DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2016–0037; 4500030113]

RIN 1018–BB55

Endangered and Threatened Wildlife and Plants; Threatened Species Status for Pearl Darter

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine threatened species status under the Endangered Species Act of 1973 (Act), as amended, for the pearl darter (*Percina aurora*), a fish whose historical range includes Mississippi and Louisiana. The effect of this regulation will be to add this species to the List of Endangered and Threatened Wildlife.

DATES: This rule becomes effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

ADDRESSES: This final rule is available on the internet at *http://www.regulations.gov* in Docket No. FWS–R4–ES–2016–0037 and on the Mississippi Field Office website at *https://www.fws.gov/mississippiES/*. Comments and materials we received, as well as supporting documentation we used in preparing this rule, are available for public inspection at *http://www.regulations.gov* and by appointment, during normal business hours at: U.S. Fish and Wildlife Service, Mississippi Ecological Services Field Office, 6578 Dogwood View Parkway, Jackson, Mississippi 39213, by telephone 601–321–1122 or by facsimile 601–965–4340.

FOR FURTHER INFORMATION CONTACT: Stephen Ricks, Field Supervisor, U.S. Fish and Wildlife Service, Mississippi Ecological Services Field Office, 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 Endangered Species Act of 1973, as amended (Act, 16 U.S.C. 1531 et seq.), if we determine that a species is an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the *Federal Register* and make a determination on our proposal within 1 year. Listing a species as an endangered or threatened species can only be completed by issuing a rule. We published a proposed rule to add the pearl darter (*Percina aurora*) to the List of Endangered and Threatened Wildlife in title 50 of the Code of Federal Regulations (50 CFR 17.11(h)) as threatened on September 21, 2016 (81 FR 64857).

What this document does. This rule will finalize the listing of the pearl darter as a threatened species.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species based on 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 water quality decline from point and nonpoint source pollution continues to impact portions of this species' habitat. In addition,

geomorphology changes attributed to historical sand and gravel mining operations within the drainage are considered an ongoing threat. This species has been extirpated from the Pearl River watershed and is confined today to the Pascagoula River basin where the species' small population size, scattered locations, and low genetic (allelic) diversity increase its vulnerability to extirpation from catastrophic events.

Peer review and public comment. We sought comments from independent specialists to ensure that our determination was based on scientifically sound data, assumptions, and analyses. We invited these peer reviewers to comment on our listing proposal. We also considered all comments and information received from the public during the comment period.

Previous Federal Action

Please refer to the September 21, 2016, proposed listing rule (81 FR 64857) for a detailed description of previous Federal actions concerning this species.

Background

For a more detailed discussion of the taxonomy, biology, status, and threats affecting the species, please refer to the proposed listing rule. In the proposed rule, we evaluated the biological status of the species and factors affecting its continued existence. Our assessment was based upon the best available scientific and commercial data on the status of the species, including past, present, and future threats.

Summary of Comments and Recommendations

In the proposed rule, we requested that all interested parties submit written comments on the proposal by November 21, 2016. We also contacted appropriate Federal and State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposal. Newspaper notices inviting general public comment were published in the

Hattiesburg American, Mississippi Press, and Clarion-Ledger on October 2, 2016. We did not receive any requests for a public hearing. All substantive information provided during the comment period has either been incorporated directly into this final determination or is addressed in the more specific response to comments below.

Peer Reviewer Comments

In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicited expert opinion from three individuals with scientific expertise that included familiarity with pearl darter and its habitat, biological needs, and threats. We received responses from all three of the peer reviewers.

We reviewed all comments received from the peer reviewers for new substantive information regarding the listing of the pearl darter. The peer reviewers generally concurred with our methods and conclusions and provided additional information, clarifications, and suggestions to improve the final rule. Where appropriate, we incorporated new information into the final rule as a result of the peer reviewer comments, including new survey information. Other substantive peer reviewer comments are below.

(1) *Comment*: One peer reviewer suggested our statement that the species was extirpated from the Pearl River drainage was premature, since surveys in that system were ongoing, and cautioned that a final listing decision should be withheld until surveys were completed.

Our Response: While upper Pearl River basin surveys for the pearl darter were completed in 2011 (Schaefer and Mickle 2011), surveys for the darter in the lower Pearl River drainage were only completed by the Mississippi Department of Wildlife, Fisheries, and Parks in May of 2017 (Wagner *et al.* 2017, entire). Those surveys, which included both traditional

surveys and eDNA analysis (Wagner *et al*. 2017, p. 5), were utilized over the last 2 years in an attempt to locate evidence of this species persisting in the Pearl River system. Our determination that the pearl darter has not been collected from the Pearl River drainage in over 40 years, and is considered extirpated from this system, is validated by these recent survey results.

(2) *Comment:* One peer reviewer stated that pulp mills should be considered a threat to water quality degradation. The reviewer also expressed a suspicion that pulp mill effluent may have had some influence on extirpation of pearl darters in the Pearl River.

Our Response: We agree and have made changes to this final rule to reflect the peer reviewer's input in the **Summary of Factors Affecting the Species** section, below.

(3) *Comment*: One peer reviewer stated that increased demand for water withdrawal by industry and municipalities should be considered an additional threat to the species in the Pascagoula drainage. The reviewer stated that this activity will be a continuing threat for all aquatic resources as coastal populations grow and industrial needs expand. The commenter cited the 2006 proposed Richton Salt Dome as an example of water withdrawal posing a threat to the pearl darter.

Our Response: We agree that water withdrawal from the Pascagoula drainages could have an impact on the ecological health of the system and potentially impact the pearl darter. However, at this time, we have no information to indicate that increased demand for water withdrawal by industry and municipalities currently poses a threat to the pearl darter, and we note that the peer reviewer did not identify any specific active projects. The Richton Salt Dome project cited by the peer reviewer, which at one time was a concern, was terminated and removed from the Department of Energy's budget in 2011.

(4) *Comment*: One peer reviewer stated that there was no information to indicate there has been a decline in pearl darter abundance in the Bouie River and Black Creek and, particularly, no information attributing any declines to sedimentation and unstable banks. These areas have historically had few specimens of darter and have not been thoroughly surveyed.

Our Response: We agree that there are inadequate data and a lack of thorough surveying of the Bouie River and Black Creek to definitively note a decline of the species in those systems, and we have clarified the rule accordingly. Until recently, there had been no collection efforts in the Bouie River and Black Creek since 2000. However, in 2016–2017, survey efforts in these systems found pearl darters to be sparsely present in a few sites (Schaefer *in litt*. 2017). Evidence of substantial sedimentation and unstable banks in the Bouie River and Black Creek has been documented in the past (Mossa and Coley 2004, p. 7; Mississippi Department of Environmental Quality 2005c, p. 16) and observed currently (Schaefer *in litt*. 2017). The negative impact of excessive sedimentation on darter distribution is well known and addressed under Factor A in the **Summary of Factors Affecting the Species** section of the preamble to this rule. Furthermore, there are also likely other factors contributing to water quality degradation in these systems, such as point and nonpoint source pollution related to stormwater runoff and effluent discharge from industry, agriculture, and urbanization; therefore, we have revised our statement regarding sedimentation.

(5) *Comment*: One peer reviewer commented that our statement in the proposed rule on low genetic diversity and restricted gene flow as reported by Kreiser *et al*. (2012) ran counter to the hypothesized long-distance spawning migrations noted elsewhere in the rule. The commenter stated that the genetic data support a series of potentially disjunct populations rather than one contiguous population.

Our Response: We appreciate the comment and have clarified in this final listing rule the statement that pearl darters may have long-distance spawning migrations (Bart *et al*. 2001, p. 14). Kreiser's (*et al*. 2012, pp. 14–17) recent genetic studies, indicating a series of potentially disjunct populations, are likely a more accurate representation of the population structure of the pearl darter (see **Summary of Factors Affecting the Species**, Factor E).

Comments from States

The proposed rule was reviewed by the Mississippi Department of Wildlife, Fisheries and Parks; the Mississippi Forestry Commission; and the Louisiana Department of Wildlife and Fisheries. The individual associated with the Mississippi Department of Wildlife, Fisheries and Parks also served as a peer reviewer, and his comment is addressed in Comment 1 above. The State agencies generally concurred with our methods and commented that the literature and data were thorough and properly documented. They stated that we should withhold our final listing decision until their surveys in the Pearl River drainage had been completed. Mississippi Department of Wildlife, Fisheries and Parks recently provided additional information from their recent site surveys. The Louisiana Department of Wildlife and Fisheries agreed that there were no recent records from the Pearl River system despite recent sampling efforts. An issue raised by the Mississippi Forestry Commission is addressed below.

(6) *Comment:* The Mississippi Forestry Commission and two commenters from the timber industry stated that we mischaracterized the use of best management practices (BMPs) in Mississippi by stating that: (1) their use was confined to lands managed by The Nature Conservancy and the State of Mississippi, and (2) the lack of a mandatory requirement makes forestry BMPs less effective. The commenters pointed out that 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. The commenters also stated that silviculture practices implemented with BMPs have minimal impacts on aquatic species, and that a recent statewide monitoring survey by Mississippi Forestry Commission indicated that BMPs are being implemented across all silviculture landscapes in Mississippi regardless of ownership.

Our Response: We appreciate the additional information provided by the commenters and commend the timber industry and landowners on their implementation of BMPs in their timber operations and also the success of forestry certification programs, such as Sustainable Forestry Initiative. We have updated information in this rule to acknowledge the contribution of these forest landowners implementing BMPs in the **Summary of Factors Affecting the Species** section, below.

Public Comments

We received five comments from the public, two of which are addressed in Comment 6, above; the three other commenters simply expressed their support for the proposed listing.

Summary of Changes from the Proposed Rule

This final rule incorporates minor changes to our proposed rule based on the comments we received, as discussed above in **Summary of Comments and Recommendations**, and newly available survey information. The survey data allowed us to refine distribution information; thus, the final total current range of the species is different from that in the proposed rule. Many small, nonsubstantive changes and corrections were made throughout the document in response to comments (e.g., updating the **Background** section, threats, minor clarifications). However, the information we received in response to the proposed rule did not change our determination that the pearl darter is a threatened species, nor was it significant enough to warrant reopening

the public comment period. Below is a summary of substantive changes made to the final rule.

- We now estimate the total current range of the pearl darter in the Pascagoula watershed to be 668 kilometers (km) (415 miles (mi)) based on a reanalysis of collection records and recent survey results. Detailed information about the species' range within each of the seven river/creek systems is presented in the preamble of this rule, under ***Current Distribution***.

- Additional information on habitat and population structure from peer reviewers and recent studies (Wagner *et al.* 2017) has been added to the preamble.

- Additional information and suggestions from peer reviewers was added to clarify and improve the accuracy of the information in the Distribution, Habitat, Biology, and Threats sections of the preamble to the proposed rule.

- Additional information on the species' abundance and probable cause of decline in the Pearl River, as related to the potential threat to existing populations in the Pascagoula system, from two peer reviewers was added into the **Summary of Factors Affecting the Species** section of this rule, below.

- Additional narrative on historical threats within the Pearl River basin, as well as additional historical and current threats affecting water quality within the Pascagoula River basin, including increased brine concentration from oil and gas production and pulp mill effluent related to pulp, paper, and lumber mills, was added to the preamble.

Summary of Biological Status

Below we present a summary of the biological and distributional information discussed in the proposed listing rule (81 FR 64857; September 21, 2016). We also present new information published or obtained since the proposed rule was published (see **Summary of Changes from the Proposed Rule**, above).

Taxonomy and Species Description

The pearl darter (*Percina aurora*) is a small fish and is one of three members of the subgenus *Cottogaster* (Ross 2001, p. 500). The species is allied to the channel darter (*P. copelandi*) (Ross *et al*. 1989, p. 25) but is distinguished from it by its larger size, lack of tubercules (small, raised, skin structures), heavy pigmentation, number of marginal spines on belly scales of breeding males, and fully scaled cheeks (Suttkus *et al*. 1994, pp. 13–14). Generally, pearl darters range in size from 22 to 59 millimeters (mm) (0.87 to 2.3 inches (in)) in length with the majority of adults being from 30 to 41 mm (1.2 to 1.6 in) long (Clark and Schaefer 2015, p. 10).

Historical Distribution

The pearl darter is historically known from localized sites within the Pearl and Pascagoula River drainages in Mississippi and Louisiana, based on collection records from 16 counties and parishes of Mississippi and Louisiana. Examination of site records of museum fish collections from the Pearl River drainage (compiled from Suttkus *et al*. 1994, pp. 15–18) suggests that the pearl darter once inhabited the large tributaries and main channel habitats within these drainages from St. Tammany Parish, Louisiana, to Simpson County, Mississippi. This area totaled approximately 708 km (440 mi) within the Pearl River basin and included the lower Pearl River, the Strong River, and the Bogue Chitto River (compiled from MMNS 2016, unpublished data; Slack *et al*. 2005, pp. 5–10; Ross 2001, p. 499; Ross *et al.* 2000, pp. 2–5; Bart and Piller 1997, pp. 3–10; Bart and Suttkus 1996, pp. 3–4; Suttkus *et al*. 1994, pp. 15–18). However, there have been no records of this species from the Pearl River drainage in over 40 years, despite repeated collecting efforts through the years (Wagner *et al.* 2017, pp. 3–10, 12; Geheber and Piller 2012, pp. 633–636; Schaefer and Mickel 2011, p. 10; Slack *et al*. 2005, pp.

5–10; Tipton *et al.* 2004, pp. 56–57; Ross 2001, p. 499; Bart and Piller 1997, p. 1; Bart and Suttkus 1996, pp. 3–4; Bart and Suttkus 1995, pp. 13–14; Suttkus *et al*. 1994, pp. 15–18). Survey efforts over the last few years at all historical sites, including north of and just below the Ross Barnett Reservoir (Schaefer and Mickle 2011, pp. 8–10), have confirmed its absence from the Pearl River system (Wagner *et al.* 2017, pp. 3–4; Roberts *in litt*. 2015; Geheber and Piller 2012, p. 633), including the recent analysis of water samples for eDNA from the Pearl River proper, Strong River, and Bogue Chitto River (Piller *in litt*. 2017). Thus, the pearl darter is considered extirpated from the Pearl River system today.

Current Distribution

Today, the pearl darter occurs in scattered sites within an approximately 668-km (415-mi) area of the Pascagoula drainage, including the Pascagoula (101 km, 63 mi), Chickasawhay (257 km, 160 mi), Leaf (186 km, 115 mi), Chunky (31 km, 19 mi), and Bouie (24 km, 15 mi) Rivers and Okatoma (37 km, 23 mi) and Black Creeks (32 km, 20 mi) (Wagner *et al.* 2017, pp. 3–10, 12; Wagner *in litt.* 2017; Clark and Schaefer 2015, pp. 10, 19, 23; Schaefer and Mickle 2011, pp. 1–3; Slack *et al.* 2002, p. 9).

The average catch at known occupied sites, using standard sampling (30 minutes with heavy leaded seine) is 2.1 individuals (Wagner *et al.* 2017. pp. 3–4; Clark and Schaefer 2015, pp. 9–14, 18–22), indicating a species that is rare. Surveys by Kreiser *et al.* (2012, pp. 29–32) found sporadic occurrences of the species within the Pascagoula River from its headwaters at the confluence of the Leaf and Chickasawhay Rivers downstream to where the river bifurcates (splits). Recent survey efforts indicate reproducing populations in the Chickasawhay and Leaf Rivers, based on the presence of different size classes (Clark *in litt*. 2017; Wagner *in litt*. 2017; Wagner *et al.* 2017, p. 3; Schaefer *in litt*. 2017; Clark and Schaefer 2015, pp. 9–14, 18–22).

Though there is a clear pattern of higher abundance and greater rate of occurrence at sites in the Chickasawhay River (5.03 ± 0.62 pearl darters per hour) compared to the Leaf River (2.18 ± 0.56 pearl darters per hour); a pattern that has remained constant over time (Clark and Schaefer 2015, pp. 9–14). Surveys in 2016 of historical locations (Clark *in litt*. 2017; Schaefer *in litt*. 2017) in the Bouie River, Okatoma Creek, and Black Creek yielded seven fish in the Okatoma Creek and one specimen each in the Bouie River and Black Creek. In 2017, one pearl darter was collected in the Chunky River, confirming its presence in that system for the first time since its last collection there over 15 years ago.

Habitat and Biology

The pearl darter occurs in low-gradient, coastal plain rivers and creeks (Suttkus *et al*. 1994, p. 13), predominately classified as 4th to 2nd order streams (Strahler stream order hierarchy). There have been no comprehensive microhabitat studies on the pearl darter; however, based on observations of occupancy in the field, microhabitat features consist of a bottom substrate mixture of sand, silt, loose clay, gravel, organic material, and snags (Slack *et al*. 2005, pp. 9–11). The species has been collected at the steep ends of sandbars, and inside river bends where material is deposited. The water where the species is typically captured has a slow to medium current velocity (0.003 to 0.635 centimeters/second (cm/s) (0.53 to 0.25 in/s) (tabulated from Clark *in litt*. 2017, Slack *in litt*. 2017, Schaefer *in litt*. 2017, unpublished data; Slack *et al*. 2005, p. 10). In fact, based on cluster analysis and ordination of habitat data of the Leaf and Chickasawhay Rivers, higher densities of pearl darters were found in slower moving, deeper waters with finer substrate (Clark and Schaefer 2015, p. 11). There is very little aquatic vegetation in these drainages (Slack *et al*. 2005, p. 9), and vegetation that may be present is usually river weed (*Podostemum ceratophyllum*) attached to rocks (Drennen and Wagner 2017,

pers. observ.). Banksides where the pearl darter was collected are vegetative and not vertical or severely eroded (Schaefer *in litt*. 2017, unpublished data).

There is no specific information available on the diet of the pearl darter. However, the channel darter (*P. copelendi*), a closely allied species in similar habitat, has been reported to feed on chironomid flies, small crustaceans, mayflies, and caddisflies (Kuehne and Barbour 1983, p. 49).

Summary of Factors Affecting the Species

Below we present a summary of the threats information from the proposed listing rule. We also present new information published or obtained since the proposed rule was published, including information received during the public comment period.

Factor A: *The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*

Members of the *Cottogaster* subgenus have undergone range contractions that are of potential conservation concern throughout their respective distributions (Dugo *et al*. 2008, p. 3; Warren *et al*. 2000, pp. 7–8; Goodchild 1994, pp. 433–435). The pearl darter was extirpated from the Pearl River drainage, perhaps as early as the 1970s, and many of the stressors thought to have played a role in its loss in that system are present in the Pascagoula River drainages where the species occurs today, including impoundments (sills and dams); instability in the channel; increased sedimentation from the removal of riparian vegetation and poor agriculture and silviculture practices; and general chronic water degradation from point and non-point source pollution (Piller *et al.* 2004, pp. 1004–1011; TNC 2004, p. 5; Ross 2001, pp. 499–500).

Water Quality Degradation

Water quality degradation, particularly non-point source pollution from incompatible commercial and industrial development and land use practices, has been a major concern within the Pearl River basin (TNC 2004, p. 18). Similarly, the Pascagoula River system suffers from acute and localized water quality degradation by nonpoint source pollution in association with surface, stormwater, and effluent runoffs from urbanization and municipal areas (MDEQ 2005c, p. 23; 2005d, p. 16). "Total Maximum Daily Loads" (TMDLs), a term in the U.S. Clean Water Act describing a benchmark set for a certain pollutant to bring water quality up to the applicable standard, have been established for 89 segments of the Pascagoula River basin, many of which include portions of the pearl darter's range (MDEQ 2014a, pp. 18–21). For sediment, one of the most pervasive pollutants, the State of Mississippi has TMDLs for various tributaries and main stems of the Leaf and Chickasawhay Rivers. To date, efforts by the State of Mississippi to improve water quality in the Pascagoula River basin to meet these TMDL benchmarks have been inadequate (MDEQ 2014a, pp. 18–21). Thirty-nine percent of the Pascagoula River basin tributaries are rated fair or poor due to pollution impacts (MDEQ 2014a, pp. 18–21; MDEQ 2008, p. 17).

Most water quality threats are due to increased sediment loads and variations in pH (MDEQ 2014a, pp. 1–51; 2008a, pp. 13–15). Sediment in stormwater runoff increases water turbidity and temperature and originates locally from poorly maintained construction sites, timber harvest tracts, agricultural fields, clearing of riparian vegetation, and gravel extraction in the river floodplain. Suttkus *et al*. (1994, p. 19) attributed the loss of the pearl darter in the Pearl River to increasing sedimentation from habitat modification caused by the removal of riparian vegetation and extensive cultivation near the river's edge. Excessive sediments disrupt feeding and spawning of fish and aquatic insects, abrade and suffocate periphyton (mixture of algae,

bacteria, microbes, and detritus that is attached to submerged surfaces), and impact fish growth, survival, and reproduction (Waters 1995, pp. 55–62). A localized portion of the Chickasawhay River is on the State Section 303(d) List of Water Bodies as impaired due to sediment (MDEQ 2005b, p. 17).

Nonpoint source pollution is a localized threat to the pearl darter within the drainage, and is more prevalent in areas where certified best management practices (BMPs) are not utilized. The use of certified BMPs during land-altering activities can greatly reduce impacts to water quality. Certified BMPs, currently implemented by the forestry industry (e.g., Sustainable Forestry Initiative, Forest Stewardship Council, and American Tree Farm System), are helping to minimize or eliminate non-point source pollution during the course of forestry activities. The Mississippi Forestry Commission (2016, entire) reports certified BMP implementation rates to be high in Mississippi for forestry activities, primarily due to the efforts of State forestry agencies and forest certification programs (Schilling and Wigley 2015, pp. 3–7).

Historically, timber harvesting and processing was extensive in the Pearl River basin, and at one time, the basin was home to one of the most important lumber centers in the United States (Thigpen 1965, pp. 66–69). Pulp and paper manufacturing began in the Pascagoula watershed in Mississippi with three major mills (Monthly Review 1958, p. 83). Today, there are six major pulp mills in the Pascagoula River basin whose effluent may be a threat to the pearl darter. Paper mill effluent is a contributor to water quality degradation and is suspected to have had some influence on the extirpation of the pearl darter in the Pearl River system (Slack *in litt*. 2016). Fish and mussel kills were reportedly not uncommon within reaches downstream from pulp mills in Lawrence County near historical locations for the pearl darter (Slack *in litt*. 2016). As recently as 2011, a “black liquor” (wastewater) spill from a paper manufacturing process

resulted in a massive fish kill in the Pearl River (Kizha *et al*. 2016, pp. 926–929; Piller and Geheber 2015, pp. 2433–2434).

Numerous studies have documented the effects of pulp and paper mill effluents on fish populations (Beyer *et al.* 1996, pp. 212–224). Depending on the bleaching process, pulp- and paper mill effluents may contain various kinds and concentrations of chlorinated organic compounds such as polychlorinated dibenzodioxins (dioxins) and polychlorinated dibenzofurans (furans), which elicit several lethal and sublethal effects in fish, such as alterations in steroid biosynthesis (manufacturing of hormones and other organic compounds), gonadal (sex gland) development, sexual maturation, and expression of secondary sex characteristics (features that appear at maturity such as coloration). These types of compounds are known to bioaccumulate and have reproductive and antiestrogen (opposite effects of hormones) impacts on fish (Hoffman *et al.* 2003, pp. 1063–1065).

Additionally, some contaminants may bind with one another (i.e., heavy metals bind with sediments or other contaminants in the water column) within the Pascagoula River drainage. These bound chemical contaminants have not been addressed in TMDLs. Only seven TMDLs for metals have been completed (MDEQ 2008, pp. 1–55). The Davis Dead River, a tributary at the most downstream site of the pearl darter's range, is considered critically impaired by mercury (MDEQ 2011, pp. 1–29), and fish consumption advisories continue for mercury in certain gamefish species in the Pascagoula River main stem (MDEQ 2008, p. 43).

There are 15 permitted point source discharge sites within the Bouie River system (MDEQ 2005a, p. 6) and an unknown amount of nonpoint runoff sites. Municipal and industrial discharges during periods of low flow (i.e., no or few rain events) intensify water quality degradation by increasing water temperatures, lowering dissolved oxygen, and changing pH.

Within the Pascagoula River basin, pollutants causing specific channel or river reach impairment (i.e., those pollutants preventing the water body from reaching its applicable water quality standard (Environmental Protection Agency 2012, pp. 1–9)), include sedimentation; chemicals and nutrients in the water column; and various toxins, such as heavy metals like lead or cadmium for a total of 304 km (189 mi) impaired riverine segments. TMDLs were completed for pesticides such as dichlorodiphenyltrichloroethane (DDT), toxaphene, dioxin, and pentachlorophenol, although much of the data and results are not finalized and remain unavailable for the designated reaches (Environmental Protection Agency 2012, pp. 1–7; MDEQ 2003, pp. 5–10; Justus *et al.* 1999, p. 1).

Localized wastewater effluent into the Leaf River from the City of Hattiesburg is negatively impacting water quality (Hattiesburg American 2015, pp. 1–2; Mississippi River Collaboration 2014, p. 1). Existing housing, recreational cabins, and trailers along the banks of the Leaf River between I–59 and the town of Estabutchie cause nutrient loading through treated sewage and septic water effluent (Mississippi River Collaboration 2014, p. 1). In 1997, Bart and Piller (p. 12) noted extensive algal growth during warmer months in the Leaf and Bouie Rivers, indicating nutrient and organic enrichment and decreases in dissolved oxygen and pH changes. Today, at specific locations, the water quality of the Bouie and Leaf Rivers and their tributaries continues to be negatively impacted by sediment, organic enrichment, low dissolved oxygen, fecal coliform, and elevated nutrients (MDEQ 2016, p. 86, 91; 2014a, p. 18, 21, 32; 2005a, pp. 1–26; 2004, pp. 1–29).

Oil and Gas Development

Nonpoint and point source pollution from oil and gas exploration, including drill field construction, active drilling, and pipeline easements, may add localized pollutants into the

Pascagoula River basin during stormwater runoff events if BMPs are not used. There is one major oil refinery within the basin along with 6 oil pumping stations, 10 major crude pipelines, 4 major product oil pipelines, and 5 major gas and more than 25 lesser gas lines stretching hundreds of miles and crisscrossing the main stem Pascagoula, Bouie, Leaf, Chickasawhay, and Chunky Rivers and their tributaries; in addition, there are more than 100 active oil producing wells within the pearl darters' watersheds (compiled from Oil and Gas Map of Mississippi in Phillips 2013, pp. 10, 23). All have the potential to rupture or leak and cause environmental and organismal damage as evidenced by the Genesis Oil Company and Leaf River oil spill of 2000 (Environmental Science Services, Inc. 2000, pp. 1–50; Kemp Associates, PA, 2000, pp. 4–5; The Clarion-Ledger, December 23, 1999, p. 1B) and Genesis Oil Company spill in Okatoma Creek in February 2016 (Drennen 2016, pers. observ.). In addition to gas pipelines, there are numerous railways that cross pearl darter habitat that are subject to accidental and catastrophic spilling of toxins such as fuel oil, methanol, resin, and fertilizer (MDEQ 2014b, pp. 1–23).

Alternative oil and gas collection methods (i.e., hydraulic fracturing ("fracking") and horizontal drilling and injection) have allowed the expansion of oil and gas drilling into deposits that were previously inaccessible (Phillips 2013, p. 21), which has led to increased activity within southern Mississippi, including portions of the Pascagoula River basin. There are more than 100 water injection disposal wells and enhanced oil recovery wells within the basin (compiled from Active Injection Well Map of Mississippi in Phillips 2013, p. 49). A variety of chemicals (e.g., 15% diluted hydrochloric acid, surfactants, potassium chloride) are used during the drilling and fracking process (Colborn *et al.* 2011, pp. 1040–1042), and their wastes are stored in open pits (retention basins) or storage facilities. Spills during transport or releases due to retention basin failure or overflow pose a risk for surface and groundwater contamination,

which can cause significant adverse effects to water quality and aquatic organisms that inhabit these watersheds (Osborn *et al.* 2011, pp. 8172–8176; Kargbo *et al.* 2010, pp. 5680–5681; Wiseman 2009, pp. 127–142). In addition, contamination of streams with brine (chloride), a byproduct of oil and gas development, poses a significant risk to aquatic habitats and species. High chloride concentrations interfere with osmoregulation (maintenance of proper levels of salts and other solutes in bodily fluids) and hinder the organism's survival, growth, and reproduction (Hunt *et al*. 2012, p. 1). Brine contamination has been documented within the pearl darter's historical range in the Pearl River system (Kalhoff 1993, pp. 12–15, 19–20, 25; Kalhoff 1986, p. 49) and within the Pascagoula River basin where it currently occurs, including several Leaf and Chickasawhay River drainage basin tributaries (Kalhoff 1986, pp. 52–63). There is currently no routine water quality monitoring in areas where the pearl darter currently occurs, so it is unlikely that the effects of a leak or spill would be detected quickly enough to allow for a timely response.

Geomorphology Changes

Piller *et al*. (2004, pp. 1004–1011) cited numerous human-caused disturbances within the Pearl River since the 1950s, including channelization, reservoir construction, and channel modification from bank collapse downstream of dams. Specifically, the Pearl River Navigation Canal in 1956, the Ross Barnett Reservoir in 1964, and channel changes of the lower Pearl River (increased width and decreased depth) were implicated in the decline of abundance for several fish species in that system (Piller *et al*. 2004, pp. 1004–1011). These habitat modifications and channel changes resulted in the loss of gravel substrates in places, completely replacing gravel bars with sand or sediment, which are not appropriate substrate for the pearl darter and other species (Tipton *et al*. 2004, pp. 58–60; TNC 2004, p. 5). Tipton *et al.* (2004, pp. 58–60)

documented a decrease in fish diversity and abundance within the disturbed reaches as compared with relatively undisturbed reaches. These changes most likely contributed to the decline of the pearl darter in the Pearl River system and potentially threaten the species in the Pascagoula system.

Pearl darters are not found in impounded waters and are intolerant of lentic (standing water) habitats that may be formed by gravel mining or other landscape-altering practices. Incompatible sand and gravel mining and its disruption of topography, vegetation, and flow pattern of streams is considered a major stressor to the Pearl River system where the pearl darter once occurred (TNC 2004, p. 16). In the species' current range in the Pascagoula system, the results of historical sand and gravel dredging impacts have been a concern for the Bouie and Leaf Rivers (MDEQ 2000, pp. 1–98). Historically, the American Sand and Gravel Company (1995, p. B4) has mined sand and gravel using a hydraulic suction dredge, operating within the banks or adjacent to the Bouie and Leaf Rivers. Large gravel bars of the river and its floodplain have been removed over the past 50 years, creating open-water areas that function as deep lake systems (American Sand and Gravel Company 1995, pp. B4–B8). The creation of these large, open-water areas has accelerated geomorphic processes, specifically headcutting (erosional feature causing an abrupt drop in the streambed) that has adversely affected the flora and fauna of many coastal plain streams (Patrick *et al*. 1993, p. 90). Mining in active river channels typically results in incision upstream of the mine by knickpoints (breaks in the slope of a river or stream profile caused by renewed erosion attributed to a bottom disturbance that may retreat upstream), sediment deposition downstream, and an alteration in channel morphology that can have impacts for years (Mossa and Coley 2004, pp. 1–20). The upstream migration of knickpoints, or headcutting, may cause undermining of structures, lowering of alluvial water

tables (aquifer comprising unconsolidated materials deposited by water and typically adjacent to rivers), channel destabilization and widening, and loss of aquatic and riparian habitat. This geomorphic change may cause the extirpation of riparian and lotic (flowing water) species (Patrick *et al*. 1993, p. 96).

Sedimentation from unstable banks and loose, unconsolidated streambeds (Bart and Piller 1997, p. 12) is likely impacting the pearl darters in the Bouie River and Black Creek. Mossa and Coley (2004, p. 17) determined that, of the major tributaries in the Pascagoula basin, the Bouie River was the least stable. Channel enlargement of the Bouie River showed higher than background values associated with avulsions (the rapid abandonment of a river channel and the formation of a new river channel) into floodplain pits and increased sedimentation. In addition, channel enlargement of 400 to 500 percent in the Bouie River has occurred at specific sites due to instream gravel mining (Mossa *et al*. 2006, entire; Mossa and Coley 2004, p. 17). Ayers (2014, pp. 43–45) also found significant and lengthy instream channel form changes in the Chickasawhay River floodplain. Clark and Schaefer (2015, pp. 13–14) noted a slight decrease in fish species richness in the upper Pascagoula River basin from their 2004 sampling, which they attributed to past anthropogenic influences such as gravel mining, bankside practices, and construction.

In the Bogue Chitto River of the Pearl River basin, Stewart *et al.* (2005, pp. 268–270) found that the assemblages of fishes had shifted over 27 years. In this time period, the sedimentation rates within the system had increased dramatically and caused the decrease in the relative abundance of all fish in the family Percidae (Stewart *et al.* 2005, pp. 268–270) from 35 percent to 9 percent, including the extirpation of pearl darters. Ross *et al*. (1992, pp. 8–9) studied threats to the Okatoma Creek (Pascagoula basin) fish diversity and predicted that

geomorphic changes to the stream would reduce the fish habitat diversity resulting in a decline of the fish assemblages, including the pearl darter.

Impoundments

Dams and other flow control structures within a river can block fish passage, disrupt the natural flow patterns, and cause channel degradation and erosion (see "Geomorphology Changes" section above) that directly impact aquatic life habitat, as well as reduce the capacity of the stream to carry water (TNC 2004, p. 17). Streams with highly altered flow regimes often become wide, shallow, and homogeneous, resulting in poor habitat for many fish species (Bunn and Arthington 2002, pp. 493–498). The decline of the pearl darter in the Pearl River was noted after the construction of low sill dams. Bart (in TNC 2004, p. 5) speculated that, after spawning, young darters in the Pearl River were swept downriver and unable to migrate back upriver due to the low water sills and varied water flow; their limited success year after year likely caused the population to crash. These low sill dams are also thought to have led to the extirpation of the Alabama shad (*Alosa alabamae*) from that system (Mickel *et al.* 2010, p. 158).

The proposed damming of Little and Big Cedar Creeks, tributaries to the Pascagoula River, for establishment of two recreational lakes (George County Lakes) (U.S. Army Corps of Engineers 2015, pp. 1–13) has prompted the American Rivers organization to recently list the Pascagoula River as the 10th most endangered river in the country (American Rivers 2016, pp. 20–21). Though the proposed project is not directly within known pearl darter habitat, the lakes may decrease water quantity entering the lower Pascagoula basin and will likely concentrate pollutants, reduce water flow, and alter downstream food webs and aquatic productivity (Poff and Hart 2002, p. 660).

Summary of Factor A

Habitat modification and resultant water quality degradation are occurring within the pearl darter's current range and likely led to the loss of the species from the Pearl River drainage. Water quality degradation occurs locally from point and nonpoint source pollution in association with land surface, stormwater, and effluent runoff from urbanization, industry, and municipal areas. Of particular concern is the threat of overflooding of storage ponds for industrial effluent, such as that from pulp and paper manufacturing. Increased sediment from a variety of sources, including geomorphological changes and bank instability from past habitat modification, appears to be the major contributor to water quality declines in this species' habitat. Localized sewage and waste water effluent also pose a threat to this species and its habitat. The pearl darter's vulnerability to catastrophic events, particularly the release of pollutants in its habitat from oil spills, train derailments, and hydraulic fracturing, is also a concern due to the abundance of oil wells, pumping stations, gas lines, and railways throughout its habitat, and the increased interest in alternative oil and gas collection methods in the area. The proposed damming of Big and Little Cypress Creeks may decrease water flow and increase nutrient concentration into the Pascagoula River. These threats continue to impact water quality and habitat conditions through much of this species' current range. Therefore, we conclude that habitat degradation is presently a moderate threat to the pearl darter that is expected to continue and possibly increase into the future.

Factor B: *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*

The pearl darter is not a commercially valuable species, and collecting is not considered a factor in its decline. Therefore, we do not consider overutilization for commercial, recreational, scientific, or educational purposes to be a threat to the pearl darter at this time.

Factor C: *Disease or Predation*

We have no specific information indicating that disease or predation is negatively impacting pearl darter populations. Therefore, we do not consider these factors to be threats to the pearl darter at this time.

Factor D: *The Inadequacy of Existing Regulatory Mechanisms*

The State of Mississippi classifies the pearl darter as endangered (Mississippi Natural Heritage Program 2015, p. 2), and prohibits the collection of the pearl darter for scientific purposes without a State-issued collecting permit. However, as discussed under Factor B, we have no evidence to suggest that scientific collection poses a threat to this species. This State classification conveys no legal protection for the pearl darter's habitat nor does it prohibit habitat degradation, which is the primary threat to the species. The pearl darter receives no protection in Louisiana, where it is considered to have historically occurred (Louisiana Department of Wildlife and Fisheries 2005, p. 39).

The pearl darter and its habitats are afforded some protection from water quality and habitat degradation under the Clean Water Act of 1972 (33 U.S.C. 1251 et seq.) and the Mississippi Water Pollution Control Law, as amended, 1993 (Code of Mississippi, section 49–17–1, et seq.) and regulations promulgated thereunder by the Mississippi Commission on Environmental Quality. Although these laws have resulted in some enhancement in water quality and habitat for aquatic life, particularly in reducing point-source pollutants, they have been inadequate in fully protecting the pearl darter from sedimentation and other nonpoint source pollutants.

The State of Mississippi maintains water-use classifications through issuance of National Pollutant Discharge Elimination System permits to industries, municipalities, and others that set maximum limits on certain pollutants or pollutant parameters. For water bodies on the Clean

Water Act section 303(d) list of impaired streams, the State is required to establish a TMDL for the pollutants of concern that will improve water quality to the applicable standard. The establishment of TMDLs for 89 river or stream segments and ratings of fair to poor for 39 percent of the tributaries within the Pascagoula basin are indicative of water pollution impacts within the pearl darter's habitat (MDEQ 2008a, p. 17). TMDLs are not an enforced regulation, and only reflect benchmarks for improving water quality; they have not been successful in reducing water quality degradation within this species' habitat, as these streams continue to remain on the 303(d) list of impaired streams.

Mississippi Surface Mining and Reclamation Law, Miss. Code Ann. section 53–7–1 et seq., and Federal laws regarding oil and gas drilling (42 U.S.C. 6921) are generally designed to protect freshwater resources like the pearl darter, but these regulatory mechanisms do not contain specific provisions requiring an analysis of project impacts to fish and wildlife resources. They also do not contain or provide for any formal mechanism requiring coordination with, or input from, the Service or the Mississippi Department of Wildlife, Fisheries and Parks regarding the presence of federally endangered, threatened, or candidate species, or other rare and sensitive species. In the case of surface mining, penalties may be assessed if damage is serious, but there is no immediate response for remediation of habitats or species. As demonstrated under Factor A, periodic declines in water quality and degradation of habitat for this species are ongoing despite these protective regulations. These mechanisms have been inadequate to protect the species from sediment runoff and turbidity within its habitat associated with land surface runoff and municipal and industrial discharges, as described under Factor A. There are currently no requirements within the scope of other statewide environmental laws to specifically consider the pearl darter or ensure that a project will not significantly impact the species.

The pearl darter likely receives ancillary protection (i.e., water quality improvements, protection from geomorphological changes) where it co-occurs with two other federally listed species, the Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) and yellow-blotched map turtle (*Graptemys flavimaculata*), during the course of consultation on these species under section 7 of the Act. However, protective measures through section 7 of the Act would be triggered only for those projects having a Federal nexus, which would not include many of the water quality disturbances caused by industry, municipalities, agriculture, or private landowners.

Additional protection of 53,520 hectares (ha) (132,128 acres (ac)) within the Pascagoula basin watershed occurs due to the Mississippi Wildlife, Fisheries and Parks' management of six Wildlife Management Areas (WMAs) within the upper drainage basin for recreational hunting and fishing. Four of the six WMAs (Chickasawhay and Leaf Rivers, Mason and Red Creeks) do not directly border the river system, but they do contain and protect parcels of upland buffer, wetland, and tributaries to the basin. The Pascagoula River and Ward Bayou WMAs (20,329 ha; 50,234 ac) consist of wetland buffer and river/stream reach protecting approximately 106 km (66 mi) of the Pascagoula River main stem (Stowe *in litt.* 2015). The Nature Conservancy (TNC) protects 14,164 ha (35,000 ac) within the Pascagoula River watershed and approximately 10 km (6 mi) of the Pascagoula River shoreline in Jackson County, Mississippi. Of that amount, the Charles M. Deaton Nature Preserve (1,336 ha, 3,300 ac) protects the upper reaches of the Pascagoula River, where the Leaf and Chickasawhay Rivers converge, and is part of a 19,020-ha (47,000-ac) swath of public lands surrounding the Pascagoula River, which includes approximately 8 km (5 mi) of the Chickasawhay River and approximately 7 km (4 mi) of the Leaf River shorelines (Stowe *in litt*. 2015).

These State-managed WMAs and TNC preserves provide a measure of protection for

approximately 134 km (84 mi) or 30 percent of the river reaches within this species' current range. Point and nonpoint sediment sources are decreased or reduced by using and monitoring certified BMPs during silviculture, road maintenance, and other landscape-altering activities. However, only short segments of shoreline in the Chickasawhay and Leaf Rivers are within these WMAs. Remaining lands within these segments can be vulnerable to farming and timbering to the bankside edge, and construction of structures such as houses, septic facilities, dams, and ponds. Each land management action can increase stormwater runoff laden with sediment and agricultural and wastewater chemicals. The impact of silvicultural activities on water quality degradation are likely lower than other land-altering activities according to information in the Mississippi Forestry Commission's report (2016, entire) that found certified BMP implementation rates to be high across all silvicultural landscapes in Mississippi.

Summary of Factor D

Despite existing authorities such as the Clean Water Act, pollutants continue to impair the water quality throughout much of the current range of the pearl darter. State and Federal regulatory mechanisms have helped reduce the negative effects of point source and nonpoint source discharges, yet these regulations are difficult to implement, and may not provide adequate protection for sensitive species like the pearl darter. Thus, we conclude that existing regulatory mechanisms do not adequately protect the pearl darter from the impact of other threats.

Factor E: *Other Natural or Manmade Factors Affecting Its Continued Existence*

Small Population Size and Loss of Genetic Diversity

The pearl darter has always been considered rare (Deacon *et al*. 1979, p. 42) and is currently restricted to localized sites within the Pascagoula River drainage. Genetic diversity has likely declined due to fragmentation and separation of reproducing pearl darter populations.

Kreiser *et al*. (2012, pp. 12–17) found that disjunct populations of pearl darters within the Leaf and Chickasawhay Rivers showed some distinct alleles suggesting that gene flow between the two rivers was restricted and perhaps that the total gene pool diversity was declining. Collecting data (Ross 2001, p. 500; Bart and Piller 1997, p. 4; Bart and Suttkus 1996, p. 4; Suttkus *et al*. 1994, p. 19) indicate that the pearl darter is rare in the Pascagoula River system, as when this species is collected it is typically in low numbers and a disproportionately low percentage of the total fish collected (catch per unit effort of 2.1 individuals per site, Clark and Shaefer 2015, p. 4).

Species that are restricted in range and population size are more likely to suffer loss of genetic diversity due to genetic drift, potentially increasing their susceptibility to inbreeding depression, decreasing their ability to adapt to environmental changes, and reducing the fitness of individuals (Allendorf and Luikart 2007, pp. 117–146; Soulé 1980, pp. 157–158). It is likely that some of the pearl darter populations are below the effective population size required to maintain long-term genetic and population viability (Soulé 1980, pp. 162–164).

The long-term viability of a species is founded on the conservation of numerous local populations throughout its geographic range (Harris 1984, pp. 93–104). The presence of viable, separate populations is essential for a species to recover and adapt to environmental change (Noss and Cooperrider 1994, pp. 264–297; Harris 1984, pp. 93–104). Inbreeding and loss of neutral genetic variation associated with small population size reduces the fitness of the population (Reed and Frankham 2003, pp. 230–237) and accelerates population decline (Fagan and Holmes 2006, pp. 51–60). The species' small numbers within scattered locations, coupled with its lack of genetic variability, may decrease the species' ability to adapt or recover from major hydrological events that impact potential spawning habitat (Clark and Schaefer 2015, pp. 18–22).

Hurricanes

Fish and aquatic communities and habitat, including that of the pearl darter, may be changed by hurricanes (Schaefer *et al*. 2006, pp. 62–68). In 2005, Hurricane Katrina destroyed much of the urban and industrial areas along the lower Pascagoula River basin and also impacted the ecology upriver to the confluence with the Leaf and Chickasawhay Rivers. Many toxic chemicals that leaked from grounded and displaced boats and ships, storage facilities, vehicles, septic systems, business sites, and other sources due to the hurricane were reported in the rivers, along with saltwater intrusion from the Gulf of Mexico. Initial assessment identified several fish kills and increased surge of organic material into the waters, which lowered dissolved oxygen levels (Schaefer *et al*. 2006, pp. 62–68). As discussed below, the deleterious impacts of climate change will likely lead to an increase in the strength and frequency of hurricanes.

Climate Change

Numerous long-term climate changes have been observed including widespread changes in precipitation amounts, ocean salinity, wind patterns, and aspects of extreme weather including droughts, heavy precipitation, heat waves, and the intensity of tropical cyclones (Intergovernmental Panel on Climate Change 2014, p. 4). Climate change, and the resultant shifts in spatial distribution, may result in increased fragmentation which would increase the vulnerability of any isolated populations to future extinction (Comet *et al*. 2013, p. 635). However, while continued change is certain, the magnitude and rate of change is unknown in many cases.

Climate change has the potential to increase the vulnerability of the pearl darter to random catastrophic events (Thomas *et al.* 2004, pp. 145–148; McLaughlin *et al.* 2002, pp. 6060–6074). An increase in both severity and variation in climate patterns is expected, with

extreme floods, strong storms, and droughts becoming more common (Intergovernmental Panel on Climate Change 2014, pp. 58–83). Thomas *et al.* (2004, pp. 145–148) report that frequency, duration, and intensity of droughts are likely to increase in the Southeast as a result of global climate change. Kaushal *et al.* (2010, p. 465) reported that stream temperatures in the Southeast have increased roughly 0.2–0.4 °C (0.3–0.7 °F) per decade over the past 30 years, and as air temperature is a strong predictor of water temperature, stream temperatures are expected to continue to rise. Predicted impacts of climate change on fishes, related to drought, include disruption to their physiology (e.g., temperature tolerance, dissolved oxygen needs, and metabolic rates), life history (e.g., timing of reproduction, growth rate), and distribution (e.g., range shifts, migration of new predators) (Comte *et al.* 2013, pp. 627–636; Strayer and Dudgeon 2010, pp. 350–351; Heino *et al.* 2009, pp. 41–51; Jackson and Mandrak 2002, pp. 89–98). However, estimates of the effects of climate change using available climate models typically lack the geographic precision needed to predict the magnitude of effects at a scale small enough to discretely apply to the range of a given species. Therefore, there is uncertainty about the specific effects of climate change (and their magnitude) on the pearl darter. However, climate change is almost certain to affect aquatic habitats in the Pascagoula River basin through increased water temperatures resulting in stronger storm surges and more frequent droughts (Alder and Hostetler 2013, pp. 1–12), and species with limited ranges, fragmented distributions, and small population sizes are thought to be especially vulnerable to the effects of climate change (Byers and Norris 2011, p. 18).

Summary of Factor E

The pearl darter's limited geographic range, fragmented distribution within the Pascagoula River system, small population numbers, and low genetic diversity threaten this

species' long-term viability. These threats are current and are likely to continue or increase in the future, and would be exacerbated by climate change.

Cumulative Effects of Factors A Through E

The threats that affect the pearl darter are important on a threat-by-threat basis but are even more significant in combination. Due to the loss of the species from the Pearl River system, the pearl darter is now confined to a single drainage system. The species continues to be subjected to water quality degradation from point and nonpoint source pollution in association with land-altering activities, discharges from municipalities, and geomorphological changes from past gravel mining. The laws and regulations directed at preventing water quality degradation have been ineffective at providing for the conservation of the pearl darter. Furthermore, these threats and their effect on this species are exacerbated due to the pearl darter's small population numbers, localized distribution, and low genetic diversity, which reduce its genetic fitness and resilience to possible catastrophic events. Though projecting possible synergistic effects of climate change on the pearl darter is somewhat speculative, climate change, and its effects of increased water temperatures leading to stronger storms and more frequent droughts, will have a greater negative impact on species with limited ranges and small population sizes, such as the pearl darter. While these threats or stressors may act in isolation, it is more probable that many stressors are acting simultaneously (or in combination) on the pearl darter, having a greater cumulative negative effect than any individual stressor or threat.

Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the pearl darter. The pearl darter has been extirpated from the Pearl River system, and it is now confined to the Pascagoula River

watershed. The species occurs in low numbers within its current range, and continues to be at risk throughout all of its range due to the immediacy, severity, and scope of threats from habitat degradation and range curtailment (Factor A) and other natural or manmade factors affecting its continued existence (Factor E). Existing regulatory mechanisms have been inadequate in ameliorating these threats (Factor D).

Anthropogenic activities, such as general land development, agriculture and silviculture, oil and gas development (especially when BMPs were not implemented during these activities), along with inadequate sewage treatment, uncontrolled stormwater runoff, pulp mill effluent, past gravel mining and resultant geomorphological changes, and construction of dams or sills, have all contributed to the degradation of stream habitats and water quality within this species' range (Factor A). These land use activities have led to chemical and physical changes in the main stem rivers and tributaries that continue to affect the species through negative impacts to its habitat. Specific water quality threats include inputs of sediments covering bottom stream substrates, increased turbidity, and inputs of dissolved solids. These threats, especially the inputs of dissolved solids, chemical-laden effluent, sedimentation, and geomorphic changes, have had profound negative effects on pearl darter populations, as demonstrated in the Pearl River basin, and have been the primary factor in the species' decline. Existing regulatory mechanisms (e.g., the Clean Water Act) have provided for some improvements in water quality and habitat conditions across the species' range, but these laws and regulations have been inadequate in protecting the species' habitat (Factor D), as evidenced by the extirpation of the species within the Pearl River basin and by the number of section 303(d) listed streams within the species' historical and current range. The pearl darter's vulnerability to these threats is even greater due

to its reduced range, scattered locations of small populations, and low genetic diversity (Factor E).

The Act defines an endangered species as any species that is "in danger of extinction throughout all or a significant portion of its range" and a threatened species as any species "that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future." We find that the pearl darter is likely to become endangered throughout all or a significant portion of its range within the foreseeable future, based on the immediacy, severity, and scope of the threats currently impacting the species. Foreseeable future for this species was determined to be approximately 20 years, which is based on our best professional judgement of the projected future conditions related to threats identified impacting this species. The overall range has been reduced substantially, and the remaining habitat and populations are threatened by a variety of factors acting in combination to reduce the overall viability of the species over time. The threats are not expected to change substantially within this 20-year timeframe, as water quality degradation continues to pose a risk locally despite existing regulations, and land development and land-altering activities are expected to increase. The risk of becoming endangered during this time is high because populations confined to this single watershed are fragmented and genetic diversity within the species is low. Many of the populations are small and likely below the effective population size needed to maintain long-term population viability which makes this species particularly vulnerable to catastrophic events. Though there is uncertainty about the magnitude of effects of climate change on the pearl darter, the frequency and intensity of storms affecting the Pascagoula River watershed are evident today and predicted to increase during this timeframe.

We find that endangered species status is not appropriate for this species. Despite low population numbers and numerous threats, the Chickasawhay and Leaf Rivers, within the upper Pascagoula River drainage, appear to support reproducing populations. In addition, the magnitude of threats is considered to be moderate overall, since the threats are having a localized impact on the species and its habitat. For example, water quality degradation, the most prevalent threat, is not as pervasive within areas where BMPs are utilized, and geomorphic changes caused by historic sand and gravel mining are also sporadic within its habitat. Therefore, on the basis of the best available scientific and commercial information, we are listing the pearl darter as threatened in accordance with sections 3(6) and 4(a)(1) of the Act.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that the pearl darter is threatened throughout all of its range, no portion of its range can be "significant" for purposes of the definitions of "endangered species" and "threatened species." See 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 37577, July 1, 2014). While it is the Service's position under the Policy that undertaking no further analysis of "significant portion of its range" in this circumstance is consistent with the language of the Act, we recognize that the Policy is currently under judicial review, so we also took the additional step of considering whether there could be any significant portions of the species' range where the species is in danger of extinction. We evaluated whether there is substantial information indicating that there are any portions of the species' range: (1) that may be "significant," and (2) where the species may be in danger of extinction. In practice, a key part of identifying portions appropriate for further analysis is whether the threats are geographically

concentrated. The threats affecting the species are throughout its entire range; therefore, there is not a meaningful geographical concentration of threats. As a result, even if we were to undertake a detailed "significant portion of its range" analysis, there would not be any portions of the species' range where the threats are harming the species to a greater degree such that it is in danger of extinction in that portion.

Critical Habitat

Section 3(5)(A) of the Act defines critical habitat as "(i) the specific areas within the geographical area occupied by the species, at the time it is listed...on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed...upon a determination by the Secretary that such areas are essential for the conservation of the species."

Section 4(a)(3) of the Act and implementing regulations (50 CFR 424.12) require that we designate critical habitat at the time a species is determined to be an endangered or threatened species, to the maximum extent prudent and determinable. In our September 21, 2016, proposed rule to list the darter (81 FR 64857), we determined that designation of critical habitat was prudent. We also found that critical habitat for the pearl darter was not determinable because the specific information sufficient to perform the required analysis of the impacts of the designation is currently lacking, such as information on areas to be proposed for designation and the potential economic impacts associated with designation of these areas. We are continuing the process of obtaining information on the economic impacts of our critical habitat designation, and, once this process is completed, we intend to publish our proposed critical habitat designation for the pearl darter in the *Federal Register* and request public input.

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 requires that recovery actions be carried out for all 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 these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires 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 includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. 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 identifies site-specific management actions that set a trigger for review of the five factors that control

whether a species remains endangered or may be downlisted or delisted, 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, Tribal, 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 additional cooperative conservation efforts on private, State, and Tribal lands.

Following publication of this final listing rule, 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 State of Mississippi will be eligible for Federal funds to implement management actions that promote the protection or recovery of the pearl darter. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants*.

Please let us know if you are interested in participating in recovery efforts for the pearl darter. 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 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)(1) requires Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered and threatened species listed pursuant to section 4 of the Act. 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 any endangered or threatened 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' habitat that may require consultation as described in the preceding paragraph include actions on lands under ownership by the U.S. Army Corps of Engineers, the issuance of section 404 Clean Water Act permits by the U.S. Army Corps of Engineers, construction and maintenance of gas and oil pipelines and power line rights-of-way by the Federal Energy Regulatory Commission, Environmental Protection Agency 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.

Under section 4(d) of the Act, the Service has discretion to issue regulations that we find necessary and advisable to provide for the conservation of threatened species. The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to threatened wildlife. The prohibitions of section 9(a)(1) of the Act, as applied to threatened wildlife and codified at 50 CFR 17.31, make it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) threatened wildlife within the United States or on the high seas. In addition, it is unlawful to import; export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities 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 the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

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 final listing on proposed and ongoing activities within the range of a listed species. Based on the best available information, the following actions are unlikely to result in a violation of section 9, if these activities are carried out in accordance with existing regulations, permit requirements, or certification programs; this list is not comprehensive:

(1) Normal agricultural and silvicultural practices, including herbicide and pesticide use, which are carried out in accordance with existing regulations, permit and label requirements, and certified best management practices (i.e., Sustainable Forestry Initiative, Forest Stewardship Council, and American Tree Farm System).

(2) Normal residential and urban landscape activities, such as mowing, edging, fertilizing, etc.

(3) Normal pipeline/transmission line easement maintenance.

(4) Normal bridge, culvert, and roadside maintenance consistent with appropriate best management practices for these activities.

Based on the best available information, the following activities may potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized handling or collecting of the species.

(2) Introduction of nonnative fish that compete with or prey upon the pearl darter.

(3) Unlawful discharge or dumping of toxic chemicals, contaminants, sediments, fracking and oil waste water, waste water effluent, or other pollutants into waters supporting the pearl darter that kills or injures individuals, or otherwise impairs essential life-sustaining behaviors such as spawning, feeding, or sheltering.

(4) Destruction or alteration of the species' habitat (e.g., unpermitted instream dredging, impoundment, water diversion or withdrawal, channelization, discharge of fill material, modification of tributaries, channels, or banks) that impairs essential behaviors such as spawning, feeding, or sheltering, or results in killing or injuring a pearl darter.

(5) Unpermitted gravel mining, oil and gas processes, silviculture, and agricultural processes that result in direct or indirect destruction of riparian bankside habitat or in channel habitat in waters supporting the pearl darter that kills or injures individuals, or otherwise impairs essential life-sustaining behaviors such as spawning, feeding, or sheltering.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Mississippi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Required Determinations

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

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act, need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

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. The pearl darter is not known to occur within any tribal lands or waters.

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the Mississippi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this final rule are the staff members of the Mississippi Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

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 an entry for "Darter, Pearl" to the List of Endangered and Threatened Wildlife in alphabetical order under "FISHES" to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common Name	Scientific Name	Where Listed	Status	Listing Citations and Applicable Rules
* * * * * * *				
FISHES				
* * * * * * *				
Darter, Pearl	*Percina aurora*	Wherever found	T	82 FR [insert *Federal Register* page where the document begins], [Insert date of publication in the *Federal Register*].
* * * * * * *				

Date: September 7, 2017.

James W. Kurth,

Acting Director, U.S. Fish and Wildlife Service.

Billing Code 4333–15

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