DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2023–0065; FF09E21000; FXES1111090FEDR 234]

RIN 1018–BG18

Endangered and Threatened Wildlife and Plants; Threatened Species Status With Section 4(d) Rule for Brawleys Fork Crayfish and Designation of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the Brawleys Fork crayfish (*Cambarus williami*), a freshwater crayfish species from Tennessee, as a threatened species and designate critical habitat under the Endangered Species Act of 1973, as amended (Act). This determination also serves as our 12-month finding on a petition to list the Brawleys Fork crayfish. After a review of the best available scientific and commercial information, we find that listing the species is warranted. Accordingly, we propose to list the Brawleys Fork crayfish as a threatened species with a rule issued under section 4(d) of the Act (''4(d) rule''). If we finalize this rule as proposed, it would add this species to the List of Endangered and Threatened Wildlife and extend the Act's protections to the species. We also propose to designate critical habitat for the Brawleys Fork crayfish under the Act. In total, approximately 86.6 river miles (139.4 river kilometers) in Cannon, Rutherford, and Warren Counties, Tennessee, fall within the boundaries of the proposed critical habitat designation. We also announce the availability of a draft economic analysis of the proposed designation of critical habitat for Brawleys Fork crayfish.

DATES: We will accept comments received or postmarked on or before October 23, 2023. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES,** below) must be received by 11:59 p.m. eastern time on the closing date. We must receive requests for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by October 6, 2023.

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

(1) *Electronically:* Go to the Federal eRulemaking Portal: *https://www.regulations.gov.* In the Search box, enter FWS–R4–ES–2023–0065, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the panel on the left side of the screen, under the Document Type heading, check the Proposed Rule box to locate this document. You may submit a comment by clicking on ''Comment.''

(2) *By hard copy:* Submit by U.S. mail to: Public Comments Processing, Attn: FWS–R4–ES–2023–0065, U.S. Fish and Wildlife Service, MS: PRB/3W, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

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

Availability of supporting materials: Supporting materials, such as the species status assessment report, are available on the Service's website at at *https://www.fws.gov/library/collections/Brawleys-Fork-crayfish* and at *https://www.regulations.gov* in Docket No. FWS–R4–ES–2023–0065. For the proposed critical habitat designation, the coordinates or plot points or both from which the maps are generated are included in the decision file for this critical habitat designation and are available at *https://www.regulations.gov* at Docket No. FWS–R4–ES–2023–0065 and on the Service's website at *https://www.fws.gov/library/collections/Brawleys-Fork-crayfish.*

FOR FURTHER INFORMATION CONTACT: Daniel Elbert, Field Supervisor, U.S. Fish and Wildlife Service, Tennessee Ecological Services Field Office, 446 Neal Street, Cookeville, Tennessee, 38501; Telephone 931–254–9617. Individuals in the United States who are deaf, deafblind, hard of hearing, or have a speech disability may dial 711 (TTY, TDD, or TeleBraille) to access telecommunications relay services. Individuals outside the United States should use the relay services offered within their country to make international calls to the point-of-contact in the United States.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species warrants listing if it meets the definition of an endangered species (in danger of extinction throughout all or a significant portion of its range) or a threatened species (likely to become endangered in the foreseeable future throughout all or a significant portion of its range). If we determine that a species warrants listing, we must list the species promptly and designate the species' critical habitat to the maximum extent prudent and determinable. We have determined that the Brawleys Fork crayfish meets the definition of a threatened species; therefore, we are proposing to list it as such and proposing a designation of its critical habitat. Both listing a species as an endangered or threatened species and making a critical habitat determination can be completed only by issuing a rule through the Administrative Procedure Act rulemaking process (5 U.S.C. 551 *et seq.*).

What this document does. We propose to list the Brawleys Fork crayfish as a threatened species with a rule under section 4(d) of the Act, and we propose the designation of critical habitat for the species.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species because of any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that Brawleys Fork crayfish is threatened due to the following threats: habitat loss and degradation due to sedimentation and water quality impairments from sources including agricultural practices, horticultural practices, and urbanization; and instream modification including impoundments, gravel dredging, and channel alteration. Each of the threats influencing Brawleys Fork crayfish viability may be further exacerbated by the effects of small, isolated populations and the future effects of climate change.

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary) to designate critical habitat concurrent with listing to the maximum extent prudent and determinable. 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 protections; 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(b)(2) of the Act states that the Secretary must make the designation on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impacts of specifying any particular area as critical habitat.

Information Requested

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

We particularly seek comments concerning:

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

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

(b) Genetics and taxonomy;

(c) Historical and current range, including distribution patterns and the locations of any additional populations of this species;

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

(e) Past and ongoing conservation measures for the species, its habitat, or both.

(2) Threats and conservation actions affecting the species, including:

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

(b) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to this species.

(c) Existing regulations or conservation actions that may be addressing threats to this species.

(3) Additional information concerning the historical and current status of this species.

(4) Information on regulations that may be necessary and advisable to provide for the conservation of the Brawleys Fork crayfish and that we can consider in developing a 4(d) rule for the species. In particular, information concerning the extent to which we should include any of the section 9 prohibitions in the 4(d) rule or whether we should consider any additional exceptions from the prohibitions in the 4(d) rule.

(5) Specific information on:

(a) The amount and distribution of Brawleys Fork crayfish habitat;

(b) Any additional areas occurring within the range of the species, Cannon, Rutherford, and Warren Counties, Tennessee, that should be included in the designation because they (i) are occupied at the time of listing and contain the physical or biological features that are essential to the conservation of the species and that may require special management considerations, or (ii) are unoccupied at the time of listing and are essential for the conservation of the species; and

(c) Special management considerations or protection that may be needed in critical habitat areas we are proposing, including managing for the potential effects of climate change; and

(d) To evaluate the potential to include areas not occupied at the time of listing, we particularly seek comments regarding whether occupied areas are adequate for the conservation of the species. Additionally, please provide specific information regarding whether or not unoccupied areas would, with reasonable certainty, contribute to the conservation of the species and contain at least one physical or biological feature essential to the conservation of the species. We also seek comments or information regarding whether areas not occupied at the time of listing qualify as habitat for the species.

(6) Land use designations and current or planned activities in the subject areas and their possible impacts on proposed critical habitat.

(7) Any probable economic, national security, or other relevant impacts of designating any area that may be included in the final designation, and the related benefits of including or excluding specific areas.

(8) Information on the extent to which the description of probable economic impacts in the draft economic analysis is a reasonable estimate of the likely economic impacts and any additional information regarding probable economic impacts that we should consider.

(9) Whether any specific areas we are proposing for critical habitat designation should be considered for exclusion under section 4(b)(2) of the Act, and whether the benefits of potentially excluding any specific area outweigh the benefits of including that area under section 4(b)(2) of the Act. If you think we should exclude any additional areas, please provide information supporting a benefit of exclusion.

(10) Whether we could improve or modify our approach to designating critical habitat in any way to provide for greater public participation and understanding, or to better accommodate public concerns and comments.

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

Please note that submissions merely stating support for, or opposition to, the action under consideration without providing supporting information, although noted, do not provide substantial information necessary to support a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or a threatened species must be made solely on the basis of the best scientific and commercial data available, and section 4(b)(2) of the Act directs that the Secretary shall designate critical habitat on the basis of the best scientific data available.

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

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

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

Because we will consider all comments and information we receive during the comment period, our final determinations may differ from this proposal. Based on the new information we receive (and any comments on that new information), we may conclude that the species is endangered instead of threatened, or we may conclude that the species does not warrant listing as either an endangered species or a threatened species. For critical habitat, our final designation may not include all areas

proposed, may include some additional areas that meet the definition of critical habitat, or may exclude some areas if we find the benefits of exclusion outweigh the benefits of inclusion and exclusion will not result in the extinction of the species. In addition, we may change the parameters of the prohibitions or the exceptions to those prohibitions in the 4(d) rule if we conclude it is appropriate in light of comments and new information received. For example, we may expand the prohibitions to include prohibiting additional activities if we conclude that those additional activities are not compatible with conservation of the species. Conversely, we may establish additional exceptions to the prohibitions in the final rule if we conclude that the activities would facilitate or are compatible with the conservation and recovery of the species.

Public Hearing

Section 4(b)(5) of the Act provides for a public hearing on this proposal, if requested. Requests must be received by the date specified in **DATES**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule a public hearing on this proposal, if requested, and announce the date, time, and place of the hearing, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing. We may hold the public hearing in person or virtually via webinar. We will announce any public hearing on our website, in addition to the **Federal Register**. The use of virtual public hearings is consistent with our regulations at 50 CFR 424.16(c)(3).

Previous Federal Actions

On April 20, 2010, we received a petition to list 404 species, including the Brawleys Fork crayfish, as endangered or threatened species, and designate critical habitat under the Act (Center for Biological Diversity et al. 2010, entire). Our subsequent 90-day finding concluded that the petition provided substantial information indicating that the Brawleys Fork crayfish may be warranted for listing, and that the status of the species warranted further review (September 27, 2011; 76 FR 59836).

Peer Review

A species status assessment (SSA) team prepared an SSA report for the Brawleys Fork crayfish. The SSA team was composed of Service biologists, in consultation with other species experts. The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species.

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we solicited independent scientific review of the information contained in the Brawleys Fork crayfish SSA report. The Service sent the SSA report to four independent peer reviewers and received no responses.

I. Proposed Listing Determination

Background

A thorough review of the taxonomy, life history, and distribution of the Brawleys Fork crayfish (*Cambarus williami*) is presented in the SSA report (version 1.1; Service 2023, pp. 14–24).

The Brawleys Fork crayfish is a small, freshwater crayfish endemic to the Nashville Basin and Eastern Highland Rim ecoregions of central Tennessee. The species occurs primarily in small- to medium-sized streams (first- to third-order streams) and in one medium-sized river (fifth order) of the Stones and Collins River systems (Bouchard and Bouchard 1995, p. 6; Williams et al. 2017, p. 51; Giddens and Mattingly 2020, pp. 2–3; Johansen 2021, pers. comm. 2021; Mattingly 2021, pers. comm.; Simmons 2021, pers. comm.; Williams 2021, pers. comm.).

Brawleys Fork crayfish is known to occur in 20 streams in 5 Hydrologic Unit Code 12 (HUC 12) watersheds within its range. The Brawleys Fork crayfish range has increased from historical levels and the current known range of the species is wider than the historical range (no range contraction) (Bouchard and Bouchard 1995, entire; Withers and McCoy 2005, entire; Rohrbach and Withers 2006, entire; Giddens and Mattingly 2020, entire). Brawleys Fork crayfish known occurrences are in streams with moderate to fast flow and main channel depths ranging from 5 to 30 centimeters (cm) (2–12 inches (in)) (Withers and McCoy 2005, pp. 3, 27–48; Rohrbach and Withers 2006, p. 3; Williams et al. 2017, p. 51). Brawleys Fork crayfish typically occupy runs and riffles in streams with layered chert gravel and cobble substrate with ample interstitial space not consolidated by finer substrates such as sand or silt (Khan 2021, unpublished data). This species frequently burrows into chert gravel substrate within the wetted stream channel during normal and reduced stream flows to escape predators and access subterranean water (Bouchard and Bouchard 1995, p. 6; Williams et al. 2017, p. 51; Giddens and Mattingly 2020, pp. 2–3). Streams with Brawleys Fork crayfish occurrence are characterized by water temperatures ranging from 10 to 23 degrees Celsius (°C) (50–73 degrees Fahrenheit (°F)) (Giddens and Mattingly 2020, pp. 4–5; Simmons 2021, pers. comm.). Ample riparian vegetation is an important habitat characteristic that creates shaded conditions to maintain the cooler water temperature required by the species and buffers streams against pollutants carried by stormwater runoff. Suitable habitat conditions also support an adequate prey base for Brawleys Fork crayfish, indicated by a healthy aquatic community structure including native benthic macroinvertebrates, fishes, and plant matter (*e.g.,* leaf litter, algae, detritus). Brawleys Fork crayfish site occupancy is associated with a high volume of clean groundwater discharged into the stream from subterranean aquifers (Simmons 2021, pers. comm.).

Although the specific diet of Brawleys Fork crayfish is unknown, it is likely similar to congeneric species of the same size and includes smaller invertebrates, periphyton, and plant detritus. Individuals reach reproductive maturity by their first year. A portion of males are in reproductive form in all months except August. Females bear eggs in the spring as typical of most crayfish species. The Brawleys Fork crayfish lifespan is estimated to be 3 years with two to three age classes present in healthy populations.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in title 50 of the Code of Federal Regulations set forth the procedures for determining whether a species is an endangered species or a threatened species, issuing protective regulations for threatened species, and designating critical habitat for endangered and threatened species. In 2019, jointly with the National Marine Fisheries Service, the Service issued a final rule that revised the regulations in 50 CFR part 424 regarding how we add, remove, and reclassify endangered and threatened species and the criteria for designating listed species' critical habitat (84 FR 45020; August 27, 2019). On the same day, the Service also issued final regulations that, for species listed as

threatened species after September 26, 2019, eliminated the Service's general protective regulations automatically applying to threatened species the prohibitions that section 9 of the Act applies to endangered species (84 FR 44753; August 27, 2019).

The Act defines an ''endangered species'' as a species that is in danger of extinction throughout all or a significant portion of its range, and a ''threatened species'' as a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether any species is an endangered species or a threatened species because of any of the following factors:

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

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

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

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

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

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

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

The Act does not define the term ''foreseeable future,'' which appears in the statutory definition of ''threatened species.'' Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term ''foreseeable future'' extends only so far into the future as we can reasonably determine that both the future threats and the species' responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. ''Reliable'' does not mean ''certain''; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

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

Analytical Framework

The SSA report documents the results of our comprehensive biological review of the best scientific and commercial data regarding the status of the species, including an assessment of the potential threats to the species. The SSA report does not represent our decision on whether the species should be proposed for listing as an endangered or threatened species under the Act. However, it does provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies.

To assess Brawleys Fork crayfish viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency is the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy is the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation is the ability of the species to adapt to both near-term and long-term changes in its physical and biological environment (for example, climate conditions, pathogens). In general, species viability will increase with increases in resiliency, redundancy, and representation (Smith et al. 2018, p. 306). Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

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

The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found at FWS–R4–ES–2023–0065 on *https://www.regulations.gov.*

Summary of Biological Status and Threats

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

Species Needs

For Brawleys Fork crayfish populations to have sufficient

resiliency, the needs of individuals (cool, clean flowing water with unembedded substrate) must also be met at a large enough scale to address population and species-level needs. As described under Background above, the individual needs of Brawleys Fork crayfish are primarily a function of habitat condition and are summarized in Table 1.

TABLE 1—INDIVIDUAL NEEDS OF BRAWLEYS FORK CRAYFISH

Type of requirement	Description
Stream permanence	Permanent.
Stream order	First- to third-order streams.
Water temperature	10–23 °C (50–73 °F).
Stream flow velocity	Riffle and run habitats with moderate to fast flow.
Stream substrate	Chert gravel substrate with unconsolidated pieces of cobble and gravel.
Embeddedness	Low embeddedness so that food and refugia under rocks and in crevices remain accessible.
Refugia	Cavities and burrows within gravel.
Diet	Likely smaller invertebrates, periphyton, and/or plant detritus (specific diet unknown).

Brawleys Fork crayfish populations need the same key habitat-based resources as individuals to maintain sufficient resiliency (table 1), as well as a sustainable population size and connectivity within and among populations. Populations also need relatively stable conditions within the stream ecosystem each year, especially during the spring when females are ovigerous, to maintain successful reproduction and recruitment. Connectivity among populations is necessary to avoid the effects of genetic isolation, promote genetic diversity, and facilitate gene flow via emigration, immigration, and reproduction. For Brawleys Fork crayfish, maintaining gene flow within and among populations is facilitated by corridors of suitable habitat for movement of individuals throughout the stream network, including road crossings that are designed to easily pass aquatic organisms at a range of streamflow conditions. The species may move between areas of suitable habitat within and among connected streams in response to behavioral drivers (dispersal or mating) or in search of suitable habitat in response to environmental drivers when species' needs are no longer met in previously suitable habitat (reduced prey, unavailable shelter or refugia, inadequate conditions for breeding).

For species viability to be sufficient, there must be adequate redundancy (suitable number of populations, distribution of populations, and connectivity between populations to allow the species to withstand catastrophic events) and representation (suitable genetic and environmental diversity to allow the species to adapt to changing environmental conditions). Redundancy improves with more sufficiently resilient, connected populations to allow recovery after catastrophic events. Representation or adaptive capacity is maintained with genetic and ecological diversity within and among populations.

Threats

We identified sedimentation, water quality degradation, and instream modification as the primary threats currently affecting the Brawleys Fork crayfish. The impacts of these threats may be further exacerbated by the effects of small, isolated populations and the future effects of climate change. The following discussion provides a summary of the threats and stressors that are affecting or may be affecting the current and future condition of the Brawleys Fork crayfish throughout some or all of its range. A more detailed description may be found in the SSA report (Service 2023, pp. 24–38).

Sedimentation

Sedimentation of substrate and filling of interstitial spaces is the key driver affecting the Brawleys Fork crayfish's condition. Crayfish are benthic (bottom-dwelling) invertebrates that occupy stream or riverine habitats. The species requires unembedded rocks, crevices, and woody debris for access to prey, refuge from predation and competition, and cover during vulnerable periods such as molting or egg extrusion. Brawleys Fork crayfish density is strongly and positively correlated with the relative abundance of unconsolidated cobble and gravel substrates (Withers and McCoy 2005, p. 3; Rohrbach and Withers 2006, p. 3). Excessive sediment input from a variety of sources can overwhelm the capacity of the lower order stream systems where the species occurs to remove sediment (except during heavy rainfall events), resulting in sediment deposition that embeds necessary species' resources (*e.g.,* food, shelter, refugia) and negatively impacts Brawleys Fork crayfish individuals and populations (Withers and McCoy 2005, p. 5; Rohrbach and Withers 2006, p. 8). Sedimentation is also related to water quality as sediment may carry pollutants into the stream and cloud the water with suspended solids, reducing light availability and causing aquatic plants to die.

In the Brawleys Fork crayfish range, the sources of sedimentation that have affected or are affecting the species and its habitat as a result of current and historical surrounding land uses include agriculture and horticulture practices, stream impoundment, and urbanization and development. These stressors are present rangewide and impact the viability of Brawleys Fork crayfish at a species level, but the sources are more concentrated in some areas and may affect some individuals and populations to a greater extent (*e.g.,* increased urbanization in the West Fork Stones watershed).

Agriculture and horticulture occur rangewide on the relatively flat terrain of the Eastern Highland Rim and Nashville Basin regions where the species occurs, particularly lands in row crops, hay/pasture, livestock grazing, and plant nurseries. Agricultural and horticultural practices that do not implement best management practices (BMPs) or improperly implement BMPs influence Brawleys Fork crayfish viability by contributing to sedimentation within nearby streams. Practices that contribute to sedimentation include harvest techniques that expose bare soil and use of heavy machinery that disturbs soil composition and breaks down sediments into fine particles (Burskey and Simon 2009, p. 207). Heavy machinery entering the stream channel via the stream bank contributes sediment and modifies the channel structure (Schmidt 1982, p. 39).

Stream impoundment results in decreased flow velocity and fine sediment accumulation leading to

subsequent substrate embeddedness, decreased woody debris availability, more severely entrenched stream channels, and increased water temperature (Arnwine et al. 2006, p. 3; Adams 2013, p. 1328; Barnett and Adams 2021, p. 3; Williams 2021, pers. comm.). In the Brawleys Fork crayfish's range, impounded streams demonstrated a lower percentage of dominant cobble substrate compared to unimpounded streams, and, statewide, 80 percent of impoundments failed to meet regional habitat quality expectations as a result of sediment deposition below small dams (Arnwine et al. 2006, pp. 3, 62). However, the percentage of small impoundments (less than 250 acres) within the Brawleys Fork crayfish's range is relatively low in comparison to other watersheds in Tennessee (0.6 and 1.7 percent in the Stones and Collins watersheds, respectively) (Arnwine et al. 2006, pp. 9–14). Small impoundments are associated with large plots of residential development in this region, and we expect the impact of this threat may increase in the future as projected future residential development increases, particularly in the East and West Fork Stones River watersheds (Withers and McCoy 2005, p. 5; Rohrbach and Withers 2006, p. 8).

Urbanization, commercial and residential development, and associated infrastructure and road construction have affected Brawleys Fork crayfish and its habitat in the past and are expected to continue to affect the species. In the Brawleys Fork crayfish's range, the human population increased as much as 122 percent from 1990 to 2010 and an additional 32 percent from 2010 to 2020 (World Population Review 2021). In the future, urbanization in the Southeast is projected to increase up to 192 percent by 2060. In addition, the greatest change in land use associated with urbanization and development is expected to be the conversion of agricultural land into urban land use (Terando et al. 2014, p. 5). Because Brawleys Fork crayfish occurs in a region of heavy agricultural land use, the threat of land conversion as a result of urbanization and development is expected to affect the species to a greater extent in the future as urbanization increases. Streams in the Southeast experience significant impacts to water quality when urban land use reaches 10–14 percent of the catchment or drainage area (Suttles et al. 2018, p. 813). One watershed with Brawleys Fork crayfish occurrences now has greater than 10 percent of its area in urban land use (West Fork Stones River).

Urbanization and development can alter water quality and hydrology in a number of ways. An increase in impervious surfaces associated with urban land use directly results in a higher volume and velocity of stormwater runoff, scouring of streambeds and stream banks, increased water temperatures, and increased sediment and pollutants discharged into receiving streams. The effects of sedimentation and other pollutants on water quality and the Brawleys Fork crayfish as a result of a variety of stressors are described under *Sedimentation* below. Brawleys Fork crayfish requires cool, clean water, and the increased water quantity and pollutants associated with increased urbanization negatively impact habitat conditions. Temperature tolerances of the Brawleys Fork crayfish are unknown. However, life stage development of several aquatic organisms, including crayfish, is temperature-dependent and an increase in water temperature could result in changes to growth rates, reproduction, and overall survival (Poff et al. 2002, p. 7). In addition, a higher rate of microbial activity is associated with warmer water temperatures, leading to an increased rate of organic material decomposition and nutrient loading within streams (Poff et al. 2002, p. 7). Although we do not have temperature information for all streams with Brawley's crayfish occurrences, we expect that increased water temperature associated with urbanization and other stressors negatively impacts the species (Lockaby et al. 2013, p. 333).

Water Quality

Suitable water quality is a requirement for the Brawleys Fork crayfish. Although little is known regarding the Brawleys Fork crayfish's specific water quality requirements, water quality parameters such as water temperature, nutrient load, pH, and conductivity are significant factors influencing several biological processes of crayfish including osmoregulation, immunology, acid/base regulation, gas exchange, reproduction, molting, growth rate, and behavior (Romano and Zeng 2013, p. 17; Schorr et al. 2013, p. 340). In the Brawleys Fork crayfish's range, agriculture and horticultural practices, urbanization, and wastewater treatment outfall negatively affect the species and its habitat through changes to water quality.

Agricultural and horticultural practices influence water quality by means of stormwater runoff that transports chemicals (pesticides, fungicides, and herbicides) and nutrients (fertilizers and livestock waste) into nearby streams. In areas with no BMPs or improperly implemented BMPs, stormwater runoff from agricultural fields during planting season (spring and early summer) is the most significant source of water quality contamination. Several stream reaches with Brawleys Fork crayfish occurrences may be exposed to contaminants on an ongoing basis. For example, horticultural lands surrounding occurrences in Mountain Creek receive pesticide, fungicide, and fertilizer applications, and these chemicals enter the adjacent stream (Mattingly et al. 2021, entire; Mattingly 2021, pers. comm.). Pesticides can cause deleterious effects on crayfish behavior, increasing risk of predation (Sohn et al. 2018, pp. 900, 905).

Stormwater runoff from agricultural and horticultural practices also contributes to increased nutrient (nitrogen and phosphate) loads within nearby streams through fertilizers and livestock waste transported into the streams. Nitrogen loading has deleterious effects on molting, respiration, disease resistance, and disruption of reproductive behaviors in crustaceans, and we expect similar effects to Brawleys Fork crayfish fitness and reproductive success (Romano and Zeng 2013, p. 17; Schorr et al. 2013, p. 340). In addition, slower areas of stream habitat between occupied riffles and runs may become stagnant and oxygen depleted as a result of livestock waste discharged into the stream (Rorhbach and Withers 2006, p. 8; Withers and McCoy 2005, p. 5).

Urbanization and development influence Brawleys Fork crayfish through effects to water quality as described under *Sedimentation* above. The increased impervious surface associated with urbanization results in higher flow, higher velocity, increased transport of contaminants, and warmer water temperatures that negatively impact Brawleys Fork crayfish through habitat degradation.

Historically, the Woodbury wastewater treatment plant has contributed to increased nutrient loads in the East Fork Stones River with negative impacts including fish kills and decreased benthic macroinvertebrate communities (indication of water quality and ecosystem function) (Schmidt 1982, pp. 26, 30, 49–50). The effects of excessive nutrients and nutrient loading on crustaceans are described above. More recently, the treatment plant was out of compliance or not complete and/or

stable in 4 of 13 inspections from 2007 to 2022, primarily due to issues with sampling. Spring overflows with discharges outside of the National Permit Discharge Elimination System limits have occurred in recent years as well.

Instream Modification

Stream modification and impoundment influences Brawleys Fork crayfish and its habitat through altered stream depth and flow, sedimentation, and water quality degradation. Stream channel modification has occurred and continues to occur in the Brawleys Fork crayfish range. Reaches of Mountain Creek, East Fork Stones River, and Hollis Creek with Brawleys Fork crayfish occurrences have experienced significant disturbance and modification including heavy machinery directly entering the stream channel to dredge gravel, modify stream banks, and alter the stream channel (Mattingly et al. 2021, entire; Mattingly 2021, pers. comm.). For headwater species with specific habitat needs such as Brawleys Fork crayfish, even small alterations to the channel, flow, and substrate may affect individuals or populations. In Mountain Creek, small rock dams resulted in local alteration of flows, depths, and siltation of substrate particles, negatively impacting Brawleys Fork crayfish (Mattingly 2021, pers. comm.).

In addition to the effects of sedimentation described above, stream impoundment also results in changes to stream depth, flow, and water temperature that may influence Brawleys Fork crayfish resiliency. Upstream of impoundments, stream flows are slower, stream channels are wider, and water temperatures are higher. Downstream, flows are decreased. Thus, crayfish assemblages are altered both upstream and downstream of impoundments in affected stream reaches (Arnwine et al. 2006, p. 152; Hartfield 2010, pp. 25, 43; Adams 2013, pp. 1325, 1328; Barnett and Adams 2021, pp. 2, 4). The changes associated with impoundments degrade the habitat conditions required by Brawleys Fork crayfish including changes from cool, clean water with moderate to fast flow in riffles and runs to slower, warmer water with increased sedimentation and pollutants.

Climate Change

Climate change is projected to result in changes to precipitation and temperature in the range of Brawleys Fork crayfish in the future (Nissenbaum 2016, pp. 6–7). We used a downscaled model of projected climate change and changes to the frequency and severity of drought and extreme weather events (*e.g.,* flooding) to assess the effect of climate change on the Brawleys Fork crayfish and its habitat (Nissenbaum 2016, entire).

The range of Brawleys Fork crayfish experienced above-average annual rainfall in the period 2010–2020 (Climate Explorer 2021). An increase in the frequency, duration, and severity of rain events will result in heavier stormwater runoff transporting larger loads of sediment, pollutants, and nutrients into streams and will also modify stream channels and substrate composition through flooding (Poff et al. 2002, p. 12; Lockaby et al. 2013, p. 310). These changes may negatively influence the Brawleys Fork crayfish through the effects associated with increased sedimentation and degraded water quality as described above.

Since the 1970s, moderate to severe droughts in the Southeast have increased by 12 to 14 percent during spring and summer months and this trend is projected to continue or increase (Jones et al. 2015, p. 126; Nissenbaum 2016, p. 6). An increase in the frequency and severity of droughts could result in shallower or dry headwater streams due to increased evapotranspiration if this loss is not counteracted by rainfall and groundwater recharge (Lockaby et al. 2013, p. 310). We expect decreased stream flow and reduced habitat availability to reduce the availability of food, shelter, or refugia sites as well as increase predation and competition for these resources. However, Brawleys Fork crayfish exhibits an adaptive strategy during dry periods by burrowing deeper into the streambed, thereby accessing subterranean water, likely providing some resiliency to drought conditions (Simmons 2021, pers. comm.; Williams 2021, pers. comm.). In addition to effects to flow, warmer water temperatures, particularly in lower order streams, may influence Brawleys Fork crayfish growth and reproduction as described under *Water Quality* above. The best available information does not indicate that the effects of climate change are currently impacting Brawleys Fork crayfish, but increased drought conditions and the frequency of extreme weather events, including increased frequency, severity, and duration of precipitation, are projected to increase in the future. Accordingly, the impact of climate change on Brawleys Fork crayfish viability may increase in the future.

Small, Isolated Populations

The Brawleys Fork crayfish is a narrow endemic species with a limited range and fragmented distribution. These species' characteristics coupled with small population size (low abundance of less than 1 crayfish/100 meters or less than 1 crayfish/person hour) in 8 of 20 streams with Brawleys Fork crayfish occurrences may exacerbate the impact of other threats described above (Service 2023, appendix A). Small, isolated populations may have reduced genetic diversity as a result of inbreeding, resulting in lower levels of population resiliency and species' representation (Frankham 1995, p. 309; Frankham 2005, pp. 132–135; Johansen 2018, p. 38; Grubb 2019, p. 29). Although the effects of small, isolated populations may exacerbate other threats, the best available information indicates that the threat of small, isolated populations is not currently influencing Brawleys Fork crayfish viability alone.

Conservation Efforts and Regulatory Mechanisms

State Protections

Brawleys Fork crayfish is listed as endangered by the State of Tennessee and receives some protections under the provisions of the State wildlife code (Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974 (Tennessee Code Annotated, Section 70–8–101–112)), which states that it is unlawful for any person to take, attempt to take, possess, transport, export, process, sell or offer for sale, or ship nongame wildlife, or for any common or contract carrier knowingly to transport or receive for shipment nongame wildlife. Brawleys Fork crayfish is considered a Species of Greatest Conservation Need (SGCN) in Tennessee's State Wildlife Action Plan (TN–SWAP 2015, appendix C, p. 255). Key goals of TN–SWAP are to develop and implement conservation strategies and prioritize funding for conservation projects to protect SGCN species and their habitats, although specific actions for Brawleys Fork crayfish have not been implemented. The protections for the Brawleys Fork crayfish in Tennessee do not prohibit the species' habitat from destruction, modification, or alteration.

In addition to State protections, the Brawleys Fork crayfish receives some habitat protection through the Clean Water Act of 1972 (33 U.S.C. 1251). Section 404 of the Clean Water Act requires a Department of the Army permit to discharge dredge or fill material in ''waters of the United

States'' that includes most streams where Brawleys Fork crayfish occurs. Before acquiring a permit, the requester must first show that steps have been taken to avoid impacts to wetlands, streams, and other aquatic resources, such as Brawleys Fork crayfish; that potential impacts have been minimized; and that compensation will be provided for all remaining unavoidable impacts. State-level regulation of water quality occurs through the Tennessee Department of Environment and Conservation (TDEC), whereby laws such as Tennessee's Water Quality Control Act of 1977 (T.C.A. 69–3–101) are enforced. TDEC personnel also monitor water quality in surface waters throughout the State, including watersheds within the Brawleys Fork crayfish's range.

Cumulative Threats

Due to the complexity of freshwater ecosystems, any single factor influencing Brawleys Fork crayfish viability often impacts the species in a variety of ways. The interconnectedness of these influences and their ecological impacts create synergistic and cumulative effects on Brawleys Fork crayfish viability. For example, conversion of forested land to agricultural use may be associated with subsequent stream impoundment to create small reservoirs for livestock or crop irrigation. The effects of climate change (warmer temperatures and more frequent and/or severe drought) could lead to decreased water availability. As a result, water withdrawal from nearby streams would increase to support crop irrigation demands. Additionally, urbanization can exacerbate drought conditions in streams by channeling stormwater runoff from impervious surfaces into ditches and drains that flow into sewer lines and/or larger-order streams, bypassing headwater streams and decreasing the amount of water available for groundwater recharge to headwater streams. Without adequate groundwater recharge, lower-order streams including those with Brawleys Fork crayfish occurrence are susceptible to going dry during severe droughts. Reduced groundwater recharge would also impact Brawleys Fork crayfish by decreasing the availability of subterranean water, which the species uses as refuge during periods of drought. Climate change and the effects of small, isolated populations may exacerbate the effects of other threats, including cumulative threats.

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

Current Condition

For the purposes of the Brawleys Fork crayfish SSA, we delineated five analysis units (AUs) using available spatial occurrence data (1955–2021) obtained from State agency survey reports and data (Tennessee Wildlife Resources Agency (TWRA), TDEC), federally owned corporation data (Tennessee Valley Authority), an interim research report (Tennessee Tech University), peer-reviewed literature, and other surveys (Bouchard and Bouchard 1995; Withers and McCoy 2005; Rohrbach and Withers 2006; Giddens and Mattingly 2020). We evaluated the current viability of Brawleys Fork crayfish using the conservation biology principles of population resiliency, and species' redundancy and representation.

Based on Brawleys Fork crayfish survey information and species' needs (*e.g.,* the availability of unembedded chert gravel and cobble substrate within areas of fast to moderate flow, adequate water quality, sufficient population size, and connectivity to support reproduction and recruitment), we developed an approach using key habitat and demographic parameters to assess population resiliency. These included three habitat condition parameters (percent riparian canopy cover, percent agricultural and/or urban development, and drought) and three demographic condition parameters (extent, abundance, and age class distribution). We developed four condition categories for each parameter ranging from high to very low condition. Descriptions of the parameters included in our resiliency assessment are summarized individually below (Service 2023, pp. 38–47). We developed a scoring framework for current resiliency that categorized each AU as either high, moderate, low, or very low resiliency based on the overall condition of assessed parameters.

Habitat Parameters

Riparian canopy cover (vegetation) regulates stream temperature, reduces sedimentation, and sequesters stormwater runoff and associated pollutants. To assess the influence of riparian vegetation on Brawleys Fork crayfish resiliency, we determined the mean percent canopy cover score within 30 meters (m) of the stream edge for each occupied stream catchment. We categorized the canopy cover condition (table 2), then averaged the catchment scores for an overall AU canopy cover score.

The extent of land use in agriculture and urban development impact Brawleys Fork crayfish current resiliency through the effects of increased sedimentation and water quality degradation. We assessed the percentage of the stream catchment in agricultural and urban land cover categories in the National Land Cover Database (NLCD 2016 Products in Dewitz 2019, entire). We developed four categories for percent agriculture and/or urban development and scored each stream catchment with Brawleys Fork crayfish occurrences, then averaged the catchment scores within each AU.

We assessed the level of drought in each AU in the Brawleys Fork crayfish range using U.S. Drought Monitor data on the severity and duration of extreme drought (category D3) and exceptional drought (category D4) from 2000 to 2020 (U.S. Drought Monitor 2021). We categorized drought experienced by Brawleys Fork crayfish AUs based on the duration of D3 or D4 category drought conditions that occurred during reproductive (March–June) and non-reproductive seasons (July–February) (table 2).

The habitat parameters of riparian canopy cover and percent agriculture and/or urban development were adjusted by –0.5 at the catchment level to account for the greater impact of the factors on first-, second- and third-order streams. Drought scores were not adjusted at the AU level. The adjusted riparian canopy cover and land cover scores and the drought parameter scores were summed for an overall habitat condition score.

TABLE 2—HABITAT PARAMETERS AND PARAMETER CONDITION CATEGORIES USED IN DETERMINING BRAWLEYS FORK CRAYFISH RESILIENCY

[Parameters were assessed at the catchment level and averaged over the analysis unit, except drought, which was assessed at the analysis unit level. D3 = extreme drought; D4 = exceptional drought.]

Habitat parameter	High (4)	Moderate (3)	Low (2)	Very low (1)
Mean percent riparian canopy cover.	Greater than 75 percent ...	50–75 percent	25–50 percent	Less than 25 percent.
Percent agriculture and urban land use.	Less than 10 percent	10–30 percent	30–50 percent	Greater than 50 percent.
Drought (D3 or D4 2000–2020).	D3 or D4 drought never exceeds 4 consecutive weeks in any season in a calendar year.	D3 or D4 drought exceeds 4 consecutive weeks in any non-reproductive season in a calendar year.	D3 or D4 drought exceeds 4 consecutive weeks during reproductive season in 1 calendar year.	D3 or D4 drought exceeds 4 consecutive weeks during reproductive season in 2 or more calendar years.

Demographic Parameters

Suitable habitat conditions and occurrence records for Brawleys Fork crayfish are patchily distributed within streams. To assess the species' distributional extent within occupied streams, we determined the proportion of stream catchments with Brawleys Fork crayfish occurrences out of the total catchments in each AU (extent) (table 3). We categorized each extent from high to very low and adjusted the score based on the level of connectivity between known occurrences (Service 2023, p. 44). The level of connectivity was determined using a dendritic network complexity model.

We used abundance estimates as an indicator of population size, an essential demographic factor influencing Brawleys Fork crayfish resiliency. For each stream occupied by Brawleys Fork crayfish, we used quantitative abundance estimates (reported as crayfish/100 m) if available, or, if no quantitative estimate was available, we used qualitative abundance estimates (reported as number of crayfish/person hour or average catch per site visit) (Withers and McCoy 2005, pp. 20–48; Rohrbach and Withers 2006, p. 18; Khan 2021, unpublished data). We developed abundance estimate categories (table 3) and averaged the occupied catchment level abundance scores to obtain an overall abundance score for each AU.

Evidence of reproduction is an indicator of a population's fitness and ability to sustain itself over time (viability). For Brawleys Fork crayfish, we used evidence of reproduction (population age class distribution) as a parameter to assess current resiliency (table 3). If age class information was not available, we assigned each stream with any abundance data a default score of one age class. We recognize that this assignment of a very low age class distribution to populations with unknown age class distribution may lead to an underestimation of the level of reproduction in that stream. We next averaged the population age class distribution scores for each stream within an AU to calculate the overall score for the AU. We then summed the (adjusted) extent, abundance, and population age class distribution scores for each AU to obtain a total demographic score for each AU. Finally, we summed the total AU habitat and total AU demographic parameter scores to obtain an overall AU resiliency condition score. Each AU was assigned an overall resiliency condition class from high to very low based on the overall resiliency score.

TABLE 3—DEMOGRAPHIC PARAMETERS AND CONDITION CATEGORIES USED TO ASSESS BRAWLEYS FORK CRAYFISH CURRENT RESILIENCY

Demographic parameter	High (4)	Moderate (3)	Low (2)	Very Low (1)
Extent	50 percent or greater	30–50 percent	10–30 percent	Less than 10 percent.
Abundance	Quantitative density greater than 20 crayfish/100 m^2; or qualitative greater than 10 crayfish/person hour or per site visit.	Quantitative density 10–20 crayfish/100 m^2; or qualitative 5–10 crayfish/person hour or per site visit.	Quantitative density 1–9 crayfish/100 m^2; or qualitative 1–4 crayfish/person hour or per site visit.	Quantitative density less than 1 crayfish/100 m^2; or qualitative less than 1 crayfish/person hour or per site visit.
Age Class Distribution	3 distinct age classes including hatchlings or juveniles.	2 distinct age classes including hatchlings or juveniles.	2 distinct age classes, but no hatchlings or juveniles.	1 age class of any type.

Of the five delineated Brawleys Fork crayfish AUs, two currently exhibit moderate resiliency (Hollis Creek–East Fork Stones River and Brawleys Fork AUs), and three exhibit low resiliency (Lower West Fork Stones River, Bullpen Creek, and Mountain Creek AUs) (figure 1). Values for habitat parameters were generally low, while most AUs have moderate or high demographic parameters (Service 2023, appendix A). Three AUs have very low extent (area of occupancy) (Lower West Fork Stones River, Bullpen Creek, and Mountain Creek AUs), contributing to a lack of connectivity within AUs.

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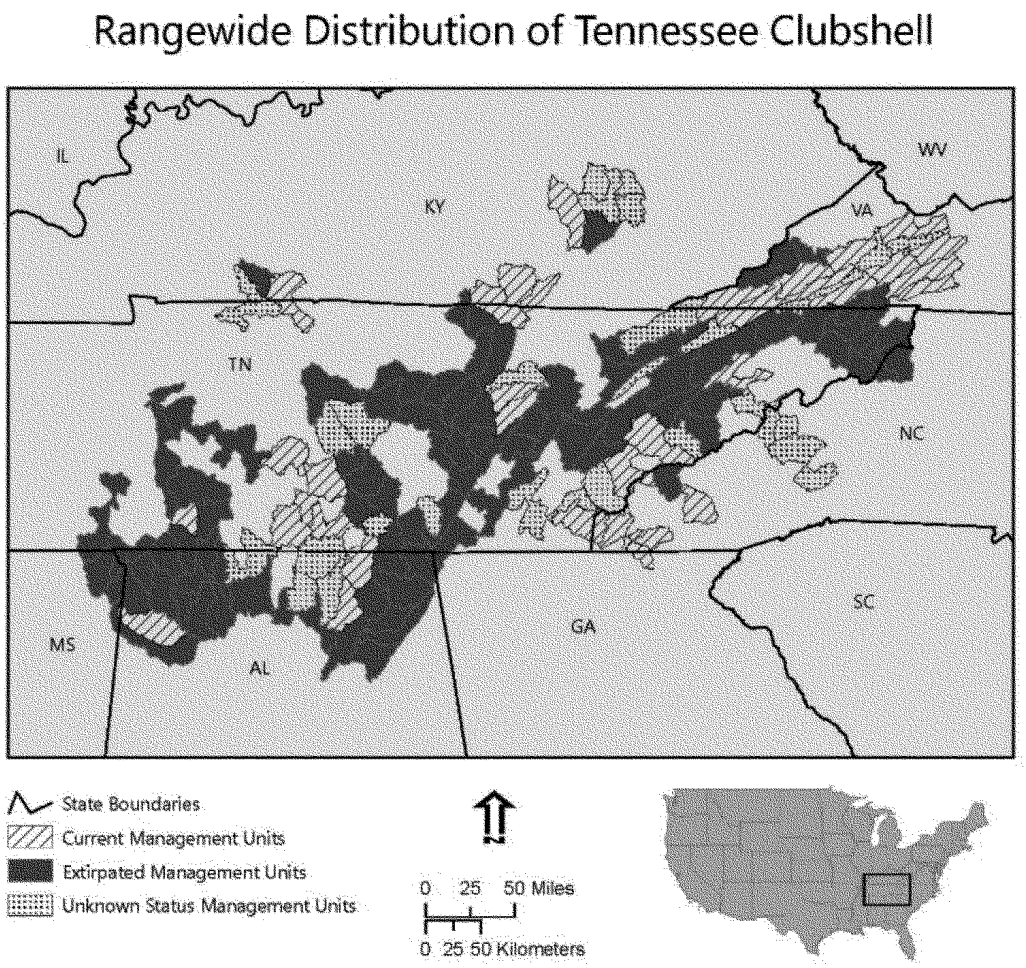

Figure 1. Tennessee clubshell range map. Management units are 10-digit hydrologic unit code (HUC) watersheds (HUC-10).

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For Brawleys Fork crayfish, we assessed redundancy by mapping the number and distribution of occupied streams across the species' geographic range. We determined that current redundancy is sufficient to support species viability with small populations patchily distributed in streams with suitable habitat across the known current range. The species occurs in a limited geographic area, although the West Fork Stones River Lower analysis unit is spatially separated from the other four analysis units, potentially providing protection against some catastrophic events. The best available information does not indicate that Brawleys Fork crayfish redundancy has decreased from historical levels as the current known range of the species is wider than the historical range (no range contraction).

Brawleys Fork crayfish has a known distribution in first- to third-order streams and a fifth-order stream in two EPA level IV ecoregions. We expect the species occurrence in a diversity of habitat conditions across ecoregions and stream types indicates inherent adaptive capacity that may allow adaption to changing biotic and abiotic conditions. We determined that Brawleys Fork crayfish current representation is moderate, and best available information indicates that the species' representation has not declined from historical levels (no range contraction).

Future Condition

To project the future condition of Brawleys Fork crayfish, we developed three plausible future scenarios with varying levels of key threats to the species. We assessed both the projected threats and the species' likely response to those threats to determine the effect on the resiliency, representation, and redundancy of Brawleys Fork crayfish in 2036 and 2051. We modeled the scenarios at these timesteps based on the average lifespan of the species (approximately 3 years), confidence in models and projections of factors influencing the species' viability, and certainty in predictions of the species' response to those factors. To assess the future condition of Brawleys Fork crayfish, we selected four key threats (urbanization, agricultural land-use change, climate change, and water withdrawal) based on the potential influence these factors have on Brawleys Fork crayfish viability. We quantitatively assessed expected levels of urbanization (SLEUTH model), land use change (cropland in the FORE–SCE model), and climate change (air temperature in USGS National Climate Change Viewer (NCCV 2021) model), and we qualitatively assessed the threat of future water withdrawals (see chapter 5 of the SSA report for additional modeling and scoring details) (Service 2023, pp. 53–57). The three scenarios considered when predicting future conditions include: (1) status quo with

lower development; (2) status quo with higher development; and (3) increased impacts (table 4) (Service 2023, pp. 57–61).

TABLE 4—DATA SOURCES AND MODELED LEVELS OF FOUR KEY DRIVERS OF SPECIES CONDITION IN EACH FUTURE SCENARIO FOR BRAWLEYS FORK CRAYFISH

Scenario	Parameters			
	Urbanization	Land use change	Climate change	Water withdrawal
Scenario 1: Status quo/ lower development.	Greater than 50 percent probability of urbanization in SLEUTH*.	FORE–SCE*; SRES B1*	USGS NCCV*; RCP 4.5*	Reduced rate of increase in withdrawal.
Scenario 2: Status quo/ higher development.	Greater than 50 percent probability of urbanization in SLEUTH.	FORE–SCE SRES B1	USGS NCCV; RCP 4.5	Current rate of increase in withdrawal.
Scenario 3: Increased impacts.	Greater than 50 percent probability of urbanization in SLEUTH.	FORE–SCE; SRES A2* ...	USGS NCCV; RCP 8.5* ...	Increased rate of increase in withdrawal.

*The three future scenarios include the following models or data sources: the SLEUTH model (slope, land use, excluded area, urban area, transportation, hillside area) to predict the probability of urbanization (Chaudhuri and Clarke 2013, pp. 1–3); the United States Geological Survey (USGS) Earth Resources Observation and Science Center FOREcasting SCEnarios (FORE–SCE) to model projections of land use change under two different Special Report on Emission Scenarios (SRES), similar to what is assumed under the two future climate scenarios with varying levels of CO_2 concentration known as representative concentration pathways RCP4.5 and RCP8.5 (Nakicenovic et al. 2000, entire; Sohl et al. 2014, entire); and, the USGS National Climate Change Viewer to model projections of future air temperatures and precipitation in the species' range.

Overall, our analysis projected declines in Brawleys Fork crayfish future resiliency, representation, and redundancy with the magnitude of decline increasing with increased impacts and longer timesteps (table 5). At the 15-year timestep, resiliency is projected to decline in 3 AUs under scenarios 1 and 2. At the 15-year timestep, resiliency is projected to decline in 4 AUs under scenario 3. At the 30-year timestep, resiliency is projected to decline in 3 AUs under scenario 1. Resiliency is projected to decline in 4 AUs under scenario 2, and resiliency is projected to decline in 5 AUs under scenario 3.

Two AUs are projected to maintain current low resiliency under some scenarios: Bullpen Creek is projected to maintain low resiliency at 15 years under scenarios 1 and 2, and Mountain Creek is projected to maintain low resiliency for 15 years under all scenarios and for 30 years under scenarios 1 and 2 (table 5). No AUs are estimated to maintain moderate resiliency in 15 or 30 years under the three future condition scenarios. Our analysis did not project the extirpation of any AUs under any scenario; however, at least one AU is predicted to exhibit very low resiliency in all scenarios, and all AUs are predicted to exhibit very low resiliency in 2051 under scenario 3 (increased impacts).

Redundancy is expected to decline in the future as a function of loss of resiliency in AUs, although no AUs are projected to be extirpated and the distribution of the species across the range is projected to remain at the current level. Representation is expected to decline slightly from current levels in both future timesteps as populations (not AUs) are extirpated and habitat fragmentation reduces inherent adaptive capacity in Brawleys Fork crayfish due to decreases in connectivity and gene flow.

TABLE 5—FUTURE RESILIENCY OF BRAWLEYS FORK CRAYFISH ANALYSIS UNITS UNDER THREE PLAUSIBLE FUTURE SCENARIOS AT 15- AND 30-YEAR TIMESTEPS

Analysis unit (HUC 12*)	Current resiliency class	Scenario 1		Scenario 2		Scenario 3	
		2036	2051	2036	2051	2036	2051
Hollis Creek–East Fork Stones River.	Moderate	Low	Low	Low	Low	Low	Very Low.
Brawleys Fork	Moderate	Low	Low	Low	Low	Low	Very Low.
Lower West Fork Stones River	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low.
Bullpen Creek	Low	Low	Low	Low	Very Low	Very Low	Very Low.
Mountain Creek	Low	Low	Low	Low	Low	Low	Very Low.

*Hydrologic Unit Code.

Determination of Brawleys Fork Crayfish Status

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

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of

the threats under the Act's section 4(a)(1) factors, we determined the following threats are acting as the primary drivers of Brawleys Fork crayfish viability and are ongoing: habitat loss and degradation (Factor A) due to sedimentation and water quality degradation from sources including agricultural practices, horticultural practices, and urbanization; and instream modification including impoundments, gravel dredging, and channel alteration. The impacts of these threats may be further exacerbated by the effects of small, isolated populations (Factor E) and the future effects of climate change (Factor E).

Brawleys Fork crayfish is known to occur in 20 streams in 5 central Tennessee HUC12 watersheds and is distributed across the current range of the species, which represents an expansion of the known historical range. Available information does not indicate population-level extirpations or evidence of range contraction for the species. Of the five delineated analysis units (HUC12 watersheds), two currently exhibit moderate resiliency and three low resiliency. Although Brawleys Fork crayfish is impacted by past and ongoing threats of sedimentation, water quality degradation, and instream modifications, the species currently exhibits sufficient population-level resiliency and species-level representation and redundancy to withstand stochastic and catastrophic events and has inherent capacity to adapt to environmental change. Accordingly, we conclude that the Brawleys Fork crayfish is not in danger of extinction throughout its range.

Upon determining that the Brawleys Fork crayfish is not in danger of extinction throughout its range, we consider whether it is likely to become an endangered species in the foreseeable future throughout its range. Our analysis of the species' future condition under future scenarios at two timesteps encompasses the best available information for future projections of modeled parameters under a range of plausible threat levels. We selected these time steps based on the Brawleys Fork crayfish's lifespan of approximately 3 years and the reliability of the data and models used in the future threat projections and analysis. We determined we can reliably predict both the future threats and the species' responses to those threats within a 30-year timeframe (*i.e.,* the foreseeable future). However, after that time period, we have less confidence in projections.

We found that impacts from habitat loss and degradation present the most substantial threat to the Brawleys Fork crayfish viability. As described above, the threats currently acting on the species include sedimentation, water quality degradation, and instream modifications, all of which may be exacerbated by the effects of climate change and small, isolated populations. In the foreseeable future, we anticipate that threats associated with urbanization, land use change, and climate change will continue to increase in magnitude and will have the greatest influence on species' viability. We also considered the effects of instream impoundments, water withdrawals, and small, isolated populations, including cumulative effects. The best available information indicates that the threats and stressors currently acting on the Brawleys Fork crayfish are expected to continue into the foreseeable future, some of which (*e.g.,* urbanization, land use change (agriculture and horticulture), and climate change) are reasonably expected to worsen over time.

Our assessment of plausible future scenarios projects declines in resiliency, representation, and redundancy in the future as a result of ongoing threats of habitat loss and degradation. However, no extirpations of AUs are projected. In our future condition analysis, no moderate resiliency populations are projected and all 5 Brawleys Fork crayfish AUs are projected to exhibit low or very low resiliency in the three plausible future scenarios. Representation and redundancy are also projected to be reduced from current levels in the future as a result of declining resiliency, extirpations of individual populations within AUs, and loss of connectivity. Thus, after assessing the best available information, we conclude that the Brawleys Fork crayfish is not currently in danger of extinction but is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. The court in *Center for Biological Diversity* v. *Everson,* 435 F. Supp. 3d 69 (D.D.C. 2020) (*Everson*), vacated the provision of the Final Policy on Interpretation of the Phrase ''Significant Portion of Its Range'' in the Endangered Species Act's Definitions of ''Endangered Species'' and ''Threatened Species'' (hereafter ''Final Policy''; 79 FR 37578, July 1, 2014) that provided if the Services determine that a species is threatened throughout all of its range, the Services will not analyze whether the species is endangered in a significant portion of its range.

Therefore, we proceed to evaluating whether the species is endangered in a significant portion of its range—that is, whether there is any portion of the species' range for which both (1) the portion is significant and (2) the species is in danger of extinction in that portion. Depending on the case, it might be more efficient for us to address the ''significance'' question or the ''status'' question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

Following the court's holding in *Everson,* we now consider whether there are any significant portions of the species' range where the species is in danger of extinction now (*i.e.,* endangered). In undertaking this analysis for Brawleys Fork crayfish, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify portions of the range where the species may be endangered.

We evaluated the range of the Brawleys Fork crayfish to determine if the species is in danger of extinction now in any portion of its range. The range of a species can theoretically be divided into portions in an infinite number of ways. We focused our analysis on portions of the species' range that may meet the definition of an endangered species. For Brawleys Fork crayfish, we considered whether the threats or their effects on the species are greater in any biologically meaningful portion of the species' range than in other portions such that the species is in danger of extinction now in that portion.

We examined the following threats: sedimentation and water quality degradation from sources including agricultural/horticultural practices and urbanization; and instream modification including impoundments, gravel dredging, and channel alteration, including cumulative effects. We also considered the effects of climate change, small and isolated populations, and conservation efforts and regulatory mechanisms. These stressors are present rangewide, and threats influence Brawleys Fork crayfish viability rangewide, but the sources are more

concentrated in some areas and may affect some individuals and populations to a greater extent (*e.g.,* increased urbanization in the West Fork Stones watershed). We identified three AUs where the impact of these threats may have a more pronounced effect such that the species may have a different status in those AUs than the remainder of the range. The portions we considered are the geographic areas described as the West Fork Stones River, Bullpen Creek, and Mountain Creek AUs (HUC 12 watersheds) in the SSA report (Service 2023).

As described in *Status Throughout All of Its* Range, the threats of sedimentation, water quality degradation, and instream modifications have impacted the Brawleys Fork crayfish's viability through habitat loss and degradation. Although threats are similar throughout the range of the species, the threats associated with increased urbanization and development are greater in the West Fork Stones River unit. In addition, this unit does not have connectivity to any other watershed with Brawleys Fork crayfish occurrences and is geographically distanced from other occupied streams. The West Fork Stones River unit currently exhibits low resiliency, and resiliency is projected to decline in this unit under our future condition scenarios. Given the current and ongoing threats, including urbanization, and the species' current and future condition within this unit, we have identified the West Fork Stones River AU as an area that may have a different status than the remainder of the range.

We also considered the Bullpen Creek and Mountain Creek AUs as areas that may require further analysis. The best available historical information indicated that the Brawleys Fork crayfish has occurred and continues to occur with low abundance at limited sites within Bullpen Creek and Mountain Creek. In addition, although threats are similar throughout the range of the species, the species' response to threats may be more pronounced in the Bullpen Creek and Mountain Creek AUs. Due to low current resiliency, threats are having a greater impact in the Bullpen Creek and Mountain Creek AUs. The two AUs exhibit low current resiliency driven primarily by low extent of occupancy (few sites known within the streams), and resiliency is projected to decline in the two AUs in future scenarios. Given the current and ongoing threats and the species' current and future condition within this unit, we have identified the Bullpen Creek and Mountain Creek AUs as areas that may have a different status than the remainder of the range.

We then proceeded to the significance question, asking whether these portions of the range (West Fork Stones River, Bullpen Creek, or Mountain Creek AU) are significant. The Service's most recent definition of ''significant'' within agency policy guidance has been invalidated by court order (see *Desert Survivors* v. *U.S. Department of the Interior,* 321 F. Supp. 3d 1011, 1070–74 (N.D. Cal. 2018)). In undertaking this analysis for the range of the Brawleys Fork crayfish, we considered whether any of the three portions of the range identified are significant based on the biological importance to the overall viability of the Brawleys Fork crayfish. Therefore, for the purposes of this analysis, when considering whether this portion is significant, we considered whether the portion may (1) occur in a unique habitat or ecoregion for the species, (2) contain high-quality or high-value habitat relative to the remaining portions of the range, for the species' continued viability in light of the existing threats, (3) contain habitat that is essential to a specific life-history function for the species and that is not found in the other portions of the range, or (4) contain a large geographic portion of the suitable habitat relative to the remaining portions of the range.

Although every unit provides some contribution to a species' viability, the West Fork Stones River AU comprises a small geographic portion of the range with low-quality habitat. This unit may offer some value to representation as the West Fork Stones River is the only fifth-order stream with Brawleys Fork crayfish occurrences and provides somewhat different habitat conditions (*e.g.,* a larger, perennial stream that does not go dry seasonally) and may offer a refugia in extreme drought. However, the habitat does not support high abundance or high-quality habitat. Brawleys Fork crayfish occurrences are known only from the Lower West Fork Stones River in this AU with a low extent of occupancy compared to the two moderate-resiliency units (4.3 percent of stream catchments in the unit have occurrence records) (Service 2023, appendix A). Overall, there is little evidence to suggest that the geographical area of the West Fork Stones River unit has higher quality or higher value habitat or provides any unique resource to the species life history. Thus, based on the best available information, we find that this portion of the range is not biologically significant in terms of the habitat considerations discussed above.

Although every unit provides some contribution to a species' viability, the Bullpen Creek and Mountain Creek AUs comprise a small percentage of the known Brawleys Fork crayfish sites and abundance. The habitat in the Bullpen Creek and Mountain Creek AUs does not support high abundance or represent high-quality habitat. Brawleys Fork crayfish occurrences are known from only one site in each AU resulting in a low extent of occupancy compared to the two moderate-resiliency units. In Bullpen Creek AU, 1.4 percent of stream catchments in the unit have known occurrences, and, in Mountain Creek AU, 3.8 percent of stream catchments have known occurrences (Service 2023, appendix A). Overall, there is little evidence to suggest that the geographical areas of the Bullpen Creek or Mountain Creek AU have higher quality or higher value habitat or provide any unique resource to the species life history. Thus, based on the best available information, we find that the portions of the range represented by the Bullpen Creek and Mountain Creek AU are not biologically significant in terms of the habitat considerations discussed above.

In addition, we considered the three AUs (West Fork Stones River, Bullpen Creek, and Mountain Creek) as one portion that may have a different status in order to assess the potential significance as one geographic area. In total, the three units represent approximately 9.5 percent of occupied catchments in the species' range. The units do not provide high-value or unique habitat for the species, as described above. Thus, based on the best available information, we find that the portion of the range represented by the West Fork Stones River, Bullpen Creek, and Mountain Creek AUs is not biologically significant in terms of the habitat considerations and occupancy described above.

We found no biologically meaningful portion of the Brawleys Fork crayfish's range where the species may have a different status than the species rangewide and the portion is significant. Therefore, no portion of the species' range provides a basis for determining that the species is in danger of extinction in a significant portion of its range, and we determine that the species is likely to become in danger of extinction within the foreseeable future throughout all of its range. This does not conflict with the courts' holdings in *Desert Survivors* v. *U.S. Department of the Interior,* 321 F. Supp. 3d 1011, 1070–74 (N.D. Cal. 2018) and *Center for Biological Diversity* v. *Jewell,* 248 F. Supp. 3d 946, 959 (D. Ariz. 2017)

because, in reaching this conclusion, we did not apply the aspects of the Final Policy, including the definition of ''significant'' that those court decisions held to be invalid.

Determination of Status

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

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition as a listed species, planning and implementation of recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies, including the Service, 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. Section 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

The recovery planning process begins with development of a recovery outline made available to the public soon after a final listing determination. The recovery outline guides the immediate implementation of urgent recovery actions while a recovery plan is being developed. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) may be established to develop and implement recovery plans. The recovery planning process involves the identification of actions that are necessary to halt and reverse the species' decline by addressing the threats to its survival and recovery. The recovery plan identifies recovery criteria for review of when a species may be ready for reclassification from endangered to threatened (''downlisting'') or removal from protected status (''delisting''), and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery outline, draft recovery plan, final recovery plan, and any revisions will be available on our website as they are completed (*https://www.fws.gov/program/recovery/recovery-plans*), or from our Tennessee Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

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

If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of Tennessee would be eligible for Federal funds to implement management actions that promote the protection or recovery of the Brawleys Fork crayfish. Information on our grant programs that are available to aid species recovery can be found at: *https://www.fws.gov/service/financial-assistance.*

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

Section 7 of the Act pertains to interagency cooperation and mandates all Federal action agencies to use their existing authorities to further the conservation purposes of the Act and to ensure that their actions are not likely to jeopardize the continued existence of listed species or adversely modify critical habitat. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402.

Section 7(a)(2) states that each Federal action agency shall, in consultation with the Secretary, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Each Federal agency shall review its action at the earliest possible time to determine whether it may affect listed species or critical habitat. If a determination is made that the action may affect listed species or critical habitat, formal consultation is required (50 CFR 402.14(a)), unless the Service concurs in writing that the action is not likely to adversely affect listed species or critical habitat. At the end of a formal consultation, the Service issues a biological opinion, containing its determination of whether the Federal action is likely to result in jeopardy or adverse modification.

In contrast, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that *is likely* to jeopardize the continued existence of a species proposed to be listed under the Act or result in destruction or adverse modification of critical habitat proposed to be designated for such species. Although the conference procedures are required only when an action is likely to result in jeopardy or adverse modification, action agencies may voluntarily confer with the Service on actions that may affect species proposed for listing or critical habitat proposed to be designated. In the event that the subject species is listed or the relevant critical habitat is designated, a conference opinion may be adopted as a biological opinion and serve as compliance with section 7(a)(2).

Examples of discretionary actions for the Brawleys Fork crayfish that may be subject to the conference and consultation procedures under section 7 are land management or other landscape-altering activities on Federal lands administered by the U.S. Army Corps of Engineers (USACE) as well as actions on State, Tribal, local, or private lands that require a Federal permit

(such as a permit from USACE under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat—and actions on State, Tribal, local, or private lands that are not federally funded, authorized, or carried out by a Federal agency—do not require section 7 consultation. Federal agencies should coordinate with the local Service Field Office (see **FOR FURTHER INFORMATION CONTACT**) with any specific questions on section 7 consultation and conference requirements.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the extent known at the time a species is listed, specific activities that will not be considered likely to result in a violation of section 9 of the Act. To the extent possible, activities that will be considered likely to result in a violation will also be identified in as specific a manner as possible. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. Although most of the prohibitions in section 9 of the Act apply to endangered species, sections 9(a)(1)(G) and 9(a)(2)(E) prohibit the violation of any regulation under section 4(d) pertaining to any threatened species of fish or wildlife, or threatened species of plant, respectively. Section 4(d) of the Act directs the Secretary to promulgate protective regulations that are necessary and advisable for the conservation of threatened species. As a result, we interpret our policy to mean that, when we list a species as a threatened species, to the extent possible, we identify activities that will or will not be considered likely to result in violation of the protective regulations under section 4(d) for that species.

At this time, we are unable to identify specific activities that will or will not be considered likely to result in violation of section 9 of the Act beyond what is already clear from the descriptions of prohibitions and exceptions established by protective regulation under section 4(d) of the Act.

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

II. Proposed Rule Issued Under Section 4(d) of the Act

Background

Section 4(d) of the Act contains two sentences. The first sentence states that the Secretary shall issue such regulations as she deems necessary and advisable to provide for the conservation of species listed as threatened species. The U.S. Supreme Court has noted that statutory language similar to the language in section 4(d) of the Act authorizing the Secretary to take action that she ''deems necessary and advisable'' affords a large degree of deference to the agency (see *Webster* v. *Doe,* 486 U.S. 592, 600 (1988)). Conservation is defined in the Act to mean the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Additionally, the second sentence of section 4(d) of the Act states that the Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants. Thus, the combination of the two sentences of section 4(d) provides the Secretary with wide latitude of discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of the threatened species. The second sentence grants particularly broad discretion to the Service when adopting one or more of the prohibitions under section 9.

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have upheld, as a valid exercise of agency authority, rules developed under section 4(d) that included limited prohibitions against takings (see *Alsea Valley Alliance* v. *Lautenbacher,* 2007 WL 2344927 (D. Or. 2007); *Washington Environmental Council* v. *National Marine Fisheries Service,* 2002 WL 511479 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (see *State of Louisiana* v. *Verity,* 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history when the Act was initially enacted, ''once an animal is on the threatened list, the Secretary has an almost infinite number of options available to [her] with regard to the permitted activities for those species. [She] may, for example, permit taking, but not importation of such species, or [she] may choose to forbid both taking and importation but allow the transportation of such species'' (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

The provisions of this proposed 4(d) rule would promote conservation of the Brawleys Fork crayfish by encouraging management of the habitat for the species in ways that facilitate conservation for the species. The provisions of this proposed rule are one of many tools that we would use to promote the conservation of the Brawleys Fork crayfish. This proposed 4(d) rule would apply only if and when we make final the listing of the Brawleys Fork crayfish as a threatened species.

As mentioned previously in Available Conservation Measures, section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action that is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us.

These requirements are the same for a threatened species with a species-specific 4(d) rule. For example, a Federal agency's determination that an action is ''not likely to adversely affect'' a threatened species will require the Service's written concurrence. Similarly, a Federal agency's determination that an action is ''likely to adversely affect'' a threatened species will require formal consultation and the formulation of a biological opinion.

Provisions of the Proposed 4(d) Rule

Exercising the Secretary's authority under section 4(d) of the Act, we have developed a proposed rule that is designed to address the Brawleys Fork crayfish's conservation needs. As discussed previously in Summary of Biological Status and Threats, we have concluded that the Brawleys Fork crayfish is likely to become in danger of extinction within the foreseeable future primarily due to habitat loss and degradation due to sedimentation and water quality degradation from sources including agricultural practices, horticultural practices, and

urbanization; and instream modification including impoundments, gravel dredging, and channel alteration. Each of the threats influencing Brawleys Fork crayfish viability may be further exacerbated by the effects of small, isolated populations and the future effects of climate change.

As stated previously, section 4(d) requires the Secretary to issue such regulations as she deems necessary and advisable to provide for the conservation of each threatened species and authorizes the Secretary to include among those protective regulations any of the prohibitions that section 9(a)(1) of the Act prescribes for endangered species. We find that, if finalized, the protections, prohibitions, and exceptions in this proposed rule as a whole satisfy the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for the conservation of the Brawleys Fork crayfish.

The protective regulations we are proposing for Brawleys Fork crayfish incorporate prohibitions from section 9(a)(1) to address the threats to the species. Section 9(a)(1) prohibits the following activities for endangered wildlife: importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, carrying, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; or selling or offering for sale in interstate or foreign commerce. This protective regulation includes all of these prohibitions because the Brawleys Fork crayfish is at risk of extinction in the foreseeable future and putting these prohibitions in place will help to prevent further declines, preserve the species' remaining populations, and decrease synergistic, negative effects from other ongoing or future threats.

In particular, this proposed 4(d) rule would provide for the conservation of the Brawleys Fork crayfish by prohibiting the following activities, unless they fall within specific exceptions or are otherwise authorized or permitted: importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, carrying, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; or selling or offering for sale in interstate or foreign commerce.

Under the Act, ''take'' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have been further defined in regulations at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. Regulating take would help preserve the species' remaining populations, slow their rate of decline, and decrease synergistic, negative effects from other ongoing or future threats. Therefore, we propose to prohibit take of the Brawleys Fork crayfish, except for take resulting from those actions and activities specifically excepted by the 4(d) rule.

Exceptions to the prohibition on take would include all the general exceptions to the prohibition against take of endangered wildlife, as set forth in 50 CFR 17.21 and additional exceptions, as described below.

The proposed 4(d) rule would also provide for the conservation of the species by allowing exceptions that incentivize conservation actions or that, while they may have some minimal level of take of the Brawleys Fork crayfish, are not expected to rise to the level that would have a negative impact (*i.e.,* would have only de minimis impacts) on the species' conservation. The proposed exceptions to these prohibitions include channel restoration and bank stabilization projects, migration barrier removal projects, and transportation projects that provide fish passage (described below) and are expected to have negligible impacts to the Brawleys Fork crayfish and its habitat.

The first exception is for incidental take resulting from channel restoration projects for creation of natural, physically stable, ecologically functioning streams (or stream and wetland systems). These projects can be accomplished using a variety of methods, but the desired outcome is a natural channel with low shear stress (force of water moving against the channel); bank heights that enable reconnection to the floodplain; a reconnection of surface and groundwater systems, resulting in perennial flows in the channel; riffles and pools composed of existing soil, rock, and wood instead of large imported materials; low compaction of soils within adjacent riparian areas; and inclusion of riparian wetlands.

The second exception is for incidental take resulting from bank stabilization projects that use bioengineering methods to replace preexisting, bare, eroding stream banks with vegetated, stable stream banks, thereby reducing bank erosion and instream sedimentation and improving habitat conditions for the species. This exception includes a requirement that the bank stabilization bioengineering use methods such as native species live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), native species live fascines (live branch cuttings, usually willows, bound together into long, cigar-shaped bundles), or native species brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). This exception also includes a requirement to use native species vegetation including woody and herbaceous species appropriate for the region and habitat conditions. This exception does not apply if the bank stabilization includes the sole use of quarried rock (riprap) or the use of rock baskets or gabion structures.

The third exception is for incidental take resulting from bridge and culvert replacement/removal projects or low head dam removal projects that remove migration barriers or generally allow for improved upstream and downstream movements of Brawleys Fork crayfish while maintaining normal stream flows, preventing bed and bank erosion, and improving habitat conditions for the species.

The fourth exception is for incidental take resulting from transportation projects that provide for fish passage at stream crossings, thereby providing for connectivity and dispersal for the Brawleys Fork crayfish.

Despite these prohibitions regarding threatened species, we may under certain circumstances issue permits to carry out one or more otherwise-prohibited activities, including those described above. The regulations that govern permits for threatened wildlife state that the Director may issue a permit authorizing any activity otherwise prohibited with regard to threatened species. These include permits issued for the following purposes: for scientific purposes, to enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act (50 CFR 17.32). The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

We recognize the special and unique relationship with our State natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, and candidate species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique

position to assist us in implementing all aspects of the Act. In this regard, section 6 of the Act provides that we must cooperate to the maximum extent practicable with the States in carrying out programs authorized by the Act. Therefore, any qualified employee or agent of a State conservation agency that is a party to a cooperative agreement with us in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, would be able to conduct activities designed to conserve Brawleys Fork crayfish that may result in otherwise prohibited take without additional authorization.

Nothing in this proposed 4(d) rule would change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or our ability to enter into partnerships for the management and protection of the Brawleys Fork crayfish. However, interagency cooperation may be further streamlined through planned programmatic consultations for the species between us and other Federal agencies, where appropriate. We ask the public, particularly State agencies and other interested stakeholders that may be affected by the proposed 4(d) rule, to provide comments and suggestions regarding additional guidance and methods that we could provide or use, respectively, to streamline the implementation of this proposed 4(d) rule (see Information Requested, above).

III. Critical Habitat

Background

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

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

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

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

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

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

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

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

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) which are essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the extent known using the best scientific data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat).

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

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

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

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the

species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) the prohibitions found in the 4(d) rule. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of the species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available at the time of those planning efforts calls for a different outcome.

Physical or Biological Features Essential to the Conservation of the Species

In accordance with section 3(5)(A)(i) of the Act and regulations at 50 CFR 424.12(b), in determining which areas we will designate as critical habitat from within the geographical area occupied by the species at the time of listing, we consider the physical or biological features that are essential to the conservation of the species and which may require special management considerations or protection. The regulations at 50 CFR 424.02 define ''physical or biological features essential to the conservation of the species'' as the features that occur in specific areas and that are essential to support the life-history needs of the species, including, but not limited to, water characteristics, soil type, geological features, sites, prey, vegetation, symbiotic species, or other features.

A feature may be a single habitat characteristic or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity. For example, physical features essential to the conservation of the species might include gravel of a particular size required for spawning, alkaline soil for seed germination, protective cover for migration, or susceptibility to flooding or fire that maintains necessary early-successional habitat characteristics. Biological features might include prey species, forage grasses, specific kinds or ages of trees for roosting or nesting, symbiotic fungi, or absence of a particular level of nonnative species consistent with conservation needs of the listed species. The features may also be combinations of habitat characteristics and may encompass the relationship between characteristics or the necessary amount of a characteristic essential to support the life history of the species.

In considering whether features are essential to the conservation of the species, we may consider an appropriate quality, quantity, and spatial and temporal arrangement of habitat characteristics in the context of the life-history needs, condition, and status of the species. These characteristics include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing (or development) of offspring; and habitats that are protected from disturbance.

As described above under *Species Needs,* the Brawleys Fork crayfish occurs in riffles and runs with fast to moderately rapid flow in first- to third-order streams and one fifth-order stream. Brawleys Fork crayfish typically occupy streams with layered chert gravel and cobble substrate with ample interstitial space not consolidated by finer substrates such as sand or silt. Cool water with ample riparian vegetation and a high volume of clean groundwater discharged into the stream from subterranean aquifers also characterize streams with Brawleys Fork crayfish occurrences.

The primary habitat elements that influence resiliency of the Brawleys Fork crayfish include water quantity and flow, water quality, substrate, and habitat connectivity. These features are also described above as resource needs under Background and Summary of Biological Status and Threats, with individual needs summarized in table 1, and a full description is available in the SSA report (Service 2023, pp. 18–20).

We derive the specific physical or biological features essential to the conservation of Brawleys Fork crayfish from studies of the species' habitat, ecology, and life history as described below. Additional information can be found in the SSA report (Service 2023, pp. 14–24); available on *https://www.regulations.gov* under Docket No. FWS–R4–ES–2023–0065). We have determined that the following physical or biological features are essential to the conservation of Brawleys Fork crayfish:

(1) Moderate to fast-flowing stream with unembedded chert gravel and cobble substrate within an unobstructed stream continuum (*i.e.,* riffle, run, pool complexes) of perennial, small- to moderate-sized (generally third order or smaller) streams and rivers (up to the ordinary high-water mark as defined at 33 CFR 329.11).

(2) Stream banks with intact riparian cover to maintain stream morphology and reduce erosion and sediment inputs that may reduce availability of substrate interstitial spaces.

(3) Water quality characterized by seasonally moderated, or spring influenced, water temperatures and physical and chemical parameters (*e.g.,* pH, conductivity, dissolved oxygen) sufficient for the normal behavior, growth, reproduction, and viability of all life stages.

(4) Adequate food base, indicated by a healthy aquatic community structure including native benthic macroinvertebrates, fishes, and plant matter (*e.g.,* leaf litter, algae, detritus).

(5) An interconnected network of streams and rivers that have the physical and biological features described in (1) through (4), above, that allow for the movement of individual crayfish in response to environmental, physiological, or behavioral drivers. The connectivity of the stream network should be sufficient to allow for gene flow within and among watersheds.

Special Management Considerations or Protection

When designating critical habitat, we assess whether the specific areas within the geographical area occupied by the species at the time of listing contain features which are essential to the conservation of the species and which may require special management considerations or protection. The features essential to the conservation of the Brawleys Fork crayfish may require special management considerations or protection to reduce the following threats: (1) Urbanization of the landscape, including, but not limited to, land conversion for urban and commercial use, infrastructure (roads, bridges, utilities), and urban water uses (water supply reservoirs, wastewater treatment); (2) nutrient pollution from agricultural and horticultural activities that impact water quantity and quality; (3) significant alteration of water quality; (4) significant alteration of channel morphology or geometry, including channelization,

impoundment, road and bridge construction, or instream mining, dredging, or channelization; and (5) watershed, riparian, and floodplain disturbances that release sediments or nutrients into the water or fill suitable habitat.

Special management considerations or protections may be required within critical habitat areas to address these threats. Management activities that could ameliorate these threats include, but are not limited to, restoration and protection of riparian corridors and retention of sufficient canopy cover along banks; implementation of best management practices to reduce sedimentation, erosion, and streambank degradation; stream bank restoration projects; increased use of stormwater management and reduction of stormwater flows into the stream systems; reduction of other watershed, riparian, and floodplain disturbances that release sediments, pollutants, or nutrients into the water; and improvements to industrial and municipal water treatment facilities and sewage systems to reduce nutrient and pathogen pollution.

Criteria Used To Identify Critical Habitat

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. In accordance with the Act and our implementing regulations at 50 CFR 424.12(b), we review available information pertaining to the habitat requirements of the species and identify specific areas within the geographical area occupied by the species at the time of listing and any specific areas outside the geographical area occupied by the species to be considered for designation as critical habitat. We are not currently proposing to designate any areas outside the geographical area occupied by the species because we have not identified any unoccupied areas that meet the definition of critical habitat; specifically, no unoccupied areas are essential for the conservation of the species.

We are proposing to designate six units that are currently occupied across the geographic range as critical habitat. The occupied areas proposed are sufficient and adequate to ensure the conservation of the species, as they will support the species' redundancy and representation (table 6). We anticipate that recovery will require continued protection of the existing populations and habitat, as well as ensuring there are streams distributed across the known range with stable Brawleys Fork crayfish occurrences in five or more analysis units (as delineated in the SSA) with sufficient abundance and occupied reaches to increase species' viability. This conservation strategy and the designation of proposed critical habitat support the species' ability to withstand the loss of occurrences or occupied stream reaches through a catastrophic event, such as the effects of a rangewide drought or mega-drought or chemical spills and help ensure such an event is less likely to simultaneously affect all known streams with species' occurrence. Rangewide recovery considerations, such as maintaining existing genetic diversity and striving for representation across the current range of the species, were considered in formulating this proposed critical habitat designation.

Sources of data for this proposed critical habitat designation include the SSA (Service 2023, entire); records maintained by the Tennessee Department of Environment and Conservation, Tennessee Wildlife Resources Agency, Tennessee Valley Authority; research published in peer-reviewed articles or presented in academic theses and agency reports (Rohrbach and Withers 2006; Williams et al. 2017; Grubb 2019; Giddens and Mattingly 2020); university and museum collections; regional Geographic Information System (GIS) coverages; and information from other survey reports on streams throughout the species' range (Khan 2021, unpublished data). We have also reviewed available information that pertains to the habitat requirements of the Brawleys Fork crayfish. Sources of information on habitat requirements include studies conducted at occupied sites and published in peer-reviewed articles, agency reports, and data collected during monitoring efforts (Service 2023, pp. 14–24).

In summary, for areas within the geographic area occupied by the species at the time of listing, we delineated critical habitat unit boundaries using the following criteria:

We identified streams and rivers within the geographical area occupied at the time of listing (*i.e.,* with Brawleys Fork crayfish occurrence records from 2000 to 2021). Many streams with suitable habitat in the species' range have been surveyed in the last 15 years; however, a rangewide survey has not been conducted. Accordingly, it is possible the species may be detected in other locations upon subsequent surveys. For example, the crayfish was observed in the West Fork Stones River in 2016 and Mountain Creek in 2018, both representing new collection sites and range extensions for the species (TWRA 2021, unpublished data).

We then identified those streams that contain one or more of the physical or biological features to support the life-history functions essential to the conservation of the Brawleys Fork crayfish. We delineated end points of stream and river units by evaluating the presence or absence of habitat conditions and physical or biological features essential to the species. We selected upstream and downstream endpoints for each unit where habitat conditions no longer meet species requirements (*i.e.,* do not contain the physical or biological features essential to the conservation of the Brawleys Fork crayfish). The endpoints often correspond to tributary confluences, dams, or headwater sources because of the effect of these features on habitat conditions. Where favorable habitat that contains physical or biological features essential to the conservation of Brawleys Fork crayfish shifts to less favorable habitat that does not contain these features, we selected a reference point such as a highway or bridge crossing that will allow the public to identify proposed critical habitat units. The occurrence data are linear in nature; therefore, for stretches of habitat between occurrences, and between occurrences and endpoints of units, we assumed the interposing stream segments contain at least one of the physical or biological features essential to the conservation of the species and include the interposing stream segment in the proposed critical habitat unit. Based on the best available scientific data, we determined that all currently known occupied habitat for the Brawleys Fork crayfish contains one or more of the physical or biological features essential to the conservation of the species and which may require special management considerations or protection.

Based on this analysis, the following streams or rivers meet the criteria for areas occupied by the species: West Fork Stones River, Brawleys Fork, Carson Fork, Haws Spring Fork, East Fork Stones River, Rockhouse Creek, Bullpen Creek, and Mountain Creek. The critical habitat designation includes only the occupied streams or rivers within the current range that have one or more of the physical or biological features essential to the conservation of the species.

The result was the inclusion of six units of critical habitat occupied by the Brawleys Fork crayfish. These six units encompass the same geographic area and streams as the five analysis units delineated in the SSA report (Service

2023). These six occupied units constitute approximately 86.6 river miles (139.4 river kilometers). No areas outside the geographical area occupied by the species at the time of listing were delineated as proposed critical habitat. We are not designating any areas outside the geographical area currently occupied by the Brawleys Fork crayfish because we determined that occupied areas are sufficient to conserve the species. Accordingly, we did not find any unoccupied areas to be essential for the conservation of the species.

When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for Brawleys Fork crayfish. Critical habitat for the Brawleys Fork crayfish includes only stream channels up to bankfull height, where the stream base flow is contained within the channel. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this proposed rule have been excluded by text in the proposed rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat.

We propose to designate as critical habitat lands that we have determined are occupied at the time of listing (*i.e.,* currently occupied) and that contain one or more of the physical or biological features that are essential to support life-history processes of the species. Units are proposed for designation based on one or more of the physical or biological features being present to support Brawleys Fork crayfish's life-history processes. Some units contain all of the identified physical or biological features and support multiple life-history processes. Some units contain only some of the physical or biological features necessary to support the Brawleys Fork crayfish's particular use of that habitat.

The proposed critical habitat designation is defined by the map or maps, as modified by any accompanying regulatory text, presented at the end of this document under Proposed Regulation Promulgation. We include more detailed information on the boundaries of the critical habitat designation in the preamble of this document. We will make the coordinates or plot points or both on which each map is based available to the public on *https://www.regulations.gov* at Docket No. FWS–R4–ES–2023–0065 and on our internet site *https://www.fws.gov/library/collections/Brawleys-Fork-crayfish.*

Proposed Critical Habitat Designation

We are proposing to designate 86.6 rmi (139.4 rkm) in six units as critical habitat for Brawleys Fork crayfish. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for Brawleys Fork crayfish. The six areas we propose as critical habitat are: (1) West Fork Stones River, (2) Brawleys Fork, (3) Carson Fork, (4) East Fork Stones River, (5) Bullpen Creek, and (6) Mountain Creek. Table 6 shows the proposed critical habitat units and the approximate area of each unit. All six areas proposed as critical habitat are occupied by Brawleys Fork crayfish.

TABLE 6—PROPOSED CRITICAL HABITAT UNITS FOR BRAWLEYS FORK CRAYFISH

[Area estimates reflect stream length within critical habitat unit boundaries]

Unit/subunit No.	Unit name	Private (rmi)	Federal (rmi)	State or local (rmi)	Total river miles
1	West Fork Stones		6.2		6.2
2	Brawleys Fork	13.8			13.8
Unit 3—Carson Fork					
3a	Carson Fork	12.3			12.3
3b	Haws Spring Fork	5.9			5.9
Unit 4—East Fork Stones River					
4a	East Fork Stones	30.9		1.6	32.5
4b	Rockhouse Creek	3.4			3.4
5	Bullpen Creek	3.1			3.1
6	Mountain Creek	9.4			9.4
Total		78.8	6.2	1.6	86.6

Note: Area sizes may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Brawleys Fork crayfish, below.

Unit 1: West Fork Stones

Unit 1 consists of approximately 6.2 rmi (10 rkm) of the West Fork Stones River beginning at the Nice's Mill Recreation Area lowhead dam and continuing to the confluence with the Stones River in Rutherford County, Tennessee. All riparian lands in Unit 1 are in Federal ownership (Department of Defense, USACE, J. Percy Priest Lake). Unit 1 is considered to be occupied by the Brawleys Fork crayfish. Unit 1 contains four of the identified physical or biological features essential to the conservation of the Brawleys Fork crayfish. The West Fork Stones River is isolated and does not have connectivity to any other streams with known Brawleys Fork crayfish occurrences; thus, Unit 1 lacks the physical or biological feature related to an interconnected network of streams and rivers. There is no overlap with any designated critical habitat for other listed species.

Threats identified within this unit include the degradation of habitat and water quality from sedimentation and water quality degradation due to urbanization and development, flow reduction and water quality degradation due to water withdrawals and wastewater treatment plants, and habitat degradation due to instream modifications including impoundments and activities that degrade streambanks. Special management considerations or protection that may be required within Unit 1 to reduce or alleviate impacts may include implementation of best management practices to improve water quality or reverse degradation resulting from urbanization and development (see Special Management Considerations or Protection, above). Special management or protection may also include consideration of Brawleys Fork crayfish in the J. Percy Priest Lake Master Plan and inclusion of habitat restoration efforts in future actions.

Unit 2: Brawleys Fork

Unit 2 consists of approximately 13.8 rmi (22.2 rkm) of the Brawleys Fork and tributaries in Cannon County, Tennessee. Unit 2 includes the Brawleys Fork from the headwaters at Mill Bluff Hollow to the confluence with the Carson Fork and Shelton Branch from the Gene Perkins Road crossing to the confluence with Brawleys Fork. Riparian lands in Unit 2 are in private ownership except for a small amount of publicly owned bridge crossings and road easements. Unit 2 is considered to be occupied by the Brawleys Fork crayfish and contains all physical or biological features essential to the conservation of the Brawleys Fork crayfish. There is no overlap with any designated critical habitat for other listed species.

Threats identified within this unit include the degradation of habitat and water quality from sedimentation, siltation, and pollution due to agriculture, flow reduction and water quality degradation due to water withdrawals, and habitat degradation due to instream modifications including gravel dredging, impoundments, and activities that degrade streambanks. In some cases, these threats are being addressed or coordinated with our partners and landowners to implement needed actions. Special management considerations or protection measures that may be required within Unit 2 to alleviate impacts include reducing wastewater or stormwater runoff, removal of barriers or impoundments, natural stream restoration, and implementation of agricultural and grazing practices that minimize nutrient and sediment input. Special management or protection may also include consideration of Brawleys Fork crayfish in agriculture and urban development plans and habitat restoration efforts.

Unit 3: Carson Fork

Unit 3 consists of approximately 18.2 rmi (29.3 rkm) of the Carson Fork and tributaries in Cannon County, Tennessee. Two subunits are included in Unit 3 (Carson Fork), Subunit 3a (Carson Fork) and Subunit 3b (Haws Spring Fork).

Subunit 3a (Carson Fork) consists of 12.3 rmi (19.8 rkm) and extends from the headwaters of the Carson Fork near Sadler Lane downstream to the confluence with the East Fork Stones River, from the headwaters of Duck Branch to the confluence of Carson Fork, and from the headwaters of an unnamed tributary in Simmons Hollow to the confluence of Carson Fork. Subunit 3b (Haws Spring Fork subunit) consists of 5.9 rmi (9.5 rkm) and extends from the headwaters of Smith Branch near Carrick Hollow to the confluence with Haws Spring Fork and from the headwaters of Haws Spring to the confluence with the Carson Fork. Riparian lands in Unit 3 are in private ownership except for a small amount of publicly owned bridge crossings and road easements. Unit 3 is considered to be occupied by the Brawleys Fork crayfish. Unit 3 (subunits 3a and 3b) contains all physical or biological features essential to the conservation of the Brawleys Fork crayfish. There is no overlap with any designated critical habitat for other listed species.

Threats identified within this unit include the following: degradation of habitat and water quality from sedimentation, siltation, and pollution due to agriculture, flow reduction, and water withdrawals; and habitat degradation due to instream modifications including gravel dredging, impoundments, and activities that degrade streambanks. Special management considerations or protection that may be required within Unit 3 to alleviate impacts include reducing wastewater or stormwater runoff, removal of barriers or impoundments, natural stream restoration, and implementation of agricultural and grazing practices that minimize nutrient and sediment input into receiving streams. Special management or protection may also include consideration of Brawleys Fork crayfish in agriculture and urban development plans and habitat restoration efforts.

Unit 4: East Fork Stones River

Unit 4 consists of approximately 35.9 rmi (57.8 rkm) of the East Fork Stones River mainstem and some of its tributaries in Cannon County, Tennessee. Two subunits are included in Unit 4 (East Fork Stones River), Subunit 4a (East Fork Stones) and Subunit 4b (Rockhouse Creek). Subunit 4a (East Fork Stones subunit) consists of 32.5 rmi (52.3 rkm) and includes Hollis Creek from the headwaters near Hollis Creek South Road to the confluence with the East Fork Stones River, Hill Creek from the tributary at Wood Hollow to the confluence with the East Fork Stones River, Parchcorn Hollow Branch from the Parchcorn Hollow road crossing to the confluence with the East Fork Stones River, Cavender Branch from the Cavender Road bridge to the confluence with the East Fork Stones River, and from Locke Creek to the confluence with the East Fork Stones River.

Subunit 4b (Rockhouse Creek subunit) consists of 3.4 rmi (5.5 rkm) and extends from the stream crossing at Seal Hollow Branch by Seal Hollow Road to the confluence with Rockhouse Branch and from the Higgins Road crossing of Rockhouse Creek downstream to the confluence with the East Fork Stones River. Riparian lands in Unit 4 are in State (0.7 rmi (1.1 rkm) of Headwater Wildlife Management Area), local (0.9 rmi (1.4 rkm) in two parks), and private ownership, as well as small amount of publicly owned bridge crossings and road easements. Unit 4 is considered to be occupied by the Brawleys Fork crayfish. Unit 4 (subunits 4a and 4b) contains all physical or biological features essential to the conservation of the Brawleys Fork crayfish. There is no overlap with any designated critical habitat for other listed species.

Threats identified within this unit include the following: degradation of habitat and water quality from sedimentation, siltation, and pollution due to urbanization and development, agriculture, flow reduction, water withdrawals, and wastewater treatment plant discharge; and habitat degradation due to instream modifications including gravel dredging, impoundments, and activities that degrade streambanks. In some cases, these threats are being addressed or coordinated with our partners and landowners to implement needed actions. Special management considerations or protection that may be required within Unit 4 to alleviate impacts include treating wastewater to the greatest extent feasible, reducing wastewater or stormwater runoff, removal of barriers or impoundments,

natural stream restoration, implementation of appropriate silvicultural and forestry best management practices, and implementation of agricultural and grazing practices that minimize nutrient and sediment input. Special management or protection may also include consideration of Brawleys Fork crayfish in agriculture and urban development plans and habitat restoration efforts.

Unit 5: Bullpen Creek

Unit 5 consists of approximately 3.1 rmi (5.0 rkm) of Bullpen Creek beginning at the Lonnie Smith Road crossing and extending downstream to the lowhead dam near Charlie Powell Road in Cannon County, Tennessee. Riparian lands in Unit 5 are in private ownership except for a small amount of publicly owned bridge crossings and road easements. Unit 5 is considered to be occupied by the Brawleys Fork crayfish. Unit 5 contains four of the identified physical or biological features essential to the conservation of the Brawleys Fork crayfish. The Bullpen Creek unit is isolated and does not have connectivity to any other streams with known Brawleys Fork crayfish occurrences; thus, Unit 5 lacks the physical or biological feature related to an interconnected network of streams and rivers. There is no overlap with any designated critical habitat for other listed species.

Threats identified within this unit include the following: degradation of habitat and water quality from sedimentation, siltation, and pollution due to agriculture and horticulture, flow reduction, and water withdrawals; and habitat degradation due to instream modifications including gravel dredging, impoundments, and activities that degrade streambanks. In some cases, these threats are being addressed or coordinated with our partners and landowners to implement needed actions. Special management considerations or protection that may be required within Unit 5 to alleviate impacts from stressors include but are not limited to the following: treating wastewater to the greatest extent feasible, reducing wastewater or stormwater runoff, removal of barriers or impoundments, natural stream restoration, and implementation of agricultural and grazing practices that minimize nutrient and sediment input. Special management or protection may also include consideration of Brawleys Fork crayfish in agriculture and urban development plans and habitat restoration efforts.

Unit 6: Mountain Creek

Unit 6 consists of approximately 9.4 rmi (15.1 rkm) of Mountain Creek in Warren County, Tennessee. Unit 6 extends from the Mountain Creek road crossing at Short Mountain Road downstream to the Smithville Highway bridge in the city of Dibrell, Warren County, Tennessee. Riparian lands in Unit 6 are in private ownership except for a small amount of publicly owned bridge crossings and road easements. Unit 6 is considered to be occupied by the Brawleys Fork crayfish. Unit 6 contains four of the identified physical or biological features essential to the conservation of the Brawleys Fork crayfish. The Mountain Creek unit is isolated and does not have connectivity to any other streams with known Brawleys Fork crayfish occurrences, thus, Unit 6 lacks the physical or biological feature related to an interconnected network of streams and rivers. There is no overlap with any designated critical habitat for other listed species.

Threats identified within this unit include the following: degradation of habitat and water quality from sedimentation, siltation, and pollution due to urbanization and development, agriculture, and horticulture, flow reduction, and water withdrawals; and habitat degradation due to instream modifications including gravel dredging, impoundments, and activities that degrade streambanks. Special management considerations or protection that may be required within Unit 6 to alleviate impacts from stressors include but are not limited to the following: treating wastewater to the greatest extent feasible, reducing wastewater or stormwater runoff, removal of barriers or impoundments, natural stream restoration, and implementation of agricultural and grazing practices that minimize nutrient and sediment input. Special management or protection may also include consideration of Brawleys Fork crayfish in agriculture and urban development plans and habitat restoration efforts.

Effects of Critical Habitat Designation

Section 7 Consultation

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

We published a final rule revising the definition of destruction or adverse modification on August 27, 2019 (84 FR 44976). Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

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

Compliance with the requirements of section 7(a)(2) is documented through our issuance of:

(1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or

(2) A biological opinion for Federal actions that may affect, and are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species and/or destroy or adversely modify critical habitat, we provide reasonable and prudent alternatives to the project, if any are identifiable, that would avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat. We define ''reasonable and prudent alternatives'' (at 50 CFR 402.02) as alternative actions identified during consultation that:

(1) Can be implemented in a manner consistent with the intended purpose of the action,

(2) Can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction,

(3) Are economically and technologically feasible, and

(4) Would, in the Service Director's opinion, avoid the likelihood of jeopardizing the continued existence of the listed species and/or avoid the likelihood of destroying or adversely modifying critical habitat.

Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 set forth requirements for Federal agencies to reinitiate formal consultation on previously reviewed actions. These requirements apply when the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law) and, subsequent to the previous consultation: (a) if the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (d) if a new species is listed or critical habitat designated that may be affected by the identified action. The reinitiation requirement applies only to actions that remain subject to some discretionary Federal involvement or control. As provided in 50 CFR 402.16, the requirement to reinitiate consultations for new species listings or critical habitat designation does not apply to certain agency actions (*e.g.,* land management plans issued by the Bureau of Land Management in certain circumstances.

Application of the ''*Destruction or Adverse Modification*'' *Standard*

The key factor related to the destruction or adverse modification determination is whether implementation of the proposed Federal action directly or indirectly alters the designated critical habitat in a way that appreciably diminishes the value of the critical habitat for the conservation of the listed species. As discussed above, the role of critical habitat is to support physical or biological features essential to the conservation of a listed species and provide for the conservation of the species.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may violate section 7(a)(2) of the Act by destroying or adversely modifying such habitat, or that may be affected by such designation.

Activities that we may, during a consultation under section 7(a)(2) of the Act, consider likely to destroy or adversely modify critical habitat include, but are not limited to: (1) Actions that would impede or disconnect stream and river channels and contribute to further habitat fragmentation at a scale and magnitude that appreciably diminishes the value of critical habitat (*e.g.,* large impoundments, reservoir creation). Such activities include, but are not limited to, construction of barriers that impede the instream movement of the Brawleys Fork crayfish (*e.g.,* impoundments, dams, culverts, or weirs). These activities could result in destruction or fragmentation of habitat, block movements between habitats, and/or affect flows within or into critical habitat. In addition, these activities can isolate populations that are more at risk of decline or extirpation as a result of genetic drift, demographic or environmental stochasticity, and catastrophic events.

(2) Actions that would affect channel substrates and stability or geomorphology at a scale and magnitude that appreciably diminishes the value of critical habitat (*e.g.,* multiple or large tributaries or main channel rerouting, dam construction on a river with Brawleys Fork crayfish occurrences). Such activities include channelization, impoundment, mining, dredging, road and bridge construction, removal of riparian vegetation, and land clearing. These activities may lead to changes in channel substrates, erosion of the streambed and banks, and excessive sedimentation that could degrade Brawleys Fork crayfish habitat.

(3) Actions that would reduce flow levels or alter flow regimes at a scale and magnitude that appreciably diminishes the value of critical habitat (*i.e.,* flow levels or regimes that no longer support Brawleys Fork crayfish in one or more critical habitat units). These could include, but are not limited to, activities that block or lower surface flow or groundwater levels, including channelization, impoundment, groundwater pumping, and surface water withdrawal or diversion. Such activities can result in long-term changes in stream flows that affect habitat quality and quantity for the Brawleys Fork crayfish and its prey.

(4) Actions that would significantly alter water chemistry or quality to the extent that the value of critical habitat is appreciably diminished (*i.e.,* water quality does not support the Brawleys Fork crayfish's needs in one or more units). Such activities could include, but are not limited to, release of chemicals or biological pollutants or heated effluents into the surface water or connected groundwater at a point source or by dispersed release (non-point source). These activities could alter water conditions to levels that are beyond the tolerances of the Brawleys Fork crayfish and result in direct or cumulative adverse effects to individuals and their life cycles.

(5) Actions that would significantly increase sediment deposition or stream bottom embeddedness within the stream channel to the extent that the value of critical habitat is appreciably diminished (*e.g.,* excessive siltation such that Brawleys Fork crayfish are not able to use the critical habitat unit). Such activities could include, but are not limited to, excessive sedimentation from livestock grazing, road construction, channel alteration, and agricultural or horticultural practices that do not implement BMPs or improperly implement BMPs, mining, dredging, and other watershed and floodplain disturbances. These activities could eliminate or reduce the habitat necessary for the growth and reproduction of the Brawleys Fork crayfish by increasing the sediment deposition to levels that would adversely affect the Brawleys Fork crayfish's ability to complete its life cycle.

Exemptions

Application of Section 4(a)(3) of the Act

Section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) provides that the Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense (DoD), or designated for its use, that are subject to an integrated natural resources management plan (INRMP) prepared under section 101 of the Sikes Act Improvement Act of 1997 (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation. No DoD lands with a completed INRMP are within the proposed critical habitat designation.

Consideration of Impacts Under Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary shall designate and make revisions to critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude an area from designated critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. Exclusion decisions are governed by the regulations at 50 CFR 424.19 and the Policy Regarding Implementation of Section 4(b)(2) of the Endangered Species Act (hereafter, the ''2016 Policy''; 81 FR 7226, February 11, 2016), both of which were developed jointly with the National Marine Fisheries Service (NMFS). We also refer to a 2008 Department of the Interior Solicitor's opinion entitled ''The Secretary's Authority to Exclude Areas from a Critical Habitat Designation under Section 4(b)(2) of the Endangered Species Act'' (M–37016). We explain each decision to exclude areas, as well as decisions not to exclude, to demonstrate that the decision is reasonable.

In considering whether to exclude a particular area from the designation, we identify the benefits of including the area in the designation, identify the benefits of excluding the area from the designation, and evaluate whether the benefits of exclusion outweigh the benefits of inclusion. If the analysis indicates that the benefits of exclusion outweigh the benefits of inclusion, the Secretary may exercise discretion to exclude the area only if such exclusion would not result in the extinction of the species. In making the determination to exclude a particular area, the statute on its face, as well as the legislative history, are clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor. We describe below the process that we undertook for taking into consideration each category of impacts and our analyses of the relevant impacts.

Consideration of Economic Impacts

Section 4(b)(2) of the Act and its implementing regulations require that we consider the economic impact that may result from a designation of critical habitat. To assess the probable economic impacts of a designation, we must first evaluate specific land uses or activities and projects that may occur in the area of the critical habitat. We then must evaluate the impacts that a specific critical habitat designation may have on restricting or modifying specific land uses or activities for the benefit of the species and its habitat within the areas proposed. We then identify which conservation efforts may be the result of the species being listed under the Act versus those attributed solely to the designation of critical habitat for this particular species. The probable economic impact of a proposed critical habitat designation is analyzed by comparing scenarios both ''with critical habitat'' and ''without critical habitat.''

The ''without critical habitat'' scenario represents the baseline for the analysis, which includes the existing regulatory and socio-economic burden imposed on landowners, managers, or other resource users potentially affected by the designation of critical habitat (*e.g.,* under the Federal listing as well as other Federal, State, and local regulations). Therefore, the baseline represents the costs of all efforts attributable to the listing of the species under the Act (*i.e.,* conservation of the species and its habitat incurred regardless of whether critical habitat is designated). The ''with critical habitat'' scenario describes the incremental impacts associated specifically with the designation of critical habitat for the species. The incremental conservation efforts and associated impacts would not be expected without the designation of critical habitat for the species. In other words, the incremental costs are those attributable solely to the designation of critical habitat, above and beyond the baseline costs. These are the costs we use when evaluating the benefits of inclusion and exclusion of particular areas from the final designation of critical habitat should we choose to conduct a discretionary section 4(b)(2) exclusion analysis.

Executive Order (E.O.) 12866, as reaffirmed by E.O.s 13563 and 14094, direct Federal agencies to assess the costs and benefits of available regulatory alternatives in quantitative (to the extent feasible) and qualitative terms. Consistent with the Executive order's regulatory analysis requirements, our effects analysis under the Act may take into consideration impacts to both directly and indirectly affected entities, where practicable and reasonable. If sufficient data are available, we assess to the extent practicable the probable impacts to both directly and indirectly affected entities. Section 3(f) of E.O. 12866 identifies four criteria when a regulation is considered a ''significant regulatory action'' and requires additional analysis, review, and approval if met. The criterion relevant here is whether the designation of critical habitat may have an economic effect of $200 million in any given year (section 3(f)(1)). Therefore, our consideration of economic impacts uses a screening analysis to assess whether a designation of critical habitat for Brawleys Fork crayfish is likely to exceed the economically significant threshold.

For this particular designation, we developed an incremental effects memorandum (IEM) considering the probable incremental economic impacts that may result from this proposed designation of critical habitat. The information contained in our IEM was then used to develop a screening analysis of the probable effects of the designation of critical habitat for the Brawleys Fork crayfish (Industrial Economics, Inc. 2022, entire). We began by conducting a screening analysis of the proposed designation of critical habitat in order to focus our analysis on the key factors that are likely to result in incremental economic impacts. The purpose of the screening analysis is to filter out particular geographic areas of critical habitat that are already subject to such protections and are, therefore, unlikely to incur incremental economic impacts. In particular, the screening analysis considers baseline costs (*i.e.,* absent critical habitat designation) and includes any probable incremental economic impacts where land and water use may already be subject to conservation plans, land management plans, best management practices, or regulations that protect the habitat area as a result of the Federal listing status of the species. Ultimately, the screening analysis allows us to focus our analysis on evaluating the specific areas or sectors that may incur probable incremental economic impacts as a result of the designation.

The presence of the listed species in occupied areas of critical habitat means that any destruction or adverse modification of those areas is also likely to jeopardize the continued existence of the species. For that reason, designating occupied areas as critical habitat typically causes little if any incremental impacts above and beyond the impacts of listing the species. Therefore, the screening analysis focuses on areas of unoccupied critical habitat. If there are any unoccupied units in the proposed critical habitat designation, the screening analysis assesses whether any additional management or conservation efforts may incur incremental economic impacts. This screening analysis combined with the information contained in our IEM constitute what we consider to be our draft economic

analysis (DEA) of the proposed critical habitat designation for the Brawleys Fork crayfish; our DEA is summarized in the narrative below.

As part of our screening analysis, we considered the types of economic activities that are likely to occur within the areas likely affected by the critical habitat designation. In our evaluation of the probable incremental economic impacts that may result from the proposed designation of critical habitat for the Brawleys Fork crayfish, first we identified, in the IEM dated April 8, 2022, probable incremental economic impacts associated with the following categories of activities: (1) agriculture, (2) forestry, (3) development, (4) recreation, (5) restoration activities, (6) flood control, (7) transportation, (8) water quantity/supply, (9) dredging, and (10) utilities. We considered each industry or category individually. Additionally, we considered whether their activities have any Federal involvement. Critical habitat designation generally will not affect activities that do not have any Federal involvement; under the Act, designation of critical habitat affects only activities conducted, funded, permitted, or authorized by Federal agencies. If we list the species, in areas where the Brawleys Fork crayfish is present, Federal agencies would be required to consult with the Service under section 7 of the Act on activities they fund, permit, or implement that may affect the species. If, when we list the species, we also finalize this proposed critical habitat designation, our consultations would include an evaluation of measures to avoid the destruction or adverse modification of critical habitat.

In our IEM, we attempted to clarify the distinction between the effects that would result from the species being listed and those attributable to the critical habitat designation (*i.e.,* difference between the jeopardy and adverse modification standards) for the Brawleys Fork crayfish's critical habitat. Because the designation of critical habitat for Brawleys Fork crayfish is being proposed concurrently with the listing, it has been our experience that it is more difficult to discern which conservation efforts are attributable to the species being listed and those which will result solely from the designation of critical habitat. However, the following specific circumstances in this case help to inform our evaluation: (1) The essential physical or biological features identified for critical habitat are the same features essential for the life requisites of the species, and (2) any actions that would likely adversely affect the essential physical or biological features of occupied critical habitat are also likely to adversely affect the Brawleys Fork crayfish. The IEM outlines our rationale concerning this limited distinction between baseline conservation efforts and incremental impacts of the designation of critical habitat for this species. This evaluation of the incremental effects has been used as the basis to evaluate the probable incremental economic impacts of this proposed designation of critical habitat.

The proposed critical habitat designation for the Brawleys Fork crayfish totals approximately 86.6 rmi (139.4 rkm) of stream and river channels in six units in Tennessee. Ownership of riparian lands adjacent to the proposed units includes 78.8 rmi (126.8 rkm; 91 percent) in private ownership and 7.8 rmi (12.5 rkm; 9 percent) in public (Federal or State) ownership. All six units are currently occupied by the species and contain recent (2000 to 2021) occurrences of Brawleys Fork crayfish. In these areas, any actions that may affect the species or its habitat would also affect proposed critical habitat. Thus, it is unlikely that any additional conservation efforts would be recommended to address the adverse modification standard over and above those recommended as necessary to avoid jeopardizing the continued existence of the Brawleys Fork crayfish. We are not proposing to designate any units of unoccupied habitat.

Because we are proposing the designation only of occupied critical habitat, the only additional costs that are expected in all of the proposed critical habitat designation are administrative costs. The entities most likely to incur incremental costs are the Federal action agencies that are parties to section 7 consultations. While the analysis for adverse modification of critical habitat will require time and resources by both the Federal action agency and the Service, these costs would predominantly be administrative in nature. About 91 percent of the proposed critical habitat designation for the Brawleys Fork crayfish lies on private lands. As such, incremental costs from public perception of the designation have some potential to arise (Industrial Economics, Inc. (IEc) 2022, pp. 14–15). However, the critical habitat units are in largely rural areas that are not experiencing significant development pressures. As such, the likelihood that critical habitat designation for the Brawleys Fork crayfish will result in perception-related impacts appears unlikely. The estimated incremental costs of critical habitat designation for the Brawleys Fork crayfish in the first year are not expected to exceed $9,200 per year (2022 dollars) (IEc 2022, p. 14). Thus, critical habitat designation for the Brawleys Fork crayfish is unlikely to generate costs or benefits exceeding $200 million in a single year. Therefore, this rule is unlikely to meet the threshold for an economically significant rule, with regard to costs, under E.O. 12866.

We are soliciting data and comments from the public on the DEA discussed above. During the development of a final designation, we will consider the information presented in the DEA and any additional information on economic impacts we receive during the public comment period to determine whether any specific areas should be excluded from the final critical habitat designation under authority of section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19. We may exclude an area from critical habitat if we determine that the benefits of excluding the area outweigh the benefits of including the area, provided the exclusion will not result in the extinction of this species.

Consideration of National Security Impacts

Section 4(a)(3)(B)(i) of the Act may not cover all DoD lands or areas that pose potential national-security concerns (*e.g.,* a DoD installation that is in the process of revising its INRMP for a newly listed species or a species previously not covered). If a particular area is not covered under section 4(a)(3)(B)(i), then national-security or homeland-security concerns are not a factor in the process of determining what areas meet the definition of ''critical habitat.'' However, the Service must still consider impacts on national security, including homeland security, on those lands or areas not covered by section 4(a)(3)(B)(i) because section 4(b)(2) requires the Service to consider those impacts whenever it designates critical habitat. Accordingly, if DoD, Department of Homeland Security (DHS), or another Federal agency has requested exclusion based on an assertion of national-security or homeland-security concerns, or we have otherwise identified national-security or homeland-security impacts from designating particular areas as critical habitat, we generally have reason to consider excluding those areas.

However, we cannot automatically exclude requested areas. When DoD, DHS, or another Federal agency requests exclusion from critical habitat on the basis of national-security or homeland-security impacts, we must conduct an exclusion analysis if the Federal

requester provides information, including a reasonably specific justification of an incremental impact on national security that would result from the designation of that specific area as critical habitat. That justification could include demonstration of probable impacts, such as impacts to ongoing border-security patrols and surveillance activities, or a delay in training or facility construction, as a result of compliance with section 7(a)(2) of the Act. If the agency requesting the exclusion does not provide us with a reasonably specific justification, we will contact the agency to recommend that it provide a specific justification or clarification of its concerns relative to the probable incremental impact that could result from the designation. If we conduct an exclusion analysis because the agency provides a reasonably specific justification or because we decide to exercise the discretion to conduct an exclusion analysis, we will defer to the expert judgment of DoD, DHS, or another Federal agency as to: (1) Whether activities on its lands or waters, or its activities on other lands or waters, have national-security or homeland-security implications; (2) the importance of those implications; and (3) the degree to which the cited implications would be adversely affected in the absence of an exclusion. In that circumstance, in conducting a discretionary section 4(b)(2) exclusion analysis, we will give great weight to national-security and homeland-security concerns in analyzing the benefits of exclusion.

We have evaluated whether any of the lands within the proposed designation of critical habitat are owned by DoD or DHS or could lead to national-security or homeland-security impacts if designated. In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for Brawleys Fork crayfish including the J. Percy Priest Reservoir in Unit 1 are owned or managed by the DoD Army Corps of Engineers. However, we anticipate no impact on national security or homeland security resulting from the proposed critical habitat designation.

Consideration of Other Relevant Impacts

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts on national security discussed above. To identify other relevant impacts that may affect the exclusion analysis, we consider a number of factors, including whether there are permitted conservation plans covering the species in the area—such as HCPs, safe harbor agreements (SHAs), or candidate conservation agreements with assurances (CCAAs)—or whether there are non-permitted conservation agreements and partnerships that may be impaired by designation of, or exclusion from, critical habitat. In addition, we look at whether Tribal conservation plans or partnerships, Tribal resources, or government-to-government relationships of the United States with Tribal entities may be affected by the designation. We also consider any State, local, social, or other impacts that might occur because of the designation.

In preparing this proposal, we have determined that no HCPs or other management plans for Brawleys Fork crayfish currently exist, and the proposed designation does not include any Tribal lands or trust resources or any lands for which designation would have any economic or national security impacts. Therefore, we anticipate no impact on Tribal lands, partnerships, or HCPs from this proposed critical habitat designation and thus, as described above, we are not considering excluding any particular areas on the basis of the presence of conservation agreements or impacts to trust resources.

However, if through the public comment period we receive information that we determine indicates that there are potential economic, national security, or other relevant impacts from designating particular areas as critical habitat, then as part of developing the final designation of critical habitat, we will evaluate that information and may conduct a discretionary exclusion analysis to determine whether to exclude those areas under authority of section 4(b)(2) and our implementing regulations at 50 CFR 424.19. If we receive a request for exclusion of a particular area and after evaluation of supporting information we do not exclude, we will fully describe our decision in the final rule for this action.

Required Determinations

Clarity of the Rule

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

(1) Be logically organized;

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

(3) Use clear language rather than jargon;

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

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

Regulatory Planning and Review (Executive Orders 12866, 13563, and 14094)

Executive Order 14094 reaffirms the principles of E.O. 12866 and E.O. 13563 and states that regulatory analysis should facilitate agency efforts to develop regulations that serve the public interest, advance statutory objectives, and are consistent with E.O. 12866, E.O. 13563, and the Presidential Memorandum of January 20, 2021 (Modernizing Regulatory Review). Regulatory analysis, as practicable and appropriate, shall recognize distributive impacts and equity, to the extent permitted by law. We have developed this proposed rule in a manner consistent with these requirements.

E.O. 12866, as reaffirmed by E.O. 13563 and E.O. 14094, provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) will review all significant rules. OIRA has determined that this proposed rulemaking action is not significant.

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.*), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA; 5 U.S.C. 801 *et seq.*), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (*i.e.,* small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the RFA to require Federal agencies to provide a certification statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

According to the Small Business Administration, small entities include small organizations such as

independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents; and small businesses (13 CFR 121.201). Small businesses include manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than $5 million in annual sales, general and heavy construction businesses with less than $27.5 million in annual business, special trade contractors doing less than $11.5 million in annual business, and agricultural businesses with annual sales less than $750,000. To determine whether potential economic impacts to these small entities are significant, we considered the types of activities that might trigger regulatory impacts under this designation as well as types of project modifications that may result. In general, the term ''significant economic impact'' is meant to apply to a typical small business firm's business operations.

Under the RFA, as amended, and as understood in light of recent court decisions, Federal agencies are required to evaluate the potential incremental impacts of rulemaking on those entities directly regulated by the rulemaking itself; in other words, the RFA does not require agencies to evaluate the potential impacts to indirectly regulated entities. The regulatory mechanism through which critical habitat protections are realized is section 7 of the Act, which requires Federal agencies, in consultation with the Service, to ensure that any action authorized, funded, or carried out by the agency is not likely to destroy or adversely modify critical habitat. Therefore, under section 7, only Federal action agencies are directly subject to the specific regulatory requirement (avoiding destruction and adverse modification) imposed by critical habitat designation. Consequently, it is our position that only Federal action agencies would be directly regulated if we adopt the proposed critical habitat designation. The RFA does not require evaluation of the potential impacts to entities not directly regulated. Moreover, Federal agencies are not small entities. Therefore, because no small entities would be directly regulated by this rulemaking, the Service certifies that, if made final as proposed, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small entities.

In summary, we have considered whether the proposed designation would result in a significant economic impact on a substantial number of small entities. For the above reasons and based on currently available information, we certify that, if made final, the proposed critical habitat designation would not have a significant economic impact on a substantial number of small business entities. Therefore, an initial regulatory flexibility analysis is not required.

Energy Supply, Distribution, or Use—Executive Order 13211

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare statements of energy effects when undertaking certain actions. Facilities that provide energy supply, distribution, or use occur within some units of the proposed critical habitat designations (for example, dams, pipelines) and may potentially be affected. We determined that consultations, technical assistance, and requests for species lists may be necessary in some instances. In our economic analysis, we did not find that this proposed critical habitat designation would significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no statement of energy effects is required.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*), we make the following finding:

(1) This proposed rule would not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or Tribal governments, or the private sector, and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or Tribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and Tribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding,'' and the State, local, or Tribal governments ''lack authority'' to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.''

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions are not likely to destroy or adversely modify critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply, nor would critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(2) We do not believe that this rule would significantly or uniquely affect small governments because small governments will be affected only to the extent that any programs having Federal funds, permits, or other authorized activities must ensure that their actions will not adversely affect the critical habitat. Therefore, a small government agency plan is not required.

Takings—Executive Order 12630

In accordance with E.O. 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we have analyzed the potential takings implications of designating critical habitat for Brawleys Fork crayfish in a takings implications assessment. The Act does not authorize the Service to regulate private actions on private lands or confiscate private

property as a result of critical habitat designation. Designation of critical habitat does not affect land ownership, or establish any closures, or restrictions on use of or access to the designated areas. Furthermore, the designation of critical habitat does not affect landowner actions that do not require Federal funding or permits, nor does it preclude development of habitat conservation programs or issuance of incidental take permits to permit actions that do require Federal funding or permits to go forward. However, Federal agencies are prohibited from carrying out, funding, or authorizing actions that would destroy or adversely modify critical habitat. A takings implications assessment has been completed for the proposed designation of critical habitat for Brawleys Fork crayfish, and it concludes that, if adopted, this designation of critical habitat does not pose significant takings implications for lands within or affected by the designation.

Federalism—Executive Order 13132

In accordance with E.O. 13132 (Federalism), this proposed rule does not have significant Federalism effects. A federalism summary impact statement is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of this proposed critical habitat designation with, appropriate State resource agencies. From a federalism perspective, the designation of critical habitat directly affects only the responsibilities of Federal agencies. The Act imposes no other duties with respect to critical habitat, either for States and local governments, or for anyone else. As a result, the proposed rule does not have substantial direct effects either on the States, or on the relationship between the Federal government and the States, or on the distribution of powers and responsibilities among the various levels of government. The proposed designation may have some benefit to these governments because the areas that contain the features essential to the conservation of the species are more clearly defined, and the physical or biological features of the habitat necessary for the conservation of the species are specifically identified. This information does not alter where and what federally sponsored activities may occur. However, it may assist State and local governments in long-range planning because they no longer have to wait for case-by-case section 7 consultations to occur.

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) of the Act would be required. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

Civil Justice Reform—Executive Order 12988

In accordance with E.O. 12988 (Civil Justice Reform), the Office of the Solicitor has determined that the rule would not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We have proposed designating critical habitat in accordance with the provisions of the Act. To assist the public in understanding the habitat needs of the species, this proposed rule identifies the physical or biological features essential to the conservation of the species. The proposed areas of critical habitat are presented on maps, and the proposed rule provides several options for the interested public to obtain more detailed location information, if desired.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain information collection requirements, and a submission to the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*) is not required. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid OMB control number.

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

Regulations adopted pursuant to section 4(a) of the Act are exempt from the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*) and do not require an environmental analysis under NEPA. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This includes listing, delisting, and reclassification rules, as well as critical habitat. In a line of cases starting with *Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995) the courts have upheld this position.

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), E.O. 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 federally recognized Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. We have determined that no Tribal lands fall within the boundaries of the proposed critical habitat for the Brawleys Fork crayfish, so no Tribal lands would be affected by the proposed designation.

References Cited

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

Authors

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

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

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

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

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

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

■ 2. In § 17.11, amend paragraph (h) by adding an entry for ''Crayfish, Brawleys Fork'' to the List of Endangered and Threatened Wildlife in alphabetical order under CRUSTACEANS to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* *	*	*	*	* *
CRUSTACEANS				
* *	*	*	*	* *
Crayfish, Brawleys Fork	*Cambarus williami*	Wherever found	T	[**Federal Register** citation when published as a final rule]; 50 CFR 17.46(d); [4d] 50 CFR 17.95(h).[CH]
* *	*	*	*	* *

■ 3. Amend § 17.46 by adding paragraph (d) to read as follows:

* * * * *

§ 17.46 Special rules—crustaceans.

* * * * *

(d) Brawleys Fork crayfish (*Cambarus williami*). (1) *Prohibitions.* The following prohibitions that apply to endangered wildlife also apply to Brawleys Fork crayfish. Except as provided under paragraph (d)(2) of this section and §§ 17.4 and 17.5, it is unlawful for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit, or cause to be committed, any of the following acts in regard to Brawleys Fork crayfish:

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

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

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

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

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

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

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

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

(iii) Take, as set forth at § 17.31(b).

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

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

(A) Channel restoration projects that create natural, physically stable, ecologically functioning streams (or stream and wetland systems). These projects can be accomplished using a variety of methods, but the desired outcome is a natural channel with low shear stress (force of water moving against the channel); bank heights that enable reconnection to the floodplain; a reconnection of surface and groundwater systems, resulting in perennial flows in the channel; riffles and pools composed of existing soil, rock, and wood instead of large imported materials; low compaction of soils within adjacent riparian areas; and inclusion of riparian wetlands.

(B) Bank stabilization projects that use bioengineering methods to replace preexisting, bare, eroding stream banks with vegetated, stable stream banks, thereby reducing bank erosion and instream sedimentation and improving habitat conditions for the species. Following these bioengineering methods, stream banks may be stabilized using native species live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), native species live fascines (live branch cuttings, usually willows, bound together into long, cigar-shaped bundles), or native species brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). Native species vegetation includes woody and herbaceous species appropriate for the region and habitat conditions. These methods will not include the sole use of quarried rock (riprap) or the use of rock baskets or gabion structures.

(C) Bridge and culvert replacement/removal projects or low head dam removal projects that remove migration barriers or generally allow for improved upstream and downstream movements of Brawleys Fork crayfish while maintaining normal stream flows, preventing bed and bank erosion, and improving habitat conditions for the species.

(D) Transportation projects that provide for fish passage at stream crossings.

■ 4. In § 17.95, amend paragraph (h) by adding an entry for ''Brawleys Fork Crayfish (*Cambarus williami*)'' after the entry for ''Big Sandy Crayfish (*Cambarus callainus*)'' to read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(h) *Crustaceans.*

* * * * *

Brawleys Fork Crayfish (*Cambarus williami*)

(1) Critical habitat units are depicted for Cannon, Rutherford, and Warren Counties, Tennessee, on the maps in this entry.

(2) Within these areas, the physical or biological features essential to the conservation of Brawleys Fork crayfish consist of the following components:

(i) Moderate to fast-flowing stream with unembedded cherty-gravel and cobble substrate within an unobstructed stream continuum (*i.e.,* riffle, run, pool complexes) of perennial, small- to moderate-sized (generally third order or smaller) streams and rivers (up to the ordinary high-water mark as defined at 33 CFR 329.11).

(ii) Stream banks with intact riparian cover to maintain stream morphology and reduce erosion and sediment inputs that may reduce availability of substrate interstitial spaces.

(iii) Water quality characterized by seasonally moderated, or spring influenced, water temperatures and physical and chemical parameters (*e.g.,* pH, conductivity, dissolved oxygen) sufficient for the normal behavior, growth, reproduction, and viability of all life stages.

(iv) Adequate food base, indicated by a healthy aquatic community structure including native benthic macroinvertebrates, fishes, and plant matter (*e.g.,* leaf litter, algae, detritus).

(v) An interconnected network of streams and rivers that have the physical and biological features described in paragraphs (2)(i) through (iv) of this entry that allow for the movement of individual crayfish in response to environmental, physiological, or behavioral drivers. The connectivity of the stream network should be sufficient to allow for gene flow within and among watersheds.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on [EFFECTIVE DATE OF FINAL RULE].

(4) Data layers defining map units were created using Esri ArcGIS Pro mapping software, version 2.7.2 with U.S. Geological Survey's National Hydrography Dataset flowline data, on a base map of State, County, and city limit boundaries from the State of Tennessee's Strategic Technology Solutions branch. Critical habitat units were mapped using the Tennessee State Plane Coordinate System, Lambert Conformal Conic projection and North American 1983 (NAD83) datum. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which each map is based are available to the public at the Service's internet site at *https://www.fws.gov/library/collections/Brawleys-Fork-crayfish,* at *https://www.regulations.gov* at Docket No. FWS–R4–ES–2023–0065, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Index map of critical habitat units for the Brawleys Fork crayfish follows:

Figure 1 to Brawleys Fork crayfish (Cambarus williami) paragraph (5)

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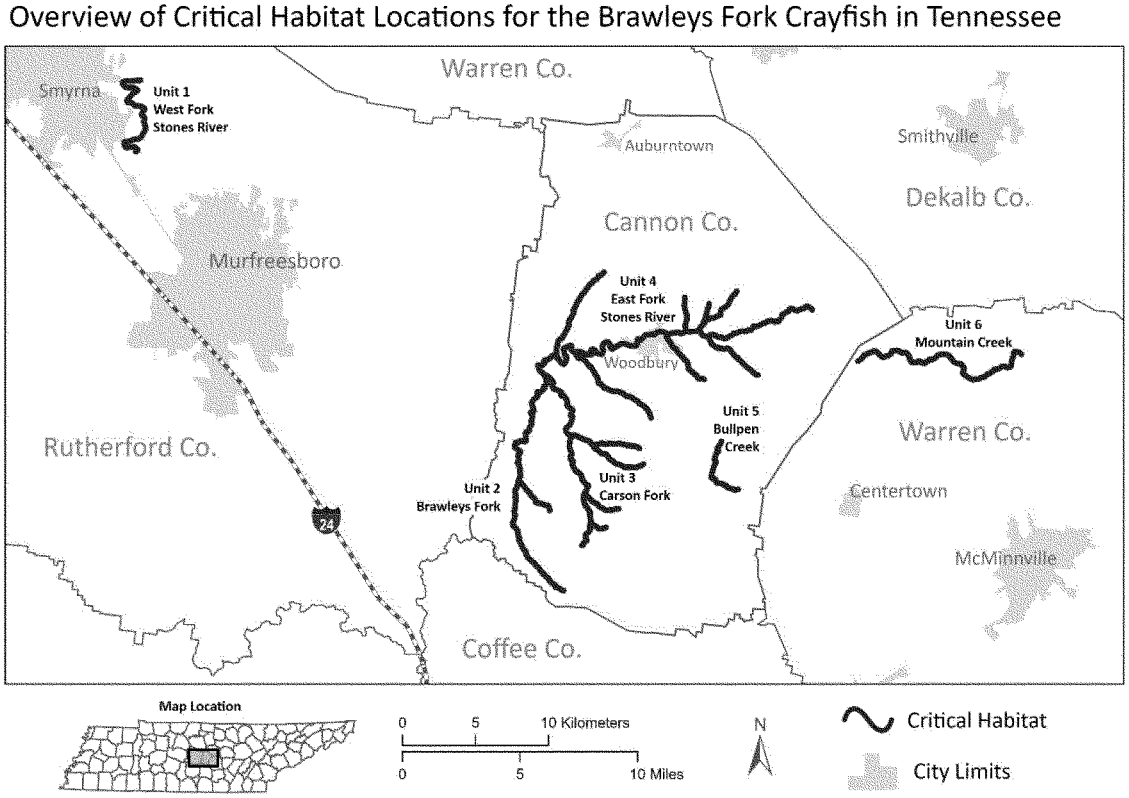


(6) Unit 1: West Fork Stones; Rutherford County, Tennessee.

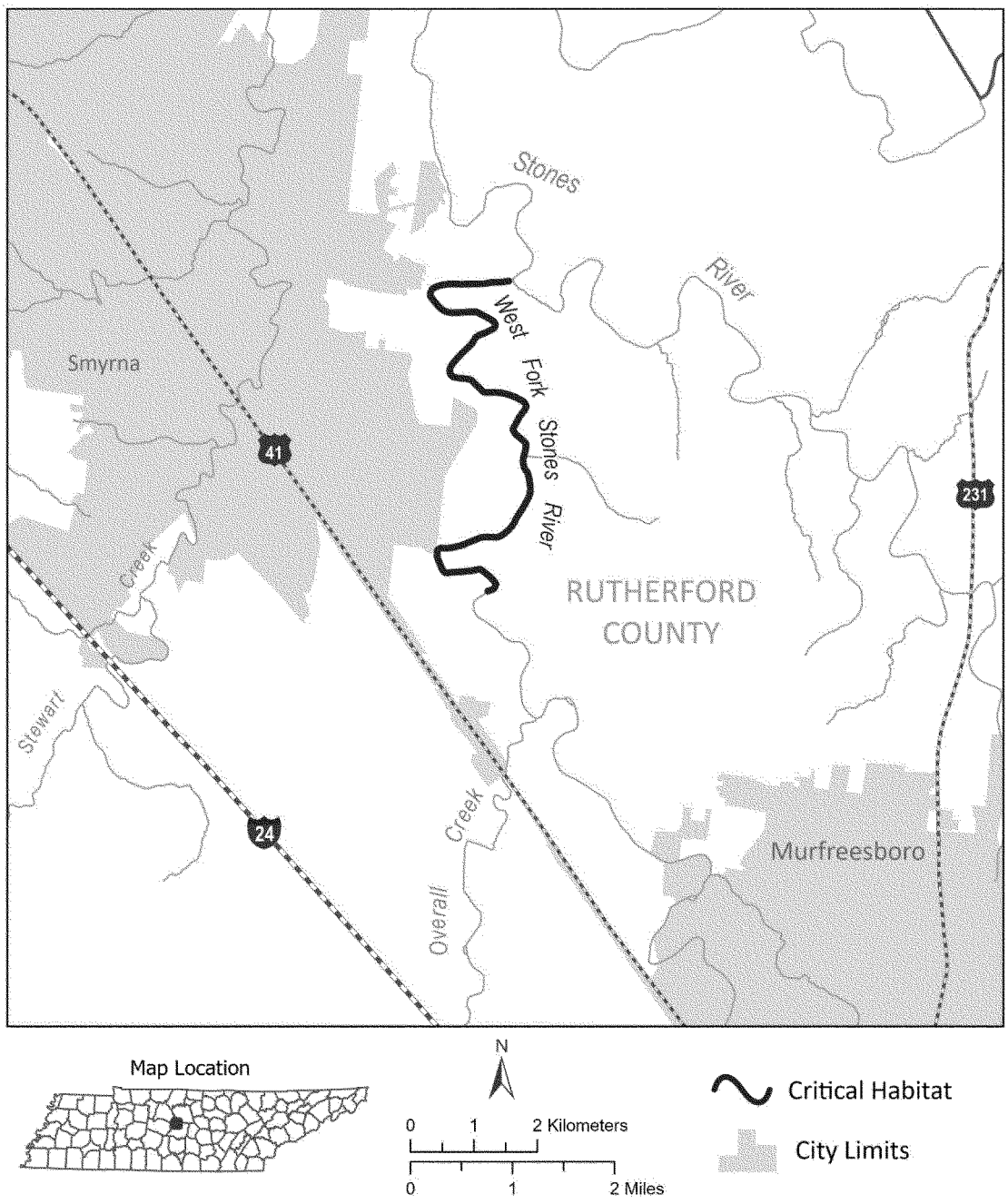
(i) Unit 1 consists of 6.2 rmi (10 rkm) of the West Fork Stones River beginning at the Nice's Mill Recreation Area lowhead dam and continuing to the confluence with the Stones River in Rutherford County, Tennessee. Riparian lands in Unit 1 are in Federal ownership (Department of Defense, U.S. Army Corps of Engineers, J. Percy Priest Lake).

(ii) Unit 1 includes stream channel up to bankfull height.

(iii) Map of Unit 1 follows:

Figure 2 to Brawleys Fork crayfish (Cambarus williami) paragraph (6)(iii)

Unit 1: West Fork Stones River, Brawleys Fork Crayfish Critical Habitat
Rutherford County, Tennessee



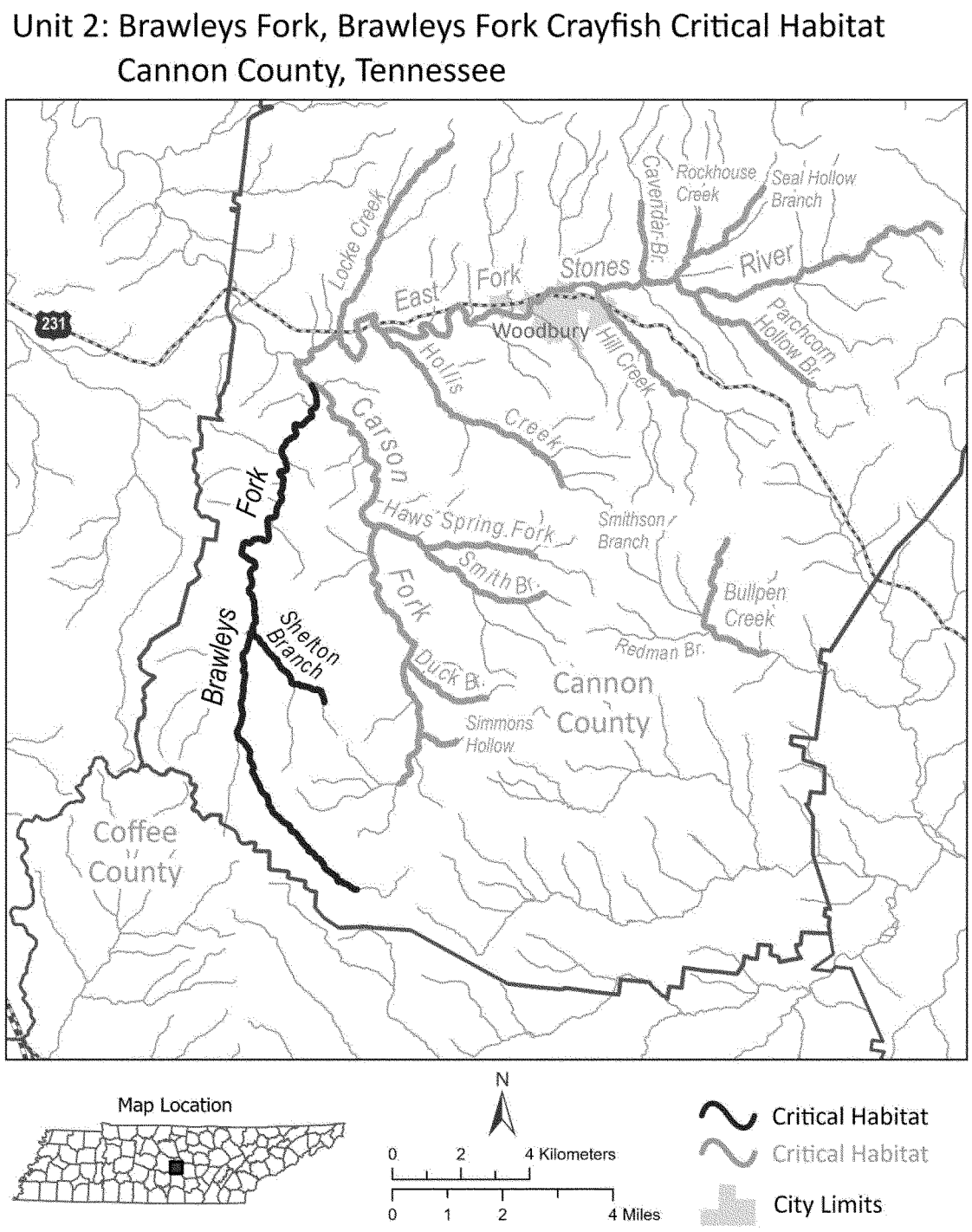
(7) Unit 2: Brawleys Fork; Cannon County, Tennessee.

(i) Unit 2 consists of approximately 13.8 rmi (22.2 rkm) of the Brawleys Fork and tributaries in Cannon County, Tennessee. Unit 2 includes the Brawleys Fork from the headwaters at Mill Bluff Hollow to the confluence with the Carson Fork and Shelton Branch from the Gene Perkins Road crossing to the confluence with Brawleys Fork. Riparian lands in Unit 2 are in private ownership except for a small amount of publicly owned bridge crossings and road easements.

(ii) Unit 2 includes stream channel up to bankfull height.

(iii) Map of Unit 2 follows:

Figure 3 to Brawleys Fork crayfish (Cambarus williami) paragraph (7)(iii)



(8) Unit 3: Carson Fork; Cannon County, Tennessee.

(i) Unit 3 consists of approximately 18.2 rmi (29.3 rkm) of the Carson Fork and tributaries in Cannon County, Tennessee. Riparian lands in Unit 3 are in private ownership except for a small amount of publicly owned bridge crossings and road easements.

(A) Subunit 3a (Carson Fork) consists of 12.3 rmi (19.8 rkm) and extends from the headwaters of the Carson Fork near Sadler Lane downstream to the confluence with the East Fork Stones River, from the headwaters of Duck Branch to the confluence of Carson Fork, and from the headwaters of an unnamed tributary in Simmons Hollow to the confluence of Carson Fork.

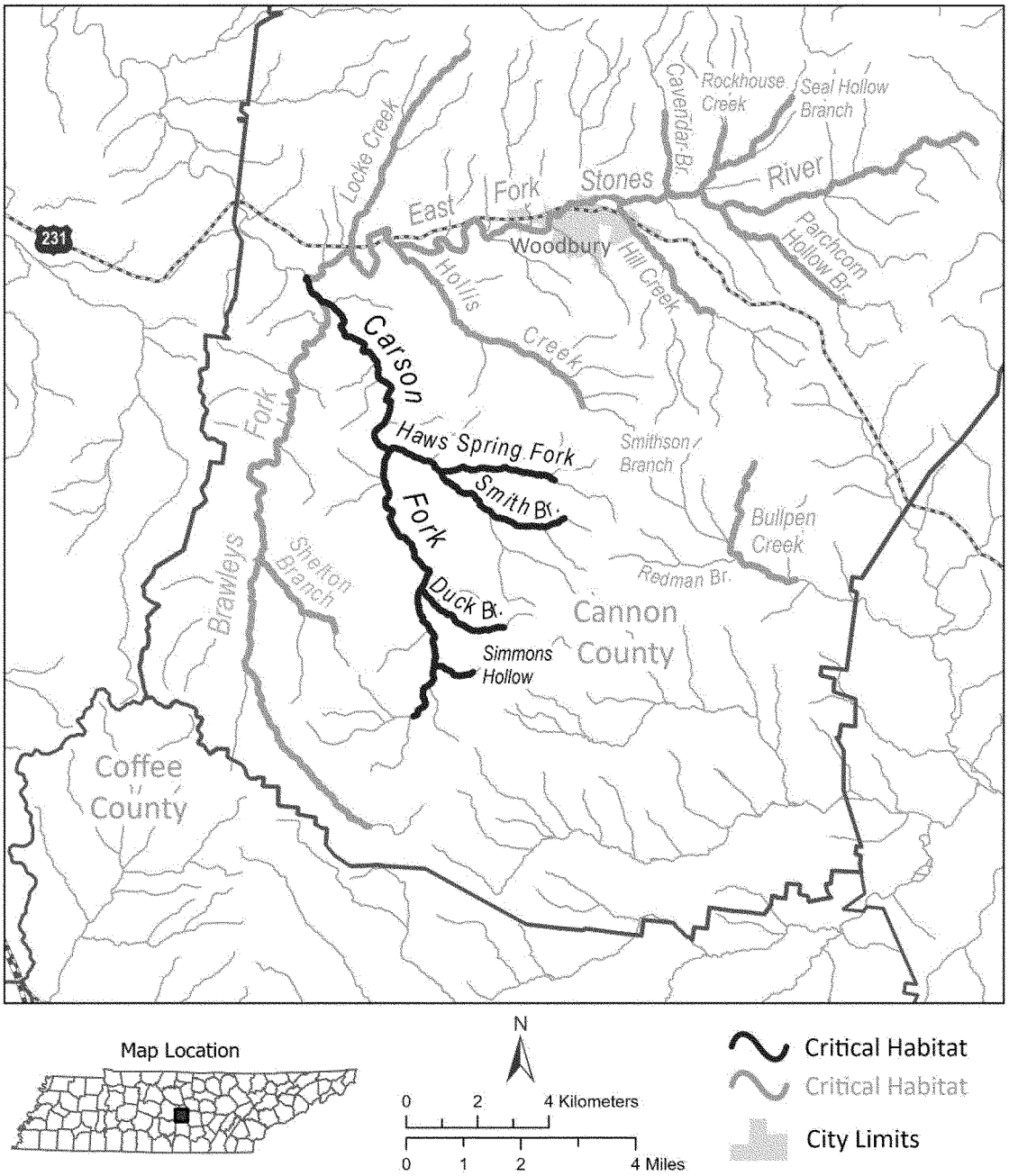
(B) Subunit 3b (Haws Spring Fork) consists of 5.9 rmi (9.5 rkm) and extends from the headwaters of Smith Branch near Carrick Hollow to the confluence with Haws Spring Fork and from the headwaters of Haws Spring to the confluence with the Carson Fork.

(ii) Unit 3 includes stream channel up to bankfull height.

(iii) Map of Unit 3 follows:

Figure 4 to Brawleys Fork crayfish (Cambarus williami) paragraph (8)(iii)

Unit 3: Carson Fork, Brawleys Fork Crayfish Critical Habitat
Cannon County, Tennessee



(9) Unit 4: East Fork Stones River, Cannon County, Tennessee.

(i) Unit 4 consists of approximately 35.9 rmi (57.8 rkm) of the East Fork Stones River mainstem and some of its tributaries in Cannon County, Tennessee. Riparian lands in Unit 4 are in State (0.7 rmi (1.1 rkm), local (0.9 rmi (1.4 rkm) in two parks), and private ownership, as well as small amount of publicly owned bridge crossings and road easements.

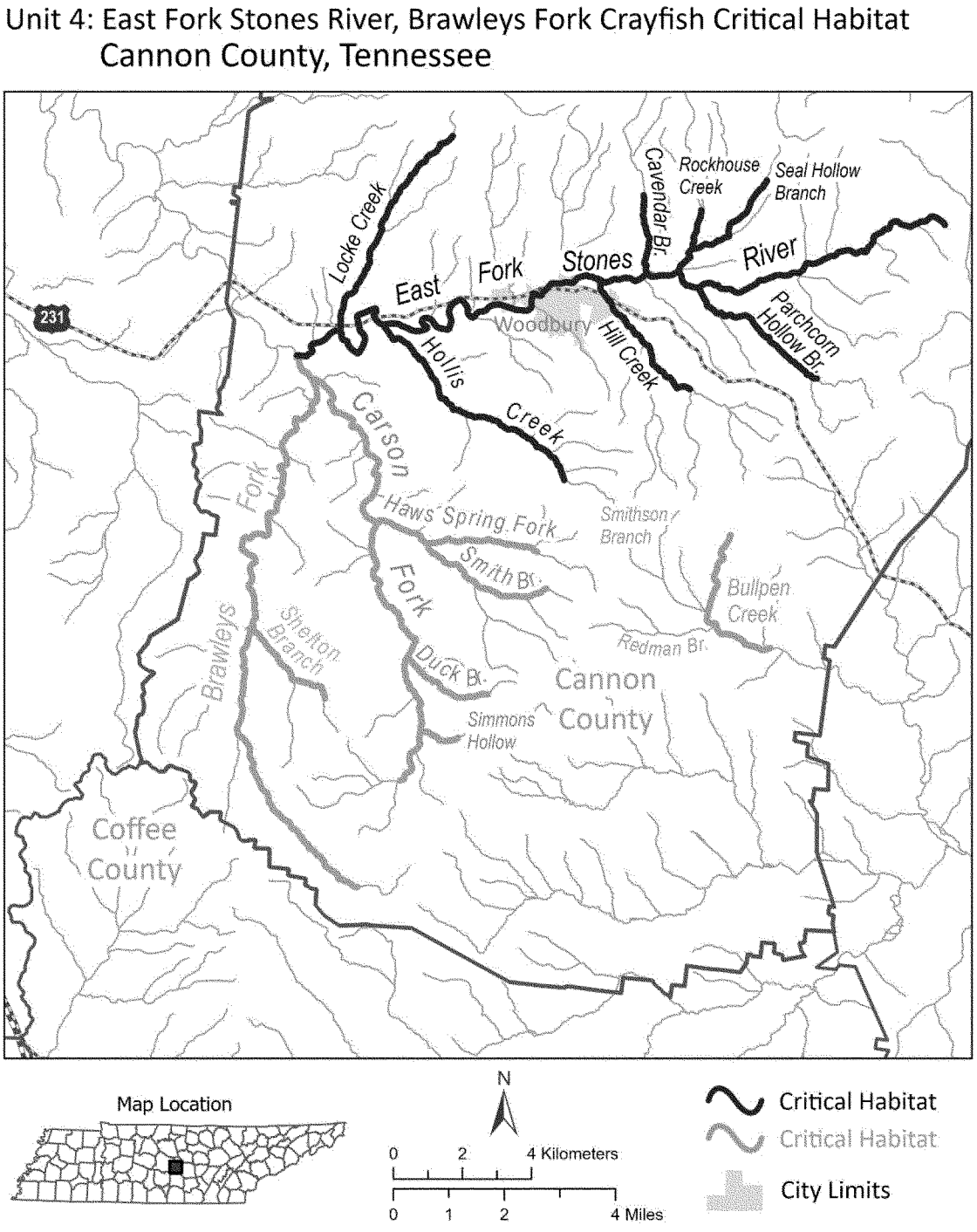
(A) Subunit 4a (East Fork Stones) consists of 32.5 rmi (52.3 rkm) and includes Hollis Creek from the headwaters near Hollis Creek South Road to the confluence with the East Fork Stones River, Hill Creek from the tributary at Wood Hollow to the confluence with the East Fork Stones River, Parchcorn Hollow Branch from the Parchcorn Hollow road crossing to the confluence with the East Fork Stones River, Cavender Branch from the Cavender Road bridge to the confluence with the East Fork Stones River, and from Locke Creek to the confluence with the East Fork Stones River.

(B) Subunit 4b (Rockhouse Creek) consists of 3.4 rmi (5.5 rkm) and extends from the stream crossing at Seal Hollow Branch by Seal Hollow Road to the confluence with Rockhouse Branch and from the Higgins Road crossing of Rockhouse Creek downstream to the confluence with the East Fork Stones River.

(ii) Unit 4 includes stream channel up to bankfull height.

(iii) Map of Unit 4 follows:

Figure 5 to Brawleys Fork crayfish (Cambarus williami) paragraph (9)(iii)



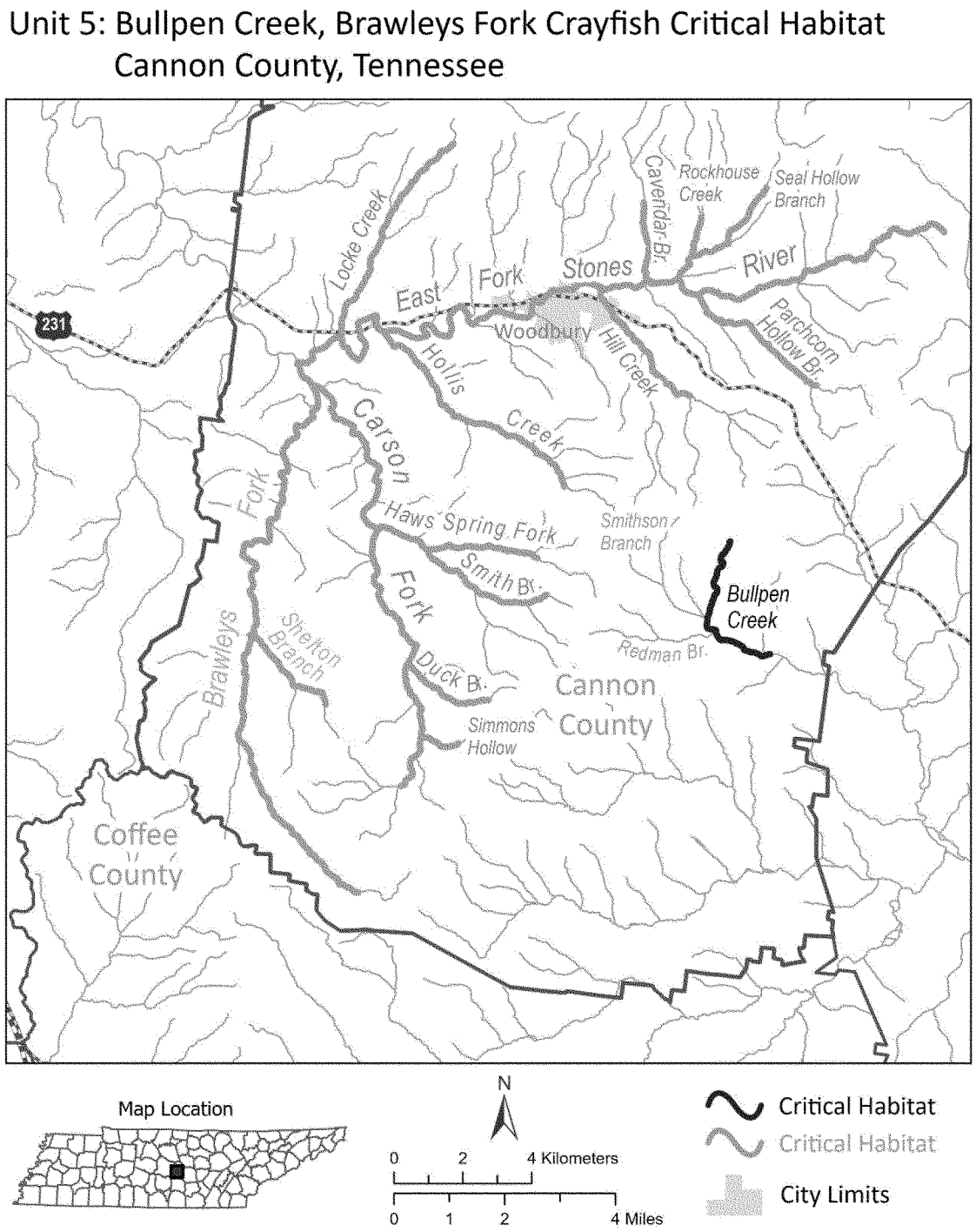
(10) Unit 5: Bullpen Creek; Cannon County, Tennessee.

(i) Unit 5 consists of approximately 3.1 rmi (5.0 rkm) of Bullpen Creek beginning at the Lonnie Smith Road crossing and extending downstream to the lowhead dam near Charlie Powell Road in Cannon County, Tennessee. Riparian lands in Unit 5 are in private ownership except for a small amount of publicly owned bridge crossings and road easements.

(ii) Unit 5 includes stream channel up to bankfull height.

(iii) Map of Unit 5 follows:

Figure 6 to Brawleys Fork crayfish (Cambarus williami) paragraph (10)(iii)



(11) Unit 6: Mountain Creek; Warren County, Tennessee.

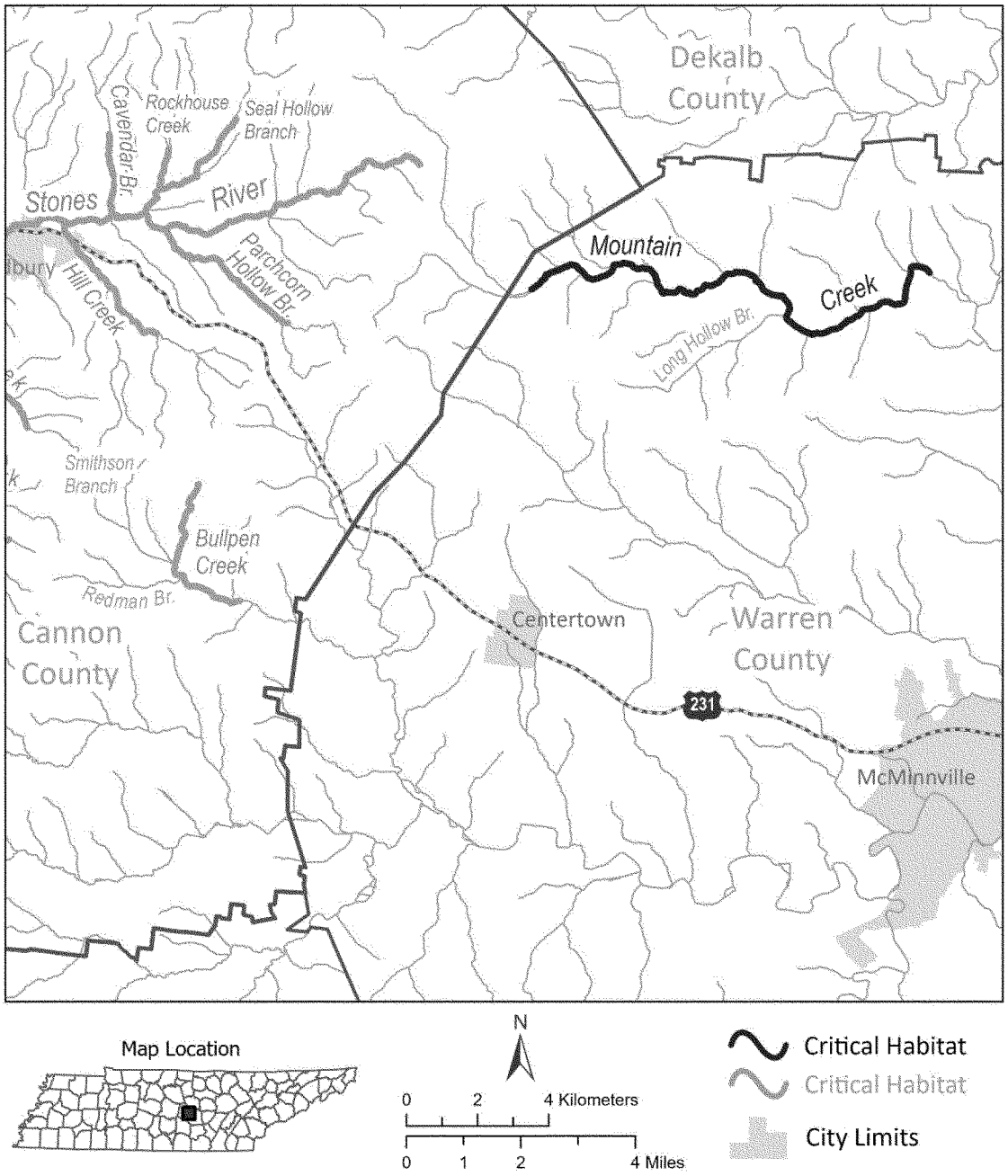
(i) Unit 6 consists of approximately 9.4 rmi (15.1 rkm) of Mountain Creek in Warren County, Tennessee. Unit 6 extends from the Mountain Creek road crossing at Short Mountain Road downstream to the Smithville Highway bridge in the city of Dibrell, Warren County, Tennessee. Riparian lands in Unit 6 are in private ownership except for a small amount of publicly owned bridge crossings and road easements.

(ii) Unit 6 includes stream channel up to bankfull height.

(iii) Map of Unit 6 follows:

Figure 7 to Brawleys Fork crayfish (Cambarus williami) paragraph (11)(iii)

Unit 6: Mountain Creek, Brawleys Fork Crayfish Critical Habitat
Warren County, Tennessee



* * * * *

Wendi Weber,

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

[FR Doc. 2023–17666 Filed 8–21–23; 8:45 am]

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