



DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2024–0065; FXES1111090FEDR–245–FF09E21000]

RIN 1018–BH46

Endangered and Threatened Wildlife and Plants; Endangered Species Status for Kentucky Creekshell 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 Kentucky creekshell (*Leaunio ortmanni* [= *Villosa ortmanni*]), a freshwater mussel species from Kentucky and Tennessee, as an endangered 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 Kentucky creekshell. 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 Kentucky creekshell as an endangered species under the Act. Finalizing this rule as proposed 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 Kentucky creekshell under the Act. In total, approximately 545 river miles (877 river kilometers) in Kentucky and Tennessee fall within the boundaries of the proposed critical habitat designation. We also announce the availability of an economic analysis of the proposed designation of critical habitat for the Kentucky creekshell.

DATES: We will accept comments received or postmarked on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. 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 [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

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–2024–0065, 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–2024–0065, 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 <https://ecos.fws.gov/ecp/species/8209>, at <https://www.regulations.gov> at Docket No. FWS–R4–ES–2024–0065, or both.

FOR FURTHER INFORMATION CONTACT: Lee Andrews, Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services Kentucky Field Office, 330 West Broadway, Room 265, Frankfort, KY 40601; telephone 502–653–0571. 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. Please see Docket No. FWS–R4–ES–2024–0065 on <https://www.regulations.gov> for a document that summarizes this proposed rule.

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 an endangered species within 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 Kentucky creekshell meets the definition of an endangered 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 designation 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 Kentucky creekshell as an endangered species under the Act, and we propose designation of approximately 545

stream miles (877 river kilometers) in Kentucky and Tennessee as 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 Kentucky creekshell is endangered due to the following threats: Habitat loss, degradation, and fragmentation (Factor A) resulting from stressors, including dams and other instream barriers, and degraded water quality from development, agriculture, and instream gravel mining. Changes in climate conditions and small population size exacerbate the effects of habitat loss, degradation, and fragmentation (Factor E).

Section 4(a)(3) of the Act requires that the Secretary of the Interior (Secretary), to the maximum extent prudent and determinable, concurrently with listing designate critical habitat for the species. 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) Specific information on:

(a) The amount and distribution of Kentucky creekshell habitat;

(b) Any additional areas occurring within the range of the species 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 protection, or (ii) are unoccupied at the time of listing and are essential for the conservation of the species;

(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) Whether areas not occupied at the time of listing qualify as habitat for the species and are essential for the conservation of the species.

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

(5) 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.

(6) 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.

(7) 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 . If you think we should exclude any additional areas, please provide information supporting a benefit of exclusion.

(8) 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>.

Our final determination may differ from this proposal because we will consider all comments we receive during the comment period as well as any information that may become available after this proposal. Based on the new information we receive (and, if relevant, any comments on that new information), we may conclude that the species is threatened instead of endangered 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 our final rule, we will clearly explain our rationale and the basis for our final decision, including why we made changes, if any, that differ from this proposal.

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, the Kentucky creekshell was included in a listing petition from the Center for Biological Diversity (CBD) and others (CBD 2010, entire) requesting that

the Service list 404 aquatic, riparian, and wetland species as endangered or threatened under the Act. In 2011, the Service found that this petition presented substantial scientific or commercial information indicating that listing may be warranted for 374 species, including the Kentucky creekshell (76 FR 59836, September 27, 2011). Based on that finding, we conducted a species status assessment (SSA) for the Kentucky creekshell to compile the best scientific and commercial data available regarding the species' biology and any factors influencing its viability. This document constitutes our 12-month finding on the April 20, 2010, petition to list the Kentucky creekshell under the Act.

Peer Review

An SSA team prepared an SSA report for the Kentucky creekshell. 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 in listing and recovery actions under the Act, we solicited independent scientific review of the information contained in the Kentucky creekshell SSA report. We sent the SSA report to two independent peer reviewers and received one response. Results of this structured peer review process can be found at <https://www.regulations.gov>. In preparing this proposed rule, we incorporated the results of the review, as appropriate, into the SSA report, which is the foundation for this proposed rule.

Summary of Peer Reviewer Comments

As discussed in **Peer Review** above, we received comments from one peer reviewer on the draft SSA report. We reviewed all comments we received from the peer

reviewer for substantive issues and new information regarding the information contained in the SSA report. The peer reviewer provided additional information and clarification regarding the propagation of Kentucky creekshell. Otherwise, no substantive changes to our analysis and conclusions within the SSA report were deemed necessary, and the peer reviewer's comments are addressed in version 1.0 of the SSA report.

I. Proposed Listing Determination

Background

The Kentucky creekshell (*Leaunio ortmanni* [= *Villosa ortmanni*]) is a member of the Class Bivalvia, Order Unionodia, and Family Unionidae (ITIS 2023). It was described by Walker (1925) from specimens collected from the Green River at Mammoth Cave, Edmonson County, Kentucky, and from Sulphur Fork of Russell Creek, Adair County, Kentucky. The Kentucky creekshell was previously placed in the genus *Villosa*, which was a loose amalgam of species generally defined by rayed and elongated shells with weak hinged teeth. None of these characteristics were unique to *Villosa*, and not all species possessed all the characteristics (Watters 2018, p. 4). As a result, the genus was broken into multiple new genera with true *Villosa* being limited to the extreme Southeast with additional nominal taxa being placed into *Paetulunio*, *Cambarunio*, *Leaunio*, and *Sagittunio* (Watters 2018, entire).

While the 2010 CBD petition referred to Kentucky creekshell (*Villosa ortmanni*), the species' taxonomy, common name, and scientific name as *Leaunio ortmanni* have been accepted by the scientific community, as evidenced by the species' inclusion in A Revised List of the Freshwater Mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada (Williams et al. 2017, p. 45), as well as its inclusion in the Freshwater Mollusk Conservation Society Names Subcommittee list (FMCS 2021). Therefore, this rulemaking action proposes to list the Kentucky creekshell (*Leaunio ortmanni*). A

thorough review of the taxonomy, life history, and ecology of the Kentucky creekshell is presented in the SSA report (Version 1.0; Service 2023, pp. 1–63).

Kentucky creekshell adult shells are 2–3 inches in length with a greenish-yellow to tan color with numerous, fine green rays, mostly located on the posterior end of the shell (Watters 2018, p. 42). The species is considered relatively fast-growing and short-lived compared to other mussel species. It occurs in medium-sized rivers to small streams and spring runs. The species can be found in riffles comprised of sand and gravel or found in adjacent depositional areas near shore (Haag and Cicerello 2016, p. 261). Kentucky creekshell most often occurs in suitable habitat influenced by nearby springs due to the preferred habitat of its obligate host fish, the banded sculpin (*Cottus carolinae*).

The Kentucky creekshell is endemic to the Green River basin. Historically, the species occurred in the Clifty Creek–Rough River, Ugly Creek–Green River, Lower Nolin River, Bays Fork–Barren River, Skaggs Creek, Little Muddy Creek–Barren River, Middle Nolin River, Upper Nolin River, Russell Creek, East Fork Barren River–Barren River, Trammel Creek, Drakes Creek, and Gasper River basins (figure 1). The Kentucky creekshell is presumed extirpated from the historically occupied Lower Nolin River, Bays Fork–Barren River, Skaggs Creek, and Little Muddy Creek–Barren River basins, with no observations of the species since 1973 (a 50-year absence).

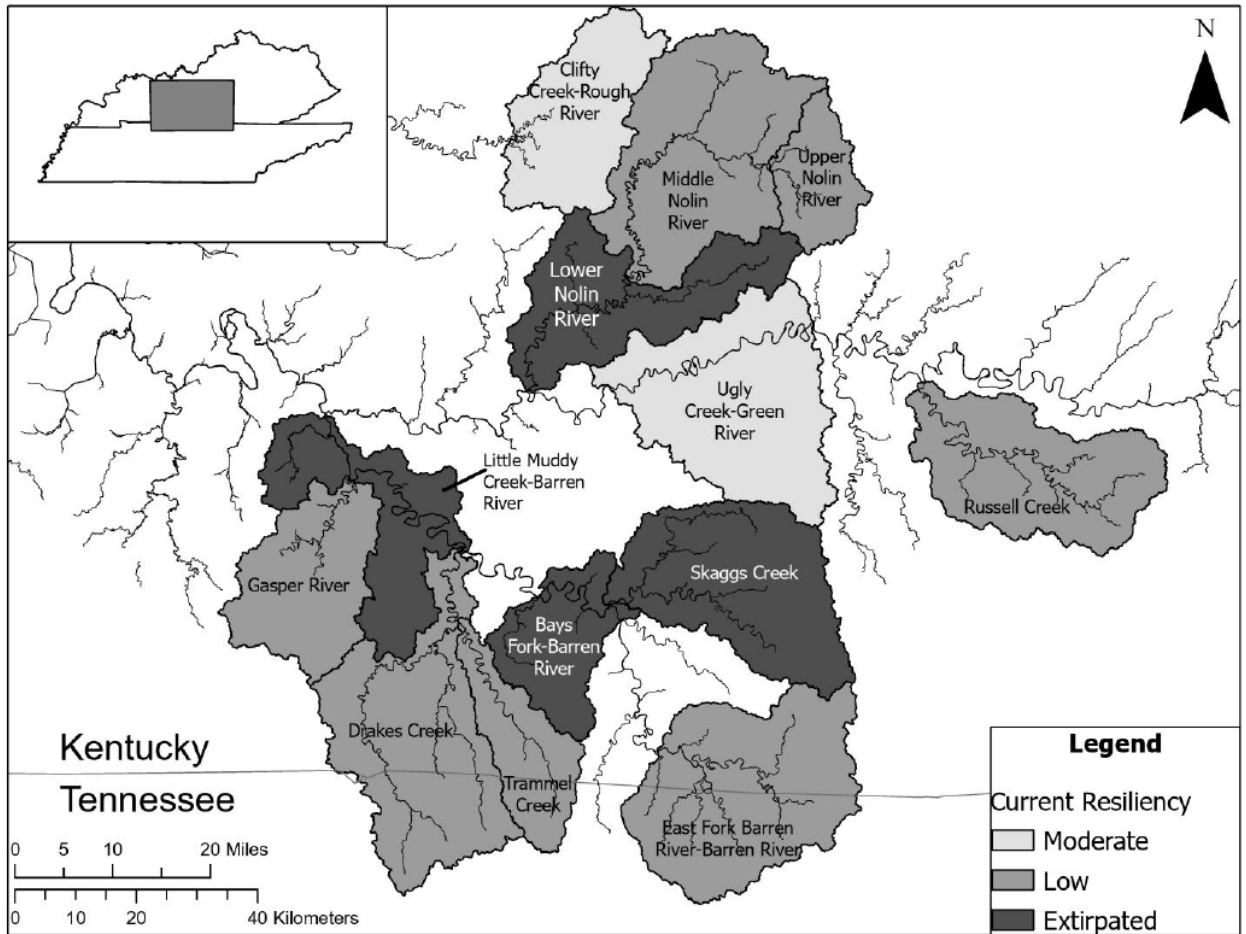


Figure 1. Kentucky creekshell range map, distributed across the Green River basin. The species is known from 13 analytical units.

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.

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.

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, which is further described in the 2009 Memorandum Opinion on the foreseeable future from the Department of the Interior, Office of the Solicitor (M-37021, January 16, 2009; “M-Opinion,” available online at <https://www.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/M-37021.pdf>). The foreseeable future extends as far into the future as the Service and NMFS (hereafter, the Services) can make reasonably reliable predictions about the threats to the species and the species’ responses to those threats. We need not identify the foreseeable future in terms of a specific period of time. We will describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species’ life-history characteristics, threat-projection timeframes, and environmental variability. In other words, the foreseeable future is the period of time over which we can make reasonably reliable predictions. “Reliable” does not mean “certain”; it means sufficient to provide a reasonable degree of confidence in the prediction, in light of the conservation purposes of the Act.

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 the Kentucky creekshell's 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, which we then used 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 Docket No. FWS–R4–ES–2024–0065 on <https://www.regulations.gov> and at <https://ecos.fws.gov/ecp/species/8209>.

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

We assessed the best available information to identify the physical and biological needs to support individual fitness at all life stages for the Kentucky creekshell. Full descriptions of all needs are available in chapter 2 of the SSA report (Service 2023, pp. 6–13), which can be found in docket number FWS–R4–ES–2024–0065 on <https://www.regulations.gov>, and on our internet site <https://ecos.fws.gov/ecp/species/8209/>. We have determined that the resource and demographic needs for the Kentucky creekshell include biotic and abiotic habitat characteristics as described below.

(1) Kentucky creekshell individuals of all life stages require habitat conditions characterized by clean, flowing water with appropriate water quality and temperature conditions and an absence of contaminants and fine sediments, as well as natural flow regimes that vary with respect to timing, magnitude, durations, and frequency of river discharge events. The species occurs in stable sand, cobble, and gravel substrates in riffles and runs that are predominantly silt-free.

(2) As filter feeders, Kentucky creekshells require adequate nutrition for survival and growth of juveniles and adults that includes suspended food and nutrients including (but not limited to) phytoplankton, zooplankton, rotifers, protozoans, detritus, and dissolved organic matter from the water column or sediments.

(3) The Kentucky creekshell requires host fish to complete its life cycle. Kentucky creekshell use the banded sculpin as a host fish (Haag and Cicerello 2016, p. 261); it is the only sculpin known to occur in the Kentucky creekshell range. The Kentucky creekshell requires sufficient host fish numbers to provide nutrition to and dispersal of glochidia. The presence of life history requirements for the banded sculpin influence Kentucky creekshell viability through host fish contribution to mussel recruitment. Suitable habitat for the banded sculpin is characterized as spring-fed and spring-influenced streams with riffle and pool areas with gravel and rubble substrate, adjacent riparian cover, and sufficient food items, including macroinvertebrates and small fish such as darters. The banded sculpin is susceptible to impacts from habitat fragmentation due to its small size and lower ability to swim the distance between suitable habitat patches compared to larger fishes (Etnier and Starnes 1993, p. 387). Additionally, even small vertical drops (2–3 inches) created by culverts can be a significant barrier to the banded sculpin's upstream movement. Being a benthic species, the banded sculpin is particularly sensitive to silt and sedimentation (Greenberg and Holtzman 1987, entire).

(4) Connectivity among Kentucky creekshell populations is also important for species viability. Although the species' capability to disperse is evident through its historical occurrence in a wide range of rivers and streams, instream barriers have fragmented Kentucky creekshell populations and suitable habitat, resulting in the isolation of populations, loss of access to quality habitat for one or more life stages, and prevention of host fish movement, which in turn, influences Kentucky creekshell

distribution. Barriers to movement can cause isolation or patchy distributions of Kentucky creekshells, which may limit both genetic exchange and recolonization. Genetic exchange occurs between and among Kentucky creekshell beds via sperm drift, host fish movement, and movement of Kentucky creekshells during high flow events. For genetic exchange to occur, connectivity must be maintained, and proximity of males and females is essential.

(5) Most freshwater mussels, including the Kentucky creekshell, are found in mussel beds with other species that vary in size and density. The Kentucky creekshell occurs very sporadically within these beds, which are often separated by stream reaches in which the species is absent or rare. Because the Kentucky creekshell is often a component of these healthy mussel assemblages within optimal mussel habitats, maintaining the beds and connectivity between these populations is necessary for the species to maintain resiliency over time.

Threats

The following discussions include the evaluations of threats and associated stressors that are affecting the Kentucky creekshell and its habitats: (1) Habitat loss and degradation, including water quality degradation; (2) changing climate conditions; and (3) nonnative invasive species (Service 2023, chapter 3). We also considered the effects of small population size and enigmatic population declines in mussels. Full descriptions of each of the threats and their sources are available in chapter 3 of the SSA report (Service 2023, pp. 16–27).

Habitat Loss and Degradation

Land Cover

Certain land cover types have been correlated with degrading aquatic systems including urbanization and development and agricultural uses including cultivated crops, hay/pasture land cover, and livestock operations.

Urbanization or Development

As a land cover type, the term “development” refers to urbanization of the landscape, including (but not limited to) land conversion for residential, commercial, and industrial uses and the accompanying infrastructure. The effects of urbanization may include alterations to water quality, water quantity, and habitat (both in-stream and streamside) (EPA 2003, entire). Urban development can lead to increased variability in streamflow, typically increasing the extent and volume of water entering a stream after a storm and decreasing the time it takes for the water to travel over the land before entering the stream (Giddings et al. 2009, p. 1). Impervious surface refers to all hard surfaces like paved roads, parking lots, roofs, and even highly compacted soils like sports fields. Impervious surfaces prevent the natural soaking of rainwater into the ground and ultimately and gradually seeping into streams (Brabec et al. 2002, p. 499). Instead, rainwater accumulates and often flows into storm drains, which rapidly drain to local streams. This flow results in deleterious effects on streams in three important ways (USGS 2014, pp. 2–5):

(1) *Water quantity*: Storm drains deliver large volumes of water to streams much faster than would naturally occur, often resulting in flooding and bank erosion that reshapes the channel and causes substrate instability. Increased high-velocity discharges can cause species living in streams (including mussels) to be stressed, displaced, or killed by fast-moving water and the debris and sediment carried in it. Displaced individuals may be left stranded out of the water once floodwaters recede or displaced into less suitable or unsuitable habitat.

(2) *Water quality*: Pollutants (e.g., gasoline, oil, road salts) that accumulate on impervious surfaces may be washed directly into streams during storm events. Freshwater mussels, as a group, are particularly sensitive to changes in water quality parameters including, but not limited to, dissolved oxygen, salinity, ammonia, elevated temperature, excessive suspended solids, and other pollutants.

(3) *Water temperature*: During warm and hot weather, the temperature of rainwater that falls on impervious surfaces rapidly warms to temperatures outside the species' tolerance and can stress or kill freshwater species when it enters streams.

Urbanization increases the quantity of impervious surfaces (Center for Watershed Protection 2003, p. 1). The resulting storm water runoff affects water quality parameters such as temperature, pH, dissolved oxygen, and salinity, which in turn alters the water chemistry such that it is less able to support aquatic biota, including mussels. The rapid runoff also reduces the amount of infiltration into the soil and into the water table, resulting in lower sustained streamflow, especially during droughts and dry periods (Giddings et al. 2009, p. 1). Within the Kentucky creekshell's range, there is one major city, Bowling Green, Kentucky (U.S. Census Bureau 2022). Bowling Green has a population of approximately 75,000 people and is the third most populated city in Kentucky. Bowling Green is located on the mainstem Barren River between the Gasper River and Drakes Creek, which both have populations of Kentucky creekshell. This city, along with other, smaller towns, ultimately contribute to the degradation of the aquatic conditions of the nearby rivers and streams due to the relatively high amounts of impervious surfaces.

Agricultural Land Cover

Cultivated crops, hay/pasture land cover types, and large crop farming operations contribute to nutrient pollution when best management practices are not properly implemented (EPA 2016, entire). Fertilizers from these operations are both rich in

nitrogen and phosphorus and are the primary sources of nutrient pollution from agricultural sources. If fertilizers are not applied according to best management practices, including the appropriate rate, timing, and application method, water quality in stream systems can be negatively affected by excess nutrients from fertilizers.

Excess nutrients are transported to streams when it rains or when water and soil containing nitrogen and phosphorus wash into nearby waters or leach into groundwater. Excess nitrogen and phosphorus affect water quality and may cause lethal algal blooms in surface waters, which can reduce the dissolved oxygen to fatal levels for aquatic life (Carpenter et al. 1998, entire). Fertilized soils and livestock can also contribute significant sources of nitrogen-based compounds like ammonia and nitrogen oxides (Carpenter et al. 1998, entire). Ammonia is extremely toxic to freshwater mussels and other aquatic life and can be extremely detrimental if large amounts are deposited to surface waters (Augspurger et al. 2003, entire). Stream banks with unstable slopes from agricultural clearing with no vegetative riparian buffer or the lack of stable cover crops between rotations on farmed lands can increase the amount of nutrients that enter nearby streams by way of increased soil erosion. Conversely, cover crops and other vegetation will use excess nutrients and increase soil stability (Barling and Moore 1994, p. 543). Livestock often use streams, which degrades water quality and stream bank stability and reduces water quantity available for mussels and other aquatic fauna that may occur downstream from these agricultural activities.

Siltation/Sedimentation

Excess siltation is a threat to mussel survival and can be a significant factor affecting mussel distribution when siltation prevents mussel life history needs from being met in habitat reaches (Dennis 1984, p. 150). Major sources of siltation and sedimentation (when silt and sediment particles accumulate on the stream bottom) are development and agriculture (Hasse and Lathrop 2003, p. 159) and instream gravel

mining (see Instream Gravel Mining below). Legacy sediment resulting from past landscape development persists in the Green River drainage, but much of the current siltation/sedimentation is caused by activities that directly destabilize stream channels and remove riparian vegetation (e.g., channelization, construction projects, land development). Stream bank erosion and stream scour are the primary generators of excess sediment in the Green River basin. According to the Kentucky Division of Water list of impaired streams that meet section 305(b) of the Clean Water Act (33 U.S.C. 1251 et seq.), the most prevalent pollutant in impaired streams in the Green River drainage is sedimentation/siltation, affecting 18 percent of assessed stream miles (KDOW 2022). Based on these data, 134 of 222 stream segments with known causes of impairment in the Green River drainage are impaired due to siltation and sedimentation, and the leading sources of the impairment include agriculture, coal mining, channelization, and loss of riparian habitat.

Sedimentation causes several negative effects on freshwater mussels, including reduced reproduction, reduced feeding, reduced respiration, and decreased survival (Goldsmith et al. 2021 pp. 104–105). The Kentucky creekshell relies on sight-feeding fishes as part of its life cycle; therefore, turbidity and high levels of suspended solids during critical reproductive periods may affect glochidial attachment to host fish and ultimately decrease recruitment in any given population (McLeod et al. 2017, p. 348). Sedimentation affects mussel reproduction as elevated levels of suspended sediment may cause host fish to avoid such areas, thereby decreasing the likelihood of physical interaction between host fishes and gravid female mussels (Goldsmith et al. 2021, p. 12).

Elevated levels of suspended sediment affect the ability of freshwater mussels to filter sperm and food items from the water column. Suspended silt can interfere with mussel filtration and respiration and reduce mussel food consumption rates (Dennis 1984, p. 212; McMahon and Bogan 2001, p. 382). Stream beds can become inundated with fine

sediment, which may lead to smothering of mussels (Goldsmith et al. 2021 p. 18). For example, one live Kentucky creekshell was found in the Upper Nolin River among stable substrates; however, the site was covered in shifting sands one year later and the individual was presumed dead (Compton 2023, pers. comm.). Additionally, silt hinders surface water infiltration into groundwater, and increased sedimentation can reduce or stop groundwater recharge, causing a decline in groundwater levels (Abdalla and Rawahi 2013, p. 1956; Rajendran et al. 2020, p. 1). The presence of groundwater and spring-fed streams are vitally important to the Kentucky creekshell as this is the preferred habitat of its host fish, the banded sculpin. In the future, siltation and sedimentation in rivers and streams are expected to increase due to associated human disturbance.

Instream Gravel Mining

Instream sand and alluvial gravel mining has been implicated in the destruction of mussel populations in the Southeast (Hartfield 1993, p. 138). Negative effects associated with gravel mining include stream channel modifications such as altered habitat, disrupted flow patterns, and sediment transport. Additionally, gravel mining degrades water quality, including increased turbidity, reduced light penetration, increased temperature, and increased sedimentation. This habitat and water quality degradation results in reductions in aquatic macroinvertebrate and fish populations, as well as negatively affects fish spawning and nursery habitats, causing cumulative food web disruptions (Kondolf 1997, p. 541; Brown et al. 1998, p. 988). Instream gravel mining has negatively affected Kentucky creekshell habitat for many years. (Cicerello 2005, p. 14).

Multiple instream gravel mining operations have been observed throughout the species' range within the last 10 years. For example, in 2021, evidence of heavy machinery in the stream and severely altered streambed was noted at one gravel mine site immediately upstream of a known Kentucky creekshell population (Compton 2023, pers.

comm.). This type of habitat alteration reduces the amount of suitable habitat and limits the ability of the species to move farther upstream. An additional gravel mining operation occurs in a stream valley immediately adjacent to a known Kentucky creekshell population. The Kentucky creekshell has not been observed in the mined stream valley; however, based on proximity to known populations and habitat conditions, the species very likely occurred there historically (Dinkins 2023, pers. comm.). Consequently, instream mining may be linked to the loss of the species from areas where it was historically present.

Impoundment Effects

The negative effects of impoundments and barriers on aquatic habitats and freshwater mussels are well-documented (Watters 2000, p. 261). Extinction/extirpation of North American freshwater mussels can be traced to impoundment and inundation of riffle habitats in all major river basins of the central and eastern United States (Haag 2009, p. 107; North Carolina Wildlife Resources Commission 2015, p. 109). Dams, either natural (by beavers or aggregations of woody debris) or manmade, can have various effects on stream ecosystems, many of them negative. Reductions in the diversity and abundance of mussels are primarily attributed to habitat loss caused by human-made impoundments (Neves et al. 1987, p. 63).

The Kentucky creekshell requires rivers and streams with natural flow regimes because the species requires a lotic (flowing water) environment. Perturbations that disrupt natural water flow patterns (e.g., dams) thus have a negative influence on the Kentucky creekshell and its host fish species, the banded sculpin. Effects from instream barriers include population isolation, hydrological instability, high shear stress, scour, and cold-water releases, all of which suppress mussel recruitment (Hardison and Layzer 2001, p. 79; Smith and Meyer 2010, p. 543; Hubbs 2012, p. 8). Consequently, the construction and continued operation of dams has resulted in the likely extirpation of the

Kentucky creekshell in many portions of its historical range including the decline of the species in the Green River which can be partly attributed to long-term altered flows from the Green River Lake Dam (Konrad et al. 2011, entire; Haag and Cicerello 2016, p. 261). Furthermore, Kentucky creekshell occurrences have not been reported from heavily dam-influenced reaches on the mainstem Barren, Nolin, and Rough Rivers indicating dam-influenced reaches do not provide conditions that meet the species' life-history needs.

The construction and presence of dams had a substantial negative impact on the Kentucky creekshell and was a primary driver of its condition historically. The historical negative impact of dams continues through isolation of populations and the degradation and fragmentation of habitat throughout the range of the species. Although some obsolete navigation locks and dams on the Green and Barren Rivers have been removed, the historical negative effects associated with large reservoir dams and smaller, more numerous low-head dams continue to negatively influence the species and its habitats.

Changing Climate Conditions

Changing climate conditions can affect freshwater mussels, their habitat, and their host fish by altering water temperatures and precipitation patterns that increase flooding, prolong droughts, or reduce stream flows (Nobles and Zhang 2011, pp. 147–148). Increases in water temperatures alter fundamental ecological processes, thermal suitability of aquatic habitats for resident species, and their geographic distribution, thus increasing the likelihood of species extinction and loss of biodiversity.

Climate change may cause changes and shifts in seasonal patterns of precipitation and runoff, which can alter the hydrology of stream systems, affecting species composition and ecosystem productivity. Aquatic organisms are sensitive to changes in frequency, duration, and timing of extreme precipitation events such as floods or droughts, potentially resulting in interference of reproduction. Further, increased water

temperatures and seasonally reduced streamflow can alter many ecosystem processes, including increases in nuisance algal blooms.

Some nonnative invasive species may be better adapted to the effects of climate change, including more tolerance to higher temperatures (Ferreira-Rodriguez et al. 2017, entire). Changes in presence or combinations of native and nonnative invasive species could result in specific ecological responses to changing climate conditions that cannot be easily predicted at this time. Shifts in mussel community structure may occur in response to climate-induced changes in water temperatures since sedentary freshwater mussels have limited refugia from disturbances such as droughts and floods, and because they are thermo-conformers whose physiological processes are constrained by water temperature within species-specific thermal preferences (Galbraith et al. 2010, p. 1,176).

The Kentucky creekshell is particularly vulnerable to climate change given its limited spatial distribution as an endemic to the Green River basin. The expected effects of climate change in this region will lead to more frequent and severe storms and droughts, which will destabilize suitable habitat, dewater headwater streams occupied by the species, and negatively affect host fish distribution. The species is susceptible to droughts that affect smaller streams to a greater degree, as well as flooding/scouring events, as the species is found in streams with unstable and mobile substrates. Conversely, the species is associated with spring-influenced habitats, which may provide cool, flowing water during long dry periods.

Overall, we expect the effects of climate change will negatively impact the Kentucky creekshell through changes in hydrology and stream flow, water temperature, mussel community structure (including invasive species), and drought. These impacts are anticipated to increase in the future.

Invasive Species

Approximately 42 percent of federally threatened or endangered species are estimated to be significantly affected by invasive species (Pimentel et al. 2004). When an invasive species is introduced into an ecosystem, it may have many advantages over native species, such as easy adaptation to varying environments and a high tolerance of living conditions that allow it to thrive in its new habitat. There may not be natural predators to keep the invasive species in check; therefore, it can potentially live longer and reproduce more often, further reducing the biodiversity in the system. The native species may become an easy food source for invasive species, or the invasive species may carry diseases that extirpate populations of native species. There are several invasive species that affect freshwater mussels (Service 2023, p. 23). Currently, only the Asian clam is likely to pose a significant risk to the Kentucky creekshell.

The Asian clam has several competitive advantages over freshwater mussels including competing for space and food resources while being more tolerant of higher temperatures (Fuller and Richardson 1976, p. 52, Strayer 1999, p. 82; Ferreira-Rodriguez and Pardo 2017, p. 171; Ferreira-Rodriguez et al. 2017, p. 941; Haag et al. 2020, entire). While feeding, the Asian clam may ingest large numbers of freshwater mussel sperm, glochidia, and newly metamorphosed juveniles that could severely alter the reproductive ability of nearby mussel populations (Strayer 1999, p. 82). The effect of Asian clams on freshwater mussel habitat may also contribute to the below-described enigmatic decline (Haag 2019, entire).

Asian clams grow rapidly and experience a rapid die-off following reproduction, causing toxic ammonia spikes in the streams and rivers (Scheller 1997, p. 2; Strayer 1999, p. 82; Cherry et al. 2005, p. 377). Although we do not have information that the Asian clam is currently impacting Kentucky creekshell populations, the clam has been documented to outcompete other freshwater mussels and occurs throughout the Kentucky creekshell range. We expect the negative effects of this nonnative invasive species will

continue into the future as well as to receive more documented information about the Asian clam's effect on native mussel populations once studies are published.

Enigmatic Population Declines

Enigmatic population declines have been documented in freshwater river mussel populations since the 1960s. Mussel populations occasionally experience declines in the absence of any obvious cause. These declines are termed enigmatic population declines, due to their mysterious and currently puzzling nature (Haag 2012, p. 341). The cause of these die-offs is unknown, but researchers suspect either disease or the introduction of the Asian clam (see section 3.4 of the SSA report) are likely factors (Haag 2019, entire; Service 2023, pp. 22–24). Contaminants that are not easily observable, such as metals bound in sediments, a result of past land cover, could also be a contributor (Price et al. 2014, p. 855). Characteristics of enigmatic declines include fauna-wide collapse affecting all mussel species, recruitment failure leading to a senescent fauna, rapid onset often leading to faunal collapse within 10 years, and a faunal collapse that proceeds upstream over 10 to 20 years in most cases (Haag 2019, entire). These enigmatic declines have been documented within rivers and streams occupied by the Kentucky creekshell including: the Nolin River, Drakes Creek, and Gasper River, all which have extant Kentucky creekshell populations characterized as low resiliency (Haag 2019, p. 49).

Cumulative/Synergistic Effects

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have analyzed the cumulative effects of identified threats and conservation actions on the species. To assess the current and future condition of the species, we evaluate 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.

Populations that have a small effective population size (number of breeding individuals) and that are geographically isolated from one another are more vulnerable than more robust populations. The fragmentation of habitat segments and isolation caused by instream barriers and inundation of riffle habitats contribute to the extinction risk that mussel populations face from stochastic events (Haag 2008, p. 107) and restrict or prevent the movement of host fish.

Cumulative or synergistic impacts can occur when climate change acts as an additional stressor to sensitive freshwater systems, which are already adversely affected by a variety of other human impacts, such as altered flow regimes and deterioration of water quality. Changes in presence or combinations of native and nonnative invasive species could result in specific ecological responses to changing climate conditions. These types of changes (e.g., increased temperatures that are more favorable or more tolerated by a nonnative invasive species compared to a native species) can result in novel interactions or situations that may necessitate adaptive management strategies.

Depletion of energetic reserves of native mussels to cope with increasing temperatures could compromise native mussels' tolerance to additional stressors such as competition with invasive species, including the Asian clam, or food reduction (Ferreira-Rodriguez and Pardo 2017, p. 171) (see Changing Climate Conditions above).

Conservation Efforts and Regulatory Mechanisms

Large dams in the Green River basin fall into two general categories: reservoir dams and navigation dams. Reservoir dams such as Rough River Dam, Nolin River Dam, Green River Dam, and Barren River Dam are used primarily for hydropower production, flood control, and/or municipal water supply. Navigation dams in the species' range include the Green River Locks and Dams 1–6 and Barren River Lock and Dam 1. Several

conservation efforts are occurring in the range of the Kentucky creekshell that address habitat fragmentation and isolation of populations as well as Kentucky creekshell reintroduction efforts. Green River Lock and Dam (L&D) 6 and Barren River L&D 1 were removed in 2017 and 2022, respectively, through a collaborative effort between State and Federal agencies and nongovernmental partners (Compton et al. 2017, entire). Additionally, a substantial portion of Green River L&D 5 was removed in 2022 with plans to complete the removal in the fall of 2024. These dam removals have expanded free-flowing hydrological conditions of the Green and Barren Rivers by more than 40 kilometers (km) (25 miles (mi)) and have provided increased aquatic habitat connectivity throughout much of the Kentucky creekshell range. For example, the removal of Barren River L&D 1 in 2022 restored approximately 24 continuous km (15 mi) of stream habitat, changing this reach from a lentic (still water) habitat into a lotic (moving water) habitat suitable for the Kentucky creekshell and its host fish. Additionally, this dam removal now connects the Gasper River Kentucky creekshell population with the Drakes Creek and Trammel Creek populations.

The Center for Mollusk Conservation (CMC) is a mussel propagation facility operated by the Kentucky Department of Fish and Wildlife Resources since 2002 with the mission to restore and recover rare and imperiled freshwater mollusks. The CMC has been working on propagation efforts for the Kentucky creekshell for more than 10 years and has reared juveniles for release since 2016 using the banded sculpin and in vitro (outside the body) culturing methods since 2021 resulting in higher numbers of juveniles (McGregor 2023, pers. comm.). Approximately 4,888 juveniles have been released in 14 locations in the Green River, Rough River, South Fork Nolin River, Middle Creek, Russel Creek, Walter's Creek, and Nolin River. Propagation efforts are ongoing with reintroductions and augmentations scheduled to be released in the fall of 2024. However, the post-release survival and reproduction of propagated Kentucky creekshell juveniles

and the establishment of new Kentucky creekshell populations as a result of these releases have not been fully assessed.

State Conservation Actions and Laws

The Kentucky creekshell is State-listed as endangered in Kentucky. This listing status protects the species by prohibiting any person from the import, transport, possession for resale or sale of the Kentucky creekshell or parts (shell, etc.) (KRS § 150.180). The Kentucky creekshell is not currently listed by the State of Tennessee. The Kentucky creekshell and its habitats are afforded some protection from water quality and habitat degradation under Kentucky's Forest Conservation Act of 1998 (KRS §§ 149.330–149.355), Kentucky's Agriculture Water Quality Act of 1994 (KRS §§ 224.71–224.140) and the Tennessee Water Quality Control Act of 1971 (TN Code § 69-3-121). Although the protections afforded by these statutes and regulations are not directed specifically towards Kentucky creekshell and have not prevented the degradation of some habitats used by the Kentucky creekshell, there have been some improvements in water quality and habitat conditions in areas occupied by the species stemming from these regulatory mechanisms.

The Kentucky creekshell is identified as a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan (SWAP). By identifying declining or rare species and management or protection needed to improve their conservation status, the SWAP intends to guide management and conservation of species and habitats before they become too rare or costly to restore. The Kentucky creekshell has a State rank of S1S2 (imperiled) with the highest priority for the State. Actions outlined in the SWAP to benefit Kentucky creekshell include population monitoring, propagation, augmentation of existing low-resilient populations, and further genetic or taxonomic studies. Conservation issues identified by the SWAP include dams and water management/use, ecosystem modifications, and pollution (Kentucky Department of Fish and Wildlife Resources 2023,

entire). The Kentucky creekshell is not listed in the Tennessee SWAP plan as it was not known to occur in the State at the time the latest SWAP plan was written.

Federal Laws

The Kentucky creekshell and its habitats are afforded some protection from water quality and habitat degradation under the Clean Water Act. While the protections afforded are not directed specifically towards Kentucky creekshell and have not prevented the degradation of some habitats used by the Kentucky creekshell, there have been certain improvements in water quality and habitat conditions stemming from these regulatory mechanisms.

The Kentucky creekshell receives incidental protection under the Endangered Species Act because populations in portions of the Barren River and Green River share habitats with multiple federally listed mussels and critical habitat. Some of these mussels include the fanshell (*Cyprogenia stegaria*), rough pigtoe (*Pleurobema plenum*), spectaclecase (*Cumberlandia monodonta*), pink mucket (*Lampsilis abrupta*), and sheepnose mussel (*Plethobasus cyphus*); and critical habitat for the longsolid (*Fusconaia subrotunda*) and round hickorynut (*Obovaria subrotunda*). Section 7 of the Act requires Federal agencies to consult with the Service on any action that may affect a listed species or any action that may destroy or adversely modify critical habitat. Section 9 of the Act also provides protection against “take” of the species (“take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct). In Kentucky, streams supporting federally threatened or endangered species receive additional protection under Kentucky’s water quality standards. Pursuant to 401 KAR §§ 10:031, Section 8, the existing water quality and habitat of these Outstanding State Resource Waters (OSRWs) shall be maintained and protected, unless it can be demonstrated that lowering of water quality or a habitat modification will not have a harmful effect on the threatened or endangered species that

the water supports. Kentucky Pollutant Discharge Elimination System permits associated with OSRWs typically contain additional requirements designed to protect waters supporting listed species.

It is also unlawful under the Lacey Act (see 16 U.S.C. 3372(a)(2)(A)) to import, export, transport, sell, receive, acquire, or purchase in interstate or foreign commerce any fish or wildlife taken, possessed, transported, or sold in violation of any law or regulation of any State. Because the possession of Kentucky creekshell is illegal in Kentucky, interstate or international sale of individuals collected is prohibited by the Lacey Act.

Current Condition

The Kentucky creekshell's range and distribution has declined over time. Four of 13 analytical units (AUs) are now extirpated. In our SSA analyses, we considered an analytical unit extant if it contained records after 2003. We considered AUs with observations prior to 2003 (and no more recent observations) as historical. We considered analytical units to be extirpated if no individuals were detected since 1973, indicating a 50-year absence. This species was formerly the most abundant species found in the Nolin River in the 1960s, and hundreds of shells were found in the 1980s. Very few individuals have been found in this system since 2003. On the Green River mainstem at Munfordville, hundreds of live individuals were found, and hundreds of shells were collected multiple times during the 1960s, whereas a 2022 survey targeting the species for propagation efforts in the same general location found just three individuals in 24 person-hours search time.

In our SSA, we describe the current condition of the species using categories that estimate overall condition (resiliency) of the Kentucky creekshell populations. We identified five major factors that act or will act on the viability of Kentucky creekshell populations. These include habitat loss and degradation (i.e., aquatic degrading land cover, siltation/sedimentation, gravel mining, impoundment effects), climate change,

invasive species, enigmatic population declines, and conservation actions. See chapter 4 in the SSA report for further explanation of the analysis methodology (Service 2023, pp. 28–31). The Kentucky creekshell is known historically from 13 AUs. Historical populations in the Lower Nolin River, Bays Fork–Barren River, Skaggs Creek, Little Muddy Creek–Barren River are now considered to be extirpated, and current condition was not assessed for these AUs. Currently, the Kentucky creekshell occurs in nine AUs in the Green River Basin. We assessed the current condition of these nine AUs to inform species' current viability. We determined no AU currently exhibits high resiliency, two AUs exhibit moderate resiliency, and seven AUs exhibit low resiliency. To assess resiliency, we considered five variables for each AU—instream habitat (substrates), percent of suitable land cover, length of occupied reaches, abundance of individuals on surveys, and connectivity as a result of the presence or absence of dams/barriers. The two moderately resilient AUs are characterized by higher habitat condition scores (substrates, land cover, and connectivity) and higher extent of occupancy than low-resiliency AUs. The Kentucky creekshell currently occurs in a limited number of populations/watersheds that are disjunct from each other. Each of those populations is very small, and only a small portion of those populations is reproducing. It is not clear or expected that these populations can sustain themselves at such low levels, which elevates the risk of local extirpations. In addition, the majority of AUs have low resiliency (seven of nine), and the two moderate-resiliency AUs are impacted by existing and ongoing threats, such as low population numbers and sedimentation, as well as increasing threats from urbanization and incompatible land use changes.

Representation describes the ability of a species to adapt to changing environmental conditions over time and is characterized by the breadth of genetic and environmental diversity within and among populations. The more representation a species has, the more it is capable of adapting to changes (natural or human caused) in its

environment. We determined the Kentucky creekshell's current representation by assessing attributes that demonstrate a species' inherent adaptive capacity. These attributes relate to the species' ability to shift in space or persist in place in response to changing environmental conditions. We found that the species' representation is moderate given its inherent ability to adapt to change. Movement and abiotic niche are deemed to be low for the species because it cannot readily move away from stressors, and it relies on a fish host with a relatively small home range. However, many characteristics such as minimal parental investment, high fecundity, and multiple reproductive cycles in lifetime are high abilities to adapt to change for the species. The combination of high and low abilities to adapt to change bring us to conclude that the species exhibits moderate representation.

We have determined the species' current redundancy to be low based on its geographically small range, limiting preferred habitat; lack of connectivity between and among populations; and lack of highly resilient AUs. Low redundancy means the Kentucky creekshell is more vulnerable to catastrophic events than species with higher redundancy. Potential catastrophes that could affect the species include extreme, range-wide drought or a chemical or other hazardous waste spill that affects water quality conditions across multiple populations.

In summary, the Kentucky creekshell currently occurs in a limited number of populations/watersheds that are disjunct from each other. The majority of AUs have low resiliency (seven of nine), and the two moderate-resiliency AUs are impacted by existing and ongoing threats, such as low population numbers and sedimentation, as well as increasing threats from urbanization and incompatible land use changes.

As part of the SSA, we also developed two plausible future-condition scenarios to capture the range of future viability including future threats and the projected responses by the Kentucky creekshell. We evaluated the future condition of the Kentucky

creekshell in 2040 and 2060 by assessing future land cover change and climate change under high emissions and lower emissions scenarios. Because we determined that the current condition of the Kentucky creekshell is consistent with an endangered species (see **Determination of the Kentucky Creekshell’s Status**), we are not presenting the results of the future scenarios in this proposed rule. Please refer to the SSA report (Service 2023, pp. 43–49) for the full analysis of future scenarios.

Determination of the Kentucky Creekshell’s 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 Kentucky creekshell currently has limited resiliency, redundancy, and representation and is expected to decline further. Historically, the Kentucky creekshell was known from 13 AUs in the Green River basin. Historical populations in the Lower Nolin River, Bays Fork–Barren

River, Skaggs Creek, and Little Muddy Creek–Barren River are now considered to be extirpated, and the species is currently known from 9 AUs. Current factors affecting the species' viability include loss and degradation of suitable habitat, low connectivity (i.e., isolation by dams), and small population size. There is not enough evidence yet to assess the direct effects of invasive species, enigmatic population declines, or conservation actions on Kentucky creekshell or its host fish. We determined that seven analytical units exhibit low current resiliency, two analytical units exhibit moderate resiliency, and no units exhibit high resiliency. Current resiliency is driven by poor instream habitat, low percent of suitable land cover, abundance as detected on recent surveys, shorter occupied reaches, and lack of connectivity due to dams/barriers.

With regard to the species' adaptive capacity, the Kentucky creekshell has moderate representation at the species level, with an inherent capacity to adapt in place. The species' redundancy is low based on its geographically small range, limiting preferred habitat; lack of connectivity with other populations; and lack of highly resilient analytical units or populations.

Thus, after evaluating the best available information and as a result of the combination of these factors, the threats have a high imminence and magnitude such that they are significantly affecting the species' current viability. Accordingly, the species meets the definition of an endangered species.

We do not find the Kentucky creekshell meets the definition of a threatened species because the species has already shown dramatic declines in abundance and resiliency of its populations. With the majority of populations in low resiliency, the species' condition is currently in poor condition and is expected to decline over time due to existing threats, such as low population numbers and sedimentation, as well as increasing threats in some of the watersheds from increasing urbanization and incompatible land use changes. The Kentucky creekshell has low redundancy and

moderate species-level representation, with an inherent capacity to adapt to changing environmental conditions but increased vulnerability to catastrophic events because it cannot readily move away from stressors, and it relies on a fish host with a relatively small home range. Thus, after assessing the best available information, we determine that Kentucky creekshell is in danger of extinction 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. We have determined that the Kentucky creekshell is in danger of extinction throughout all of its range and accordingly did not undertake an analysis of any significant portion of its range. Because the Kentucky creekshell warrants listing as endangered throughout all of its range, our determination does not conflict with the decision in *Center for Biological Diversity v. Everson*, 435 F. Supp. 3d 69 (D.D.C. 2020), because that decision related to significant portion of the range analyses for species that warrant listing as threatened, not endangered, throughout all of their range.

Determination of Status

Our review of the best available scientific and commercial information indicates that the Kentucky creekshell meets the definition of an endangered species. Therefore, we propose to list the Kentucky creekshell as an endangered species in accordance with sections 3(6) 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, foreign governments, 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/endangered-species>), or from our Kentucky 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 States of Kentucky and Tennessee would be eligible for Federal funds to implement management actions that promote the protection or recovery of the Kentucky creekshell. 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 Kentucky creekshell 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 is titled 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 section 7 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 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 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 Kentucky creekshell that may be subject to conference and consultation procedures under section 7 are land management or other landscape-altering activities on Federal lands administered by the U.S. Department of Agriculture, Environmental Protection Agency, or National Park Service (NPS) as well as 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 (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 Kentucky Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**) with any specific questions on section 7 consultation and conference requirements.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered wildlife. The prohibitions of section 9(a)(1) of the Act, and the Service's implementing regulations codified at 50 CFR 17.21, make it illegal for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit or to cause to be committed any of the following acts with regard to any endangered wildlife: (1) import into, or export from, the United States; (2) take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect) within the United States, within the territorial sea of the United States, or on the high seas; (3) possess, sell, deliver, carry, transport, or ship, by any means whatsoever, any such wildlife that has been taken illegally; (4) deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever and in the

course of commercial activity; or (5) sell or offer for sale in interstate or foreign commerce. Certain exceptions to these prohibitions apply to employees or agents of the Service, NMFS, other Federal land management agencies, and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered wildlife under certain circumstances. Regulations governing permits for endangered wildlife are codified at 50 CFR 17.22, and general Service permitting regulations are codified at 50 CFR part 13. With regard to endangered wildlife, a permit may be issued: for scientific purposes, for enhancing the propagation or survival of the species, or for take incidental to otherwise lawful activities. The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

II. 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 each Federal action agency 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 designated 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. Rather, designation requires that, where a landowner requests Federal agency funding or authorization for an action that may affect an area designated as critical habitat, the Federal agency consult with the Service under section 7(a)(2) of the Act. If the action may affect the listed species itself (such as for occupied critical habitat), the Federal agency would have already been required to consult with the Service even absent the designation because of the requirement to ensure that the action is not likely to jeopardize the continued

existence of the species. Even if the Service were to conclude after consultation that the proposed activity is likely to 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 compiled in the SSA report and information developed during the listing process for the species. Additional information sources may include any generalized conservation strategy, criteria, or outline that may have been developed for the species; the recovery plan for the species; articles in peer-reviewed journals; conservation plans developed by States and counties; scientific status surveys and studies; biological assessments; other unpublished materials; or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) the prohibitions found in section 9 of the Act. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of the species. Similarly, critical habitat designations made on the basis of the best scientific data available 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.

Summary of Essential Physical or Biological Features

As described in **Summary of Biological Status and Threats**, the Kentucky creekshell is a freshwater mussel that occurs in rivers and streams. Occasional or regular interaction among individuals in different reaches not interrupted by a barrier likely occurs, but in general, interaction is strongly influenced by habitat fragmentation and distance between occupied river or stream reaches. Once released from their fish host, freshwater mussels are benthic, generally sedentary aquatic organisms and closely associated with appropriate habitat patches within a river or stream.

We derive the specific physical or biological features essential to the conservation of the Kentucky creekshell from studies of the species' habitat, ecology, and life history as described below. The primary habitat elements that influence resiliency of the Kentucky creekshell include water quality, water quantity, substrate, habitat connectivity, and the presence of host fish species to ensure recruitment. Adequate flows ensure delivery of oxygen, enable reproduction, deliver food to filter-feeding mussels, and reduce contaminants and fine sediments from interstitial spaces. Stream velocity is not static over time, and variations may be attributed to seasonal changes (with higher flows in winter/spring and lower flows in summer/fall), extreme weather events (e.g., drought or floods), or anthropogenic influence (e.g., flow regulation via impoundments). These

features are also described above as species needs under **Summary of Biological Status and Threats**, and a full description is available in the SSA report; the resource and demographic needs for breeding, feeding, sheltering, and dispersal of the Kentucky creekshell include the following: (1) Adequate freshwater availability (water quantity) and sufficient water quality, including spring-influenced river sections; (2) appropriate substrates; (3) sufficient food and nutrition; (4) availability of sufficient host fish numbers; (5) connected instream habitats; and (6) appropriate abundance, density, and distribution of mussel beds (aggregations of freshwater mussels).

Additional information can be found in the SSA report (Service 2023, entire; available on <https://www.regulations.gov> under Docket No. FWS-R4-ES-2024-0065). We have determined that the following physical or biological features are essential to the conservation of the Kentucky creekshell:

(1) Water quantity and quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including (but not limited to): water conditions in the stream that are cool; are well-oxygenated with no evidence of excessive sediments or suspended solids, salinity, ammonia, nutrients, pesticides, or herbicides; and have a stream flow and pattern consistent with natural flow regimes. Spring-influenced river sections are important habitat types for this species as most Kentucky creekshell populations are associated with this habitat type, and this is also the preferred habitat type for the host fish, the banded sculpin.

(2) Suitable substrates and connected instream habitats characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) and stable riffle-run-pool habitats that provide flow refuges consisting of predominantly silt-free, stable coarse sand, gravel, and cobble substrates.

(3) Adequate food availability for Kentucky creekshell including (but not limited to): suspended phytoplankton, zooplankton, rotifers, protozoans, detritus, and dissolved organic matter from the water column or sediments.

(4) Habitat conditions that support the presence and abundance of banded sculpin, the host fish necessary for Kentucky creekshell recruitment, as well as the actual presence and abundance of the banded sculpin in the habitat.

(5) Connected instream habitats without barriers such as dams and perched or undersized culverts to provide suitable lotic rather than lentic habitat; access to quality habitat for multiple life stages of Kentucky creekshell; access for host fish movement, which in turn, may influence Kentucky creekshell distribution and provide genetic exchange for both species and recolonization of Kentucky creekshell.

(6) Appropriate abundance, density, and distribution of mussel beds (aggregations of freshwater mussels) such that local stochastic events do not necessarily eliminate the bed(s), allowing the mussel beds and the overall local population within a stream reach to recover from any single event and for resilient populations.

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 Kentucky creekshell may require special management considerations or protections to reduce the following threats:

(1) Alteration of the natural flow regime (modifying the natural hydrograph and seasonal flows), including groundwater and surface water withdrawal as well as

water releases from impoundments and reservoirs, resulting in hydrological instability, high shear stress, and scour.

(2) significant alteration of water quality and nutrient pollution from a variety of activities, such as urban development, mining, and agricultural activities;

(3) alteration of instream substrate, stream channels, and stream banks from a variety of activities, including but not limited to those that cause stream siltation and sedimentation, destabilize stream channels, and result in the removal of riparian vegetation (e.g., instream gravel mining, agriculture, channelization, construction projects, and land development);

(4) urbanization of the landscape, including (but not limited to) land conversion for residential, commercial, and industrial uses and the accompanying infrastructure (impervious surfaces, pipelines, roads, bridges, utilities), and urban water uses (resource extraction activities, water supply reservoirs, wastewater treatment, etc.);

(5) land use activities that remove large areas of forested wetlands and riparian systems;

(6) dam, culvert and pipe, or other instream installations that create barriers to movement for the Kentucky creekshell, or their host fish, the banded sculpin;

(7) impacts from invasive species;

(8) changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and

(9) other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water.

Management activities that could ameliorate these threats include but are not limited to: use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation;

protection of groundwater and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; use of best management practices when releasing water from reservoirs/impoundments; improved stormwater management; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; removal of instream barriers; prevention of instream gravel mining; and controlling invasive species.

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 proposing to designate critical habitat in areas within the geographical area occupied by the species at the time of listing. We also are proposing to designate specific areas outside the geographical area occupied by the species because we have determined those areas are essential for the conservation of the species. Rangewide recovery considerations, such as maintaining existing genetic diversity and representation of all major portions of the species' current range, were considered in formulating this proposed critical habitat designation. Given the Kentucky creekshell's substantial lost historical range and currently fragmented populations, we are designating unoccupied areas. The unoccupied critical habitat areas we are adding each contain one or more physical or biological features essential to the conservation of the Kentucky creekshell (although not required by 50 CFR 424.12). These features include

suitable water quality and quantity, substrates, food, host fish, connected instream habitat, and/or mussel beds. Designating unoccupied areas would aid in increasing the species' currently low redundancy, as having additional protected and connected habitat will contribute to the conservation of the species as it will allow the species to expand in the future through recovery efforts. Thus, the unoccupied units we are designating are essential for the conservation of the Kentucky creekshell.

Sources of data for this proposed critical habitat designation include multiple databases maintained by universities, information from State agencies throughout the species' range, and survey reports on streams throughout the species' range (see SSA report (Service 2023, entire)). We have also reviewed available information that pertains to the habitat requirements of this species. Sources of information on habitat requirements include studies conducted at occupied sites, agency reports, and data collected during monitoring efforts (Service 2023, entire).

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

- (1) Stream reaches with species occurrences after 2003;
 - (2) Suitable habitat with at least one physical or biological feature present, such as suitable substrates and spring-influenced river reaches;
 - (3) A stream reach that provides a connective corridor between populations;
- and/or
- (4) A stream reach that may contain a historical Kentucky creekshell occurrence.

For areas within the geographical area not occupied by the species at the time of listing, we delineated unoccupied critical habitat unit boundaries using the following criteria:

(1) Stream reaches with species occurrences before 2003 or expert opinion that the species likely once existed in the reach;

(2) Suitable habitat with at least one physical or biological feature present, such as suitable substrates and spring-influenced river reaches; and

(3) A stream reach that provides a connective corridor between populations or provides a logical reintroduction location for the recovery of a unit.

In addition, we determined the upstream extent of critical habitat units as the first perennial tributary confluence upstream of the upstream-most occurrence record and the downstream extent as the mouth of the stream of the farthest downstream record. The lateral extent of each unit includes the bankfull width of the stream. We considered portions of the Kentucky creekshell's historical, current range as well as any stream segment that had one or more PBFs that would contribute to the continuation of the species. 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. 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 areas 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. We have also identified, and propose for designation as critical habitat, four unoccupied areas that are essential for the conservation of the species. These unoccupied areas all have one or more of the physical or biological features present to support Kentucky creekshell's life-history processes.

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.

Proposed Critical Habitat Designation

We are proposing 10 units as critical habitat for Kentucky creekshell. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for Kentucky creekshell. Critical habitat includes only stream channels up to bankfull height, where the stream base flow is contained within the channel. The 10 areas that we propose as critical habitat are: (1) Green River; (2) Barren River; (3) Gasper River; (4) Drakes Creek; (5) Trammel Creek; (6) Salt Lick Creek; (7) Russell Creek; (8) Middle Nolin River; (9) Upper Nolin River; and (10) Rough River. Table 1 shows the proposed critical habitat units and the approximate area of each unit.

TABLE 1—PROPOSED CRITICAL HABITAT UNITS FOR KENTUCKY CREEKSHELL
 [Area estimates reflect all land within critical habitat unit boundaries.]

| Critical habitat unit number/name | Adjacent riparian land ownership | Length of unit in miles (kilometers) | Occupied? |
|--|----------------------------------|---|-----------|
| Unit 1: Green River Subunit 1a (Green River) | Private, NPS, State agency | 72.21 (116.2) 0.67 (1.1) 0.12 (0.2) Total = 73.0 (117.5) | Yes |
| Unit 1: Green River Subunit 1b (Green River) | Private, NPS | 50.2 (80.8) 7.5 (12.1) Total = 57.7 (92.9) | No |
| Unit 2: Barren River | Private | 79.9 (128.6) | No |
| Unit 3: Gasper River | Private | 52.8 (85) | Yes |
| Unit 4: Drakes Creek | Private | 55.1 (88.7) | Yes |
| Unit 5: Trammel Creek | Private | 15.9 (25.6) | Yes |
| Unit 6: Salt Lick Creek | Private | 19.1 (30.7) | Yes |
| Unit 7: Russell Creek | Private | 53.7 (86.4) | Yes |
| Unit 8: Middle Nolin River Subunit 8a (Nolin River) | Private, USACE, State agency | 53.7 (86.4) 0.38 (0.63) 0.39 (0.68) Total = 54.5 (87.7) | No |
| Unit 8: Middle Nolin River Subunit 8b (Round Stone Creek) | Private, USACE | 9.8 (15.9) 0.02 (0.03) Total = 9.9 (15.9) | Yes |
| Unit 9: Upper Nolin River | Private, State Agency | 21.3 (34.3) 2.6 (4.2) Total = 23.9 (38.5) | Yes |
| Unit 10: Rough River Subunit 10a (Rough River and Meeting Creek) | Private, USACE | 35.8 (57.6) 1.6 (2.7) Total = 37.5 (60.4) | Yes |
| Unit 10: Rough River Subunit 10b (Clifty Creek) | Private, USACE | 11.3 (18.2) 0.34 (0.54) Total = 11.6 (18.7) | No |
| TOTAL | | 544.6 (876.4) | |

Note: Miles may not sum due to rounding.

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

Unit 1: Green River

Unit 1 consists of a total of 130.7 river miles (210.4 km) within two subunits; one that is occupied, and one that is unoccupied habitat. Subunit 1a (Green River) is occupied, while Subunit 1b (Green River) is unoccupied.

Subunit 1a (Green River):

Subunit 1a consists of 73.0 river miles (117.5 km) of Green and Hart Counties, Kentucky, from the confluence of Russell Creek near Greensburg, Kentucky, downstream to the Edmonson County line in Mammoth Cave National Park. Nearly all (approximately 99 percent) of the lands adjacent to Subunit 1a are privately owned including lands managed under the Green River Watershed conservation easement by The Nature Conservancy. The remaining lands adjacent to this subunit (one percent) include parts of the Mammoth Cave National Park, managed by the National Park Service, and Western Kentucky University's Upper Green River Biological Preserve, which is managed by the State of Kentucky. Subunit 1a is considered occupied by the species and contains the physical or biological features 1 through 6 (**See Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include alteration of the natural flow regime; significant alteration of water quality and nutrient pollution; urbanization of the landscape; land use activities that remove large areas of forested wetlands and riparian systems; dam, culvert and pipe, or other instream installations that create barriers to movement; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation;

protection of groundwater and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; use of best management practices when releasing water from reservoirs/impoundments; improved stormwater management; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; removal of instream barriers; prevention of instream gravel mining; and controlling invasive species (see **Special Management Considerations or Protection**).

Subunit 1b (Green River):

Subunit 1b consists of 57.7 river miles (92.9 km) of Edmonson, Butler, and Warren Counties, Kentucky. The unit is located from the Edmonson County line in Mammoth Cave National Park to the confluence with the Barren River in Woodbury, Kentucky. Approximately 87 percent of the lands adjacent to Subunit 1b are owned by private entities, and the remaining 13 percent is managed by the National Park Service for the Mammoth Cave National Park. Subunit 1b is currently unoccupied by the species and contains the physical or biological features 1 through 4, and 6 (**See Summary of Essential Physical or Biological Features**) essential to the conservation of the species. The unit will contain physical and biological feature 5 once Green River Lock and Dam 5 is completely removed (see below for more details).

Threats identified within this unit includes alteration of the natural flow regime; significant alteration of water quality and nutrient pollution; urbanization of the landscape; land use activities that remove large areas of forested wetlands and riparian systems; dam, culvert and pipe, or other instream installations that create barriers to movement; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the

threats may include use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of groundwater and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; use of best management practices when releasing water from reservoirs/impoundments; improved stormwater management; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; removal of instream barriers; prevention of instream gravel mining; and controlling invasive species.

Suitable habitat in this area was lost during the construction of Green River Lock and Dam (GRLD) 5 and 6 in the early 1900s, which isolated the Green River populations from the Barren River populations; however, with the removal of GRLD 6 in 2017 and partial removal of GRLD 5 in 2022 (with full removal expected in fall 2024), suitable habitat has been gradually restored. Although some evidence suggests that Kentucky creekshell populations in subunit 1b may not have been as abundant as in subunit 1a due to changes in karst landscape characteristics, experts still believe that they were sufficient to facilitate genetic exchange between the Green River and Barren River populations (Compton 2023, pers. comm.).

The Green River mainstem plays a crucial role in the conservation of the Kentucky creekshell as it serves as the sole link between populations in the Green River and populations in the Barren River. Reintroduction efforts in this subunit will help preserve genetic diversity and facilitate the exchange of genes between populations in Unit 1a, which is occupied and begins at the confluence of Russell Creek near Greensburg, and populations in Unit 7, upstream from Unit 1a, downstream to the confluence of the Barren River near Woodbury. For these reasons, this unit is essential for the conservation of the species.

Unit 2: Barren River

Unit 2 consists of 79.9 river miles (128.6 km) of Barren River in Butler, Warren, Allen, and Barren Counties, Kentucky, from the Barren River Lake dam in Barren and Allen Counties to the confluence of the Green River in Butler and Warren Counties. Approximately 79.4 river miles (127.8 km; 99 percent) of riparian lands that border the unit are in private ownership, and 0.46 stream mile (0.74 km; less than 1 percent) is in Federal (Barren River Lake; USACE) ownership. Unit 2 is considered currently unoccupied by the species and contains the physical or biological features 1 through 4, and 6 (See **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit includes alteration of the natural flow regime, alteration of instream substrate, urbanization of the landscape, impacts from invasive species, and dam, culvert and pipe, or other instream installations. Special management considerations or protection measures to reduce or alleviate the threats may include the use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; use of best management practices when releasing water from reservoirs/impoundments; improved stormwater management; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; removal of instream barriers; and controlling impacts from invasive species (see **Special Management Considerations or Protection**).

This unit serves a critical role in conservation by providing the sole connection between populations in the Barren River tributaries and those in the Green River; thus, it is essential for the conservation of the Kentucky creekshell. The species was extirpated along the mainstem Barren River following the construction of Barren River Lock and

Dam 1 in the 1930s, which created extensive unsuitable habitat for the Kentucky creekshell and its host fish, leading to the isolation and restriction of populations to the tributaries. However, the dam's removal in 2022 has led to the rapid restoration of suitable habitat along the river.

An influence on the species in this unit is a small rock dam barrier between the Gasper River and the Drakes/Trammel Creek populations. While this barrier may impede gene flow, experts believe it may still allow for some connectivity, resembling a large riffle through which the banded sculpin (Kentucky creekshell host fish) could likely pass (Compton 2023, pers. comm.). To reestablish gene flow between the Barren River tributaries and the Green River populations, reintroductions of captively propagated individuals should be undertaken along this section.

Unit 3: Gasper River

Unit 3 consists of 52.8 river miles (85.0 km) of the Gasper River, Wigginton Creek, and Clear Fork Creek in Warren and Logan Counties, Kentucky. This unit includes Wigginton Creek from the headwaters near Rogers, Kentucky, to the confluence with Gasper River; Clear Fork Creek from the headwaters near US HWY 68 bridge to the confluence with Gasper River; and the Gasper River from headwaters near Auburn, Kentucky, to the confluence with the Barren River. All riparian lands that border the unit are in private ownership. Unit 3 is considered occupied by the species and contains the physical or biological features 1 through 5 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit includes significant alteration of water quality and nutrient pollution; alteration of instream substrate, stream channels, and stream banks; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special

management considerations or protection measures to reduce or alleviate the threats may include best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; prevention of instream gravel mining; and controlling invasive species (see **Special Management Considerations or Protection**).

The mainstem Gasper River connects Wiggington Creek and Clear Fork Creek, and other historically occupied tributaries, with the mainstem Barren River. Including this unit protects occupied habitat for improved redundancy throughout the range and protects connections to other occupied habitat in these areas, all of which contributes to the conservation of the Kentucky creekshell.

Unit 4: Drakes Creek

Unit 4 consists of 55.1 river miles (88.7 km) of Drakes Creek, West Fork Drakes Creek, and Lick Creek in Warren and Simpson Counties, Kentucky. This unit includes Drakes Creek from the confluence of West Fork Drakes Creek and Middle Fork Drakes Creek downstream to the confluence with the Barren River near Bowling Green, Kentucky; West Fork Drakes Creek from the West Fork Drakes Creek Reservoir in Franklin, Kentucky, downstream to the confluence with Drakes Creek; and Lick Creek from the Scottsville Road bridge to the confluence with West Fork Drakes Creek. All of the riparian lands that border the unit are in private ownership. Unit 4 is considered occupied by the species and contains the physical or biological features 1 through 4 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include significant alteration of water quality and nutrient pollution; alteration of instream substrate, stream channels, and stream

banks; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; prevention of instream gravel mining; and controlling invasive species (see **Special Management Considerations or Protection**).

Unit 5: Trammel Creek

Unit 5 consists of 15.9 river miles (25.6 km) of Trammel Creek in Warren and Allen Counties, Kentucky, from the confluence with John's Creek near Butlersville, Kentucky, downstream to its confluence with Drakes Creek. Unit 5 is considered occupied by the species and contains the physical or biological features 1 through 5 (see **Summary of Essential Physical or Biological Features**).

Threats identified within this unit include significant alteration of water quality and nutrient pollution; alteration of instream substrate, stream channels, and stream banks; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams; reduction of other watershed and floodplain disturbances

that release sediments, pollutants, or nutrients into the water; prevention of instream gravel mining; and controlling invasive species (see **Special Management Considerations or Protection**).

This stream is a major tributary of Drakes Creek, which allows for genetic exchange and redundancy in the Drakes Creek system and Barren River system.

Unit 6: Salt Lick Creek

Unit 6 consists of 19.1 river miles (30.7 km) of Salt Lick Creek in Monroe County, Kentucky, and Macon County, Tennessee, from the headwaters south of Red Boiling Springs, Tennessee, to the confluence with Long Fork, Kentucky. All of the riparian lands that border the unit are in private ownership. Unit 6 is considered occupied by the species and contains the physical or biological features 1 through 5 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include alteration of instream substrate, stream channels, and stream banks; land use activities that remove large areas of forested wetlands and riparian systems; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; and prevention of instream gravel mining (see **Special Management Considerations or Protection**).

This unit is one of the most isolated units within the Kentucky creekshell range as it is the only known population upstream of Barren River Lake. This population is also

the most recently discovered population, found in 2019 during a survey of the upper Barren River basin in Tennessee. This unit provides improved redundancy and potential representation across the species' range and could be used as a source population for future propagation efforts upstream of Barren River Lake, , both of which will contribute to the conservation of the species.

Unit 7: Russell Creek

Unit 7 consists of 53.7 river miles (86.4 km) of Russell Creek in Green and Adair Counties, Kentucky, from the confluence with Cabin Fork Creek approximately 5 miles southeast of Columbia downstream to the confluence with the Green River south of Greensburg, Kentucky. All the riparian lands that border the unit are in private ownership. Unit 7 is considered occupied by the species and contains the physical or biological features 1 through 5 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include alteration of the natural flow regime; significant alteration of water quality and nutrient pollution; alteration of instream substrate, stream channels, and stream banks; urbanization of the landscape; land use activities that remove large areas of forested wetlands and riparian systems; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or

nutrients into the water; and prevention of instream gravel mining (see **Special Management Considerations or Protection**).

Experts believe the species can be found all the way to the confluence of the Green River, given the flow regimes and suitable substrates throughout the reach, although in likely very small numbers (Compton 2023, pers. comm.). This unit provides improved redundancy across the species' range as it is the only known population upstream of the mainstream Green River population. Additionally, this unit offers the shortest distance to connect with the mainstem Green River population to reestablish gene flow between these units and contributes to the conservation of the species.

Unit 8: Middle Nolin River

Unit 8 consists of a total of 64.4 river miles (103.6 km) with two subunits: one occupied and one unoccupied by the Kentucky creekshell. Subunit 8a (Nolin River) is occupied, while Subunit 8b (Round Stone Creek) is unoccupied.

Subunit 8a (Nolin River):

Subunit 8a consists of 54.5 river miles (87.7 kilometers) of the Nolin River in Larue, Hardin, Grayson, and Hart Counties, Kentucky. Subunit 8a extends from the confluence of the north and south fork of the Nolin River west of Hodgenville, Kentucky, downstream to the confluence of Round Stone Creek south of Millerstown, Kentucky. Approximately 99 percent of the lands adjacent to subunit 8a are privately owned, and the remaining are Federal lands managed by the USACE for Nolin River Recreation Area and State lands of Kentucky State Department of Natural Resources. Subunit 8a is considered occupied by the species and contains the physical or biological features 1 through 4 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include alteration of the natural flow regime; alteration of instream substrate, stream channels, and stream banks; land use activities

that remove large areas of forested wetlands and riparian systems; urbanization of the landscape; dam, culvert and pipe, or other instream installations that create barriers to movement for the Kentucky creekshell or its host fish; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include the use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; removal of instream barriers; prevention of instream gravel mining; and controlling invasive species (see **Special Management Considerations or Protection**).

Subunit 8b (Round Stone Creek):

Subunit 8b consists of 9.9 river miles (15.9 km) of Round Stone Creek in Hart County, Kentucky. Subunit 8b extends from the origins of the stream at Blue Hole Spring to the confluence with the mainstem Nolin River. Approximately 99 percent of riparian lands adjacent to subunit 8b are in private ownership. The rest (less than 0.5 percent) are managed by the USACE in the Nolin River Recreation Area. Subunit 8b is considered unoccupied by the species and contains the physical or biological features 1 through 4 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include alteration of the natural flow regime; alteration of instream substrate, stream channels, and stream banks; land use activities that remove large areas of forested wetlands and riparian systems; urbanization of the

landscape; dam, culvert and pipe, or other instream installations that create barriers to movement for the Kentucky creekshell or their host fish; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include the use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; removal of instream barriers; prevention of instream gravel mining; and controlling invasive species (see **Special Management Considerations or Protection**).

Round Stone Creek, a tributary in the lower section of the Nolin River may provide a location for reintroduction that would augment the overall Nolin River population. Relic shells have been found in the mouth of Round Stone Creek, and the stream's source is two springs, the species' associated habitats. Protection of spring-fed habitat in this tributary off the main stem channel could reduce the effects of potential catastrophic events. Experts believe this stream segment may still hold Kentucky creekshell (Compton 2023, pers. comm.), which would contribute genetic variation (representation) to the species, as well as improved redundancy in a degraded system. In addition, this stream is the most logical place for augmentation/reintroductions to begin for lower sections of the Nolin River, all of which would contribute to the conservation of the species. For these reasons, this unit is essential to the conservation of the species.

Unit 9: Upper Nolin River

Unit 9 consists of 23.9 river miles (38.5 km) of the Nolin River, South Fork Nolin River, and Walters Creek in Larue County, Kentucky. Approximately 21.3 stream miles (34.3 km; 89 percent) of riparian lands that border the unit are in private ownership, and 2.6 stream miles (4.2 km; 11 percent) are managed by the State Department of Natural Resources for the Kentucky Department of Agriculture. This unit includes the South Fork Nolin River from Buffalo, Kentucky, downstream to its confluence with the North Fork Nolin River and Walters Creek from its headwaters near J.E. Jones Road to its confluence with the South Fork Nolin Creek. Unit 9 is considered occupied by the species and contains the physical or biological features 1 through 5 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include significant alteration of the natural flow regime; alteration of water quality and nutrient pollution; alteration of instream substrate, stream channels, and stream banks; land use activities that remove large areas of forested wetlands and riparian systems; dam, culvert and pipe, or other instream installations that create barriers; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; and the removal of instream

barriers (see **Special Management Considerations or Protection**).

This unit is the only area in the upper Nolin River section known to have Kentucky creekshell populations. Given the consistent numbers of individuals found in this area, this section has been the source population for Nolin River stock and augmentation from propagated individuals and has been stocked at multiple locations to increase species abundance. This area is vitally important for the conservation of the species and future recovery of the Nolin River populations.

Unit 10: Rough River

Unit 10 consists of 49.1 stream miles (79.1 km) with two subunits; one occupied and one unoccupied. Subunit 10a (Rough River and Meeting Creek) is occupied, while Subunit 10b (Clifty Creek) is unoccupied.

Subunit 10a (Rough River and Meeting Creek):

Subunit 10a consists of 37.5 river miles (60.4 km) of the Rough River in Breckinridge, Hardin, and Grayson Counties, Kentucky. This subunit includes the Rough River from the Hardinsburg Road bridge downstream to its confluence with Meeting Creek and Meeting Creek from its confluence with Petty Creek downstream to its confluence with Rough River. Approximately 96 percent of the lands adjacent to subunit 10a are privately owned; the remaining 4 percent are managed by the USACE for Rough River Lake. Subunit 10a is considered occupied by the species and contains the physical or biological features 1 through 4 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include alteration of the natural flow regime; significant alteration of water quality and nutrient pollution from a variety of activities; alteration of instream substrate, stream channels, and stream banks from a variety of activities; land use activities that remove large areas of forested wetlands and riparian systems; dam, culvert and pipe, or other instream installations that create barriers to

movement for the Kentucky creekshell, or their host fish; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; and removal of instream barriers. (see **Special Management Considerations or Protection**).

This unit has the highest number of individuals found (57) since 2003 including multiple age classes observed during the collections. It could be characterized as the most resilient unit among all 10 analytical units. Including this unit protects occupied habitat for improved redundancy throughout the species' range.

Subunit 10b (Clifty Creek):

Subunit 10b consists of 11.6 river miles (18.7 km) of Clifty Creek in Grayson County, Kentucky, from Elizabethtown Road bridge downstream to Rough River Lake. Approximately 97 percent of the lands adjacent to subunit 10b are owned by private entities, while the remainder is managed by the USACE for Rough River Lake backwaters. Subunit 10b is considered unoccupied by the species and contains the physical or biological features 1 through 4 (see **Summary of Essential Physical or Biological Features**) essential to the conservation of the species.

Threats identified within this unit include alteration of the natural flow regime; significant alteration of water quality and nutrient pollution from a variety of activities; alteration of instream substrate, stream channels, and stream banks from a variety of activities; land use activities that remove large areas of forested wetlands and riparian

systems; dam, culvert and pipe, or other instream installations that create barriers to movement for the Kentucky creekshell or their host fish; impacts from invasive species; changes and shifts in seasonal temperature and precipitation patterns as a result of climate change; and other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water. Special management considerations or protection measures to reduce or alleviate the threats may include use of best management practices designed to reduce sedimentation, erosion, and bank destruction; protection of riparian corridors and woody vegetation; protection of ground water and spring-fed streams and moderation of surface and ground water withdrawals to maintain natural flow regimes; reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water; the removal of instream barriers; prevention of instream gravel mining; and controlling invasive species. (see **Special Management Considerations or Protection**).

Clifty Creek is a nearby tributary of the mainstem Rough River with suitable substrates and is heavily influenced by springs. Experts believe the species could be present in Clifty Creek and was likely there historically (Compton 2023, pers. comm.). Clifty Creek is the most promising location for reintroduction/augmentation in unit 9, which would add redundancy to the most resilient unit. It is essential for the conservation of the species.

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 authorize, fund, 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.

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 (50 CFR 402.02).

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 formal 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 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 consultation. Reinitiation of consultation is required and shall be requested by the Federal agency, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) 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; (3) 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 (4) if a new species is listed or critical habitat designated that may be affected by the identified action. 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).

Destruction or Adverse Modification of Critical Habitat

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 that our *Federal Register* documents “shall, to the maximum extent practicable also include a brief description and evaluation of those activities (whether public or private) which, in the opinion of the Secretary, if undertaken may adversely modify [critical] habitat, or may be affected by such designation.” Activities that may be affected by designation of critical habitat for the Kentucky creekshell include those that may affect the physical or biological features of the Kentucky creekshell’s critical habitat (see Physical or Biological Features Essential to the Conservation of the Species).

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 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).

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. In our final rules, we explain any decision to exclude areas, as well as decisions not to exclude, to make clear the rational basis for our decision. We describe below the process that we use for taking into consideration each category of impacts and any initial 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.) 14094 supplements and reaffirms E.O. 12866 and E.O. 13563 and directs Federal agencies to assess the costs and benefits of available regulatory alternatives in quantitative (to the extent feasible) and qualitative terms. Consistent with the E.O. 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 or more in any given year (section 3(f)(1) as amended by E.O. 14094). Therefore, our consideration of economic impacts uses a screening analysis to assess whether a designation of critical habitat for Kentucky creekshell 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 Kentucky creekshell (IEc 2024, 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 geographical 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. Therefore, designating occupied areas as critical habitat typically causes little if any incremental impacts above and beyond the impacts of listing the species. As a result, we generally focus the screening analysis on areas of unoccupied critical habitat (unoccupied units or unoccupied areas within occupied units). Overall, the screening analysis assesses whether designation of critical habitat is likely to result in any additional management or conservation efforts that may incur incremental economic impacts. This screening analysis combined with the information contained in our IEM constitute what we consider to be our economic analysis of the proposed critical habitat designation for the Kentucky creekshell and 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 Kentucky creekshell, first we identified, in the IEM dated March 26, 2024, probable incremental economic impacts associated with the following categories of activities: (1) Development along the Interstate 65 corridor; (2) installation of expanded broadband internet; (3) solar energy development; (4) pipeline maintenance projects; (5) bridge and road replacements and rehabilitations; and (6) water control activities. 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 Kentucky creekshell is present, Federal agencies would be required to consult with the Service under section 7 of the Act on activities they authorize, fund, or carry out that may affect the species. If when we list the species, we also finalize this proposed critical habitat designation, Federal agencies would be required to consider the

effects of their actions on the designated habitat, and if the Federal action may affect critical habitat, 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 Kentucky creekshell's critical habitat. Because the designation of critical habitat for Kentucky creekshell 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 species itself. 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 Kentucky creekshell totals approximately 544.6 river miles, of which 159.1 miles are considered to be unoccupied by the species. Critical habitat designation for the Kentucky creekshell is unlikely to generate costs exceeding \$200 million in a single year. Therefore, the rule is unlikely to meet the threshold for an economically significant rule, with regard to costs, under E.O. 12866. In fact, the total annual incremental cost of critical habitat designation for the Kentucky creekshell is anticipated to be a maximum of \$51,300 per year (2024 dollars).

The total incremental costs of critical habitat designation for the Kentucky creekshell are anticipated to be between approximately \$438,200 to \$513,100 over the next 10 years, or approximately \$43,800 to \$51,300 annually.

We have determined that, in occupied Kentucky creekshell critical habitat, costs are likely to be limited to administrative costs. This is primarily because, regardless of whether critical habitat is designated, all projects with a Federal nexus would be subject to section 7 requirements, and conservation efforts requested to avoid jeopardizing the continued existence of the species would be substantially similar to those that would be recommended to avoid adverse modification. In addition, in both occupied and unoccupied habitat for Kentucky creekshell, conservation efforts for other listed species with ranges and/or proposed critical habitat areas that overlap the Kentucky creekshell proposed designation are likely to provide protections to the Kentucky creekshell, even absent critical habitat designation for the Kentucky creekshell. Of the more than 540 miles of proposed designated critical habitat, 13 federally listed mussel species' ranges overlap with Kentucky creekshell: between 33 miles and 208 miles for each species. Additionally, three critical habitat units for federally listed mussel species overlap with the Kentucky creekshell's critical habitat: between 73 miles and 156 miles for each species. Total overlap across all species is 208 miles (38%) and the majority of these overlaps occur in the mainstem Green River and mainstem Barren River. These species have similar habitat requirements to the Kentucky creekshell.

The incremental costs associated with section 7 consultations for the Kentucky creekshell in unoccupied habitat are likely to include administrative costs resulting from consultations as well as costs associated with potential additional conservation efforts. This is primarily because activities with a Federal nexus in unoccupied areas would not be subject to section 7 consultation requirements for the Kentucky creekshell absent the designation of critical habitat because the species is not present. Depending on the action

and the level of its impact on the habitat, the action agency or project proponent may need to undertake conservation activities, which may have an associated cost.

We are soliciting data and comments from the public on the economic analysis discussed above. During the development of a final designation, we will consider the information presented in the economic analysis 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), our implementing regulations at 50 CFR 424.19, and the 2016 Policy. 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, we 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 us to consider those impacts whenever it designates critical habitat. Accordingly, if DoD, the 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.

In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for Kentucky creekshell are not owned or managed by the DoD or DHS, and, therefore, we anticipate no impact on national security or homeland security.

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 safe harbor agreements (SHAs), candidate conservation agreements with assurances (CCAAs) or “conservation benefit agreement” or “conservation agreement” (CBAs) (CBAs are a new type of agreement replacing SHAs and CCAAs in use after April 2024 (89 FR 26070; April 12, 2024)) or HCPs, 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.

Summary of Exclusions Considered Under 4(b)(2) of the Act

In preparing this proposal, we have determined that no HCPs or other management plans for the Kentucky creekshell 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, and 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. E.O. 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this proposed rule in a manner consistent with these requirements.

Executive Order 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 will review all significant rules. OIRA has determined that this rule 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 “to the extent permitted by law” when undertaking actions identified as significant energy actions (66 FR 28355; May 22, 2001). E.O. 13211 defines a “significant energy action” as an action that (i) is a significant regulatory action under E.O. 12866 or any successor order; and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy. This rule is not a significant regulatory action under E.O. 12866 or E.O. 14094 (88 FR 21879; April 11, 2023). Therefore, this action is not a significant energy action, and there is no requirement to prepare a statement of energy effects for this action.

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 findings:

(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 it will not produce a Federal mandate of \$100 million or more (adjusted annually for inflation) in any year; that is, it is not a “significant regulatory action” under the Unfunded Mandates Reform Act. Small governments will be affected only to the extent that any Federal programs issuing Federal funds or permits, or conducting 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 the Kentucky creekshell in a takings implications assessment. The Act does not authorize the Services 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 the Kentucky creekshell, 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 designations. 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, May 4, 1994), E.O. 13175 (Consultation and Coordination with Indian Tribal Governments), the President's memorandum of November 30, 2022 (Uniform Standards for Tribal Consultation; 87 FR 74479, December 5, 2022), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with federally recognized Tribes and Alaska Native Corporations (ANCs) on a government-to-government basis. In accordance with Secretary's 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 Kentucky creekshell, 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 Kentucky 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 Kentucky 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) in the List of Endangered and Threatened Wildlife by adding an entry for “Creekshell, Kentucky” in alphabetical order under CLAMS to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

| Common name | Scientific name | Where listed | Status | Listing citations and applicable rules |
|----------------------|-------------------------|----------------|--------|--|
| * * * * | * * * | | | |
| CLAMS | | | | |
| * * * * | * * * | | | |
| Creekshell, Kentucky | <i>Leaunio ortmanni</i> | Wherever found | E | [<i>Federal Register</i> citation when published as a final rule]; 50 CFR 17.95(f). ^{CH} |
| * * * * | * * * | | | |

3. In § 17.95, amend paragraph (f) by adding an entry for “Kentucky Creekshell (*Leaunio ortmanni*)” after the entry for “Canoe Creek Clubshell (*Pleurobema athearni*)” to read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(f) * * *

* * * * *

Kentucky Creekshell (*Leaunio ortmanni*)

(1) Critical habitat units are depicted for Adair, Allen, Barren, Breckinridge, Butler, Edmonson, Grayson, Green, Hardin, Hart, Larue, Logan, Monroe, Simpson, and Warren Counties, Kentucky, and Macon County, Tennessee, on the maps in this entry.

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

(i) Water quantity and quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including (but not limited to) water conditions in the stream that are cool; are well-oxygenated with no evidence of excessive sediments or suspended solids, salinity, ammonia, nutrients, pesticides, or herbicides; and have a stream flow and pattern consistent with natural flow regimes. Spring-influenced river sections are important: Most Kentucky creekshell populations are associated with this habitat type, and it is also the preferred habitat type for the host fish, the banded sculpin (*Cottus carolinae*).

(ii) Suitable substrates and connected instream habitats characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation); stable riffle-run-pool habitats that provide flow refuges consisting of predominantly silt-free, stable coarse sand, gravel, and cobble substrates.

(iii) Adequate food availability for Kentucky creekshell including (but not limited to): suspended phytoplankton, zooplankton, rotifers, protozoans, detritus, and dissolved organic matter from the water column or sediments.

(iv) Habitat conditions that support the presence and abundance of banded sculpin, the host fish necessary for Kentucky creekshell recruitment, as well as the actual presence and abundance of the banded sculpin in the habitat.

(v) Connected instream habitats without barriers such as dams and perched or undersized culverts to provide suitable lotic rather than lentic habitat; access to quality habitat for multiple life stages of Kentucky creekshell; access for host fish movement, which in turn, may influence Kentucky creekshell distribution and provide genetic exchange for both species and recolonization of Kentucky creekshell.

(vi) Appropriate abundance, density, and distribution of mussel beds (aggregations of freshwater mussels) such that local stochastic events do not necessarily eliminate the bed(s), allowing the mussel beds and the overall local population within a stream reach to recover from any single event and for resilient populations.

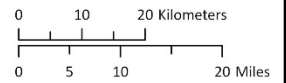
(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of the final rule.



(4) Data layers defining map units were created using ArcGIS Profession version 3.2.2 (Environmental Systems Research Institute, Inc.), a geographic information systems program on a base of USA Topo Maps. Critical habitat units were then mapped by delineating stream segments and polygons from the National Hydrography Database high-resolution flow lines and areas with USA Contiguous Albers Equal Area Conic USGS projection and NAD83 datum. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation.

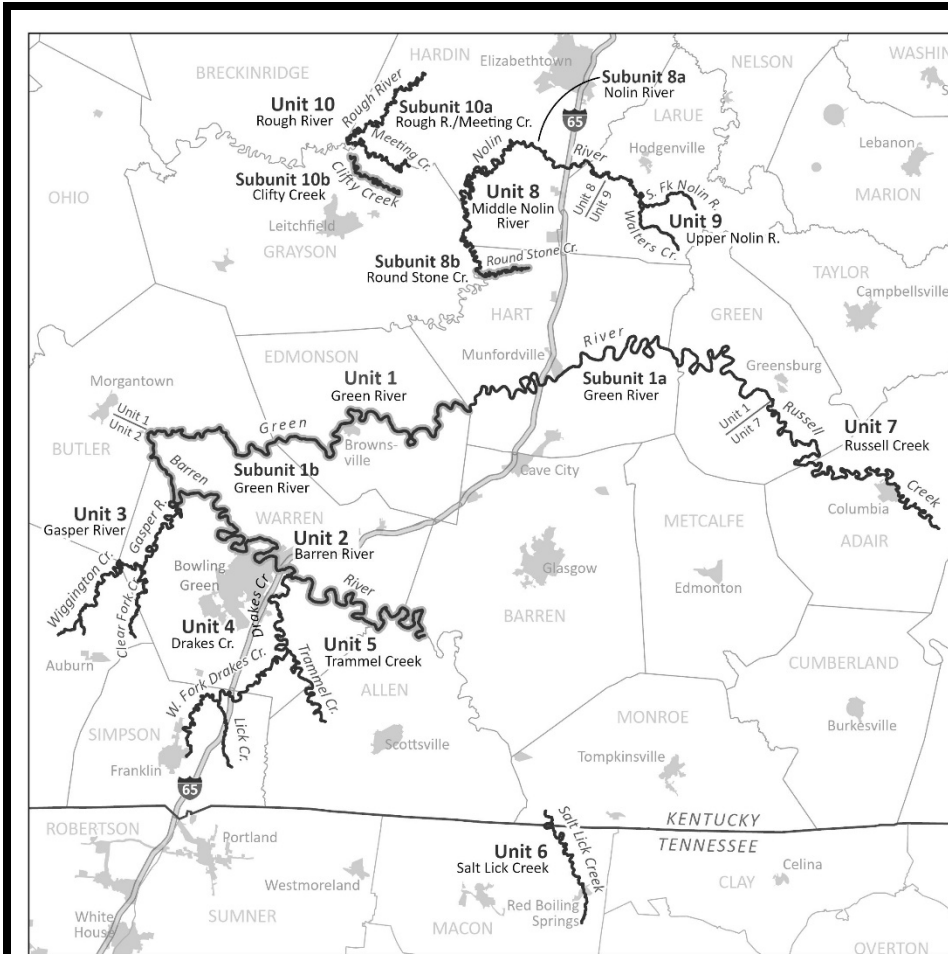
(5) Index map follows:

Figure 1 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (5)

Kentucky Creekshell Critical Habitat Overview



-  Critical Habitat
-  Unoccupied Critical Habitat



(6) Unit 1: Green River; Green, Hart, Edmonson, Butler, and Warren Counties, Kentucky.

(i) Unit 1 consists of 130.7 stream miles (210.4 km) in Green, Hart, Edmonson, Butler, and Warren Counties, Kentucky. The unit includes both occupied and unoccupied subunits.

(A) Subunit 1a (Green River) is approximately 73.0 stream miles (117.5km) and considered occupied habitat. Nearly all (approximately 99 percent) of the lands adjacent to subunit 1a are privately owned. The remaining lands adjacent to this subunit (one percent) are federally or State owned.

(B) Subunit 1b (Green River) is approximately 57.7 stream miles (92.9 km) and considered unoccupied habitat. Approximately 87 percent of the lands adjacent to subunit 1b are privately owned. The remaining 13 percent is federally owned.

(ii) Map of Unit 1 follows:

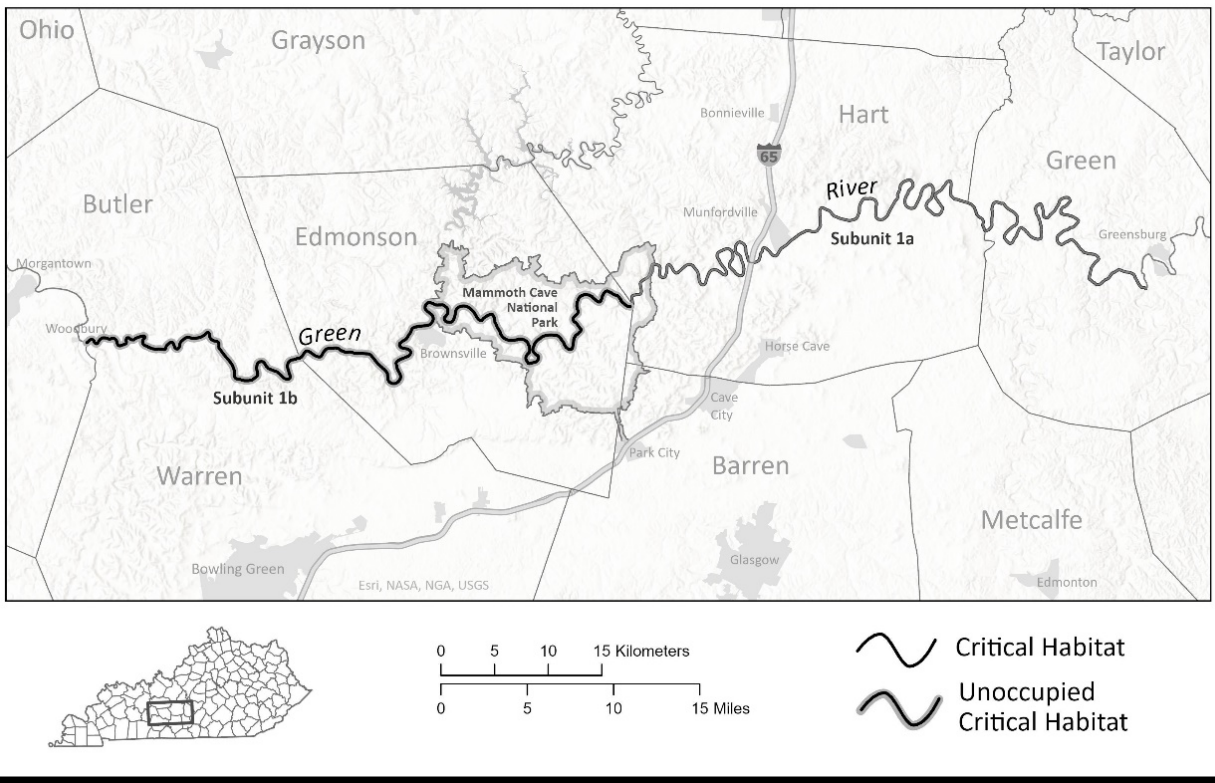
Figure 2 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (6)(ii)

Critical Habitat for Kentucky Creekshell

Unit 1: Green River

Subunit 1a (Green River)

Subunit 1b (Green River)



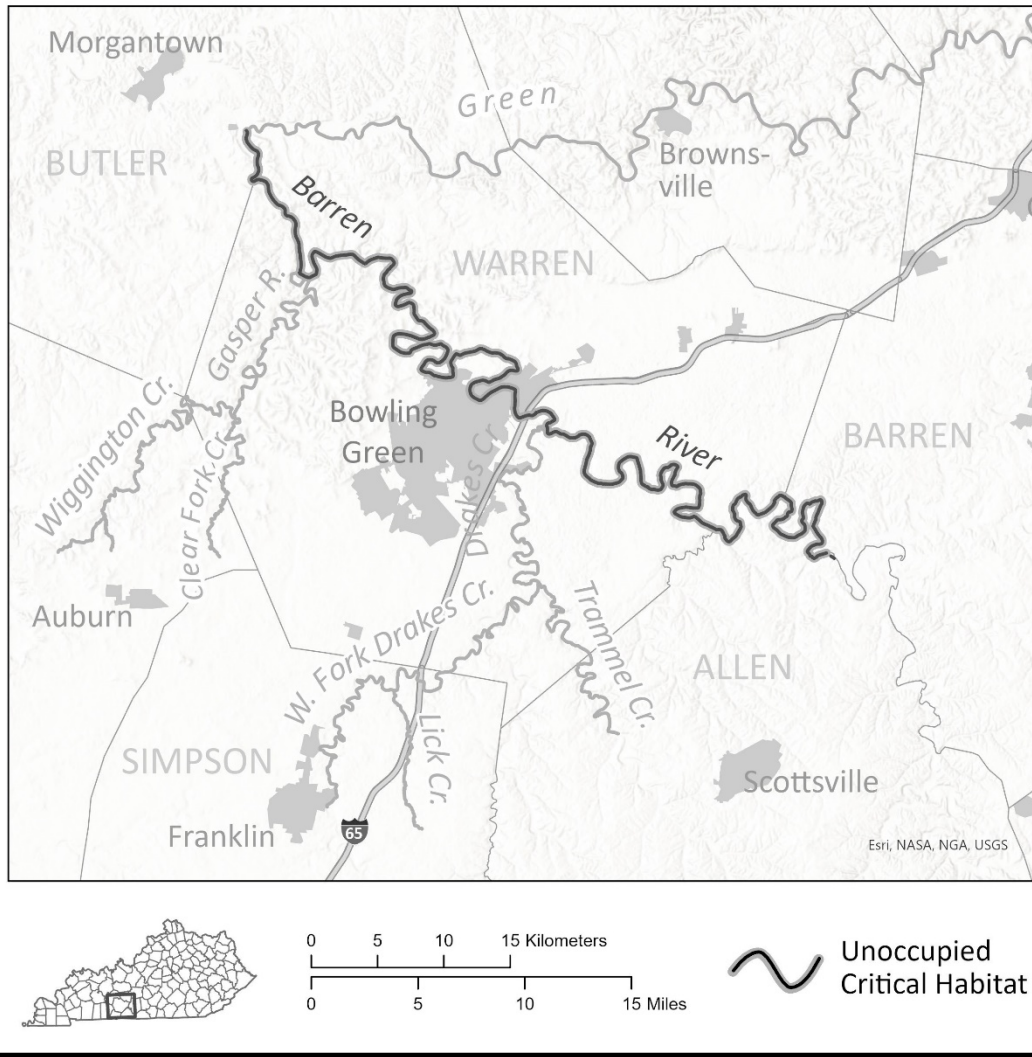
(7) Unit 2: Barren River; Butler, Warren, Allen, and Barren Counties, Kentucky.

(i) Unit 2 consists of 79.9 stream miles (128.6 km) of Barren River in Butler, Warren, Allen, and Barren Counties, Kentucky. Approximately 79.4 stream miles (127.8 km; 99 percent) of riparian lands that border the unit is private ownership, and 0.46 stream miles (0.74 km; less than 1 percent) are federally owned and managed. Unit 2 is unoccupied by the species.

(ii) Map of Unit 2 follows:

Figure 3 to Kentucky creekshell (*Leaunio ortmani*) paragraph (7)(ii)

Critical Habitat for Kentucky Creekshell Unit 2: Barren River

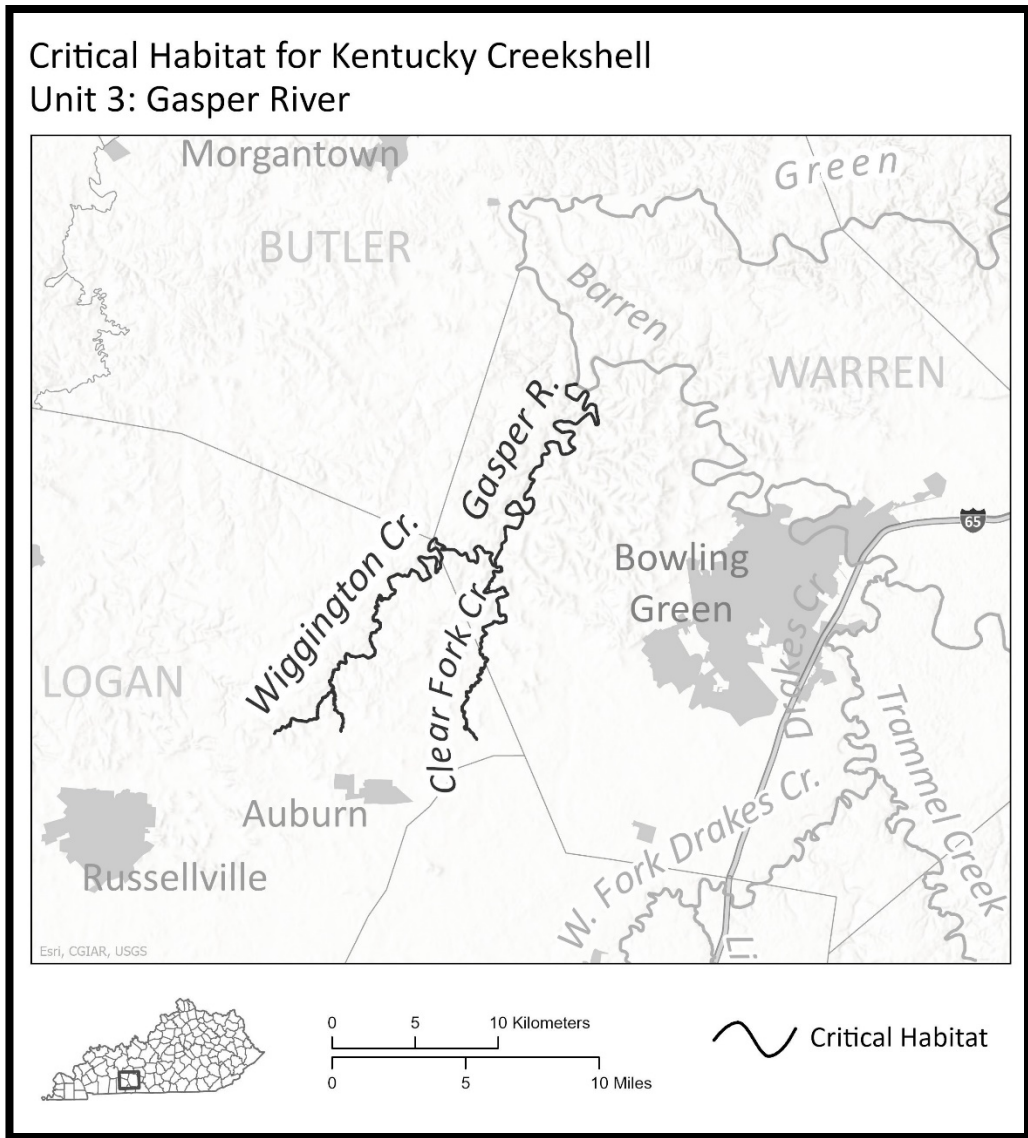


(8) Unit 3: Gasper River; Warren and Logan Counties, Kentucky.

(i) Unit 3 consists of 52.8 stream miles (85.0 km) of the Gasper River, Wiggington Creek, and Clear Fork Creek in Warren and Logan Counties, Kentucky. All the riparian lands that border the unit are in private ownership. Unit 3 is occupied by the species.

(ii) Map of Unit 3 follows:

Figure 4 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (8)(ii)



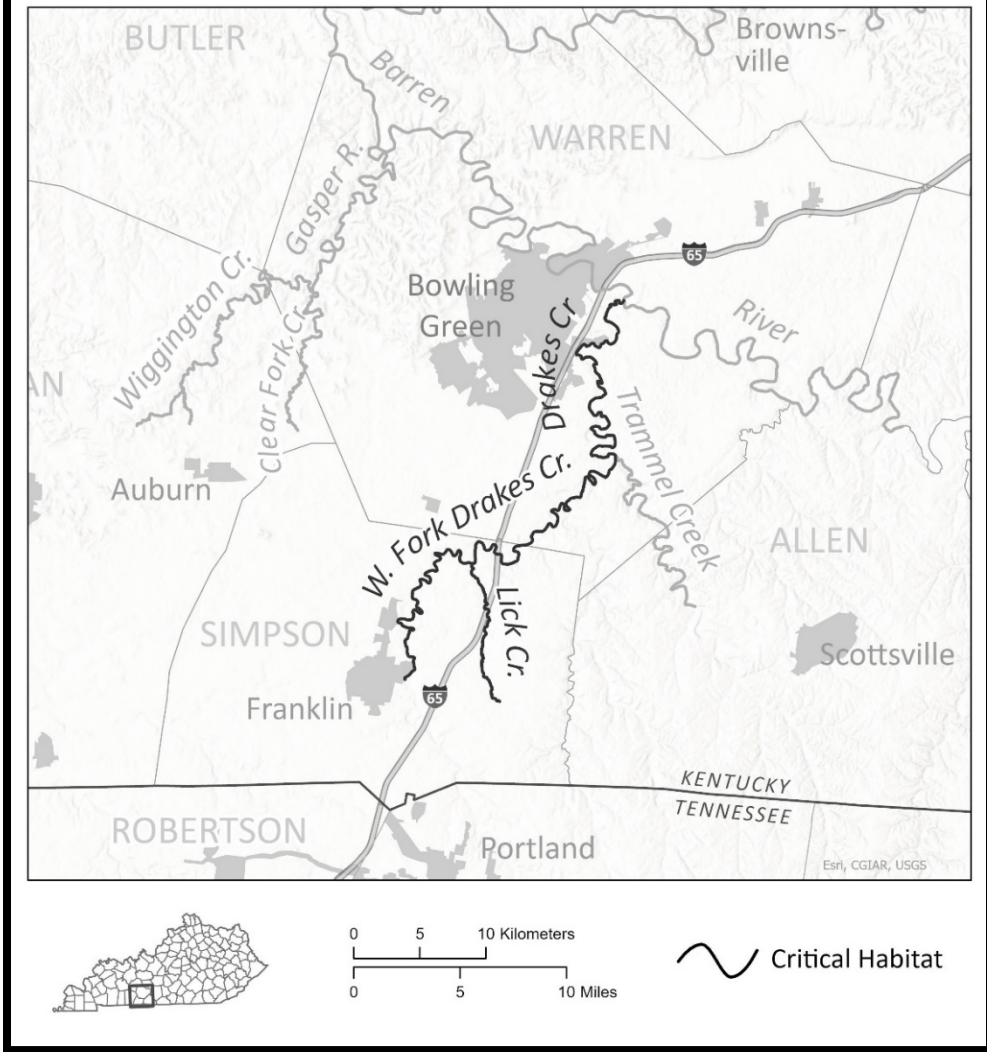
(9) Unit 4: Drakes Creek; Warren and Simpson Counties, Kentucky.

(i) Unit 4 consists of 55.1 stream miles (88.7 km) of Drakes Creek, West Fork Drakes Creek, and Lick Creek in Warren and Simpson Counties, Kentucky. All of the riparian lands that border the unit are in private ownership. Unit 4 is occupied by the species.

(ii) Map of Unit 4 follows:

Figure 5 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (9)(ii)

Critical Habitat for Kentucky Creekshell
Unit 4: Drakes Creek

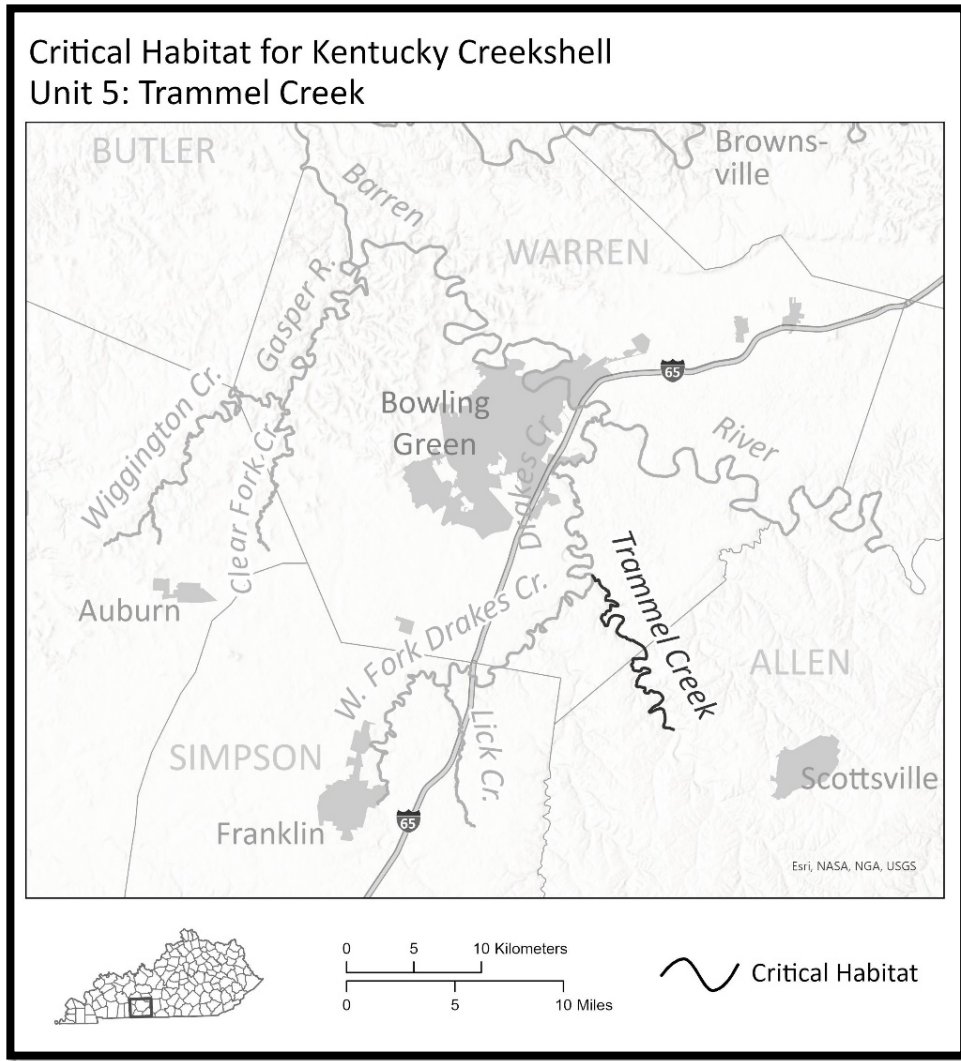


(10) Unit 5: Trammel Creek; Warren and Allen Counties, Kentucky.

(i) Unit 5 consists of 15.9 stream miles (25.6 km) of Trammel Creek in Warren and Allen Counties, Kentucky. All of the riparian lands that border the unit are in private ownership. Unit 5 is occupied by the species.

(ii) Map of Unit 5 follows:

Figure 6 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (10)(ii)



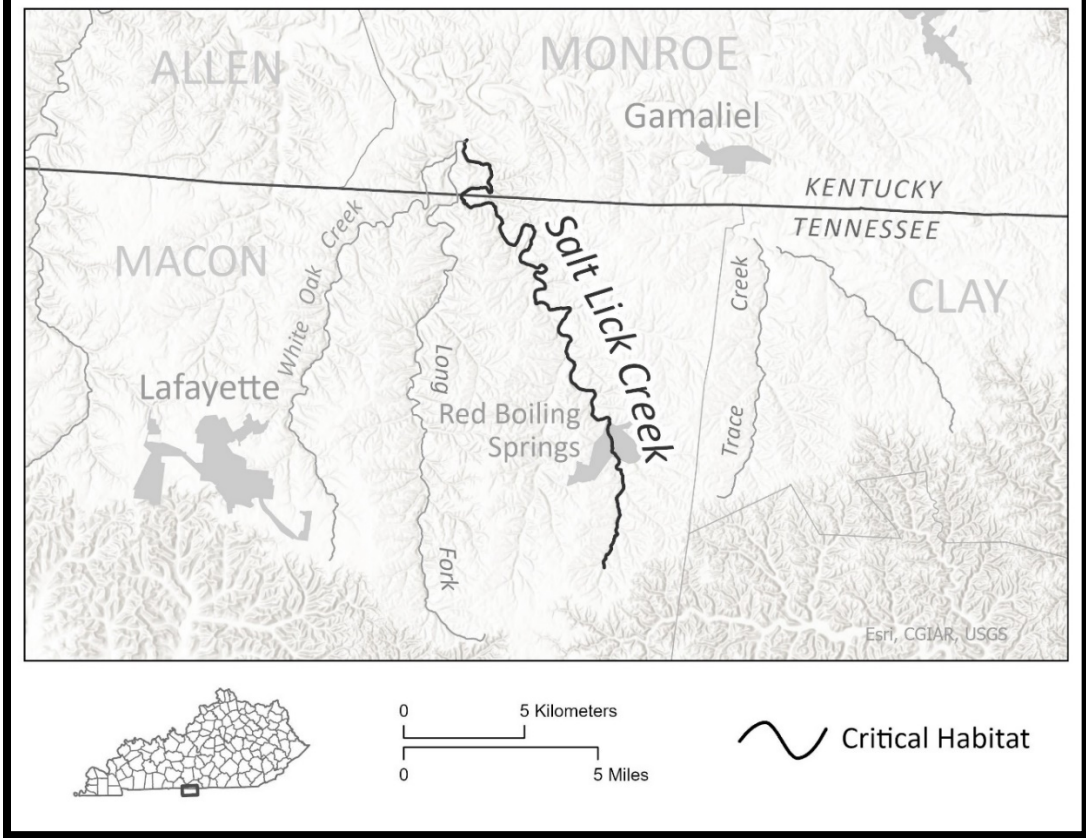
(11) Unit 6: Salt Lick Creek; Monroe County, Kentucky, and Macon County, Tennessee.

(i) Unit 6 consists of 19.1 stream miles (30.7 km) of Salt Lick Creek in Monroe County, Kentucky, and Macon County, Tennessee. All of the riparian lands that border the unit are private ownership. Unit 6 is occupied by the species.

(ii) Map of Unit 6 follows:

Figure 7 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (11)(ii)

Critical Habitat for Kentucky Creekshell Unit 6: Salt Lick Creek

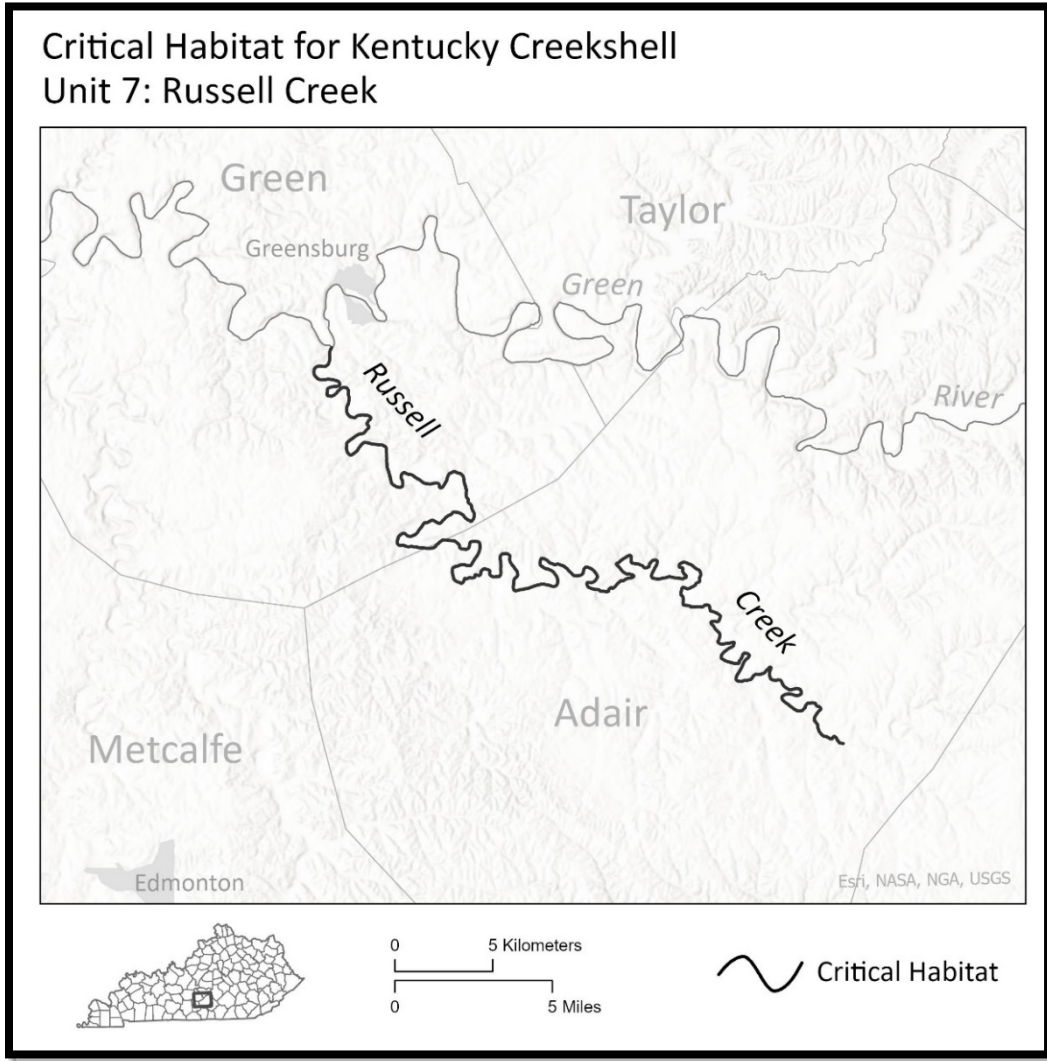


(12) Unit 7: Russell Creek; Green and Adair Counties, Kentucky.

(i) Unit 7 consists of 53.7 stream miles (86.4 km) of Russell Creek in Green and Adair Counties, Kentucky. All of the riparian lands that border the unit are in private ownership. Unit 7 is occupied by the species.

(ii) Map of Unit 7 follows:

Figure 8 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (12)(ii)



(13) Unit 8: Middle Nolin River; Larue, Hardin, Hart, and Grayson Counties, Kentucky.

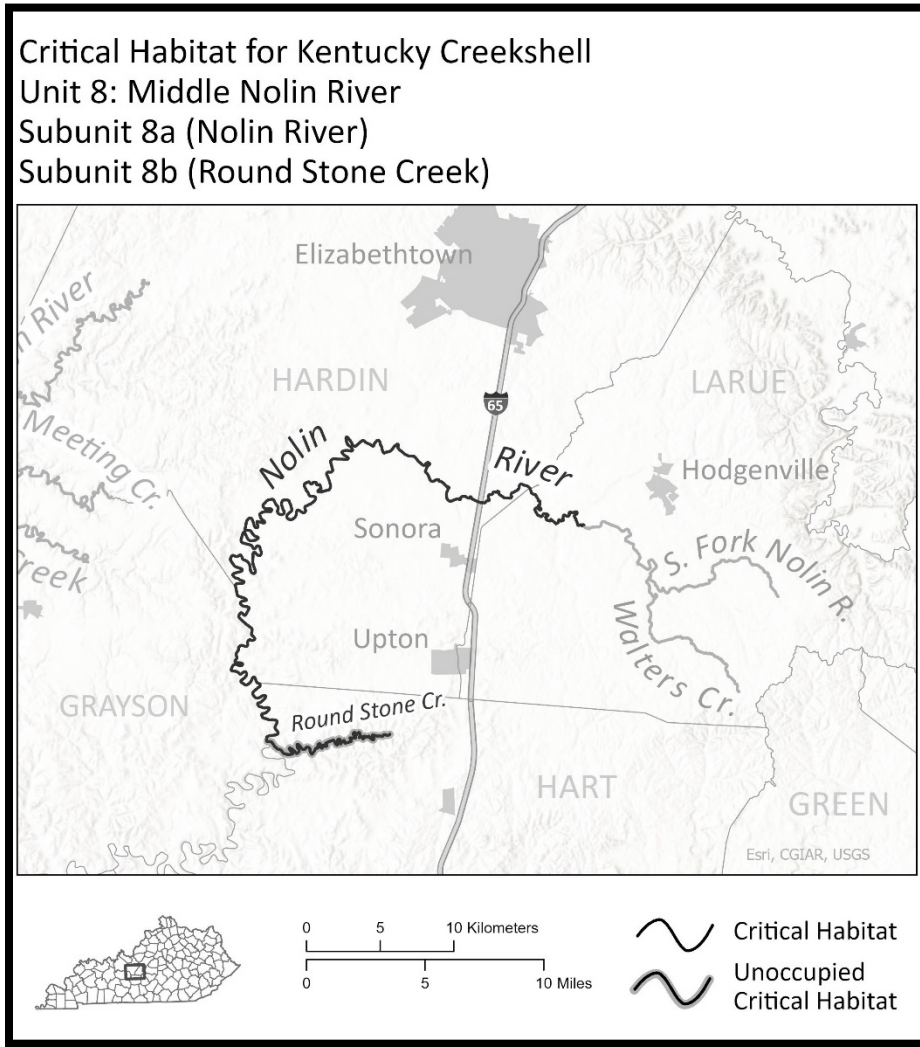
(i) Unit 8 consists of 64.4 stream miles (103.6 km) in Larue, Hardin, Hart, and Grayson Counties, Kentucky. The unit includes both occupied and unoccupied subunits.

(A) Subunit 8a (Nolin River) is approximately 54.5 stream miles (87.7 km) and considered occupied habitat. Nearly all (approximately 99 percent) of the lands adjacent to subunit 8a are privately owned. The remaining lands adjacent to this subunit (one percent) are federally owned and managed.

(B) Subunit 8b (Round Stone Creek) is approximately 9.8 stream miles (15.9 km) and considered unoccupied habitat. Approximately 99 percent of the lands adjacent to subunit 8b are owned by private entities. The other 1 percent is federally owned and managed.

(ii) Map of Unit 8 follows:

Figure 9 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (13)(ii)



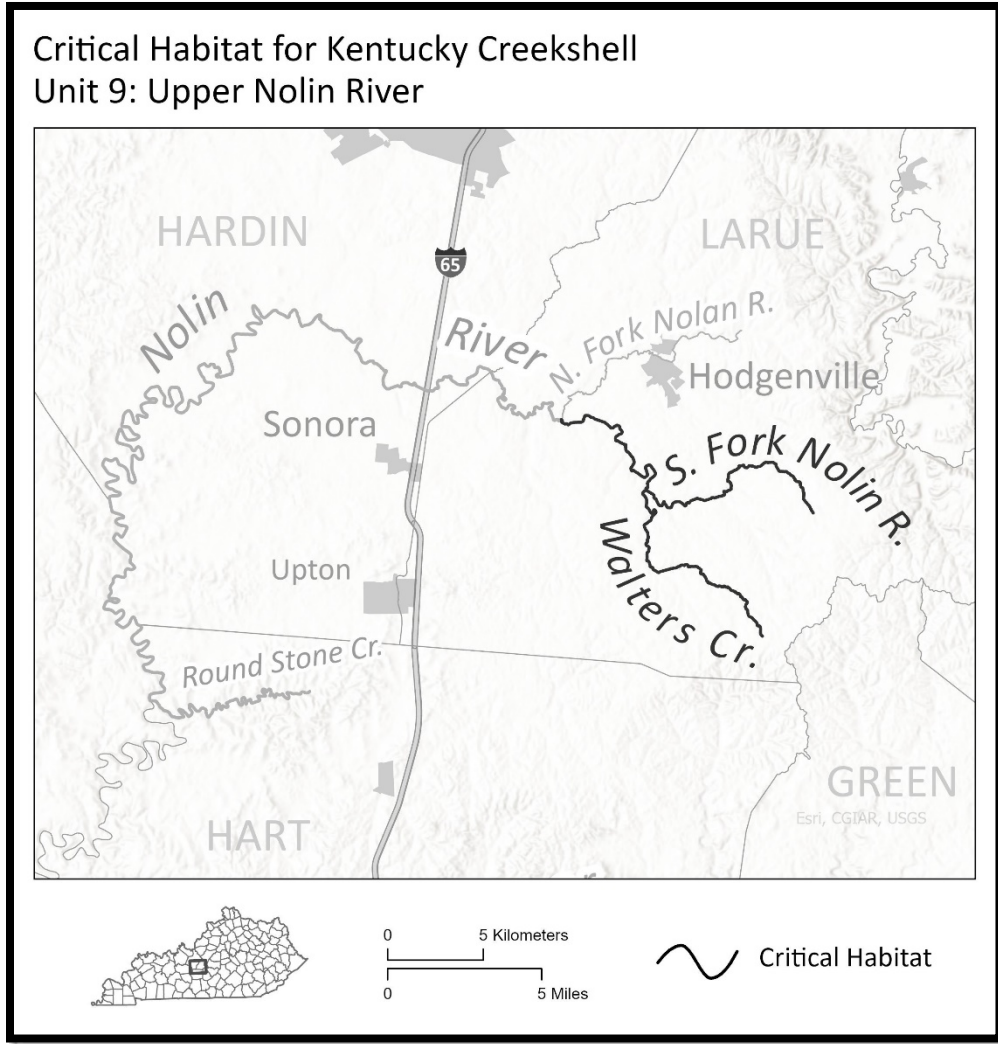
(14) Unit 9: Upper Nolin River; Larue County, Kentucky.

(i) Unit 9 consists of 23.9 stream miles (38.5 km) of the South Fork Nolin River and Walters Creek in Larue County, Kentucky. Approximately 21.3 stream miles (34.3 km; 89 percent) of riparian lands that border the unit are in private ownership, and 2.6

stream miles (4.2 km; 11 percent) are State owned and managed. Unit 9 is occupied by the species.

(ii) Map of Unit 9 follows:

Figure 10 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (14)(ii)



(15) Unit 10: Rough River; Breckinridge, Hardin, and Grayson Counties, Kentucky.

(i) Unit 10 consists of 49.1 stream miles (79.0 km) in Breckinridge, Hardin, and Grayson Counties, Kentucky. The unit includes both occupied and unoccupied subunits.

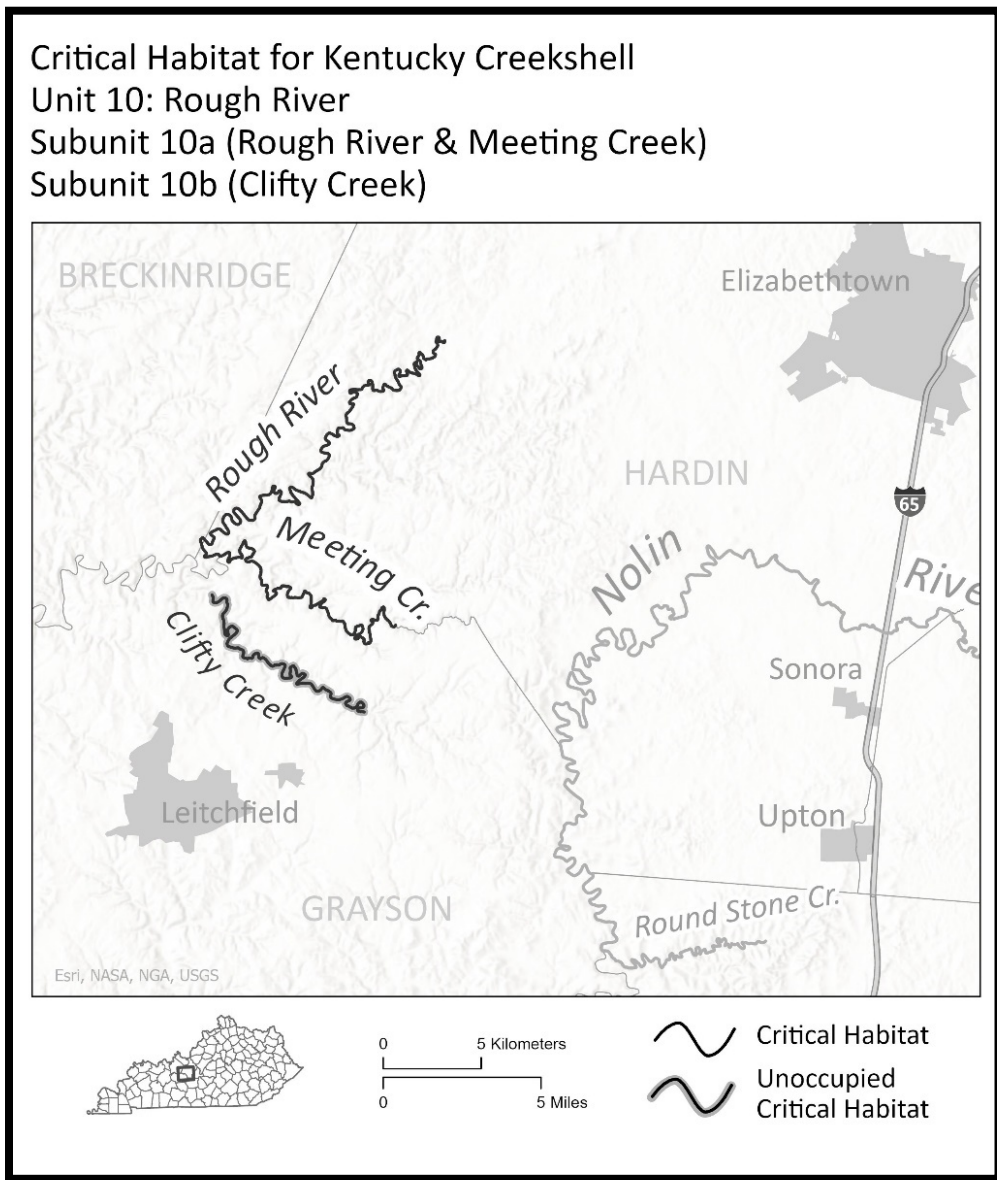
(A) Subunit 10a (Rough River and Meeting Creek) is approximately 37.5 stream miles (60.4 km) and considered occupied habitat. Approximately 96 percent of the lands

adjacent to subunit 10a are privately owned. The remaining lands adjacent to this subunit (four percent) are federally owned and managed.

(B) Subunit 10b (Clifty Creek) is approximately 11.6 stream miles (18.7 km) and considered unoccupied habitat. Approximately 97 percent of the lands adjacent to subunit 10b are owned by private entities. The other 3 percent is federally owned and managed.

(ii) Map of Unit 10 follows:

Figure 11 to Kentucky creekshell (*Leaunio ortmanni*) paragraph (15)(ii)



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Martha Williams,
Director,
U.S. Fish and Wildlife Service.

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