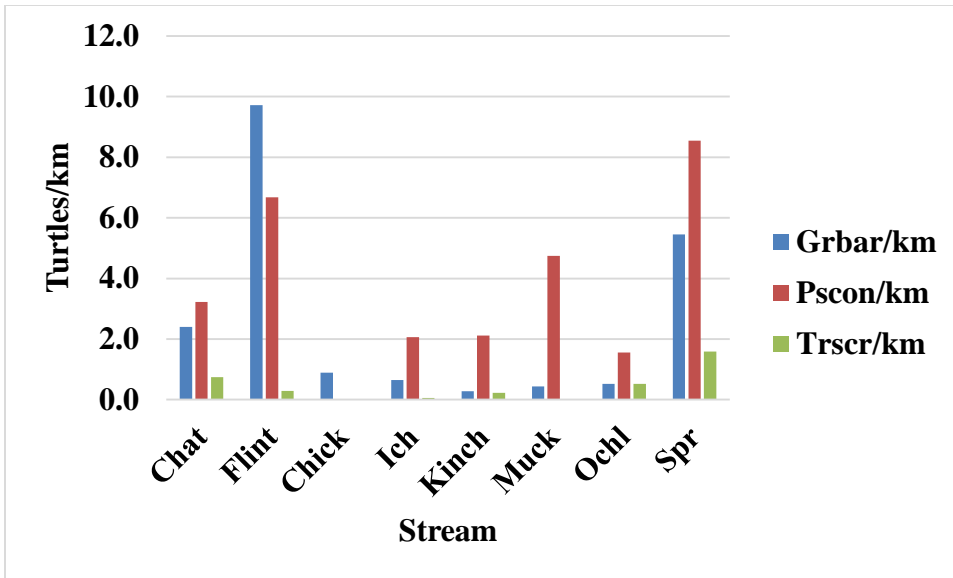


Figure 2. Observation rate (turtles observed per km surveyed) of the three most common turtle species on eight streams in southwestern Georgia, 2014-2015. Grbar = *Graptemys barbouri*, Pscon = *Pseudemys concinna*; Trscr = *Trachemys scripta*.

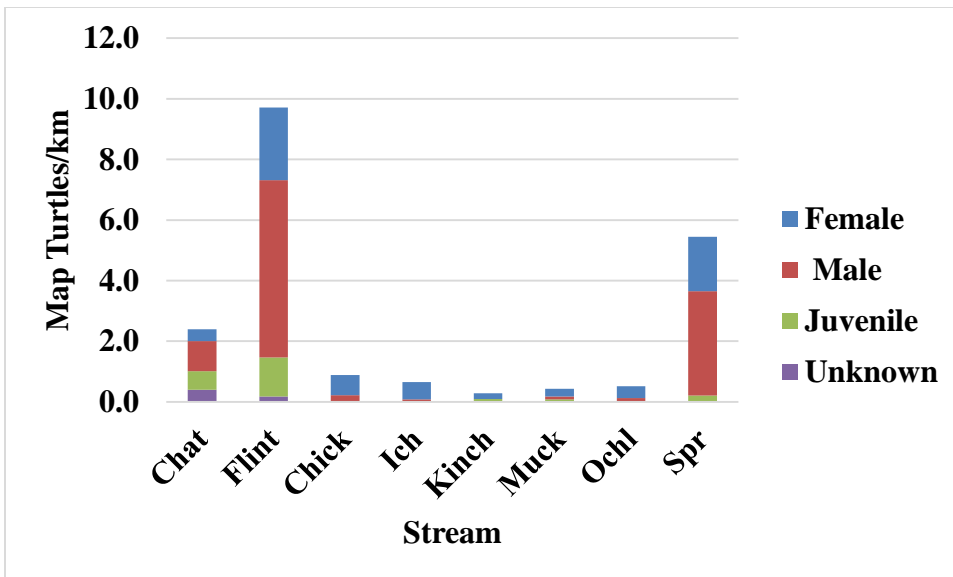


Figure 3. Observation rate of sex/age classes of Barbour's map turtle on eight streams in southwestern Georgia, 2014-2015.

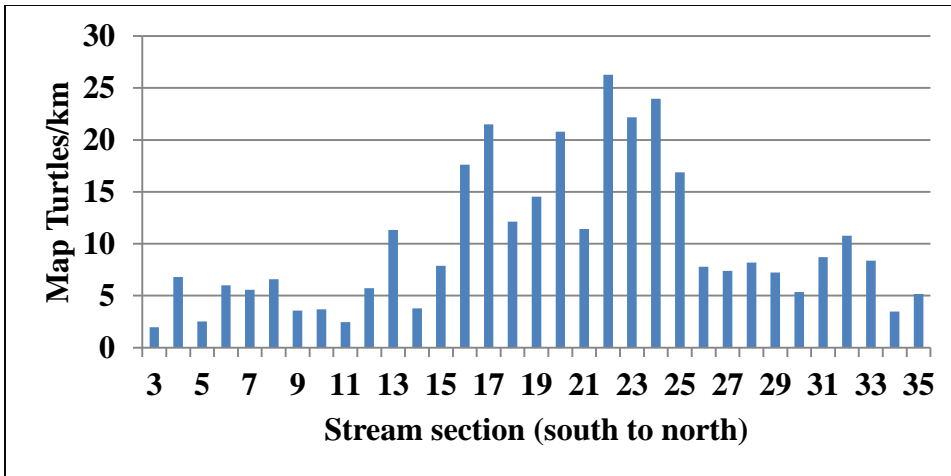


Figure 4. Observation rate (turtles/km) by section on the Flint River in Georgia, 2014-2015.

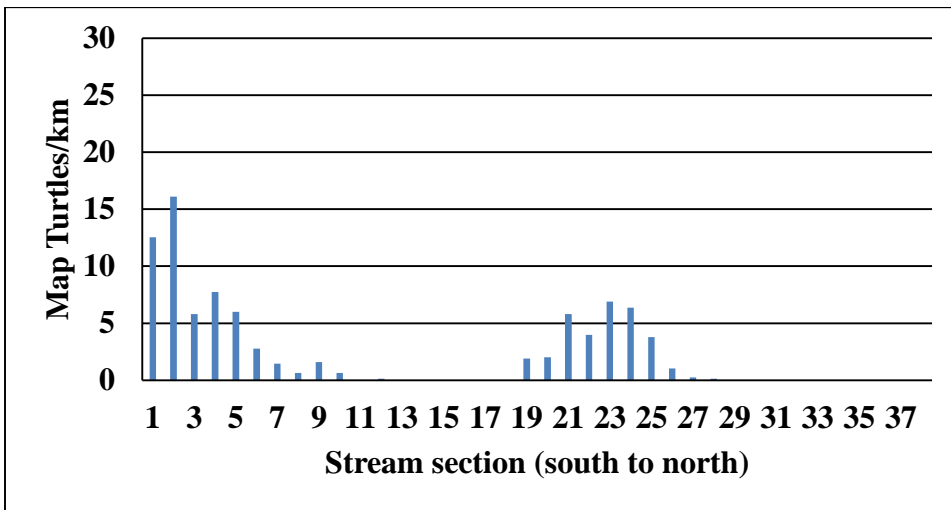


Figure 5. Observation rate (turtles/km) by section on the Chattahoochee River in Georgia, 2014-2015.

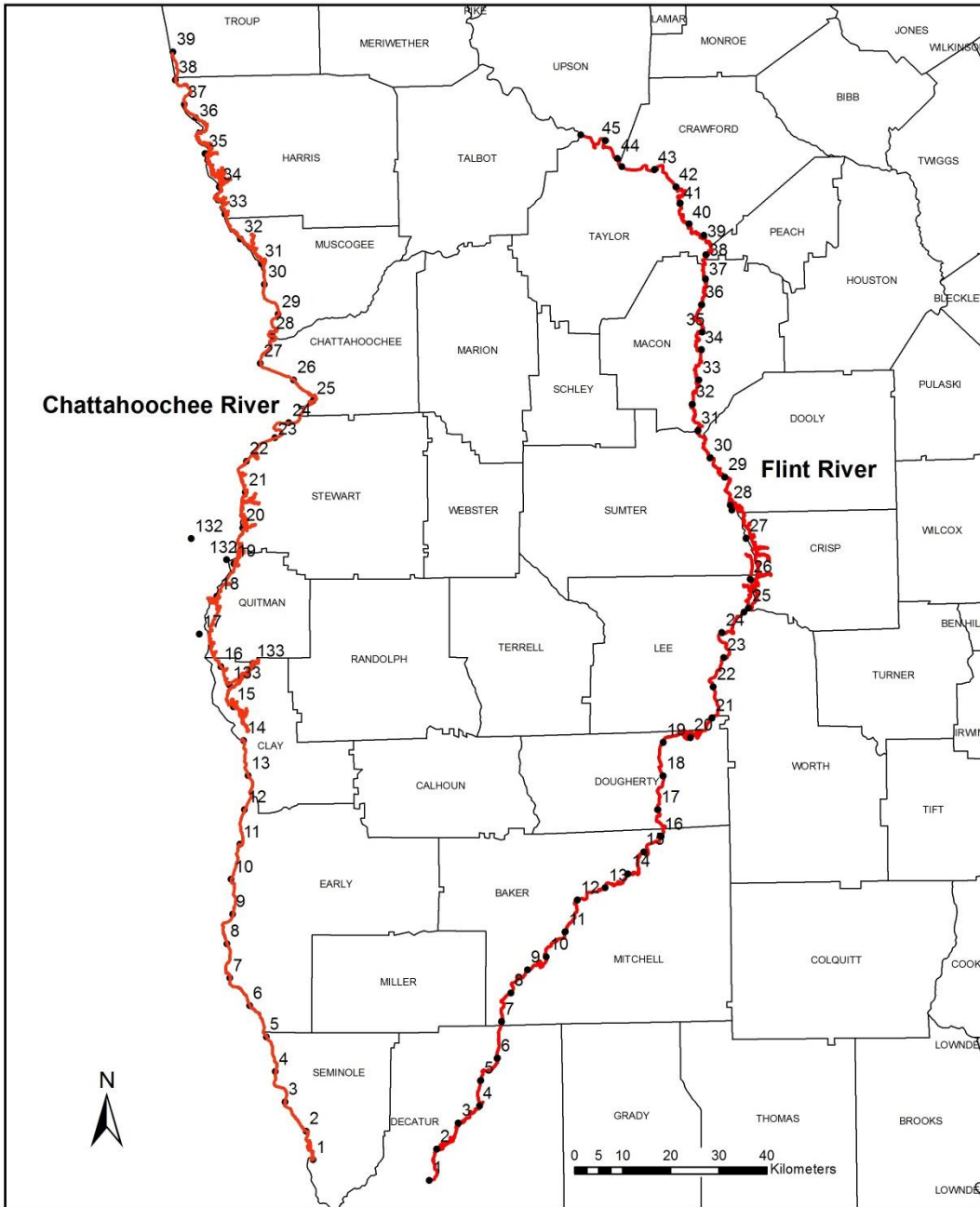


Figure 6. Sections of the Chattahoochee River and Flint River surveyed for basking Barbour's map turtle in 2014-2015.