

Ringed map turtle
(Graptemys oculifera)

5-Year Review:
Summary and Evaluation



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

5-YEAR REVIEW
Ringed map turtle / *Graptemys oculifera*

I. GENERAL INFORMATION

A. Methodology used to complete the review:

This review was accomplished using available information pertaining to historic and current distributions, life histories, and habitats of these species. Our sources include the final rule listing these species under the Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by Service, State and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts. The completed draft was forwarded to three peer reviewers and their comments were incorporated into the final document as appropriate (see Appendix A). We announced initiation of this review and requested information in a published *Federal Register* notice on June 14, 2005 (70 FR34492)

B. Reviewers

Lead Region: Southeast Region: Kelly Bibb, 404-679-7132

Lead Field Office: Jackson, Mississippi, Ecological Services: Linda LaClaire, 601-321-1126

Cooperating Field Office: Lafayette, Louisiana, Ecological Services: Deborah Fuller, 337-291-3124

C. Background

1. FR Notice citation announcing initiation of this review: June 14, 2005. (70 FR 34492)

2. Species status: 2010 Recovery Data Call Declining. Results from recent survey work have demonstrated that two of five ringed map turtle populations on the Pearl River have declined since the 1980's.

3. Recovery achieved: 2 (26-50% recovery objectives achieved); see section II.B.3 for details on recovery criteria and how each criterion has or has not been met

4. Listing history

Original Listing

FR notice: 51 FR 45907

Date listed: December 23, 1986

Entity listed: Species

Classification: Threatened

5. Associated rulemakings:

Not applicable

6. Review History:

Final Recovery Plan: 1988

Recovery Data Call: 2010, 2009, 2008, 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000, and 1999

7. Species' Recovery Priority Number at start of review (48 FR 43098): 14

Degree of Threat: Low

Recovery Potential: High

Taxonomy: Species

8. Recovery Plan

Name of plan: Ringed Sawback Turtle Recovery Plan, U.S. Fish and Wildlife Service, Atlanta, GA 28 pp.

Date issued: April 8, 1988

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. Is the species under review listed as a DPS? No

2. Is there relevant new information that would lead you to reconsider the classification of this species with regard to designation of DPSs? No

B. Recovery Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria? Yes. The ringed sawback (or map) turtle has an approved recovery plan with objective measurable criteria.

2. Adequacy of recovery criteria.

- a. **Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?** Yes
 - b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?** Yes
3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.**

Criteria for removal of the ringed map turtle from the list of threatened species:

1. **Protection of a total of 150 miles 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.**

Status: A ringed map turtle sanctuary has been designated north of the Ross Barnett Reservoir at Jackson. The Pearl River Valley Water Supply District (District) set aside approximately 12 river miles north from Ratliff Ferry to Lowhead Dam on the Pearl River as a sanctuary area, 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 record a notation on the deed of the property comprising the sanctuary area that will in perpetuity notify transferees that the sanctuary must be maintained in accordance with these provisions.

No areas have been formally protected south of the Ross Barnett Reservoir. Only 12 miles in one Pearl River reach north of the Ross Barnett Reservoir have been protected. Therefore, this criterion has not been met.

Criterion 1. addresses Factor A., B., D., and E.

2. **Evidence of a stable or increasing population over at least a ten year period in the two Pearl River reaches.**

Status: Personnel with the Mississippi Museum of Natural Science/Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP), the Louisiana Department of Wildlife and Fisheries (LDWF), and the Corps of Engineers have conducted periodic surveys of ringed map turtle populations in their respective states (Jones and Hartfield 1995; Dickerson and Reine 1996; Shively 1999; Jones 2009; LDWF 2009). Additional surveys have been conducted by an individual researcher (Lindeman 1998). Only the MDWFP surveys provide data that can be used to judge the status of populations over time. The four MDWFP surveys were conducted over a 20-year period during 1988/1989, 1994, 2002, and 2008/2009 at the same five sites (Jones 2009). Comparisons between the sites over this time period indicate that three of the studied populations are relatively stable and one of the populations is declining. Survey data from 2008/2009 indicate that the remaining population may also be in decline (Jones 2009).

Two of the stable ringed map turtle populations (Carthage and Ratliff Ferry study sites) occur north of the Ross Barnett Reservoir and one (Lakeland study site) occurs south of the reservoir. The Ratliff Ferry population occurs within the sanctuary designated by the Pearl River Valley Water Supply District.

Twenty-two ringed map turtles, which had been marked during earlier surveys, were recaptured during the 2008/2009 study (Jones 2009). Minimum age estimates of 23.5 years for males and 30 to 36 years for females were made for these recaptured turtles (Jones 2009). Although the 20-year study of selected sites on the Pearl River by MDWFP indicated the presence of three relatively stable populations, the duration of the study was less than that of a single generation of the ringed map turtle (Jones 2009). Therefore, although this criterion has partially been met, further monitoring over at least another 10 to 15 years will be necessary before a final determination can be made concerning the stability of these populations.

Criterion 2. addresses Factor B., C., and D.

3. An established, continuing plan of periodic monitoring of population trends and habitat to ensure a stable population in these river reaches.

There is no formal population and habitat monitoring plan for the ringed map turtle. However survey/monitoring studies have been

conducted at regular intervals, as described above, and as a result this criterion has been partially met.

Criterion 3. addresses Factor A., B., C., D., and E.

C. Updated Information and Current Species Status

1. Biology and Habitat:

a. Abundance, population trends

Dr. Robert Jones of the Mississippi Museum of Natural Science has studied the ringed map turtle at selected sites in Mississippi, over a period of 20 years (summary in Jones 2009). Population estimates at the five study sites varied, sometimes considerably, during this time period. Two of these study sites are located north of the Ross Barnett Reservoir (Reservoir) at Jackson, Mississippi, and three sites are located south of the Reservoir. Data from the two sites north of the Reservoir, and the northernmost site south of the Reservoir, indicate that populations in these localities have been relatively stable for the last 20 years. However, the two additional sites south of the Reservoir appear to be in decline. The number of ringed map turtles captured during the 2009 study of the population near Columbia, Mississippi, was significantly smaller than any of the estimates from the previous three surveys during the 20-year period. Jones (2009) suggested that further surveys at this site should be made to determine if this is the beginning of a long-term trend. However, population estimates at the site near Monticello, Mississippi, demonstrated a consistent downward trend throughout the study and may indicate that this population is in decline (Jones 2009).

Less information on the status of the ringed map turtle is available for portions of the Pearl River and its tributaries in Louisiana. In 1999, a study was completed along portions of the Bogue Chitto River located within Louisiana (Shively 1999). In 2009, a survey was initiated to re-visit these same sections of river. This study will be completed in the summer of 2010. The final results will be compared to findings from the 1999 survey to provide current population status and a 10-year trend for the ringed map turtle in this area of its distribution (LDWF 2009).

b. Genetics, genetic variation, or trends in genetic variation:

In initial studies of the molecular systematics of map turtles (genus *Graptemys*), mitochondrial DNA (mtDNA) were used to estimate the levels of variation between species. The results of these studies revealed relatively low levels of variation between species in this group when compared to other vertebrate genera (Lamb *et al.* 1994). However, results from more recent work using nuclear DNA (nucDNA) strongly support the traditional sawback clade (yellow-blotched map turtle (*G.*

flavimaculata), black-knobbed map turtle (*G. nigrinoda*), and the ringed map turtle) and the species-level relationships within it (Wiens *et al.* 2010). This is important because the almost identical mtDNA sequences of these species might lead to the mistaken assertion that they were not, in fact, distinct species (Wiens *et al.* 2010).

Levels of genetic variation between ringed map turtle populations have not been studied.

c. Taxonomic classification or changes in nomenclature:

Kingdom: Animalia

Division: Chordata

Class: Reptilia

Order: Testudines

Family: Emydidae

Genus: *Graptemys*

Species: *oculifera*

Common name: Ringed map turtle [as currently accepted (Crother 2008); however common name, ringed sawback turtle, was used in the listing of the species]

d. Spatial distribution, trends in spatial distribution or historic range:

The ringed map turtle is restricted to the Pearl River and its major tributaries in Mississippi and Louisiana. It is not found in the tidally influenced section of the lower West Pearl River. This species' distribution has been monitored periodically since the late 1970's (McCoy and Vogt 1980; Jones and Hartfield 1995; Dickerson and Reine 1996; Lindeman 1998; Shively 1999; Jones 2009; LDWF 2009). The spatial distribution of the ringed map turtle throughout the Pearl River drainage has not changed based on these studies.

e. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem): The decline of the ringed map turtle has been attributed to habitat modification and water quality deterioration, reservoir construction, channelization, desnagging for navigation, siltation, and the subsequent loss of invertebrate food sources (U.S. Fish and Wildlife Service 1988). Little information is available on any improvements that have been made in quality and quantity of ringed map turtle habitat. However, the designation of a 12-mile reach of the Pearl River as a sanctuary has reduced some threats to ringed map turtle habitat in this area (see discussion under Criteria 1. for removal of the ringed map turtle from the list of threatened species).

In the Bogue Chitto River in Louisiana, a study of the long-term trends in the river fish assemblage indicated a decline in the relative abundance or possible extirpation of over twenty species during the 27-year study period

(Stewart *et al.* 2005). The authors of this study speculated that increased siltation contributed to the decline in the local fish assemblage (Stewart *et al.* 2005). Increased siltation may also be having negative effects on ringed map turtle populations in this area. More data are needed on the comparison of specific water quality conditions in areas occupied by stable ringed map turtle populations versus areas occupied by populations that are declining (see discussion under Five Listing Factors, Factor D).

2. The Five Listing Factors and a Summary of their Application to the Ringed Map Turtle

Factor A: *The present or threatened destruction, modification, or curtailment of its habitat or range.* The ringed map turtle requires structures (logs, snags, etc.) on which it can safely bask protected from predation and suitable nesting habitat (large, high, sandbars adjacent to the river). These habitat features are threatened by habitat modification conducted for flood control (impoundments) and navigation, as well as sand and gravel mining.

An impoundment for flood control of the Pearl River within ringed map turtle habitat at Jackson, Mississippi, south of the existing Ross Barnett Reservoir, has been considered. A feasibility study was conducted by the Corps of Engineers on the formation of this impoundment; however, the future of the project is unclear. If the proposed reservoir is completed, it would likely result in the extirpation of the known ringed map turtle population at this location. The population at this location represents the best known population on the Pearl River south of the Ross Barnett Reservoir.

River channel erosion is continuing to change the structural dynamics of the river system, especially south of the reservoir at Jackson, Mississippi. Sand and gravel mining and the removal of logs in streams are contributing to river channel erosion in Louisiana (Shively 1999). Erosion results in a wider and shallower channel due to stream bank destabilization. River channel erosion may have negative effects on the basking sites of the ringed map turtle. This is important because *Graptemys* are the most habitual baskers among aquatic turtles and rely on basking logs and branches for temperature regulation, feeding and nocturnal resting sites (summarized in Lindeman 1998 and 1999) (see additional discussion under Factor E regarding basking). Results of a study conducted by Dickerson and Reine (1996) in Louisiana indicated that ringed map turtles prefer basking sites which are partially submerged in those areas with the deepest water and swiftest current. As the river channel widens, the number of these sites will decrease. In a survey of the Bogue Chitto River in Louisiana, ringed map turtle numbers were lower near sand and gravel mining operations than in similar areas of the stream elsewhere (Shively 1999). Near sand and gravel mining operations, the channel was shallower and appeared scoured; the substrate was loose and in-stream logs were few.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes. Shooting of basking turtles for recreation and collecting turtles for commercial purposes posed a threat to the ringed map turtle at the time of listing. Direct take by humans is a continuing threat. Shooting of ringed map turtles has been documented since the time of listing the species (Shively 1999). There is evidence that collecting for commercial purposes also continues.

Factor C: Disease or predation. There was no known threat from disease at the time of listing and disease does not appear to be a current threat.

Predation, however, is a current threat. During a study of the largest population of ringed map turtles, Jones (2006) found that the turtles endured a very high level of nest predation from both vertebrate and invertebrate predators. Approximately 86 percent of the ringed map turtle nests in the study were attacked by vertebrates and approximately 24 percent of the remaining eggs were destroyed by invertebrates (Jones 2006). Armadillos (*Dasypus novemcinctus*) and raccoons (*Procyon lotor*) were the most frequent nest predators; fish crows (*Corvus ossifragus*) were also significant nest predators (Jones 2006). Invertebrate predators included *Solenopsis molesta*, a native species of fire ant, and larvae of the dipteran *Tripanurga importuna*, a sarcophagid fly (Jones 2006). The increase in predation may be a result of increased predator populations due to human-induced habitat deterioration in the vicinity of the river. This particular suite of vertebrate predators is of particular concern since armadillos are a recently arrived component of the fauna, raccoons have increased substantially in Mississippi over the last few years, and fish crows are expanding both their range and numbers (Jones 2006). Since turtles, and *Graptemys* in particular, are long-lived animals (Snider and Bowler 1992), they are extremely limited in their ability to respond to increased mortality of any life-history stage (Congdon *et al.* 1993) (see additional discussion under Factor E.).

Factor D: The inadequacy of existing regulatory mechanisms. Prior to federal listing, the ringed map turtle was listed as endangered under Mississippi Department of Wildlife Conservation Public Notice 2408 and as a result, the Federal Lacey Act applied to the taking and transportation of the ringed map turtle from Mississippi. Louisiana did not recognize the turtle as a protected species prior to listing. Listing under the Endangered Species Act added restrictions against take and against transportation of the ringed map turtle from Louisiana.

Neither Louisiana nor Mississippi has regulations to protect the ringed map turtle against the loss or alteration of its habitat. However, monitoring of water quality is conducted by states under Section 305(b) of the Clean Water Act (CWA). Monitoring results indicate that water quality and quantity are not fully supporting a minimum designated use of fishing or fish and wildlife habitat in many of the river reaches where the ringed map turtle occurs. The Mississippi and Louisiana

Departments of Environmental Quality have developed lists of impaired waters in their respective states to satisfy the requirements with respect to Section 303(d) of the CWA (Louisiana Department of Environmental Quality 2004; Mississippi Department of Environmental Quality 2006). Reaches of the Pearl River in both states, and reaches of the Bogue Chitto River in Louisiana, are included on these lists. Also identified on the lists are the pollutants causing or potentially causing impairment of designated uses. Pollutants include excessive nutrients, organic enrichment/low dissolved oxygen, pesticides, sedimentation/siltation, mercury and other toxics, and pathogens. One of these pollutants, increased siltation, has been implicated in the decline of diversity in the fish fauna of the Bogue Chitto River in Louisiana where the ringed map turtle also occurs (Stewart *et al.* 2005).

Additional research is needed to determine sensitivities of the ringed map turtle to known pollutants. This lack of data may prevent agencies from exercising their existing regulatory authorities.

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

In the final listing rule, water quality degradation was described as a serious threat under this factor. Although direct effects on the ringed map turtle had not been determined, the negative effects on their primary food sources were well documented. Water quality degradation was assumed to reduce or eliminate the turtle's food supply.

Boating and other recreational uses of the Pearl and Bogue Chitto Rivers during the summer months are threats to basking turtles and turtle nests. Ringed map turtles usually abandon their perches when people boat or float by their sites and may not re-emerge to bask for up to an hour (Shively 1999). A study has been conducted on the impacts of boating on basking by the yellow-blotched map turtle in the Pascagoula River. In order to reduce the negative impacts to basking behavior that they documented, the authors of the study suggested that a limit be enacted on the size of boats allowed to access the river (Selman *et al.* 2010). *Graptemys* species bask with a greater frequency than many other turtles (Lindemann 1998). Alterations in basking frequencies may affect the general health of ringed map turtles, and because basking may be integral to the maturation of eggs, lower basking frequencies may reduce the ability of females to mature their clutches of eggs. In addition, large numbers of people party and camp on the same open, high sandbars favored by nesting ringed map turtles (Jones 2006). This use of sandbars by humans can limit turtle nesting habitat when turtles avoid these otherwise quality nesting sites (Jones 2006) or nests may be destroyed inadvertently by human activities on the sandbars.

A reproductive study of the ringed map turtle indicated that this turtle apparently has a low annual reproductive potential (Jones 2006). Females mature at the relatively late age of 10 years (Jones and Hartfield 1995). They likely nest only once during the year and some female ringed map turtles apparently skip

reproduction in certain years (Jones 2006). Since *Graptemys* are long-lived turtles, these may be demographic traits that evolved with longevity. However, data collected during studies of other *Graptemys* species have documented alterations in reproductive parameters that likely result from chemical stressors in the environment (Shelby and Mendonca 2001; Selman and Qualls 2005). In either case, this low reproductive potential which limits the species' ability to adapt to increases in mortality, combined with the known high levels of predation in ringed map turtles, represents a serious threat.

- D. **Synthesis** – Existing data comparing surveys of five sites over a period of 20 years indicate that three of the Pearl River ringed map turtle populations are stable, while the remaining two Pearl River populations are likely declining. A study on the Bogue Chitto River, replicating previous surveys from the late 1990's, will be completed during the summer of 2010. Studies monitoring known populations will need to be continued for 10 to 15 more years to give an adequate picture of population trends due to the long life span of the ringed map turtle.

A measure of protection has been achieved for the ringed map turtle by the establishment of a ringed map turtle sanctuary at Ratliff Ferry on the Pearl River north of Jackson, Mississippi. However, this section of river represents only 12 river miles of the total 150 river miles suggested as a benchmark in the recovery criteria. In addition, many of the threats present at the time of listing still remain. River channel erosion with subsequent habitat loss, a potential impoundment, water quality degradation, "recreational" shooting, and commercial collecting continue to be problems. Not addressed specifically in the final rule, but a current threat, is the increasing amount of human use of the Pearl and Bogue Chitto Rivers for boating and other recreational uses which have direct and indirect effects on ringed map turtle populations. Low reproductive potential is a newly documented threat to the species.

In summary, threats to the species are continuing. Although there has been some progress towards achieving recovery goals for the ringed map turtle, the recovery criteria have not been met and this species continues to meet the definition of a threatened species under the Act.

III. RESULTS

- A. **Recommended Classification:** No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Conduct an analysis of potential effects to the ringed map turtle from a proposed impoundment of the Pearl River at Jackson, Mississippi.
2. Enforce protection against commercial collecting of ringed map turtles.

3. Educate the public about the protected status of the ringed map turtle in order to reduce the direct take of turtles by shooting and encourage support of limiting public use of nesting sandbars.
4. Study effects of high nest predation on selected populations.
5. Pursue land acquisition of selected river reaches in order to achieve further protection of critical ringed map turtle populations.
6. Investigate the endocrine system of the ringed map turtle to determine if its apparent low reproductive frequency might result from a disruption of the hormonal system due to chemical effects.
7. Conduct research to determine sensitivities of ringed map turtle to known pollutants.
8. Compare water quality data from habitat occupied by stable ringed map turtle populations with data from habitat occupied by declining populations.
9. Enforce TMDLs once they have been developed.
10. Monitor selected populations of ringed map turtles and their habitats on a regular basis.
11. Work with partners to limit other threats to the ringed map turtle such as restricting sand mining at potential nest sites and restricting the size of boats that access occupied river reaches.
12. Implement all other tasks identified in the recovery plan.

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U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of *Graptemys oculifera* (Ringed map turtle)

Current Classification: Threatened

Recommendation resulting from the 5-Year Review

No change is needed

The review was completed by Linda LaClaire, Jackson, Mississippi Field Office.

FIELD OFFICE APPROVAL:

for
Lead Field Supervisor, Fish and Wildlife Service
Approve *Paul Wright* Date 7-31-10

REGIONAL OFFICE APPROVAL:

for
Lead Regional Director, Fish and Wildlife Service
Approve *Aaron L. Valen* Date 8-17-10

APPENDIX A
Summary of peer review for the 5-year review of
Ringed map turtle / *Graptemys oculifera*

A. Peer Review Method:

The document was peer-reviewed internally by Cary Norquist, Jackson, Mississippi Field Office and by Debbie Fuller, Lafayette, Louisiana Field Office. Once the comments were added to the document, it was sent to three outside reviewers (see below). The outside peer reviewers were chosen based on their qualifications and knowledge of the species.

B. Peer Review Charge: The below guidance was provided to the reviewers.

1. Review all materials provided by the Service.
2. Identify, review, and provide other relevant data that appears not to have been used by the Service.
3. Do not provide recommendations on the Endangered Species Act classification (e.g., endangered, threatened) of the species.
4. Provide written comments on:
 - Validity of any models, data, or analyses used or relied on in the review.
 - Adequacy of the data (e.g., are the data sufficient to support the biological conclusions reached). If data are inadequate, identify additional data or studies that are needed to adequately justify biological conclusions.
 - Oversights, omissions, and inconsistencies.
 - Reasonableness of judgments made from the scientific evidence.
 - Scientific uncertainties by ensuring that they are clearly identified and characterized, and those potential implications of uncertainties for the technical conclusions drawn are clear.
 - Strengths and limitation of the overall product.
5. All peer reviews and comments will be public documents, and portions may be incorporated verbatim into our final document with appropriate credit given to the author of the review.

C. Summary of Peer Review Comments/Report

Dr. Bob Jones

Mississippi Museum of Natural Science

Mississippi Department of Wildlife, Fisheries, and Parks

2148 Riverside Drive

Jackson, MS 39202-1353

Dr. Jones supplied recent research reports and concurred with the completed review.

Gary Lester

Louisiana Natural Heritage Program

Louisiana Department of Wildlife and Fisheries

P.O. Box 98000

Baton Rouge, LA 70898

Mr. Lester did not respond directly to my request for comments. However, other personnel in the Heritage Program supplied recent reports of on-going survey work on the Bogue Chitto River.

Dr. Peter Lindeman
Edinboro University of Pennsylvania
Department of Biology and Health Services
150 Cooper Hall
Edinboro, PA 16444

Dr. Lindeman supplied recent research reports on *Graptemys* species and made specific comments on the review based on his recent research.

D. Response to Peer Review

Peer reviewers' comments were evaluated and incorporated into the document, as appropriate.