Pearl Darter
(*Percina aurora*)

Status Review:
Summary and Evaluation

Pearl darter. Photograph by Matthew Wagner, U.S. Fish and Wildlife Service.

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

May 2023

STATUS REVIEW
Pearl Darter (*Percina aurora*)

GENERAL INFORMATION

Current classification: Threatened

Lead Field Office: Mississippi Ecological Services Field Office, Matthew D. Wagner, 601–321–1130

Review prepared by: Matthew D. Wagner, Mississippi Ecological Services Field Office, 601–321–1130

Reviewers:

Lead Regional Office: Atlanta Regional Office, Carrie Straight, 404–679–7226

Cooperating Field Office(s): Louisiana Ecological Services Field Office, Amy Trahan, 337–291–3126

Cooperating Service Program(s): Fisheries, Baton Rouge Fish and Wildlife Conservation Office, Scott Clark, 225–578–8064

Date of original listing: October 20, 2017 (82 FR 43885)

Critical Habitat: Critical habitat final rule: April 6, 2023 (88 FR 20410)

Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the pearl darter to inform this status review.

In conducting this 5-year review, the Service relied on the best available information pertaining to historical and current distributions, life history, ecology, and habitat of this species. Much of the information contained herein is taken from a Species Status Assessment Report (SSA; Service 2023a) that was developed to inform the Draft Recovery Plan for pearl darter, this 5-year review, and other Endangered Species Act documents. The SSA (Service 2023a, entire) is a peer-reviewed document that represents our evaluation of the best available scientific information regarding the biology, life history, and condition of the species. In addition to the Service, the core team responsible for the SSA included species experts from state and federal agencies such as Mississippi Department of Wildlife, Fisheries, and Parks, the University of Southern Mississippi, and U.S. Army Corps of Engineers. The SSA represents our evaluation of the best available scientific information, including the resource needs and the current and future condition of the species. Independent peer reviewers and partner representatives reviewed the SSA. Other sources for this status review include the final listing rule, published and unpublished reports and field observations, and personal communications from recognized experts in the field. We published an announcement in the Federal Register requesting information on this species on May 13, 2022 (87 FR 29364), and a 60-day comment period was opened. In response,

we received two public comments (Appendix A): a joint response from Audubon Delta, Healthy Gulf, Mississippi Chapter of the Sierra Club, and Pearl Riverkeeper and an additional response from the National Council for Air and Stream Improvement, which we have incorporated into this review.

FR Notice citation announcing the species is under active review: May 13, 2022 (87 FR 29364)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098): 8. At the time of listing, the pearl darter was determined to be a species with a moderate degree of threat and a high recovery potential.

Review history: This is the first 5-year status review for this species.

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature

The pearl darter is recognized as a valid taxon in the Integrated Taxonomic Information System (ITIS) database (ITIS 2023). We are not aware of any changes to the taxonomy of this entity, and it is considered valid by the Service.

Distinct Population Segment (DPS) (61 FR 4722)

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

Recovery Criteria

Recovery Plan

Draft Recovery Plan for the Pearl Darter (*Percina aurora*), February 22, 2023

At the time of this review, recovery criteria for the pearl darter have not been finalized.

Biology and Habitat Summary

The pearl darter historically occurred the Pearl River drainage in Mississippi and Louisiana and Pascagoula River drainage in Mississippi. The pearl darter was extirpated from the Pearl River drainage by 1973. However, the species continues to occur in all historically occupied rivers and streams in the Pascagoula River drainage, where it exists as a single contiguous population (Figure 1, Table 1). The species is associated with river and stream reaches with silt and detritus on steep banks and sandbars (Service 2023a, pp. 26–28).

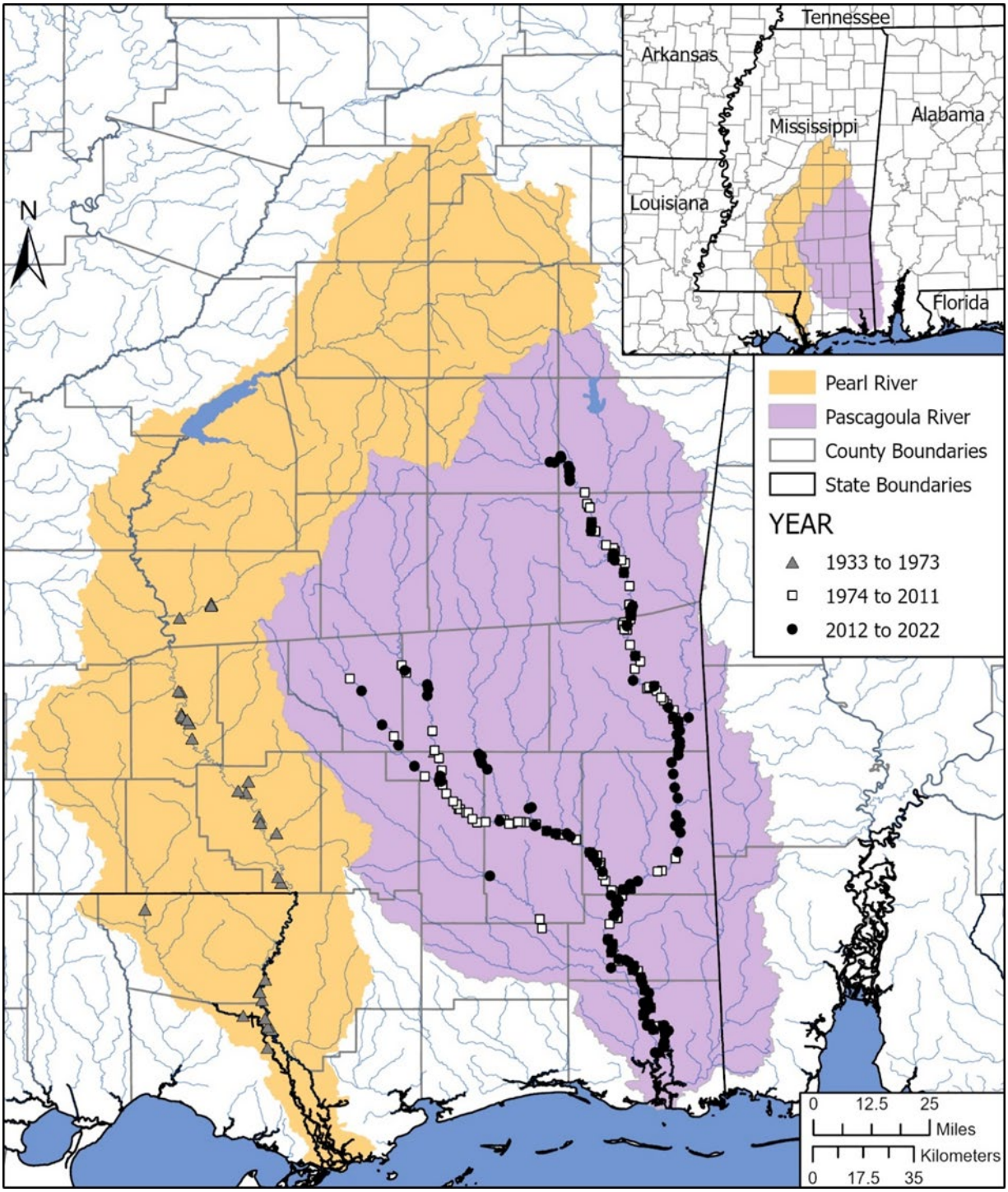

Figure 1. Current and historical pearl darter collection records (1933 to 2022) from the Pearl River drainage and Pascagoula River drainage. Symbols indicate time of detection. Inset map shows the location of these drainages in the southeastern United States.

Figure 1 shows the current distribution of the pearl darter based on a database maintained by the Service, Mississippi Department Wildlife, Fisheries, and Parks, and the University of Southern Mississippi (Service, unpublished data). The database of unpublished survey data informed the recent SSA (Service 2023a, entire).

Table 1. Summary of pearl darter HUC8 management units including last year of detection and mean catch per unit effort since 1999 and frequency of occurrence since 1999.

Drainage	Management Unit	Last Year of Detection	Mean Catch Per Unit Effort	Frequency of Occurrence
Pascagoula River	Black Creek	2019	2.3 ± 0.4	0.15
Pascagoula River	Chunky River	2021	8.9 ± 7.9	0.37
Pascagoula River	Lower Chickasawhay River	2021	7.8 ± 7.7	0.70
Pascagoula River	Lower Leaf River	2022	5.0 ± 7.0	0.49
Pascagoula River	Pascagoula River	2020	4.8 ± 4.1	0.50
Pascagoula River	Upper Chickasawhay River	2022	7.1 ± 6.3	0.59
Pascagoula River	Upper Leaf River	2022	4.1 ± 3.1	0.26
Pearl River	Bogue Chitto River	1971	0.0 ± 0.0	0
Pearl River	Lower Pearl River	1972	0.0 ± 0.0	0
Pearl River	Middle Pearl River	1973	0.0 ± 0.0	0
Pearl River	Strong River	1971	0.0 ± 0.0	0

For the purposes of the SSA, we identified two pearl darter populations, the extirpated Pearl River population and the extant Pascagoula River population. The two populations were further divided into 11 management units based on eight-digit hydrologic units (HUC8), with 7 management units in the Pascagoula River drainage and 4 management units in the Pearl River drainage (Figure 2, Table 1). We are not currently aware of data available to inform delineation of biological populations. We delineated appropriate management units to facilitate meaningful evaluation of current and future resiliency variability across the range. We assessed the current resiliency of each management unit by examining population and habitat factors. We then evaluated the species' viability based on the three conservation principles of resiliency, redundancy, and representation. Details of the analyses are provided in the SSA (Service 2023a, entire), and a summary of the information is provided below.

Resiliency was assessed at the management unit level and describes the ability of a species to withstand stochastic disturbance. Resilient populations are better able to withstand disturbances, such as random fluctuations in birth rates (demographic stochasticity), variations in rainfall (environmental stochasticity), or the effects of anthropogenic activities. We evaluated the resiliency of the pearl darter using two population factors (frequency of occurrence and catch per unit effort) and four habitat factors (water quality/land use, protected land, and channel modification) to develop a resiliency score for each management unit (Table 1) (Service 2023a, pp. 53–74). Based on these factors, four units exhibit low resiliency (Bogue Chitto River, Lower Pearl River, Middle Pearl River, and Strong River Units), two units exhibit moderate resiliency (Black Creek and Upper Leaf River Units), three units exhibit moderate-high resiliency (Chunky River, Lower Leaf River, and Upper Chickasawhay River Units), and two units exhibit high resiliency (Lower Chickasawhay River and Pascagoula River Units) (Figure 2, Table 2.). Currently, only the Pascagoula River drainage's seven management units contribute to the species' viability. The four extirpated management units in the Pearl River drainage do not contribute to the species' overall viability as the species no longer occurs there.

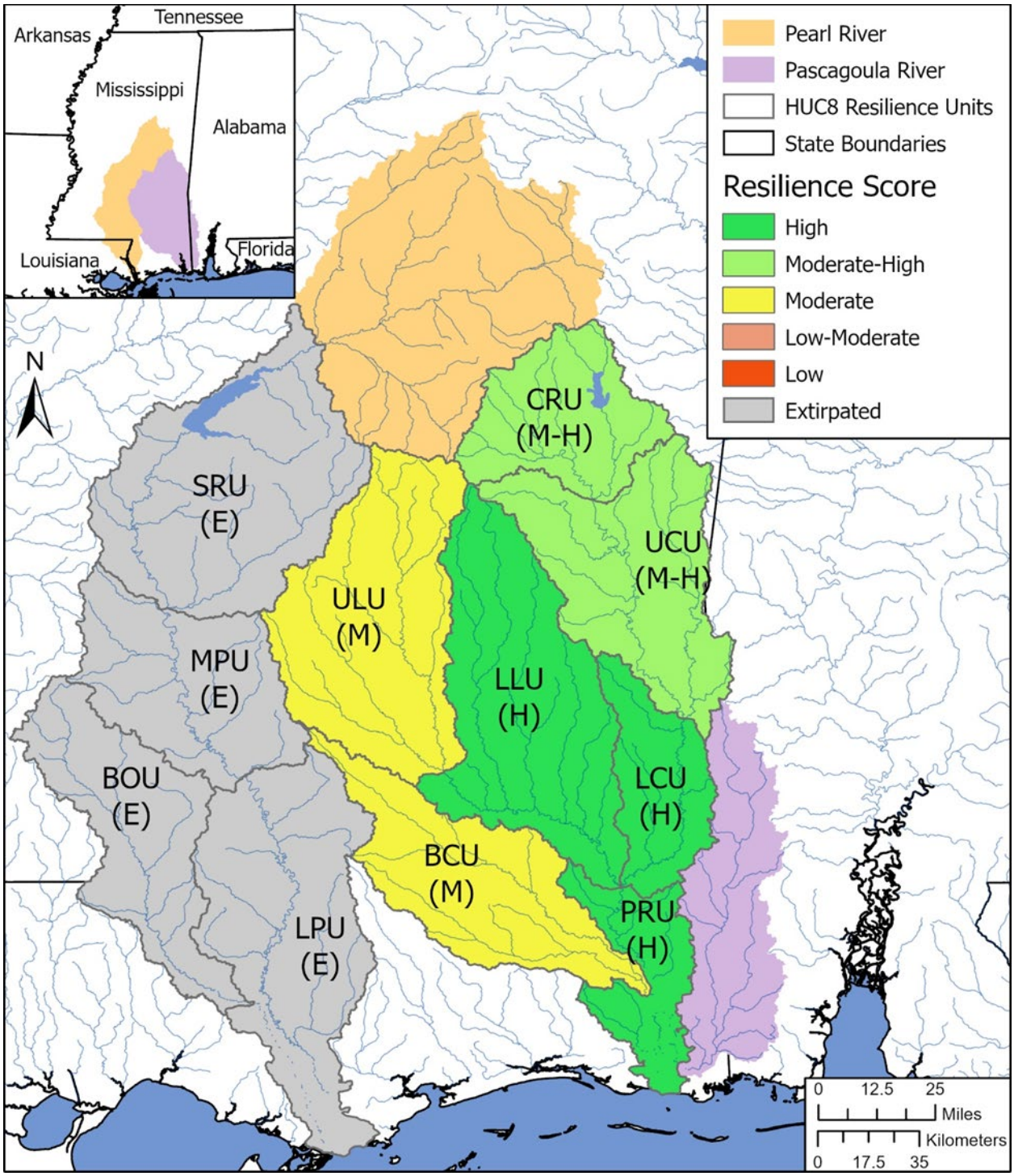

Figure 1. Current resiliency of the 11 pearl darter HUC8 management units. Pascagoula River drainage units include the Black Creek Unit (BCU), Chunky River Unit (CRU), Lower Chickasawhay River Unit (LCU), Lower Leaf River Unit (LLU), Pascagoula River Unit (PRU), Upper Chickasawhay River Unit (UCU), and Upper Leaf River Unit (ULU). Pearl River Units include the Bogue Chitto River Unit (BOU), Middle Pearl River Unit (MPU), Lower Pearl River Unit (LPU), and Strong River Unit (SRU). Resilience classification is noted for each population H: High; M-H: Moderate-High; M: Moderate; E: Extirpated.

Redundancy describes the ability of a species to withstand catastrophic events (a rare destructive event or episode involving several populations or subpopulations). We assessed current redundancy as a function of the resiliency and distribution of management units within drainages (Service 2023a). The seven currently occupied management units exhibit moderate or higher resiliency and are distributed widely throughout the Pascagoula River drainage. We assessed the redundancy of the species to be moderate in the Pascagoula River drainage. We determined the pearl darter has no redundancy within the Pearl River drainage where it is extirpated.

Table 2. Resiliency of pearl darter populations by management unit in the Pearl River and Pascagoula River based on habitat and population factors.

Drainage	Management Unit	Composite Habitat Score	Composite Population Score	Current Resiliency
Pascagoula River	Black Creek	High	Low	Moderate
Pascagoula River	Chunky River	Moderate	High	Moderate-High
Pascagoula River	Lower Chickasawhay River	High	High	High
Pascagoula River	Lower Leaf River	High	High	High
Pascagoula River	Pascagoula River	High	High	High
Pascagoula River	Upper Chickasawhay River	Moderate	High	Moderate-High
Pascagoula River	Upper Leaf River	Moderate	Moderate	Moderate
Pearl River	Bogue Chitto River	Low	Extirpated	Extirpated
Pearl River	Lower Pearl River	Moderate	Extirpated	Extirpated
Pearl River	Middle Pearl River	Moderate	Extirpated	Extirpated
Pearl River	Strong River	Moderate	Extirpated	Extirpated

Representation describes the adaptive capacity, or ability of a species to adapt to changing environmental conditions over time and is characterized by the breadth of genetic and environmental diversity within and among populations. The more representation a species has, the more it is capable of coping with or adjusting to large-scale changes, such as climatic changes. To assess pearl darter representation, we evaluated 10 attributes that may indicate adaptive capacity in a species (Thurman et al. 2020, entire). We concluded that the pearl darter exhibits moderate levels of adaptive capacity attributable to its high fecundity, high breadth of diet, high physiological tolerances, low to moderate population size/extent of occurrence, the unique habitat throughout the range in the Pascagoula River drainage, the single genetically homogeneous population in the Pascagoula River drainage (Schaefer et al. 2020, pp. 14–16), and the loss of the Pearl River drainage population. Overall, levels of these attributes indicate the pearl darter has moderate adaptive capacity sufficient to support species' viability (Service 2023a, pp.75–76).

To assess future viability of the pearl darter, we modeled the expected threats (land use, climate change including sea level rise, and water engineering projects, with described influences on the species and their habitat as detailed in the Threats section next) and the species response to those threats in management units range-wide in 2040 and 2070. Several units are projected to experience slight declines from current condition, and several units are projected to maintain current conditions depending on the future scenario and timestep (Service 2023a, pp. 80–102). Based on our evaluation of the resiliency, redundancy, and representation of pearl darter populations, the viability of the pearl darter has remained stable since the time of listing and the

species is expected to maintain viability throughout the Pascagoula River drainage. However, we expect that current viability is not sufficient for species' recovery. Improved viability to facilitate recovery in the future will be reliant on human intervention through species restoration efforts via captive propagation and augmentation in the Pearl River drainage, as well as maintaining adequate water quality and connectivity throughout the entire range of the species.

Threats (Five-factor Analysis) Summary

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

Habitat loss and degradation (Factor A; 82 FR 43885) as a result of degraded water quality is one of the primary threats to the pearl darter. Geomorphological changes and bank instability from past habitat modifications (including reservoir, dam, and sill construction, channelization, and channel modification, gravel mining) and associated increases in sedimentation are the major contributors to water quality declines in pearl darter habitat. 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 negatively impact fish growth, survival, and reproduction (Waters 1995, p. 5562). Additionally, proposals for new reservoirs on the Pearl River and Pascagoula River are ongoing and pose a threat to the species and its habitat through impacts to water flow, temperature, and sedimentation, if constructed (Service 2023a, pp. 82–83, 96). Water quality degradation also occurs at a local level from point and nonpoint source pollution in association with urbanization, agriculture, stormwater, and effluent runoff from industrial, agricultural, and municipal areas. The pearl darter is also vulnerable to catastrophic events that affect water quality on a wide scale, particularly the release of pollutants from oil spills, train derailments, and hydraulic fracturing (oil and gas development). These pollutants have acute and chronic negative impacts on fish physiological processes (Grosnell and Pasparakis 2021, entire). The best available information indicates the threat of habitat loss and degradation is ongoing, severe, and occurs throughout the species range, and we expect these threats to continue in the future.

We have no indication that overutilization for commercial, recreational, scientific, or educational purposes (Factor B) or disease and predation (Factor C) poses a significant threat for the species.

In the recent SSA, we reviewed the State and Federal laws and regulations relevant to the pearl darter and its habitat (Service 2023a, pp. 16–18, 40–42). The State of Mississippi classifies the pearl darter as endangered under Mississippi Code § 49-5-109. It is unlawful for any person to take, possess, transport, export, process, sell or offer for sale or ship, and for any common or contract carrier knowingly to transport or receive for shipment any endangered species without a scientific collecting permit. Within the species' current and historical range, the Clean Water Act of 1972 (33 U.S.C. 1251 *et seq.*) and the 1993 Mississippi Water Pollution Control Law, as amended, set water quality standards. Despite these two existing authorities, pollutants continue to impair the water quality throughout much of the 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 (Factor D) do not adequately protect the pearl darter from the impact of other threats.

For Factor E, the other natural factors considered as threats to the species include the small population size and the associated effects on the genetics of the species and the complex effects of climate change including drought/flood intensity and frequency, altered flow regimes, altered water temperature regimes. Sea level rise may affect some populations as well. The effects of small population size are expected to exacerbate the effect of other threats (Service 2023a, pp. 42–44). Although there is uncertainty around the magnitude and timing of the specific effects of climate change, the effects are expected to increase in the future and negatively impact the pearl darter's physiological processes, life history, and distribution (Jackson and Mandrak 2002, pp. 89–98; Heino et al. 2009, pp. 41–51; Strayer and Dudgeon 2010, pp. 350–351; Comte et al. 2013, pp. 627–636).

Synthesis

The pearl darter is small bottom dwelling fish that currently occurs in the Pascagoula River drainage in Mississippi and historically also occurred in the Pearl River drainage in Mississippi and Louisiana. The species is currently only found in the Pascagoula River drainage, where it occupies seven management units characterized by habitat and population factors in moderate or higher condition. The four Pearl River drainage management units are extirpated and do not contribute to the species' resiliency, redundancy, or representation. We determined the current redundancy of the Pascagoula River drainage is moderate based on the wide distribution of the seven currently occupied management units in the Pascagoula River drainage, and the moderate or higher resiliency of all management units. We assessed current representation as a function of the core attributes indicative of the species' overall adaptive capacity and determined the pearl darter has moderate adaptive capacity sufficient to support viability. Our analysis of future conditions projects several units will experience slight declines in viability from current condition, and some units are projected to maintain current conditions, depending on the future scenario and timestep. Based on our evaluation of the resiliency, redundancy, and representation of the pearl darter, species' viability has remained stable since the time of listing and is expected to maintain sufficient viability throughout the Pascagoula River drainage. However, the species continues to be affected by threats associated with water quality degradation, geomorphological disturbances, construction of reservoirs and dams, gravel mining, urbanization and agriculture, and long-term climate impacts such as prolonged flooding, drought, and sea level rise. Furthermore, these threats and their effect on the pearl darter are exacerbated by small population numbers, localized distribution, and low genetic diversity, which reduce its genetic fitness and resiliency and redundancy to possible stochastic and catastrophic events. Current and ongoing threats continue to impact the species' condition and the pearl darter continues to meet the definition of a threatened species.

RECOMMENDED FUTURE ACTIVITIES

The pearl darter does not have a final recovery plan and no activities beyond those listed in the draft recovery plan (Service 2023b, p. 8) are recommended. We have identified the following

potential recovery activities which are included below that should be prioritized for the recovery of the species.

Recovery Activities

- Finalize a controlled propagation and reintroduction plan to guide propagation activity until enough progeny are produced to reintroduce the species into the Pearl River drainage.
    - Determine appropriate source locations for potential broodstock.
    - Assess river reaches within the Pearl River drainage for potential reintroduction.
- Assess the potential for additional hatcheries to propagate the species.

Monitoring and Research Activities

- Sample large tributaries to the Pascagoula River drainage using traditional and novel techniques (e.g., environmental DNA, trawls, etc.) to detect additional pearl darter subpopulations.
- Implement standardized annual monitoring of the species to monitor the population trends to assess early rangewide declines.

REFERENCES

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Pearl Darter

Status Recommendation:

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

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

FIELD OFFICE APPROVAL:

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

JAMES AUSTIN Digitally signed by JAMES AUSTIN
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Approve _____

LEAD REGIONAL OFFICE APPROVAL:
***Acting for* Assistant Regional Director – Ecological Services, Fish and Wildlife Service**

AARON VALENTA Digitally signed by AARON VALENTA
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Approve _____

APPENDIX A. SUMMARY OF PUBLIC COMMENTS

I. Public Comments

On May 13, 2022 (87 FR 29364), we published an announcement in the Federal Register requesting information on the pearl darter from the public. During the 60-day comment period, we received two public comments.

A. Summary of Public Comments:

Comment 1: Audubon Delta, Healthy Gulf, Mississippi Chapter of the Sierra Club, and Pearl Riverkeeper provided a joint public comment for this 5-year review. The comment supported continued listing of the species as threatened under the Act and asked the Service to acknowledge current threats in the Pearl River drainage, which would negatively affect any attempts to successfully reestablish the species' historical range in this river system through reintroduction as the threats are similar to the very same stressors that led to the species extirpation. The comment specifically notes the threats to the drainage from the proposed reservoir (One Lake) in the Jackson area that is currently under active review by the Assistant Secretary of the Army for Civil Works and may receive final approval this year. Received July 11, 2022.

Comment 2: The National Council for Air and Stream Improvement provided a public comment for this 5-year review. The comment provides references to literature reviews of State-approved forestry best management practices that minimize risks to water quality from forest management and benefit aquatic species. Received July 12, 2022.

A. Response to Public Comments:

Response to Comment 1: We address proposed reservoir in the future conditions chapter of the SSA under future water engineering projects (Service 2023a, pp. 82–83, 96). We have expanded our description of Factor A to include information from the SSA regarding the proposed reservoir and reference the relevant SSA pages in the summary of Factor A above.

Response to Comment 2: The Service recognizes the scientific articles and reviews included in this comment and the thorough summary of the science behind implementation of forestry best management practices. This comment supports our description of State and Federal regulatory mechanisms that may reduce the negative effects of point source and nonpoint source discharges as assessed under Factor D.