DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2021–0097; FF09E21000 FXES1111090FEDR 223]

RIN 1018–BF42

Endangered and Threatened Wildlife and Plants; 12-Month Finding for Pascagoula Map Turtle; Threatened Species Status With Section 4(d) Rule for Pearl River Map Turtle; and Threatened Species Status for Alabama Map Turtle, Barbour's Map Turtle, Escambia Map Turtle, and Pascagoula Map Turtle Due to Similarity of Appearance With a Section 4(d) Rule

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule; announcement of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce our 12-month findings for two freshwater turtle species, the Pascagoula map turtle (*Graptemys gibbonsi*) and the Pearl River map turtle (*Graptemys pearlensis*), as endangered or threatened species. The Pascagoula map turtle is endemic to the Pascagoula River drainage in Mississippi, and the Pearl River map turtle is endemic to the Pearl River drainage in Mississippi and Louisiana. We propose to list the Pearl River map turtle as a threatened species with a rule issued under section 4(d) of the Act (''4(d) rule''). After a thorough review of the best available scientific and commercial information, we find that it is not warranted at this time to list the Pascagoula map turtle; however, we propose to list the Pascagoula map turtle along with Alabama map turtle (*Graptemys pulchra*), Barbour's map turtle (*Graptemys barbouri*), and Escambia map turtle (*Graptemys ernsti*) as threatened species due to similarity of appearance to the Pearl River map turtle with a 4(d) rule. If we finalize this rule as proposed, it would add the Pearl River map turtle, Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle to the List of Endangered and Threatened Wildlife and extend the Act's protections to the species.

DATES:

Comment submission: For the proposed rules to list the Pearl River map turtle and the four other species (Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle) due to similarity of appearance, we will accept comments received or postmarked on or before January 24, 2022. We also request comments on the proposed 4(d) rule for the Pearl River map turtle and the proposed 4(d) rule for the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle during the same timeframe as comments for the proposed listing actions. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES**, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by January 7, 2022.

12-month petition finding: For the Pascagoula map turtle, the finding in this document was made on November 23, 2021.

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *https://www.regulations.gov.* In the Search box, enter the RIN or docket number (presented above in the document headings). For best results, do not copy and paste either number; instead, type the docket number or RIN into the Search box using hyphens. Then, click on the Search button. On the resulting page, in the panel on the left side of the screen, under the Document Type heading, check the Proposed Rule box to locate this document. You may submit a comment by clicking on ''Comment.''

(2) *By hard copy:* Submit by U.S. mail to: Public Comments Processing, Attn: FWS–R4–ES–2021–0097, U.S. Fish and Wildlife Service, MS: PRB/3W, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

We request that you send comments only by the methods described above. We will post all comments on *https://www.regulations.gov.* This generally means that we will post any personal information you provide us (see Information Requested, below, for more information).

FOR FURTHER INFORMATION CONTACT: Stephen Ricks, Field Supervisor, U.S. Fish and Wildlife Service, Mississippi Ecological Services Field Office, 6578 Dogwood View Park, Jackson, MS 39213; telephone 601–321–1122. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if we determine that a species warrants listing, we are required to promptly publish a proposal in the **Federal Register**, unless doing so is precluded by higher-priority actions and expeditious progress is being made to add and remove qualified species to or from the List of Endangered and Threatened Wildlife and Plants. The Service will make a determination on our proposal within one year. If there is substantial disagreement regarding the sufficiency and accuracy of the available data relevant to the proposed listing, we may extend the final determination for not more than six months. To the maximum extent prudent and determinable, we must designate critical habitat for any species that we determine to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species and designation of critical habitat can be completed only by issuing a rule.

What this document does. We find that listing the Pascagoula map turtle as an endangered or threatened species is not warranted at this time. We propose to list the Pearl River map turtle as a threatened species with a rule under section 4(d) of the Act. We also propose to list the Pascagoula map turtle, Alabama map turtle, Barbour's map turtle, and Escambia map turtle as threatened species based on their similarity of appearance to the Pearl River map turtle and propose a rule under section 4(d) of the Act for these species. We find that designation of critical habitat for the Pearl River map turtle is not prudent.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species because of any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that threats to the Pearl River map turtle include habitat degradation or loss (degraded water quality, channel and hydrologic modifications/impoundments, agricultural runoff, and development—Factor B), collection (Factor C), and effects of climate change (increasing temperatures, drought, sea level rise (SLR), hurricane regime changes, and increased seasonal precipitation—Factor E).

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary) to designate critical habitat concurrent

with listing to the maximum extent prudent and determinable. We have determined that designation of critical habitat for the Pearl River map turtle is not prudent at this time.

Information Requested

We intend that any final action resulting from these proposed rules will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other concerned governmental agencies, Native American Tribes, the scientific community, industry, or any other interested parties concerning this proposed rule.

We particularly seek comments concerning:

(1) The species' biology, range, and population trends, including:

(a) Biological or ecological requirements of the species, including habitat requirements for feeding, breeding, and sheltering;

(b) Genetics and taxonomy;

(c) Historical and current range, including distribution patterns;

(d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for the species, their habitats, or both.

(2) Factors that may affect the continued existence of the species, which may include habitat modification or destruction, overutilization, disease, predation, the inadequacy of existing regulatory mechanisms, or other natural or manmade factors.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to the species and existing regulations that may be addressing the threats.

(4) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of this species.

(5) Information on regulations that are necessary and advisable to provide for the conservation of the Pearl River map turtle, and that the Service can consider in developing a 4(d) rule for the species. We seek information concerning the extent to which we should include any of the section 9 prohibitions in the 4(d) rule or whether we should consider any additional exceptions from the prohibitions in the 4(d) rule. This proposed 4(d) rule will not apply take prohibitions for otherwise legal activities to the four turtles listed due to similarity of appearance (Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle) if those activities will not pose a threat to the Pearl River map turtle.

(6) Specific information on bycatch of Pearl River map turtle from fishing or trapping gear due to recreational and commercial fishing activities for other species.

(7) Information on why we should or should not designate habitat as ''critical habitat'' under section 4 of the Act, including information to inform the following factors that the regulations identify as reasons why designation of critical habitat may be not prudent:

(a) The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;

(b) The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;

(c) Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States; or

(d) No areas meet the definition of critical habitat.

(8) For the Pascagoula map turtle, we ask the public to submit to us at any time new information relevant to the species' status, threats, or its habitat.

(9) Information regarding legal or illegal collection of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, Pascagoula map turtle, or Pearl River map turtle.

(10) Threats to the Pearl River map turtle from collection of or commercial trade involving the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle.

(11) Information regarding domestic and international trade of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, Pascagoula map turtle, or Pearl River map turtle.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for, or opposition to, the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or a threatened species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via *https://www.regulations.gov,* your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *https://www.regulations.gov.*

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *https://www.regulations.gov.*

Because we will consider all comments and information we receive during the comment period, our final determinations may differ from this proposal. Based on the new information we receive (and any comments on that new information), we may conclude that the species are endangered instead of threatened, or we may conclude that the species do not warrant listing as either endangered species or threatened species. In addition, we may change the parameters of the prohibitions or the exceptions to those prohibitions in the 4(d) rules if we conclude it is appropriate in light of comments and new information received. For example, we may expand the prohibitions to include prohibiting take related to additional activities if we conclude that those additional activities are not compatible with conservation of the species. Conversely, we may establish additional exceptions to the prohibitions in the final rule if we conclude that the activities would facilitate or are compatible with the conservation and recovery of the species.

Public Hearing

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received by the date specified in **DATES**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule a public hearing on this proposal, if requested, and announce the date, time, and place of the hearing, as well as how to obtain reasonable accommodations,

in the **Federal Register** and local newspapers at least 15 days before the hearing. For the immediate future, we will provide these public hearings using webinars that will be announced on the Service's website, in addition to the **Federal Register**. The use of these virtual public hearings is consistent with our regulations at 50 CFR 424.16(c)(3).

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity (CBD), Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, and West Virginia Highlands Conservancy (referred to below as the CBD petition) to list 404 aquatic, riparian, and wetland species, including the Pascagoula map turtle as an endangered or threatened species under the Act. On September 27, 2011, we published a 90-day finding that the petition contained substantial information indicating listing may be warranted for the Pascagoula map turtle (76 FR 59836). At the time of the petition, the Pascagoula map turtle description included turtles that occur in the Pascagoula and Pearl rivers. Since then, the Pascagoula map turtle was determined to be two similar, yet distinct species, the Pascagoula map turtle (*Graptemys gibbonsi*) and the Pearl River map turtle (*Graptemys pearlensis*) (Ennen et al. 2010, pp. 109–110).

On January 21, 2020, CBD filed a complaint challenging the Service's failure to complete 12-month findings for both species within the statutory deadline. The Service and CBD reached a stipulated settlement agreement whereby the Service agreed to deliver 12-month findings for the Pascagoula map turtle and the Pearl River map turtle to the Office of the Federal Register by October 29, 2021. This document constitutes our 12-month finding for the April 20, 2010, petition to list the Pascagoula map turtle and Pearl River map turtle under the Act in compliance with the October 29, 2021, stipulated settlement agreement.

Supporting Documents

A species status assessment (SSA) team prepared SSA reports for the Pascagoula map turtle and the Pearl River map turtle. The SSA team was composed of Service biologists, in consultation with other species experts. The SSA reports represent compilations of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species. In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we sought the expert opinions of four appropriate specialists regarding the Pascagoula map turtle SSA report, and five appropriate specialists regarding the Pearl River map turtle SSA report. We received responses from all the peer reviewers; feedback we received informed our findings and this proposed rule. The purpose of peer review is to ensure that our listing determinations and 4(d) rules are based on scientifically sound data, assumptions, and analyses. The peer reviewers have expertise in the biology, habitat, and threats to the species.

In addition, we provided the draft SSA reports for review to Federal partners, State partners, and scientists with expertise in aquatic ecology and freshwater turtle biology, taxonomy, and conservation. We notified Tribal nations early in the SSA process for the Pearl River map turtle. We sent the draft SSA report for review to the Mississippi Band of Choctaw Indians and received comments that were addressed in the SSA report. There are no Tribes associated with the Pascagoula map turtle across its range.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species is an endangered species or a threatened species. The Act defines an ''endangered species'' as a species that is in danger of extinction throughout all or a significant portion of its range, and a ''threatened species'' as a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether any species is an endangered species or a threatened species because of any of the following factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species' continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

We use the term ''threat'' to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term ''threat'' includes actions or conditions that have a direct impact on individuals (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). The term ''threat'' may encompass—either together or separately—the source of the action or condition or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an ''endangered species'' or a ''threatened species.'' In determining whether a species meets either definition, we must evaluate all identified threats by considering the expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an ''endangered species'' or a ''threatened species'' only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

The Act does not define the term ''foreseeable future,'' which appears in the statutory definition of threatened species. Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term ''foreseeable future'' extends only so far into the future as the Service can reasonably determine that both the future threats and the species' responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make

reliable predictions. ''Reliable'' does not mean ''certain''; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

It is not always possible or necessary to define foreseeable future as a particular number of years. Analysis of the foreseeable future uses the best scientific and commercial data available and should consider the timeframes applicable to the relevant threats and to the species' likely responses to those threats in view of its life-history characteristics. Data that are typically relevant to assessing the species' biological response include species-specific factors such as lifespan, reproductive rates or productivity, certain behaviors, and other demographic factors.

Analytical Framework

Each SSA report documents the results of our comprehensive biological review of the best scientific and commercial data regarding the status of the species, including an assessment of potential threats to the species. SSA reports do not represent a decision by the Service on whether either species should be proposed for listing as an endangered or threatened species under the Act. However, they do provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies. We completed SSA reports for the Pascagoula map turtle and the Pearl River map turtle and summarize the key results and conclusions from the reports below, beginning with the Pascagoula map turtle, followed by the Pearl River map turtle. The Pascagoula map turtle SSA report can be found in docket number FWS–R4–ES–2021–0097 on *https://www.regulations.gov,* and on the species profile page of the Service's Environmental Conservation Online System (ECOS) internet site, *https://www.ecos.gov/ecp/species/3198.* The Pascagoula map turtle SSA report can be found in docket number FWS–R4–ES–2021–0097 on *https://www.regulations.gov,* and on the species profile page of the Service's Environmental Conservation Online System (ECOS) internet site, *https://www.ecos.gov/ecp/species/10895.*

To assess the species' viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes). In general, the more resilient and redundant a species is and the more representation it has, the more likely it is to sustain populations over time, even under changing environmental conditions. Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated the individual species' life-history needs. The next stage involved an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

I. 12-Month Finding for the Pascagoula Map Turtle

Under section 4(b)(3)(B) of the Act, we are required to make a finding whether or not a petitioned action is warranted within 12 months after receiving any petition that we have determined contains substantial scientific or commercial information indicating that the petitioned action may be warranted (''12-month finding''). We must make a finding that the petitioned action is: (1) Not warranted; (2) warranted; or (3) warranted but precluded. ''Warranted but precluded'' means that (a) the petitioned action is warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened species, and (b) expeditious progress is being made to add qualified species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) and to remove from the Lists species for which the protections of the Act are no longer necessary. Section 4(b)(3)(C) of the Act requires that, when we find that a petitioned action is warranted but precluded, we treat the petition as though resubmitted on the date of such finding, that is, requiring that a subsequent finding be made within 12 months of that date. We must publish these 12-month findings in the **Federal Register**.

In conducting our evaluation of the five factors provided in section 4(a)(1) of the Act to determine whether the Pascagoula map turtle (*Graptemys gibbonsi;* Service 2021a, entire) currently meets the definition of ''endangered species'' or ''threatened species,'' we considered and thoroughly evaluated the best scientific and commercial data available regarding the past, present, and future stressors and threats. We reviewed the petition, information available in our files, and other available published and unpublished information. This evaluation may include information from recognized experts; Federal, State, and Tribal governments; academic institutions; private entities; and other members of the public. After comprehensive assessment of the best scientific and commercial data available, we determined that the Pascagoula map turtle does not meet the definition of an endangered or a threatened species.

The SSA report for the Pascagoula map turtle contains more detailed biological information, a thorough description of the factors influencing the species' viability, and the current and future conditions of the species. (Service 2021, entire). This supporting information can be found on the internet at *https://www.regulations.gov* under docket number FWS–R4–ES–2021–0097. The following is a summary of our determination for the Pascagoula map turtle.

Summary of Finding

The Pascagoula map turtle is a freshwater turtle in the family Emydidae (that includes all map turtles) and the megacephalic (broad-headed) clade. Map turtles (genus *Graptemys*) are named for the intricate pattern on the carapace (top half of shell) that often resembles a topographical map. In addition to the intricate pattern, the shape of map turtle carapaces is very different from that of other turtle genera. The carapace is keeled, and most species show some type of knobby projections or spikes down the vertebral (located down the center of the carapace) scutes (thickened plates similar to scales on the turtle's shell) (Service 2021a, p. 5). Specific to

Pascagoula map turtle, the plastron (entire ventral surface of the shell) can reach lengths of up to 8.6 inches (in) (21.8 centimeters (cm)) in mature females and in mature males can range from 2.8 to 4.0 in (7.2 to 10.1 cm) (Lindeman 2013, p. 294). Typically, male map turtles mature in 2 to 3 years, while females mature at approximately 11 years of age (Service 2021a, pp. 18 and 26). The species is endemic to the Pascagoula River drainage in Mississippi including the Pascagoula, Leaf, and Chickasawhay Rivers and associated tributaries.

Before 1992, all megacephalic map turtles from the Pascagoula River system in southeastern Mississippi, the Pearl River system in central Mississippi and eastern Louisiana, the Escambia-Conecuh River system in western Florida and eastern Alabama, and the Mobile Bay system in Alabama, eastern Mississippi, northwestern Georgia, and southeastern Tennessee were recognized as the Alabama map turtle (*Graptemys pulchra*) (Baur 1893, pp. 675–676). The Pascagoula map turtle was taxonomically separated from the Alabama map turtle in 1992, when morphological features were analyzed for four operational taxonomic units, resulting in the name *G. pulchra* being restricted to the Mobile Bay drainages, individuals from the Escambia-Conecuh River system being elevated to a new species *G. ernsti* (Escambia map turtle), and individuals from the Pascagoula and Pearl River systems being elevated to the new species *G. gibbonsi* (Pascagoula map turtle; Lovich and McCoy 1992, pp. 296–306). A molecular systematics study supported the division of *G. pulchra* into three species, although *G. gibbonsi* was only represented in the analysis by genetic material collected from individuals in the Pearl River drainage (Lamb et al. 1994, pp. 554–559). The Pearl River map turtle (*G. pearlensis*) was taxonomically separated from the Pascagoula map turtle (*G. gibbonsi*) in 2010 based on morphological and genetic features (Ennen et al. 2010, pp. 109–110). This separation was subsequently supported with a molecular analysis of the phylogeny of the entire genus *Graptemys* (Thomson et al. 2018, p. 65). The Pascagoula map turtle is recognized as a separate species from the Pearl River map turtle, Escambia map turtle, and Alabama map turtle, and the distinction as a valid species is supported in the literature and recognized by the herpetological community (Crother et al. 2017, p. 82).

The Pascagoula map turtle inhabits stretches of perennial rivers and creeks with sand or gravel substrates, with higher population densities near dense accumulations of deadwood (Lindeman 2013, p. 293). Emergent deadwood serves as thermoregulatory basking structure, foraging structure for males and juveniles (Selman and Lindeman 2015, pp. 794–795), and as an overnight resting place for males and juveniles (Cagle 1952, p. 227). Pascagoula map turtles prefer clean water (Lovich et al. 2009, p. 029.4). They have never been documented in oxbow lakes or other floodplain hydrological features, despite the fact that other microcephalic map turtle species can be found in oxbows (Lindeman 2013, p. 293). They have also never been documented in saltwater or within a mile of estuaries (McCoy and Vogt 1979, p. 15; Lovich et al. 2009, p. 029.4).

Adult female Pascagoula map turtles feed mostly on freshwater mussel species, with nonnative Asian clams (*Corbicula fluminea*) as the major source of food; however, they may also consume insects and vegetation (Ennen et al. 2007, p. 200; Floyd and Floyd 2013, p. 5). Adult males forage on mussels, insects, and some vegetation (Vucenović and Lindeman 2021, pp. 123–124). Juveniles, small females, and mature males rely on insects (Dundee and Rossman 1989, p.187; Lovich et al. 2009, p. 029.4; Vučenović and Lindeman 2021, p. 123). Additionally, other aquatic invertebrates such as sponges and snails are also consumed by all sex and age classes (Selman and Lindeman 2015, pp. 794–795; Vučenović and Lindeman 2021, p. 20).

For the Pascagoula map turtle to survive and reproduce, individuals need suitable habitat that supports essential life functions at all life stages. Several elements appear to be essential to the survival and reproduction of individuals: Mainstem and tributary reaches within the Pascagoula River system that have sandbars, natural hydrologic regimes, adequate supply of invertebrate prey items including insects and mollusks, an abundance of emergent and floating basking structures of various sizes, and sand, gravel, or rocky substrates (Service 2021a, p. 22).

Additional resource needs of the Pascagoula map turtle include appropriate terrestrial nesting habitat (patches of bare sand adjacent to adult habitat with sparse vegetation, typically on sandbars; adequate sand incubation temperatures to yield an appropriate hatchling sex ratio; and adequate river flow to prevent nest mortality due to flooding).

To assess the species' viability in terms of resiliency, redundancy, and representation, we delineated the range into resilience units as a proxy for populations. As data are not available to delineate biological populations at this time, these units were intended to subdivide the species' range to facilitate assessing and reporting the variation in current and future resilience across the range. To describe the species' current and future conditions in the SSA, we delineated eight resilience units of Pascagoula River map turtles based on Hydrologic Unit Code (HUC) 8 watersheds and in accordance with guidance from species experts. These units are: Black, Chunky-Okatibbee, Escatawpa, Lower Chickasawhay, Lower Leaf, Pascagoula, Upper Chickasawhay, and Upper Leaf. Historically, the majority of the range of the species was likely connected in a single interbreeding biological population, but we used the eight units in the SSA to most accurately describe trends in resiliency, forecast future resiliency, and capture differences in stressors among units. Additional descriptions of the methodology for delineating units and the current resiliency of each unit are available in the SSA report (Service 2021a, pp. 41–65).

For units to be resilient, the needs of individuals (sandbars, adequate flow, adequate supply of invertebrate prey items, basking structures, and sand or gravel substrates) must be met at a larger scale. Tributary and mainstem reaches with suitable habitat uninterrupted by impoundments must be sizable enough to support a large enough population of individuals to avoid issues associated with small population sizes, such as inbreeding depression (Service 2021a, p. 22). The resiliency of the eight units was assessed for the current and future condition to inform the species' viability (Service 2021a, pp. 41–105). The current condition of the eight units are described as one population with low resiliency (Escatawpa), five populations with moderate resiliency (Black, Chunky-Okatibbee, Lower Chickasawhay, Pascagoula, and Upper Chickasawhay), and two units with high resiliency (Lower Leaf and Upper Leaf) (Service 2021a, p. 66).

For the species to maintain viability, there must be adequate redundancy (suitable number of populations and connectivity to allow the species to withstand catastrophic events) and representation (genetic and environmental diversity to allow the species to adapt to changing environmental conditions). Redundancy improves with increasing numbers of populations (natural or reintroduced) distributed across the species' range, and connectivity (either natural or human-facilitated) allows connected populations to ''rescue'' each other after

catastrophes. The Pascagoula map turtle is found across the eight resilience units in varying densities within the mainstems and tributaries that would prevent extinction of the entire species from the impacts of a single catastrophic event.

Representation improves with the persistence of populations spread across the range of genetic and/or ecological diversity within the species. Long-term viability will require resilient populations to persist into the future; for the Pascagoula map turtle, this will mean maintaining high-quality tributary and mainstem habitat and water quality to support many redundant populations across the species' range, while preventing barriers to dispersal between populations such as dams or impoundments (Service 2021a, p. 22). The Pascagoula map turtle has distinct genetic characteristics in at least three of the rivers: Leaf, Chickasawhay, and Pascagoula (Pearson et al. 2020, entire). We described representation based on four representative units: Chickasawhay River representative unit (includes the Chunky-Okatibbee, Upper Chickasawhay, and Lower Chickasawhay resilience units), Leaf River representative unit (consists of the Upper and Lower Leaf resilience units), Pascagoula River representative unit (consists of the Black and Pascagoula resilience units), and the Escatawpa River representative unit (consists of the Escatawpa resilience unit only) (Service 2021a, pp. 67–70).

All representative units are currently occupied, though the Escatawpa is occupied at a very low density. The Leaf River representative units substantially contribute to representation with high resiliency. The Pascagoula River and Chickasawhay River representative units both significantly contribute to representation with moderate resiliency (Service 2021a, pp. 72–73).

Status Throughout All of Its Range

We have carefully assessed the best scientific and commercial data available regarding the past, present, and future threats to the Pascagoula map turtle, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these stressors. The primary stressors (which are pervasive across the species' range) affecting the Pascagoula map turtle's biological status include habitat degradation or loss (*i.e.,* channel and hydrological modifications and impoundments; removal or loss of deadwood; declines in water quality from agricultural runoff; development; and mining), collection, and effects of climate change (SLR, drought, and flooding). Additional stressors acting on the species include disease and invasive species and the synergistic effects of a multitude of stressors that affect the species or its habitat over time.

When considering the threats acting on the species, there are adequate numbers of sufficiently resilient units with redundancy and representation across the species' range to withstand any imminent threats. The current conditions of the eight resilience units range from low to high with only a single unit, Escatawpa, with low resiliency, five units with moderate resiliency (Black, Chunky-Okatibbee, Lower Chickasawhay, Pascagoula, and Upper Chickasawhay), and two with high resiliency (Lower Leaf and Upper Leaf). The species is distributed throughout the Pascagoula River watershed and thus has sufficient redundancy such that a catastrophic event, like a major, direct-hit hurricane, would only affect the small portion of the range that is in close proximity to the Gulf of Mexico. The species is also not confined to the mainstem rivers, and there are many tributaries that serve as refugia for the species.

This species' habitat is surrounded by protected lands in many areas and the species is buffered from many threats such as development. Because the species currently retains moderate to high resiliency in seven out of eight of the units with sufficient redundancy and representation, the species is not currently in danger of extinction throughout all of its range.

For the species to maintain viability, there must be adequate redundancy (suitable number of populations and connectivity to allow the species to withstand catastrophic events) and representation (genetic and environmental diversity to allow the species to adapt to changing environmental conditions). Our projections of Pascagoula map turtle viability into the foreseeable future (*i.e.,* approximately 20 to 50 years (2040 and 2070)) consider habitat and population factors, plus available climate modeling projections to inform future conditions. The greatest future threats to the Pascagoula map turtle include the effects of climate change: Loss of suitable habitat through salinization due to SLR, overall habitat changes, and other effects of climate (more precipitation extremes, including drought and floods). However, future condition projections that extend out to 2040 and 2070 do not indicate the threats will act on the species within this timeframe in a manner that would place the species in danger of extinction throughout its range. We can reasonably rely on the predictions within the timeframe presented in the future condition scenarios because these timeframes are based on input from species experts, generation time for the species, and the confidence in predicting patterns of urbanization and agriculture. This is sufficient time to account for the species' response to threats over three to seven generations. Confidence in how these land uses will interact with the species and its habitat diminishes beyond 50 years.

Habitat in the lower portions of the Escatawpa and Pascagoula units would likely experience SLR effects and a contraction of suitable habitat due to the effects of salinization. However, six of the eight populations would remain in high or moderate resiliency and moderate or better redundancy, and representation would still occur in all eight units into the foreseeable future. The two units with the greatest impacts from the above listed threats, the Escatawpa and the Pascagoula units, would also remain extant but likely with less habitat overall and some reduced resiliency. There will be sufficient redundancy with the units across the range and representation for adaptive capacity for the species to maintain viability into the future. Therefore, this species is not likely to become an endangered species in the foreseeable future. After assessing the best available information, we determine that the Pascagoula map turtle is not in danger of extinction now or likely to become so in the foreseeable future throughout all of its range.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. Having determined that the Pascagoula map turtle is not in danger of extinction or likely to become so in the foreseeable future throughout all of its range, we now consider whether it may be in danger of extinction or likely to become so in the foreseeable future in a significant portion of its range—that is, whether there is any portion of the species' range for which it is true that both (1) the portion is significant; and (2) the species is in danger of extinction now or likely to become so in the foreseeable future in that portion. Depending on the case, it might be more efficient for us to address the ''significance'' question or the ''status'' question first. We can choose to address either question first. Regardless

of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

In undertaking this analysis for the Pascagoula map turtle, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered or threatened.

For the Pascagoula map turtle, we considered whether the threats are geographically concentrated in any portion of the species' range at a biologically meaningful scale, which may signal that it is more likely to be endangered or threatened in that portion. We examined the following threats: Habitat degradation or loss (*i.e.,* channel and hydrological modifications and impoundments, removal or loss of deadwood, declines in water quality from agricultural runoff, development, and mining); collection; and the effects of climate change (SLR, drought, and flooding). We also considered whether cumulative effects contributed to a concentration of threats across the species' range. Overall, we found that the effects of SLR are concentrated in the lower portion of the Pascagoula and Escatawpa resilience units and will affect the southern portions of these units in the future.

We first consider the threat of SLR acting on the Pascagoula resiliency unit. The effects of SLR will encroach in the southern portion of the unit, which currently has a moderate resiliency. The unit is linearly aligned along a north-south axis and connects to the Gulf of Mexico, which is the source of the saltwater inundation into the unit. The future conditions of the habitat within the unit are projected to improve because forest cover is expected to increase. The amount of available habitat will decline due to SLR; however, this situation will affect less than 15 percent of occupied habitat within the unit. This threat will create a gradual shift in conditions, allowing turtles within the area that will be affected to move north into other suitable areas not affected by saltwater intrusion from SLR. Because such a small percentage of occupied habitat in the unit will be affected by SLR, we find that SLR is not acting at a biologically meaningful scale in the Pascagoula resiliency unit such that the species may be in danger of extinction currently or within the foreseeable future in the Pascagoula unit. Therefore, this portion of the species' range does not provide a basis for determining that the species is in danger of extinction now or likely to become so in the foreseeable future in a significant portion of its range.

We next consider the threat of SLR acting on the Escatawpa resilience unit. This unit will be impacted by SLR in its southern portion as it also is connected to the Pascagoula River in close proximity to the Gulf of Mexico. In the Escatawpa, the area projected to be inundated has only a single record of Pascagoula map turtle occurrence. Another recent detection was approximately 25 river miles (rmi) (40 river kilometers (rkm)) upstream, so it is logical to assume there are other undetected turtles that may be impacted by inundation. Depending on the magnitude of SLR over the next 50 years, the Escatawpa unit will be inundated between 2.5 rmi (4.0 rkm) and 5.5 rmi (8.9 rkm) with 1-ft (0.3-m) and 5-ft (1.5-m) level increase, respectively (Service 2021a, p. 89). Between 5–17 percent of the species' habitat within the Escatawpa resilience unit will be affected by SLR. Because such a small percentage of the unit and such a low density and abundance of turtles within it will be affected by SLR, we find that SLR is not acting at a biologically meaningful scale in the Escatawpa resiliency unit such that the species may be in danger of extinction currently or within the foreseeable future in the Escatawpa unit. Therefore, this portion of the species' range does not provide a basis for determining that the species is in danger of extinction now or likely to become so in the foreseeable future in a significant portion of its range.

All other threats to the species are distributed throughout its range and affect the species uniformly throughout its range. After evaluating the areas that will be disproportionately affected by SLR in the future, our examination leads us to find that no portion of the species' range can provide a basis for determining that the species is in danger of extinction now or likely to become so in the foreseeable future in a significant portion of its range, and we find that the Pascagoula map turtle is not in danger of extinction now or likely to become so in the foreseeable future in any significant portion of its range. This is consistent with the courts' holdings in *Desert Survivors* v. *Department of the Interior,* No. 16–cv–01165–JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity* v. *Jewell,* 248 F. Supp. 3d, 946, 959 (D. Ariz. 2017).

Determination of Pascagoula Map Turtle Status

Our review of the best available scientific and commercial information indicates that the Pascagoula map turtle does not meet the definition of an endangered species or a threatened species in accordance with sections 3(6) and 3(20) of the Act. Therefore, we find that listing the Pascagoula map turtle is not warranted at this time. A detailed discussion of the basis for this finding can be found in the Pascagoula map turtle species assessment form (Service 2021, entire) and other supporting documents, such as the accompanying SSA report (Service 2021a, entire) (see *https://www.regulations.gov* under docket number FWS–R4–ES–2021–0097).

II. Proposed Listing Determination for Pearl River Map Turtle

Background

The Pearl River map turtle (*Graptemys pearlensis*) is a freshwater turtle species belonging to the Emydidae family that includes terrapins, pond turtles, and marsh turtles. Turtles in the genus *Graptemys* are also known as map turtles or sawback turtles for the intricate pattern on the carapace that often resembles a topographical map. The species is in the megacephalic (large-headed) clade as females grow proportionally larger heads and jaws than males as they age; the carapace length of adult females is over two times the length of adult males on average (Gibbons and Lovich 1990, pp. 2–3).

The species inhabits rivers and large creeks with sand and gravel bottoms in the Pearl River drainage from central Mississippi to the border of southern Mississippi and Louisiana. For the Pearl River map turtle to survive and reproduce, individuals need suitable habitat that supports essential life functions at all life stages. Several elements appear to be essential to the survival and reproduction of individuals: Mainstem and tributary reaches within the Pearl River system that have sandbars, adequate flow, adequate supply of invertebrate prey items including insects and mollusks (particularly freshwater mussels), and an abundance of emergent and floating basking structures of various sizes. The diet of the Pearl River map turtle varies between females and males; mature females consume mostly Asian clams (*Corbicula fluminea*), while males and juveniles eat insects, with mature males specializing in caddisfly larvae and consuming more mollusks than juveniles (Vucenović and Lindeman 2021, entire; Service 2021a, p. 11).

Pearl River map turtles are found in rivers and creeks with sand and gravel bottoms and dense accumulations of deadwood; turtles have not been documented in oxbow lakes or other floodplain habitats. They were notably absent from lakes where their sympatric microcephalic species, the ringed map turtle (*Graptemys oculifera*), is present, but do occur at the upstream reach of Ross Barnett Reservoir, an impoundment of the Pearl River (Lindeman 2013, p. 298). Accounts from before the Pearl River map turtle and Pascagoula map turtle were taxonomically divided described ideal habitat as rivers and creeks with sand or gravel bottoms, abundant basking structures, and swift currents (Lovich 2009, p. 304; Service 2006, p. 2). Although some species of *Graptemys* may tolerate conditions with some salinity, there is evidence that the genus is largely intolerant of brackish and saltwater environments (Selman and Qualls 2008, pp. 228–229; Lindeman 2013, pp. 396–397).

The species requires semi-exposed structure for basking. Emergent deadwood serves as thermoregulatory basking structure, foraging structure for males and juveniles (Selman and Lindeman 2015, pp. 794–795), and as an overnight resting place for males and juveniles (Cagle 1952, p. 227). Moderate-to-high basking densities of Pearl River map turtles were always associated with moderate-to-high deadwood densities, but some sites with ample deadwood structure did not have high densities of basking map turtles, indicating that those sites may lack other important characteristics (Lindeman 1999, pp. 37–40). Deadwood and its source in riparian forests are positively correlated to the abundance of riverine turtles (Sterrett et al. 2011, entire),

The life history of the Pearl River map turtle can be described as the stages of egg, hatchling, juvenile, and adult. Typically, male map turtles mature in 2 to 3 years, while females mature much later (Lindeman 2013, p. 109). Maturity for adult female Pearl River map turtles may occur around 9 years of age (Vogt et al. 2019, pp. 557–558).

Female Pearl River map turtles excavate nests and lay their eggs on sandbars and beaches along riverbanks during the late spring and early summer months. Nesting habitat has been described as sandy substrates near the water's edge. At a beach on the Pearl River downstream of the Strong River, a nest was found in fine sand 82 ft (25 m) from the water (Vogt et al. 2019, p. 557). Three confirmed Pearl River map turtle nests found on sandbars along the Pearl River were dug in relatively fine sand ranging from 23 to 180 ft (7 to 55 m) from the water's edge and averaging 5.2 ft (1.6 m) from the closest vegetation (Ennen et al. 2016, pp. 094.4–094.6). Another account states that nests are typically near the vegetation lines of sandbars (Anderson 1958, pp. 212–215).

The time from deposition to nest emergence by hatchlings in natural clutches ranged from 67 to 79 days and averaged 69.3 days. Hatchlings incubated in captivity averaged 3.66 cm (1.44 in) in carapace length (Jones, unpublished data, summarized in Ennen et al. 2016, pp. 094.4094.6). Hatchlings typically emerge from the nest within 3 hours after sunset, and this life stage depends on adequate abundance of invertebrate prey and emergent branches near the riverbank. All life stages require adequate quality and quantity of water as they are primarily freshwater aquatic turtles.

A more thorough review of the taxonomy, life history, and ecology of the Pearl River map turtle is presented in detail in the SSA report (Service 2021b, pp. 15–30).

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the Pearl River map turtle, its resources, and the threats that influence the species' current and future conditions in order to assess its overall viability and the risks to that viability.

Species Needs

We assessed the best available information to identify the physical and biological needs to support individual fitness at all life stages for the Pearl River map turtle. Full descriptions of all needs are available in chapter 3 of the SSA report (Service 2021b, pp. 19–21), which can be found in docket number FWS–R4–ES–2021–0097 on *https://www.regulations.gov.* Based upon the best available scientific and commercial information, and acknowledging existing ecological uncertainties, the resource and demographic needs for breeding, feeding, sheltering, and dispersal of the Pearl River map turtle are characterized as:

- For successful reproduction, the species requires patches of fine sand adjacent to adult habitat with sparse vegetation, typically on sandbars, adequate sand incubation temperatures to yield an appropriate hatchling sex ratio, and appropriate river flow to prevent nest mortality due to flooding.
- Hatchlings require an adequate abundance of invertebrate prey and of emergent branches and tangles near the riverbank.
- Adult males require an adequate abundance of insect prey, emergent logs, branches, and tangles near the bank.
- Adult females require an adequate abundance of native mussels or Asian clams; deeper, sand or gravel-bottomed stretches for foraging; and emergent logs and branches for basking.
- Population needs include the same requirements as individuals (sandbars; natural hydrologic regimes; and an adequate supply of invertebrate prey items, basking structures, and sand, gravel, or rocky substrates) but must be met at a larger scale. Connectivity that facilitates genetic exchange and maintains high genetic diversity is needed; tributary and mainstem reaches with suitable habitat uninterrupted by impoundments must be sufficient in size to support a large enough population of individuals to avoid issues associated with small populations, such as inbreeding depression.

Threats Analysis

The following discussions include evaluations of three threats and associated sources that are affecting the Pearl River map turtle and its habitat: (1) Habitat degradation or loss, (2) collection, and (3) climate change (Service 2021b, Chapter 4). In addition, potential impacts from disease and invasive species were evaluated but were found to have minimal effects on viability of the species based on current knowledge (Service 2021b, pp. 43–45).

Habitat Degradation or Loss

Water Quality

Degradation of stream and wetland systems through reduced water quality and increased concentrations of contaminants can affect the occurrence and abundance of freshwater turtles (DeCatanzaro and Chow-Fraser 2010, p. 360). Infrastructure development increases the percentage of impervious surfaces, reducing and degrading terrestrial and aquatic habitats. Increased water volume and land-based contaminants (*e.g.,* heavy metals, pesticides, oils) flow into aquatic systems, modifying hydrologic and sediment regimes of rivers and wetlands (Walsh et al. 2005, entire). Aquatic toxicants can have both immediate and long-term negative impacts on species and ecosystems by degrading the water quality and causing direct and indirect effects to the species or its required resources (Service 2021b, p. 25). Despite these effects, species vary widely in their tolerances and abilities to adapt to

water quality degradation, including variation in stress and immune responses (French et al. 2008, pp. 5–6), population structure (Patrick and Gibbs 2010, pp. 795–797), survival and recruitment (Eskew and Dorcas 2010, pp. 368–371), and ultimately distribution and abundance (Riley et al. 2005, pp. 6–8).

Freshwater mussels and snails are important food sources for the Pearl River map turtle, and sedimentation and pollution can have adverse impacts on mollusk populations (Box and Mossa 1999, entire). While past studies have focused on the closely related Pascagoula map turtle's prey, we expect impacts to be similar for the Pearl River map turtle. Inputs of point (point source discharge from particular pipes, discharges, etc.) and nonpoint (diffuse land surface runoff) source pollution across the range are numerous and widespread. Point source pollution can be generated from inadequately treated effluent from industrial plants, sanitary landfills, sewage treatment plants, active surface mining, drain fields from individual private homes, and others (Service 2000, pp. 14–15). Nonpoint source pollution may originate from agricultural activities, poultry and cattle feedlots, abandoned mine runoff, construction, silviculture, failing septic tanks, and contaminated runoff from urban areas (Deutsch et al. 1990, entire; Service 2000, pp. 14–15).

These sources may contribute pollution to streams via sediments, heavy metals, fertilizers, herbicides, pesticides, animal wastes, septic tank and gray water leakage, and oils and greases. Glyphosate (found in Roundup and other herbicides), which is widely used as an herbicide, has been found in many waterways across the United States from agricultural runoff and exposure has been associated with endocrine and reproductive disorders in animals (Jerrell et al. 2020, entire; Medalie et al 2020, entire; Mesnage et al. 2015, entire). Water quality and many native aquatic fauna often decline as a result of this pollution, which causes nitrification, decreases in dissolved oxygen concentration, and increases in acidity and conductivity. These alterations likely have direct (*e.g.,* decreased survival and/or reproduction) and indirect (*e.g.,* loss, degradation, and fragmentation of habitat) effects. For aquatic species, submergent vegetation provides critical spawning habitat for adults, refugia from predators, and habitat for prey of all life stages (Jude and Pappas 1992, pp. 666–667), and degraded water quality and high algal biomass that result from pollutant inputs, cause loss of these critical submergent plant species (Chow-Fraser et al. 1998, pp. 38–39).

A wide range of current activities and land uses within the range of the Pearl River map turtle can lead to sedimentation within streams: Agricultural practices, construction activities, stormwater runoff, unpaved roads, incompatible timber harvest, utility crossings, and mining. Fine sediments are not only input into streams during these activities, but historical land use practices may also have substantially altered hydrological and geological processes such that sediments continue to be input into streams for several decades after those activities cease (Harding et al. 1998, p. 14846). The negative effects of increased sedimentation are well understood for aquatic species (Burkhead et al. 1997, p. 411; Burkhead and Jelks 2001, p. 964). Sedimentation can alter food webs and stream productivity (Schofield et al. 2004, p. 907), force altered behaviors (Sweka and Hartman 2003, p. 346), and even have sublethal effects on and result in mortality of individual aquatic organisms (Sutherland 2005, p. 94; Wenger and Freeman 2007, p. 7).

Degradation of water quality from municipal and industrial effluents is recognized as a cause of decline in the ringed map turtle (*Graptemys oculifera*), a sympatric endangered species (Lindeman 1998, p. 137). Lower numbers of ringed map turtles have been recorded near gravel and sand mining operations (Shively 1999, p. 10). Native mussel and gastropod populations have likely already decreased due to sedimentation and other anthropogenic alterations (Jones at al. 2005, entire). Pearl River map turtles' mollusk prey species may be affected by municipal (*e.g.,* sewage) and industrial (*e.g.,* paper mills and chicken farms) effluents that are discharged into the Pearl River (EPA 2018, entire). Because of the similar life-history traits of the ringed map turtle and the Pearl River map turtle, it is reasonable to expect that water quality also impacts the Pearl River map turtle populations (Selman 2020a, p. 2).

Additionally, water quality for the Pearl River map turtle is impacted by four processes that are further discussed below: Channel and hydrology modifications and impoundments, agriculture, development (urbanization), and mining. Water quality is affected across the range of the species; however, the source and effects are greater in certain units.

Channel and Hydrology Modifications and Impoundments

Dredging and channelization have led to loss of aquatic habitat in the Southeast (Warren Jr. et al. 1997, unpaginated). Dredging and channelization projects are extensive throughout the region for flood control, navigation, sand and gravel mining, and conversion of wetlands into croplands (Neves et al. 1997, unpaginated; Herrig and Shute 2002, pp. 542–543). Many rivers are continually dredged to maintain a channel for shipping traffic. Dredging and channelization modify and destroy habitat for aquatic species by destabilizing the substrate, increasing erosion and siltation, removing woody debris, decreasing habitat heterogeneity, and stirring up contaminants, which settle onto the substrate (Williams et al. 1993, pp. 7–8; Buckner et al. 2002, entire; Bennett et al. 2008, pp. 467–468). Channelization can also lead to headcutting, which causes further erosion and sedimentation (Hartfield 1993, pp. 131–141). Dredging removes woody debris, which provides cover and nest locations for many aquatic species (Bennett et al. 2008, pp. 467–468). Anthropogenic deadwood removal has been noted as a reason for decline in a microcephalic species, the ringed map turtle (Lindeman 1998, p. 137). Snags and logs are removed from some sites to facilitate boat navigation (Dundee and Rossman 1989, p. 187). Experiments with manual deposition of deadwood in stretches with less riparian forest have been suggested as potential habitat restoration measures (Lindeman 2019, p. 33).

Stream channelization, point-bar mining, and impoundments were identified as potential threats in a report issued prior to the Pascagoula map turtle and Pearl River map turtle being recognized as taxonomically distinct (Service 2006, p. 2). Channel modification is recognized as a cause of decline in the ringed map turtle, a sympatric endangered species (Lindeman 1998, p. 137). Considerably low densities of Pearl River map turtles were observed in the lower reaches of the Pearl, where much channelization and flow diversion has occurred (Lindeman 2019, pp. 23–29).

Impoundment of rivers is a primary threat to aquatic species in the Southeast (Benz and Collins 1997, unpaginated; Buckner et al. 2002, entire). Dams modify habitat conditions and aquatic communities both upstream and downstream of an impoundment (Winston et al. 1991, pp. 103–104; Mulholland and Lenat 1992, pp. 193–231; Soballe et al. 1992, pp. 421–474).

Upstream of dams, habitat is flooded, and in-channel conditions change from flowing to still water, with increased depth, decreased levels of dissolved oxygen, and increased sedimentation. Sedimentation alters substrate conditions by filling in interstitial spaces between rocks that provide habitat for many species (Neves et al. 1997, unpaginated). Downstream of dams, flow regime fluctuates with resulting fluctuations in water temperature and dissolved oxygen levels, the substrate is scoured, and downstream tributaries are eroded (Schuster 1997, unpaginated; Buckner et al. 2002, unpaginated). Negative ''tailwater'' effects on habitat can extend many kilometers downstream (Neves et al. 1997, unpaginated). Dams fragment habitat for aquatic species by blocking corridors for migration and dispersal, resulting in population geographic and genetic isolation and heightened susceptibility to extinction (Neves et al. 1997, unpaginated). Dams also preclude the ability of aquatic organisms to escape from polluted waters and accidental spills (Buckner et al. 2002, unpaginated).

Damming of streams and springs is extensive throughout the Southeast (Etnier 1997, unpaginated; Morse et al. 1997, unpaginated; Shute et al. 1997, unpaginated). Most Southeastern streams are impacted by impoundment (Shute et al. 1997, p. 458). Many streams have both small ponds in their headwaters and large reservoirs in their lower reaches. Small streams on private lands are regularly dammed to create ponds for cattle, irrigation, recreation, and fishing, with significant ecological effects due to the sheer abundance of these structures (Morse et al. 1997, unpaginated). Small headwater streams are increasingly being dammed in the Southeast to supply water for municipalities (Buckner et al. 2002, unpaginated), and many Southeastern springs have also been impounded (Etnier 1997, unpaginated). Dams are known to have caused the extirpation and extinction of many Southeastern species, and existing and proposed dams pose an ongoing threat to many aquatic species (Folkerts 1997, unpaginated; Neves et al. 1997, unpaginated; Service 2000, p. 15; Buckner et al. 2002, unpaginated).

On the Pearl River, Ross Barnett Reservoir was constructed between 1960 and 1963 and provides a water supply for the City of Jackson, Mississippi, and the associated area, as well as recreational opportunities on the 33,000-acre (ac) (13,355 hectares (ha)) lake and the 17,000 ac (6,880 ha) surrounding it (Pearl River Valley Water Management District 2020, entire). A total of 20.9 rmi (33.6 rkm) of the Pearl River that was previously suitable habitat is now submerged beneath the Ross Barnett Reservoir (Lindeman 2019, p. 19). The Ross Barnett Reservoir has greatly reduced habitat suitability of five percent of the mainstem Pearl River by altering the lotic (flowing water) habitat preferred by Pearl River map turtles to lentic (lake) habitat and fragmented the contiguous habitat for the species. Low population densities of Pearl River map turtles have been observed upstream of the Ross Barnett Reservoir, possibly due to recreational boating and extended recreational foot traffic or camping on sandbars by reservoir visitors (Selman and Jones 2017, pp. 32–34). Between the late 1980s and early 2010s, notable population declines also have been observed in the stretch of the Pearl River downstream of the Ross Barnett Reservoir (north of Lakeland Drive), but the exact reason for the decline is unknown (Selman 2020b, p. 194). Additionally, plans for new reservoirs on the Pearl River both upstream and downstream of Jackson have been or are being considered (Lindeman 2013, pp. 202–203). Up to 170 individual Pearl River map turtles could be impacted by the construction of the One Lake Project, one of several proposed impoundments (Selman 2020b, entire).

Agriculture

Agriculture is generally high across the Pearl River basin, where levels of agriculture within the units ranged from 12–23 percent, with the Bogue Chitto Unit having the highest levels of agriculture (Service 2021b, pp. 53–56). Some of the major crops in the area include soybeans and cotton, and much of the livestock farming includes chickens and cattle. Agricultural practices such as traditional farming, feedlot operations, and associated land use practices can contribute pollutants to rivers and may affect the Pearl River map turtle's aquatic habitat. These practices degrade habitat by eroding stream banks, which results in alterations to stream hydrology and geomorphology. Nutrients, bacteria, pesticides, and other organic compounds are generally found in higher concentrations in areas affected by agriculture than in forested areas. Contaminants associated with agriculture (*e.g.,* fertilizers, pesticides, herbicides, and animal waste) can cause degradation of water quality and habitats through instream oxygen deficiencies, excess nutrification, and excessive algal growths. These, in turn, alter the aquatic community composition, shifting food webs and stream productivity, forcing altered behaviors, and even having sublethal effects or outright killing individual aquatic organisms (Petersen et al. 1999, p. 6). These alterations likely have direct (*e.g.,* decreased survival and/or reproduction) and indirect (*e.g.,* loss, degradation, and fragmentation of habitat) effects on the Pearl River map turtle or its habitat.

Agricultural development may also reduce the amount of adjacent riparian forest available to produce deadwood through land conversion; in another megacephalic map turtle species (Barbour's map turtle), turtle abundance decreased in areas where adjacent riparian corridors had been disturbed by agriculture, while the abundance of the red-eared slider (*Trachemys scripta*), a cosmopolitan species, increased (Sterrett et al. 2011, entire).

Pesticide application and use of animal waste for soil amendment are becoming common in many regions and pose a threat to biotic diversity in freshwater systems. Over the past two decades, these practices have corresponded with marked declines in populations of fish and mussel species in the Upper Conasauga River watershed in Georgia/Tennessee (Freeman et al. 2017, p. 419). Nutrient enrichment of streams was widespread with nitrate and phosphorus exceeding levels associated with eutrophication, and hormone concentrations in sediments were often above those shown to cause endocrine disruption in fish, possibly reflecting widespread application of poultry litter and manure (Lasier et al. 2016, entire). Researchers postulate that species declines observed in the Conasauga watershed may be at least partially due to hormones, as well as excess nutrients and herbicide surfactants (Freeman et al. 2017, p. 429).

Development

The Pearl River map turtle range includes areas of the Pearl River that are adjacent to several urban areas, including the Jackson, Mississippi, metropolitan area where urbanization is expected to increase; other areas within the Pearl River basin that are expected to grow in the future include the cities of Monticello and Columbia, Mississippi. Urbanization is a significant source of water quality degradation that can reduce the survival of aquatic organisms. Urban development can stress aquatic systems in a variety of ways, which could affect the diet and habitat needs of aquatic turtles. This includes increasing the frequency and magnitude of high flows in streams, increasing sedimentation and nutrient loads, increasing

contamination and toxicity, decreasing the diversity of fish, aquatic insects, plants, and amphibians, and changing stream morphology and water chemistry (Coles et al. 2012, entire; CWP 2003, entire). Activities related to development can also reduce the amount of adjacent riparian forest available to produce deadwood; in another megacephalic map turtle species (Barbour's map turtle), abundance decreased in areas where adjacent riparian corridors had been disturbed (Service 2021b, p. 10). In addition, sources and risks of an acute or catastrophic contamination event, such as a leak from an underground storage tank or a hazardous materials spill on a highway or by train, increase as urbanization increases.

Mining

The rapid rise in urbanization and construction of large-scale infrastructure projects are driving increasing demands for construction materials such as sand and gravel. Rivers are a major source of sand and gravel because transport costs are low; river energy produces the gravel and sand, thus eliminating the cost of mining, grinding, and sorting rocks; and the material produced by rivers tends to consist of resilient minerals of angular shape that are preferred for construction (Koehnken et al. 2020, p. 363). Impacts of sand and gravel mining can be direct or indirect. Direct impacts include physical changes to the river system and the removal of gravel and floodplain habitats from the system. Indirect impacts include shifting of habitat types due to channel and sedimentation changes; changes in water quality, which changes the chemical and physical conditions of the system; and hydraulic changes that can impact movement of species and habitat availability, which is vital for supporting turtle nesting and basking activities.

Gravel mining is a major industry in southeastern Louisiana, particularly along the Bogue Chitto River, within the range of the Pearl River map turtle (Selman 2020a, p. 20). In-stream and unpermitted point-bar mining was observed in the late 1990s and was the biggest concern for *Graptemys* species in the Bogue Chitto River (Shively 1999, pp. 10–11). Gravel mining is perhaps still the greatest threat to the Pearl River system in southeastern Louisiana, particularly in the Bogue Chitto floodplain where run-off and effluents would affect the downstream of these point sources (Selman 2020a, p. 20). Gravel mining can degrade water quality, increase erosion, and ultimately impact movement and habitat quality for aquatic species such as the Pearl River map turtle (Koehnken et al. 2020, p. 363). A recent comparison of aerial imagery from the mid-1980s and late 1990s with images from 2019 reveal increases in distribution and magnitude of gravel mines in the Bogue Chitto River system, and recent surveys have reported several areas where mining appears to have degraded water quality significantly (Selman 2020a, pp. 20–21, and p. 40). Mining in the floodplain continues to be a threat to the species; however, permit requirements in Louisiana and Mississippi have reduced the threat of instream gravel mining.

Collection

Due to the intricacy of the shell morphology, map turtles are popular in the pet trade (Service 2006, p. 2), both domestically and internationally. An analysis of online marketplace offerings in Hong Kong revealed that interest in turtles as pets is increasing, that many of the species offered for sale are from North America, and that there is a higher interest in rare species (Sung and Fong 2018, p. 221). The common map turtle (*Graptemys geographica*) is one of three most-traded species in the international wildlife trade market, with individuals being sold both as pets and incorporated into Chinese aquaculture for consumption (Luiselli et al. 2016, p. 170). Exploitation of Pearl River map turtles for the pet trade domestically and in Asian markets has been documented, but the degree of impact is unclear, as it is unknown whether captive individuals were Pascagoula map turtles or Pearl River map turtles (Lindeman 1998, p. 137; Cheung and Dudgeon 2006, p. 756; Service 2006, p. 2; Selman and Qualls 2007, pp. 32–34; Ennen et al. 2016, p. 094.6).

According to a species expert, collection of wild turtles in the Pearl River system is probably occurring, and similar to what has been observed in other States, these turtles are likely destined for the high-end turtle pet trade in China and possibly other Southeast Asian countries (Selman 2020a, p. 23). Information has been documented from three different local individuals, at three different locations, concerning turtle bycatch or harvesting in local Louisiana waterways occupied by Pearl River map turtles (Selman 2020a, pp. 22–23). These locations included the Pearl River south of Bogalusa, Louisiana (possible mortality resulting from bycatch in hoop nets), the West Pearl River Navigation Canal (turtles captured and sold, possibly for shipment to China), and the Bogue Chitto River (local comment that baby turtles were being captured and shipped to China) (Selman 2020a, pp. 22–23). The specific species captured were not documented; however, it is likely that at least some of these turtles were Pearl River map turtles.

The Service manages information related to species exports in the Law Enforcement Management Information System (LEMIS). According to a LEMIS report from 2005 to 2019, more than 300,000 turtles identified as *Graptemys* spp. or their parts were exported from the United States to 29 countries (Service 2021b, Appendix B). The number of turtles recorded in each shipment ranged widely. Due to their similarity in appearance, species of *Graptemys* are difficult to differentiate. Records from 2005, when the highest number of *Graptemys* were exported, show more than 35,000 turtles (*Graptemys* spp.) in a single shipment to Spain and a total of 172,645 individual *Graptemys* exported to 24 different countries. However, there is some uncertainty in the sources of the exported turtles as they could have originated from captive stock.

Collection is allowed in Mississippi with an appropriate license through the State; a person may possess and harvest from the wild no more than 10 non-game turtles per license year. No more than four can be of the same species or subspecies. It is illegal to harvest turtles between April 1 to June 30 (40 MISS Admin Code Part 5 Rule 2.3 on Non-game Species in Need of Management).

Climate Change

In the Southeastern United States, climate change is expected to result in a high degree of variability in climate conditions with more frequent drought, more extreme heat (resulting in increases in air and water temperatures), increased heavy precipitation events (*e.g.,* flooding), more intense storms (*e.g.,* increased frequency of major hurricanes), and rising sea level and accompanying storm surge (Intergovernmental Panel on Climate Change (IPCC) 2013, entire). Warming in the Southeast is expected to be greatest in the summer, which is predicted to increase drought frequency, while annual mean precipitation is expected to increase slightly, leading to increased flooding events (IPCC 2013, entire; Alder and Hostetler 2013, unpaginated). This variability in climate may affect ecosystem processes and communities by altering the abiotic conditions experienced by biotic assemblages resulting in potential effects on community composition and individual species interactions (DeWan et al. 2010, p. 7). These changes have the potential to impact Pearl River map turtles and/

or their habitat, are ongoing, and will likely become more evident in the future.

The dual stressors of climate change and direct human impact have the potential to impact aquatic ecosystems by altering stream flows and nutrient cycles, eliminating habitats, and changing community structure (Moore et al. 1997, p. 942). Increased water temperatures and alterations in stream flow are the climate change effects that are most likely to affect stream communities (Poff 1992, entire), and each of these variables is strongly influenced by land use patterns. For example, in agricultural areas, lower precipitation may trigger increased irrigation resulting in reduced stream flow (Backlund et al. 2008, pp. 42–43). Alternatively, increased urbanization may lead to more impervious surfaces, increasing runoff and flashiness of stream flows (Nelson et al. 2009, pp. 156–159).

Increasing Temperatures

Another area where climate change may affect the viability of the Pearl River map turtle is through temperature-dependent sex determination (TDSD) during embryo development within buried nests. In turtle species that exhibit TDSD, increasing seasonal temperatures may result in unnatural sex ratios among hatchlings. This could be an important factor as climate change drives increasing temperatures. Since male map turtles with TDSD develop at lower temperatures than females, rising temperatures during developmental periods may result in sex ratios that are increasingly female-biased.

Drought

Climate change may increase the frequency of drought events, such as the one that occurred in the Southeastern United States in 2007. Based on down-scaled climate models for the Southeastern United States, the frequency, duration, and intensity of droughts are likely to increase in this region in the future (Keellings and Engstrom 2019, pp. 4–6). Stream flow is strongly correlated with important physical and chemical parameters that limit the distribution and abundance of riverine species (Power et al. 1995, entire; Resh et al. 1988, pp. 438–439). The Pearl River map turtle is aquatic and requires adequate flow for all life stages.

Sea Level Rise

As a result of climate change, the world's oceanic surface-waters and land are warming. The density of water decreases as temperature increases causing it to expand. This process of ''thermal expansion,'' exacerbated by an influx of melt water from glaciers and polar ice fields, is causing sea levels to rise. During the 20th century, global sea level rose by 0.56 feet (ft) (0.17 meters (m)) at an average annual rate of 0.079 in (2.01 millimeter (mm) per year, which was 10 times faster than the average during the previous 3,000 years (IPCC 2007, pp. 30–31). The rate of SLR continues to accelerate and is currently believed to be about 0.12 in (3 mm) per year (Church and White 2006, pp. 2–4). It is estimated that sea level will rise by a further 0.59 ft (0.18 m) to 1.94 ft (0.59 m) by the century's end (IPCC 2007, p. 46). However, some research suggests the magnitude may be far greater than previously predicted due to recent rapid ice loss from Greenland and Antarctica (Rignot and Kanagaratnam 2006, pp. 989–990). Accounting for this accelerated melting, sea level could rise by between 1.64 ft (0.5 m) and 4.6 ft (1.4 m) by 2100 (Rahmstorf et al. 2007, p. 709). SLR is likely to impact downstream Pearl River map turtle populations directly by reducing the quality and quantity of available habitat through increased salinity of the freshwater system upstream from the Gulf of Mexico (Service 2021b, p. 86). Local scenarios based on downscaled climate models predict between 2–10 ft (0.6–3.0 m) of SLR in the northern Gulf of Mexico near the mouth of the Pearl River and could inundate up to 23.73 rmi (38.18 rkm) of the Pearl River under an extreme scenario (NOAA 2020, unpaginated).

SLR may also affect the salt marsh wetlands at the mouth of the Pearl River deteriorating the protective effect of the marsh in reducing saltwater intrusion. Barrier islands off the coast may also be submerged, resulting in loss of the protections from the small land masses that buffer the effects of hurricanes and storms. Although some species of *Graptemys* appear to handle some salinity increases, there is evidence that the group is largely intolerant of brackish and saltwater environments (Selman and Qualls 2008, pp. 228–229; Selman et al. 2013, p. 1201; Lindeman 2013, pp. 396–397).

Hurricane Regime Changes—Increased Intensity and Frequency

Since 1996, the frequency of hurricane landfalls in the Southeastern United States has increased, and that trend is predicted to continue for some years into the future (Goldenberg et al. 2001, p. 475; Emanuel 2005, entire; Webster et al. 2005, p. 1845). Individual storm characteristics play a large role in the types and temporal extent of impacts (Greening et al. 2006, p. 878). For example, direction and speed of approach, point of landfall, and intensity all influence the magnitude of storm surge and resultant flooding (Weisberg and Zheng 2006, p. 164) and consequent environmental damage. The storm surge from storms of increased intensity, when compounded with SLR, will force salt water higher upstream with storm surges. Conditions that result from storm surge that correspond with high tides are amplified and change the salinity of waters ever farther upstream, negatively affecting freshwater species, such as map turtles, that are not tolerant of saline environments.

Increased Precipitation—Flooding

While river flooding under natural hydrologic conditions may be important for sandbar construction and deposition of nesting sand on riverine beaches (Dieter et al. 2014, pp. 112–117), an increase in hurricane frequency and stochastic catastrophic floods could cause an increase in nest mortality. Nest mortality from flooding has not been studied in the Pearl River map turtle but has been documented in several other riverine turtle species. A study on the sympatric yellow-blotched map turtle (*Graptemys flavimaculata*) revealed that nest mortality from flooding can be as high as 86.3 percent in some years (Horne et al. 2003, p. 732). In a study on nests of the Ouachita map turtle (*Graptemys ouachitensis*), two 10-day floods (in 2008 and 2010) were believed to have caused the complete mortality of all nests existing before the floods, as hatchlings were found dead inside eggs after the flood. However, a shorter flooding event in 2011 (approximately 4 days of inundation) caused no known nest mortalities (Geller 2012, pp. 210–211). A study on freshwater turtles in South America indicated that as flooding incidents have increased since the 1970s, the number of days that nesting sandbars remain above the inundation threshold has been steadily and significantly decreasing, causing steep declines in the number of hatchlings produced per year (Eisemberg et al. 2016, p. 6).

The effects of climate change will continue affecting the species into the future with chronic and acute exposure to the changes that will occur in its aquatic and terrestrial habitats over time.

Additional Stressors

Additional stressors that affect the Pearl River map turtle that are not well studied or considered major threats to the species' viability include disease,

contaminants, and persecution by humans. Some of the contaminants include pesticides (herbicides and insecticides) and heavy metals. The culmination of stress due to disease and chronic exposure to contaminants may exacerbate the effects of the other threats on individuals. Wanton shooting of turtles has been documented for *Graptemys* species and may impact populations (Lindeman 1998, p. 137; Service 2006, p. 2). However, this practice often goes unreported and is thus difficult to study and/or quantify.

Cumulative/Synergistic Effects

The Pearl River map turtle uses both aquatic and terrestrial habitats that may be affected by activities along the Pearl River basin. Ongoing and future stressors that may contribute to cumulative effects include habitat fragmentation, genetic isolation, invasive species, disease, climate change, and impacts from increased human interactions due to human population increases. When considering the compounding and synergistic effects acting on the species, the resiliency of the analysis units will be further reduced in the future. However, these effects would not change the overall current and future conditions of the species.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. To assess the current and future conditions of the species, we undertake an iterative analysis that encompasses and incorporates the threats individually and then accumulates and evaluates the effects of all the factors that may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

Current Condition

The current condition of the Pearl River map turtle is described in terms of population resiliency, redundancy, and representation across the species. The analysis of these conservation principles to understand the species' current viability is described in more detail in the Pearl River map turtle SSA report (Service 2021b, pp. 52–75).

Resiliency

In order to analyze the species' resiliency, we delineated the species into resiliency units that represent groups of interbreeding individuals. Historically, the majority of the range of the species was likely a single, connected biological population prior to the fragmentation from the Ross Barrett Reservoir; however, we delineated five different resilience units to more accurately describe trends in resiliency, forecast future resiliency, and capture differences in stressors between the units. We considered population and habitat factors to describe the overall resiliency of each unit. The resilience units are: Upper Pearl, Middle Pearl—Silver, Middle Pearl—Strong, Bogue Chitto, and Lower Pearl (figure 1).

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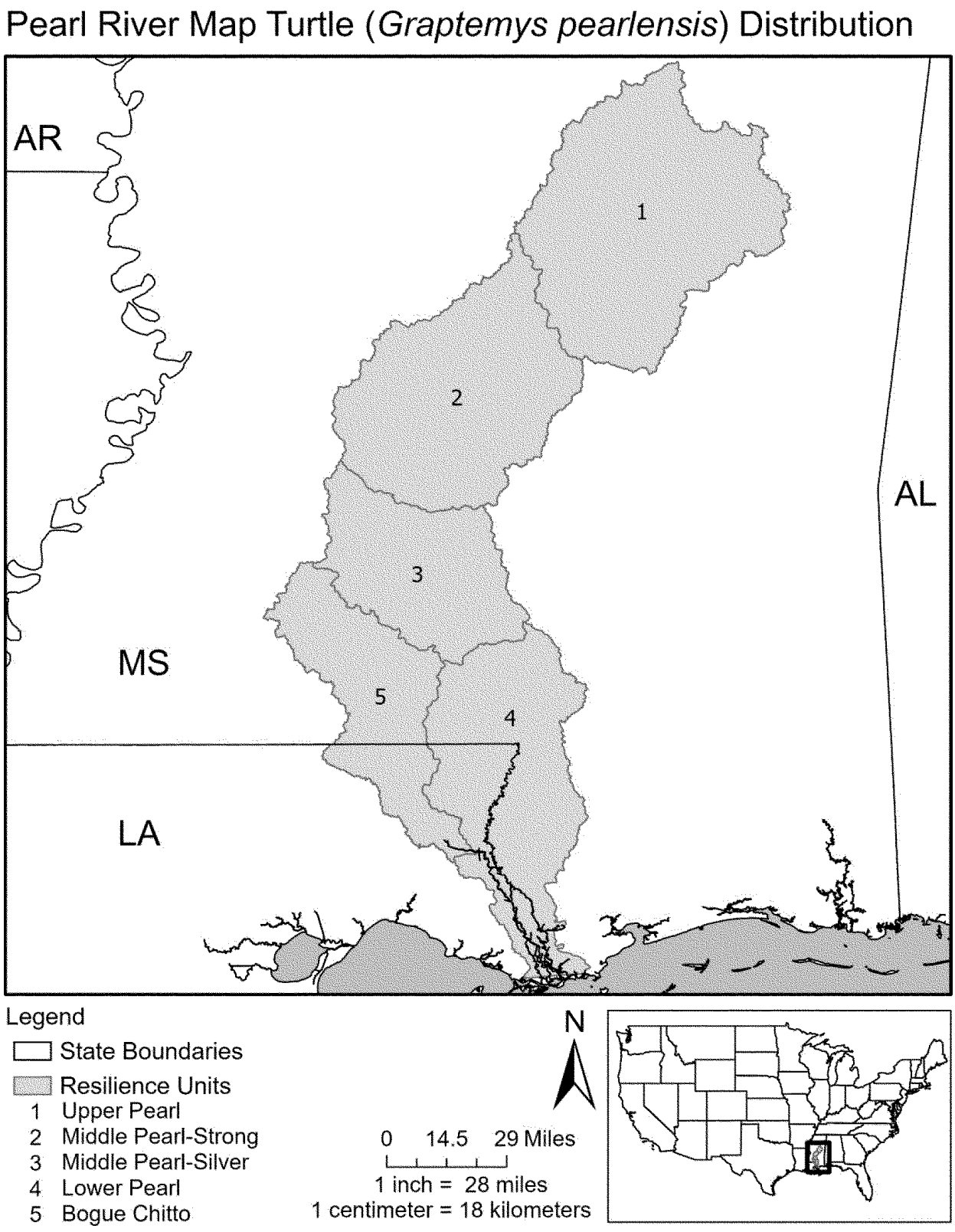

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The factors used to assess current resiliency of Pearl River map turtle resilience units include two population factors: (1) Occupied tributaries as a proxy for presence and (2) density and abundance of four habitat factors: (a) Water quality, (b) forested riparian cover, (c) protected land, and (d) presence of channelization/reservoirs/gravel mining. These population and habitat factors are collectively described as resiliency factors.

Forty-nine percent of the total range occupied by the Pearl River map turtle is in the mainstem Pearl and West Pearl Rivers, with the remaining 51 percent of the occupied range found in various tributary systems (Lindeman 2019, p.

19). Tributary populations have been shown to be less densely populated compared to mainstem populations, although some tributaries (*e.g.,* Bogue Chitto River) contain relatively large populations of Pearl River map turtles, including some that have only recently been discovered.

To assess the occupancy of tributaries, we used survey data collected from 2005–2020. These data were collected by several different observers through a variety of survey types, including bridge surveys, basking surveys, and live trapping. We used 2005 as the cutoff based on the species' biology and expert input. Females typically reach sexual maturity after 8 years, so 15 years approximates two generations. Species experts also noted that most surveys conducted for the species have occurred after 2005. When assessing the occupancy of tributaries within the range, we considered all surveyed tributaries including those where Pearl River map turtles were not detected. We established thresholds to describe the occupancy of the surveyed tributaries within each resilience unit by applying the following rule set:

- *Very Low:* No currently occupied tributaries;
- *Low:* Between 1–25 percent of surveyed tributaries are currently occupied;
- *Moderate:* Between 25–50 percent of surveyed tributaries are currently occupied;
- *High:* 50 Percent or more of surveyed tributaries are currently occupied.

Using this threshold rule set, we found that one unit was determined to be ranked very low (Middle Pearl—Silver); three ranked moderate (Upper Pearl, Bogue Chitto, and Lower Pearl); and one ranked high (Middle Pearl—Strong). The Middle Pearl—Silver unit has four surveyed tributaries, with zero detections in any of those tributaries, leading to the very low rank. In the Lower Pearl, although only 43 percent of surveyed tributaries were found to be occupied, this unit had by far, the most occupied tributaries (7), thus the moderate rank is likely more a function of survey effort. Half of the tributaries surveyed within the Middle Pearl—Strong unit were found to be occupied, giving it a high rank.

Data from point counts, basking density surveys, and results from trapping efforts in 2006–2018 were combined to estimate density and abundance for stream segments throughout the range of the Pearl River map turtle (Lindeman 2019, pp. 11–12). The entire species' population estimate is 21,841 individuals, with 61 percent occurring on mainstem reaches, 34 percent occurring in 4 large tributaries, and the remaining 5 percent spread amongst other smaller tributaries (Lindeman 2019, p. 21). Generally, abundance of the species declined with the size of the river reach surveyed, where smaller tributaries generally had lower numbers of turtles compared to larger, mainstem reaches (Lindeman 2019, p. 13). For example, basking density was found to be 2.2 times higher on mainstem reaches than on tributary reaches, and 2.1 times higher on large tributaries than on small tributaries (Lindeman 2019, p. 15).

When applying the population factors of density and abundance to determine resiliency, each river drainage was divided into river reaches that were categorized as high, moderate, low, and very low density based on basking density surveys and point count results. All mainstem reaches of the Pearl River were classified as moderate with the exception of the Lower Pearl, which was low. The tributaries and sections of the mainstems of each resilience unit were classified resulting in all moderate to low scores, with only the Pearl River mainstem within the Upper Pearl resiliency unit scoring moderate/high for its density classification.

To determine a composite (combined) score for population factors within individual units, we combined the results of the assessment of the occupancy of tributaries and density classes of mainstream reaches and large tributaries. The resulting population factor composite scoring for each resiliency unit describes three units (Bogue Chitto, Middle Pearl—Strong, and Upper Pearl) as moderate and two units (Lower Pearl and Middle Pearl—Strong) as low (table 1). Additional information regarding the methodology is described in detail in the SSA report (Service, 2021b, pp. 47–50).

TABLE 1—POPULATION FACTORS AND THE COMPILED COMPOSITE SCORE FOR EACH RESILIENCY UNIT

Resiliency unit	Tributary occupancy	Density	Composite score
Bogue Chitto	Moderate	Moderate	Moderate.
Lower Pearl	Moderate	Low	Low.
Middle Pearl—Silver	Very Low	Moderate	Low.
Middle Pearl—Strong	High	Moderate	Moderate.
Upper Pearl	Moderate	Moderate	Moderate.

The habitat factors used to describe resiliency include water quality; hydrological and structural changes from channelization, reservoirs, and gravel mining; amount of protected land adjacent to the rivers and streams; and forested riparian cover (a proxy for deadwood abundance). All four of the habitat factors were then compiled into a composite score (table 2) that is analyzed together with the population factors composite score for an overall assessment of the current resiliency of the Pearl River map turtle (table 3).

TABLE 2—HABITAT FACTOR COMPOSITE SCORES FOR ALL PEARL RIVER MAP TURTLE UNITS AS A FUNCTION OF FOUR HABITAT FACTORS (WATER QUALITY, CHANNELIZATION/RESERVOIRS, PROTECTED LAND, AND DEADWOOD ABUNDANCE)

Resiliency unit	Water quality	Channelization/ reservoirs	Protected land	Deadwood	Composite score
Bogue Chitto	Moderate	Low	Low	Moderate	Low.
Lower Pearl	Moderate	Low	Low	High	Low.
Middle Pearl—Silver	Moderate	High	Low	Moderate	Moderate.
Middle Pearl—Strong	Moderate	Low	Moderate	High	Moderate.
Upper Pearl	Moderate	Moderate	Low	High	Moderate.

Water quality is an important habitat component of Pearl River map turtle resiliency because it affects how well all life stages can survive and, for the adults, reproductive success. To characterize water quality, we considered the watershed health, riparian health, and land use. Water quality is monitored by Mississippi and Louisiana Departments of Environmental Quality (DEQ); however, the surveyed sites do not cover all of the tributaries or provide information for the entire range. Instead of using water quality monitoring data to describe the species' habitat conditions, we used land use as a proxy as it can be an indicator of overall watershed health and provide insight into water quality. Agricultural land use within riparian zones has been shown to directly impact biotic integrity when assessed within intermediate-sized zones (*i.e.,* 200-ft (61-m) buffer) surrounding streams in the region (Diamond et al. 2002, p. 1150). Urbanization has also been shown to impair stream quality by impacting riparian health (Diamond et al. 2002, p. 1150). We assessed watershed health by combining several metrics within each resiliency unit: Percent urban and agricultural land use at the watershed level, as well as riparian effects, which included urban and agricultural land use in close proximity to the stream (within a 200-ft (61-m) buffer from the center of the waterbody).

The resulting water quality composite scores based on land use for all five units were moderate (table 2). The only stream that was assessed as having a relatively high degree of threat based on land use was the Lower Pearl, driven primarily by a high degree of development within the riparian buffer (33 percent). In general, development is low throughout the Pearl River basin, although there is continual development across the Middle Pearl—Strong Unit (12 percent development) associated with the area near the city of Jackson, Mississippi. Agriculture is generally high across the Pearl River basin, where levels of agriculture within the units ranged from 12 to 23 percent, with the Bogue Chitto Unit having the highest levels of agriculture.

The next habitat factor evaluated for resiliency is the presence and abundance of channelization, reservoirs, and gravel mining. We assume that substantial channelization, the presence of a major reservoir, or evidence of gravel mining operations has a negative impact on resiliency and include these as a resiliency factor.

Considerably low densities of Pearl River map turtles were observed in the Lower Pearl unit, where much channelization and flow diversion has occurred (Lindeman 2019, pp. 23–29). Low densities of Pearl River map turtles in the West and East Pearl Rivers have been attributed to flow alteration due to the construction of the Pearl River Navigation Canal, which also has very low densities of turtles, suggesting that substantial loss of population in the lower reaches of the Pearl River drainage has occurred historically due to river engineering (Lindeman 2019, p. 27). Significantly lower basking densities of Pearl River map turtles have been reported in the West Pearl (0.16/rmi (0.1/rkm)) compared to the Upper Pearl (2.9/rmi (1.8/rkm)) (Dickerson and Reine 1996, Table 4, unpaginated; Selman 2020a, pp. 17–18). Because of these stream alterations, we assessed the Lower Pearl unit as low (*i.e.,* high degree of threats) for this factor.

Within the Middle Pearl—Strong unit, 20.9 rmi (33.6 rkm) of the middle Pearl River is inundated by the Ross Barnett Reservoir, which is a suspected contributing factor to the overall decline in Pearl River map turtle population densities upstream and downstream. Near Jackson, Mississippi, river channelization has also impacted the species' habitat negatively (Selman 2020b, entire), and Pearl River map turtles are almost nonexistent in a highly channelized stretch of the Pearl River. However, upstream and downstream of this section, the species occurs in low numbers (Selman 2020b, entire). Due to the presence of the Ross Barnett Reservoir, and the river channelization that has occurred in and around Jackson, we assessed the Middle Pearl—Strong unit as low habitat quality due to the effects of channelization and reservoirs.

In the Upper Pearl unit, channelization has occurred along Tuscolameta Creek and the upper Yockanookany River. In 1924, the Tuscolameta Creek received a 24-mile (mi) (39-kilometer (km)) channelization, and Yockanookany River received a 36-mi (58-km) canal, which was completed in 1928 (Dunbar and Coulters 1988, p. 51). In the Yockanookany, low water stages in 1960 were 6 feet higher than those of 1939, as the channel silted significantly during that period (Speer et al. 1964, pp. 26–27). In some areas of the Yockanookany, water continues to flow in the river's old natural channel (Speer et al. 1964, pp. 26–27). Although stream alteration has occurred within these streams, there has yet to be any reported evidence of Pearl River map turtle decline, thus we assessed this habitat factor as moderate for the Upper Pearl unit.

In-stream and unpermitted point-bar mining in the Bogue Chitto unit was a concern in the late 1990s (Shively 1999, entire), and although these activities no longer occur, gravel mining operations within floodplains do occur (Selman 2020a, pp. 20–21). Recent surveys have reported several areas where mining appears to have degraded water quality significantly (Selman 2020a, pp. 20–21). There is also a concern that historical in-stream and point-bar mining can have deleterious legacy effects that could be negatively impacting the species (Selman 2020a, p. 21). For these reasons, we assessed this habitat factor as low for the Bogue Chitto unit.

The next habitat factor considered protected lands adjacent to or including the terrestrial and aquatic habitat of the species. For the purposes of this analysis, we apply the definition of protected area as a clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature (IUCN 2008, pp. 8–9). Protected areas are a generally accepted, although not always uncontroversial, mechanism for halting the global decline of biodiversity. Some examples of the positive effects that protected areas can have on freshwater biodiversity have been reported, such as increased local abundance or size classes of some fish species (Suski and Cooke, 2007, entire).

From an indirect standpoint, the presence of protected lands will function to minimize human disturbance in an area, which may benefit freshwater environments at multiple levels. First, enforcement of restrictions in protected areas can serve to minimize boat traffic that has been shown to have deleterious impacts to other *Graptemys* species (Selman 2013 et al., entire). The presence of protected areas may help ameliorate some of these conflicts by segregating user groups into defined areas (Suski and Cooke 2007, p. 2024). Finally, the more land within a unit that is under some sort of protection (*e.g.,* easement, State and Federal ownership), the less likely land will be developed. Because development can have negative impacts to aquatic fauna, as discussed previously, the more protected land that exists in a unit, the more resilient that unit is assumed to be.

Conservation areas have been established along the Pearl River that have positively influenced riparian forest along the river or forest land cover in the basin. Riparian conservation areas include Nanih Waiya Wildlife Management Area (WMA) (Neshoba County), Mississippi Band of Choctaw

Indian Reservation (Neshoba County), Pearl River WMA (Madison County), Fannye Cook Natural Area (Rankin County), Old River WMA (Pearl River County), Bogue Chitto National Wildlife Refuge (St. Tammany and Washington Parishes), and Pearl River WMA (St. Tammany Parish). Bienville National Forest contributes positively to increased forest cover in headwater streams that drain into the Pearl River, especially the Strong River. The most extensive habitat preservation on the Pearl River is the Bogue Chitto National Wildlife Refuge along the upper West and East Pearl and lower Bogue Chitto Rivers, which is contiguous with the Pearl River WMA, which protects the area between the West and East Pearl Rivers downstream to the Gulf of Mexico.

To assess the contribution of protected areas to the resilience of Pearl River map turtle resilience units, we calculated the percentage of the HUC 8 that is in protected status. We used the Protected Areas Database of the U.S. version 2.0 (PAD—US 2.0), released in 2019 (USGS 2019, unpaginated). The results of the analysis of protected lands show that the Pearl River basin in general has relatively small amounts of land in protected status. Four of the units have a low condition (*i.e.,* <10 percent of land protected), and one unit has a moderate condition (10–20 percent of land protected). The Middle Pearl—Strong unit has by far the greatest amount of land in protection with 147,597 ac (59,730 ha) in protection (11.67 percent), with all other units having less than 6 percent of land in protected status.

The final habitat factor used to determine current resiliency is the amount of forested riparian cover, which we used as a proxy for available deadwood. Correlations of Pearl River map turtle density is positively associated with deadwood density (Lindeman 1999, pp. 35–38). Abundance of basking substrates has shown to be an important habitat component driving *Graptemys* abundance in Kansas and Pennsylvania (Pluto and Bellis 1986, pp. 26–30; Fuselier and Edds 1994, entire), and radiotelemetry work with yellow-blotched map turtles (*G. flavimaculata)* has indicated the importance of deadwood to habitat selection on the lower Pascagoula River (Jones 1996, pp. 376, 379–380, 383). Anthropogenic deadwood removal, mainly through dredging, has been noted as a reason for decline in the sympatric microcephalic species, the ringed map turtle (*G. oculifera*) (Lindeman 1998, p. 137). Experiments with manual deposition of deadwood in stretches with less riparian forest have been recommended as potential habitat restoration measures (Lindeman 2019, p. 33).

An intact riparian habitat provides numerous benefits to map turtles, including the stabilization of stream banks and the reduction of erosional processes and channel sedimentation. Under normal erosional processes, riparian forests also provide material for in-stream deposition of deadwood, and deadwood is known to provide important basking sites for thermoregulation and also foraging sites for prey items (Lindeman 1999, entire). To assess the contribution of riparian forests to the resilience of Pearl River map turtle units, we calculated the percentage of forest within a 200-ft (61-m) riparian buffer using the 2016 National Land Cover Database land use land cover data. We considered forests to include four land use classes: deciduous forest, evergreen forest, mixed forest, and woody wetlands.

An assessment of forested cover resulted in three units in high condition (Lower Pearl, Middle Pearl—Strong, and Upper Pearl) and two units in moderate condition (Bogue Chitto and Middle Pearl—Silver). Forested cover within riparian buffers ranged from 60–98 percent across the 5 resilience units. Forested cover was highest in the Upper Pearl, where cover ranged from 90–96 percent across the occupied streams within the unit, and lowest in the Middle Pearl—Silver, where forested cover was 60 percent across the single occupied river segment. The Bogue Chitto unit was assessed as moderate for forested cover, primarily due to the Bogue Chitto and Topisaw having relatively low cover compared to other streams across the range.

The habitat factors were combined into a single composite score determined by combining the results of the water quality, channelization/reservoirs, protected lands, and deadwood abundance assessments (table 2). The final habitat composite score for each resiliency unit resulted in low condition for two units (Bogue Chitto and Lower Pearl) and moderate condition for three units (Middle Pearl—Silver, Middle Pearl—Strong, and Upper Pearl). Additional details and methodologies for determining each habitat condition score are described in the SSA report (Service 2021b, pp. 74–80).

After evaluating the population and habitat factors together, we describe the overall current resiliency of each unit. Current resiliency results are as follows: Two units have low resiliency (Bogue Chitto and Lower Pearl), and three units have moderate resiliency (Middle Pearl—Silver, Middle Pearl—Strong, and Upper Pearl) (table 3). The Lower Pearl seems particularly vulnerable, as both the population and habitat composite scores were low. The Lower Pearl has significant channelization issues, low amounts of protected land, and a low density of individual turtles, all of which are driving the low resilience of this unit. Although the Middle Pearl—Silver unit scored moderate for composite habitat score, the low composite population score (mainly a function of there being no occupied tributaries) is what is driving the low resilience of this unit. When looking at the three units with moderate resiliency, the Middle Pearl—Strong and Bogue Chitto units appear to be vulnerable to further decreases in resiliency. For the Bogue Chitto unit, low amounts of protected land and substantial mining activity make this unit vulnerable. For the Middle Pearl—Strong, development in the Jackson area and the presence of the Ross Barnett Reservoir make this unit vulnerable. If development increases substantially in this unit, or if proposed reservoir projects move forward, it is likely there would be population-level impacts that would drop the resiliency to low in the future conditions.

TABLE 3—CURRENT RESILIENCY OF PEARL RIVER MAP TURTLE UNITS BASED ON COMPOSITE HABITAT AND POPULATION FACTORS

Resiliency unit	Composite habitat score	Composite population score	Current resilience
Bogue Chitto	Low	Moderate	Moderate.
Lower Pearl	Low	Low	Low.
Middle Pearl—Silver	Moderate	Low	Low.
Middle Pearl—Strong	Moderate	Moderate	Moderate.

TABLE 3—CURRENT RESILIENCY OF PEARL RIVER MAP TURTLE UNITS BASED ON COMPOSITE HABITAT AND POPULATION FACTORS—Continued

Resiliency unit	Composite habitat score	Composite population score	Current resilience
Upper Pearl	Moderate	Moderate	Moderate.

Redundancy

Redundancy refers to the ability of a species to withstand catastrophic events and is measured by the amount and distribution of sufficiently resilient populations across the species' range. Catastrophic events that could severely impact or extirpate entire Pearl River map turtle units include chemical spills, changes in upstream land use that alter stream characteristics and water quality downstream, dam construction with a reservoir drowning lotic river habitat, and potential effects of climate change such as rising temperatures and SLR. The Middle Pearl—Silver unit is the most vulnerable to a catastrophic land-based spill due to transportation via train or automobile, and there are no known occupied tributaries at this time. However, extant units of the species are distributed relatively widely, and several of those units have moderate resilience, thus it is highly unlikely that a catastrophic event would impact the entire species' range. Consequently, the Pearl River map turtle exhibits a moderate-high degree of redundancy.

Representation

Representation refers to the breadth of genetic and environmental diversity within and among populations, which influences the ability of a species to adapt to changing environmental conditions over time. Differences in life-history traits, habitat features, and/or genetics across a species' range often aid in the delineation of representative units, which are used to assess species representation.

Between 2005 and 2018, researchers genotyped 124 Pearl River map turtles from 15 sites across the Pearl River basin (Pearson et al. 2020, pp. 6–7). No distinct genetic variation was found across the Pearl River system. A single genetic population has been described, and there was no evidence of isolation by distance (Pearson et al. 2020, pp. 11–12). For this reason, we consider the entire range of the Pearl River map turtle to be a single representative unit; however, the Strong River, located in the Pearl River—Strong unit, may have some unique habitat features that could facilitate adaptative capacity (Lindeman 2020, pers. comm.). Perhaps most notably, the Strong River has some very rocky stretches that are unlike anything else in the drainage and could conceivably have a population with unique diet, behaviors, or other life-history parameters, though no studies to date have addressed this question (Lindeman 2020, pers. comm.). The Strong River is a large tributary and occupies an estimated 54.3 rmi (87.4 rkm), with an estimated 1,749 individuals, accounting for 8 percent of the species' total population (Lindeman 2019, p. 47). Although we do not consider the Strong River to be a separate representative unit, we consider the Strong River to be a potentially significant stream for the species from a habitat diversity perspective. The species is described as consisting of a single representative unit due to the lack of genetic structuring across the range; the limited genetic diversity may reduce the ability of the species to adapt to changing conditions (Pearson et al. 2020, entire). However, we acknowledge the habitat differences for the Strong River and the potential importance of that system to the adaptive capacity of the species.

In summary, the current condition of the Pearl River map turtle is described using resiliency, redundancy, and representation. We assessed current resiliency as a function of two population factors (occupied tributaries and density) and four habitat factors (water quality, protected areas, deadwood abundance, and reservoirs/channelization) for each resiliency unit. Based on these factors, there are two units with low resiliency (Lower Pearl and Middle Pearl—Silver) and three units with moderate resiliency (Upper Pearl, Middle Pearl—Strong, and Bogue Chitto); no units were assessed as highly resilient. Because three of the five units are classified as moderate resilience, and those units are distributed relatively widely, the Pearl River map turtle exhibits a moderate-high degree of redundancy (*i.e.,* it is unlikely that a catastrophic event would impact the entire range of the species). Even with the unique habitat in the Strong River, we only recognize a single representative unit based on low genetic variation, however, the wide distribution within the five resilience units across the range provides sufficient adaptive capacity to remain viable.

Future Condition

As described in the ''Summary of Biological Status and Threats'' section above, we describe what the Pearl River map turtle needs to maintain viability. We describe the future conditions of the species by forecasting the species' response applying plausible future scenarios of varying environmental conditions and conservation efforts. The future scenarios project the threats into the future and consider the impacts those threats could have on the viability of the Pearl River map turtle. The scenarios described in the SSA report represent six plausible future conditions for the species. The scenarios include land use changes and SLR in a matrix to determine the effects of both factors to each unit. We then considered future water engineering projects for each matrix and found the resiliency of each unit based on whether the project is installed or not. All six scenarios were projected out to two different time steps: 2040 (~20 years) and 2070 (~50 years). These timeframes are based on input from species experts, generation time for the species, and the confidence in predicting patterns of urbanization and agriculture. Confidence in how these land uses will interact with the species and its habitat diminishes beyond 50 years.

We continue to apply the concepts of resiliency, redundancy, and representation to the future scenarios to describe possible future conditions of the Pearl River map turtle and understand the overall future viability of the species. When assessing the future, viability is not a specific state, but rather a continuous measure of the likelihood that the species will sustain populations over time.

Using the best available information regarding the factors influencing the species' viability in the future, we applied the following factors to inform the future resiliency of the five units: Changes in land use/water quality, SLR, and future water engineering projects. We considered projected land-use changes regarding agricultural and developed land in assessing future resiliency of each unit for the Pearl River map turtle. We also considered

these land-use classes as surrogates for potential changes in water quality, a primary risk factor for the species. We used data available at the resiliency unit scale from the U.S. Geological Survey (USGS) Forecasting Scenarios of Land-use Change (FORE–SCE) modelling framework (USGS 2017, unpaginated) to characterize nonpoint source pollution (*i.e.,* development and agriculture). The FORE—SCE model provides spatially explicit historical, current, and future projections of land use and land cover. Projecting future land cover requires modelers to account for driving forces of land-cover change operating at scales from local (''bottom-up'') to global (''top-down'') and how those driving forces interact over space and time. As a result of the high level of uncertainty associated with predicting future developments in complex socio-environmental systems, a scenario framework is needed to represent a wide range of plausible future conditions.

As previously mentioned, SLR impacts the future resiliency of Pearl River map turtles directly through loss/degradation of habitat. To estimate loss/degradation of habitat due to inundation from SLR, we used National Oceanic and Atmospheric Administration (NOAA) shapefiles available at their online SLR viewer (NOAA 2020, unpaginated). Projected SLR scenarios from NOAA provide a range of inundation levels from low to extreme. We used NOAA's SLR projections corresponding to the representative concentration pathways (RCP) of RCP6 and RCP8.5 emission scenarios to provide realistic future possible trajectories. The amount of greenhouse gases in the atmosphere through the different emission scenarios are influenced by human behavior. With uncertainty in future emissions, we included two plausible trajectories of SLR by considering RCP6 (intermediate-high) and RCP8.5 (extreme).

Local scenarios were available from a monitoring station located near Mobile Bay, Alabama, providing estimates of SLR at decadal time steps out to the year 2100. We found the average SLR estimate for the intermediate-high and extreme NOAA scenarios from this station and used the estimate (rounded to the nearest foot, because shapefiles of topography were available at only 1-ft (0.30-m) increments) to project estimated habitat loss at years 2040 and 2070. If SLR estimates overlap with known occupied portions of the river system, we assume that area is no longer suitable or occupiable; thus, resiliency would decrease.

SLR is occurring, but the rate at which it continues is dependent on the different atmospheric emissions scenarios. The range is 1 ft (0.30 m) to 2 ft (0.61 m) in the next 20 years. By 2070, 3 ft (0.91 m) to 5 ft (1.52 m) are projected for the lower and higher emissions scenarios. The effects of the SLR and saltwater intrusion are exacerbated with storm surge and high tides. Pulses of saltwater from increased storm frequency and intensity on top of slower SLR can have direct effects on freshwater habitats and species that are not salt-tolerant.

Stream channelization, point-bar mining, and impoundment have been listed as potential threats in a report written before the Pascagoula map turtle and Pearl River map turtle were taxonomically separated (Service 2006, p. 2). As noted above, in the Threats Analysis section, the proposed One Lake project proposes a new dam and commercial development area 9 mi (14.5 km) south of the current Ross Barnett Reservoir Dam near Interstate 20. However, the One Lake project is still being debated, and there is uncertainty as to whether the project will proceed. Because of this uncertainty, we have created two scenarios based around the proposed One Lake project: One in which the project occurs, and one in which it does not, within the next 50 years. Because of the potential for negative impacts on Pearl River map turtles from the proposed One Lake project, we assume a decrease in resiliency of the Middle Pearl—Strong unit if the project moves forward.

We do not assess population factors (occupancy of tributaries and density) in our future conditions analysis because the data are not comparable through time or space; the baseline data come from recent surveys and no historical data are available to allow for analyses of trends or comparisons over time. Additionally, we assume the amount of protected land within each unit stays the same within our projection timeframes, although it is possible that additional land could be converted to a protected status or lands could degrade over time. Rather than attempting to categorize future resiliency as was done in the current condition analysis, we indicate a magnitude and direction of anticipated change in resiliency of Pearl River map turtle units.

Scenario Descriptions

Scenarios were built around three factors: Land use, SLR, and water engineering projects. To present plausible future conditions for the species and to assess the viability for the Pearl River map turtle in response to those conditions, we projected two land use and two SLR scenarios out to the years 2040 (20 years) and 2070 (50 years).

The two land use scenarios are based on scenarios from the IPCC Special Report on Emissions Scenarios (SRES). The SRES presents a set of scenarios developed to represent the range of driving forces and emissions in the scenario literature so as to reflect current understanding and knowledge about underlying uncertainties. Four different narrative storylines were developed to describe consistently the relationships between emission driving forces and their evolution and add context for the scenario quantification. Each storyline represents different demographic, social, economic, technological, and environmental developments. The four qualitative storylines yield four sets of scenarios called ''families'': A1, A2, B1, and B2.

The two land use scenarios we examined are embedded within the FORE–SCE model (A2 and B1). The two SLR projections are based on NOAA's intermediate-high (RCP6) and extreme (RCP8.5) scenarios. We also considered whether a proposed water engineering project (*i.e.,* One Lake) would be constructed within the species' range. This results in six plausible scenarios for each of two time increments (2040 and 2070), with the A2–Extreme—One Lake project scenarios representing the highest threat scenario for 2040 and 2070, the B1–Intermediate High—No One Lake project scenario the lowest threat scenario for 2040 and 2070, and the other four scenarios representing moderate threat scenarios (table 4).

TABLE 4—SCENARIOS USED TO MODEL FUTURE CONDITION FOR PEARL RIVER MAP TURTLE

[Scenarios were built around three factors: Land use (SRES emission scenarios A2 and B1), sea level rise (emission scenarios Intermediate High (IH) and Extreme (EX)), and water engineering projects (One Lake Project: Yes or No). Scenarios were projected under two time-frames: 2040 and 2070]

	Sea level rise			
	2040		2070	
	Intermediate high	Extreme	Intermediate high	Extreme
One Lake Project (Yes)				
Land Use:				
A2	A2–IH—OneLake	A2–EX—OneLake	A2–IH—OneLake	A2–EX—OneLake.
B1	B1–IH—OneLake		B1–IH—OneLake.	
One Lake Project (No)				
Land Use:				
A2	A2–IH—NoProject	A2–EX—NoProject	A2—IH—NoProject	A2–EX—NoProject.
B1	B1–IH—NoProject		B1–IH—NoProject.	

Future Resiliency

Bogue Chitto—Under all scenarios, development remains low across the Bogue Chitto unit. Agriculture is high across the entire unit in all scenarios, except for the B1 scenario in the year 2070, where agriculture is moderate. Forested cover is relatively high across the unit under all scenarios; thus, deadwood does not appear to be a limiting factor. There are no predicted SLR or water engineering project impacts directly affecting this unit. It is likely that the condition of the unit will decline into the future, though there is uncertainty regarding future impacts related to mining activity, which has the potential to further reduce resiliency. Even with declines in condition of the Bogue Chitto unit, there will be no change in the resiliency category over the next 50 years according to the future scenarios.

Lower Pearl—SLR impacts this unit under all scenarios, although the impacts of inundation are localized to the southern portion of the unit, mainly in the East Pearl River. Under the A2 scenarios, a few streams are impacted by high levels of development, although most of the unit has low levels of development; under the B1 scenario, development is low across the entire unit. Agriculture is predicted to be high across the unit under the A2 scenarios, and moderate across the unit under the B1 scenario. There are no predicted water engineering projects, and forested cover is anticipated to be relatively high. Current resiliency for this unit is low, and resiliency is anticipated to decrease across all scenarios, with the A2 scenarios with extreme SLR associated with the most substantial decreases.

Middle Pearl—Silver—Development remains low across the unit under all scenarios at both time steps. Agriculture increases to high under the A2 scenarios and stays moderate under the B1 scenario. There are no predicted SLR effects or water engineering project impacts on this unit. Forested cover is relatively high across the unit under all scenarios and is predicted to increase under the B1 scenario; thus, deadwood does not appear to be a limiting factor. Current resiliency for this unit is low, and although declines in condition of the Middle Pearl–Silver unit are predicted, there will be no change in the resiliency category in the future based on the factors assessed.

Middle Pearl—Strong—Development is substantial in a few areas within this unit, particularly around Jackson, Mississippi. The current resiliency for this unit is moderate and the future resiliency is likely to decline due to increased agriculture and decreased forest cover within the unit (without One Lake). Agriculture is predicted to be high across the unit under all scenarios. If the One Lake project moves forward, there is a substantial decrease in resiliency predicted within and adjacent to the project area. A few streams are predicted to lose a substantial amount of forested cover. No SLR impacts are predicted in this unit. The Middle Pearl—Strong unit is perhaps the most vulnerable unit, as development, agriculture, and water engineering projects are all potential stressors in this unit.

Upper Pearl—The habitat associated with this unit provides conditions to potentially support a stronghold for the species because it has the highest amount of protected lands compared to the other four units (Service 2021a, p. 92). Development remains low across the entire unit under all scenarios. Agriculture is high across the entire unit in all scenarios, except for the B1 scenario in the year 2070, where agriculture is moderate. Forested cover is relatively high across the unit under all scenarios; thus, deadwood does not appear to be a limiting factor. There are no predicted SLR or water engineering project impacts in this unit; however, this population may experience genetic drift over time due to isolation caused by habitat fragmentation from the existing (Ross Barnett) and planned (One Lake) reservoirs in the adjacent unit. Even though the threats are projected to be low, the overall condition of the Upper Pearl unit is likely to decline as a result of the loss of connectivity with the rest of the turtle's range. Even with declines in condition of the Upper Pearl unit, it will remain in the moderate category over the next 50 years according to the future scenarios.

Future Redundancy

Although we do not project any of the units to be extirpated in any scenarios, we do anticipate resiliency to decline in two units. For example, the Middle Pearl—Strong unit will potentially lose a substantial amount of habitat and individuals under all scenarios in which the One Lake project is built. Also, the Lower Pearl unit will be impacted by SLR under all scenarios, and this is compounded by projected increases in both development and agriculture. All other units are anticipated to remain relatively stable. Because extant units of the species are predicted to be distributed relatively widely, it is highly unlikely that a catastrophic event would impact the entire species' range, thus

the Pearl River map turtle is predicted to exhibit a moderate degree of redundancy in the future under all scenarios.

Future Representation

As described under the current conditions, the species is a single representative unit regarding genetic variation. Relatively unique habitat conditions in the Strong River may influence the species' adaptive capacity and its overall representation. When looking at projections of threats within the Strong River, a few general trends can be seen. First, for land use, development is projected to remain low. In the A2 climate scenarios, agriculture increases from moderate to high; in the B1 climate scenario, agriculture stays moderate. Also, forested cover within the riparian zone of the Strong River remains relatively high (68–83 percent), although it does drop across all climate scenarios from the current condition (92 percent). SLR does not impact this river in any of our scenarios, as the Strong River is far enough inland to avoid the effects of inundation. Finally, the One Lake project is not anticipated to directly impact the Strong River due to the location of the project (*i.e.,* mainstem Pearl River). Given all of this information, although the resiliency of the Strong River might decrease slightly due to land use projections, it is likely the Strong River will support a moderate density of individual turtles, and thus contribute to representation through maintenance of potential genetic diversity based on unique habitat features.

It is noteworthy that a recent genetics study has revealed that genetic diversity is lower in Pearl River map turtles compared to the closely related congener, Pascagoula map turtles (Pearson et al. 2020, pp. 11–12). Declining populations generally have reduced genetic diversity, which can potentially elevate the risk of extinction by reducing a species' ability and potential to adapt to environmental changes (Spielman et al. 2004, entire). Future studies could help to elucidate whether levels of genetic diversity seen in Pearl River map turtles are low enough to suggest potential genetic bottlenecks, thus clarifying the species' level of representation. Genetic bottleneck and low overall genetic diversity are more of a concern for populations that become geographically isolated by physical barriers that inhibit connectivity.

Conservation Efforts and Regulatory Mechanisms

Federal

The Clean Water Act of 1972 (33 U.S.C. 1251 *et seq.*) regulates dredge and fill activities that would adversely affect wetlands. Such activities are commonly associated with dry land projects for development, flood control, and land clearing, as well as for water-dependent projects such as docks/marinas and maintenance of navigational channels. The U.S. Army Corps of Engineers (Corps) and the Environmental Protection Agency (EPA) share the responsibility for implementing the permitting program under section 404 of the Clean Water Act. Permit review and issuance follows a process that encourages avoidance, minimizing and requiring mitigation for unavoidable impacts to the aquatic environment and habitats. This includes protecting the riverine habitat occupied by the Pearl River map turtle. This law has resulted in some enhancement of water quality and habitat for aquatic life, particularly by reducing point-source pollutants.

The regulatory mechanisms have improved water quality within the Pearl River drainage, as evidenced by a resurgence of intolerant fishes (Wagner et al. 2018, p. 13). Because the Pearl River map turtle has a greater tolerance for variances in water quality compared to intolerant fishes, these regulatory mechanisms provide some protection for the species and its habitat from the threat of water quality degradation; however, there may be some instances where sources and occurrences may exceed EPA thresholds and degrade water quality.

Additionally, Federal agencies are required to evaluate the effects of their discretionary actions on federally listed species and must consult with the Service if a project is likely to affect a species listed under the Endangered Species Act. Such discretionary Federal actions within the Pearl River map turtle's habitat that may affect other listed species include: Maintenance dredging for navigation in the lower Pearl River by the Corps and their issuance of section 404 Clean Water Act permits; construction and maintenance of gas and oil pipelines and power line rights-of-way by the Federal Energy Regulatory Commission; EPA pesticide registration; construction and maintenance of roads or highways by the Federal Highway Administration; and funding of various projects administered by the U.S. Department of Agriculture's Natural Resources Conservation Service and the Federal Emergency Management Agency. Section 7 consultations on other federally listed aquatic species are known to frequently require and recommend Federal agencies implement conservation measures, best management practices, and other actions that may also minimize or eliminate potential harmful effects on Pearl River map turtle and encourage best management practice for all aquatic species. Accordingly, requirements under section 7 of the Act may provide some protections indirectly to the Pearl River map turtle and its habitat.

National Wildlife Refuges

The National Wildlife Refuge System Administration Act (NWRAA) represents organic legislation that set up the administration of a national network of lands and water for the conservation, management, and restoration of fish, wildlife, and plant resources and their habitats for the benefit of the American people and is managed by the Service. Conservation-minded management of public lands allows for: (1) Natural processes to operate freely and thus changes to habitat occur due to current and future environmental conditions; (2) managing the use of resources and activities, which minimizes impacts; (3) preservation and restoration to maintain habitats; and (4) reduction of the adverse physical impacts from human use. Amendment of the NWRAA in 1997 required the refuge system to ensure that the biological integrity, diversity, and environmental health of refuges be maintained.

The Pearl River map turtle occurs on the Bogue Chitto National Wildlife Refuge within Pearl River County, Mississippi, and St. Tammany and Washington Parishes, Louisiana. A Comprehensive Conservation Plan (CCP) has been developed to provide the framework of fish and wildlife management on the refuge (Service 2011, entire). Within the CCP, specific actions are described to protect the ringed map turtle that will also benefit the Pearl River map turtle. Actions include ongoing habitat management to provide downed woody debris for basking turtles and to maintain 330-ft (100.6-m) buffers along all named streams during forest habitat improvement and harvest to protect water quality in streams (Service 2011, pp. 21, 73, 89, 179).

National Forests

The National Forest Management Act (1976) provides standards for National Forest management and planning to protect the designated forest lands while maintaining viable populations of existing native and desired non-native

vertebrate species. The Planning Rule (2012) requires that the U.S. Forest Service develop land management plans for all units within the National Forest system. The National Forests in Mississippi have adopted, and in most cases exceeded, the best management practices (BMPs) (see discussion below of State BMPs) established by the State of Mississippi (U.S. Forest Service 2014, p. 66). These include practices such as establishing streamside buffer zones, restricting vegetation management in riparian zones, and employing erosion control measures. The Bienville National Forest has no known records for the Pearl River map turtle but contains tributaries that flow into the Pearl and Strong Rivers; thus, these practices may provide some protective measures for habitat occupied by the species downstream. The regulations and practices applied across the national forests upstream from the Pearl River map turtle habitat provide protections for the species' aquatic habitat and contribute to the conservation of the species.

Department of Defense Integrated Natural Resources Management Plans

The Sikes Act Improvement Act (1997) led to Department of Defense guidance regarding development of Integrated Natural Resources Management Plans (INRMPs) for promoting environmental conservation on military installations. The U.S. Navy operates the Stennis Western Maneuver Area located along the western edge of the NASA Stennis Space Center and incorporated into the Stennis Space Center Buffer Zone. The Stennis Western Maneuver Area encompasses a 4-mile reach of the East Pearl River and a smaller eastern tributary named Mikes River (Buhlman 2014, p. 4) in Hancock and Pearl River Counties, Mississippi. These river reaches are used by the Navy's Construction Battalion Center for riverboat warfare training. The western bank of the East Pearl River denotes the boundary of the Navy property and is managed as the Pearl River Wildlife Management Area by the State of Louisiana (see below under State/Louisiana). There are records of the Pearl River map turtle from Stennis Western Maneuver Area (Buhlman 2014, pp. 11–12, 31–32). The U.S. Navy has developed an INRMP for the Stennis Western Maneuver Area (U.S. Navy 2011, entire). Measures within the INRMP are expected to protect listed species, and also provide a level of protection for the Pearl River map turtle, include erosion and storm water control, floodplain management, invasive plant species management, and the use of an ecosystem approach to general fish and wildlife management (U.S. Navy 2011, pp. 4–4–4–20).

Convention on International Trade in Endangered Species of Wild Fauna and Flora, Appendix III

All species of *Graptemys* are included on the Convention on International Trade in Endangered Species of Wild Fauna and Flora's (CITES) Appendix III (CITES 2019, p. 43). The Pearl River map turtle was added to the CITES Appendix III list in 2006 (70 FR 74700; December 16, 2005). Appendix III is a list of species included at the request of a Party to the Convention that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable, illegal exploitation. International trade in specimens of species listed in Appendix III is allowed only on presentation of the appropriate permits or certificates. The information that is provided in export reports for the Pearl River map turtle does not provide sufficient information to support identification of the source of the turtles. According to a LEMIS report from 2005 to 2019, more than 300,000 turtles identified as *Graptemys* spp. or their parts were exported from the United States to 29 countries (Service 2021b, Appendix B). Due to their similarity in appearance, species of *Graptemys* are difficult to differentiate. Records from 2005, when the highest number of *Graptemys* were exported, show more than 35,000 turtles (*Graptemys* spp.) in a single shipment to Spain and a total of 172,645 individual *Graptemys* exported to 24 different countries. However, there is some uncertainty regarding the sources of the exported turtles as they could have originated from captive stock. The CITES Appendix III reporting does not provide sufficient protections for the Pearl River map turtle because only the genus name, *Graptemys,* is used to describe the turtles, resulting in no mechanism to understand the number or source of Pearl River map turtles that are exported.

State Protections—Louisiana

In Louisiana, the species has no State status under Louisiana regulations or law (LDWF 2021, entire). Protections under State law for collecting the Pearl River map turtle are limited to licensing restrictions for turtles. In Louisiana, a recreational basic fishing license is required but allows unlimited take of most species of turtles, including the Pearl River map turtle; exceptions are that no turtle eggs or nesting turtles may be taken (LDWF 2020, pp. 50–51). A recreational gear license is also required for operating specified trap types (see Louisiana's regulations for details on trap types), for instance, five or fewer hoop nets; greater than five hoop nets requires a Commercial Fisherman License.

The Louisiana Scenic Rivers Act (1988) was established as a regulatory program administered by the Louisiana Department of Wildlife and Fisheries (LDWF) through a system of regulations and permits. Certain actions that may negatively affect the Pearl River map turtle are either prohibited or require a permit on rivers included on the natural and scenic river list. Prohibited actions include channelization, channel realignment, clearing and snagging, impoundments, and commercial clearcutting within 100 ft (30.5 m) of the river low water mark (Louisiana Department of Agriculture and Forestry (LDAF) undated, p. 45). Permits are required for river crossing structures, bulkheads, land development adjacent to the river, and water withdrawals (LDAF undated, p. 45). Rivers with the natural and scenic river designation that are occupied by the Pearl River map turtle include the Bogue Chitto River, Holmes Bayou, and West Pearl River in St. Tammany Parish and Pushepatapa Creek in Washington Parish (LDAF undated, p. 48).

Additional protected areas of Pearl River map turtle habitat in Louisiana include the Pearl River Wildlife Management Area located in St. Tammany Parish and Bogue Chitto State Park located on the Bogue Chitto River in Washington Parish. A master plan for management of Wildlife Management Areas and State Refuges has been developed for Louisiana, which describes the role of these lands in improving wildlife populations and their habitat including identifying and prioritizing issues threatening wildlife resources (LDWF and The Conservation Fund 2014, entire). Bogue Chitto State Park is managed by the Louisiana Department of Culture, Recreation, and Tourism for public use.

The Louisiana State Comprehensive Wildlife Action Plan (Holcomb et al. 2015, entire) was developed as a roadmap for nongame conservation in Louisiana. The primary focus of the plan is the recovery of Species of Greatest Conservation Need, those wildlife species in need of conservation action within Louisiana, which includes the Pearl River map turtle. Specific actions identified for the Pearl River map turtle include conducting ecological studies of the turtle's reproduction, nest success, and recruitment as well as developing general population estimates via mark

and recapture studies (Holcomb et al. 2015, p. 69). Recent Pearl River map turtle survey work in Louisiana was conducted using funding from the SWG program (Selman 2020a, entire).

Gravel mining activities that occur within Louisiana require review and permits by Louisiana Department of Environmental Quality. Additional permits are required by LDWF for any mining activities that occur within designated Scenic Streams in Louisiana. The permit requirements ensure all projects are reviewed and approved by the State, thus ensuring oversight by the State and application of State laws.

State Protections—Mississippi

The Pearl River map turtle is S2 (imperiled because of rarity or because of some factor making it very vulnerable to extinction) in Mississippi (Mississippi Museum of Natural Science (MMNS) 2015, p. 38) but is not listed on the Mississippi State list of protected species (Mississippi Natural Heritage Program 2015, entire). Protections under State law are limited to licensing restrictions for take for personal use of nongame species in need of management (which includes native species of turtles). A Mississippi resident is required to obtain one of three licenses for capture and possession of Pearl River map turtles (Mississippi Commission on Wildlife, Fisheries, and Parks, Mississippi Department of Wildlife, Fisheries, and Parks 2016, pp. 3–5). The three licenses available for this purpose are a Sportsman License, an All Game Hunting/Freshwater Fishing License, and a Small Game Hunting/Freshwater Fishing License. A nonresident would require a Nonresident All Game Hunting License. Restrictions on take for personal use include no more than four turtles of any species or subspecies may be possessed or taken within a single year and that no turtles may be taken between April 1st and June 30th except by permit from the Mississippi Department of Wildlife, Fisheries, and Parks (Mississippi Commission on Wildlife, Fisheries, and Parks, MDWFP 2016, pp. 3–5). Additional restrictions apply to this species if removed from the wild; non-game wildlife or their parts taken from wild Mississippi populations may not be bought, possessed, transported, exported, sold, offered for sale, shipped, bartered, or exhibited for commercial purposes.

The Mississippi Comprehensive Wildlife Action Plan (MMNS 2015, entire) was developed to provide a guide for effective and efficient long-term conservation of biodiversity in Mississippi. As in Louisiana, the primary focus of the plan is on the recovery of species designated as SGCN, which includes the Pearl River map turtle. Specific actions identified for the Pearl River map turtle in Mississippi include planning and conducting status surveys for the species (MMNS 2015, p. 686).

Lands managed for wildlife by the State of Mississippi, which may provide habitat protections for the Pearl River map turtle, include the Old River Wildlife Management Area, Pearl River County and Pearl River Wildlife Management Area, Madison County. In addition, a ringed map turtle sanctuary was designated in 1990 by the Pearl River Valley Water Supply District (District), north of the Ross Barnett Reservoir, Madison County, which also provides habitat for the Pearl River map turtle. One of the goals of management on Wildlife Management Areas in Mississippi is to improve wildlife populations and their habitat (MDWFP 2020, entire). The District sanctuary is approximately 12 rmi (19.3 rkm) north from Ratliff Ferry to Lowhead Dam on the Pearl River (Service 2010, p. 4). Within the sanctuary, the District maintains informational signs to facilitate public awareness of the sanctuary and of the importance of the area to the species and conducts channel maintenance by methods that do not hinder the propagation of the species. The District has recorded 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 the stated provisions (Service 2010, p. 4).

Additionally, gravel mining activities that occur within Mississippi require review and permits by Mississippi Department of Environmental Quality. The permit requirements ensure all projects are reviewed and approved by the State, thus ensuring oversight by the State and application of State laws.

U.S. Fish and Wildlife State Wildlife Grants

In 2000, the State Wildlife Grants (SWG) Program was created through the Fiscal Year 2001 Interior Appropriations Act and provided funding to States ''for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished.'' The SWG Program is administered by the Service and allocates Federal funding for proactive nongame conservation measures nationwide. Congress stipulated that each State fish and wildlife agency that wished to participate in the SWG program develop a Wildlife Action Plan to guide the use of SWG funds (see discussion below regarding the plans developed by the Louisiana Department of Wildlife and Fisheries (LDWF) and Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP)). This program funds studies that assist conservation by providing needed information regarding the species or its habitat and has contributed to the conservation of the species by assessing the current status and range of the Pearl River map turtle.

Additional Conservation Measures—Best Management Practices

Most of the land adjacent to the Pearl and Bogue Chitto Rivers in Louisiana and Mississippi is privately owned and much of it is managed for timber. Both States have developed voluntary BMPs for forestry activities conducted in their respective States with the intent to protect water quality and minimize the impacts to plants and wildlife. In addition, the forest industry has a number of forest certification programs, such as the Sustainable Forestry Initiative, which require participating landowners to meet or exceed State forestry BMPs. Silvicultural practices implemented with State-approved BMPs can reduce negative impacts to aquatic species, such as turtles, through reductions in nonpoint source pollution, such as sedimentation. Although nonpoint source pollution is a localized threat to the Pearl River map turtle, it is less prevalent in areas where State-approved BMPs are used (Service 2021b, p. 41).

In Louisiana, BMPs include streamside management zones (SMZ) of 50 ft (15.24 m), measured from the top of the streambank, for streams of less than 20 ft (6.1 m) under estimated normal flow, to a width of 100 ft (30.5 m) for streams more than 20 ft (6.1 m) wide (LDAF undated, p. 15). Guidance includes maintaining adequate forest canopy cover for normal water and shade conditions as well as an appropriate amount of residual cover to minimize soil erosion (LDAF undated, p. 14). An overall rate of 97.4 percent of 204 forestry operations surveyed by the LDAF in 2018 complied with the State's voluntary guidelines; compliance with guidelines in SMZs was 98.6 percent (LDAF 2018, entire).

The State of Mississippi has voluntary BMPs developed by the Mississippi Forestry Commission (MFC) (MFC 2008, entire). These BMPs include SMZs with the purpose of maintaining bank stability and enhancing wildlife habitat by leaving 50 percent crown cover during timber cuts (MFC 2008, p. 6). The width of SMZs is based on slope,

with a minimum SMZ width of 30 ft (9.14 m) extending to 60 ft (18.3 m) at sites with over 40 percent slope (MFC 2008, p. 6). The most recent monitoring survey of 174 Mississippi forestry sites indicated that 95 percent of applicable sites were implemented in accordance with the 2008 guidelines (MFC 2019, p. 6).

Overall, voluntary BMPs related to forest management activities conducted on private lands throughout the riparian corridor of the Pearl River System have provided a significant foothold for Pearl River map turtle conservation. As a result of high BMP compliance in these specific areas, non-point source pollution associated with silvicultural operations is not a major contributor to impacts on the species.

Determination of Pearl River Map Turtle Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of endangered species or threatened species. The Act defines an ''endangered species'' as a species that is in danger of extinction throughout all or a significant portion of its range, and a ''threatened species'' as a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether a species meets the definition of endangered species or threatened species because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence.

In conducting our status assessment of the Pearl River map turtle, we evaluated all identified threats under the Act's section 4(a)(1) factors and assessed how the cumulative impact of all threats acts on the current and future viability of the species based on resiliency, redundancy, and representation. In assessing future viability, all the anticipated effects from both habitat-based and direct threats to the species are examined in total and then evaluated in the context of what those combined negative effects will mean to the future condition of the Pearl River map turtle. We use the best available information to determine the magnitude of each individual threat on the species, and then assess how those effects combined (and as may be ameliorated by any existing regulatory mechanisms or conservation efforts) will impact the Pearl River map turtle's future viability.

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we determined that the species currently has sufficient resiliency, redundancy, and representation contributing to its overall viability across its range. Even though the species is described as a single population, the current condition of the units are all below optimal or high resiliency, three units have moderate resiliency, and the remaining two units have low resiliency. There are no units within the range that demonstrate high resiliency. Despite the moderate and low conditions of all units, the species is widely distributed across much of its range. Current threats to the species include habitat degradation and loss due to alterations in the aquatic and terrestrial environments that affect water quality through sedimentation, impoundment, and gravel mining; and collection for the pet trade is also an ongoing threat to the species.

The Ross Barnett Reservoir was completed in 1963 and has reduced the amount of available habitat for the species and fragmented contiguous suitable habitat. Pearl River map turtles prefer flowing water in rivers and creeks. Indirect effects from the reservoir are associated with recreational use from boat traffic and foot traffic from day visitors and campers. Declines in Pearl River map turtles have been documented both upstream (lower density) and downstream (population declines) from the reservoir (Selman and Jones 2017, pp. 32–34). A total of 20.9 rmi (33.6 rkm) of the Pearl River is submerged beneath the Ross Barnett Reservoir and no longer suitable for the Pearl River map turtle. This reservoir is currently affecting the Middle Pearl–Strong unit and the Upper Pearl unit, reducing the suitable habitat of five percent of the mainstem Pearl River by altering the lotic (flowing water) habitat preferred by Pearl River map turtles to lentic (lake) habitat. The reservoir reduces the resiliency and overall condition of these affected units.

Despite the effects of the existing reservoir on the Upper Pearl and Middle Pearl–Strong resilience units, sufficient habitat remains to provide adequate resiliency of these units to contribute to the viability of the species. The effects from the reservoir may continue affecting the species in the future as the turtles in the Upper Pearl unit (above the reservoir) become more isolated over time; however, there is currently adequate resiliency.

In terms of redundancy and the ability of the species to respond to catastrophic events, the species currently has enough redundancy across the five resilience units to protect it from a catastrophe such as a large hurricane or oil spill. The Middle Pearl–Silver and Middle Pearl–Strong units are particularly vulnerable to a potential spill from railways and transportation corridors that are near or adjacent to habitat occupied by Pearl River map turtles. The Lower Pearl unit is vulnerable to the effects from hurricanes as it is in close proximity to the Gulf of Mexico. However, because the species is a single population distributed across five resilience units encompassing 1,279.6 rkm (795.1 rm), it is buffered against catastrophic events such as these.

While the overall current condition of the species exhibits low redundancy, the species is still widespread across its range in all resilience units across the single representative unit. Although we do not project any of the units to be extirpated in any scenarios, we do anticipate resilience to drop significantly in several units across many scenarios. Thus, after assessing the best available information, we conclude that the Pearl River map turtle is not currently in danger of extinction throughout all of its range.

A threatened species, as defined by the Act, is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Because the species is not currently in danger of extinction (endangered) throughout its entire range, we evaluated the viability of the species over the foreseeable future considering the condition of the species in relation to its resiliency, redundancy, and representation. We analyzed future conditions based on input from species experts, generation time for the species, and the confidence in predicting patterns of urbanization and agriculture, enabling us to reliably predict threats and conservation actions and the species' response over time. Details regarding the future condition analyses are available in the SSA report (Service 2021b, pp. 81–118).

The threats included in the future scenarios are projected to negatively affect the Pearl River map turtle and result in a decline of resiliency throughout four (Bogue Chitto, Lower Pearl, Middle Pearl–Strong, and Upper Pearl) of the five resilience units (table

2). While the Middle Pearl–Silver unit is not expected to see major declines in resiliency, its current resiliency is low and it is anticipated to remain low in the future projections. None of the resilience units will improve from current conditions to provide high resiliency; three units are moderate, but the conditions decline in the future scenarios. Three resilience units may have additional stressors including isolation for the Upper Pearl, compounded by the addition of another planned reservoir for the Middle Pearl–Strong unit, and gravel mining for the Bogue Chitto unit. These threats will likely cause a decline in the amount of available suitable habitat, thereby affecting the future resiliency; however, the development of the reservoir and future sand and gravel mining activities are uncertain. Two of the resilience units are low (Lower Pearl and Middle Pearl), with the most southern unit (Lower Pearl) facing threats from SLR. The single population that consists of five resilience units has low genetic variability resulting in low adaptive capacity or the potential to adapt to environmental or habitat changes within the units. Most of the population primarily uses the main stem river, which is subject to more catastrophic events (*e.g.,* an oil spill) as any point source pollutants would flow downstream throughout the range of the turtle below the point of contamination. The species has limited occurrence in tributaries in its range, resulting in limited refugia from future catastrophic effects.

In terms of resiliency, the future condition is expected to decline for all resilience units. The future scenarios project out to the year 2070 to capture the species' response to threats and changing landscape conditions. The impacts from the existing Ross Barnett Reservoir will continue affecting the species, and resilience of the units will decline as the turtles in the most northern unit (Upper Pearl) will become even more spatially isolated. An additional planned development project adjacent to the existing reservoir could affect up to 170 turtles directly and 360 turtles indirectly in the Upper Pearl and Middle Pearl–Strong units (Selman 2020b, pp. 192–193). If this impoundment project moves forward, the species' viability will continue to decline in the foreseeable future as resiliency declines through loss of suitable habitat and further isolation of turtles above the reservoirs. The turtles in the Upper Pearl unit are subject to genetic isolation and potentially the effects of small population size as the species here will not be connected to the rest of the contiguous habitat south of the reservoir.

Another future threat to the species is SLR, which will cause a contraction in the most southern unit (Lower Pearl) as saline waters encroach farther north from the Gulf of Mexico in rising seas, and the effects will be magnified with hurricane-related storm surge pulsing saline water upstream into the freshwater system. The amount of habitat affected over time depends on the rate of SLR and other factors that influence surge such as increased hurricane or storm frequency and severity.

An additional threat that is expected to impact the species in the foreseeable future includes the continued collection from wild populations for the domestic and international pet trade. Map turtles are desired by collectors for their intricate shell patterns. Despite the less distinctive shell patterns and markings of adult Pearl River map turtles, the species remains a target for some herptile enthusiasts and personal collections. The demand for turtles globally is increasing, which results in more intense pressures on wild populations. The threat of illegal collection is expected to continue into the foreseeable future.

The overall future condition of the species is expected to continue a declining trajectory resulting in compromised viability as described in the future scenarios out to year 2070. Therefore, the species is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. The court in *Center for Biological Diversity* v. *Everson,* 2020 WL 437289 (D.D.C. Jan. 28, 2020) (*Center for Biological Diversity*), vacated the aspect of the Final Policy on Interpretation of the Phrase ''Significant Portion of Its Range'' in the Endangered Species Act's Definitions of ''Endangered Species'' and ''Threatened Species'' (79 FR 37578; July 1, 2014) that provided that the Service does not undertake an analysis of significant portions of a species' range if the species warrants listing as threatened throughout all of its range. Therefore, we proceed to evaluating whether the species is endangered in a significant portion of its range—that is, whether there is any portion of the species' range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion. Depending on the case, it might be more efficient for us to address the ''significance'' question or the ''status'' question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

Following the court's holding in *Center for Biological Diversity,* we now consider whether there are any significant portions of the species' range where the species is in danger of extinction now (*i.e.,* endangered). In undertaking this analysis for the Pearl River map turtle, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered. We considered whether the threats are geographically concentrated in any portion of the species' range at a biologically meaningful scale. We examined the following threats: Effects of climate change (including SLR), habitat loss and degradation, and illegal collection. We also considered whether cumulative effects contributed to a concentration of threats across the species' range.

Overall, we found that the threat of SLR and habitat loss are likely acting disproportionately to particular areas within the species' range. The threat of SLR is concentrated in the Lower Pearl, which is the most southern resilience unit that connects to the Gulf of Mexico. However, the salinity influx into the species' habitat due to SLR is not currently affecting this area but will affect the species' habitat within the foreseeable future; thus, we excluded SLR from the significant portion of its range analysis as we have already determined the species is threatened across all of its range.

The threat of habitat loss and degradation is concentrated on the Middle Pearl–Strong and Upper Pearl units due to an existing reservoir and a planned project that disjoins the connectivity of turtles above and below the reservoir. The impacts due to habitat degradation and loss are acting on the species' current condition and possibly future condition if the One Lake project is constructed as planned. Future reduction in habitat in the Middle Pearl–Strong and Upper Pearl units will occur, and increased isolation of the Upper Pearl unit will further reduce

connectivity if the additional One Lake project is completed. Researchers have estimated that up to 170 individual Pearl River map turtles could be directly impacted by the One Lake Project (Selman 2020b, pp. 192–193). The impacts from this project are in the future and are not currently affecting the species; therefore, we will only consider the existing reservoir for the analysis to determine if the species is endangered in a significant portion of its range.

After identifying areas where the concentration of threats of habitat degradation and loss affects the species or its habitat and the time horizon of these threats, we considered the status to determine if the species is endangered in the affected portion of the range. The area that currently contains a concentration of threats includes a portion of the Middle Pearl–Strong and Upper Pearl units. Habitat loss and degradation from an existing reservoir has reduced the amount and quality of existing habitat for the species in these units. The Ross Barnett Reservoir constructed between 1960 and 1963 near Jackson, Mississippi, changed the natural hydrology of the Pearl River and resulted in 20.9 rmi (33.6 rkm) of river submerged and made unsuitable for the Pearl River map turtle (Lindeman 2019, p. 19). Low population densities of turtles have been observed upstream from the reservoir (Selman and Jones 2017, pp. 32–34). Notable population declines also have been observed in the stretch of the Pearl River downstream of the Ross Barnett Reservoir (north of Lakeland Drive), but the exact reason for the decline is unknown (Selman 2020b, p. 194). However, despite these declines, the species currently exhibits adequate resiliency in these portions.

As a result, the Pearl River map turtle is not in danger of extinction in the portion of the range affected by the Barnett Ross Reservoir. In other words, we found no concentration of threats in any portion of the Pearl River map turtle's range at a biologically meaningful scale. Thus, there are no portions of the species' range where the species has a different status from its rangewide status. Therefore, no portion of the species' range provides a basis for determining that the species is in danger of extinction in a significant portion of its range, and we determine that the Pearl River map turtle is likely to become in danger of extinction within the foreseeable future throughout all of its range. This is consistent with the courts' holdings in *Desert Survivors* v. *Department of the Interior,* No. 16–cv–01165–JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity* v. *Jewell,* 248 F. Supp. 3d, 946, 959 (D. Ariz. 2017).

Determination of Pearl River Map Turtle Status

Our review of the best available scientific and commercial information indicates that the Pearl River map turtle meets the definition of a threatened species. Therefore, we propose to list the Pearl River map turtle as a threatened species in accordance with sections 3(20) and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of listed species, so that they no longer need the protective measures of the Act. Section 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning consists of preparing draft and final recovery plans, beginning with the development of a recovery outline and making it available to the public within 30 days of a final listing determination. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when a species may be ready for reclassification from endangered to threatened (''downlisting'') or removal from protected status (''delisting''), and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (*http://www.fws.gov/endangered*) or from our Mississippi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (*e.g.,* restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

If the Pearl River map turtle is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the States of Louisiana and Mississippi would be eligible for Federal funds to implement management actions that promote the protection or recovery of the Pearl River map turtle. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants.*

Although the Pearl River map turtle is only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that

is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Federal agency actions within the species' range that may require conference or consultation or both as described in the preceding paragraph include actions that fund, authorize, or carry out management and any other landscape-altering activities include, but are not limited to:

(1) Actions that would increase sediment deposition within the stream channel. Such activities could include, but are not limited to, channelization, channel alteration, dredging, impoundment, flood-control structures, road and bridge construction, de-snagging (submerged dead-wood removal), timber harvests, destruction of riparian vegetation, oil or natural gas development, pipeline construction, off-road vehicle use, and other land-disturbing activities in the watershed and floodplain. Sedimentation from these activities could lead to stream bottom embeddedness that eliminates or reduces the quality of aquatic habitat necessary for the conservation of the Pearl River map turtle.

(2) Actions that would alter river or tributary morphology or geometry. Such activities could include, but are not limited to, channelization, dredging, impoundment, road and bridge construction, pipeline construction, and destruction of riparian vegetation. These activities may cause changes in water flows or channel stability and lead to increased sedimentation that eliminates or reduces the sheltering habitat necessary for the conservation of the Pearl River map turtle.

(3) Actions that would alter water chemistry or quality. Such activities could include, but are not limited to, the release of chemicals, fill, biological pollutants, or off-label pesticide use. These activities could alter water conditions to levels that are beyond the tolerances of the Pearl River map turtle and result in direct or cumulative adverse effects to individual turtles.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. The discussion below (section III. Proposed Rule Issued Under Section 4(d) of the Act for the Pearl River Map Turtle) regarding protective regulations under section 4(d) of the Act complies with our policy.

III. Proposed Rule Issued Under Section 4(d) of the Act for the Pearl River Map Turtle

Background

Section 4(d) of the Act contains two sentences. The first sentence states that the Secretary shall issue such regulations as she deems necessary and advisable to provide for the conservation of species listed as threatened. The U.S. Supreme Court has noted that statutory language like ''necessary and advisable'' demonstrates a large degree of deference to the agency (see *Webster* v. *Doe,* 486 U.S. 592 (1988)). Conservation is defined in the Act to mean the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Additionally, the second sentence of section 4(d) of the Act states that the Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants. Thus, the combination of the two sentences of section 4(d) provides the Secretary with wide latitude of discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of threatened species. The second sentence grants particularly broad discretion to the Service when adopting the prohibitions under section 9.

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have upheld rules developed under section 4(d) as a valid exercise of agency authority where they prohibited take of threatened wildlife or include a limited taking prohibition (see *Alsea Valley Alliance* v. *Lautenbacher,* 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); *Washington Environmental Council* v. *National Marine Fisheries Service,* 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (*see State of Louisiana* v. *Verity,* 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history when the Act was initially enacted, ''once an animal is on the threatened list, the Secretary has an almost infinite number of options available to him/[her] with regard to the permitted activities for those species. [S]he may, for example, permit taking, but not importation of such species, or [s]he may choose to forbid both taking and importation but allow the transportation of such species'' (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

Exercising our authority under section 4(d), we have developed a proposed rule that is designed to address the Pearl River map turtle's conservation needs. Although the statute does not require us to make a ''necessary and advisable'' finding with respect to the adoption of specific prohibitions under section 9, we find that this proposed rule as a whole satisfies the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for the conservation of the Pearl River map turtle. As discussed under Summary of Biological Status and Threats, we have concluded that the Pearl River map turtle is likely to become in danger of extinction within the foreseeable future primarily due to habitat degradation and loss due to impoundments, dams, agricultural runoff, development, mining, loss of riparian habitat and deadwood abundance, collection, and climate change. Additional stressors acting on the species include disease and contaminants (pesticides and heavy metals). Drowning and/or capture due to bycatch associated with recreational and commercial fishing of some species of freshwater fish also may affect the species but are of unknown frequency or severity.

The provisions of this proposed 4(d) rule would promote conservation of the Pearl River map turtle by encouraging responsible land management activities and implementing use of best management practices for activities near and in rivers, streams, and riparian areas to minimize habitat alteration to the maximum extent practicable. The rule will also address the threat of

collection by prohibiting take of individuals from the wild. The provisions of this proposed rule include some of the many tools that we would use to promote the conservation of Pearl River map turtle. This proposed 4(d) rule would apply only if and when we make final the listing of Pearl River map turtle as a threatened species.

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Examples of actions that are subject to the section 7 consultation process are actions on State, Tribal, local, or private lands that require a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat—and actions on State, Tribal, local, or private lands that are not federally funded, authorized, or carried out by a Federal agency—do not require section 7 consultation.

This obligation does not change in any way for a threatened species with a species-specific 4(d) rule. Actions that result in a determination by a Federal agency of ''not likely to adversely affect'' continue to require the Service's written concurrence and actions that are ''likely to adversely affect'' a species require formal consultation and the formulation of a biological opinion.

Provisions of the Proposed 4(d) Rule for the Pearl River Map Turtle

This proposed 4(d) rule would provide for the conservation of the Pearl River map turtle by prohibiting the following activities, except as otherwise authorized or permitted: Importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; or selling or offering for sale in interstate or foreign commerce. We also include several exceptions to these prohibitions, which along with the prohibitions, are set forth under Proposed Regulation Promulgation, below.

As discussed above under Summary of Biological Status and Threats, habitat degradation and loss (aquatic and terrestrial nesting) and collection are affecting the status of the Pearl River map turtle. A range of activities has the potential to affect the Pearl River map turtle, including: Dredging, de-snagging, removal of riparian cover, channelization, in-stream activities that result in stream bank erosion and siltation (*e.g.,* stream crossings, bridge replacements, flood control structures, impoundments, etc.), improper pesticide use, and changes in land use within the riparian zone of waterbodies (*e.g.,* clearing land for agriculture). Regulating take associated with these activities would provide for the conservation of the species by better preserving the condition of the species' resilience units, slowing its rate of decline, and decreasing synergistic, negative effects from other ongoing or future threats.

Under the Act, ''take'' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have been further defined in regulation at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. This proposed 4(d) rule would provide for the conservation of Pearl River map turtle by prohibiting intentional and incidental take, except as otherwise authorized or permitted. Prohibiting take of the species resulting from activities, including but not limited to habitat alteration and collection, will provide for the conservation of the species. Regulating take from these activities under a 4(d) rule would prevent continued declines in population abundance and decrease synergistic, negative effects from other threats; this regulatory approach will provide for the conservation of the species by improving resiliency of the species across all units within its range and prevent future projected declines in its viability.

Prohibitions

Aquatic and terrestrial nesting habitat alteration is a threat to the Pearl River map turtle, as the species is endemic to the Pearl River basin and its river ecosystems, including tributary waterbodies, where structure (*e.g.,* tree root masses, stumps, submerged trees, etc.) provides habitat for the species and its prey. Pearl River map turtles spend the majority of their time in aquatic habitat; overland movements are generally restricted to nesting females and juveniles moving from the nest to water (Jones 2006, pp. 207–208; Lindeman 2013, pp. 211–212). The primary causes for aquatic habitat alteration include actions that change hydrologic conditions to the extent that dispersal and genetic interchange are impeded.

The activities that alter Pearl River map turtle aquatic and terrestrial nesting habitats may directly or indirectly affect the species. As well as providing basking sites for all age classes of Pearl River map turtles, fallen riparian woody debris provides important feeding areas for juvenile and male turtles. The species' habitat needs include flowing water with limited sedimentation, sufficient water quality to support the invertebrate and mussel food source of the species, and sandbars for nesting sites. We recommend the implementation of industry and/or State-approved best management practices for activities that may change the hydrology or water quality or reduce available basking structures such as deadwood. Additionally, pesticides should be applied according to label guidelines complying with State and Federal regulations.

State regulatory programs for Pearl River map turtle include regulations in Louisiana and Mississippi that limit or prohibit possession, purchase, sale, transport, or export. Additionally, collection of turtles for the pet trade and aquaculture is a practice that continues to threaten many turtle species globally and also within the Southeastern United States. Based on the provisions of this proposed 4(d) rule, the following actions would be prohibited across the range of the species: Importing or exporting individuals; take (as set forth at 50 CFR 17.21(c)(1) with exceptions as discussed below); possession, sale, delivery, carrying, transporting, or shipping of specimens from any source; delivering, receiving, transporting, or shipping individuals in interstate or foreign commerce in the course of commercial activity; and selling or offering for sale individuals in interstate or foreign commerce.

Exceptions to the Prohibitions

We are proposing several exceptions to the prohibitions: Take incidental to any otherwise lawful activity caused by pesticide and herbicide use; construction, operation, and maintenance activities that implement industry and/or State-approved best management practices accordingly; silviculture practices and forestry activities that implement industry and/or State-approved best management practices accordingly; and maintenance dredging that affects previously disturbed portions of the maintained channel.

Best Management Practices for Implementing Actions That Occur Near- or In-Stream—Implementing best management practices to avoid and/or minimize the effects of habitat alterations in areas that support Pearl River map turtles would provide additional measures for conserving the species by reducing direct and indirect effects to the species. We consider that certain construction, forestry, and pesticide/herbicide management activities that occur near- and in-stream may remove riparian cover or forested habitat, change land use within the riparian zone, or increase stream bank erosion and/or siltation. These actions and activities, if implemented using appropriate best management practices, may have some minimal level of incidental take of the Pearl River map turtle, but any such take is expected to be rare and insignificant and is not expected to negatively impact the species' conservation and recovery efforts.

Construction, operation, and maintenance activities such as installation of stream crossings, replacement of existing in-stream structures (*e.g.,* bridges, culverts, water control structures, boat launches, etc.), operation and maintenance of existing flood control features (or other existing structures), and directional boring, when implemented with industry and State-approved standard best management practices, will have minimal impacts to Pearl River map turtles and their habitat. In addition, silviculture practices and forestry management activities that follow State-approved best management practices to protect water and sediment quality and stream and riparian habitat will not impair the species' conservation. Lastly, invasive species removal activities, particularly through pesticide (insecticide and herbicide) application, are considered beneficial to the native ecosystem and are likely to improve habitat conditions for the species; all excepted pesticide applications must be conducted in a manner consistent with Federal and applicable State laws, including Environmental Protection Agency label restrictions and pesticide application guidelines as prescribed by pesticide manufacturers that would not impair the species' conservation. These activities should have minimal impacts to Pearl River map turtles if industry and/or State-approved best management practices are implemented. These activities and management practices should be carried out in accordance with any existing regulations, permit and label requirements, and best management practices to avoid or minimize impacts to the species and its habitat.

Thus, under this proposed 4(d) rule, incidental take associated with the following activities are excepted:

(1) Construction, operation, and maintenance activities that occur near- and in-stream, such as installation of stream crossings, replacement of existing in-stream structures (*e.g.,* bridges, culverts, water control structures, boat launches, etc.), operation and maintenance of existing flood control features (or other existing structures), and directional boring, when implemented with industry and/or State-approved best management practices for construction;

(2) Pesticide and herbicide applications that follow the chemical label and appropriate application rates; and

(3) Silviculture practices and forest management activities that use State-approved best management practices to protect water and sediment quality and stream and riparian habitat.

Maintenance Dredging of Navigable Waterways—We considered that maintenance dredging activities generally disturb the same area of the waterbody in each cycle; thus, there is less likelihood that suitable turtle habitat (*e.g.,* submerged logs, cover, etc.) occurs in the maintained portion of the channel. Accordingly, incidental take associated with maintenance dredging activities that occur within the previously disturbed portion of the navigable waterway is excepted from the prohibitions as long as these activities do not encroach upon suitable turtle habitat outside the maintained portion of the channel and provide for the conservation of the species.

We may issue permits to carry out otherwise prohibited activities, including those described above, involving threatened wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act. The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

We recognize the special and unique relationship with State natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, and candidate species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique position to assist the Service in implementing all aspects of the Act. In this regard, section 6 of the Act provides that the Service shall cooperate to the maximum extent practicable with the States in carrying out programs authorized by the Act. Therefore, any qualified employee or agent of a State conservation agency that is a party to a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, would be able to conduct activities designed to conserve Pearl River map turtle that may result in otherwise prohibited take without additional authorization.

The proposed 4(d) rule would also allow any employee or agent of the Service, or other Federal land management agency, the National Marine Fisheries Service, a State conservation agency, or a State-licensed wildlife rehabilitation facility staff member designated by his/her agency for such purposes, when acting in the course of official duties, to take endangered wildlife without a permit in accordance with 50 CFR 17.21(c)(3).

Nothing in this proposed 4(d) rule would change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or the ability of the Service to enter into partnerships for the management and protection of the Pearl River map turtle. However, interagency cooperation may be further streamlined through planned programmatic consultations for the species between Federal agencies and the Service, where appropriate. We ask the public, particularly State agencies and other interested stakeholders that may be affected by the proposed 4(d) rule, to provide comments and

suggestions regarding additional guidance and methods that the Service could provide or use, respectively, to streamline the implementation of this proposed 4(d) rule (see Information Requested, above).

IV. Critical Habitat for the Pearl River Map Turtle

Background

Critical habitat is defined in section 3 of the Act as:

(1) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features

(a) Essential to the conservation of the species, and

(b) Which may require special management considerations or protection; and

(2) Specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Our regulations at 50 CFR 424.02 define the geographical area occupied by the species as an area that may generally be delineated around species' occurrences, as determined by the Secretary (*i.e.,* range). Such areas may include those areas used throughout all or part of the species' life cycle, even if not used on a regular basis (*e.g.,* migratory corridors, seasonal habitats, and habitats used periodically, but not solely by vagrant individuals).

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, habitat restoration, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Designation also does not allow the government or public to access private lands. Designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the Federal agency would be required to consult with the Service under section 7(a)(2) of the Act. However, even if the Service were to conclude that the proposed activity would result in destruction or adverse modification of the critical habitat, the Federal action agency and the landowner are not required to abandon the proposed activity, or to restore or recover the species; instead, they must implement ''reasonable and prudent alternatives'' to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) which are essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the extent known using the best scientific and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical or biological features that occur in specific occupied areas, we focus on the specific features that are essential to support the life-history needs of the species, including, but not limited to, water characteristics, soil type, geological features, prey, vegetation, symbiotic species, or other features. A feature may be a single habitat characteristic or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity.

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. The implementing regulations at 50 CFR 424.12(b)(2) further delineate unoccupied critical habitat by setting out three specific parameters: (1) When designating critical habitat, the Secretary will first evaluate areas occupied by the species; (2) the Secretary will consider unoccupied areas to be essential only where a critical habitat designation limited to geographical areas occupied by the species would be inadequate to ensure the conservation of the species; and (3) for an unoccupied area to be considered essential, the Secretary must determine that there is a reasonable certainty both that the area will contribute to the conservation of the species and that the area contains one or more of those physical or biological features essential to the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658)), and our associated Information Quality Guidelines provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

When we are determining which areas should be designated as critical habitat, our primary source of information is generally the information from the SSA report and information developed during the listing process for the species. Additional information sources may include any generalized conservation strategy, criteria, or outline that may have been developed for the species; the recovery plan for the species; articles in peer-reviewed journals; conservation plans developed by States and counties; scientific status surveys and studies; biological assessments; other unpublished materials; or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the

species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) the prohibitions found in section 9 of the Act. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of the species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans, or other species conservation planning efforts if new information available at the time of those planning efforts calls for a different outcome.

Prudency Determination

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary shall designate critical habitat at the time the species is determined to be an endangered or threatened species. Our regulations (50 CFR 424.12(a)(1)) state that the Secretary may, but is not required to, determine that a designation would not be prudent in the following circumstances:

(i) The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;

(ii) The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;

(iii) Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States;

(iv) No areas meet the definition of critical habitat; or

(v) The Secretary otherwise determines that designation of critical habitat would not be prudent based on the best scientific data available.

Increased Degree of Threat to the Pearl River Map Turtle

After evaluating the status of the species and considering the threats acting on the species, we find the designation of critical habitat would not be prudent for Pearl River map turtle because the species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of such threat to the species. As discussed earlier in the proposed listing determination for Pearl River map turtle, there is currently an imminent threat of collection identified under Factor B for the Pearl River map turtle. Identification and mapping of critical habitat is expected to facilitate any such threat.

Collection of wild turtles in the Pearl River system is probably occurring, and similar to what has been observed in other States, these turtles are likely destined for the high-end turtle pet trade in China and possibly other Southeast Asian countries (Selman 2020a, p. 23). Information has been documented from three different local individuals, at three different locations, concerning turtle bycatch or harvesting in local Louisiana waterways occupied by Pearl River map turtles (Selman 2020a, pp. 22–23). These locations included the Pearl River south of Bogalusa, Louisiana (possible mortality resulting from bycatch in hoop nets), the West Pearl River Navigation Canal (turtles captured and sold, possibly for shipment to China), and the Bogue Chitto River (local comment that baby turtles were being captured and shipped to China) (Selman 2020a, pp. 22–23). The specific species captured were not documented; however, it is likely that at least some of these turtles were Pearl River map turtles.

The Service manages information related to species exports in the Law Enforcement Management Information System (LEMIS). According to a LEMIS report from 2005 to 2019, more than 300,000 turtles identified as *Graptemys* spp. or their parts were exported from the United States to 29 countries (Service 2021b, Appendix B). The number of turtles recorded in each shipment ranged widely. Due to their similarity in appearance, species of *Graptemys* are difficult to differentiate (Selman 2021, pers comm.). Records from 2005, when the highest number of *Graptemys* were exported, show more than 35,000 turtles (*Graptemys* spp.) in a single shipment to Spain and a total of 172,645 individual *Graptemys* exported to 24 different countries (Service 2021b, Appendix B). However, there is some uncertainty regarding the sources of the exported turtles as they could have originated from captive stock.

The Pearl River map turtle is declining throughout its range as a consequence of factors including collection of live adult turtles from the wild for the pet trade. All life stages of aquatic turtles are at risk of collection for both domestic and international distribution (Stanford et al. 2020, p. R722). All species of map turtles are prized by collectors because of their intricate shell patterns. While the Pearl River map turtle lacks many of the distinct intricacies, there is still a demand for all map turtles and this species is collected and trafficked domestically and internationally (Service 2021b, Appendix B).

The unauthorized collection of Pearl River map turtles for the pet trade is a factor contributing to the species' decline and remains a threat today. Pearl River map turtles can be found near basking structures because many turtles may use the same logs and semi-submerged features (Selman and Lindeman 2015, pp. 794–795). Therefore, publishing specific location information would provide a high level of assurance that any person going to a specific location would be able to successfully locate and collect multiple individuals given the species' concentrated use of limited basking sites.

Designation of critical habitat requires the publication of maps and a narrative description of specific critical habitat areas in the **Federal Register**. We are concerned that designation of critical habitat would more widely announce the exact locations of Pearl River map turtles and their suitable habitat that may facilitate unauthorized collection/poaching and contribute to further declines of the species' viability. Moreover, as species become rarer and more difficult to obtain, the monetary value increases, thus driving increased collection pressure on remaining wild individuals. We anticipate that listing the Pearl River map turtle under the Act may promote further interest in black market sales of the turtles and increase the likelihood that the species will be sought out for the pet trade as demand rises. The removal of the species by taking is expected to increase if we identify critical habitat; thus, we find that designation of critical habitat for

the Pearl River map turtle is not prudent. Therefore, because the species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species, the criterion as provided in regulations at 50 CFR 424.12(a)(1) has been met. Accordingly, we have determined that the designation of critical habitat is not prudent for the Pearl River map turtle.

Critical Habitat Determinability

Having determined that designation is not prudent, under section 4(a)(3) of the Act we do not evaluate the extent to which critical habitat for the Pearl River map turtle is determinable.

V. Similarity of Appearance for the Alabama Map Turtle, Barbour's Map Turtle, Escambia Map Turtle, and Pascagoula Map Turtle

Whenever a species which is not endangered or threatened closely resembles an endangered or threatened species, such species may be treated as either endangered or threatened if the Secretary makes such determination in accordance with section 4(e) of the Act for similarity of appearance. Section 4(e) authorizes the treatment of a species, subspecies, or population segment as an endangered or threatened species if: ''(a) Such species so closely resembles in appearance, at the point in question, a species which has been listed pursuant to such section that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species; (b) the effect of this substantial difficulty is an additional threat to an endangered or threatened species; and (c) such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of this Act.''

A designation of an endangered or threatened species due to similarity of appearance under section 4(e) of the Act, however, does not extend other protections of the Act, such as consultation requirements for Federal agencies under section 7 and the recovery planning provisions under section 4(f), that apply to species that are listed as an endangered or threatened species under section 4(a). All applicable prohibitions and exceptions for species listed under section 4(e) of the Act due to similarity of appearance to a threatened or endangered species will be set forth in a species-specific rule issued under section 4(d) of the Act. The Service implements this Section 4(e) authority in accordance with the Act and our regulations at 50 CFR 17.50. Our analysis of the criteria for the 4(e) rule is described below for the similarity of appearance of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle in relation to the proposed threatened Pearl River map turtle.

Do the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle so closely resemble in appearance, at the point in question, the Pearl River map turtle such that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species?

Map turtles (genus *Graptemys*) are named for the intricate pattern on the carapace that often resembles a topographical map. In addition to the intricate markings, the shape of the carapace (top half of shell) in map turtles is very distinctive. The carapace is keeled, and many species show some type of knobby projections or spikes down the vertebral scutes (located down the midline of the carapace). All five of these map turtle species are in the megacephalic (large-headed) clade where the females have large, broad heads and all occur in the Southeastern United States. There are only slight morphological differences between the Pearl River map turtle and four other map turtle species in the megacephalic clade from the Southeastern United States: Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle. The ranges of these species do not geographically overlap, with the exception of Barbour's and Escambia map turtle ranges in some areas of the Choctawhatchee River drainage in Alabama and Florida (figure 2). Additional information regarding characteristics and identification of megacephalic map turtles is described in the SSA report (Service 2021b, pp. 17–24). The lack of distinctive physical features makes it difficult to differentiate among these species, even for law enforcement officers, especially considering their similar body form, shell markings, and head markings (Selman 2021, pers. comm). The Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle all closely resemble in appearance, at the point in question, the Pearl River map turtle such that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species.

Is the effect of this substantial difficulty an additional threat to Pearl River map turtle?

As provided in 50 CFR 17.50(b)(2), we considered the additional threat posed to the proposed threatened Pearl River map turtle because of its similarity of appearance to the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle. Specifically, we considered the possibility that an additional threat is posed to the Pearl River map turtle by unauthorized trade or commerce by persons who misrepresent Pearl River map turtle specimens as Alabama map turtle, Barbour's map turtle, Escambia map turtle, or Pascagoula map turtle specimens, because this might result in the Pearl River map turtle (if listed) entering the global black market via the United States or contributing to market demand for the Pearl River map turtle.

Due to the lack of distinct physical characteristics and difficulty in distinguishing individual species of megacephalic map turtles, the similarity of these species poses a problem for Federal and State law enforcement agents trying to stem unauthorized collection of the Pearl River map turtle. Collection is a real threat to many turtle species in the United States and also affects species globally (Stanford et al. 2020, entire). Turtles are collected in the wild and sold into the pet trade both domestically and internationally. The proposed listing of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle as threatened due to similarity of appearance minimizes the possibility that private and commercial collectors will be able to misrepresent Pearl River map turtles as Alabama map turtles, Barbour's map turtles, Escambia map turtles, or Pascagoula map turtles for private or commercial purposes.

We find that the difficulty enforcement personnel have in attempting to differentiate between the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle species would pose an additional threat to the Pearl River map turtle.

Would treatment of the four unlisted map turtles as threatened or endangered due to similarity of appearance substantially further the enforcement and policy of the Act?

The listing of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle due to similarity of appearance will facilitate Federal, State, and local law enforcement agents' efforts to curtail

unauthorized possession, collection, and trade in the Pearl River map turtle. Listing the four similar map turtle species due to similarity of appearance under section 4(e) of the Act and providing applicable prohibitions and exceptions under section 4(d) of the Act will substantially facilitate the enforcement and further the policy of the Act for the Pearl River map turtle. For these reasons, we propose to list Alabama map turtle (occurring in Alabama, Georgia, Mississippi, and Tennessee), Barbour's map turtle (occurring in Alabama, Florida, and Georgia), Escambia map turtle (occurring in Alabama and Florida), and Pascagoula map turtle (occurring in Mississippi) as threatened due to similarity of appearance to the Pearl River map turtle pursuant to section 4(e) of the Act (see figure 2).

With this proposed rule, we do not consider the Alabama map turtle, Barbour's map turtle, Escambia map turtle, or Pascagoula map turtle to be biologically threatened or endangered but we have determined that listing the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle as threatened species under the similarity of appearance provision of the Act, coupled with a proposed 4(d) rule as discussed below, minimizes misidentification and enforcement-related issues. This proposed listing would promote and enhance the conservation of the Pearl River map turtle.

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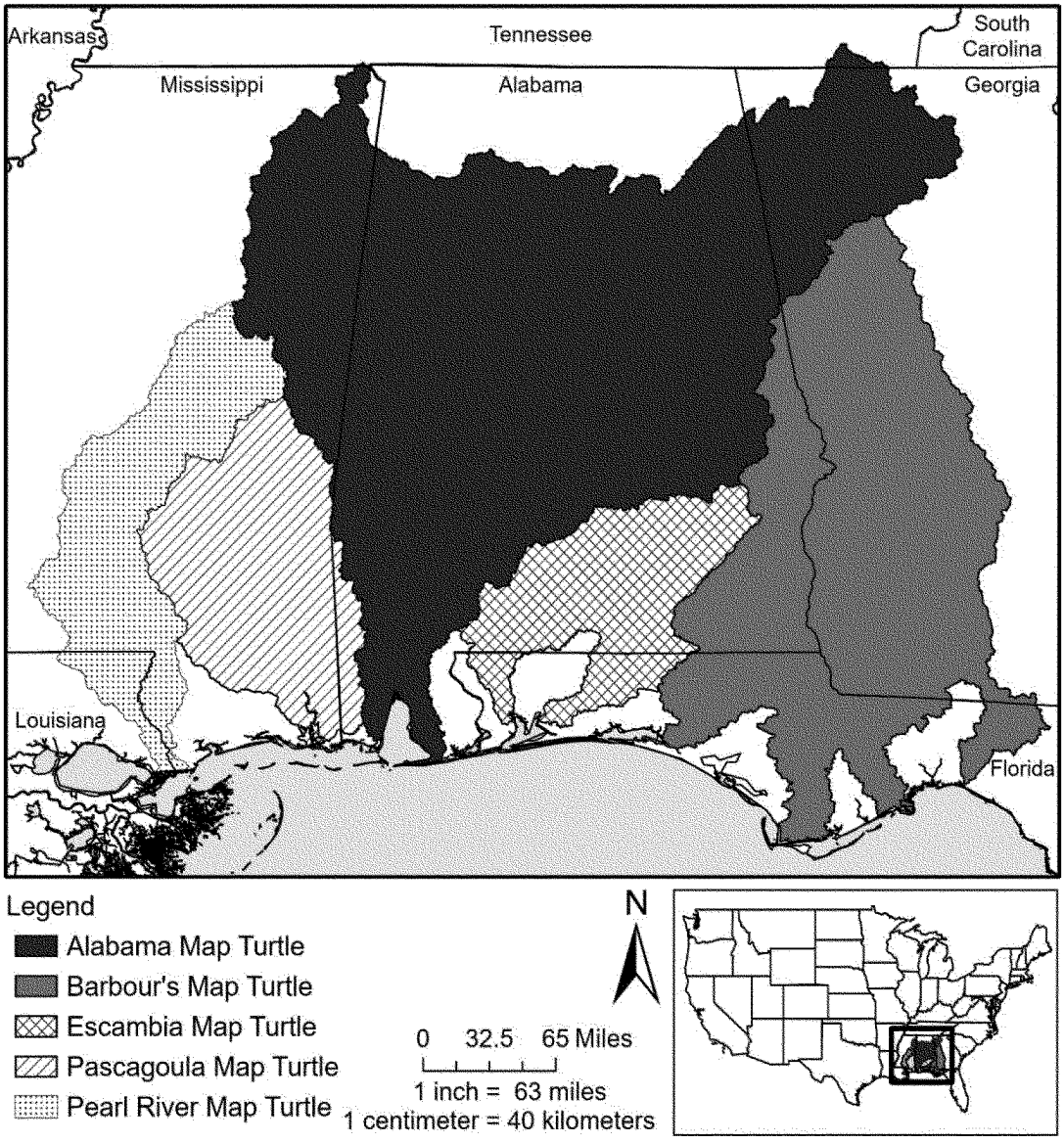

Figure 2—Range map of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, Pascagoula map turtle, and Pearl River map turtle.

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VI. Proposed Rule Issued Under Section 4(d) of the Act for the Alabama Map Turtle, Barbour's Map Turtle, Escambia Map Turtle, and Pascagoula Map Turtle Background

Whenever a species is listed as a threatened species under the Act, the Secretary may specify regulations that she deems necessary and advisable to provide for the conservation of that species under the authorization of section 4(d) of the Act. Because we are proposing to list the Alabama map turtle (*Graptemys pulchra*), Barbour's map turtle (*Graptemys barbouri*), Escambia map turtle (*Graptemys ernsti*), and Pascagoula map turtle (*Graptemys gibbonsi*) as threatened species due to similarity of appearance to the Pearl River map turtle (see V. Similarity of Appearance for the Alabama Map Turtle, Barbour's Map Turtle, Escambia Map Turtle, and Pascagoula Map Turtle section), we are proposing a 4(d) rule to minimize misidentification and enforcement-related issues. This proposed 4(d) rule would promote and enhance the conservation of the Pearl River map turtle.

This proposed 4(d) rule, to be promulgated for addition to 50 CFR 17.42, will establish prohibitions on collection of these four similar-in-appearance species of map turtle in order to protect the Pearl River map turtle from unlawful collection, unlawful possession, and unlawful trade. In this context, collection is defined as any activity where Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle are, or are attempted to be, collected from wild populations. Capture of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle is not prohibited if it is not intentional, such as during research or fishing activities, provided live animals are released immediately upon discovery at the point of capture and dead animals are reported to the Service. Incidental take associated with all otherwise legal activities involving the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle that are conducted in accordance with applicable State, Federal, Tribal, and local laws and regulations is not considered prohibited under this proposed rule.

Provisions of the Proposed 4(d) Rule for the Alabama Map Turtle, Barbour's Map Turtle, Escambia Map Turtle, and Pascagoula Map Turtle

This proposed 4(d) rule would provide for the conservation of the Pearl River map turtle by prohibiting the following activities for Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle, except as otherwise authorized or permitted: Take in the form of collection (other than for scientific purposes); importing or exporting individuals; possession and other acts with unlawfully taken specimens; delivering, receiving, transporting, or shipping of unlawfully taken specimens from any source; delivering, receiving, transporting, or shipping individuals in interstate or foreign commerce in the course of commercial activity; and selling or offering for sale individuals in interstate or foreign commerce.

The proposed 4(d) rule does not prohibit incidental take of the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle through permitted and other excepted activities as described below. Incidental take is take that results from, but is not the purpose of, carrying out an otherwise lawful activity. For example, construction activities, application of pesticides and fertilizers according to label, silviculture and forest management practices, maintenance dredging activities that remain in the previously disturbed portion of a maintained channel, and any other legally undertaken actions that result in the accidental take of an Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle will not be considered a violation of section 9 of the Act in the southern States of Alabama, Florida, Georgia, Louisiana, Mississippi, and Tennessee.

Effect of the Proposed Rule

Listing the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle as threatened species under the ''similarity of appearance'' provisions of the Act, and the promulgation of a rule under section 4(d) of the Act, to extend take prohibitions regarding collection, import, export, and commerce to these species will provide a conservation benefit to the Pearl River map turtle. Capture of these species is not prohibited if it is accidental, such as during research, provided the animal is released immediately upon discovery at the point of capture.

As Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle can be confused with the Pearl River map turtle, we strongly recommend maintaining the appropriate documentation and declarations with legal specimens at all times, especially when importing them into the United States, and permit holders should also comply with the import/export transfer regulations under 50 CFR part 14, where applicable. All otherwise legal activities that may involve what we would normally define as incidental take (take that results from, but is not the purpose of, carrying out an otherwise lawful activity) of these similar turtles, and which are conducted in accordance with applicable State, Federal, Tribal, and local laws and regulations, are not prohibited under this proposed regulation.

This proposed 4(d) rule will not consider instances of incidental take as violations of section 9 of the Act if they result in incidental take of any of the similarity of appearance turtles. We do not find it necessary to apply incidental take prohibitions for those otherwise legal activities to these four similar turtles (Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle), as these activities will not pose a threat to the Pearl River map turtle because: (1) Activities that affect the waters where Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle reside will not affect Pearl River map turtle and (2) the primary threat to the Pearl River map turtle comes from collection and commercial trade as it relates to the similar turtles. Listing the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle under the similarity of appearance provision of the Act, coupled with this 4(d) rule, will help minimize enforcement problems related to collection and enhance conservation of the Pearl River map turtle.

Required Determinations

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell

us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*) in connection with regulations adopted pursuant to section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. We coordinated with Tribes within the Pearl River map turtle's range when we initiated the SSA process. We also requested review and addressed comments accordingly. We also coordinated with Tribes within the Alabama, Barbour's, and Escambia map turtles' ranges, requesting information regarding threats and conservation actions for those species. There are no Tribes within the range of the Pascagoula map turtle. We will continue to work with Tribal entities during the development of a final rule.

References Cited

A complete list of references cited in the petition finding for the Pascagoula map turtle and this proposed rulemaking for the Pearl River map turtle is available on the internet at *https://www.regulations.gov* and upon request from the Mississippi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this document are the staff members of the Fish and Wildlife Service's Species Assessment Team and the Service's Mississippi Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

■ 2. Amend § 17.11(h) by adding entries for ''Turtle, Alabama map'', ''Turtle, Barbour's map'', ''Turtle, Escambia map'', ''Turtle, Pascagoula map'' and ''Turtle, Pearl River map'' to the List of Endangered and Threatened Wildlife in alphabetical order under Reptiles to read as set forth below:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
*	*	*	*	*
REPTILES				
*	*	*	*	*
Turtle, Alabama map	*Graptemys pulchra*	Wherever found	T (S/A)	[**Federal Register** citation when published as a final rule]; 50 CFR 17.42(n).[4d]
*	*	*	*	*
Turtle, Barbour's map	*Graptemys barbouri*	Wherever found	T (S/A)	[**Federal Register** citation when published as a final rule]; 50 CFR 17.42(n).[4d]
*	*	*	*	*
Turtle, Escambia map	*Graptemys ernsti*	Wherever found	T (S/A)	[**Federal Register** citation when published as a final rule]; 50 CFR 17.42(n).[4d]
*	*	*	*	*
Turtle, Pascagoula map	*Graptemys gibbonsi*	Wherever found	T (S/A)	[**Federal Register** citation when published as a final rule]; 50 CFR 17.42(n).[4d]
*	*	*	*	*
Turtle, Pearl River map	*Graptemys pearlensis*	Wherever found	T	[**Federal Register** citation when published as a final rule]; 50 CFR 17.42(m).[4d]
*	*	*	*	*

■ 3. As proposed to be amended at 85 FR 61700 (September 30, 2020), 86 FR 18014 (April 7, 2021), and 86 FR 62122 (November 9, 2021), § 17.42 is further amended by adding paragraphs (m) and (n) to read as follows:

§ 17.42 Special rules—reptiles.

* * * * *

(m) Pearl River map turtle (*Graptemys pearlensis*)—(1) *Prohibitions.* The following prohibitions that apply to endangered wildlife also apply to the Pearl River map turtle. Except as provided under paragraph (m)(2) of this section and §§ 17.4 and 17.5, it is unlawful for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit, or cause to be committed, any of the following acts in regard to this species:

(i) Import or export as set forth at § 17.21(b) for endangered wildlife.

(ii) Take, as set forth at § 17.21(c)(1) for endangered wildlife.

(iii) Possession and other acts with unlawfully taken specimens, as set forth at § 17.21(d)(1) for endangered wildlife.

(iv) Interstate or foreign commerce in the course of a commercial activity, as set forth at § 17.21(e) for endangered wildlife.

(v) Sale or offer for sale, as set forth at § 17.21(f) for endangered wildlife.

(2) *Exceptions from prohibitions.* In regard to this species, you may:

(i) Conduct activities as authorized by a permit under § 17.32.

(ii) Take, as set forth at § 17.21(c)(2) through (4) for endangered wildlife.

(iii) Possess and engage in other acts with unlawfully taken wildlife, as set forth at § 17.21(d)(2) for endangered wildlife.

(iv) Take as set forth at § 17.31(b).

(v) Take incidental to an otherwise lawful activity caused by:

(A) Construction, operation, and maintenance activities that occur near- and in-stream, such as installation of stream crossings, replacement of existing in-stream structures (*e.g.,* bridges, culverts, water control structures, boat launches, etc.), operation and maintenance of existing flood control features (or other existing structures), and directional boring, when implemented with industry and/or State-approved best management practices for construction.

(B) Pesticide (insecticide or herbicide) application that follows approved chemical label instructions and appropriate application rates.

(C) Silviculture practices and forest management activities that use State-approved best management practices to protect water and sediment quality and stream and riparian habitat.

(D) Maintenance dredging activities that remain in the previously disturbed portion of the maintained channel.

(n) Alabama map turtle (*Graptemys pulchra*), Barbour's map turtle (*Graptemys barbouri*), Escambia map turtle (*Graptemys ernsti*), and Pascagoula map turtle (*Graptemys gibbonsi*)—(1) *Prohibitions.* The following prohibitions that apply to endangered wildlife also apply to the Alabama map turtle, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle. Except as provided under paragraph (n)(2) of this section and §§ 17.4 and 17.5, it is unlawful for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit, or cause to be committed, any of the following acts in regard to these species:

(i) Take in the form of collection (other than for scientific purposes).

(ii) Import or export, as set forth at § 17.21(b) for endangered wildlife.

(iii) Possession and other acts with unlawfully taken specimens, as set forth at § 17.21(d)(1) for endangered wildlife.

(v) Interstate or foreign commerce in the course of a commercial activity, as set forth at § 17.21(e) for endangered wildlife.

(vi) Sale or offer for sale, as set forth at § 17.21(f) for endangered wildlife.

(2) *Exceptions from prohibitions.* In regard to these species, you may:

(i) Conduct activities as authorized by a permit under § 17.32.

(ii) Take as set forth at § 17.31(b).

Martha Williams,

Principal Deputy Director, Exercising the Delegated Authority of the Director, U.S. Fish and Wildlife Service.

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