Bayou Darter
(*Etheostoma rubrum*)

5-Year Status Review:
Summary and Evaluation

Photo: Noah Daun

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

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5-YEAR STATUS REVIEW
Bayou Darter (*Etheostoma rubrum*)

GENERAL INFORMATION

Current Classification: Threatened

Lead Field Office: Mississippi Ecological Services Field Office, Jackson, Mississippi

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Reviewers:

Lead Regional Office: Southeast Region, Carrie Straight

Date of original listing: October 28, 1975 (44 FR 44149; September 25, 1975)

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 best available information about the bayou darter's biology, habitat, and threats to inform this status review.

We announced initiation of this review in the Federal Register on June 6, 2024 (89 FR 48437), with a 60-day comment period and received one public comment. The primary sources of information used in this analysis were the 1975 final listing rule (44 FR 44149), peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts. This review was completed by the U.S. Fish and Wildlife Service, Mississippi Ecological Services Field Office (MSFO), Jackson, Mississippi. All literature and documents used for this review are on file at the MSFO. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the bayou darter. Along with information and data received from state agencies, we received one public comment from National Council for Air and Stream Improvement, Incorporated. The comment received was evaluated and incorporated into this final document as appropriate. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the bayou darter.

Federal Register Notice citation announcing the species is under active review:

June 6, 2024 (89 FR 48437)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098):

8C. Bayou darter is a species with a moderate degree of threat and a high recovery potential.

Review history:

Two previous 5-year reviews recommending no change in status were published on May 9, 2012 (Service 2012) and August 20, 2020 (Service 2020).

REVIEW ANALYSIS

Listed Entity

Taxonomy and Nomenclature

Raney and Suttkus (1966) originally described the species as *Etheostoma rubrum*. However, multiple analyses of the genetics of this species resulted in a change of the genus and species from *Etheostoma rubrum* to *Nothonotus rubrus* (Wood 1996; Near and Keck 2005; Keck and Near 2008; Near et al. 2011). Details of this taxonomic change are given in Near et al. (2011) and are currently supported by the Integrated Taxonomic Information System (2024) and the American Fisheries Society (Page et al. 2023). This updated nomenclature does not impact our assessment of the listed entity (e.g., does not change its distribution, biology, life history, or threats), and it is still considered a valid entity by the Service. Until we finalize a technical correction of the name, we will continue to reference the species using the name as it was listed (*Etheostoma rubrum*).

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 indicating that the species should be listed as a DPS under the Service's 1996 DPS Policy.

Recovery Criteria

Recovery Plan

Bayou Darter (*Etheostoma rubrum*) Recovery Plan, September 8, 1983

Bayou Darter (*Etheostoma rubrum*) Revised Recovery Plan, July 10, 1990

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

The criteria for delisting the species are:

(1) Evidence of a stable or increasing population and habitat over at least a 10-year period in Bayou Pierre and Foster Creek;

(2) Evidence of the continued existence of the bayou darter in White Oak and Turkey Creeks;

(3) Data on the fluvial geomorphic processes operating in the Bayou Pierre system which indicates a trend of no net loss of, or improving, habitat for the species;

(4) An established continuing plan of periodic monitoring of population trends and habitat stability; and

(5) Protection of bayou darter habitat through full implementation of task 4 of this recovery plan.

The Service believes these criteria are appropriate and relevant. Criterion 1 has been partially met and criterion 2 has been fully met; however, criteria 3, 4, and 5 have not currently been met. We discuss these below.

Biology and Habitat Summary

Since the last 5-year review (Service 2020), a comprehensive distribution database of all records of bayou darter was assembled to assess status through time (Figure 1). A subset of the data was then grouped into six stream reaches and chronologically separated based on targeted surveys (Figure 2). This dataset using only presence data allowed us to assess the average number of bayou darter collected in a survey through time (Figure 2). Range-wide surveys have been completed since the last 5-year review by the University of Southern Mississippi and the Service and are included in the comprehensive dataset. These recent surveys have found the species still occurs in all six stream reaches of Bayou Pierre (Figure 1, Figure 2).

The species has occupied 96.6 river miles(rmi) (155.5 river kilometers(rkm)) throughout the watershed. Although still found in all six reaches, a clear decline in the species' downstream range has been noted as no individuals were collected among four samples in the lowermost 17.7 rmi (28.6 rkm) in 2020. This downstream range contraction reflects a decline both in the numbers and quality of riffle habitats in this section of mainstem Bayou Pierre, leading to a decline in the presence of the species in the reach (Slack et al. 2004; Hubbel et al. 2021; Stearman and Schaefer 2023a). However, since the last 5-year review the species has expanded its range 3.3 rmi (5.31 rkm) upstream in mainstem Bayou Pierre, where it was detected for the first time at Sylvarena Road in 2021. This range expansion has been attributed to the erosional wave that moved upstream in the system resulting in more suitable habitat for the species in mainstem Bayou Pierre upstream of Sylvarena Road, where the stream has become wider and shallower with more riffles and woody structure available to the species.

Although the range of the species has contracted 18.3% since the surveys in the 1980's, the contemporary average abundance in years surveys was higher than in all historic survey periods with the exception of Tallahalla Creek and mainstem Bayou Pierre downstream of White Oak Creek (Figure 2). While the average abundance in Tallahalla Creek in 2024 was less than half of that in 2018 to 2022, the species was still detected at both historically sampled sites since the last 5-year review (Figure 1, Figure 2). In mainstem Bayou Pierre downstream of White Oak Creek, no sampling occurred in 2024. However, sampling did occur in 2021 and found low average abundance, which was comparable to the data from all previous surveys (Figure 2).

Three genetically distinct populations related to erosional stages of the river rather than tributaries were determined in a recent study of genetic structure patterns (Stearman and Schaeffer 2023b). One population is confined to mainstem Bayou Pierre upstream of Mississippi State Highway 28; one is near the Bayou Pierre and White Oak Creek confluence; and the last is spread throughout upper White Oak Creek, the mainstem Bayou Pierre, Turkey Creek, and Foster Creek. They note that observed patterns of heterozygosity support the hypothesis of recent

colonization of upper White Oak Creek/Tallahalla Creek and that there is evidence of population introgression between the two downstream populations.

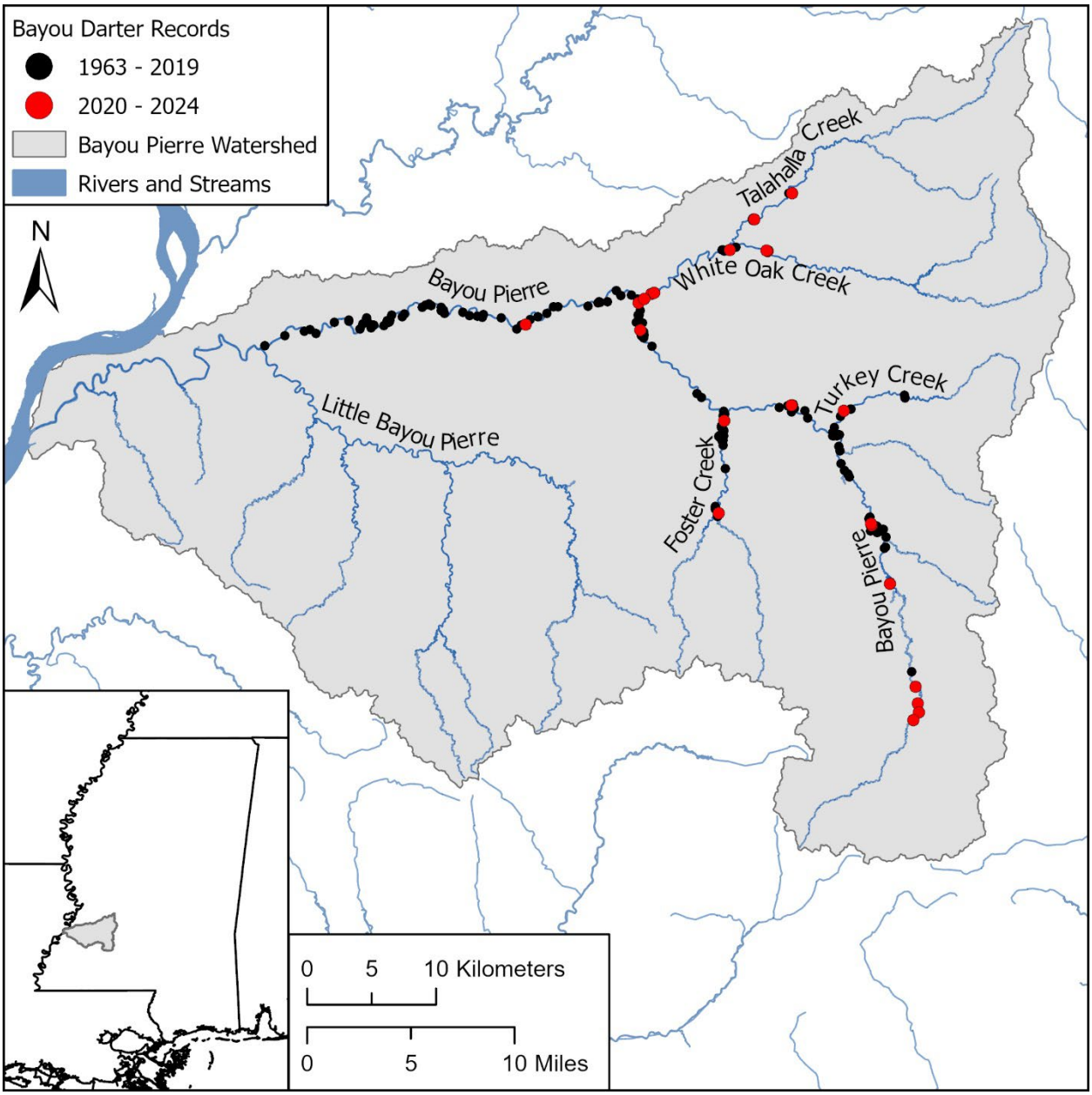

Figure 1. Distribution of the Bayou Darter in Bayou Pierre Watershed including all known records.

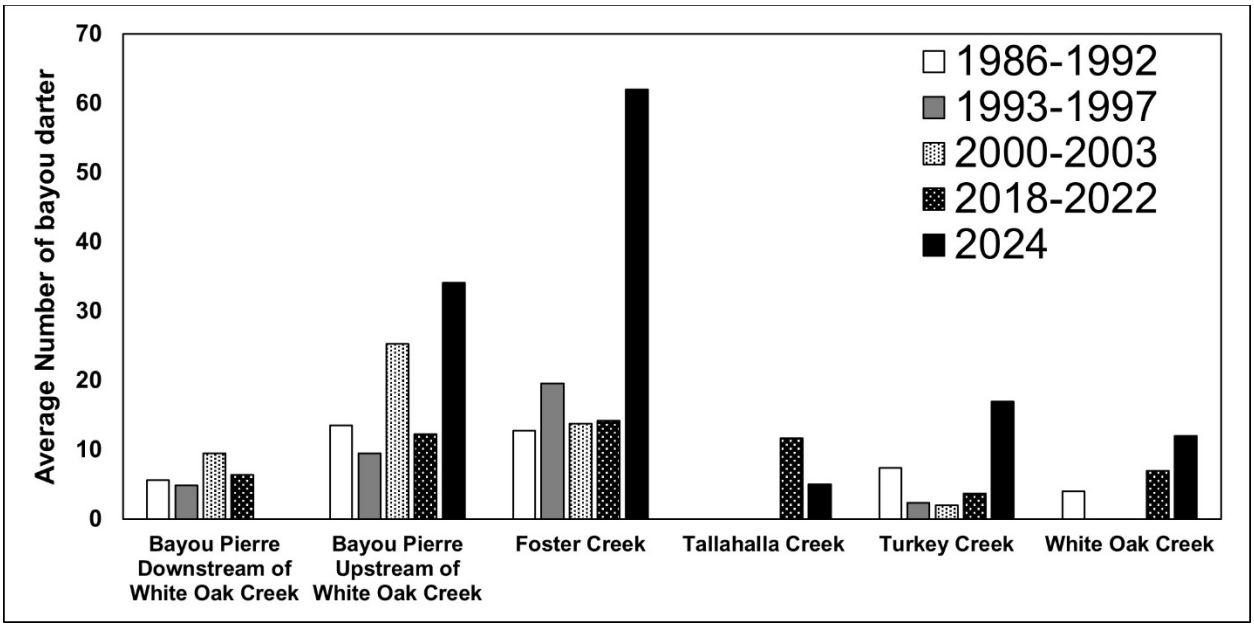

Figure 2. Average number of bayou darters collected in targeted surveys when the bayou darter was present (excluding absences) by stream reach of Bayou Pierre. As effort was not available for past surveys, catch per unit effort was not able to be calculated.

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. Summaries of our assessments are detailed below.

Factor A. Present or threatened destruction, modification or curtailment of its habitat or range

The final listing rule for the bayou darter described the primary threat to the species as habitat modification and water quality deterioration caused by gravel mining and agricultural land use practices that accelerate erosion (Service 1975). Gravel mining is regulated by Mississippi Department of Environmental Quality and no active permits are currently issued in the Bayou Pierre watershed; however, historical sand and gravel extraction likely has ongoing legacy effects on accelerated erosion in the watershed (Stearman and Heitmuller 2024). Additionally, agricultural land use practices that contribute to accelerated erosional processes are still prevalent throughout the watershed. Erosion has caused a deepening and widening of the channel, bank collapse, and lower channel sinuosity, which caused a decline both in the numbers and quality of riffle habitats in mainstem Bayou Pierre and its tributaries (Slack et al. 2004; Stearman and Schaefer 2023a). We do not have specific information how changes in Bayou Pierre geomorphology affect bayou darter's different life stages (adult, juvenile, drifting larvae, and egg). The changes to aquatic habitats in Bayou Pierre have resulted in an observed decrease in abundance and loss of diversity in riffle habitat specialists through time as required riffle habitat

is reduced (Ross et al. 2001; Stearman and Schaefer 2023a). Therefore, the threat of habitat modification and water quality deterioration remain ongoing, severe, and occur throughout the species range, and we expect this threat to continue in the future.

Instream all-terrain vehicle (ATV) traffic is an emerging threat to the species that has been documented in Turkey Creek, mainstem Bayou Pierre at Carter Hill Road, and at an ATV park on mainstem Bayou Pierre near Carlisle, Mississippi. Operation of a motor vehicle in a public waterway is illegal under Mississippi Code § 51-1-4. Instream ATV operation negatively impacts the species in a variety of ways and can directly crush individual fish, destroy and destabilize riffle habitat, cause excess sediment plumes that smother eggs and fish, and leak pollutants (e.g., oil, gasoline, hydraulic fluid) into the water, impairing water quality.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes

Mississippi Department of Wildlife, Fisheries, and Parks regulates collection of the species and only allows for minimal scientific collection when mortality occurs during sampling. There is no permitted collection of the species for commercial, recreational, or education purposes; therefore, there is no indication that overutilization poses a significant threat for the species throughout the species range.

Factor C. Disease or predation

We have no specific information indicating that disease or predation pose a threat to the species.

Factor D. Inadequacy of existing regulatory mechanisms

Bayou darter and its habitat are afforded some protection from surface water quality and habitat degradation under the Clean Water Act of 1977 (33 U.S.C. 1251 et seq.) and the Mississippi Water Pollution Control Law (Code of Mississippi, sections 49-17 et seq.) and regulations promulgated thereunder by the Mississippi Department of Environmental Management (Ables et al. 1994). Additionally, 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 annually assessed Clean Water Act's Section 303(d) List of Impaired Water Bodies, States are required under the Clean Water Act to establish a Total Maximum Daily Load for the pollutants of concern that will bring water quality into the applicable standard. Currently, White Oak Creek, from the confluence of Tallahalla Creek to its confluence with Bayou Pierre, is the only water body that does not meet Clean Water Act standards (Mississippi 2024 Section 303(d) List of Impaired Water Bodies, 2024) and constitutes 9% of the currently occupied range of the species.

The State of Mississippi's surface water quality standards, adopted from the national standards set by the U.S. Environmental Protection Agency, are expected to be protective of the bayou darter as long as discharges are within permitted limits and are enforced according to the provisions of the Clean Water Act. These regulatory mechanisms remain inadequate in fully protecting the species and its habitat as habitat and water quality degradation continue to impact the species range-wide. The best available information indicates that the magnitude and imminence of this threat are not likely to decline appreciably in the future.

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

.As described above, three genetically distinct populations of bayou darter were identified across the species' range: 1) group one near the Bayou Pierre and White Oak Creek confluence, 2) group two in upper White Oak Creek, the mainstem Bayou Pierre, Turkey Creek, and Foster Creek, and 3) group three in the mainstem Bayou Pierre upstream of Mississippi State Highway 28 (Stearman and Schaeffer (2023b). The distribution of group three is small and linear making it prone to extirpation from catastrophic events. Additionally, mean heterozygosity showed a lower trend in upper White Oak and Tallahalla Creeks, consistent with the hypothesis of a genetic bottleneck due to recent colonization (i.e., founder effect). Lower heterozygosity may be associated with decreased adaptability and a higher risk of inbreeding depression or genetic drift, negatively impacting the overall fitness and survival of the species. These factors impact portions of the species range and are not expected to decrease in the future.

Synthesis

Bayou darter is a small benthic fish species endemic to the Bayou Pierre watershed in southwestern Mississippi. The waterbodies occupied by the bayou darter have not changed. The species continues to occur in mainstem Bayou Pierre, although occupied reaches have shifted, and occurs in all historically known tributaries of Bayou Pierre (Foster Creek, White Oak Creek, Tallahalla Creek, Turkey Creek). Habitat alteration has reduced required riffle habitat quantity and quality within the lowermost 17.7 rmi (28.6 rkm) of mainstem Bayou Pierre where the species no longer occurs. However, habitat alteration in the uppermost reach of mainstem Bayou Pierre has provided habitat conditions suitable for the species and extended the known range by 3.3 rmi (5.31 rkm). Contemporary average abundance of the species was higher than historic average abundance in all reaches except Tallahalla Creek and mainstem Bayou Pierre below the mouth of White Oak Creek.

Rangewide, the impacts of historical gravel mining and agricultural land use practices continue to accelerate the rate the erosion in the system; therefore, the threat of habitat modification and water quality deterioration are ongoing, moderate, and not expected to diminish in magnitude and severity in the future. In addition, we have identified the emerging threat of instream ATV use causing current and ongoing habitat degradation through direct destruction of stable riffles and indirectly through increased sedimentation. Therefore, sedimentation, erosion, and loss of riffle habitat continue to cause habitat and water quality degradation that negatively impact the bayou darter rangewide. The bayou darter continues to meet the definition of a threatened species due to the negative effects of current, ongoing, and emerging threats on the species and its habitat.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria is presented in the Recovery Plan (Service 1990). In the course of this review, new and/or targeted potential recovery activities were identified and are included below. These actions are recommended to support and promote recovery of the bayou darter. Use of a numbered list for these recommendations is for convenient reference only and does not necessarily imply prioritization.

Recovery Activities

1. Complete an assessment of the potential species introduction into Little Bayou Pierre based on the distribution of other darter species and available habitat.
2. Work with local law enforcement and private landowners to stop the use of all-terrain vehicles instream via educational outreach and increased enforcement.
3. Increase landowner awareness for the Working Lands for Wildlife program through Natural Resources Conservation Service to

Monitoring and Research Activities

1. Continue the established long-term monitoring utilizing gear recommendations from the ongoing gear comparison study in progress at the University of Southern Mississippi. This monitoring should continue to assess the upstream and downstream range extent of the species and target the lowermost 17 miles where the species has not been recently detected.
2. Work with state partners to develop a controlled propagation plan and initiate captive propagation program to develop propagation techniques at Private John Allen National Fish Hatchery.
3. Assess the feasibility and effectiveness of installing large substrate riffles to create suitable habitat within the lower portion of Bayou Pierre.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Bayou 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 is recovered*
  - ☐ *New information indicates the species does not meet the definition of an endangered or threatened species*
  - ☐ *The listed entity does not meet the statutory definition of a species*
- ☒ No change needed

FIELD OFFICE APPROVAL:

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

JAMES AUSTIN Digitally signed by JAMES AUSTIN Date: 2025.04.11 08:56:05 -05'00'

Approve _____