

**Ringed Map Turtle  
(*Graptemys oculifera*)**

**5-Year Review:  
Summary and Evaluation**



Hatchling ringed map turtle. Photo: © Luke Pearson

**U.S. Fish and Wildlife Service  
Southeast Region  
Mississippi Ecological Services Field Office  
Jackson, Mississippi**

**December 2024**

## **5-YEAR REVIEW**

### **Ringed Map Turtle (*Graptemys oculifera*)**

#### **GENERAL INFORMATION**

**Current classification:** Threatened

**Lead Field Office:** Mississippi ES Field Office, Luke Pearson, (601) 321–1125

**Review prepared by:** Luke Pearson, Mississippi Ecological Services Field Office

**Reviewers:**

**Cooperating Field Office:** Louisiana Ecological Services Field Office

**Lead Regional Office:** Atlanta Regional Office, Carrie Straight

**Date of original listing:** January 22, 1987 ([51 FR 45907](#)); December 23, 1986)

**Methodology used to complete the review:** In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants ([50 CFR 424.11](#)). The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the ringed map turtle to inform this status review. We announced initiation of this review and a request for information in a published *Federal Register* notice on June 6, 2024 ([89 FR 48437](#)), with a 60-day comment period and received one public comment with information of applied Best Management Practices in the silviculture industry. The primary sources of information used in this analysis were the 1986 final listing rule, 1988 Recovery Plan (Service 1988), 2010 and 2020 5-year Status Reviews (Service 2010, 2020), peer-reviewed scientific publications, unpublished survey data and reports, and solicited information from knowledgeable individuals, including those associated with academia and State conservation programs. This review was completed by the Service, Mississippi Ecological Services Field Office, Jackson, Mississippi. All literature and documents used for this review are on file at the Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the ringed map turtle.

**FR Notice citation announcing the species is under active review:** June 6, 2024 ([89 FR 48437](#))

**Species' Recovery Priority Number at start of 5-year review ([48 FR 43098](#)):** 14. The ringed map turtle is a species with a low degree of threat and high recovery potential.

**Review history:**

January 10, 2020 – The 2020 5-year review for the ringed map turtle included new information gathered between the 2010 5-year review and 2019. The 2020 5-year review recommended no change in listing status.

#### **REVIEW ANALYSIS**

## **Listed Entity**

### **Taxonomy and nomenclature**

We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service, the Society for the Study of Amphibians and Reptiles (SSAR; Crother 2017), and the Turtle Taxonomy Working Group (TTWG 2021).

### **Distinct Population Segment (DPS) ([61 FR 4722](#))**

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This species was not listed as a DPS, and we have no new information that would indicate the species should be listed as a DPS under the Service's 1996 DPS Policy.

## **Recovery Criteria**

### **Recovery Plan or Outline**

Recovery Plan for the Ringed Sawback Turtle (*Graptemys oculifera*), April 8, 1988.

Recovery plans are not regulatory documents and are intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act ([84 FR 45020](#)).

“The criteria for delisting the species are:

- (1) Protection of a total of 150 miles (241 km) of the turtle's habitat in two reaches of the Pearl River. These reaches must be on opposite ends of the Ross Barnett Reservoir at Jackson. The smaller of the two reaches must contain a minimum of 30 river miles [rmi].
- (2) Evidence of a stable or increasing population over at least a ten-year period in these two Pearl River reaches.
- (3) An established, continuing plan of periodic monitoring of population trends and habitat to ensure a stable population in these river reaches.” (Service 1988, p. 12)

**Criterion 1:** A ringed map turtle sanctuary has been designated north of the Ross Barnett Reservoir at Jackson which directly protects 12 rmi (19.3 river kilometers [rkm]) of the Pearl River. This sanctuary was set aside by the Pearl River Valley Water Supply District (District) from Ratliff Ferry to Lowhead Dam (Leake County Water Park) on the Pearl River, effective July 1990. Within the sanctuary, the District is required to maintain informational signs to facilitate public awareness of the sanctuary and of the importance of the area to the species, conduct channel maintenance by methods which do not hinder the propagation of the species, and maintain this sanctuary in perpetuity for all potential future property owners. Additionally, 84.4 rmi (135.9 rkm) of the Bogue Chitto, West Pearl River, and Bogue Falaya are designated Scenic Rivers in Louisiana. Indirect protections includes those afforded by conservation lands adjacent to the Pearl River and Bogue Chitto that are within Federal (100.7 rmi; 162.4 rkm), State (79.1 rmi; 127.3 rkm), Tribal (23 rmi; 39 rkm), and NGO (10.9 rmi; 17.5 rkm) ownership and management. These conservation lands total approximately 215.7 rmi (347 rkm) of the Pearl

River, Bogue Chitto, and Bogue Falaya. Therefore, this criterion has been partially met, as there are some direct and indirect protections within the range of the ringed map turtle, although threats (e.g., heavy recreational use, dredging, mining) are present and ongoing on some protected waterways.

**Criterion 2:** The University of Southern Mississippi, Millsaps College, Louisiana Department of Wildlife and Fisheries, and U.S. Geological Survey conducted surveys rangewide between 2019 and 2024. Current estimates suggest an increase in population size over a 34-year monitoring period at two sites (Lakeland and Columbia) and a decrease in population size at three sites (Carthage, Ratliff Ferry, and Monticello) (Jones 2017; Devros et al. 2023; see Table 1). Both sites with an increasing population trend are downstream of the Ross Barnett Reservoir, while the only two sites (Carthage and Ratliff Ferry) upstream of the reservoir are declining. Long-term monitoring needs to be expanded to include the newly discovered Bogue Falaya population to document population trends in this discrete genetic lineage.

This criterion has partially been met, with two of the three populations downstream of the Ross Barnett Reservoir exhibiting an increase in population size in the last 34 years. However, populations upstream of the reservoir are declining, and additional monitoring is necessary to determine the cause.

**Criterion 3:** There is no formal population and habitat monitoring plan for the ringed map turtle. However, monitoring studies have been conducted at regular intervals using similar techniques, as described above, and as a result, this criterion has been partially met.

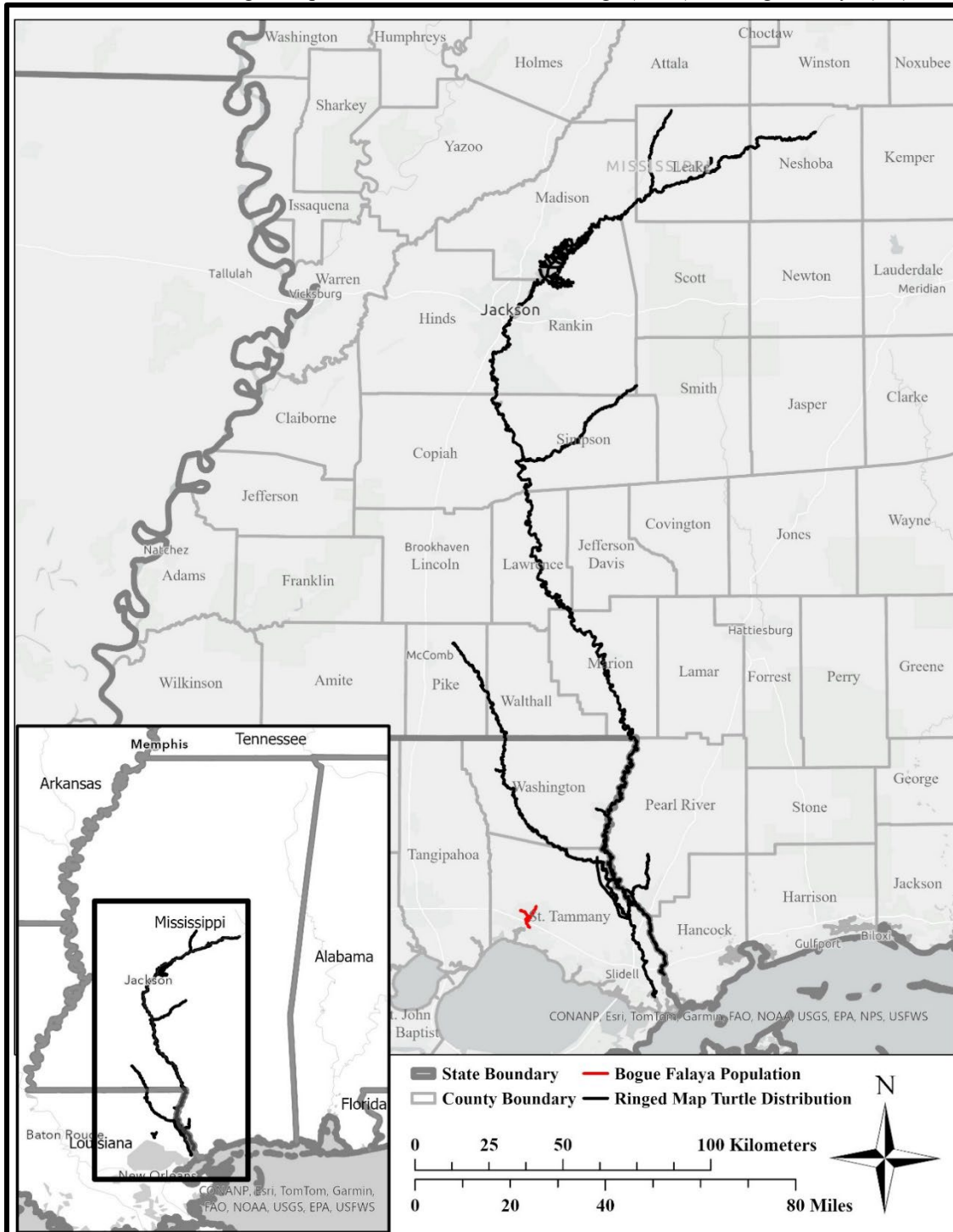
### **Biology and Habitat Summary**

Since the last 5-year review (Service 2020), three surveys have estimated population abundance for the ringed map turtle. The University of Southern Mississippi assessed the population trends over time at the five long-term monitoring sites and attempted to estimate population abundance at an additional three sites using mark-resight surveys (Devros et al. 2023). Over a 34-year monitoring period, population abundance has increased at the Lakeland (+50%) and Columbia (+37%) sites, while the population abundance at the three remaining sites are declining (Carthage: -19%; Ratliff Ferry: -69%; Monticello: -60%; Table 1). At the Lakeland monitoring site, mark-resight surveys yielded similar density estimates (217.7 turtles/rkm) as earlier total population density estimates (219 turtles/rkm) using basking densities with a correction factor (Selman 2020; Devros et al. 2023). Population densities were estimated for eight additional sites within the Pearl River drainage, ranging from 17 to 159 ringed map turtles/rkm (Devros et al. 2023; Selman 2024).

The ringed map turtle was considered endemic to the Pearl River drainage; however, a disjunct population was discovered in the Bogue Falaya within the Pontchartrain Basin of Louisiana in 2021. This population was determined to be genetically distinct, have slightly lower genetic diversity, and low population abundances when compared to the populations from the Pearl River drainage (Glorioso et al. 2024). This new population inhabits approximately 11.2 rmi (18 rkm) of the Bogue Falaya and Tchefuncte Rivers. This population is naturally occurring and presumed to be relatively small (<500 individuals), suggesting isolation from the Pearl River drainage for an extended period of time. Currently, the ringed map turtle inhabits approximately 808 rmi (1,300 rkm) in the following rivers and streams: 520 rmi (837 rkm) of the Pearl River; 29.6 rmi (47.6 rkm) of the Yockanookany River; 108 rmi (174 rkm) of the Bogue Chitto; 49 rmi

(78.8 rkm) of the Strong River; and the remaining range occurring in small tributaries. Range extensions since the previous 5-year review include the East Pearl River (4.5 rmi; 7.3 rkm), West Pearl River (6.6 rmi; 10.7 rkm), and two small tributaries (4.4 rmi; 7.1 rkm; Selman 2024). No known range contractions have occurred within the Pearl River drainage.

**Figure 1.** Distribution of the ringed map turtle in the Pearl River drainage (black) and Bogue Falaya (red).



**Table 1.** Lincoln-Peterson population density estimates (turtles/rkm) for the ringed map turtle (*G. oculifera*) at five long-term monitoring sites in the Pearl River drainage.

Site	1988/1989	1994	2002	2008/2009	2013/2014	2022	Source of Information
Carthage	92	48	113	76	47	66	Jones (2017); Devros et al. (2023)
Ratliff Ferry	371	331	428	241	242	107	Jones (2017); Devros et al. (2023)
Lakeland	129	104	160	159	228	218	Jones (2017); Devros et al. (2023)
Monticello	151	107	103	79	94	60	Jones (2017); Devros et al. (2023)
Columbia	137	85	130	38	82	187	Jones (2017); Devros et al. (2023)

### **Threats (Five-Factor Analysis) Summary**

The status of a species is determined from an assessment of factors specified in section 4(a)(1) of the Act, including: Factor A: the present or threatened destruction, modification, or curtailment of its habitat or range; Factor B: overutilization for commercial, recreational, scientific, or educational purposes; Factor C: disease or predation; Factor D: the inadequacy of existing regulatory mechanisms; Factor E: other natural or manmade factors affecting its continued existence. A summary of this assessment is detailed below.

#### **a. The present or threatened destruction, modification, or curtailment of its habitat or range:**

The final listing rule for the ringed map turtle described the primary threat to the species as habitat modification and water quality deterioration (Service 1986). This threat continues to act as a primary driver of the species condition across the range, with some areas of concentrated impacts in the Upper Pearl River as described below. Map turtles rely on coarse woody debris for a variety of physiological and behavioral needs, as well as water quality that allows for sufficient growth and abundance of freshwater prey sources (Service 2020; Lindeman et al. 2023). Deadwood removal for navigation, flood control, or construction of impoundments can impact habitat quality; however, retaining deadwood within the river system, rather than complete removal from the waterway, can mitigate population impacts from habitat modification and water quality deterioration.

The flow of the Pearl River is regulated primarily by releases from the Ross Barnett Reservoir spillway to maintain stable water levels in the reservoir (Selman and Jones 2017). Water releases may occur rapidly and are stopped quickly when the target reservoir level is achieved (Selman and Jones 2017). These rapid changes in water level can inundate turtle nests and saturate downstream riverbanks, leading to bank collapse, channel filling, and degradation of ringed map turtle habitat through increased sedimentation. Encroaching invasive vegetation such as cogon grass (*Imperata cylindrica*) and Chinese tallow tree (*Triadica sebifera*) are currently reducing the quantity and quality of available sandbar nesting habitat and forcing turtles to nest in suboptimal areas that are more flood-prone (Janzen 1994; Kolbe and Janzen 2002; Selman and Jones 2011).

A planned impoundment (Pearl River Basin Federal Flood Risk Management Project or “One Lake”) in Jackson, Mississippi, south of the existing Ross Barnett Reservoir, is expected to impact ringed map turtle habitat. Conversion of riverine habitat to predominantly lake habitat will result in loss of riverine dependent species, reduced flow velocities that maintain riverine habitats such as sandbars and river sinuosity, and further impact hydrology downstream (Service 2019). This proposed reservoir is

expected to directly and indirectly impact an estimated 4,960 ringed map turtles (Service 2019), which will further fragment ringed map turtle populations and could cause long-term population declines of up to 90% from the proposed weir site to the Ross Barnett Reservoir (Selman 2020).

**b. Overutilization for commercial, recreational, scientific, or educational purposes:**

Collecting turtles for commercial purposes was described as a threat to the species in the final listing rule (Service 1986). Threats of overutilization continue to impact the species to a limited degree, with a few sites more highly impacted by collection. Illegal collection of ringed map turtles is occasionally reported, with recent collection occurring in Mississippi and Louisiana (E. Field, pers. comm. 2024; Selman 2024). While online searches of U.S. websites with available ringed map turtles for purchase indicate specimens are captive-bred, it can be difficult to document whether a particular turtle is wild-caught with certainty.

**c. Disease or predation:**

We have no indication that disease poses a significant threat to the species, although emerging diseases, such as herpesvirus, ranavirus, and *Emydomyces*, are reported in other turtle populations in the southeastern U.S. (Adamovicz et al. 2020). The species is affected rangewide by predation, particularly through loss of nests and hatchlings. Anthropogenically subsidized mesopredators (e.g., armadillos, raccoons, fish crows) are the most significant predators to ringed map turtle nests, with 86% of protected nests visited by a predator (Jones 2006). American alligators also prey on ringed map turtles and may affect the sex ratio by consuming smaller male turtles (Jones 2017). Experimental nest protection boxes have been installed on a sandbar of the lower East Pearl River, with preliminary success resulting in the protection and hatching of up to 27 nests (K. Buhlmann, pers. comm. 2024).

**d. The inadequacy of existing regulatory mechanisms:**

The ringed map turtle is listed as endangered by the State of Mississippi (Mississippi Natural Heritage Program 2015) and threatened by the State of Louisiana (Holcomb et al. 2015), which provides some protection from collection. No laws in Mississippi or Louisiana protect the ringed map turtle against the loss or alteration of its habitat. The Naval Construction Battalion Center Gulfport Stennis Western Maneuver Area includes the ringed map turtle in their Integrated Natural Resources Management Plan (INRMP; U.S. Navy 2022). The INRMP covers a 10-year period and includes measures to protect habitat for the turtle by controlling quantity and quality of stormwater runoff, controlling invasive species that may negatively affect ringed map turtle habitat (i.e., sandbars), and conducting regular monitoring surveys.

The ringed map turtle is currently listed on Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix III (CITES 2024), which requires export permits from the listing countries or certificates of origin from the non-listing countries to allow exports. The intention of this designation is to make it possible to track the legitimate international trade of the species; however, differentiating captive-bred turtles from wild-caught turtles is difficult and can lead to laundering of wild-caught turtles through the pet trade.

The Bogue Chitto, West Pearl River, and Bogue Falaya have been designated as Scenic Rivers under the Louisiana Department of Wildlife and Fisheries Scenic Rivers Program. By law, these waterbodies are protected from clearing, de-snagging, or mining; however, these actions are still permitted by State and Federal agencies and degrade turtle habitat within these waterbodies (K. Lejeune, pers. comm. 2024).

**e. Other natural or manmade factors affecting its continued existence:**

The current primary threat to the ringed map turtle is habitat and water quality degradation caused by human population growth in southeast Mississippi. Urbanization and associated water pollution are known to negatively impact turtle prey sources (Gál et al. 2019), while chemical stressors can inhibit endocrine cycles and alter reproductive output (see Shelby and Mendonça 2001; Selman and Qualls 2005, 2006). Ringed map turtles frequently abandon basking perches and nesting forays due to human disturbances, such as boat traffic, resulting in negative impacts to their physiological health (Selman et al. 2013; Jones 2017; Heppard and Buchholz 2019). Although presumably impacting a small proportion of the population, direct mortality from boat collisions may disproportionately affect females (Bulté et al. 2010; Bennett and Litzgus 2014) since they are larger-bodied and more commonly found in open water channels than males (Jones 1996). The impact of urbanization and development and subsequent habitat degradation and disturbance has increased since listing in 1987 and is expected to continue and increase in the future.

Climate change may increase the intensity and frequency of hurricane events (IPCC 2022), resulting in potentially severe impacts to the lower Pearl River drainage and Bogue Falaya from saltwater inundation caused by storm surge and sea level rise. Declines in population abundance of the yellow-blotched map turtle were observed after Hurricane Katrina, presumably due to hurricane-related saltwater inundation (Selman and Qualls 2008). Sea level rise is predicted to inundate 37 rkm (23 rmi) of the lower Pearl River and the entire known range of the ringed map turtle in the Bogue Falaya by 2070 according to National Oceanic and Atmospheric Administration's (NOAA) Sea Level Rise Viewer, Dauphin Island, for an intermediate to high sea level rise of 0.91 meter (3 feet; NOAA 2024). Although individual turtles may move in response to inundation, suitable habitat is very limited in the Bogue Falaya portion of the range. Additional expected impacts of climate change include an increase in frequency of drought and out-of-season flooding. The effects of droughts on the ringed map turtle are generally unknown but may impact nest success and sex ratios of hatchlings through temperature-dependent sex determination (Service 2020). Increased frequency of heavy precipitation, and subsequent out-of-season flooding, can inundate and drown turtle nests, resulting in population recruitment declines. There is limited information regarding the effects of climate change currently impacting the species, but the impacts of sea level rise, storm surge, drought, and extreme weather (flood) events is expected to increase in the future.

A secondary threat to the species is the established population of the non-native false (Mississippi) map turtle (*Graptemys pseudogeographica*) in the Jackson segment of the Pearl River (Smith et al. 2020). The impact of this introduced species to survival and recovery of ringed map turtle populations is unknown; however, potential hybridization between these species may be possible. Interspecific competition for prey sources (e.g., aquatic invertebrates) may also be possible as the diet of the false (Mississippi) map turtle can overlap to some degree with the diet of the ringed map turtle.

## **Synthesis**

The ringed map turtle is a riverine species that inhabits the Pearl River drainage and the Bogue Falaya of Mississippi and southeastern Louisiana. This species is dependent on heterogeneous microhabitats including coarse woody debris, steep cutbanks, and large sandbars. Repeated ringed map turtle surveys using similar methodologies have been conducted since the late 1980s, allowing for an assessment of population trends over time. Currently, population abundance has increased at two of five long-term monitoring sites and declined at the remaining three long-term monitoring sites in the last 34 years. The ringed map turtle is currently present in all known historical localities throughout the Pearl River drainage, indicating no known range contractions since listing.

Threats to the species are ongoing, with habitat loss and degradation due to urbanization, impoundment creation, and removal of deadwood as the primary threat. The construction of One Lake could have significant negative impacts on the largest monitored population of ringed map turtles. The effects of a changing climate are also expected to impact the species in the future through increasing frequency of out-of-season flooding (declining nest survivorship) and intensity and frequency of hurricanes affecting the lower Pearl River and Bogue Falaya due to saltwater inundation and sea level rise.

Although some threats have been reduced since the time of listing, the threats of habitat and water quality degradation, climate change, and the recent discovery of a population of non-native false (Mississippi) map turtles continue to impact the species. Because of ongoing threats and the condition of the species, our analysis indicates the ringed map turtle continues to meet the definition of a threatened species under the Act.

## **RECOMMENDED FUTURE ACTIVITIES**

A detailed discussion of recovery actions and criteria are presented in the Recovery Plan (Service 1988). During this status review, new and/or targeted potential recovery activities were identified and are included below. These actions are recommended to support and promote recovery of the ringed map turtle. Use of a numbered list for these recommendations is for convenient reference only and does not necessarily imply prioritization.

### **Recovery Activities**

1. The acquisition of conservation lands adjacent to the Pearl River has provided some measure of riparian habitat protection; however, additional waterway-specific protections are necessary to conserve and maintain riverine habitats.
2. Reassess how best to define “stable” or “increasing” populations (Criterion 2).
3. Develop a Standard Operating Procedure (i.e., management plan) for data collection to document turtle population density, viability, demography, growth and survivorship rates, long-distance movements, and longevity for the long-term monitoring sites.
4. Educate the public about the protected status of the ringed map turtle to reduce the direct take of turtles and encourage support of limiting public use of nesting sandbars, especially in the recently discovered Bogue Falaya population. Education can take the form of boat ramp signage, media outreach, or in-person events.

5. Provide training to Law Enforcement personnel on identifying turtles of conservation concern and the threats they face from disturbance and collection while encouraging enforcement of existing laws and regulations.
6. Work with partners to continue experimental techniques that can increase survivorship. Experimental techniques include installing electrified nest boxes to decrease nest predation, installing turtle ladders on seawalls to give turtles access to potential nesting locations, or establishing “No Wake” zones around significant nesting sandbars to reduce habitat erosion and disturbance of nesting females.
7. Work with partners to reduce threats of sand and gravel mining and de-snagging, especially in waterways with robust populations or areas that are designated Scenic Rivers.
8. Determine if the presence of the non-native false (Mississippi) map turtle (*Graptemys pseudogeographica*) is negatively impacting the ringed map turtle in the Jackson segment of the Pearl River. Work with partners to determine the efficacy of an invasive species control effort to remove these non-native map turtles from the Pearl River.

### **Monitoring and Research Activities**

1. Continue long-term mark-resight surveys at the five established monitoring sites and add the Bogue Falaya population as a sixth monitoring site due to its unique genetic lineage and isolation. It is recommended to increase the number of long-term monitoring sites to nine to better represent the entire range of the species.
2. Conduct a telemetry study to determine the impact of dredging, impoundments, or construction activities on the baseline movement patterns, home ranges, and habitat use of the ringed map turtle, especially in regard to the One Lake project.
3. Evaluate the size and status of the Bogue Falaya ringed map turtle population and conduct a telemetry study in this region to assess this population’s spatial use of coastal environments.
4. Assess nest success, predation rates, clutch size, and clutch frequency at representative populations throughout the Pearl River drainage and Bogue Falaya and determine the impact these reproductive parameters and nest predation have on recruitment.
5. Conduct research to determine if clutch size and frequency, and nest survivorship differs along the river continuum, from upstream to downstream within the Pearl River drainage, and if there are differences when compared to the Bogue Falaya population. If differences are documented, determine the efficacy of installing nest protectors or other experimental techniques to increase nest survivorship.
6. Assess macro- and micro-habitat variables that can be used to assess habitat suitability and inform areas where management of suboptimal habitat would be most useful. Additional monitoring of submerged deadwood density would inform habitat minimization and mitigation measures during consultation for in-stream construction activities.
7. Evaluate the reproductive hormone cycle for the ringed map turtle and assess if heavily disturbed populations (e.g., Ratliff Ferry) are physiologically less healthy than less disturbed populations. If disturbance is causing significant impacts to the physiological health of the ringed map turtle, implement methods or regulations to reduce disturbance, such as “No Wake” zones or limits on boat size.

8. Assess the impacts of variable water releases from the Ross Barnett Reservoir on downstream populations. Determine if large water releases are increasing nest failure rates through inundation and if nesting sandbars are being eroded more quickly compared to upstream sandbars.

## RESULTS / SIGNATURES

### U.S. Fish and Wildlife Service Status Review of Ringed Map Turtle

#### **Status Recommendation:**

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

- Downlist to Threatened
- Uplist to Endangered
- Delist:
  - The species is extinct*
  - The species is recovered*
  - New information indicates the species does not meet the definition of an endangered or threatened species*
  - The listed entity does not meet the statutory definition of a species*
- No change needed

**Field Supervisor, Mississippi Ecological Services Field Office, Fish and Wildlife Service**

Approve \_\_\_\_\_

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