



DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2020–0010; FF09E21000 FXES11110900000 201]

RIN 1018–BD32

Endangered and Threatened Wildlife and Plants; 12-Month Finding for Purple Lilliput; Threatened Species Status with Section 4(d) Rule for Longsolid and Round Hickorynut and Designation of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule; announcement of 12-month findings.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce 12-month findings on a petition to list the purple lilliput (*Toxolasma lividum*), longsolid (*Fusconaia subrotunda*), and round hickorynut (*Obovaria subrotunda*) freshwater mussels as endangered or threatened species and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). We find that listing the longsolid and round hickorynut is warranted. Accordingly, we propose to list the longsolid and round hickorynut as threatened species with a rule issued under section 4(d) of the Act (“4(d) rule”). If we finalize this rule as proposed, it would add these 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 longsolid and round hickorynut under the Act. For the longsolid, approximately 1,115 river miles (1,794 kilometers), all of which is occupied by the species, in Pennsylvania, Kentucky, West Virginia, Virginia, Tennessee,

and Alabama fall within the boundaries of the proposed critical habitat designation. For the round hickorynut, approximately 921 river miles (1,482 kilometers), all of which is occupied by the species, in Pennsylvania, Ohio, Indiana, Kentucky, West Virginia, Tennessee, Alabama, and Mississippi fall within the boundaries of the proposed critical habitat designation. Finally, we announce the availability of a draft economic analysis of the proposed designation of critical habitat for the longsolid and round hickorynut. After a thorough review of the best available scientific and commercial information, we find that it is not warranted at this time to list the purple lilliput. We ask the public to submit to us at any time new information relevant to the status of purple lilliput or its habitat.

DATES: For the proposed rule to list and designate critical habitat for the longsolid and round hickorynut, we will accept comments received or postmarked on or before

[INSERT DATE 90 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]**.

Petition finding for the purple lilliput: For the purple lilliput, the finding in this document was made on **[INSERT 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:

<http://www.regulations.gov>. In the Search box, enter FWS–R4–ES–2020–0010, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search 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 Now!”

(2) *By hard copy*: Submit by U.S. mail to: Public Comments Processing, Attn: FWS–R4–ES–2020–0010, 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 <http://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: For the critical habitat designation, the coordinates or plot points or both from which the maps are generated are included in the administrative record and are available at <https://www.fws.gov/Asheville/> and at <http://www.regulations.gov> under Docket No. FWS–R4–ES–2020–0010. Any additional tools or supporting information that we may develop for the critical habitat designation will also be available at the Service website set out above, and may also be included in the preamble and/or at <http://www.regulations.gov>.

FOR FURTHER INFORMATION CONTACT: Janet Mizzi, Field Supervisor, U.S. Fish and Wildlife Service, Asheville Ecological Services Field Office, 160 Zillicoa St., Asheville, NC 28801; telephone 828–258–3939. Persons who use a telecommunications

device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if we determine that a species is an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the *Federal Register* and make a determination on our proposal within one year. To the maximum extent prudent and determinable, we must designate critical habitat for any species that we determine to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species and designation of critical habitat can only be completed by issuing a rule.

What this document does. We find that listing the purple lilliput as an endangered or threatened species is not warranted. We propose to list the longsolid and round hickorynut as threatened species with a rule under section 4(d) of the Act, and we propose the designation of critical habitat for these two 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 threats to the longsolid and round hickorynut include habitat degradation or loss from a variety of sources (e.g., dams and other barriers, resource extraction); degraded water

quality from chemical contamination and erosion from development, agriculture, mining, and timber operations; direct mortality from dredging; residual impacts (reduced population size) from historical harvest; and the proliferation of invasive, nonnative species. These threats also contribute to the negative effects associated with the species' small population size.

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary) to designate critical habitat concurrent with listing to the maximum extent prudent and determinable. Section 3(5)(A) of the Act defines critical habitat as (i) the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protections; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary that such areas are essential for the conservation of the species. Section 4(b)(2) of the Act states that the Secretary must make the designation on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impacts of specifying any particular area as critical habitat.

Peer review. In accordance with our joint policy on peer review published in the *Federal Register* on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we sought the expert opinions of 10 appropriate specialists regarding the purple lilliput species status assessment (SSA) report, 11 regarding the longsolid SSA report, and 10 regarding the round hickorynut SSA report. We received responses from three, none, and one

specialists, respectively; feedback we received informed our findings and this proposed rule. The purpose of peer review is to ensure that our listing determinations, critical habitat designations, and 4(d) rules are based on scientifically sound data, assumptions, and analyses. The peer reviewers have expertise in the biology, habitat, and threats to the species.

Because we will consider all comments and information we receive during the comment period, our final determinations for the longsolid and round hickorynut may differ from this proposal. Based on the new information we receive (and any comments on that new information), we may conclude that either the longsolid or round hickorynut are endangered instead of threatened, or we may conclude that either species does not warrant listing as either an endangered species or a threatened species. Such final decisions would be a logical outgrowth of this proposal, as long as we: (1) Base the decisions on the best scientific and commercial data available after considering all of the relevant factors; (2) do not rely on factors Congress has not intended us to consider; and (3) articulate a rational connection between the facts found and the conclusions made, including why we changed our conclusion.

Acronyms and Abbreviations Used

We use several acronyms and abbreviations throughout the preamble of this finding and proposed rule. To assist the reader, we list them here:

Act = Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)

AMD = acid mine and saline drainage

BMP = best management practice

CBD = Center for Biological Diversity

DEA = draft economic analysis

IEM = incremental effects memorandum

HUC = hydrologic unit code

LS = longsolid

ppm = parts per million

RFA = Regulatory Flexibility Act

RH = round hickorynut

SSA = species status assessment

TDEC = Tennessee Department of Environment and Conservation

TVA = Tennessee Valley Authority

Information Requested

For the purple lilliput, we ask the public to submit to us at any time new information relevant to the species' status or its habitat.

For the longsolid and round hickorynut, 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 concerned 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;
- (d) Historical and current population levels, and current and projected trends; and
- (e) Past and ongoing conservation measures for the species, their habitats, or both.

(2) Factors that may affect 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.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to the species and existing regulations that may be addressing those threats.

(4) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of this species.

(5) Information on regulations that are necessary and advisable to provide for the conservation of the longsolid and round hickorynut, and that the Service can consider in developing a 4(d) rule for the species. In particular, we seek information concerning the extent to which we should include any of the section 9 prohibitions in the 4(d) rule or whether any other forms of take should be excepted from the prohibitions in the 4(d) rule.

(6) The reasons why we should or should not designate habitat as “critical habitat” under section 4 of the Act, including information to inform the following factors that the regulations identify as reasons why designation of critical habitat may be not prudent:

(a) The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;

(b) The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;

(c) Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States; or

(d) No areas meet the definition of critical habitat.

(7) Specific information on:

(a) The amount and distribution of longsolid or round hickorynut habitat;

(b) What areas, that were occupied at the time of listing and that contain the physical or biological features essential to the conservation of the species, should be included in the designation and why;

(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) What areas not occupied at the time of listing are essential for the conservation of the species. We particularly seek comments:

(i) Regarding whether occupied areas are inadequate for the conservation of the species; and

(ii) Providing specific information regarding whether or not unoccupied areas would, with reasonable certainty, contribute to the conservation of the species and contain at least one physical or biological feature essential to the conservation of the species.

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

(9) 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.

(10) 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 (i.e., incremental impacts estimated to be less than \$327,000 per year for the next 10 years).

(11) Whether any specific areas we are proposing for critical habitat designation should be considered for exclusion under section 4(b)(2) of the Act, and whether the benefits of potentially excluding any specific area outweigh the benefits of including that area under section 4(b)(2) of the Act.

(12) 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, will not be considered in making a determination, as 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.”

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 <http://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 <http://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 <http://www.regulations.gov>.

Public Hearing

Section 4(b)(5) of the Act provides for a public hearing on this proposal for the longsolid and round hickorynut, if requested. We must receive requests for a public hearing, in writing, at 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. For the immediate future, we will provide these public hearings using webinars that will be announced on the Service's website, in addition to the *Federal Register*. The use of these virtual public hearings is consistent with our regulations at 50 CFR 424.16(c)(3).

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity (CBD), Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, and West Virginia Highlands Conservancy (referred to below as the CBD petition) to list 404 aquatic, riparian, and wetland species, including the purple lilliput, longsolid, and round hickorynut, as endangered or threatened species under the Act. On September 27, 2011, we published a 90-day finding that the petition contained substantial information indicating listing may be warranted for these three species (76 FR 59836).

On April 17, 2019, CBD filed a complaint challenging the Service's failure to complete 12-month findings for these species within the statutory deadline. The Service and CBD reached a stipulated settlement agreement whereby the Service agreed to deliver 12-month findings for purple lilliput, longsolid, and round hickorynut to the Office of the *Federal Register* by June 30, 2020. Subsequently, we requested a 30-day extension that was approved by CBD and granted by the Court on May 12, 2020, whereby the Service would deliver 12-month findings to the Office of the *Federal Register* by July 30, 2020. This document constitutes our 12-month finding on the April 20, 2010, petition to list the purple lilliput, longsolid, and round hickorynut under the

Act, and complies with the October 11, 2019, stipulated settlement agreement and May 12, 2020, extension.

Supporting Documents

An SSA team prepared SSA reports for the purple lilliput, longsolid, and round hickorynut. The SSA team was composed of Service biologists, in consultation with other species experts. The SSA reports represent a compilation of the best scientific and commercial data available concerning the status of these species, including the impacts of past, present, and future factors (both negative and beneficial) affecting these species. As discussed above under *Peer review*, we solicited appropriate peer review of all three of the species' SSA reports. In addition, we sent the draft SSA reports for review to Federal partners, State partners, and scientists with expertise in aquatic ecology and freshwater mussel biology, taxonomy, and conservation. Although we notified tribal nations early in the SSA process for these species, we did not receive any information or comments regarding these species on tribal lands in the United States. The round hickorynut SSA report was also shared with the Canadian government and the Walpole Islands First National Indian Reservation in Canada.

I. Finding for Purple Lilliput

Under section 4(b)(3)(B) of the Act, we are required to make a finding whether or not a petitioned action is warranted within 12 months after receiving any petition that we have determined contains substantial scientific or commercial information indicating that the petitioned action may be warranted (“12-month finding”). We must make a finding that the petitioned action is: (1) Not warranted; (2) warranted; or (3) warranted but precluded. “Warranted but precluded” means that (a) the petitioned action is warranted,

but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened species, and (b) expeditious progress is being made to add qualified species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) and to remove from the Lists species for which the protections of the Act are no longer necessary. Section 4(b)(3)(C) of the Act requires that, when we find that a petitioned action is warranted but precluded, we treat the petition as though resubmitted on the date of such finding, that is, requiring that a subsequent finding be made within 12 months of that date. We must publish these 12-month findings in the *Federal Register*.

Summary of Information Pertaining to the Five Factors

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 is an “endangered species” or a “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 expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the

species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

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

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

In conducting our evaluation of the five factors provided in section 4(a)(1) of the Act to determine whether the purple lilliput (*Toxolasma lividum*; Service 2020a, entire) currently meets the definition of “endangered species” or “threatened species,” we considered and thoroughly evaluated the best scientific and commercial data available

regarding the past, present, and future stressors and threats. We reviewed the petition, information available in our files, and other available published and unpublished information. This evaluation may include information from recognized experts; Federal, State, and tribal governments; academic institutions; private entities; and other members of the public. After comprehensive assessment of the best scientific and commercial data available, we determined that the purple lilliput does not meet the definition of an endangered or a threatened species.

The species assessment for the purple lilliput contains more detailed biological information, a thorough analysis of the listing factors, and an explanation of why we determined that this species does not meet the definition of an endangered species or a threatened species. This supporting information can be found on the Internet at <http://www.regulations.gov> under docket number FWS-R4-ES-2020-0010. The following is an informational summary for the purple lilliput finding in this document.

Summary of Finding

The purple lilliput is a freshwater mussel that belongs to the order Unionida, also known as the naiads and pearly mussels. Purple lilliput adult mussels are small, with a relatively thick, inflated, oval shell (up to 1.5 inches (in) (38 millimeters (mm))) (Williams et al. 2008, p. 719), and the shell typically darkens with age. The species is currently found in the Great Lakes, Ohio, Cumberland, Tennessee, Arkansas-White-Red, and Lower Mississippi major river basins, within the States of Alabama, Kentucky, Missouri, Arkansas, Ohio, Illinois, Indiana, Michigan, and Tennessee. It is considered extirpated from North Carolina and Georgia, and potentially extirpated from Oklahoma and Virginia. Although it has never been collected within the State of Kansas, it occurs in the

Spring River drainage nearby in Missouri, and thus potentially occurs in Kansas, and may eventually be discovered there (Obermeyer et al. 1997, p. 49; Angelo *et al.* 2009, p. 95).

Little information is known specific to purple lilliput; thus, we relied on surrogate life-history information for closely related species when necessary, including for sex-specific information, for information on reproduction, and for determining appropriate temperatures for glochidia metamorphosis. For example, the purple lilliput is a short-lived species, estimated to live 5 to 10 years (possibly up to 15 years), based on the life expectancy of the Savannah lilliput (*Toxolasma pullus*) (9 years; Hanlon and Levine 2004, p. 294), lilliput (*T. parvum*) (at least 5 years; Haag and Rypel 2011, p. 229), and Texas lilliput (*T. texasiense*) (11 years; Haag and Rypel 2011, p. 229).

The purple lilliput can be found in a wide range of habitats and a variety of substrates in rivers and streams at depths less than 3.3 feet (ft) (1 meter (m)) (Gordon and Layzer 1989, p. 34). It may be located in coarse substrates such as cobble and gravel, or fine-particle substrates such as packed sand, silty clay, and mud. It is commonly collected in and near shorelines, in backwaters, and in vegetation and root masses in waters just a few centimeters deep. Purple lilliput also exhibits some ability to inhabit lentic (still water) environments (Roe 2002, p. 5). In unimpounded reaches, the species commonly occurs in a range of slow to swift currents, and from shallow, rocky gravel points, mud, and sandbars in overbank areas and embayments (Parmalee and Bogan 1998, p. 231; Williams et al. 2008, p. 720).

The purple lilliput is a suspension-feeder that filters water and nutrients to eat. Its diet consists of a mixture of algae, bacteria, detritus, and microscopic animals (Gatenby et al. 1996, p. 606; Strayer et al. 2004, p. 430). It has also been surmised that dissolved

organic matter may be a significant source of nutrition (Strayer et al. 2004, p. 431). For their first several months, juvenile mussels ingest food through their foot and are thus deposit feeders, although they may also filter interstitial pore water and soft sediments (Yeager et al. 1994, p. 221; Haag 2012, p. 26). Due to the mechanisms by which food and nutrients are taken in, freshwater mussels collect and absorb toxins (Service 2020a, pp. 54–57).

The purple lilliput has a complex life cycle that relies on fish hosts for successful reproduction, similar to other mussels (Service 2020a, pp. 23–25, 29). This complex life history involves an obligate parasitic larval life stage, called glochidia, which are wholly dependent on host fish, including the longear sunfish (*Lepomis megalotis*) and green sunfish (*L. cyanellus*) (Hill 1986, p. 5).

Additional resource needs of the purple lilliput include appropriate water quality and temperatures, and connectivity of aquatic habitat that facilitates dispersal and an abundance of multiple age classes to ensure recruitment.

Status Throughout All of Its Range

We have carefully assessed the best scientific and commercial data available regarding the past, present, and future threats to the purple lilliput, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these stressors. The primary stressors (which are pervasive across the species' range) affecting the purple lilliput's biological status include habitat degradation or loss (i.e., declines in water quality; reduced water levels; riparian and instream fragmentation; and genetic isolation from development, urbanization, contaminants, agricultural activities, impoundments, changing climate

conditions, resource extraction, and forest conversion), and impacts associated with invasive and nonnative species.

While threats have acted on the species to reduce available habitat, the purple lilliput persists in 145 of 272 (53 percent) of its historically occupied populations, and its distribution continues to be represented within the six major river basins that it is historically known to occupy. Our projections of purple lilliput viability into the foreseeable future (i.e., approximately 20 to 30 years, which takes into account available climate modeling projections that inform future conditions) suggest that between 10 and 30 populations have a high risk of extirpation, or could become functionally extirpated. However, the purple lilliput is expected to maintain resilient populations (i.e., able to withstand stochastic events arising from random factors) across the six major river basins in which it historically and currently occurs. In other words, we estimate between 116 and 136 populations would continue to be resilient (or between 79 and 93 percent of the currently known populations) into the future. Additionally, we note that the species' host fish has a broad range, and the purple lilliput has the capability to adapt to lentic habitats in certain situations, which is a life-history trait that suggests it may be less susceptible to some potential habitat changes. Thus, after assessing the best available information, we determine that the purple lilliput is not in danger of extinction now or likely to become so in the foreseeable future throughout all of its range.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. Having determined that the purple lilliput is not in

danger of extinction or likely to become so in the foreseeable future throughout all of its range, we now consider whether it may be in danger of extinction or likely to become so in the foreseeable future in a significant portion of its range—that is, whether there is any portion of the species’ range for which it is true that both (1) the portion is significant; and, (2) the species is in danger of extinction now or likely to become so in the foreseeable future in that portion. Depending on the case, it might be more efficient for us to address the “significance” question or the “status” question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species’ range.

In undertaking this analysis for the purple lilliput, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered or threatened.

We found two areas (Great Lakes and Cumberland River basins) where there may be a concentration of threats acting on the species such that the species in these portions of the range may be endangered or threatened, but we did not find that these areas constituted significant portions of the species’ range. Accordingly, we found that the purple lilliput is not in danger of extinction now and is not likely to become so within the foreseeable future in any significant portion of its range. This is consistent with the courts’ holdings in *Desert Survivors v. Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d , 946, 959 (D. Ariz. 2017).

Determination of Status

Our review of the best available scientific and commercial information indicates that the purple lilliput does not meet the definition of an endangered species or a threatened species in accordance with sections 3(6) and 3(20) of the Act. Therefore, we find that listing the purple lilliput is not warranted at this time. A detailed discussion of the basis for this finding can be found in the purple lilliput species assessment form, and other supporting documents, such as the accompanying SSA report (Service 2020a, entire) (see <http://www.regulations.gov> under docket number FWS–R4–ES–2020–0010).

II. Proposed Listing Determination for Longsolid and Round Hickorynut

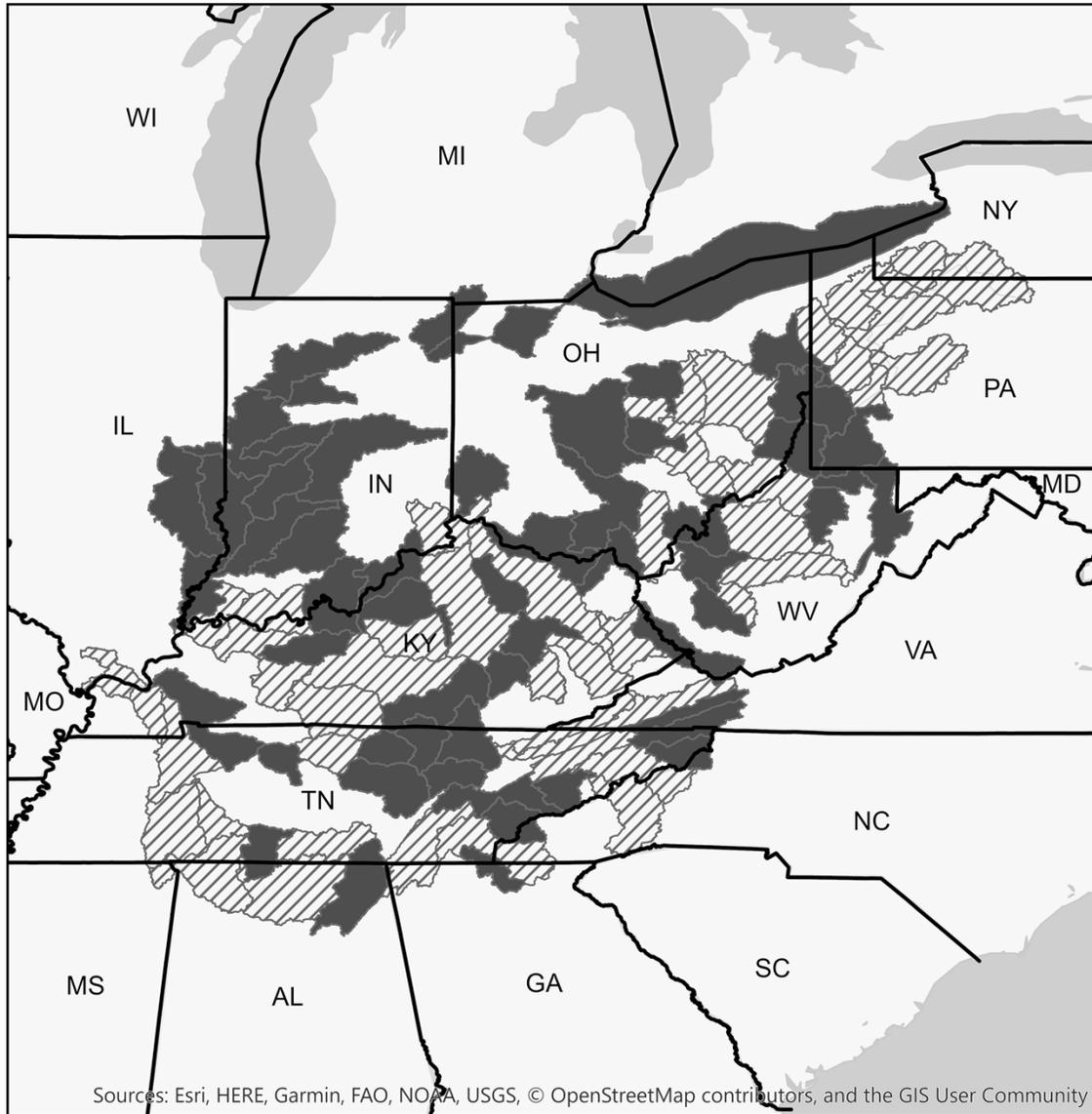
Background

The longsolid (*Fusconaia subrotunda*) is a freshwater river mussel belonging to the Unionidae family, also known as the naiads and pearly mussels. Longsolid adults are light brown in color, darkening with age. The shell is thick and medium-sized (up to 5 inches (in) (125 millimeters (mm))), and typically has a dull sheen (Williams et al. 2008, p. 322). There is variability in the inflation of the shell depending on population and latitudinal location (Ortmann 1920, p. 272; Watters et al. 2009, p. 130).

The longsolid is currently found in the Ohio, Cumberland, and Tennessee River basins, overlapping within the States of Alabama, Kentucky, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia (Service 2018, Appendix A; Figure 1, below). It is considered extirpated from Georgia, Indiana, and Illinois. Additionally, it is classified as an endangered species by the State of Ohio, and considered to have various levels of concern, imperilment, or vulnerability (see Table 1-1

in the SSA report) by the States of Alabama, Kentucky, North Carolina, Pennsylvania, Tennessee, Virginia, and West Virginia.

Rangewide Distribution of Longsolid



- State Boundaries
- ▨ Extant Management Units
- Extirpated Management Units

1 inch = 249 Kilometers

1 inch = 154 miles

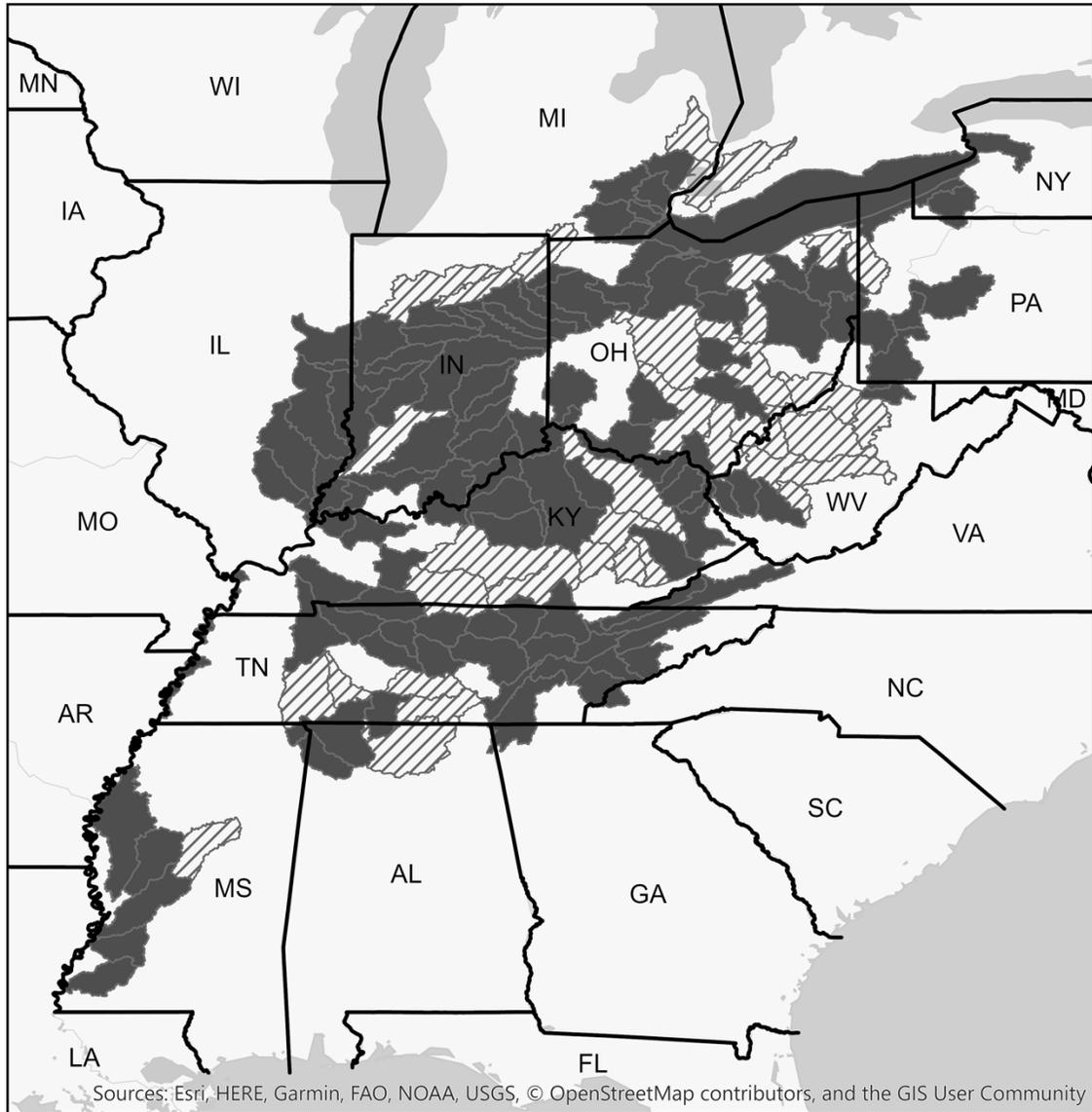


Figure 1. Longsolid range map, distributed across the Ohio, Cumberland, and Tennessee River basins. A total of 60 populations within 45 management units (i.e., 8-digit hydrologic unit code (HUC) watersheds (HUC-8)) are currently considered extant. The species exhibits reduced redundancy and representation compared to historical conditions due to a loss of 102 populations and 60 management units.

Similar to the longsolid, the round hickorynut also belongs to the Unionidae family of naiads and pearly mussels. Round hickorynut adult mussels are greenish-olive to dark or chestnut brown, sometimes blackish in older individuals, and may have a yellowish band dorsally (Parmalee and Bogan 1998, p. 168). Inflation of the shell is variable depending on population and latitudinal location (Ortmann 1920, p. 272; Williams et al. 2008, p. 474). The shell is thick, solid, and up to 3 in (75 mm) in length, but usually is less than 2.4 in. (60 mm) (Williams et al. 2008, p. 473; Watters et al. 2009, p. 209). A distinctive characteristic is that the shell is round in shape, nearly circular, and the umbo (the raised portion of the dorsal margin of a shell) is centrally located.

Within the United States, the round hickorynut is currently found in the Great Lakes, Ohio, Cumberland, Tennessee, and Lower Mississippi River basins, overlapping within the States of Alabama, Indiana, Kentucky, Michigan, Mississippi, Ohio, Pennsylvania, Tennessee, and West Virginia (Service 2019, Appendix A; Figure 2, below). It is considered extirpated from Georgia, Illinois, and New York. Additionally, it has State-level conservation status, ranging across various levels of concern, imperilment, or vulnerability (see Table 1-1 in the SSA report), in the States of Alabama, Indiana, Kentucky, Michigan, Pennsylvania, Tennessee, Virginia, and West Virginia. The round hickorynut also occurs within the Canadian Province of Ontario, where it was listed as an endangered species in 2005, due to the loss of and significant declines in populations (Committee on the Status of Species at Risk in Ontario 2013, p. 4); a single remaining population (showing no recruitment (Morris 2018, pers. comm.)) occurs in Lake St. Clair and the East Sydenham River.

Rangewide Distribution of Round Hickorynut



- State Boundaries
- ▨ Extant Management Units
- Extirpated Management Units

1 inch = 287 Kilometers

1 inch = 178 miles



Figure 2. Round hickorynut range map, distributed across the Great Lakes, Ohio, Cumberland, Tennessee, and Lower Mississippi River basins, and the Ontario Province of Canada. A total of 65 populations within 34 management units (HUC-8) are currently considered extant. The species exhibits reduced redundancy and representation compared to historical conditions due to a loss of 232 populations and 104 management units.

Thorough reviews of the taxonomy, life history, ecology and State listing status of the longsolid and round hickorynut are presented in detail in the SSA reports (Service 2018, pp. 14, 15, 22–30; Service 2019, pp. 14, 15, 22–29).

Regulatory and Analytical Framework

Regulatory Framework

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 is an “endangered species” or a “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 expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

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

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

Analytical Framework

The SSA reports document the results of our comprehensive biological review of the best scientific and commercial data regarding the status of both species, including an assessment of potential threats to the species. The SSA reports do not represent a decision by the Service on whether either species should be proposed for listing as an endangered or threatened species under the Act. They do, however, 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. The following is a summary of the key results and conclusions from the SSA reports for the longsolid and round hickorynut; the full SSA reports can be found in docket number FWS–R4–ES–2020–0010 on <http://www.regulations.gov>, and on our Internet site <https://www.fws.gov/Asheville/>.

To assess the longsolid's and round hickorynut's viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes). In general, the more resilient and redundant a species is and the more representation it has, the more likely it is to sustain populations over time, even under changing environmental conditions. Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated the individual species' life-history needs. The next stage involved an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species'

responses to positive and negative environmental and anthropogenic influences.

Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the longsolid and round hickorynut, their resources, and the threats that influence both species' current and future condition, in order to assess each 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 longsolid and round hickorynut. Full descriptions of all needs are available in chapter 4 of the SSA reports (Service 2018, pp. 25–30; Service 2019, pp. 30–36), which can be found in docket number FWS–R4–ES–2020–0010 on <http://www.regulations.gov>, and on our Internet site <https://www.fws.gov/Asheville/>. Based upon the best available scientific and commercial information, and acknowledging existing ecological uncertainties (see section 4.3 in the SSA reports), the resource and demographic needs for both the longsolid and round hickorynut are characterized as:

- Clean, flowing water with appropriate water quality and temperate conditions, such as (but not limited to) dissolved oxygen above 2 to 3 parts per million (ppm), ammonia generally below 0.5 ppm total ammonia-nitrogen, temperatures generally below 86 degrees Fahrenheit (°F) (30 degrees Celsius (°C)), and (ideally) an absence of excessive total suspended solids and other pollutants.

- Natural flow regimes that vary with respect to timing, magnitude, duration, and frequency of river discharge events.
- Predominantly silt-free, stable sand, gravel, and cobble substrates.
- Suspended food and nutrients in the water column including (but not limited to) phytoplankton, zooplankton, protozoans, detritus, and dissolved organic matter.
- Availability of sufficient host fish numbers to provide for glochidia infestation and dispersal. Host fish species for the longsolid include (but may not be limited to): minnows of the family Cyprinidae and stonerollers (genera *Campostoma* sp.), satinfish shiners (*Cyprinella* sp.), eastern shiners (*Notropis* sp.), and highscale shiners (*Luxilus* sp.), as well as potentially freshwater sculpins of the genus *Cottus*. Host fish species documented for the round hickorynut include the banded sculpin (*Cottus carolinae*), eastern sand darter (*Ammocrypta pellucida*), emerald darter (*Etheostoma baileyi*), greenside darter (*Etheostoma blennioides*), Iowa darter (*Etheostoma exile*), fantail darter (*Etheostoma flabellare*), Cumberland darter (*Etheostoma gore*), spangled darter (*Etheostoma obama*), variegate darter (*Etheostoma variatum*), blackside darter (*Percina maculata*), and frecklebelly darter (*Percina stictogaster*).
- Connectivity among populations. Although the species' capability to disperse is evident through historical occurrence of a wide range of rivers and streams, the fragmentation of populations by small and large impoundments has resulted in isolation and only patches of what once was occupied contiguous river and stream habitat. Genetic exchange occurs between and among mussel beds via sperm drift, host fish movement, and movement of mussels during high flow events. For genetic exchange to occur, connectivity must be maintained. Most freshwater mussels, including the longsolid and

round hickorynut, are found in mussel beds that vary in size and are often separated by stream reaches in which mussels are absent or rare (Vaughn 2012, p. 983). The species is often a component of a large healthy mussel assemblage within optimal mussel habitats; therefore, the beds in which they occur are necessary for the species to be resilient over time.

Current Conditions

Current (and future) conditions are described using categories that estimate the overall condition (resiliency) of the longsolid and round hickorynut mussel populations.

These categories include:

- High—Resilient populations with evidence of recruitment and multiple age classes represented. They are likely to maintain viability and connectivity among populations, and populations are not linearly distributed (i.e., occur in tributary streams within a management unit). Populations are expected to persist in 20 to 30 years and beyond, and withstand stochastic events. (*Thriving; capable of expanding range.*)

- Medium—Spatially restricted populations with limited levels of recruitment or age class structure. Resiliency is less than under high conditions, but the majority of populations (approximately 75 percent) are expected to persist beyond 20 to 30 years. (*Stable; not necessarily thriving or expanding its range.*)

- Low—Small and highly restricted populations, with no evidence of recent recruitment or age class structure, and limited detectability. These populations have low resiliency, are not likely to withstand stochastic events, and potentially will no longer persist in 20 to 30 years. Populations are linearly distributed within a management unit. (*Surviving and observable, but population likely declining.*)

Given the longsolid's and round hickorynut's ranges include lengthy rivers, such as the Ohio, Allegheny, Cumberland, and Tennessee Rivers, all of which include populations fragmented primarily by dams, we identified separate populations for each hydrologic unit code (HUC) (Seaber et al. 1987, entire; U.S. Geological Survey 2018, entire) at the fourth of 12 levels (i.e., HUC-8 watershed). The HUC-8 watersheds are analogous to medium-sized river basins across the United States. Our analysis describes conditions relevant to longsolid and round hickorynut populations and the overarching HUC-8 watersheds, identified herein as a "management unit." A management unit could harbor one or more populations. See chapter 2 in the SSA reports for further explanation of the analysis methodology (Service 2018, pp. 15–19; Service 2019, pp. 17–22).

Longsolid

The longsolid's current range extends over nine States, including New York, Pennsylvania, West Virginia, Ohio, Kentucky, Virginia, Tennessee, North Carolina, and Alabama; the species is now considered extirpated in Georgia, Illinois, and Indiana. This range encompasses three major river basins (the Ohio, Cumberland, and Tennessee basins); the species now no longer exists in the Great Lakes basin (loss of six historical populations and four management units). In addition, its representation in the Cumberland River basin is currently within a single population and management unit (loss of nine historical populations and eight management units). Overall, the longsolid is presumed extirpated from 63 percent (102 of 162 populations) of its historically occupied populations, including 6 populations (the entirety) in the Great Lakes basin, 65 populations in the Ohio River basin, 9 populations in the Cumberland River basin, and 26 populations in the Tennessee River basin (see Appendix B in the SSA report (Service

2018, pp. 131–154)). Of the current populations, 3 (5 percent) are estimated to be highly resilient, 9 (15 percent) are estimated to be moderately resilient, and 48 (80 percent) are estimated to have low resiliency.

The longsolid was once a common, occasionally abundant component of the mussel assemblage in rivers and streams where it is now extirpated. Examples include the Beaver River, Pennsylvania (Ortmann 1920, p. 276); Ohio River, Pennsylvania (Tolin 1987, p. 11); Mahoning River, Pennsylvania (Ortmann 1920 p. 276); Wabash River, Indiana/Illinois (Cummings et al. 1992, p. 46); Nolin River, Kentucky (Taylor 1983a, p. 111); and the South Fork Holston River, Virginia/Tennessee (Parmalee and Pohemus 2004, p. 234). Significant declines of the longsolid have been observed and documented in the Ohio and Cumberland Rivers, and in the Muskingum River system, which harbors the last remaining populations (Muskingum, Tuscarawas, and Walhonding) in Ohio (Neel and Allen 1964, p. 434; Watters and Dunn 1993–94, p. 252; Watters et al. 2009, p. 131; Haag and Cicerello 2016, p. 139).

Round Hickorynut

The current range of the round hickorynut extends over nine States, including Alabama, Indiana, Kentucky, Michigan, Mississippi, Ohio, Pennsylvania, Tennessee, and West Virginia; the species is now considered extirpated in Georgia, Illinois, and New York. This range encompasses five major river basins (Great Lakes, Ohio River, Cumberland River, Tennessee River, and Lower Mississippi River). Round hickorynut representation in the Cumberland River basin is restricted to two linear populations within two management units, while it exists in the Lower Mississippi River basin in a single population. Therefore, while the species currently maintains representation from

historical conditions, it is at immediate risk of losing 40 percent (2 of 5 basins) of its representation due to these small, isolated populations under a high degree of threats that have resulted from habitat loss and water quality degradation.

Overall, the round hickorynut has lost an approximate 232 of 297 known populations (78 percent), and 104 of 138 management units (75 percent). This includes 25 populations in the Great Lakes basin, 150 populations in the Ohio River basin, 23 populations in the Cumberland River basin, 29 populations in the Tennessee River basin, and 9 populations in the Lower Mississippi River basin (see Appendix B in the SSA report (Service 2019, pp. 191–212)). Of the current populations, 4 (6 percent) are estimated to be highly resilient, 16 (23 percent) are estimated to be moderately resilient, and 45 (69 percent) are estimated to have low resiliency.

The round hickorynut was once a much more common, occasionally abundant, component of the mussel assemblage in rivers and streams across much of the eastern United States. Population extirpations have been extensive and widespread within every major river basin where the round hickorynut is found. Surveys throughout eastern North America have not targeted the round hickorynut specifically, and as a result, there could have been additional population losses or declines that have gone undocumented. Conversely, it is possible that there are populations that have gone undetected. However, the majority of the species' range has been relatively well-surveyed for freshwater mussel communities, and the likelihood is small that there are substantial or stronghold populations that are undetected. Patterns of population extirpation and declines are pronounced particularly in the Ohio River basin, which appears to be the basin most

important for redundancy and representation for the species, due to its documented historical distribution and remaining concentration of populations within the basin.

Populations of the round hickorynut have been apparently lost from entire watersheds and management units in which the species once occupied multiple tributaries, such as the Allegheny, Coal, Little Scioto, Miami, and Vermilion River management units in the Ohio River basin. The State of Ohio, for example, has lost 53 populations of round hickorynut, along with 19 management units (Watters et al. 2009, p. 210). The species is also critically imperiled in Canada, and as a result, the future of the species in Canada may be reliant on hatchery-supported activities or augmentation activities coordinated with the United States.

Precipitous declines and extirpations of round hickorynut populations have been documented in the Great Lakes, Ohio, Cumberland, Tennessee, and Lower Mississippi basins. These declines and extirpations are exhibited in museum collections and reported in published literature accounts of the species (see Appendix D in the SSA report (Service 2019, pp. 214–238)). While this documentation could be a result of more intensive survey effort in the core of the species' distribution, regardless, the extirpation of formerly abundant and extensive populations is a cautionary note for current and future condition projections, and has been most pronounced in the Ohio and Cumberland basins.

Examples of rivers where the round hickorynut is extirpated within these basins include: Crooked Creek, Pennsylvania (Ortmann 1913, p. 298); West Branch Mahoning River, Ohio (Swart 1940, p. 42); Coal River, West Virginia (Carnegie Museum and University of Michigan Museum of Zoology records); Olentangy River, Ohio (Stein

1963, p. 109); Alum Creek, Ohio (Ohio State University, Marion records); Blaine Creek, Kentucky (Bay and Winford 1984, p. 19); Embarras River, Illinois (Parmalee 1967, p. 80); Big Vermilion River, Illinois (Parmalee 1967, p. 80); Cumberland River, Kentucky (Neel and Allen 1964, p. 442); Stones River, Tennessee (Ohio State University, Marion records); and Red River, Tennessee/Kentucky (Ohio State University, Marion records).

Threats Analysis

The following discussions include evaluations of three threats and associated sources that are affecting the longsolid and round hickorynut, and their habitats: (1) Habitat degradation or loss, (2) invasive and nonnative species, and (3) negative effects associated with small population size (Service 2018 and 2019, chapter 6). We note that potential impacts associated with overutilization were evaluated, but we found no evidence of current effects on the species' viability (noting historical effects from harvest on the longsolid that no longer occur). In addition, potential impacts from disease, parasites, and predation, as well as potential impacts to host species, were evaluated but were found to have minimal effects on viability of either species based on current knowledge (Service 2018, pp. 70, 73–74; Service 2019, pp. 91–95). Finally, we also considered effects associated with enigmatic population declines, which have been documented in fresh water river mussel populations since the 1960s; despite speculation and repeated aquatic organism surveys and water quality monitoring, the causes of these events are unknown (Haag 2019, p. 43). In some cases, the instream habitat often remains basically intact and continues to support other aquatic organisms such as fish and crayfish. Full descriptions of each of the threats and their sources, including specific examples across the species' range where threats are impacting the species or its habitat,

are available in chapter 6 and Appendix A of the SSA reports (Service 2018, pp. 43–76, 134–157; Service 2019, pp. 58–96, 169–187).

Habitat Degradation or Loss

Development/Urbanization

Development and urbanization activities that may contribute to longsolid and round hickorynut habitat degradation and loss, including reduced water quality, occur throughout the species' range. 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) (Ren et al. 2003, p. 649; Wilson 2015, p. 424). 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). Deleterious effects on streams (i.e., water collection on impervious surfaces that rapidly flows into storm drains and local streams), including those that may be occupied by the longsolid and round hickorynut include:

(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, resulting in destabilization of bottom sediments. Increased, high-velocity discharges can cause species living in streams (including mussels) to become 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.

(2) *Water Quality*: Pollutants (e.g., gasoline, oil drips, fertilizers) that accumulate on impervious surfaces may be washed directly into streams during storm events.

Contaminants contained in point and non-point source discharges degrade water and substrate quality, and can result in reduced survival, growth, and reproduction of mussels.

(3) *Water Temperature*: During warm weather, rain that falls on impervious surfaces becomes superheated and can stress or kill freshwater species when it enters streams.

Other development-related impacts to the longsolid and round hickorynut, or their habitat, may occur as a result of:

- **Water infrastructure.** This includes water supply, reclamation, and wastewater treatment, which results in pollution point discharges to streams. Concentrations of contaminants (including nitrogen, phosphorus, chloride, insecticides, polycyclic aromatic hydrocarbons, and personal care products) increase with urban development (Giddings et al. 2009, p. 2; Bringolf et al. 2010, p. 1,311).
- **Utility crossings and right-of-way maintenance.** Direct impacts from utility crossings include direct exposure or crushing of individuals, sedimentation, and habitat disturbance. The greatest cumulative impact involves cleared rights-of-way that result in direct runoff and increased stream temperature at the crossing location, and potentially promote maintenance utility and all-terrain vehicle access from the rights-of-way (which destroys banks and instream habitat, and thus can lead to increased erosion (see also Service 2017, pp. 48–49)).
- **Anthropogenic activities.** These types of activities may act to lower water tables,

making the longsolid or round hickorynut susceptible to depressed flow levels. Water withdrawals for irrigation, municipal, and industrial water supplies are an increasing concern due to expanding human populations. Water infrastructure development, including water supply, reclamation, and wastewater treatment, results in pollution point discharges to streams. Concentrations of contaminants (including nitrogen, phosphorus, chloride, insecticides, polycyclic aromatic hydrocarbons, and personal care products) increase with urban development (Giddings et al. 2009, p. 2; Bringolf et al. 2010, p. 1,311). It is currently unknown whether anthropogenic effects of development and urbanization are likely to impact the longsolid or round hickorynut at the individual or population level. However, secondary impacts such as the increased likelihood of potential contaminant introduction, stream disturbance caused by impervious surfaces, barrier construction, and forest conversion are likely to act cumulatively on longsolid and round hickorynut populations.

Agricultural activities are pervasive across the range of the longsolid and round hickorynut. Examples include (but are not limited to):

- Longsolid: Agricultural erosion is listed among the factors affecting the Clinch and Powell Rivers (Ahlstedt et al. 2016, p. 8).
- Longsolid: Sedimentation and other non-point source pollution, primarily of agricultural origin, are identified as a primary threat to aquatic fauna of the Nolichucky River (The Tennessee Valley Authority (TVA) 2006, p. 11).
- Longsolid: Agricultural impacts have been noted to take a toll on mussel fauna in the Goose Creek watershed on the South Fork Kentucky River (Evans 2010, p. 15).
- Longsolid and round hickorynut: The Elk River in Tennessee is a watershed with

significant agricultural activity (Woodside et al. 2004, p. 10).

- Round hickorynut: Water withdrawals for irrigation for agricultural uses have increased recently in the Tippecanoe River (Fisher 2019, pers. comm.)
- Round hickorynut: Sedimentation and other point and non-point source pollution, primarily of agricultural origin, are identified as a primary threat to aquatic fauna of Big Darby Creek and Killbuck Creek, Ohio (Ohio Department of the Environmental Protection Agency 2004, p. 1; Ohio Department of the Environmental Protection Agency 2011, p. 31).
- Round hickorynut: Approximately 25 percent of the land use area in the West Fork River management unit in West Virginia is in agriculture, and has increased by as much as 9 percent in recent years (U.S. Department of Agriculture 2010, p. 8).
- Round hickorynut: Large-scale mechanized agricultural practices threaten the last remaining population in the Lower Mississippi River basin, in the Big Black River, where the species has already undergone range reduction (Peacock and James 2002, p. 123).
- Round hickorynut: The Duck, Buffalo, and Elk Rivers in Tennessee are watersheds with significant agricultural activity in their headwaters and tributaries, and are a suspected cause for mussel community declines throughout those rivers (Reed 2014, p. 4).

Transportation

Transportation-related impacts include both road development and river navigation. By its nature, road development increases impervious surfaces as well as land clearing and habitat fragmentation. Roads are generally associated with negative effects

on the biotic integrity of aquatic ecosystems, including changes in surface water temperatures and patterns of runoff, changes in sedimentation levels, and increased heavy metals (especially lead), salts, organics, and nutrients to stream systems (Trombulak and Frissell 2000, p. 18). The adding of salts through road de-icing results in high salinity runoff, which is toxic to freshwater mussels. In addition, a major impact of road development is improperly constructed culverts at stream crossings, which can act as barriers if flow through the culvert varies significantly from the rest of the stream, or if the culvert ends up becoming perched (i.e., sitting above the downstream streambed), and fishes that serve as mussel hosts cannot pass through them.

With regard to river navigation, dredging and channelization activities (as a means of maintaining waterways) have altered riverine habitats nationwide (Ebert 1993, p. 157). Channelization affects many physical characteristics of streams through accelerated erosion, increased bed load, reduced depth, decreased habitat diversity, geomorphic instability, and riparian canopy loss (Hartfield 1993, p. 139). All of these impacts contribute to loss of habitat for the longsolid and round hickorynut, and alter habitats for host fish. Changes in both the water velocity and deposition of sediments not only alters physical habitat, but the associated increases in turbulence, suspended sediment, and turbidity affect mussel feeding and respiration (Aldridge et al. 1987, p. 25). The scope of channel maintenance activities over extensive areas alters physical habitat and degrades water quality. In addition to dredging and channel maintenance, impacts associated with barge traffic, which includes construction of fleeting areas, mooring cells, docking facilities, and propeller wash, also destroy and disrupt mussel habitat (see Miller et al. (1989, pp. 48–49) as an example for disturbance from barges).

Transportation-related impacts across the range of the longsolid and round hickorynut include (but are not limited to) the following examples:

- Channelization and dredging—Longsolid populations in the Eel, Vermilion, and Embarras Rivers and Killbuck Creek are extirpated. Round hickorynut populations in the Vermilion and Embarras Rivers are extirpated, while populations in the Eel and Killbuck Creek management units are in low condition; these streams have been extensively dredged and channelized (Butler 2007, p. 63; Appendix B). Additionally, dredging is identified by Taylor (1983b, p. 3) as the primary cause for suitable habitat loss in the Kanawha River (below river mile 79) in West Virginia.

- Barge traffic, which includes construction of fleeting areas, mooring cells, docking facilities, and propeller wash, destroys and disrupts mussel habitat, currently affecting at least 15 (25 percent) of the longsolid populations in the Ohio, Cumberland, and Tennessee River basins (Hubbs et al. 2006, p. 169; Hubbs 2012, p. 3; Smith and Meyer 2010, p. 555; Sickel and Burnett 2005, p. 7; Taylor 1983b, p. 5). All six of the Ohio River mainstem longsolid populations that are considered in low condition are affected by channel maintenance and navigation operations; at least five (8 percent) of the round hickorynut populations in the Ohio basin are affected.

- Channel maintenance and navigation are affecting the low condition populations in the lower Allegheny and Tennessee Rivers due to their clustered distribution and proximity to locks and dams. For the longsolid, these include two Allegheny River populations below Redbank, Pennsylvania (Smith and Meyer 2010, p. 556), and three low condition populations in the Tennessee River main stem above Kentucky Dam.

- Although most prevalent on the mainstem Ohio and Tennessee Rivers, commerce

and commercial navigation currently affect round hickorynut populations in the Black and Muskingum Rivers.

Contaminants

Contaminants contained in point and non-point discharges can degrade water and substrate quality and adversely impact mussel populations. Although chemical spills and other point sources of contaminants may directly result in mussel mortality, widespread decreases in density and diversity may result in part from the subtle, pervasive effects of chronic, low-level contamination (Naimo 1995, p. 354). The effects of heavy metals, ammonia, and other contaminants on freshwater mussels were reviewed by Mellinger (1972), Fuller (1974), Havlik and Marking (1987), Naimo (1995), Keller and Lydy (1997), and Newton et al. (2003).

The effects of contaminants such as metals, chlorine, and ammonia are profound on juvenile mussels (Augspurger et al. 2003, p. 2,571; Bartsch et al. 2003, p. 2,566). Juvenile mussels may readily ingest contaminants adsorbed to sediment particles while pedal feeding (Newton and Cope 2007, p. 276). These contaminants also affect mussel glochidia, which are sensitive to some toxicants (Goudreau et al. 1993, p. 221; Jacobson et al. 1997, p. 2,386; Valenti et al. 2005, p. 1,243).

Mussels are noticeably intolerant of heavy metals (Havlik and Marking 1987, p. 4). Even at low levels, certain heavy metals may inhibit glochidial attachment to fish hosts. Cadmium appears to be the heavy metal most toxic to mussels (Havlik and Marking 1987, pp. 4–9), although chromium, copper, mercury, and zinc also negatively affect biological processes (Naimo 1995, p. 355; Jacobson et al. 1997, p. 2,389; Valenti et al. 2005, p. 1,243). Chronic mercury contamination from a chemical plant on the North

Fork Holston River, Virginia, destroyed a diverse mussel fauna downstream of Saltville, Virginia, and potentially contributed to the extirpation of the longsolid from that river (Brown et al. 2005, p. 1,459). An example of long-term declines and extirpation of mussels attributed to copper and zinc contamination originating from wastewater discharges at electric power plants includes the Clinch River in Virginia (a portion of which the longsolid currently occupies) (Zipper et al. 2014, p. 9). This highlights that, despite localized improvements, these metals can stay bound in sediments, affecting recruitment and densities of the mussel fauna for decades (Price et al. 2014, p. 12; Zipper et al. 2014, p. 9).

Examples of contaminant-related impacts across the range of longsolid and/or round hickorynut include (but are not limited to):

- Contaminants have affected mussel glochidia on the Clinch River, which is a stronghold population for the longsolid (Goudreau et al. 1993, p. 221; Jacobson et al. 1997, p. 2,386; Valenti et al. 2005, p. 1,243); round hickorynut is now considered extirpated in the Tennessee section of the river.
- The toxic effects of high salinity wastewater from oil and natural gas drilling on juvenile and adult freshwater mussels were observed in the Allegheny River, Pennsylvania, and in the Ohio River basin (Patnode et al. 2015, p. 55).
- Numerous streams throughout both species' ranges have experienced mussel and fish kills from toxic chemical spills, such as Fish Creek in Indiana for the round hickorynut (Sparks et al. 1999, p. 12), and the upper Tennessee River system in Virginia for the longsolid (Ahlstedt et al. 2016, p. 8; Neves 1987, p. 9; Jones et al. 2001, p. 20; Schmerfeld 2006, p. 12). Also in the Tennessee River basin, high counts of coliform

bacteria originating from wastewater treatment plants have been documented, contributing to degradation of water quality being a primary threat to aquatic fauna (Neves and Angermeier 1990, p. 50).

- Heavy metals and their toxicity to mussels have been documented in the Great Lakes, Clinton, Muskingum, Ohio, Fox, Powell, Clinch, and Tennessee Rivers where one or both of these species occur (Havlik and Marking 1987, pp. 4-9; van Hees et al. 2010, p. 606). Coal plants are also located on the Kanawha, Green, and Cumberland Rivers, and the effects of these facilities on water quality and the freshwater mussel fauna, including the longsolid and round hickorynut, are likely similar.

The degradation of water quality as a result of land-based oil and gas drilling activities is a significant adverse effect on freshwater mussels, and specifically on longsolid in the Ohio River basin and populations in the Allegheny River, as well as the in Kanawha, Little Kanawha, and Elk Rivers.

Agricultural Activities

The advent of intensive row crop agricultural practices has been cited as a potential factor in freshwater mussel decline and species extirpation in the eastern United States (Peacock et al. 2005, p. 550). Nutrient enrichment and water withdrawals, which are threats commonly associated with agricultural activities, are most likely to affect individual longsolid and round hickorynut mussels, although in some instances may be localized and limited in scope. However, chemical control using pesticides, including herbicides, fungicides, insecticides, and their surfactants and adjuvants, are highly toxic to juvenile and adult freshwater mussels (Bringolf et al. 2007, p. 2,092). Waste from confined animal feeding and commercial livestock operations is another potential source

of contaminants that comes from agricultural runoff. The concentrations of these contaminants that emanate from fields or pastures may be at levels that can affect an entire population, especially given the highly fragmented distributions of the longsolid and round hickorynut (also see *Contaminants*, above).

Agencies such as the Natural Resources Conservation Service and Soil and Water Conservation Districts provide technical and financial assistance to farmers and private landowners. Additionally, county resource development councils and university agricultural extension services disseminate information on the importance of minimizing land use impacts, specifically agriculture, on aquatic resources. These programs help identify opportunities for conservation through projects such as exclusion fencing and alternate water supply sources, which help decrease nutrient inputs and water withdrawals, and help keep livestock off of stream banks and shorelines, thus reducing erosion. However, the overall effectiveness of these programs over a large scale is unknown given the longsolid's and round hickorynut's wide distribution and varying agricultural intensities.

Given the large extent of private land and agricultural activities within the ranges of the longsolid and round hickorynut, the effects of agricultural activities that degrade water quality and result in habitat deterioration are not frequently detected until after the event(s) occur. In summary, agricultural activities are pervasive across the ranges of the longsolid and round hickorynut. The effects of agricultural activities on the longsolid and round hickorynut are a factor in their historical decline and localized extirpations.

Agricultural activities are pervasive across the range of the longsolid and round hickorynut. Specifically, agricultural impacts have affected and continue to affect high, medium, and low condition longsolid populations within these basins, including:

- Longsolid only: French Creek and Allegheny River (Pennsylvania), Hughes River (West Virginia), Tuscarawas River (Ohio), Rolling Fork River (Kentucky), Little River and Valley River (North Carolina), Nolichucky River (Tennessee), Clinch and Powell Rivers (Tennessee and Virginia), and Estill Fork (Alabama).
- Round hickorynut only: Pine, Belle, and Black Rivers (Michigan).
- Both species: Shenango River (Pennsylvania); Elk, Little Kanawha, and North Fork Hughes Rivers (West Virginia); Licking and Kentucky Rivers (Kentucky); Elk and Buffalo Rivers (Tennessee); and Paint Rock River (Alabama).

Dams and Barriers

The effects of impoundments and barriers on aquatic habitats and freshwater mussels are relatively well-documented (Watters 2000, p. 261). Dams alter and disrupt connectivity, and alter water quality, which affect longsolid and round hickorynut species. 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). Humans have constructed dams for a variety of reasons: flood prevention, water storage, electricity generation, irrigation, recreation, and navigation (Eissa and Zaki 2011, p. 253). Dams, either natural (by beavers or by aggregations of woody debris) or manmade, have many impacts on stream ecosystems. Reductions in the diversity and abundance of mussels are primarily attributed to habitat

shifts caused by impoundments (Neves et al. 1997, p. 63). The survival of mussels and their overall reproductive success are influenced:

- *Upstream of dams*, by the change from flowing to impounded waters, increased depths, increased buildup of sediments, decreased dissolved oxygen, and the drastic alteration in resident fish populations.
- *Downstream of dams*, by fluctuations in flow regimes, minimal releases and scouring flows, seasonal depletion of dissolved oxygen, reduced or increased water temperatures, and changes in fish assemblages.

Additionally, improperly constructed culverts at stream crossings may act as barriers and have some similar negative effects as dams on stream systems. Fluctuating flows through the culvert can vary significantly from the rest of the stream, preventing fish passage and scouring downstream habitats. For example, if a culvert sits above the streambed, aquatic organisms cannot pass through it. These barriers fragment habitats along a stream course and contribute to genetic isolation of the aquatic species inhabiting the streams.

Whether constructed for purposes such as flood control, navigation, hydropower, water supply or multi-purpose uses, the construction and continued operation of dams (per existing licensing schedules) is a pervasive negative influence on the longsolid, round hickorynut, and their habitats throughout their ranges. Although there are recent efforts to remove older, failing dams within the ranges of the longsolid and round hickorynut, such as Lock and Dam 6 on the Green River, and current plans to remove others, such as Six Mile Dam on the Walhonding River, dams and their effects on longsolid and round hickorynut population distributions have had perhaps the greatest

documented negative influence on these species (Hardison and Layzer 2001, p. 79; Layzer et al. 1993, p. 68; Parmalee and Polhemus 2004, p. 239; Smith and Meyer 2010, p. 543; Hubbs 2012, p. 8; Watters and Flaute 2010, p. 2).

Over 20 of the rivers and streams currently occupied by the longsolid are directly affected by dams, thus directly influencing the species' distribution rangewide. For the round hickorynut, all occupied rivers and streams are directly or indirectly affected by dams. See section 6.1.5 of the SSA reports for specific areas where dams and other impoundments occur within the range of the species (Service 2018, pp. 59–63; Service 2019, pp. 73–77).

Changing Climate Conditions

Changing climate conditions that can influence freshwater mussels include increasing or decreasing water temperatures and precipitation patterns that result in increased flooding, prolonged droughts, or reduced stream flows, as well as changes in salinity levels (Nobles and Zhang 2011, pp. 147–148). An increase in the number of days with heavy precipitation over the next 25 to 35 years is expected across the longsolid's range (U.S. Global Climate Change Research Program 2017, p. 207). Although changing climate conditions have potentially affected the longsolid to date, the timing, frequency, and extent of these effects is currently unknown. Possible impacts to the species could include alteration of the fundamental ecological processes, such as thermal suitability; changes in seasonal patterns of precipitation and runoff, which could alter the hydrology of streams; and changes in the presence or combinations of invasive, native or nonnative species.

We examined information on anticipated climate effects to wide-ranging mussels, which included a study that used RCP 2.6 and 8.5 and was conducted on the federally endangered spectaclecase (*Cumberlandia monodonta*). Our analysis of the best available climate change information revealed that within the range of both the longsolid and round hickorynut, shifts in the species-specific physiological thresholds in response to altered precipitation patterns and resulting thermal regimes are possible. Additionally, the expansion of invasive, nonnative species because of climatic changes has the potential for long-term detriments to the mussels and their habitats. Other potential impacts are associated with changes in food web dynamics and the genetic bottleneck that can occur with low effective population sizes (Nobles and Zhang 2011, p. 148). The influences of these changes on the longsolid and round hickorynut are possible in the future (see Scenario 3, *Future Conditions*, below). Multi-scale climate models that can be interpreted at both the rangewide and population levels, and are tailored to benthic invertebrates, which incorporate genetic and life-history information, are needed before the longsolid and round hickorynut declines can be correlated with climate change. At this time, the best available information indicates that climate change is considered a secondary factor influencing the viability of the longsolid and round hickorynut and is not currently thought to be a primary factor in the longsolid's or round hickorynut's occurrence and distribution across their ranges.

Resource Extraction

The most intensive resource extraction activities affecting the longsolid, round hickorynut, and their habitats are coal mining and oil and gas exploration, which are summarized here. Additional less intensive resource extraction activities affecting the

species include gravel mining/dredging, which is detailed in the SSA reports (Service 2018, pp. 64–65; Service 2019, pp. 79–83).

Activities associated with coal mining and oil and gas drilling can contribute chemical pollutants to streams. Acid mine and saline drainage (AMD) is created from the oxidation of iron-sulfide minerals such as pyrite, forming sulfuric acid (Sams and Beer 2000, p. 3). This AMD may be associated with high concentrations of aluminum, manganese, zinc, and other constituents (Tennessee Department of Environment and Conservation (TDEC) 2014, p. 72). These metals, and the high acidity typically associated with AMD, can be acutely and chronically toxic to aquatic life (Jones 1964, p. 96).

Natural gas extraction has negatively affected water quality through accidental spills and discharges, as well as increased sedimentation due to increases in impervious surface and tree removal for drill pads and pipelines (Vidic et al. 2013, p. 6). Disposal of insufficiently treated brine wastewater is known to adversely affect freshwater mussels (Patnode et al. 2015, p. 62). Contaminant spills are also a concern.

Sediment appears to be the largest impact to mussel physical habitat in streams as a result of gas extraction activities (Clayton 2018, pers. comm.). Excessive suspended sediments can impair feeding processes, leading to acute short-term or chronic long-term stress. Both excessive sedimentation and excessive suspended sediments can lead to reduced mussel fitness (Ellis 1936, p. 29; Anderson and Kreeger 2010, p. 2). This sediment is generated by construction of the well pads, access roads, and pipelines (for both gas and water).

Examples of the variety of resource extraction activities (coal, oil, gas, and gravel mining) that occur across the range of the longsolid and round hickorynut include (but are not limited to):

- Longsolid: The Cumberland Plateau and Central Appalachian regions of Tennessee and Kentucky (upper Cumberland River system and upper Tennessee River system) continue to experience mining activity that impairs water quality in streams (TDEC 2014, p. 62).
- Longsolid: High levels of copper, manganese, and zinc, metals toxic to freshwater mussels, were found in sediment samples from both the Clinch and Powell Rivers, and mining impacts close to Big Stone Gap, Virginia, have almost eliminated the mussel fauna in the upper Powell River. The longsolid is considered extirpated from the South Fork Powell River and Cane Creek, both tributaries to the upper portion of the Powell River (Ahlstedt and Tuberville 1997, p. 75; Appendix D).
- Round hickorynut: Although populations persist in the Rockcastle River and Buck Creek in the Cumberland basin, coal and gravel mining continues to occur in these watersheds.
- Round hickorynut: The extensive mining of gravel in riparian zones reduces vegetative buffers and causes channel instability, and has been implicated in mussel declines in the Walhonding River, Ohio, which harbors a low condition population (Hoggarth 1995–96, p. 150).
- Both species: Impacts from natural gas pipelines have a high potential to occur in West Virginia and Pennsylvania. Tank trucks hauling such fluids can overturn into

mussel streams, which recently occurred in Meathouse Fork of Middle Island Creek (Clayton 2018, pers. comm.).

- Both species: Natural gas extraction in the Marcellus Shale region (the largest natural gas field in the United States that runs through northern Appalachia) has negatively affected water quality through accidental spills and discharges in populations in the Shenango, Elk, Little Kanawha, and Kanawha management units.

- Both species: Coal mining has been implicated in sediment and water chemistry impacts in the Kanawha River in West Virginia, potentially limiting the Elk River populations of both species (Morris and Taylor 1978, p. 153).

- Both species: Resource extraction and AMD have been cited as contributors to the loss of mussel species in the Cumberland basin (Haag and Cicerello 2016, p. 15), including the loss of longsolid from Rockcastle and Caney Fork Rivers, and the loss of round hickorynut in the Caney Fork, Little South Fork, Big South Fork, and Cumberland Rivers (Anderson et al. 1991, p. 6; Layzer and Anderson 1992, p. 97; Warren and Haag 2005, p. 1,383).

- Both species: In the upper Kentucky River watershed, where both species exhibit a lack of recruitment (and also the Red River for round hickorynut), historical unreclaimed mines and active coal mines are prevalent (Kentucky Department for Environmental Protection 2015, p. 66).

Forest Conversion

Silvicultural activities, when performed according to strict forest practices guidelines or best management practices (BMPs), can retain adequate conditions for aquatic ecosystems; however, when forest practices guidelines or BMPs are not followed,

these activities can also cause measurable impacts and contribute to the myriad of stressors facing aquatic systems throughout the eastern United States (Warrington et al. 2017, p. 8). Both small- and large-scale forestry activities have an impact depending on the physical, chemical, and biological characteristics of adjacent streams (Allan and Castillo 2007, p. 107).

Clearing large areas of forested wetlands and riparian systems eliminates shade once provided by tree canopies, exposing streams to more sunlight and increasing the in-stream water temperature (Wenger 1999, p. 35). The increase in stream temperature and light after deforestation alters macroinvertebrate (and other aquatic species) richness, abundance, and composition in streams to various degrees depending a species' tolerance to temperature change and increased light in the aquatic system (Kishi et al. 2004, p. 283; Couceiro et al. 2007, p. 272; Caldwell et al. 2014, p. 2,196).

Sediment runoff from cleared forested areas is a known stressor to aquatic systems (e.g., Webster et al. 1992, p. 232; Jones III et al. 1999, p. 1,455; Broadmeadow and Nisbet 2004, p. 286; Aust et al. 2011, p. 123). The physical characteristics of stream channels are affected when large quantities of sediment are added or removed (Watters 2000, p. 263). Mussels and fishes are potentially affected by changes in suspended and bed material load, changes in bed sediment composition associated with increased sediment production and runoff, changes in channel formation, stream crossings, and inadequately buffered clear-cut areas, all of which can be sources of sediment entering streams (Taylor et al. 1999, p. 13).

Forest conversion has occurred across the range of the longsolid and round hickorynut. Siltation and erosion from natural forest conversion to monoculture and

intensive forestry practices without BMPs is a well-documented stressor to aquatic systems throughout the eastern United States (Warrington et al. 2017, p. 8). Forest conversion has been documented in all basins in which these species occur.

Invasive and Nonnative Species

When a nonnative 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 nonnative 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, nonnative species, or the invasive species may carry diseases that extirpate populations of native species. Invasive, nonnative species are pervasive across the longsolid's and round hickorynut's ranges. Examples of invasive, nonnative species that affect freshwater mussels like the longsolid and round hickorynut are the Asian clam (*Corbicula fluminea*), zebra mussel (*Dreissena polymorpha*), quagga mussel (*Dreissena bugensis*), black carp (*Mylopharyngodon piceus*), didymo (also known as rock snot; *Didymosphenia geminata*), and hydrilla (also known as water-thyme; *Hydrilla verticillata*).

- The Asian clam alters benthic substrates, may filter mussel sperm or glochidia, competes with native species for limited resources, and causes ammonia spikes in surrounding water when they die off en masse (Scheller 1997, p. 2).
- Dreissenid mollusks, such as the zebra mussel and quagga mussel, adversely affect native species through direct colonization, reduction of available habitat, changes in the biotic environment, or a reduction in food sources (MacIsaac 1996, p. 292). Zebra

mussels are also known to alter the nutrient cycle in aquatic habitats, affecting other mollusks and fish species (Strayer 1999, p. 22).

- Given their size and diet preferences, black carp have the potential to restructure benthic communities by direct predation and removal of algae-grazing snails. Mussel beds consisting of smaller individuals and juvenile recruits are probably most vulnerable to being consumed by black carp (Nico et al. 2005, p. 192). Furthermore, because black carp attain a large size (well over 3.28-ft (1-m) long), and their life span is reportedly over 15 years, they are expected to persist for many years. Therefore, they have the potential to cause harm to native mollusks by way of predation on multiple age classes (Nico et al. 2005, p. 77).

- The two nonnative plant species that are most problematic for the longsolid and round hickorynut (i.e., impacting the species throughout their ranges) are hydrilla and didymo. Hydrilla is an aquatic plant that alters stream habitat, decreases flows, and contributes to sediment buildup in streams (National Invasive Species Council Management Plan 2018, p. 2). High sedimentation can cause suffocation, reduce stream flow, and make it difficult for mussels' interactions with host fish necessary for development. Didymo can alter the habitat and change the flow dynamics of a site (Jackson et al. 2016, p. 970). Invasive plants grow uncontrolled and can smother habitat, affect flow dynamics, alter water chemistry, and increase water temperatures, especially in drought conditions (Colle et al. 1987, p. 416).

Effects Associated With Small Population Size

Without the level of population connectedness that the species experienced historically (i.e., without barriers such as reservoirs), small isolated populations that may now be comprised predominantly of adult individuals could be slowly dying out. Even given the very improbable absence of other anthropogenic threats, these disjunct populations could be lost simply due to the consequences of below-threshold effective population sizes. Because only 60 primarily disjunct streams among 162 historically occupied areas continue to harbor populations of the longsolid, and 65 primarily disjunct streams of 298 historically occupied areas continue to harbor populations of the round hickorynut, this is likely partial testimony to the principle of effective population size and its role in population loss.

The longsolid and round hickorynut exhibit several traits that influence population viability, including relatively small population size and low fecundity at many locations compared to other mussels (see Appendix A in Service 2018 and 2019). Small population size puts the species at greater risk of extirpation from stochastic events (e.g., drought) or anthropomorphic changes and management activities that affect habitat. In addition, small longsolid or round hickorynut populations may have reduced genetic diversity, be less genetically fit, and be more susceptible to disease during extreme environmental conditions compared to large populations (Frankham 1996, p. 1,505).

Genetic drift occurs in all species, but the lack of drift is more likely to negatively affect populations that have a smaller effective population size (number of breeding individuals) and populations that are geographically spread out and isolated from one another. Relatively low fecundity, commonly observed in species of *Fusconaia*, is another inherent factor that could influence population viability (Geist 2010, p. 91).

Survival of juveniles in the wild is already low, and females produce fewer offspring than other mussel species (Haag and Staton 2003, p. 2,125). Factors such as low effective population size, genetic isolation, relatively low levels of fecundity and recruitment, and limited juvenile survival could all affect the ability of these species to maintain current population levels and to rebound if a reduction in population occurs (e.g., through predation, toxic releases or spills, or poor environmental conditions that inhibit successful reproduction). Additionally, based on our presumption of fish hosts of the longsolid and the known species of fish hosts for the round hickorynut, they are small-bodied fishes that have comparatively limited movement (Vaughn 2012, p. 6); therefore, natural expansion of longsolid and round hickorynut populations is limited.

Dendritic (branched) streams and rivers are highly susceptible to fragmentation and may result in multiple habitat fragments and isolated populations of variable size (Fagan 2002, p. 3,247). In contrast to landscapes where multiple routes of movement among patches are possible, pollution or other habitat degradation at specific points in dendritic landscapes can completely isolate portions of the system (Fagan 2002, p. 3,246).

Cumulative/Synergistic Effects

Populations that have a small effective population size (number of breeding individuals) and that are geographically spread out and isolated from one another are more vulnerable than more robust populations. Factors such as low effective population size, genetic isolation, relatively low levels of fecundity and recruitment, and limited juvenile survival could all affect the ability of these species to maintain current

population levels and to rebound if a reduction in population occurs (e.g., through predation, toxic releases or spills, or poor environmental conditions that inhibit successful reproduction). Additionally, fragmentation (i.e., the breaking apart of habitat segments, independent of habitat loss (Fahrig 2003; p. 299)) and isolation contribute to the extinction risk that mussel populations face from stochastic events (see Haag 2012, pp. 336–338). Impoundments result in the genetic isolation of mussel populations as well as fishes that act as hosts (Vaughn 2012, p. 6; Service 2018, pp. 59–60; Service 2019, p. 74). A culvert that is perched (i.e., sitting above the downstream streambed) or improperly maintained at stream crossings can also act as barriers (Service 2018, pp. 50–54, 59–60; Service 2019, pp. 63, 90), and have similar effects as dams on stream systems. Fluctuating flows through a culvert can differ significantly from the rest of the stream, preventing fish passage and scouring downstream habitats.

Future Conditions

In the SSA reports, we forecast the longsolid's and round hickorynut's response to plausible future scenarios of environmental conditions and conservation efforts. The future scenarios project the threats into the future and consider the impacts those threats could have on the viability of the longsolid and round hickorynut. We apply the concepts of resiliency, redundancy, and representation to the future scenarios to describe possible future conditions of the longsolid and round hickorynut. The scenarios described in the SSA reports represent only three possible future conditions for each of the species. Uncertainty is inherent in any risk assessment, so we must consider plausible conditions to make our determinations. When assessing the future, viability is not a specific state,

but rather a continuous measure of the likelihood that the species will sustain populations over time.

In the SSA reports, we considered three future scenarios. Scenario 1 assesses the species' response to factors influencing current longsolid and round hickorynut populations and management units, assuming the current level of impacts remain constant into the future. Scenario 2 assesses the species' response when factors that negatively influence most of the extant populations and management units are reduced by additional conservation, beyond the continued implementation of existing regulatory measures or voluntary conservation actions. Scenario 3 assesses the species' response to worsening conditions of the factors that most influence the species due to the implementation of known existing and projected development, resource extraction, hydroelectric projects, etc. An important assumption of the predictive analysis presented herein is that future population resiliency for each species is largely dependent on water quality, water flow, instream habitat conditions, and condition of riparian vegetation (see *Species Needs*, above).

The future conditions timeframe for our analysis is different for each species. A timeframe of 50 to 70 years into the future is evaluated for the longsolid, and 20 to 30 years into the future is evaluated for the round hickorynut. We selected these timeframes based on the availability of trends and threat information, planning documents, and climate modeling that could be reasonably projected into the future, and also the consideration of at least two generations for each species (i.e., 25 to 35 years for the long-lived longsolid, and on average 12–13 years (Shepard 2006, p. 7; Ehlo and Layzer 2014, p. 11) for the round hickorynut).

Longsolid

Our assessment predicts that if conditions remain the same or worsen into the future, all 60 populations would experience negative changes to the species' important habitat requisites (see *Species Needs*, above), including the loss of the single remaining population in the Cumberland River basin, and potentially resulting in no highly resilient populations (Scenario 3). Alternatively, the scenario that suggests additive conservation measures beyond those currently implemented (Scenario 2) could result in the continued persistence of all 60 populations in the future. However, we note that approximately 30 of 60 (50 percent) of these are currently low condition populations, based on either surveys that pre-date 2000 or on the collection of only five or fewer older, non-reproducing individuals. Some of these populations may already be extirpated. The risks facing the longsolid populations varied among scenarios and are summarized below (see Table 8-1 and Table ES-1 in the SSA report).

Under Scenario 1, lowered resiliency, representation, and redundancy are expected. Under this scenario, we predict that 1 population of the current 3 high condition populations would remain in high condition, 8 populations (13 percent) in medium condition, and 33 populations (55 percent) in low condition. Redundancy would be reduced with likely extirpation of 18 out of 60 (30 percent) currently extant populations; only the Ohio River basin (one of the three basins currently occupied by the species) would retain one highly resilient population (i.e., the Green River population in the Upper Green management unit). Representation would be reduced, with two of the three currently occupied river basins continuing to harbor longsolid populations.

Under Scenario 2, we predict higher levels of resiliency in some areas of the longsolid's range than was estimated for Scenario 1; representation and redundancy would remain the same level as current conditions, with the species continuing to occur within all currently occupied management units and States across its range. Nine populations (15 percent) are predicted to be in high condition, compared to the current four populations in high condition. Scenario 2 also predicts 24 populations (40 percent) in medium condition and 27 populations (45 percent) in low condition; no populations would become extirpated. All three currently occupied major river basins would remain occupied, and the existing levels of redundancy and representation would improve. It is possible that this scenario is the least likely to occur in the future as compared to Scenario 1 or 3 only because it will take many years (potentially beyond the 50- to 70-year timeframe analyzed in the SSA report) for all of the beneficial effects of management actions that are necessary to be implemented and realized on the landscape.

Under Scenario 3, we predict a significant decrease in resiliency, representation, and redundancy across the species' range. Redundancy would be reduced from three major river basins to two basins with no high condition populations remaining, and the likely extirpation of 44 (73 percent) of the currently extant populations. The resiliency of the remaining 16 populations is expected to be reduced to 3 populations (5 percent) in medium condition and 13 (22 percent) in low condition. In addition to the loss of 44 populations, 32 (29 percent) of the management units are predicted to become extirpated. Representation would be reduced to 13 management units, 2 major river basins, and 3 States (as compared to the current 9 States) occupied by the species.

Round Hickorynut

Our assessment predicts that if conditions remain the same (Scenario 1), 40 of 65 populations (62 percent) would experience negative changes to the important habitat requisites, including the potential loss of 23 populations. This includes the predicted extirpation of the two populations in the Cumberland River basin and the population in the Lower Mississippi River basin. Additionally, under Scenario 3, no highly resilient populations are able to persist, and 90 percent of remaining populations are in low condition. Alternatively, the scenario that suggests additive conservation measures beyond those currently implemented (Scenario 2) could result in the continued persistence of all 65 populations in the future. However, approximately 40 of 65 (62 percent) of these populations are currently in low condition. Many of the known populations of the round hickorynut have been collected as 10 or fewer individuals, with limited extent information available, due to the lack of survey effort targeting the species (Service 2019, Appendix A). The risks facing round hickorynut populations varied among scenarios and are summarized below (see also Table 8-1 and Table ES-1 in the SSA report).

Under Scenario 1, lowered resiliency, representation, and redundancy are expected. We predict that only one of the current four high condition populations would remain in high condition. Under this scenario, only the Great Lakes basin (one of the five basins currently occupied by the species) would retain a highly resilient population (i.e., the Grand River). Of the 65 extant populations, 13 (20 percent) would be in medium condition and 28 (43 percent) would be in low condition. We estimate extirpation of 23 out of 65 (35 percent) populations. Redundancy would decline due to these population and management unit losses, resulting in a loss of the species from Pennsylvania and

Mississippi. Representation would be reduced through extirpation of populations and management units in the Cumberland and Great Lakes basins, a 40 percent loss of redundancy compared to current conditions. Under this scenario, only three of the five currently occupied river basins (Great Lakes, Ohio, and Tennessee) continue to harbor round hickorynut populations.

Under Scenario 2, we predict higher levels of resiliency in some areas of the round hickorynut's range than is estimated for Scenario 1; representation and redundancy would remain the same level as current conditions with the species continuing to occur within all currently occupied management units and States across the species' 9-State range. Up to 15 populations (23 percent) are predicted to be high condition compared to the current 4 populations in high condition. Scenario 2 also predicts 37 populations (57 percent) in medium condition and 13 populations (20 percent) in low condition. All currently occupied major river basins would remain occupied, and the existing levels of redundancy and representation would improve. There are sufficient population sizes within each basin to facilitate augmentation and restoration efforts, whether it be within-basin translocations or captive propagation techniques. It is possible that this scenario is the least likely to occur in the future as compared to Scenario 1 or 3. This is because it will take many years (potentially beyond the 20- to 30-year time frame analyzed in the SSA report) for all of the beneficial effects of management actions that are necessary to be implemented on the landscape.

Under Scenario 3, we predict a significant decrease in resiliency, representation, and redundancy across the species' range. Redundancy would be reduced from five major river basins to three basins, with extirpations expected to occur in the Cumberland and

Lower Mississippi River basins. No high condition populations would remain, and 46 (71 percent) of the 65 extant populations are likely to become extirpated. The resiliency of the remaining 19 populations is expected to be reduced to 2 populations (10 percent) in medium condition and 17 (90 percent) in low condition. In addition to the potential loss of 46 populations, 20 (59 percent) of the extant 34 management units are predicted to no longer harbor the species. Representation could be reduced to 14 management units across 3 major river basins. Extirpations are expected from the States of Pennsylvania, Michigan, and Mississippi, leaving 6 States (as compared to the current 9, and historically 12) occupied by the species.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. Our assessment of the current and future conditions encompasses and incorporates the threats individually and cumulatively. Our current and future condition assessment is iterative because it accumulates and evaluates the effects of all the 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.

Determination of Longsolid and Round Hickorynut Status

Introduction

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 “endangered species” or “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 a species meets the definition of “endangered species” or “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.

In conducting our status assessment of the longsolid and round hickorynut, we evaluated all identified threats under the Act’s section 4(a)(1) factors and assessed how the cumulative impact of all threats acts on the viability of the species as a whole. That is, all the anticipated effects from both habitat-based and direct mortality-based threats are examined in total and then evaluated in the context of what those combined negative effects will mean to the future condition of the longsolid and round hickorynut. However, for the vast majority of potential threats, the effect on the longsolid and round hickorynut (e.g., total losses of individual mussels or their habitat) cannot be quantified with available information. Instead, we use the best available information to gauge the

magnitude of each individual threat on the longsolid and round hickorynut, and then assess how those effects combined (and as may be ameliorated by any existing regulatory mechanisms or conservation efforts) will impact the longsolid's or round hickorynut's future viability.

Longsolid—Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we determined that the species' distribution and abundance has been reduced across its range as demonstrated by both the number of occupied management units and the number of populations where it historically occurred. Historically, the species occurred within 162 populations and 105 management units across 12 States; currently, the species occurs in 60 populations and 45 management units across 9 States, which represents a 63 percent reduction of its historically occupied populations (although we note that the remaining populations are well-distributed as opposed to concentrated within its range). The conditions of the remaining 60 extant populations vary between being highly resilient, moderately resilient, or having low resiliency (see *Current Conditions* above, and section 5.2 in the SSA report (Service 2018, pp. 34–37)).

Currently, 3 populations (5 percent) are highly resilient, 9 (15 percent) are moderately resilient, and 48 (80 percent) have low resiliency. Although downward trends are evident compared to historical information, the 12 highly- to moderately-resilient populations continue to persist within three of the four major river basins the species is historically known to occupy. Current and ongoing threats from habitat degradation or loss (Factor A), residual impacts from past harvest and overutilization (Factor B), and

invasive, nonnative species (Factor E) contribute to the species' negative effects associated with small population size (Factor E). The persistence of these 12 populations (in addition to some survey information) implies that recent recruitment is occurring in some populations to help maintain a level of resiliency, redundancy, and representation. Thus, after assessing the best available information, we conclude that the longsolid is not currently in danger of extinction throughout all of its range. We, therefore, proceed with determining whether the longsolid is likely to become endangered within the foreseeable future throughout all of its range.

At this point in time, and as noted above, the threats currently acting on the species include habitat degradation or loss from a variety of sources and invasive, nonnative species, all of which contribute to the negative effects associated with the species' small population size. Our analysis revealed that these threats are likely to continue into the foreseeable future, or approximately 30 to 50 years. This timeframe accounts for reasonable predictions of threats continuing into the future based on our examination of empirical data available over the last 30 years (e.g., survey data, how threats are manifesting themselves on the landscape and the species, implementation of management plans and voluntary conservation actions), and also takes into consideration the biology of the species (multiple generations of a long-lived species) and the licensing schedules of dams within the species' range.

The best available information suggests that the threats currently acting upon the longsolid are expected to continue into the foreseeable future, some of which (e.g., water quality and habitat degradation, and invasive, nonnative species) are reasonably expected to worsen over time, including concurrent with increasing human population trends and

thus further reducing the species' resiliency, redundancy, and representation across its range. Our analysis reveals the potential for either none or a single population (i.e., the Green River in Kentucky) to persist as highly resilient (i.e., continued reproduction with varied age classes present) in the foreseeable future, assuming threats remain or worsen on the landscape. Additionally, the majority of the remaining populations would exhibit low resiliency, while many (between 30 and 73 percent of the current low condition populations) would potentially become extinct or functionally extinct (e.g., significant habitat degradation, no reproduction due to highly isolated, non-recruiting individuals). Our future analysis also reveals a high risk that the species would become extirpated in one of the four historically occupied river basins (i.e., Cumberland River basin); it has already been lost from the Great Lakes basin. Overall, the current threats acting on the species and its habitat are expected to continue, and there are no indications that these threats would lessen or that declining population trends would be reversed. Thus, after assessing the best available information, we conclude that the longsolid is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Longsolid—Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. The court in *Center for Biological Diversity v. Everson*, 2020 WL 437289 (D.D.C. Jan. 28, 2020) (*Everson*), vacated the aspect of the 2014 Significant Portion of its Range Policy that provided that the Services do not undertake an analysis of significant portions of a species' range if the species warrants listing as threatened throughout all of its range. Therefore, we proceed to evaluating

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

Following the court’s holding in *Everson*, we now consider whether there are any significant portions of the species’ range where the species is in danger of extinction now (i.e., endangered). In undertaking this analysis for the longsolid, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered. We examined the following threats: habitat degradation or loss; invasive, nonnative species; effects associated with small population size; and the potential for cumulative effects. We also considered whether these threats may be exacerbated by small population size (or low condition). Overall, we found that threats are likely acting on individuals or populations, or even basins, similarly across the species’ range. These threats are certain to occur, and in those basins with few populations that are predominantly in low condition, these populations are facing the same threats.

One basin—the Cumberland River—has been reduced by 91 percent with one remaining low condition population. Although there are low condition populations in all

three basins in which the species occurs, since this basin has seen its populations significantly reduced to a single population currently in low condition, this circumstance—in combination with the other threats acting on the species throughout its range—may indicate there is a concentration of threats in this basin such that the species may be in danger of extinction in this portion of the range.

Small, isolated populations often exhibit reduced levels of genetic variability, which diminishes the species' capacity to adapt and respond to environmental changes, thereby decreasing the probability of long-term persistence. Small populations may experience reduced reproductive vigor, for example, due to inbreeding depression. Isolated individuals may have difficulty reproducing. The problems associated with small population size and vulnerability to random demographic fluctuations or natural catastrophes are further magnified by synergistic interactions with other threats, such as those discussed above. Based on our review of information and the synergistic effects of threats exacerbated by a single low-condition population in the Cumberland River basin, we find that this basin is a portion of the range where the species may be in danger of extinction.

Because we have determined the Cumberland River basin is a portion of the range that may be in danger of extinction, we next evaluate whether this portion may be significant. As an initial note, the Service's most recent definition of "significant" within agency policy guidance has been invalidated by court order (see *Desert Survivors v. Dep't of the Interior*, No. 16-cv-01165 (N.D. Cal. Aug. 24, 2018)). Therefore, for purposes of this analysis, the Service is evaluating potentially significant portions of the

range by applying any reasonable definition of “significant” in terms of its biological importance.

We first examined the question of whether this portion could be a significant portion of the longsolid’s range by examining its contribution to the resiliency, redundancy, and representation of the species. We determined that this basin contains 1 of 60 populations (1.7 percent) identified in the SSA report. Therefore, this single population does not contribute significantly, either currently or in the foreseeable future, to the species’ total resiliency at a biologically meaningful scale compared to other representative areas. The overall representation described herein would likely be the same under two of the three scenarios. We conclude that the Cumberland River basin population does not contribute meaningfully to the species’ viability overall. We evaluated the best available information for the Cumberland River basin in this context, assessing its significance in terms of these conservation concepts, and determined that this single population is not biologically significant to the species.

Longsolid populations are widely distributed over nine States and three major river basins, and we considered geographic range as a surrogate for geographic variation and proxy for potential local adaptation and adaptive capacity. A river basin is any area of land where precipitation collects and drains off into a common outlet, such as into a river, bay, or other body of water. The river basin includes all the surface water from precipitation runoff and nearby streams that run downslope towards the shared outlet, as well as the groundwater underneath the earth’s surface. River basins connect into other drainage basins at lower elevations in a hierarchical pattern, with smaller sub-drainage basins. There are no data indicating genetic or morphological differentiation between the

three major river basins for the species. Further, the longsolid occurs in similar aquatic habitats and does not use unique observable environmental or behavioral characteristics attributable to any of the basins. Therefore, it exhibits similar basin-scale use of habitat.

At a population level, the Cumberland River basin population occurs in stream habitat comprised of similar substrate types to the other basins where the longsolid performs the important life-history functions of breeding, feeding, and sheltering, and occurs in areas with water quality sufficient to sustain these essential life-history traits. The single population in the Cumberland River basin does not act as a refugia for the species or as an important spawning ground. In addition, the water quality is similar throughout the species' range with impaired water quality occurring in all three basins. Since the longsolid occurs in similar aquatic habitats, the Cumberland River basin population exhibits similar habitat use as populations in the remainder of the range. Therefore, there is no unique, observable environmental usage or behavioral characteristics attributable to just the Cumberland River basin population.

Overall, we found no substantial information that would indicate the Cumberland River basin is a portion of the range that may be significant in terms of its overall contribution to the species' resiliency, redundancy, and representation, or that it may be significant in terms of high-quality habitat or habitat that is otherwise important for the species' life history. As a result, we determined there is no portion of the longsolid's range that constitutes a significant portion of the range. Accordingly, we determine that the species is likely to become in danger of extinction within the foreseeable future throughout all of its range. This is consistent with the courts' holdings in *Desert Survivors v. Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D.

Cal. Aug. 24, 2018), and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d , 946, 959 (D. Ariz. 2017).

Longsolid—Determination of Status

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

Round Hickorynut—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 that the round hickorynut's abundance has been reduced across its range as demonstrated by both number of occupied management units and the number of populations where the species has historically occurred. Historically, the species occurred within 297 populations and 138 management units across 12 States (plus at least 10 populations and 8 management units within the Canadian Province of Ontario); currently, the species occurs in 65 populations and 34 management units across 9 States, which represents a 78 percent reduction of its historically occupied populations (although we note that the remaining populations are widely distributed as opposed to concentrated within its range). The species also continues to occur in Canada, although it is estimated to have declined by greater than 92 percent, as reported in 2013 (Committee on the Status of Species at Risk in Ontario 2013, p. 4). The condition of the remaining 65 currently extant populations in the United States are categorized as either high, moderate, or low (see the applicable condition description

above under *Longsolid—Status Throughout All of Its Range*, and section 5.2 in the round hickorynut’s SSA report (Service 2019, pp. 43–47)).

Currently, 4 round hickorynut populations (6 percent) are highly resilient, 16 (25 percent) are moderately resilient, and 45 (69 percent) have low resiliency. Although downward trends are evident compared to historical information, the 20 highly to moderately resilient populations in the United States continue to persist within 4 of the 5 major river basins where the species is historically known to occur. Current and ongoing threats from habitat degradation or loss (Factor A), and invasive, nonnative species (Factor E), contribute to the negative effects associated with the species’ small population size (Factor E). The persistence of these 20 populations (in addition to some survey information) implies that recent recruitment is occurring in some populations, and they maintain a level of resiliency, redundancy, and representation. Thus, after assessing the best available information, we conclude that the round hickorynut is not currently in danger of extinction throughout all of its range. We, therefore, proceed with determining whether the round hickorynut is likely to become endangered within the foreseeable future throughout all of its range.

As noted above, the threats acting on the species include habitat degradation or loss from a variety of sources and invasive, nonnative species, both of which contribute to the negative effects associated with the species’ small population size. Our analysis revealed that these threats are likely to continue into the foreseeable future, or approximately 20 to 40 years. This timeframe accounts for reasonable predictions of threats continuing into the future based on our examination of empirical data in our files (e.g., survey data, how threats are manifesting themselves on the landscape and the

species, implementation of management plans and voluntary conservation actions), and also takes into consideration the biology of the species and the licensing schedules of dams within the species' range.

The best available information suggests that the threats currently acting upon the round hickorynut are expected to continue into the foreseeable future. The effects of water quality and habitat degradation, and invasive, nonnative species are reasonably expected to worsen over time, including concurrent with increasing human population trends and thus further reducing the species' resiliency, redundancy, and representation across its range. Our analysis reveals the potential for either none or a single population (i.e., the Grand River in Ohio) to persist as highly resilient (i.e., continued reproduction with varied age classes present) in the foreseeable future, assuming threats remain or worsen on the landscape. Additionally, the majority of the remaining populations would exhibit low resiliency, while many (between 35 and 62 percent of the current low conditions populations) would potentially become extinct or functionally extinct (e.g., significant habitat degradation, no reproduction due to highly isolated, non-recruiting individuals). Our future analysis also reveals a high risk that the species would become extirpated in two of the five historically occupied river basins (i.e., Cumberland River basin and Lower Mississippi River basin). Overall, the current threats acting on the species and its habitat are expected to continue, and there are no indications that these threats would be lessened or that declining population trends would be reverted. Thus, after assessing the best available information, we conclude that the round hickorynut is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Round Hickorynut—Status Throughout a Significant Portion of Its Range

See above, under *Longsolid—Status Throughout a Significant Portion of Its Range*, for a description of our evaluation methods and our policy application.

In undertaking the analysis for the round hickorynut, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered. We examined the following threats: habitat degradation or loss; invasive, nonnative species; negative effects associated with small population size; and the potential for cumulative effects. We also considered whether these threats may be exacerbated by small population size (or low condition). Overall, we found that threats are likely acting on individuals or populations, or even basins, similarly across the species' range. These threats are certain to occur, and in those basins with few populations that are predominantly in low condition, these populations are facing the same threats.

Three of five basins where round hickorynut has historically occurred (Great Lakes, Cumberland River, and Lower Mississippi River basins) have been reduced to predominantly low condition populations. Specifically, the Great Lakes basin has been reduced from 25 populations to 5 low condition populations, 1 medium condition population, and 1 high condition population; the Cumberland River basin has been reduced from 23 populations to 2 low condition populations; and the Lower Mississippi River basin has been reduced from 9 populations to a single remaining low condition population. Although there are low condition populations in every basin in which the species occurs, since these three basins have seen their populations significantly reduced

and a predominance of the Great Lakes basin populations and the remaining populations for the other two basins are currently in low condition, these circumstances—in combination with the other threats acting on the species throughout its range—may indicate there is a concentration of threats in these areas such that the species may be in danger of extinction in these portions of the range.

As similarly described above for the longsolid, small, isolated populations often exhibit reduced levels of genetic variability, which diminishes the species' capacity to adapt and respond to environmental changes, thereby decreasing the probability of long-term persistence. Small populations may experience reduced reproductive vigor, for example, due to inbreeding depression. Isolated individuals may have difficulty reproducing. The problems associated with small population size and vulnerability to random demographic fluctuations or natural catastrophes are further magnified by synergistic interactions with other threats, such as those discussed above. Based on our review of information and the synergistic effects of threats exacerbated by a predominance of populations in low condition within the Great Lakes, Cumberland, and Lower Mississippi River basins (where populations have been significantly extirpated), we find that these three basins are portions of the range where the species may be in danger of extinction.

Because we have determined the Great Lakes, Cumberland, and Lower Mississippi River basins are portions of the range where the species may be in danger of extinction, we next evaluate whether those portions may be significant (see additional discussion above for the longsolid). Therefore, for purposes of this analysis, the Service

is evaluating potentially significant portions of the range by applying any reasonable definition of “significant” in terms of its biological importance.

We first examined the question of whether these portions could be a significant portion of the round hickorynut’s range by examining their contribution to the resiliency, redundancy, and representation of the species. Although these basins contain 10 of 65 populations (15 percent) identified in the SSA report, the Great Lakes basin consists of 1 population currently with moderate resiliency and 1 with high resiliency, and the remaining 5 populations demonstrate low resiliency; the remaining 3 populations in the Cumberland River basin and the Lower Mississippi River basin are all low condition populations. These low condition populations do not contribute significantly, either currently or in the foreseeable future, to the species’ total resiliency at a biologically meaningful scale compared to other representative areas. Although the low condition populations in these basins are relatively small, the current and future redundancy suggests that threats would be unlikely to extirpate round hickorynut in the Great Lakes basin, but there is potential to lose the remaining three low condition populations under the current level of threats scenario (Scenario 1). Overall representation would be modified through loss of two currently occupied basins. We evaluated the best available information for the Great Lakes, Cumberland River, and Lower Mississippi River basins in this context, assessing its significance in terms of these conservation concepts, and determined that there is not substantial information to indicate that any of these areas may be significant.

Round hickorynut populations are widely distributed over nine States and five major river basins, and we considered geographic range as a surrogate for geographic

variation and proxy for potential local adaptation and adaptive capacity. A river basin is any area of land where precipitation collects and drains off into a common outlet, such as into a river, bay, or other body of water. The river basin includes all the surface water from precipitation runoff and nearby streams that run downslope towards the shared outlet, as well as the groundwater underneath the earth's surface. River basins connect into other drainage basins at lower elevations in a hierarchical pattern, with smaller sub-drainage basins. There are no data indicating genetic or morphological differentiation between the five major river basins for the species. Further, the round hickorynut occurs in similar aquatic habitats and does not use unique observable environmental or behavioral characteristics attributable to just the Great Lakes, Cumberland River, or Lower Mississippi River basin populations. Therefore, the species exhibits similar basin-scale use of habitat.

At a population level, the Great Lakes, Cumberland River, and Lower Mississippi River basin populations occur in stream habitat comprised of substrate types similar to the other basins where the round hickorynut performs the important life-history functions of breeding, feeding, and sheltering, and occurs in areas with water quality sufficient to sustain these essential life-history traits. Populations in these three basins do not act as refugia for the species or as an important spawning ground. In addition, the water quality is similar throughout the species' range with impaired water quality occurring in all basins. Since the round hickorynut occurs in similar aquatic habitats, the Great Lakes, Cumberland River, and Lower Mississippi River basin populations exhibit similar habitat use as the remainder of the species' range. Therefore, there is no unique observable environmental usage or behavioral characteristics attributable to just these basins.

Overall, we found no substantial information that would indicate the Great Lakes, Cumberland, or Lower Mississippi River basins constitute portions of the range that may be significant in terms of their contribution to the species' resiliency, redundancy, and representation, or that they may be significant in terms of high-quality habitat or habitat that is otherwise important for the species' life history. As a result, we determined there is no portion of the round hickorynut's range that constitutes a significant portion of the range. Accordingly, we determine that the round hickorynut is likely to become in danger of extinction within the foreseeable future throughout all of its range. This is consistent with the courts' holdings in *Desert Survivors v. Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d , 946, 959 (D. Ariz. 2017).

Round Hickorynut—Determination of Status

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

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection

required by Federal agencies 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 recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning consists of preparing draft and final recovery plans, beginning with the development of a recovery outline and making it available to the public within 30 days of a final listing determination. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also 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. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and

stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (<http://www.fws.gov/endangered>).

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 these species are 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 New York, Pennsylvania, Ohio, Indiana, Michigan, Kentucky, West Virginia, Virginia, North Carolina, Tennessee, Alabama, and Mississippi would be eligible for Federal funds to implement management actions that promote the protection or recovery of the longsolid or round hickorynut or both species. Information on our grant programs that are available to aid species recovery can be found at: <http://www.fws.gov/grants>.

Although the longsolid and round hickorynut are only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for these species. Additionally, we invite you to submit any new information on

these species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Federal agency actions within the species' range that may require conference or consultation or both as described in the preceding paragraph include actions that fund, authorize, or carry out management and any other landscape-altering activities administered by the following agencies:

(1) U.S. Army Corps of Engineers (channel dredging and maintenance; dam projects including flood control, navigation, hydropower, bridge projects, stream restoration, and Clean Water Act permitting).

(2) U.S. Department of Agriculture, including the Natural Resources Conservation Service and Farm Service Agency (technical and financial assistance for

projects) and the Forest Service (aquatic habitat restoration, fire management plans, fire suppression, fuel reduction treatments, forest plans, mining permits).

(3) U.S. Department of Energy (renewable and alternative energy projects).

(4) Federal Energy Regulatory Commission (interstate pipeline construction and maintenance, dam relicensing, and hydrokinetics).

(5) U.S. Department of Transportation (highway and bridge construction and maintenance).

(6) U.S. Fish and Wildlife Service (issuance of section 10 permits for enhancement of survival, habitat conservation plans, and safe harbor agreements; National Wildlife Refuge planning and refuge activities; Partners for Fish and Wildlife program projects benefiting these species or other listed species; Wildlife and Sportfish Restoration program sportfish stocking).

(7) Environmental Protection Agency (water quality criteria, permitting).

(8) Tennessee Valley Authority (flood control, navigation, hydropower, and land management for the Tennessee River system).

(9) Office of Surface Mining Reclamation and Enforcement (land resource management plans, mining permits, oil and natural gas permits, abandoned mine land projects, and renewable energy development).

(10) National Park Service (aquatic habitat restoration, fire management plans, fire suppression, fuel reduction treatments, land management plans, mining permits).

It is our policy, as published in the *Federal Register* on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent

of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. The discussion below regarding protective regulations under section 4(d) of the Act complies with our policy.

III. Proposed Rule Issued Under Section 4(d) of the Act for the Longsolid and Round Hickorynut

Background

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

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have upheld rules developed under section 4(d) as a valid exercise of agency authority where they prohibited take of threatened wildlife, or include a limited taking prohibition (see *Alsea Valley Alliance v. Lautenbacher*, 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); *Washington Environmental Council v. National Marine Fisheries Service*, 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (see *State of Louisiana v. Verity*, 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history when the Act was initially enacted, "once an animal is on the threatened list, the Secretary has an almost infinite number of options available to him with regard to the permitted activities for those species. He may, for example, permit taking, but not importation of such species, or he may choose to forbid both taking and importation but allow the transportation of such species" (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

Exercising this authority under section 4(d), we have developed a proposed rule that is designed to address the longsolid's and round hickorynut's specific threats and conservation needs. Although the statute does not require us to make a "necessary and advisable" finding with respect to the adoption of specific prohibitions under section 9, we find that this rule as a whole satisfies the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for the conservation of the longsolid and round hickorynut. As discussed above under **Summary of Biological Status and Threats**, we have concluded that the longsolid and round hickorynut are likely to become in danger of extinction within the foreseeable future primarily due to

declines in water quality, loss of stream flow, fragmentation, alteration and deterioration of instream habitats, and nonnative species. These threats, which are expected to be exacerbated by continued urbanization and the effects of climate change, were central to our assessment of the future viability of the longsolid and round hickorynut. The provisions of this proposed 4(d) rule would promote conservation of the longsolid and round hickorynut by encouraging management of the landscape in ways that meet the conservation needs of the longsolid and round hickorynut, and are consistent with land management considerations. This proposed 4(d) rule would apply only if and when we make final the listing of the longsolid and round hickorynut as threatened species.

Provisions of the Proposed 4(d) Rule

This proposed 4(d) rule would provide for the conservation of the longsolid and round hickorynut by prohibiting the following activities, except as otherwise authorized or permitted: importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; or selling or offering for sale in interstate or foreign commerce.

As discussed above under **Summary of Biological Status and Threats**, multiple factors are affecting the status of the longsolid and round hickorynut. A range of activities have the potential to affect these species, including declines in water quality, loss of stream flow, riparian and instream fragmentation, alteration and deterioration of instream habitats, and nonnative species. These threats, which are expected to be exacerbated by continued urbanization and the effects of climate change, were central to our assessment of the future viability of the longsolid and round hickorynut. Therefore,

we prohibit actions resulting in the incidental take of longsolid and round hickorynut by altering or degrading the habitat. Regulating incidental take resulting from these activities would help preserve the species' remaining populations, slow their rate of decline, and decrease synergistic, negative effects from other stressors.

Under the Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have been further defined in regulation at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. Regulating incidental and/or intentional take would help preserve the species' remaining populations, slow their rate of decline, and decrease synergistic, negative effects from other stressors. Therefore, we propose to prohibit intentional take of the longsolid and round hickorynut. Nothing in this proposed 4(d) rule would change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or the ability of the Service to enter into partnerships for the management and protection of the longsolid or round hickorynut. However, interagency cooperation may be further streamlined through planned programmatic consultations for the species' between Federal agencies and the Service, where appropriate. We ask the public, particularly State agencies and other interested stakeholders that may be affected by the proposed 4(d) rule, to provide comments and suggestions regarding additional guidance and methods that the Service could provide or use, respectively, to streamline the implementation of this proposed 4(d) rule (see **Information Requested**, above).

The proposed 4(d) rule would also provide for the conservation of the species by allowing exceptions to actions and activities that, while they may have some minimal

level of disturbance to the longsolid and round hickorynut, are not expected to negatively impact the species' conservation and recovery efforts. The proposed exceptions to these prohibitions include (1) conservation efforts by the Service or State wildlife agencies, (2) channel restoration projects, and (3) bank restoration projects.

The first exception is for conservation and restoration efforts for listed species by the Service or State wildlife agencies, and including, but not limited to, collection of broodstock, tissue collection for genetic analysis, captive propagation, and subsequent stocking into unoccupied areas within the historical range of the species. The Service recognizes our special and unique relationship with our State natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, and candidate species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique position to assist the Services in implementing all aspects of the Act. In this regard, section 6 of the Act provides that the Services shall cooperate to the maximum extent practicable with the States in carrying out programs authorized by the Act. Therefore, any qualified employee or agent of a State conservation agency that is a party to a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, would be able to conduct activities designed to conserve the longsolid and round hickorynut that may result in otherwise prohibited take for wildlife without additional authorization.

The second and third exceptions are for channel and bank restoration projects for creation of natural, physically stable, ecologically functioning streams, taking into

consideration connectivity with floodplain and groundwater aquifers. These exceptions include a requirement that bank restoration projects require planting appropriate native vegetation, including woody species appropriate for the region and habitat. We also propose language that would require surveys and relocation prior to commencement of restoration actions for longsolid and round hickorynut that would otherwise be negatively affected by the actions.

We reiterate that these actions and activities may have some minimal level of take of the longsolid and round hickorynut, but any such take is expected to be rare and insignificant, and is not expected to negatively impact the species' conservation and recovery efforts. Rather, we expect they would have a net beneficial effect on the species. Across the species' range, instream habitats have been degraded physically by sedimentation and by direct and indirect channel disturbance. The habitat restoration activities in the proposed 4(d) rule are intended to improve habitat conditions for the species in the long term.

Regulations governing permits for threatened wildlife are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act.

Finally, the proposed 4(d) rule would allow take of the longsolid and round hickorynut without a permit by any employee or agent of the Service or a State conservation agency designated by the agency for such purposes and when acting in the course of their official duties if such action is necessary to aid a sick, injured, or orphaned

specimen; to dispose of a dead specimen; or to salvage a dead specimen which may be useful for scientific study. In addition, Federal and State wildlife law enforcement officers, working in coordination with Service field office personnel, may possess, deliver, carry, transport, or ship longsolid and round hickorynut taken in violation of the Act as necessary.

IV. Critical Habitat for the Longsolid and Round Hickorynut

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, habitat restoration, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Designation also does not allow the government or public to access private lands, nor does designation require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the Federal agency would be required to consult with the Service under section 7(a)(2) of the Act. However, even if the Service were to conclude that the proposed activity would 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 and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical or biological features that occur in specific occupied areas, we focus on the specific features that are essential to support the life-history needs of the species, including, but not limited to, water characteristics, soil type, geological features, 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.

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. When designating critical habitat, the Secretary will first evaluate areas occupied by the species. The Secretary will only consider unoccupied areas to be essential where a critical habitat designation limited to geographical areas occupied by the species would be inadequate to ensure the conservation of the species. In addition, for

an unoccupied area to be considered essential, the Secretary must determine that there is a reasonable certainty both that the area will contribute to the conservation of the species and that the area contains one or more of those physical or biological features essential to the conservation of the species.

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

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

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) the prohibitions found in 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 this species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans, or other species conservation planning efforts if new information available at the time of these planning efforts calls for a different outcome.

Prudency Determination

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary shall designate critical habitat at the time the species is determined to be an endangered or threatened species. Our regulations (50 CFR 424.12(a)(1)) state that the Secretary

may, but is not required to, determine that a designation would not be prudent in the following circumstances:

(i) The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;

(ii) The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;

(iii) Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States;

(iv) No areas meet the definition of critical habitat; or

(v) The Secretary otherwise determines that designation of critical habitat would not be prudent based on the best scientific data available.

As discussed earlier in this document, there is currently no imminent threat of collection or vandalism identified under Factor B for these species, and identification and mapping of critical habitat is not expected to initiate any such threat. In our SSA reports and the proposed listing determination for the longsolid and round hickorynut, we determined that the present or threatened destruction, modification, or curtailment of habitat or range is a threat to the longsolid and round hickorynut, and that those threats in some way can be addressed by section 7(a)(2) consultation measures. The species occur wholly in the jurisdiction of the United States (with the exception of one remnant, small population of round hickorynut in the Ontario Province of Canada, which Canada has

listed as an endangered species and designated critical habitat in the East Sydenham River), and we are able to identify areas that meet the definition of critical habitat. Therefore, because none of the circumstances enumerated in our regulations at 50 CFR 424.12(a)(1) have been met and because there are no other circumstances the Secretary has identified for which this designation of critical habitat would be not prudent, we have determined that the designation of critical habitat is prudent for the longsolid and round hickorynut.

Critical Habitat Determinability

Having determined that designation is prudent, under section 4(a)(3) of the Act we must find whether critical habitat for the longsolid and round hickorynut is determinable. Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist:

- (i) Data sufficient to perform required analyses are lacking, or
- (ii) The biological needs of the species are not sufficiently well known to identify any area that meets the definition of “critical habitat.”

When critical habitat is not determinable, the Act allows the Service an additional year to publish a critical habitat designation (16 U.S.C. 1533(b)(6)(C)(ii)).

We reviewed the available information pertaining to the biological needs of the species and habitat characteristics where these species are located. Our review of the best scientific data available led us to conclude that the designation of critical habitat is determinable for the longsolid and round hickorynut.

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

As described above under **Summary of Biological Status and Threats**, longsolid and round hickorynut mussels occur in river or stream reaches. 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 for the longsolid and round hickorynut from studies of these species' (or appropriate surrogate species') habitat, ecology, and life history. The primary habitat elements that influence resiliency of the longsolid and round hickorynut include water quality, water quantity, substrate, habitat connectivity, and the presence of host fish species to ensure recruitment. These features are also described above as resource needs under **Summary of Biological Status and Threats**, and a full description is available in the SSA reports; the individuals' needs are summarized below in Table 1.

Table 1. Requirements for each life stage of the longsolid and round hickorynut mussels.

Life Stage	Resources Needed to Complete Life Stage ¹	Source
Fertilized eggs - early spring	<ul style="list-style-type: none"> • Clear, flowing water • Sexually mature males upstream from sexually mature females • Appropriate spawning temperatures 	Berg <i>et al.</i> 2008, p. 397; Haag 2012, pp. 38–39
Glochidia - late spring to early summer	<ul style="list-style-type: none"> • Clear, flowing water • Enough flow to keep glochidia or conglutinates adrift and to attract drift-feeding host fish • Presence of host fish for attachment 	Strayer 2008, p. 65; Haag 2012, pp. 41–42
Juveniles - excystment from host fish to approx. 0.8 in (~20 mm) shell length	<ul style="list-style-type: none"> • Clear, flowing water • Host fish dispersal • Appropriate interstitial chemistry; low salinity, low ammonia, low copper and other contaminants, high dissolved oxygen • Appropriate substrate (clean gravel/sand/cobble) for settlement 	Dimock and Wright 1993, pp. 188–190; Sparks and Strayer 1998, p. 132; Augspurger <i>et al.</i> 2003, p. 2,574; Augspurger <i>et al.</i> 2007, p. 2,025; Strayer and Malcom 2012, pp. 1,787–1,788
Adults - greater than 0.8 in (20 mm) shell length	<ul style="list-style-type: none"> • Clear, flowing water • Appropriate substrate (stable gravel and coarse sand free from excessive silt) • Adequate food availability (phytoplankton and detritus) • High dissolved oxygen • Appropriate water temperature 	Yeager <i>et al.</i> 1994, p. 221; Nichols and Garling 2000, p. 881; Chen <i>et al.</i> 2001, p. 214; Spooner and Vaughn 2008, p. 308

¹ These resource needs are common among North American freshwater mussels; however, due to lack of species-specific research, parameters specific to longsolid and round hickorynut are unavailable.

Summary of Essential Physical or Biological Features

We derive the specific physical or biological features essential to the conservation of the longsolid and round hickorynut from studies of the species’ habitat, ecology, and life history as described below. Additional information can be found in chapter 4 of the SSA reports (Service 2018, pp. 27–32; Service 2019, pp. 30–39), both of which are available on <http://www.regulations.gov> under Docket No. FWS–R4–ES–2020–0010. We have determined that the following physical or biological features are essential to the conservation of the longsolid and round hickorynut:

(1) Adequate flows, or a hydrologic flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain stream connectivity, specifically providing for the exchange of nutrients and sediment for maintenance of the mussels' and fish host's habitat and food availability, maintenance of spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats. 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).

(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) with habitats that support a diversity of freshwater mussel and native fish (such as, stable riffle-run-pool habitats that provide flow refuges consisting of predominantly silt-free, stable sand, gravel, and cobble substrates).

(3) Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including (but not limited to): dissolved oxygen (generally above 2 to 3 parts per million (ppm)), salinity (generally below 2 to 4 ppm), and temperature (generally below 86 °Fahrenheit (°F) (30 °Celsius (°C))). Additionally, water and sediment should be low in ammonia (generally

below 0.5 ppm total ammonia-nitrogen) and heavy metal concentrations, and lack excessive total suspended solids and other pollutants (see *Threats Analysis*, above).

(4) The presence and abundance of fish hosts necessary for recruitment of the longsolid (currently unknown, likely includes minnows of the family Cyprinidae and banded sculpin (*Cottus carolinae*)) and the round hickorynut (i.e., eastern sand darter (*Ammocrypta pellucida*), emerald darter (*Etheostoma baileyi*), greenside darter (*E. blennioides*), Iowa darter (*E. exile*), fantail darter (*E. flabellare*), Cumberland darter (*E. susanae*), spangled darter (*E. obama*), variegate darter (*E. variatum*), blackside darter (*Percina maculata*), frecklebelly darter (*P. stictogaster*), and banded sculpin).

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 longsolid and round hickorynut 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 water withdrawals, resulting in flow reduction and available water quantity; (2) urbanization of the landscape, including (but not limited to) land conversion for urban and commercial use, infrastructure (pipelines, roads, bridges, utilities), and urban water uses (resource extraction activities, water supply reservoirs, wastewater treatment, etc.); (3) significant alteration of water quality and nutrient pollution from a variety of activities, such as mining and agricultural activities; (4)

impacts from invasive species; (5) land use activities that remove large areas of forested wetlands and riparian systems; (6) culvert and pipe installation that creates barriers to movement for the longsolid and round hickorynut, or their host fishes; (7) changes and shifts in seasonal precipitation patterns as a result of climate change; and (8) 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; moderation of surface and ground water withdrawals to maintain natural flow regimes; improved stormwater management; and reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water.

In summary, we find that the occupied areas we are proposing to designate as critical habitat contain the physical or biological features that are essential to the conservation of the species and that may require special management considerations or protection. Special management considerations or protection may be required of the Federal action agency to eliminate, or to reduce to negligible levels, the threats affecting the physical and biological features of each unit.

Criteria Used To Identify Critical Habitat

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. In accordance with the Act and our implementing regulations at 50 CFR 424.12(b), we review available information pertaining to the habitat requirements of the species and identify specific areas within the geographical area

occupied by the species at the time of listing and any specific areas outside the geographical area occupied by the species to be considered for designation as critical habitat. We are not currently proposing to designate any areas outside the geographical area occupied by the longsolid or round hickorynut because we have determined that occupied areas are sufficient to conserve these two species.

Methodology Used For Selection of Proposed Units

First, we included stronghold (high) or medium condition populations (resiliency) remaining from historical conditions. These populations show recruitment or varied age class structure, and could be used for recovery actions to re-establish populations within basins through propagation activities or augment other populations through direct translocations within their basins.

Second, we evaluated spatial representation and redundancy across the species range, to include last remaining consistently observable population(s) in major river basins and the last remaining population(s) in states if necessary, as states are crucial partners in monitoring and recovery efforts.

Third, we examined the overall contribution of medium condition populations and threats to those populations. Adjacency and connectivity to stronghold and medium populations was considered, and we did not include populations that have potentially low likelihood of recovery due to limited abundances or populations currently under a high level of threats.

Finally, we evaluated overlap of longsolid and round hickorynut occurrences, as well as other listed aquatic species and designated critical habitat, to see if there are ongoing conservation and monitoring efforts that can be capitalized on for efficiency.

Rangewide recovery considerations, such as maintaining existing genetic diversity and striving for representation of all major portions of the species' current range, were considered in formulating this proposed critical habitat. For example, in the Cumberland River basin, there is only one remaining population of the longsolid (mainstem Cumberland River) and only two populations remaining of the round hickorynut (Buck Creek and Rockcastle River). In addition, in the Mississippi River basin, only one population of the round hickorynut remains (Big Black River). The distribution of the longsolid and round hickorynut in these basins is substantially reduced when compared to historical data that indicates these species were formerly much more widespread within these drainages. Therefore, these rivers and streams were included to maintain basin representation.

The proposed critical habitat designation does not include all rivers and streams currently occupied by the species, nor all rivers and streams known to have been occupied by the species historically. Instead, it includes only the occupied rivers and streams within the current range that we determined are critical to the conservation of these species. These rivers and streams contain populations large and dense enough and most likely to be self-sustaining over time (despite fluctuations in local conditions), and also have retained the physical or biological features that will allow for the maintenance and expansion of existing populations. These units also represent populations that are stable and distributed over a wide geographic area. We are not proposing to designate any areas outside the geographical area currently occupied by either the longsolid or round hickorynut because we did not find any unoccupied areas that are essential to the

conservation of these species, and we determined that occupied areas are sufficient to conserve the two species.

Sources of data for this proposed critical habitat include multiple databases maintained by universities, information from State agencies throughout the species' ranges, and numerous survey reports on streams throughout the species' ranges (see SSA reports (Service 2018, entire; Service 2019, entire)). We have also reviewed available information that pertains to the habitat requirements of these species. Sources of information on habitat requirements include studies conducted at occupied sites and published in peer-reviewed articles, agency reports, and data collected during monitoring efforts (Service 2018, entire; Service 2019, entire).

In summary, for areas within the geographic area occupied by these species at the time of listing, we delineated critical habitat unit boundaries using a precise set of criteria. Specifically, we identified river and stream reaches with observations from 2000 to present, given the variable data associated with timing and frequency of mussel surveys conducted throughout the species' ranges. We determined it is reasonable to find these areas occupied due to the longevity of the longsolid, the potential for incomplete survey detections for the round hickorynut, highly variable recent survey information across both species' ranges, and available State heritage databases and information support for the likelihood of both species' continued presence in these areas within this timeframe. Specific habitat areas were delineated based on Natural Heritage Element Occurrences, and unpublished survey data provided by States, universities, and nongovernmental organizations. These areas provide habitat for longsolid and round hickorynut populations and are large enough to be self-sustaining over time, despite

fluctuations in local conditions. The areas within the proposed units represent continuous river and stream reaches of free-flowing habitat patches capable of sustaining host fishes and allowing for seasonal transport of glochidia, which are essential for reproduction and dispersal of longsolid and round hickorynut. We consider portions of the following rivers and streams to be occupied by the species at the time of proposed listing, and appropriate for critical habitat designation:

(1) Longsolid—French Creek, Allegheny River, Shenango River, Middle Island Creek, Little Kanawha River, Elk River, Kanawha River, Licking River, Green River, Cumberland River, Clinch River, and Paint Rock River (see *Unit Descriptions*, below).

(2) Round hickorynut—Shenango River, Grand River, Tippecanoe River, Middle Island Creek, Little Kanawha River, Elk River, Kanawha River, Licking River, Rockcastle River, Buck Creek, Green River, Paint Rock River, Duck River, and Big Black River (see *Unit Descriptions*, below).

When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for the longsolid and round hickorynut. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this proposed rule have been excluded by text in the proposed rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse

modification unless the specific action would affect the physical or biological features in the adjacent critical habitat.

We propose to designate as critical habitat lands that we have determined are occupied at the time of listing (i.e., currently occupied) and that contain one or more of the physical or biological features that are essential to support life-history processes of the species. Twelve units for the longsolid and 14 units for the round hickorynut are proposed for designation based on the presence of the physical or biological features being present that support the longsolid's or round hickorynut's life-history processes. All of the units for both species contain all of the identified physical or biological features and support multiple life-history processes.

The critical habitat designation is defined by the map or maps, as modified by any accompanying regulatory text, presented at the end of this document under **Proposed Regulation Promulgation**. We include more detailed information on the boundaries of the critical habitat designation in the preamble of this document. We will make the coordinates or plot points or both on which each map is based available to the public on <http://www.regulations.gov> at Docket No. FWS-R4-ES-2020-0010 and on our Internet site <https://www.fws.gov/Asheville/>.

Proposed Critical Habitat Designation

We propose designating a total of 1,115 river mi (1,794 km) in 12 units as occupied critical habitat for the longsolid and a total of 921 river mi (1,482 km) in 14 units as occupied critical habitat for the round hickorynut. All or portions of some of these units overlap, and all 26 units are occupied by one or both species. The critical habitat areas we describe below constitute our current best assessment of areas that meet

the definition of critical habitat for the longsolid and round hickorynut. The 12 areas we propose as critical habitat for the longsolid are: French Creek, Allegheny River, Shenango River, Middle Island Creek, Little Kanawha River, Elk River, Kanawha River, Licking River, Green River, Cumberland River, Clinch River, and Paint Rock River. The 14 areas we propose as critical habitat for the round hickorynut are: Shenango River, Grand River, Tippecanoe River, Middle Island Creek, Little Kanawha River, Elk River, Kanawha River, Licking River, Rockcastle River, Buck Creek, Green River, Paint Rock River, Duck River, and Big Black River. Tables 2 and 3 show the proposed critical habitat units and the approximate river miles of each unit.

TABLE 2. Proposed critical habitat units for the longsolid. All units are occupied by the species.

[Area estimates reflect all land within critical habitat unit boundaries.]

Critical Habitat Unit (State)	Adjacent Riparian Land Ownership by Type	Approximate River Miles (Kilometers)
LS 1. French Creek (Pennsylvania)	Public (Federal, State); Private	14 (22.1) 106 (170.6) Total = 120 (191.5)
LS 2. Allegheny River (Pennsylvania)	Public (Federal, State); Private	84 (135.8) 15 (24.1) Total = 99 (159.3)
LS 3. Shenango River (Pennsylvania)	Public (Federal, State); Private	7 (11.3) 15 (24.3) Total = 22 (35.5)
LS 4. Middle Island Creek (West Virginia)	Public (Local); Private	0.13 (0.2) 14 (23.5) Total = 14 (23.7)
LS 5. Little Kanawha River (West Virginia)	Public (Federal, State); Private	0.53 (0.9) 122 (197.2) Total = 123 (198)
LS 6. Elk River (West Virginia)	Public (Federal, State, Local); Private	7 (12.7) 93 (150.3) Total = 101 (163)
LS 7. Kanawha River (West Virginia)	Public (Federal, State, Local); Private	2 (4.6) 18 (29.3) Total = 21 (33.9)
LS 8. Licking River (Kentucky)	Public (Federal, State, Local); Private	19 (31.7) 161 (259.7)

		Total = 181 (291.5)
LS 9. Green River (Kentucky)	Public (Federal, State, Local); Private	51 (82.4) 105 (169.2) Total = 156 (251.6)
LS 10. Cumberland River (Tennessee)	Public (Federal)	Total = 48 (77.5)
LS 11. Clinch River (Virginia and Tennessee)	Public (Federal, State); Private	17 (27.3) 160 (258.8) Total = 177 (286.1)
LS 12. Paint Rock River (Alabama)	Public (Federal, State); Private	56 (90.4) 2 (4.1) Total = 58 (94.5)
	Public Private TOTAL	305 (491) 810 (1,304) 1,115 (1,794)

Note: River miles may not sum due to rounding.

TABLE 3. Proposed critical habitat units for the round hickorynut. All units are occupied by the species.

[Area estimates reflect all land within critical habitat unit boundaries.]

Critical Habitat Unit	Adjacent Riparian Land Ownership by Type	Approximate River Miles (Kilometers)
RH 1. Shenango River (Pennsylvania)	Public (Federal, State); Private	7 (11.1) 15 (24.3) Total = 22 (35.5)
RH 2. Grand River (Ohio)	Public (State, Local); Private	33 (53) 59 (95.2) Total = 92 (148.2)
RH 3. Tippecanoe River (Indiana)	Public (State, Easement); Private	9 (14.5) 66 (105.6) Total = 75 (120.8)
RH 4. Middle Island Creek (West Virginia)	Public (Federal, State); Private	0.2 (0.4) 74.8 (120.4) Total = 75 (120.8)
RH 5. Little Kanawha River (West Virginia)	Public (Federal, State, Local); Private	0.7 (1.2) 109 (175.4) Total = 110 (176.6)
RH 6. Elk River (West Virginia)	Public (Federal, State, Local); Private	7 (12.7) 93 (150.3) Total = 101 (163)
RH 7. Kanawha River (West Virginia)	Public (Federal, State, Local); Private	4 (7.2) 33 (53.2) Total = 37.5 (60.4)
RH 8. Licking River (Kentucky)	Public (Federal, State, Local); Private	18 (30) 131 (211.8)

		Total = 150 (241.9)
RH 9. Rockcastle River (Kentucky)	Public (Federal); Private	15 (24.2) 0.3 (0.4) Total = 15.3 (24.6)
RH 10. Buck Creek (Kentucky)	Public (State, Local); Private	3 (5.5) 33 (52.6) Total = 36 (58.1)
RH 11. Green River (Kentucky)	Public (Federal, State); Private	37 (59.4) 61 (98.4) Total = 98 (157.7)
RH 12. Paint Rock River (Alabama)	Public (Federal, State); Private	46 (73.4) 2 (4.1) Total = 48 (77.5)
RH 13. Duck River (Tennessee)	Public (State, Local); Private	32 (51.1) 27 (43.7) Total = 59 (94.8)
RH 14. Big Black River (Mississippi)	Private	Total = 4 (7)
	Public	212 (341)
	Private	709 (1,141)
	TOTAL	921 (1,482)

Note: River 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 the longsolid and round hickorynut, below. There are a total of 12 units for the longsolid and 14 units for round hickorynut, 8 of which overlap in part or whole for both species, and all of which contain all of the physical and biological features essential to the conservation of both species. Also, the majority of proposed units overlap in part or whole with existing critical habitat designated for other federally endangered species (i.e., diamond darter (*Crystallaria cincotta*), Short's bladderpod (*Physaria globosa*), purple bean (*Villosa perpurpurea*), rough rabbitsfoot (*Quadrula cylindrica strigillata*), Cumberlandian combshell (*Epioblasma brevidens*), oyster mussel (*Epioblasma capsaeformis*), slabside pearl mussel (*Pleuronaia (=Lexingtonia) dolabelloides*), and fluted kidneyshell (*Ptychobranhus subtentus*)) or federally threatened species (i.e., rabbitsfoot (*Quadrula cylindrica cylindrica*), yellowfin madtom

(*Noturus flavipinnis*), and slender chub (*Hybopsis cahni*, listed as *Erimystax cahni*)), as specified below.

LS 1: French Creek

Unit LS 1 consists of 120 stream mi (191.5 km) of French Creek in Crawford, Erie, Mercer, and Venango Counties, Pennsylvania, from Union City Dam west of Union City, Erie County, downstream to its confluence with the Allegheny River near the City of Franklin, Venango County. Riparian lands that border the unit include approximately 106 stream mi (170.6 km; 76 percent) in private ownership and 14 stream mi (22.1 km; 24 percent) in public (Federal or State) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes agriculture, several State-managed game lands, the communities of Cambridge Springs and Venango, and the cities of Meadville and Franklin. Union City Dam is operated by the U.S. Army Corps of Engineers. Unit LS 1 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. The entire 120 stream mi (191.5 km) of this unit overlaps with designated critical habitat for the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within this unit include the degradation of habitat and water quality from impoundments, siltation and pollution due to resource extraction, agriculture, timbering practices, and human development; flow reduction and water quality degradation due to water withdrawals and wastewater treatment plants; and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include monitoring water quality degradation within the species' range resulting from row crop agriculture and oil and gas

development, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 2: Allegheny River

Unit LS 2 consists of 99 river mi (159.3 km) of the Allegheny River in Warren, Crawford, Forest, Venango, and Clarion Counties, Pennsylvania, from Kinzua Dam east of Warren, Warren County, downstream to the Pennsylvania Route 58 crossing at Foxburg, Clarion County, Pennsylvania. Riparian lands that border the unit include approximately 15 river mi (24.1 km; 14 percent) in private ownership and 84 river mi (135.8 km; 86 percent) in public (Federal or State government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, and State-managed game lands. The public land ownership for this unit is a combination of Allegheny National Forest lands and State lands, and the Kinzua Dam is operated by the U.S. Army Corps of Engineers. Unit LS 2 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 35 river mi (57 km) of this unit with designated critical habitat for the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit LS 2 include the degradation of habitat and water quality from impoundments, channelization, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Kinzua Dam to mimic the natural hydrograph,

improvements to water quality to reverse degradation resulting from row crop agriculture and oil and gas development, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 3: Shenango River

Unit LS 3 is the same as Unit RH 1, described below for the round hickorynut. Unit LS 3 consists of 22 river mi (35.5 km) of the Shenango River in Crawford County, Pennsylvania, from Pymatuning Dam downstream to the point of inundation by Shenango River Lake near Big Bend, Mercer County, Pennsylvania. Riparian lands that border the unit include approximately 15 river mi (24.3 km; 32 percent) in private ownership and 7 river mi (11.3 km; 68 percent) in public (Federal or State) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes the City of Greenville and its associated industry, and the unincorporated communities of Jamestown and New Harrisburg. Pymatuning Dam is owned by the State of Pennsylvania. Unit LS 3 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 14.5 river mi (23.4 km) of this unit with designated critical habitat for the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit LS 3 include the degradation of habitat and water quality from impoundments, domestic and industrial pollution due to human development, resource extraction, water withdrawals, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Pymatuning Dam to mimic the natural hydrograph, and efforts to prevent

the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 4: Middle Island Creek

Unit LS 4 partially overlaps with Unit RH 4 for the round hickorynut, described below. Unit LS 4 consists of 14 stream mi (23.7 km) of Middle Island Creek in Doddridge and Tyler Counties, West Virginia, from the mouth of Meathouse Fork south of Smithburg, Doddridge County, downstream to its confluence with Arnold Creek at the Tyler/Doddridge County line. Riparian lands that border the unit include approximately 14 stream mi (23.5 km; 99 percent) in private ownership and 0.13 river mi (0.2 km; less than 1 percent) in public (local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry and the communities of Smithburg, Avondale, and West Union. Unit LS 4 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit LS 4 include degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include actions to alleviate the threats of water quality and habitat degradation from hydrofracking wastewater discharges and impoundments downstream on the Ohio River, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 5: Little Kanawha River

Unit LS 5 partially overlaps with Unit RH 5 for the round hickorynut, described below. Unit LS 5 consists of 123 river mi (198 km) of the Little Kanawha River in Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia, from Burnsville Dam in Braxton County downstream to its confluence with the Ohio River in Parkersburg, Wood County, West Virginia. Riparian lands that border the unit include approximately 122 river mi (197.2 km; 99 percent) in private ownership and 0.53 river mi (0.9 km; less than 1 percent) in public (Federal or State government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities. Burnsville Dam is operated by the U.S. Army Corps of Engineers. Unit LS 5 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit LS 5 include the degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatments plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Burnsville Dam to mimic the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 6: Elk River

Unit LS 6 is the same as Unit RH 6, described below for the round hickorynut.

Unit LS 6 consists of 101 river mi (163 km) of the Elk River in Braxton, Clay, and Kanawha Counties, West Virginia, from Sutton Dam in Braxton County downstream to its confluence with the Kanawha River at Charleston, Kanawha County, West Virginia. Riparian lands that border the unit include approximately 93 river mi (150.3 km; 92 percent) in private ownership and 7 river mi (12.7 km; 8 percent) in public (Federal, State, and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC-8 level management unit includes forestry, agriculture, industry, and numerous cities and municipalities. Sutton Dam is operated by the U.S. Army Corps of Engineers. Unit LS 6 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 28 river mi (44.6 km) of this unit with designated critical habitat for the federally endangered diamond darter (78 FR 52364; August 22, 2013).

Threats identified within Unit LS 6 include the degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Sutton Dam to mimic the natural hydrograph and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 7: Kanawha River

Unit LS 7 partially overlaps with Unit RH 7 for the round hickorynut, described below. Unit LS 7 consists of 21 river mi (33.9 km) of the Kanawha River in Fayette and

Kanawha Counties, West Virginia, from Kanawha Falls in Fayette County downstream to its confluence with Cabin Creek at Chelyan, Kanawha County, West Virginia. Riparian lands that border the unit include approximately 18 river mi (29.3 km; 90 percent) in private ownership and 2 river mi (4.6 km; 10 percent) in public (Federal, State, and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities. London and Marmet locks and dams within this unit are operated by the U.S. Army Corps of Engineers. Unit LS 7 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit LS 7 include the degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from London and Marmet locks and dams to mimic the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 8: Licking River

Unit LS 8 partially overlaps with Unit RH 8 for the round hickorynut, described below. Unit LS 8 consists of 181 river mi (291.5 km) of the Licking River in Bath, Campbell, Fleming, Harrison, Kenton, Morgan, Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky, from Cave Run Dam in Bath/Rowan Counties downstream

to its confluence with the Ohio River at Newport, Campbell/Kenton County, Kentucky. Riparian lands that border the unit include approximately 161 river mi (259.7 km; 90 percent) in private ownership and 19 river mi (31.7 km; 10 percent) in public (Federal, State, and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture industry, and numerous cities and municipalities. The Cave Run Dam is operated by the U.S. Army Corps of Engineers. Unit LS 8 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit LS 8 include the degradation of habitat and water quality from impoundments and associated cold water discharges, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Cave Run Dam to mimic the natural hydrograph and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 9: Green River

Unit LS 9 partially overlaps with Unit RH 11 for the round hickorynut, described below. Unit LS 9 consists of 156 river mi (251.6 km) of the Green River in Butler/Warren, Edmonson, Green, Hart, and Taylor Counties, Kentucky, from Green River Lake Dam south of Campbellsville in Taylor County downstream to its confluence with the Barren River at Woodbury, Warren/Butler County, Kentucky. Riparian lands that border the unit include approximately 105 river mi (169.2 km; 67 percent) in private

ownership and 51 river mi (82.4 km; 33 percent) in public (Federal, State, and local government) ownership; Federal lands include a portion of Mammoth Cave National Park. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities, and Cave Run Dam is operated by the U.S. Army Corps of Engineers. Unit LS 9 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. The entire approximately 156-river-mi (252-km) unit overlaps with designated critical habitat for the federally endangered diamond darter (78 FR 52364; August 22, 2013) and the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit LS 9 include the degradation of habitat and water quality from impoundments and associated cold water discharges, siltation and pollution due to improper timbering and agricultural practices, resource extraction, water withdrawals, and development, all of which affect channel stability; wastewater treatment plants; and the presence of invasive, nonnative species. Special management considerations or protection measures may be needed to reduce or alleviate habitat degradation such as channelization and channel instability. Additional special management considerations or protection measures may be needed to address thermal and flow regimes associated with tail water releases from the Green River Lake Dam, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 10: Cumberland River

Unit LS 10 consists of 48 river mi (77.5 km) of the Cumberland River in Smith, Trousdale, and Wilson Counties, Tennessee, from Cordell Hull Dam north of Carthage in Smith County downstream to reservoir influence of Old Hickory Reservoir at U.S. Route 231 north of Lebanon, Wilson County, Tennessee. Riparian lands that border the unit are all public (Federal) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, and the municipalities of Carthage and Rome, Tennessee; both Cordell Hull and Old Hickory Dams upstream and downstream of this unit are operated by the U.S. Army Corps of Engineers. Unit LS 10 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 1 river mi (1.7 km) of this unit with designated critical habitat for the federally endangered Short's bladderpod (79 FR 50990; August 26, 2014).

Threats identified within Unit LS 10 include the degradation of habitat and water quality from upstream and downstream impoundments and associated cold water discharges, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include channel stability, thermal regimes, altered flow regimes associated with tail water releases from Cordell Hull Reservoir, actions to address channelization, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 11: Clinch River

Unit LS 11 consists of 177 river mi (286.1 km) of the Clinch River in Russell, Scott, Tazewell, and Wise Counties in Virginia, and Claiborne, Hancock, and Hawkins Counties in Tennessee. This unit extends from Secondary Highway 637 west of Pounding Mill in Tazewell County, Virginia, downstream to County Highway 25, Claiborne County, Tennessee, northwest of Thorn Hill. The Tennessee portion of this unit is also encompassed by the Tennessee Wildlife Resources Agency's Clinch River Sanctuary. Riparian lands that border the unit include approximately 160 river mi (258.8 km; 90 percent) in private ownership and 17 river mi (27.3 km; 10 percent) in public (Federal and State) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities. Unit LS 11 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 171 river mi (274.4 km) of this unit with designated critical habitat for the federally endangered purple bean, oyster mussel, rough rabbitsfoot, and Cumberlandian combshell (69 FR 53136; August 31, 2004); the federally endangered slabside pearlymussel and fluted kidneyshell (78 FR 59556; September 26, 2013); and with the federally threatened yellowfin madtom and slender chub (42 FR 45526; September 9, 1977).

Threats identified within Unit LS 11 include the degradation of habitat and water quality from downstream impoundment, mining discharges, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may

include management of the Norris Reservoir downstream to provide additional riverine habitat, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

LS 12: Paint Rock River

Unit LS 12 partially overlaps with Unit RH 12 for the round hickorynut, described below. Unit LS 12 consists of 58 river mi (94.5 km) of the Paint Rock River in Jackson and Madison/Marshall Counties, Alabama, from the confluence of Hurricane Creek and Estill Fork in Jackson County, Alabama, downstream to its confluence with the Tennessee River west of Hebron, Madison/Marshall County, Alabama. Riparian lands that border the unit include approximately 2 river mi (4.1 km; 3 percent) in private ownership and 56 river mi (90.4 km; 97 percent) in public (Federal and State) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, and several small municipalities (Princeton, Hollytree, Trenton, and Paint Rock). Unit LS 12 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 53 river mi (85 km) of this unit with designated critical habitat for the federally endangered slabside pearlymussel (78 FR 59556; September 26, 2013) and the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit LS 12 include the degradation of habitat and water quality from downstream impoundment, siltation and pollution due to improper agricultural and timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative

species. Special management considerations or protection measures to reduce or alleviate the threats may include management of Wheeler Reservoir downstream to provide additional riverine habitat, working with landowners to implement best management practices to reduce erosion and sedimentation associated with agricultural lands, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 1: Shenango River

Unit RH 1 is the same as Unit LS 3 for the longsolid, described above. It consists of 22 river mi (35.5 km) of the Shenango River in Crawford County, Pennsylvania, from Pymatuning Dam downstream to the point of inundation by Shenango River Lake near Big Bend, Mercer County, Pennsylvania. Riparian lands that border the unit include approximately 15 river mi (24.3 km; 32 percent) in private ownership and 7 river mi (11.1 km; 68 percent) in public (Federal or State) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes the City of Greenville and its associated industry, and the unincorporated communities of Jamestown and New Harrisburg. Pymatuning Dam is owned by the State of Pennsylvania. Unit RH 1 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 14.5 river mi (23.4 km) of this unit with designated critical habitat for the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit RH 1 include the degradation of habitat and water quality from impoundments, domestic and industrial pollution due to human development, resource extraction, water withdrawals, and wastewater treatment plants,

and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Pytmatuning Dam to mimic the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 2: Grand River

Unit RH 2 consists of 92 river mi (148.2 km) of the Grand River in Ashtabula, Lake, and Trumbull Counties, Ohio, from the Trumbull/Geauga County line south of Lake County, Ohio State Route 88, downstream to the mouth of the Grand River at its confluence with Lake Erie. Riparian lands that border the unit include approximately 59 river mi (95.2 km; 64 percent) in private ownership and 33 river mi (53 km; 36 percent) in public (State and local government) ownership. The Grand River is a State Wild and Scenic River, with a “Wild River” designation for approximately 23 river mi (37 km) from the Harpersfield Covered Bridge downstream to the Norfolk and Western Railroad Trestle in Lake County, and “Scenic River” designation for approximately 33 river mi (53 km) from the U.S. 322 Bridge in Ashtabula County downstream to the Harpersfield Covered Bridge. General lands use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, and several municipalities (West Farmington, Windsor, Rock Creek, and Perry). Harpersfield Dam is operated by the U.S. Army Corps of Engineers. Unit RH 2 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit RH 2 include degradation of habitat and water quality from impoundments, domestic and industrial pollution due to human

development, resource extraction, water withdrawals, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from the Harpersfield Dam to mimic the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 3: Tippecanoe River

Unit RH 3 consists of 75 river mi (120.8 km) of the Tippecanoe River in Fulton, Marshall, Pulaski, and Starke Counties, Indiana, from the railroad crossing west of the communities of Tippecanoe, Marshall County, downstream to the Pulaski/White County line, southwest of the community of Star City, Indiana. Riparian lands that border the unit include approximately 66 river mi (105.6 km; 89 percent) in private ownership and 9 river mi (14.5 km; 11 percent) in public ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes agriculture and the communities of Tippecanoe, Pershing, and Ora. Unit RH 3 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 19 river mi (29.9 km) of this unit with designated critical habitat for the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit RH 3 include the degradation of habitat and water quality from impoundments, domestic and industrial pollution due to human development, resource extraction, water withdrawals, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or

protection measures to reduce or alleviate the threats may include modifying operations of downstream impoundments to provide additional riverine habitats, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 4: Middle Island Creek

Unit RH 4 partially overlaps with Unit LS 4 for the longsolid, described above. Unit RH 4 consists of 75 stream mi (120.8 km) of the Middle Island Creek in Doddridge, Pleasants, and Tyler Counties, West Virginia, from the Tyler/Doddridge County line northeast of Deep Valley downstream to the confluence with the Ohio River, at St. Mary's, Pleasants County, West Virginia. Riparian lands that border the unit include approximately 74.8 stream mi (120.4 km; 99 percent) in private ownership and 0.2 stream mi (0.4 km; less than 1 percent) in public (Federal and State) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes the communities of Smithburg, Avondale, West Union, Alma, and Centerville. Unit RH 4 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit RH 4 include the degradation of habitat and water quality from siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include monitoring hydrofracking wastewater discharges and impoundments downstream on the Ohio River, and

implementing efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 5: Little Kanawha River

Unit RH 5 partially overlaps with Unit LS 5 for the longsolid, also described above. Unit RH 5 consists of 110 river mi (176.6 km) of the Little Kanawha River in Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia, from Burnsville Dam in Braxton County downstream to West Virginia Route 47 at Parkersburg, Wood County, West Virginia. Riparian lands that border the unit include approximately 109 river mi (175.4 km; 99 percent) in private ownership and 0.7 river mi (1.2 km; 1 percent) in public (Federal, State, and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities. Burnsville Dam is operated by the U.S. Army Corps of Engineers. Unit RH 5 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit RH 5 include the degradation of habitat from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Burnsville Dam to mimics the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 6: Elk River

Unit RH 6 is the same as Unit LS 6 for the longsolid, described above. Unit RH 6 consists of 101 river mi (163 km) of the Elk River in Braxton, Clay, and Kanawha Counties, West Virginia, from the Sutton Dam in Braxton County downstream to its confluence with the Kanawha River at Charleston, Kanawha County, West Virginia. Riparian lands that border the unit include approximately 93 river mi (150.3 km; 92 percent) in private ownership and 7 river mi (12.7 km; 8 percent) in public (Federal, State, and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities. Sutton Dam is operated by the U.S. Army Corps of Engineers. Unit RH 6 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 28 river mi (44.6 km) of this unit with the designated critical habitat for the federally endangered diamond darter (78 FR 52364; August 22, 2013).

Threats identified within Unit RH 6 include the degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Sutton Dam to mimic the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 7: Kanawha River

Unit RH 7 partially overlaps with Unit LS 7 for the longsolid, described above. Unit RH 7 consists of 37.5 river mi (60.4 km) of the Kanawha River in Fayette and Kanawha Counties, West Virginia, from Kanawha Falls in Fayette County downstream to its confluence with the Elk River at Charleston, Kanawha County, West Virginia. Riparian lands that border the unit include approximately 33 river mi (53.2 km; 90 percent) in private ownership and 4 river mi (7.2 km; 10 percent) in public (Federal, State, and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities. London and Marmet locks and dams within this unit are operated by the U.S. Army Corps of Engineers. Unit RH 7 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit RH 7 include the degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from London and Marmet locks and dams to mimic the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 8: Licking River

Unit RH 8 partially overlaps with Unit LS 8 for the longsolid, described above. Unit RH 8 consists of 150 mi (241.9 km) of the Licking River in Bath, Campbell,

Fleming, Harrison, Kenton, Morgan, Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky, from Cave Run Dam in Bath/Rowan Counties downstream to the Railroad crossing at the Campbell/Kenton/Pendleton County line at De Mossville, northwest of Butler, Pendleton County, Kentucky. Riparian lands that border the unit include approximately 131 river mi (211.8 km; 87 percent) in private ownership and 18 river mi (30 km; 13 percent) in public (Federal, State, and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture industry, and numerous cities and municipalities. Cave Run Dam is operated by the U.S. Army Corps of Engineers. Unit RH 8 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit RH 8 include the degradation of habitat and water quality from impoundments and associated cold water discharges, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include modifying dam releases from Cave Run Dam to mimic the natural hydrograph, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 9: Rockcastle River

Unit RH 9 consists of 15.3 river mi (24.6 km) of the Rockcastle River in Laurel, Pulaski, and Rockcastle Counties, Kentucky, from Kentucky Route 1956 at Billows downstream to Kentucky Route 192, near its confluence with Cane Creek along the

Laurel/Pulaski County line, northwest of Baldrock, Laurel County, Kentucky. Riparian lands that border the unit include approximately 0.3 river mi (0.4 km; less than 1 percent) in private ownership and 15 river mi (24.2 km; 99 percent) in public (Federal) ownership. Federal ownership is the Daniel Boone National Forest. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit is predominantly forestry. Unit RH 9 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 15 river mi (23.7 km) of this unit with designated critical habitat for the federally endangered fluted kidneyshell (78 FR 59556; September 26, 2013).

Threats identified within Unit RH 9 include the degradation of habitat and water quality from siltation and pollution due to improper timbering practices and resource extraction, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include management of Lake Cumberland, located downstream, to provide more riverine habitat upstream, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 10: Buck Creek

Unit RH 10 consists of 36 stream mi (58.1 km) of Buck Creek in Pulaski County, Kentucky, from its confluence with Glade Fork Creek northeast of Goochtown, downstream to its confluence with Whetstone Creek, northeast of Dykes, Pulaski County, Kentucky. Riparian lands that border the unit include approximately 33 stream mi (52.6 km; 92 percent) in private ownership and 3 stream mi (5.5 km; 8 percent) in public (State and local government) ownership. General land use on adjacent riparian lands and the

surrounding HUC 8-level management unit includes forestry, agriculture, and several small communities. Unit RH 10 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 35 stream mi (56.7 km) with designated critical habitat for the federally endangered Cumberlandian combshell and oyster mussel (69 FR 53136; August 31, 2004), and the federally endangered fluted kidneyshell (78 FR 59556; September 26, 2013).

Threats identified within Unit RH 10 include the degradation of habitat and water quality from instream gravel mining, silviculture-related activities, illegal off-road vehicle use, nonpoint source pollution from agriculture, and development activities, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include management of Lake Cumberland, located downstream, to provide more riverine habitat upstream, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 11: Green River

Unit RH 11 partially overlaps with Unit LS 9 for the longsolid, described above. Unit RH 11 consists of 98 river mi (157.7 km) of the Green River in Butler/Warren, Edmonson, Green, and Hart Counties, Kentucky, from the mouth of Lynn Camp Creek east of Linwood in Hart County downstream to its confluence with the Barren River at Woodbury, Warrant/Butler Counties, Kentucky. Riparian lands that border the unit include approximately 61 river mi (98.4 km; 62 percent) in private ownership and 37 river mi (59.4 km; 38 percent) in public (Federal and State) ownership; Federal lands

include a portion of Mammoth Cave National Park. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, industry, and numerous cities and municipalities, and Green River Lake Dam (located upstream of this unit) is operated by the U.S. Army Corps of Engineers. Unit RH 11 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. The entire 98-river-mi (157.7-km) unit overlaps with designated critical habitat for the federally endangered diamond darter (78 FR 52364; August 22, 2013) and the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit RH 11 include the degradation of habitat and water quality from Green River Lake Dam and associated cold water discharges, siltation and pollution due to improper timbering and agricultural practices, resource extraction, water withdrawals, and development, all of which affect channel stability; wastewater treatment plants; and the presence of invasive, nonnative species. Special management considerations or protection measures may be needed to reduce or alleviate habitat degradation such as channelization and channel instability. Additional special management considerations or protection measures may be needed to address thermal and flow regimes associated with tail water releases from the Green River Lake Dam, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 12: Paint Rock River

Unit RH 12 partially overlaps with Unit LS 12 for the longsolid, described above. Unit RH 12 consists of 48 river mi (77.5 km) of the Paint Rock River in Jackson and

Madison/Marshall Counties, Alabama, from the confluence of Hurricane Creek and Estill Fork in Jackson County, Alabama, downstream to U.S. Route 431, south of New Hope, Madison/Marshall Counties, Alabama. Riparian lands that border the unit include approximately 2 river mi (4.1 km; 2 percent) in private ownership and 46 river mi (73.4 km; 98 percent) in public (Federal and State) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, and several small municipalities (Princeton, Hollytree, Trenton, and Paint Rock). Unit RH 12 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. The entire approximately 48-river-mi (77.5-km) unit overlaps with designated critical habitat for the federally endangered slabside pearl mussel (78 FR 59556; September 26, 2013), and the federally threatened rabbitsfoot mussel (80 FR 24692; April 30, 2015).

Threats identified within Unit RH 12 include the degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, resource extraction, water withdrawals, development, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include management of Wheeler Reservoir downstream to provide additional riverine habitat, working with landowners to implement best management practices to reduce erosion and sedimentation associated with agricultural lands, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 13: Duck River

Unit RH 13 consists of 59 river mi (94.8 km) of the Duck River in Bedford, Marshall, and Maury Counties, Tennessee, from its confluence with Sinking Creek in Bedford County, downstream to the mouth of Goose Creek, east of Columbia, Maury County, Tennessee. Riparian lands that border the unit include approximately 27 river mi (43.7 km; 47 percent) in private ownership and 32 river mi (51.1 km; 53 percent) in public (State and local government) ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit includes forestry, agriculture, and several municipalities (Milltown, Leftwich, and Philadelphia). Normandy Dam is operated by the Tennessee Valley Authority. Unit RH 13 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species. There is overlap of approximately 55 river mi (88.9 km) of this unit with designated critical habitat for the federally endangered slabside pearl mussel and fluted kidneyshell (78 FR 59556; September 26, 2013), and the federally endangered Cumberlandian combshell and oyster mussel (69 FR 53136; August 31, 2004).

Threats identified within Unit RH 13 include the degradation of habitat and water quality from impoundments, siltation and pollution due to improper timbering practices, agricultural activities (livestock), row crop agriculture and channelization, resource extraction, water withdrawals, and wastewater treatment plants, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include seasonally adjusted flow regimes associated with tail water releases from Normandy Dam, working with landowners to implement best management practices to reduce erosion and sedimentation associated with agricultural lands, planting adequate riparian buffers to minimize agriculture impacts, and

implementing efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

RH 14: Big Black River

Unit RH 14 consists of 4 river mi (7 km) of the Big Black River in Montgomery County, Mississippi, from its confluence with Poplar Creek in Bedford County, downstream to its confluence with Lewis Creek, Mississippi. Riparian lands that border the unit are all (100 percent) in private ownership. General land use on adjacent riparian lands and the surrounding HUC 8-level management unit is predominantly agricultural activities. Unit RH 14 is occupied by the species and contains all of the physical or biological features essential to the conservation of the species.

Threats identified within Unit RH 14 include degradation of habitat and water quality from impoundments, siltation and pollution due to improper agricultural activities, row crop agriculture and channelization, and water withdrawals, and the presence of invasive, nonnative species. Special management considerations or protection measures to reduce or alleviate the threats may include working with landowners to implement best management practices to reduce erosion and sedimentation associated with agricultural lands and water quality degradation, and efforts to prevent the spread of invasive, nonnative species (see **Special Management Considerations or Protection**, above).

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the

continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

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

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

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

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

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

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

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

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

(3) Are economically and technologically feasible, and

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

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

Regulations at 50 CFR 402.16 set forth requirements for Federal agencies to reinstate formal consultation on previously reviewed actions. These requirements apply

when the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law) and, subsequent to the previous consultation, we have listed a new species or designated critical habitat that may be affected by the Federal action, the amount or extent of taking specified in the incidental take statement is exceeded, 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, or the action has been modified in a manner that affects the species or critical habitat in a way not considered in the previous consultation. In such situations, Federal agencies sometimes may need to request reinitiation of consultation with us, but the regulations also specify some exceptions to the requirement to reinitiate consultation on specific land management plans after subsequently listing a new species or designating new critical habitat. See the regulations for a description of those exceptions.

Application of the "Destruction or Adverse Modification" Standard

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

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal

action that may violate section 7(a)(2) of the Act by destroying or adversely modifying such habitat, or that may be affected by such designation.

Activities that the Services may, during a consultation under section 7(a)(2) of the Act, find are likely to destroy or adversely modify critical habitat include, but are not limited to, actions that would: (1) Alter the geomorphology of their stream and river habitats (e.g., instream excavation or dredging, impoundment, channelization, sand and gravel mining, clearing riparian vegetation, and discharge of fill materials); (2) significantly alter the existing flow regime where these species occur (e.g., impoundment, urban development, water diversion, water withdrawal, water draw-down, and hydropower generation); (3) significantly alter water chemistry or water quality (e.g., hydropower discharges, or the release of chemicals, biological pollutants, or heated effluents into surface water or connected groundwater at a point source or by dispersed release (nonpoint source)); and (4) significantly alter stream bed material composition and quality by increasing sediment deposition or filamentous algal growth (e.g., construction projects, gravel and sand mining, oil and gas development, coal mining, livestock grazing, timber harvest, and other watershed and floodplain disturbances that release sediments or nutrients into the water). Consulting agencies and such activities could include, but are not limited to:

(1) U.S. Army Corps of Engineers (channel dredging and maintenance; dam projects including flood control, navigation, hydropower, and water supply; and Clean Water Act permitting including bridge projects and stream restoration activities).

(2) U.S. Department of Agriculture, including the Natural Resources Conservation Service and Farm Service Agency (technical and financial assistance for

projects) and the Forest Service (aquatic habitat restoration, fire management plans, fire suppression, fuel reduction treatments, forest plans, and mining permits).

(3) U.S. Department of Energy (renewable and alternative energy projects).

(4) Federal Energy Regulatory Commission (interstate pipeline construction and maintenance, dam relicensing, and hydrokinetics).

(5) U.S. Department of Transportation (highway and bridge construction and maintenance).

(6) U.S. Fish and Wildlife Service (issuance of section 10 permits for enhancement of survival, habitat conservation plans, and safe harbor agreements; Partners for Fish and Wildlife program projects benefiting these species or other listed species; and Wildlife and Sportfish Restoration program sportfish stocking).

(7) Environmental Protection Agency (water quality criteria and permitting).

(8) Tennessee Valley Authority (flood control, navigation, hydropower, and land management for the Tennessee River system).

(9) Office of Surface Mining (land resource management plans, mining permits, oil and natural gas permits, abandoned mine land projects, and renewable energy development).

(10) National Park Service (land management plans and permitting).

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, or designated for its use, that are

subject to an integrated natural resources management plan [INRMP] prepared under section 101 of the Sikes Act (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.” There are no Department of Defense (DoD) lands 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 critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will 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.

The first sentence in section 4(b)(2) of the Act requires that we take into consideration the economic, national security, or other relevant impacts of designating any particular area as critical habitat. We describe below the process that we undertook for taking into consideration each category of impacts and our analyses of the relevant impacts.

Consideration of Economic Impacts

Section 4(b)(2) of the Act and its implementing regulations require that we consider the economic impact that may result from a designation of critical habitat. To assess the probable economic impacts of a designation, we must first evaluate specific land uses or activities and projects that may occur in the area of the critical habitat. We then must evaluate the impacts that a specific critical habitat designation may have on restricting or modifying specific land uses or activities for the benefit of the species and their 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 these 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). The baseline, therefore, 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 4(b)(2) exclusion analysis.

For these particular designations, we developed an incremental effects memorandum (IEM; Service 2020b, entire) 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 longsolid and round hickorynut (Industrial Economics, Inc. 2020, entire). We began by conducting a screening analysis of the proposed critical habitat designation in order to filter out particular geographic areas of critical habitat that are already subject to such protections and are, therefore, unlikely to incur incremental economic impacts. In particular, the screening analysis considers baseline costs (i.e., absent critical habitat designation) and includes probable economic impacts where land and water use may 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 screening analysis also assesses whether units are unoccupied by the species and thus may require additional management or conservation efforts as a result of the critical habitat designation for the species; these additional efforts may incur incremental economic impacts. This screening analysis combined with the information contained in our IEM are what we consider our draft economic analysis

(DEA) of the proposed critical habitat designation for the longsolid and round hickorynut; our DEA is summarized in the narrative below.

Executive Orders (E.O.s) 12866 and 13563 direct Federal agencies to assess the costs and benefits of available regulatory alternatives in quantitative (to the extent feasible) and qualitative terms. Consistent with the 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. 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 longsolid and round hickorynut, first we identified, in the IEM dated February 13, 2020 (Service 2020b, entire), probable incremental economic impacts associated with the following categories of activities: instream excavation or dredging; impoundments; channelization; sand and gravel mining; clearing riparian vegetation; discharge of fill materials; urban development; water diversion; water withdrawal; water draw-down; hydropower generation and discharges; release of chemicals, biological pollutants, or heated effluents into surface water or connected ground water at a point source or by dispersed release (nonpoint); construction projects; oil and gas development; coal mining; livestock grazing; timber harvest; and other watershed or floodplain activities that release sediments or nutrients into the water. 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 only affects activities conducted, funded, permitted, or authorized by Federal agencies. If we list these species, in areas where the longsolid or round hickorynut are 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 these species, we also finalize this proposed critical habitat designation, consultations to avoid the destruction or adverse modification of critical habitat would be incorporated into the existing consultation process.

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 longsolid's and round hickorynut's critical habitat. Because the designation of critical habitat for the longsolid and round hickorynut is proposed concurrently with the listings, 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 would result solely from the designation of critical habitat; this is particularly difficult where there is no unoccupied critical habitat and, thus, there would already be consultations for all areas. 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 result in sufficient harm or harassment to constitute jeopardy to the longsolid or round hickorynut would also likely adversely affect the essential physical or biological features of critical

habitat. 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 longsolid includes 12 units, all of which are occupied by the species. Ownership of riparian lands adjacent to the proposed units includes 810 river mi (1,304 km; 74 percent) in private ownership and 305 river mi (491 km; 26 percent) in public (Federal, State, or local government) ownership. The proposed critical habitat designation for the round hickorynut includes 14 units, all of which are occupied by the species. Ownership of riparian lands adjacent to the proposed units includes 709 river mi (1,141 km; 77 percent) in private ownership and 212 river mi (341 km; 23 percent) in public (Federal, State, or local government) ownership.

Total incremental costs of critical habitat designation for the longsolid and round hickorynut are anticipated to be approximately \$327,000 (2020 dollars) per year for the next 10 years. The costs are reflective of the proposed critical habitat area (i.e., 1,115 river mi (1,794 km) for the longsolid and 921 river mi (1,482 km) for the round hickorynut (some of which overlap each other)), the presence of the species (i.e., already occupied) in these areas, and the presence of other federally listed species and designated critical habitats. Since consultation is already required in these areas as a result of the presence of other listed species and critical habitats and would be required as a result of the listing of the longsolid and round hickorynut, the economic costs of the critical habitat designation would likely be primarily limited to additional administrative efforts

to consider adverse modification for these two species in section 7 consultations. In total, 159 section 7 consultation actions (approximately 3 formal consultations, 114 informal consultations, and 38 technical assistance efforts) are anticipated to occur annually in proposed critical habitat areas. Critical habitat may also trigger additional regulatory changes. For example, the designation may cause other Federal, State, or local permitting or regulatory agencies to expand or change standards or requirements. Regulatory uncertainty generated by critical habitat may also have impacts. For example, landowners or buyers may perceive that the rule would restrict land or water use activities in some way and therefore value the use of the land less than they would have absent critical habitat. This is a perception, or stigma, effect of critical habitat on markets.

We are soliciting data and comments from the public on the DEA discussed above, as well as all aspects of this proposed rule and our required determinations. During the development of a final designation, we will consider the information presented in the DEA and any additional information on economic impacts we receive during the public comment period to determine whether any specific areas should be excluded from the final critical habitat designations under authority of section 4(b)(2) and our implementing regulations at 50 CFR 424.19. In particular, 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 either species.

Exclusions

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. We

consider a number of factors including whether there are permitted conservation plans covering the species in the area, such as habitat conservation plans, safe harbor agreements, or candidate conservation agreements with assurances, or whether there are non-permitted conservation agreements and partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at the existence of tribal conservation plans and partnerships and consider the government-to-government relationship of the United States with tribal entities. We also consider any social impacts that might occur because of the designation.

In preparing this proposal, we have determined that there are currently no habitat conservation plans or other management plans for the longsolid or round hickorynut, and the proposed designations do not include any tribal lands or trust resources. Thus, we anticipate no impact on tribal lands, partnerships, or habitat conservation plans from these proposed critical habitat designations. During the development of a final designation, we will consider any additional information we receive during the public comment period regarding other relevant impacts to determine whether any specific areas should be excluded from the final critical habitat designation under authority of section 4(b)(2) and our implementing regulations at 50 CFR 424.19.

Consideration of National Security Impacts

In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for longsolid or round hickorynut are not owned, managed, or used by the DoD or DHS, and, therefore, we anticipate no impact on national security or homeland security. However, during the development of a final designation we will consider any additional information received through the public comment period on the

impacts of the proposed designation on national security or homeland security to determine whether any specific areas should be excluded from the final critical habitat designation under authority of section 4(b)(2) and our implementing regulations at 50 CFR 424.19.

Required Determinations

Clarity of the Rule

We are required by Executive Orders 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 and 13563)

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget will review all significant rules.

The Office of Information and Regulatory Affairs has waived their review regarding their significance determination of this proposed rule.

Executive Order 13563 reaffirms the principles of E.O. 12866 while calling for improvements in the nation's regulatory system to promote predictability, to reduce uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. 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.

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 if 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 the 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 designations. There is no requirement under the RFA to evaluate 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 designations will not have a significant economic impact on a substantial number of small entities.

In summary, we have considered whether the proposed designations 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 designations will not have a significant economic impact on a substantial number of small business entities. Therefore, an initial regulatory flexibility analysis is not required.

Executive Order 13771

We do not believe this proposed rule is an E.O. 13771 (“Reducing Regulation and Controlling Regulatory Costs”) (82 FR 9339, February 3, 2017) regulatory action because we believe this rule is not significant under E.O. 12866; however, the Office of Information and Regulatory Affairs has waived their review regarding their E.O. 12866 significance determination of this proposed rule.

Energy Supply, Distribution, or Use—Executive Order 13211

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

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

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

(1) This proposed rule would not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or tribal governments, or the private sector, and includes both “Federal intergovernmental mandates” and “Federal private sector mandates.” These terms are defined in 2 U.S.C. 658(5)–(7). “Federal intergovernmental mandate” includes a regulation that “would impose an enforceable duty upon State, local, or tribal governments” with two exceptions. It excludes “a condition of Federal assistance.” It also excludes “a duty arising from participation in a voluntary Federal program,” unless the regulation “relates to a then-existing Federal program under which \$500,000,000 or more is provided annually to State, local, and tribal governments under

entitlement authority,” if the provision would “increase the stringency of conditions of assistance” or “place caps upon, or otherwise decrease, the Federal Government’s responsibility to provide funding,” and the State, local, or tribal governments “lack authority” to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. “Federal private sector mandate” includes a regulation that “would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.”

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions do not 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 greater in any year, that is, it is not a “significant regulatory action” under the Unfunded Mandates Reform Act. The designation of critical habitat imposes no obligations on State or local governments and, as such, a Small Government Agency Plan is not required. 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 longsolid and round hickorynut in a takings implications assessment. The Act does not authorize the Service to regulate private actions on private lands or confiscate private property as a result of critical habitat designation. Designation of critical habitat does not affect land ownership, or establish any closures, or restrictions on use of or access to the designated areas. Furthermore, the designation of critical habitat does not affect landowner actions that do not require Federal funding or permits, nor does it preclude development of habitat conservation programs or issuance of incidental take permits to permit actions that do require Federal funding or permits to go forward. However, Federal agencies are prohibited from carrying out, funding, or authorizing actions that would destroy or adversely modify critical habitat. A takings implications assessment has been completed for the proposed designations of critical habitat for the longsolid and round hickorynut, and it concludes that, if adopted, these designations of critical habitat do not pose significant takings implications for lands within or affected by the designations.

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 these proposed critical habitat designations 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 national government and the States, or on the distribution of powers and responsibilities among the various levels of government. The proposed designations 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 Executive Order 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 elements of physical or biological features essential to the conservation of the species. The proposed areas of designated 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.)

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*) in connection with designating critical habitat under the Act. We published a notice outlining our reasons for

this determination in the *Federal Register* on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County v. Babbitt*, 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).

Government-to-Government Relationship with Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes. We have determined that no tribal lands fall within the boundaries of the proposed critical habitat designations for the longsolid and round hickorynut, so no tribal lands would be affected by the proposed designations.

References Cited

A complete list of references cited in the petition finding for the purple lilliput and this rulemaking for the longsolid and round hickorynut is available on the Internet at <http://www.regulations.gov> and upon request from the Asheville Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this document are the staff members of the Fish and Wildlife Service’s Species Assessment Team, Ecological Services Program, and the Service’s Asheville Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

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

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. Amend § 17.11(h) by adding entries for “Hickorynut, round” and “Longsolid” to the List of Endangered and Threatened Wildlife in alphabetical order under CLAMS to read as set forth below:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * *	* * *			
CLAMS				
* * * *	* * *			

Hickorynut, round	<i>Obovaria subrotunda</i>	Wherever found	T	[<i>Federal Register</i> citation when published as a final rule]; 50 CFR 17.45(d); ^{4d} 50 CFR 17.95(f). ^{CH}
* * * * *				
Longsolid	<i>Fusconaia subrotunda</i>	Wherever found	T	[<i>Federal Register</i> citation when published as a final rule]; 50 CFR 17.45(d); ^{4d} 50 CFR 17.95(f). ^{CH}
* * * * *				

3. Revise § 17.45 to read as follows:

§ 17.45 Special rules—snails and clams.

(a)-(c) [Reserved]

(d) Longsolid (*Fusconaia subrotunda*) and round hickorynut (*Obovaria subrotunda*).

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

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

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

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

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

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

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

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

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

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

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

(A) Conservation and restoration efforts for listed species by the Service or State wildlife agencies, including, but not limited to, collection of broodstock, tissue collection for genetic analysis, captive propagation, and subsequent stocking into unoccupied areas within the historical range of the species.

(B) Channel restoration projects that create natural, physically stable, ecologically functioning streams (or stream and wetland systems). These projects can be accomplished using a variety of methods, but the desired outcome is a natural channel with low shear stress (force of water moving against the channel); bank heights that enable reconnection to the floodplain; connection of surface and groundwater systems, resulting in perennial flows in the channel; riffles and pools comprised of existing soil, rock, and wood instead of large imported materials; low compaction of soils within adjacent riparian areas; and inclusion of riparian wetlands. Streams reconstructed in this way would offer suitable habitats for the longsolid and round hickorynut and contain stable channel features, such as pools, glides, runs, and riffles, which could be used by the species and its host fish for spawning, rearing, growth, feeding, migration, and other normal behaviors. Prior to commencement of restoration actions, surveys to determine presence of the longsolid and round hickorynut must be performed, and if located, in coordination with the local

Service field office, mussels must be relocated prior to project implementation, and monitored post-implementation. To qualify under this exemption, a channel restoration project must satisfy all Federal, State, and local permitting requirements.

(C) Bank restoration projects that use bioengineering methods to replace pre-existing, bare, eroding stream banks with vegetated, stable stream banks, thereby reducing bank erosion and instream sedimentation and improving habitat conditions for the species. Following these bioengineering methods, stream banks may be stabilized using native species live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), native species live fascines (live branch cuttings, usually willows, bound together into long, cigar-shaped bundles), or native species brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). Bank restoration projects would require planting appropriate native vegetation, including woody species appropriate for the region and habitat. These methods will not include the sole use of quarried rock (rip-rap) or the use of rock baskets or gabion structures. Prior to commencement of bank stabilization actions, surveys to determine presence of longsolid and round hickorynut must be performed, and if located, in coordination with the local Service field office, mussels must be relocated prior to project implementation, and monitored post-implementation. To qualify under this exemption, a bank restoration project must satisfy all Federal, State, and local permitting requirements.

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

4. Amend § 17.95(f) by:

a. Adding, immediately following the entry for “Carolina Heelsplitter (*Lasmigona decorata*),” an entry for “Round Hickorynut (*Obovaria subrotunda*)”; and

b. Adding, immediately following the new entry for “Round Hickorynut (*Obovaria subrotunda*),” an entry for “Longsolid (*Fusconaia subrotunda*)”.

The additions read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(f) *Clams and Snails.*

* * * * *

Round Hickorynut (*Obovaria subrotunda*)

(1) Critical habitat units for the round hickorynut are depicted on the maps in this entry for Jackson, Madison, and Marshall Counties, Alabama; Fulton, Marshall, Pulaski, and Starke Counties, Indiana; Bath, Butler, Campbell, Edmonson, Fleming, Green, Harrison, Hart, Kenton, Laurel, Morgan, Nicholas, Pendleton, Pulaski, Rockcastle, Robertson, Rowan, and Warren Counties, Kentucky; Montgomery County, Mississippi; Bedford, Marshall, and Maury Counties, Tennessee; Ashtabula, Lake, and Trumbull Counties, Ohio; Crawford and Mercer Counties, Pennsylvania; and Braxton, Calhoun, Clay, Doddridge, Fayette, Gilmer, Kanawha, Pleasants, Ritchie, Tyler, and Wood Counties, West Virginia.

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

(i) Adequate flows, or a hydrologic flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to

maintain benthic habitats where the species are found and to maintain stream connectivity, specifically providing for the exchange of nutrients and sediment for maintenance of the mussel's and fish host's habitat and food availability, maintenance of spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats. 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).

(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) with habitats that support a diversity of freshwater mussel and native fish (such as, stable riffle-run-pool habitats that provide flow refuges consisting of predominantly silt-free, stable sand, gravel, and cobble substrates).

(iii) Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including (but not limited to): dissolved oxygen (generally above 2 to 3 parts per million (ppm)), salinity (generally below 2 to 4 ppm), and temperature (generally below 86 °Fahrenheit (°F) (30 °Celsius (°C))). Additionally, water and sediment should be low in ammonia (generally below 0.5 ppm total ammonia-nitrogen) and heavy metal concentrations, and lack excessive total suspended solids and other pollutants.

(iv) The presence and abundance of fish hosts necessary for recruitment of the round hickorynut (i.e., eastern sand darter (*Ammocrypta pellucida*), emerald darter (*Etheostoma baileyi*), greenside darter (*E. blennioides*), Iowa darter (*E. exile*), fantail darter (*E. flabellare*), Cumberland darter (*E. susanae*), spangled darter (*E. obama*), variegate darter (*E. variatum*), blackside darter (*Percina maculata*), frecklebelly darter (*P. stictogaster*), and banded sculpin (*Cottus carolinae*)).

(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 this rule.

(4) *Critical habitat map units.* Data layers defining map units were created by overlaying Natural Heritage Element Occurrence data and U.S. Geological Survey hydrologic data for stream reaches. The hydrologic data used in the critical habitat maps were extracted from the U.S. Geological Survey 1:1M scale nationwide hydrologic layer (<https://www.usgs.gov/core-science-systems/ngp/national-hydrography>) with a projection of EPSG:4269—NAD83 Geographic. Natural Heritage program and State mussel database species presence data from Pennsylvania, Ohio, Indiana, West Virginia, Kentucky, Tennessee, Alabama, and Mississippi were used to select specific river and stream segments for inclusion in the critical habitat layer. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which each map is based are available to the public at the Service's Internet site at <https://www.fws.gov/Asheville/>, at <http://www.regulations.gov> at Docket No. FWS-R4-ES-2020-0010, and at the field office responsible for this designation. You may obtain field office location information

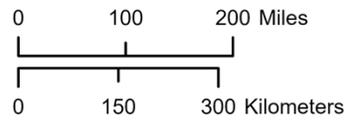
by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) *Note:* Index map for the round hickorynut follows:

Round Hickorynut Extant Management Units and Critical Habitat



-  Critical Habitat
-  Extant Management Units
-  State Boundaries



(6) Unit RH 1: Shenango River; Crawford and Mercer Counties, Pennsylvania.

(i) *General description:* Unit RH 1 consists of 22 river miles (mi) (35.5 kilometers (km)) of the Shenango River in Crawford County, Pennsylvania, from Pymatuning Dam downstream to the point of inundation by Shenango River Lake near Big Bend, Mercer County, Pennsylvania. Approximately 15 river mi (24.3 km; 68 percent) of riparian lands that border the unit are private ownership, and 7 river mi (11.1 km; 32 percent) are public (Federal or State) ownership. This unit is immediately downstream from Pymatuning Dam, which is owned by the State of Pennsylvania.

(ii) Map of Unit RH 1 follows:

Critical Habitat for Round Hickorynut
 RH1 Shenango River; Crawford and Mercer Counties, Pennsylvania



Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 5 Kilometers
 1 inch = 3 miles



(7) Unit RH 2: Grand River; Ashtabula, Lake, and Trumbull Counties, Ohio.

(i) *General description:* Unit RH 2 consists of 92 river mi (148.2 km) of the Grand River in Ashtabula, Lake, and Trumbull Counties, Ohio. Approximately 59 river mi (95.2 km; 64 percent) of riparian lands that border the unit are private ownership, and 33 river mi (53 km; 36 percent) are public (State or local) ownership. The Grand River is a State Wild and Scenic River. The Wild River designation includes approximately 23 river mi (37 km) from the Harpersfield Covered Bridge downstream to the Norfolk and Western Railroad Trestle in Lake County, and approximately 33 mi (53 km) from the U.S. Route 322 Bridge in Ashtabula County downstream to the Harpersfield Covered Bridge. Harpersfield Dam within this unit is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit RH 2 follows:

Critical Habitat for Round Hickorynut
 RH2 Grand River; Ashtabula, Lake, and Trumbull Counties, Ohio



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 11 Kilometers
 1 inch = 7 miles

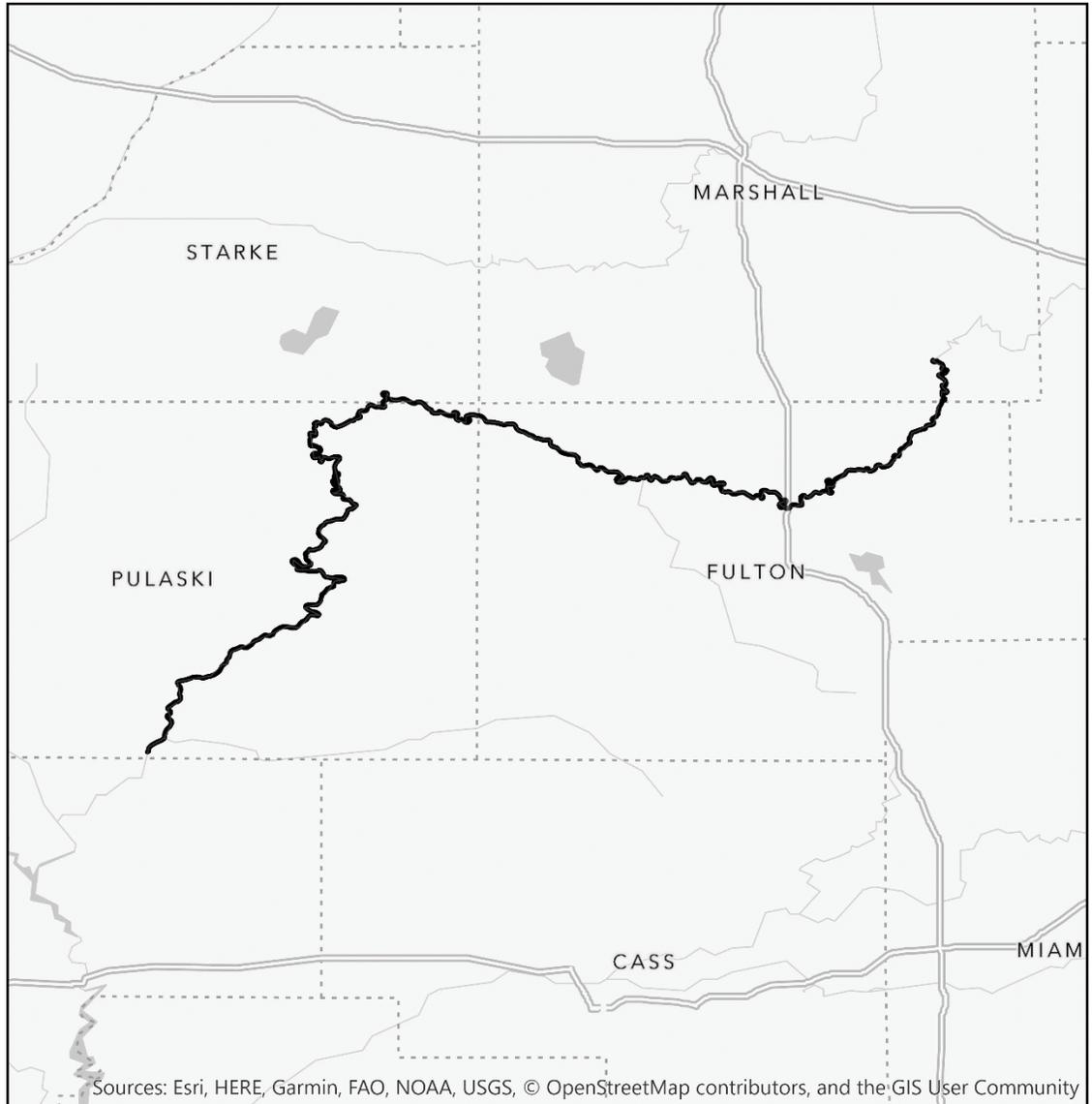


(8) Unit RH 3: Tippecanoe River; Fulton, Marshall, Pulaski, and Starke Counties, Indiana.

(i) *General description:* Unit RH 3 consists of 75 river mi (120.8 km) of the Tippecanoe River in Fulton, Marshall, Pulaski, and Starke Counties, Indiana. Approximately 66 river mi (105.6 km; 89 percent) of riparian lands that border the unit are private ownership, and 9 river mi (14.5 km; 11 percent) are public (State or easement) ownership.

(ii) Map of Unit RH 3 follows:

Critical Habitat for Round Hickorynut
 RH3 Tippecanoe River; Fulton, Marshall, Pulaski, and Starke Counties, Indiana



- Critical Habitat
- Major Road
- - - County Boundary
- · - State Boundary
- River
- Waterbody

1 inch = 15 Kilometers
 1 inch = 9 miles



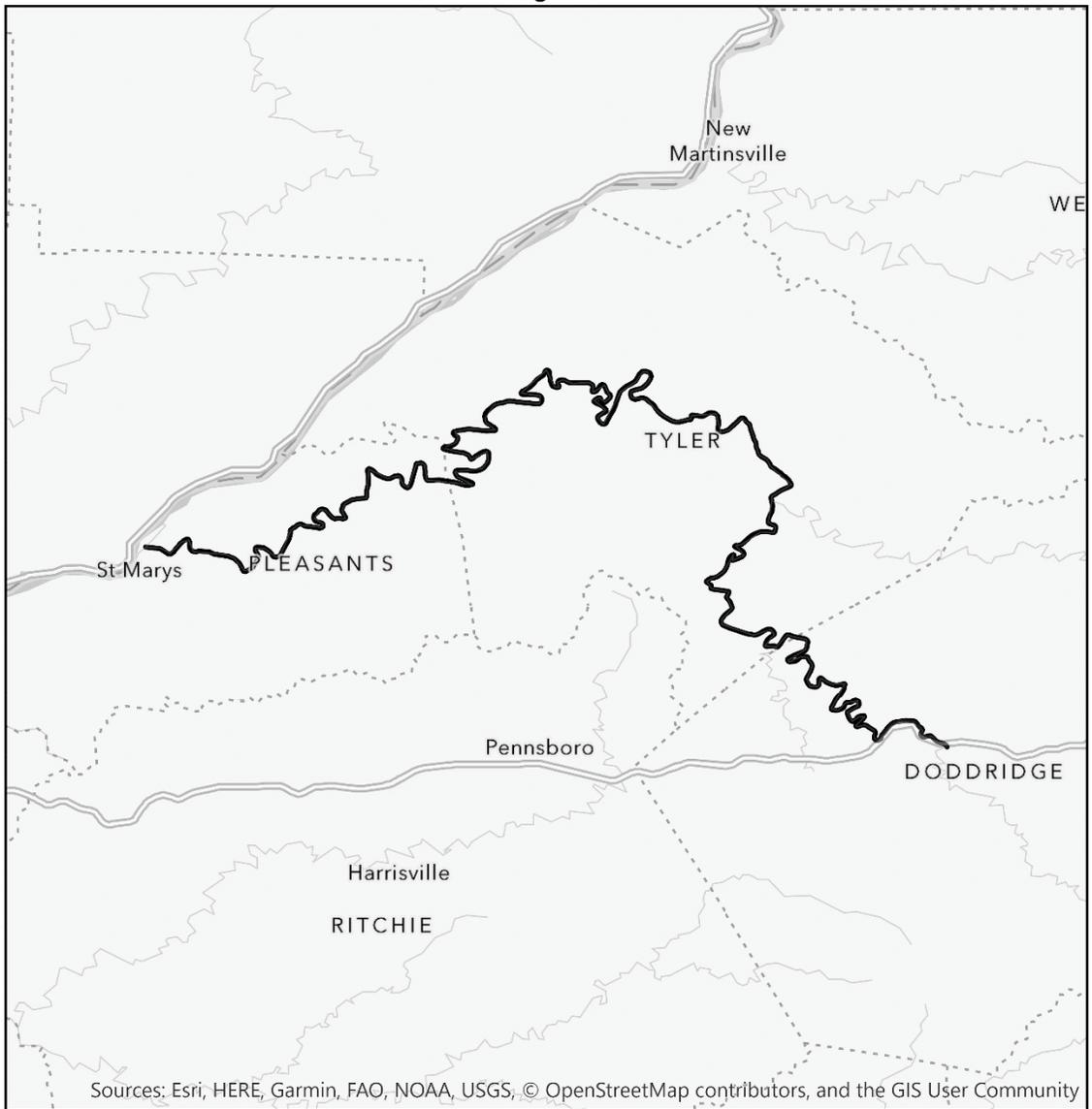
(9) Unit RH 4: Middle Island Creek; Doddridge, Pleasants, and Tyler Counties, West Virginia.

(i) *General description:* Unit RH 4 consists of 75 stream mi (120.8 km) of Middle Island Creek in Doddridge, Pleasants, and Tyler Counties, West Virginia.

Approximately 74.8 stream mi (120.4 km; 99 percent) of riparian lands that border the unit are private ownership, and 0.2 stream mi (0.4 km; less than 1 percent) is public ownership.

(ii) Map of Unit RH 4 follows:

Critical Habitat for Round Hickorynut
 RH4 Middle Island Creek; Doddridge, Pleasants, and Tyler Counties, West
 Virginia



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 12 Kilometers
 1 inch = 8 miles

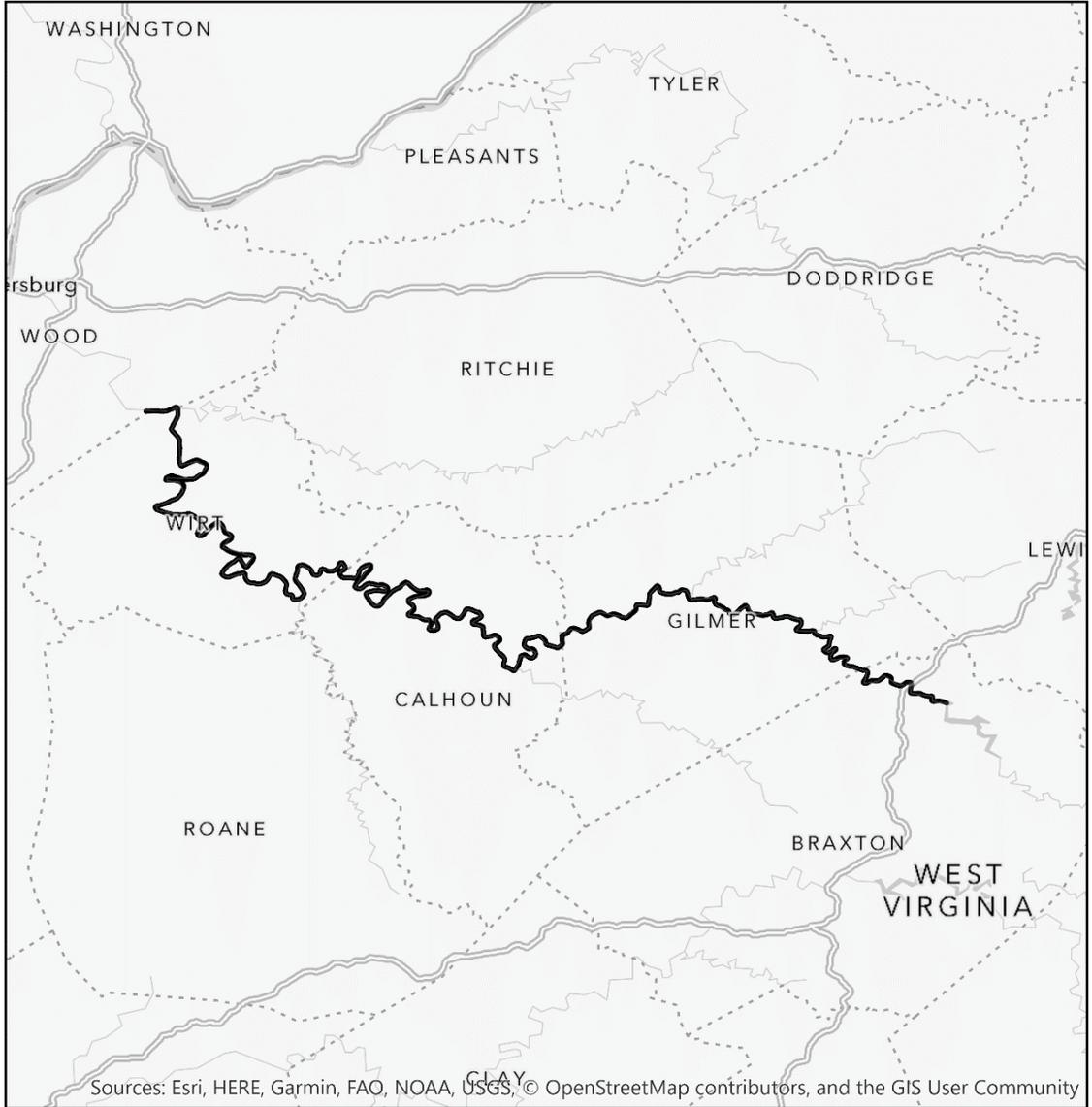


(10) Unit RH 5: Little Kanawha River; Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia.

(i) *General description:* Unit RH 5 consists of 110 stream mi (176.6 km) of the Little Kanawha River in Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia. Approximately 109 river mi (175.4 km; 99 percent) of riparian lands that border the unit are private ownership, and 0.7 river mi (1.2 km; 1 percent) are public (Federal, State, or local) ownership. This unit is directly below Burnsville Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit RH 5 follows:

Critical Habitat for Round Hickorynut
RH5 Little Kanawha River; Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 21 Kilometers
 1 inch = 13 miles

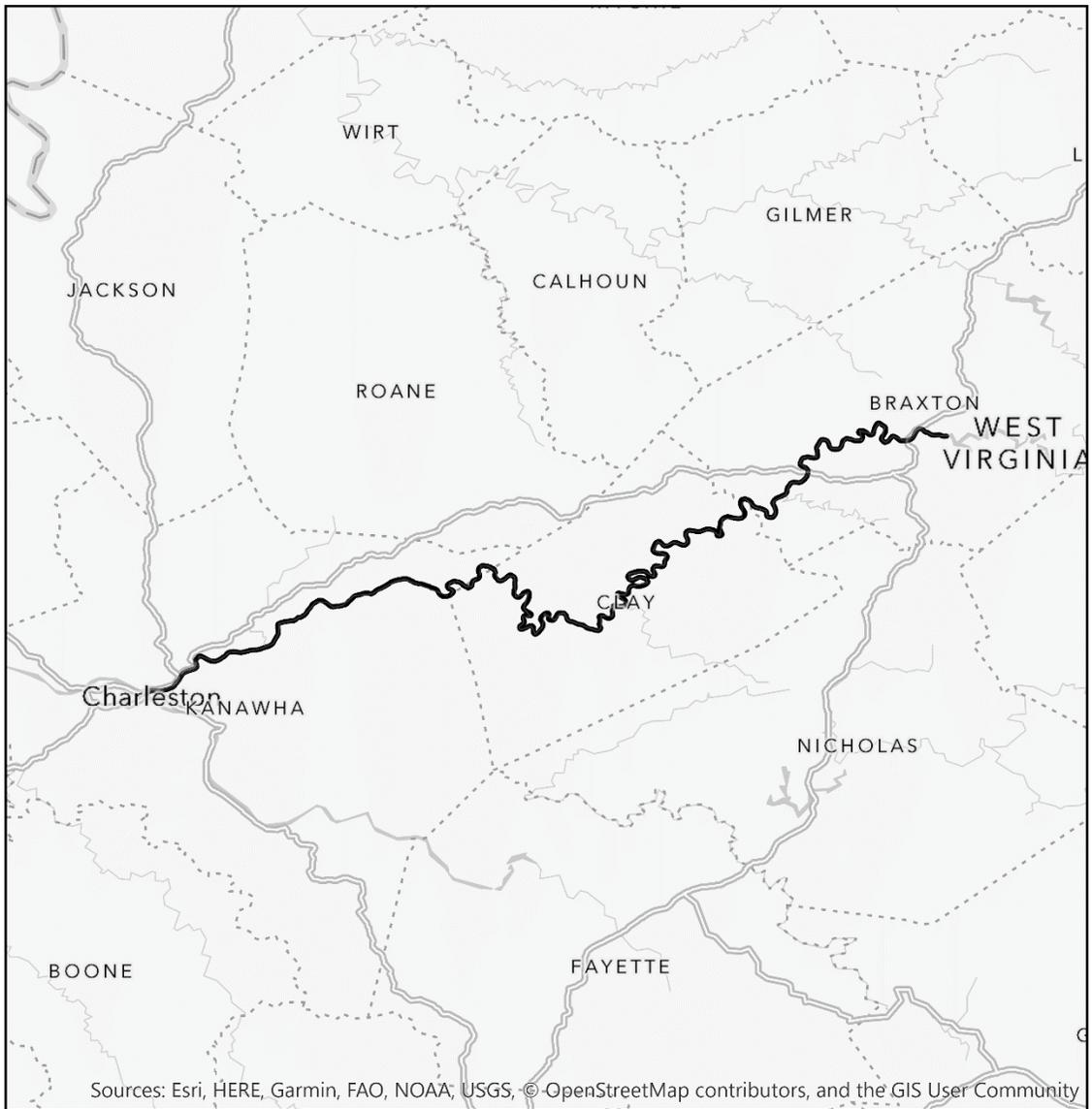


(11) Unit RH 6: Elk River; Braxton, Clay, and Kanawha Counties, West Virginia.

(i) *General description:* Unit RH 6 consists of 101 river mi (163 km) of the Elk River in Braxton, Clay, and Kanawha Counties, West Virginia. Approximately 93 river mi (150.3 km; 92 percent) of riparian lands that border the unit are private ownership, and 7 river mi (12.7 km; 8 percent) are public (Federal, State, or local) ownership. This unit is immediately below Sutton Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit RH 6 follows:

Critical Habitat for Round Hickorynut
RH6 Elk River; Braxton, Clay, and Kanawha Counties, West Virginia



-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 25 Kilometers
1 inch = 15 miles

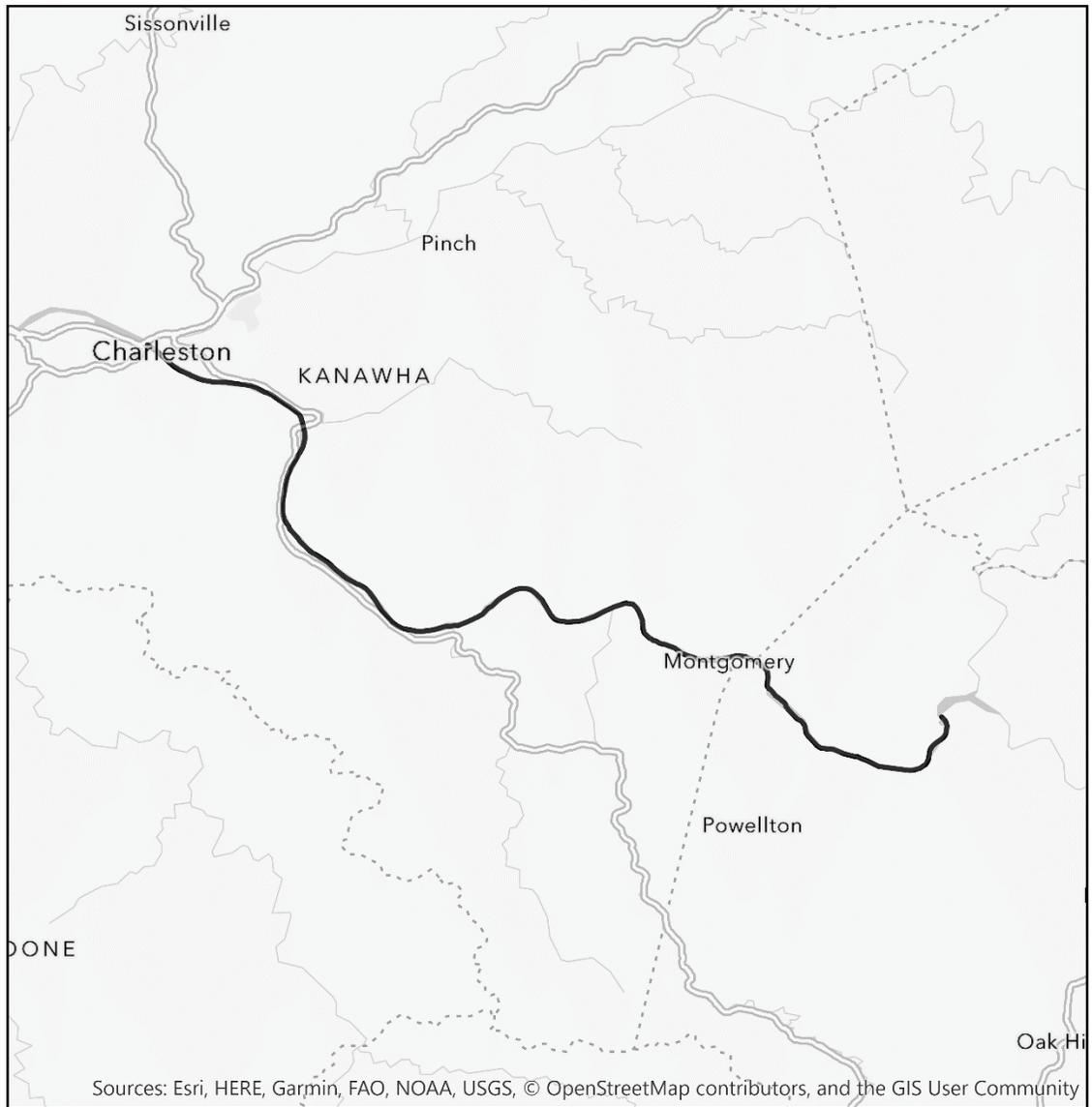


(12) Unit RH 7: Kanawha River; Fayette and Kanawha Counties, West Virginia.

(i) *General description:* Unit RH 7 consists of 37.5 river mi (60.4 km) of the Kanawha River in Fayette and Kanawha Counties, West Virginia. Approximately 33 river mi (53.2 km; 90 percent) of riparian lands that border the unit are private ownership, and 4 river mi (7.2 km; 10 percent) are public (Federal, State, or local) ownership. London and Marmet locks and dams within this unit are operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit RH 7 follows:

Critical Habitat for Round Hickorynut RH7 Kanawha River; Fayette and Kanawha Counties, West Virginia



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 11 Kilometers
1 inch = 7 miles

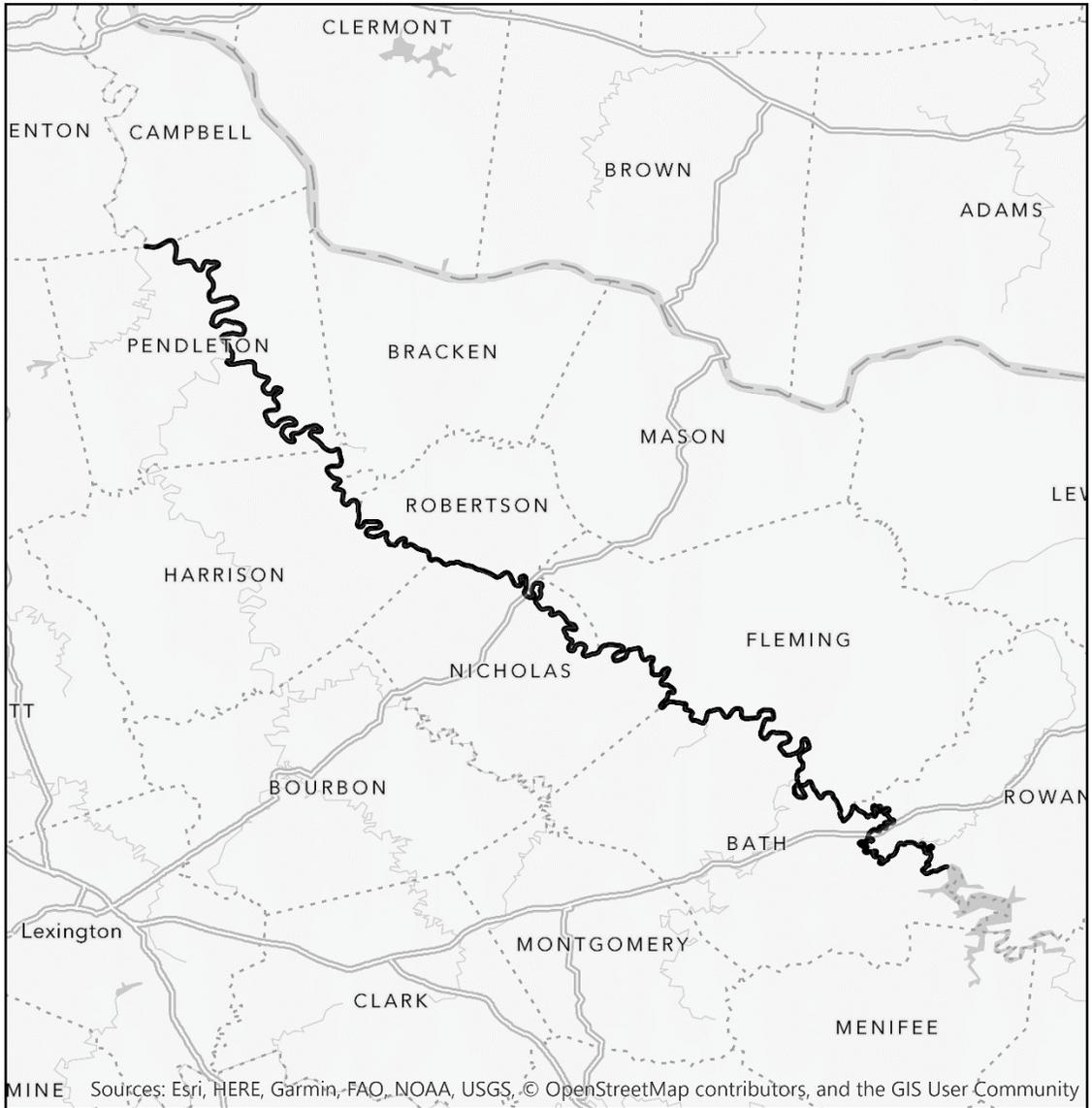


(13) Unit RH 8: Licking River; Bath, Campbell, Fleming, Harrison, Kenton, Morgan, Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky.

(i) *General description:* Unit RH 8 consists of 150 river mi (241.9 km) of the Licking River in Bath, Campbell, Fleming, Harrison, Kenton, Morgan, Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky. Approximately 131 river mi (211.8 km; 87 percent) of riparian lands that border the unit are private ownership, and 18 river mi (30 km; 13 percent) are public (Federal, State, or local) ownership. This unit is directly below Cave Run Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit RH 8 follows:

**Critical Habitat for Round Hickorynut
RH8 Licking River; Bath, Campbell, Fleming, Harrison, Kenton, Morgan,
Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky**



-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 23 Kilometers
1 inch = 14 miles



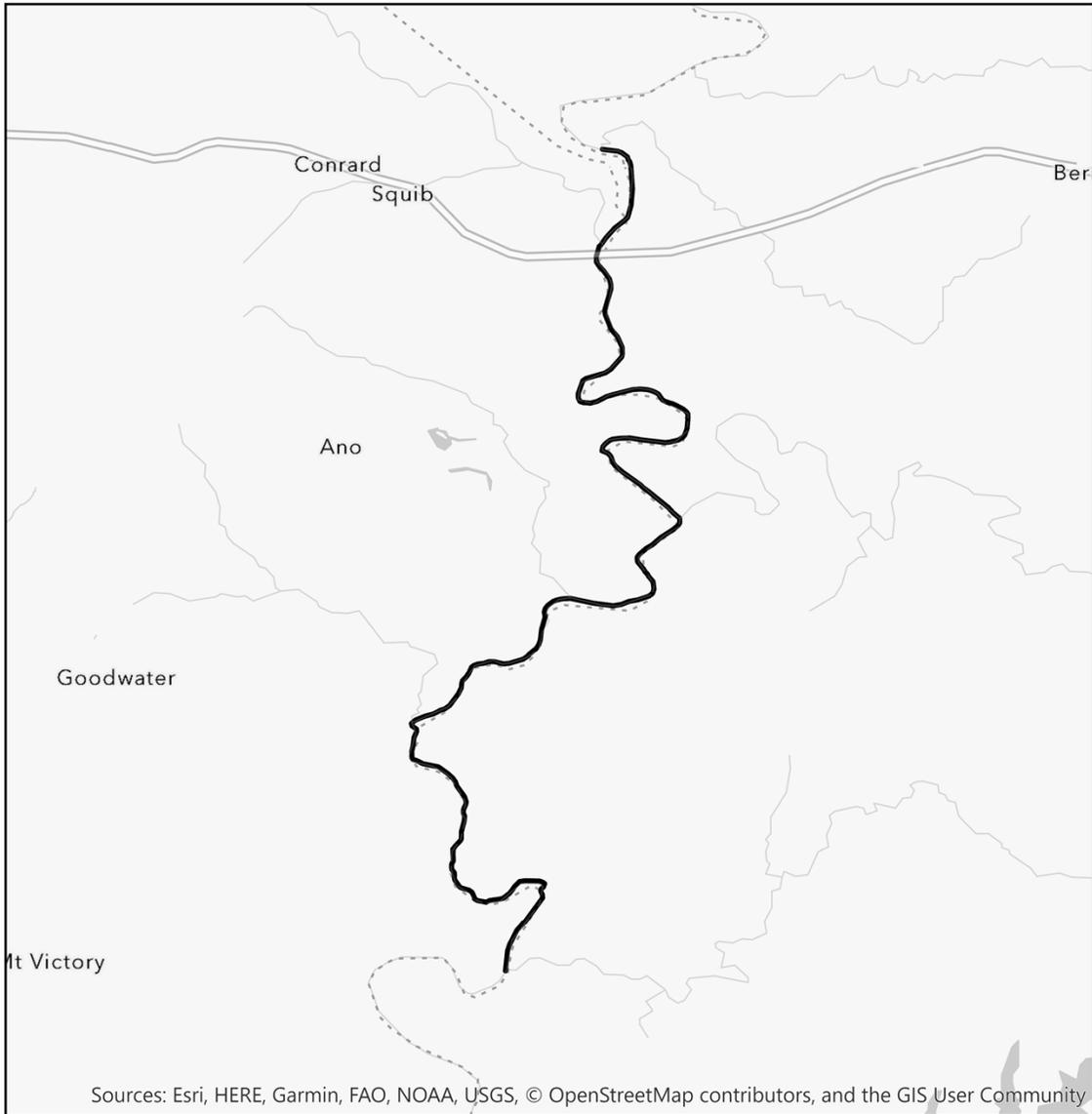
(14) Unit RH 9: Rockcastle River; Laurel, Pulaski, and Rockcastle Counties, Kentucky.

(i) *General description:* Unit RH 9 consists of 15.3 river mi (24.6 km) of the Rockcastle River in Laurel, Pulaski, and Rockcastle Counties, Kentucky.

Approximately 0.3 river mi (0.4 km; 1 percent) of riparian lands that border the unit is private ownership, and 15 river mi (24.2 km; 99 percent) are public (Federal; Daniel Boone National Forest) ownership.

(ii) Map of Unit RH 9 follows:

Critical Habitat for Round Hickorynut
 RH9 Rockcastle River; Laurel, Pulaski, and Rockcastle Counties, Kentucky



-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 3 Kilometers
 1 inch = 2 miles

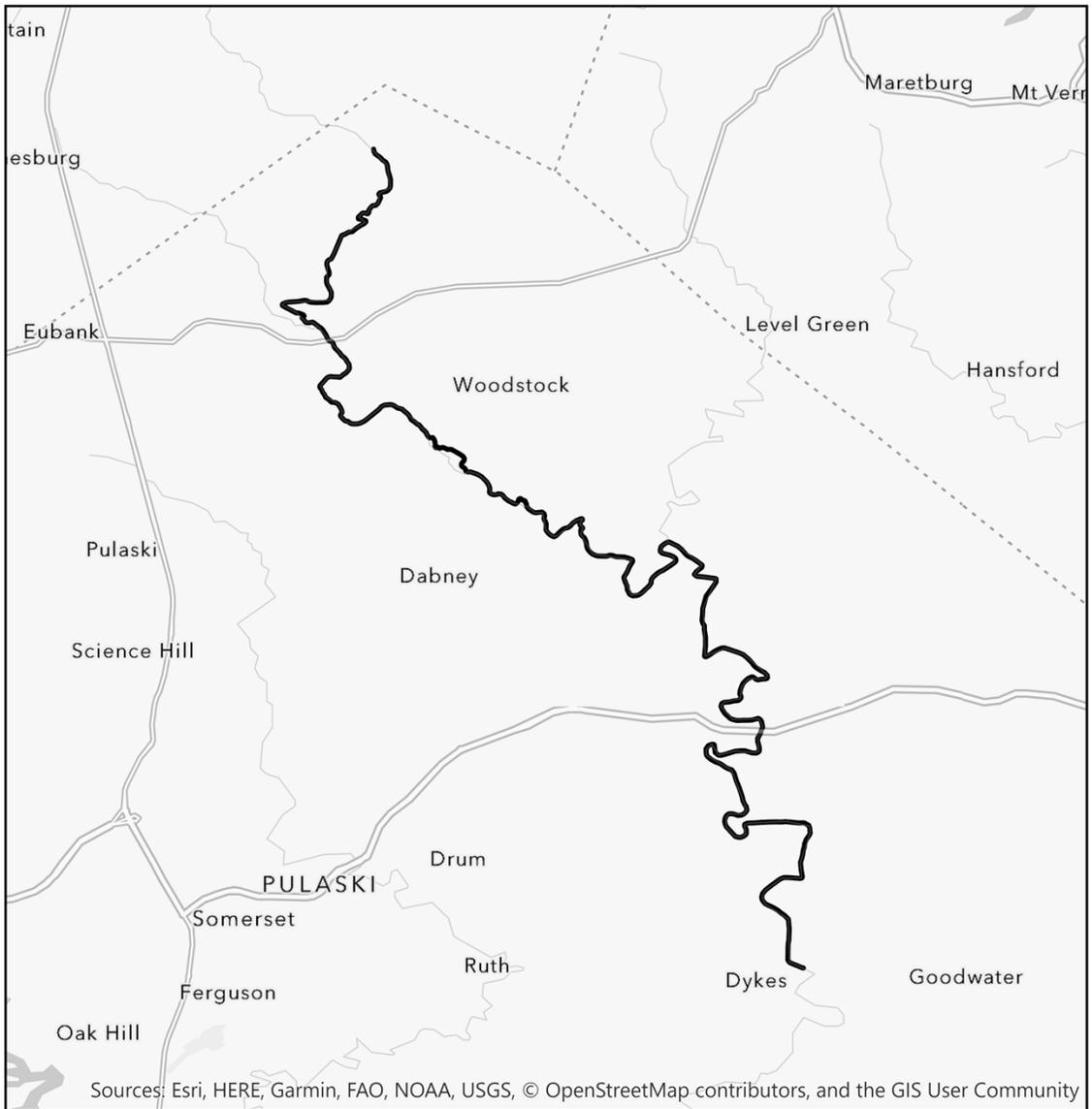


(15) Unit RH 10: Buck Creek, Pulaski County, Kentucky.

(i) *General description:* Unit RH 10 consists of 36 stream mi (58.1 km) of Buck Creek in Pulaski County, Kentucky. Approximately 33 stream mi (52.6 km; 92 percent) of riparian lands that border the unit are private ownership, and 3 stream mi (5.5 km; 8 percent) are public (State or local) ownership.

(ii) Map of Unit RH 10 follows:

Critical Habitat for Round Hickorynut RH10 Buck Creek; Pulaski County, Kentucky



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 6 Kilometers
1 inch = 4 miles

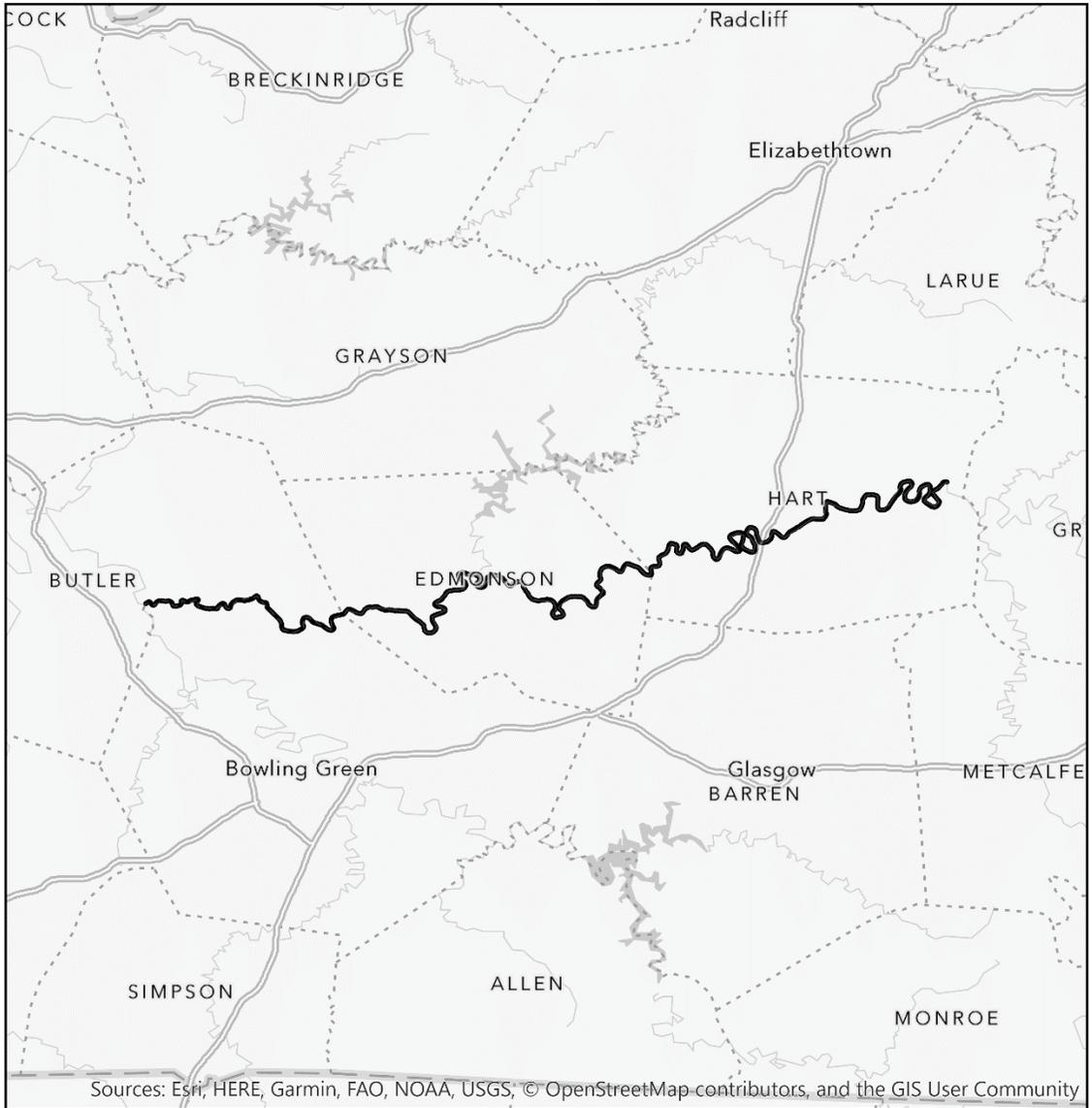


(16) Unit RH 11: Green River; Hart, Edmonson, Green, Butler, and Warren Counties, Kentucky.

(i) *General description:* Unit RH 11 consists of 98 river mi (157.7 km) of the Green River in Butler, Edmonson, Green, Hart, and Warren Counties, Kentucky. Approximately 61 river mi (98.4 km; 62 percent) of riparian lands that border the unit are private ownership, and 37 river mi (59.4 km; 38 percent) are public (Federal or State) ownership, including portions of Mammoth Cave National Park. This unit is located directly below Green River Lake Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit RH 11 follows:

**Critical Habitat for Round Hickorynut
RH11 Green River; Butler, Edmonson, Green, Hart, and Warren Counties,
Kentucky**



-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 23 Kilometers
1 inch = 14 miles

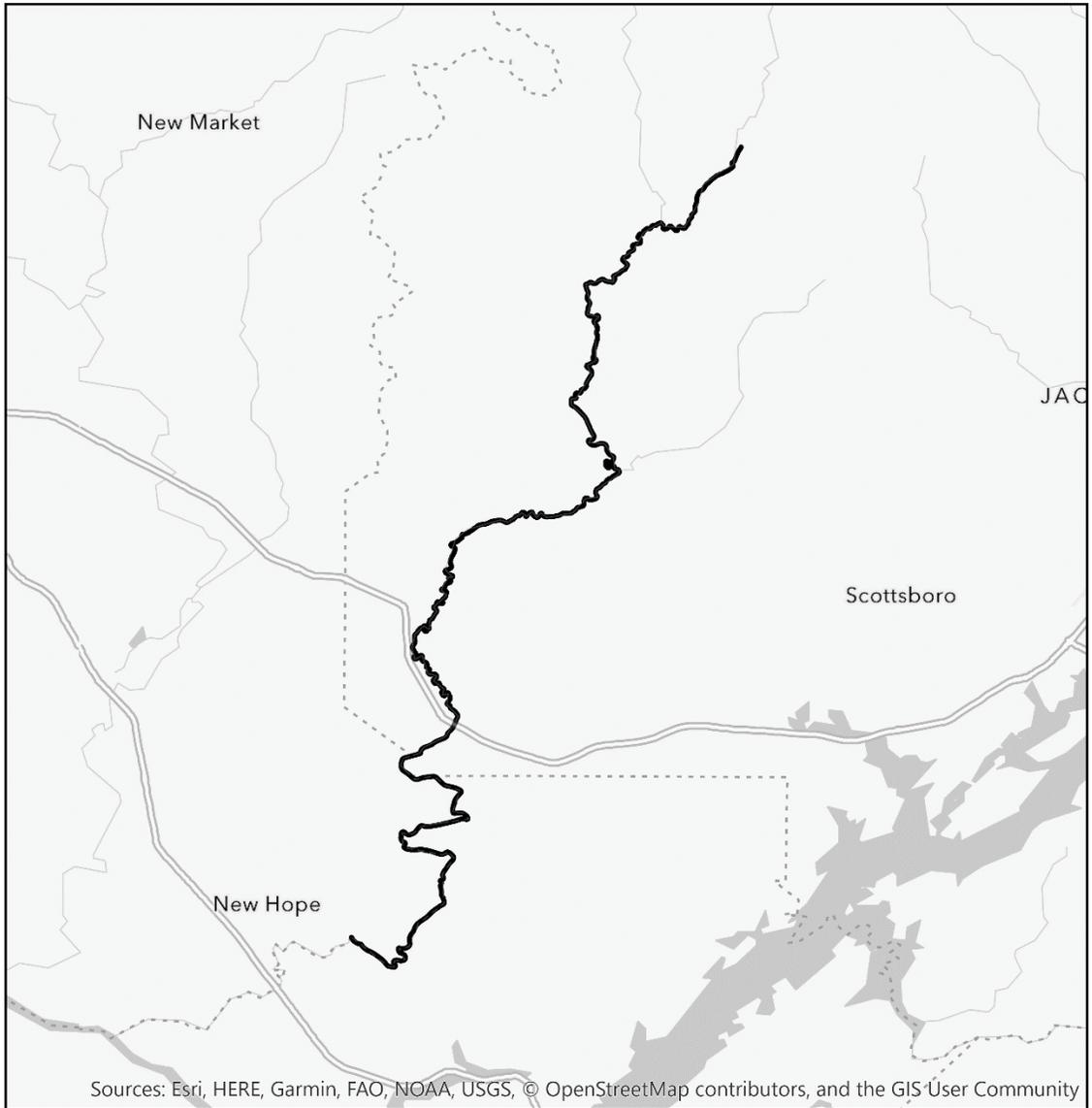


(17) Unit RH 12: Paint Rock River; Jackson, Madison, and Marshall Counties, Alabama.

(i) *General description:* Unit RH 12 consists of 48 river mi (77.5 km) of the Paint Rock River in Jackson, Madison, and Marshall Counties, Alabama. Approximately 2 river mi (4.1 km; 2 percent) of riparian lands that border the unit are private ownership, and 46 river mi (73.4 km; 98 percent) are public (Federal or State) ownership.

(ii) Map of Unit RH 12 follows:

Critical Habitat for Round Hickorynut
RH12 Paint Rock River; Jackson, Madison, and Marshall Counties, Alabama



- Critical Habitat
- == Major Road
- - - County Boundary
- · - State Boundary
- River
- Waterbody

1 inch = 10 Kilometers
1 inch = 6 miles

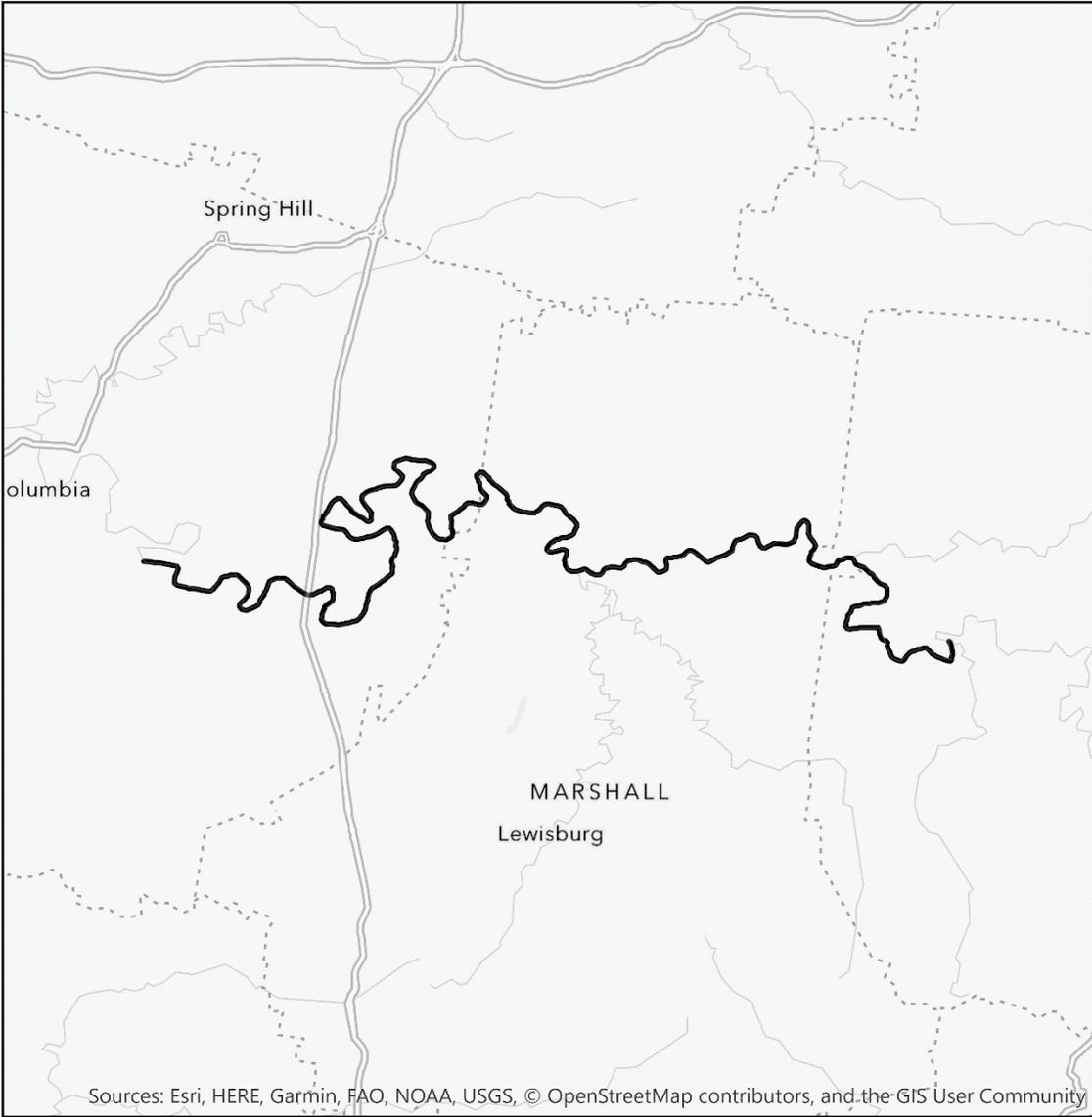


(18) Unit RH 13: Duck River; Bedford, Marshall, and Maury Counties, Tennessee.

(i) *General description:* Unit RH 13 consists of 59 river mi (94.8 km) of the Duck River in Bedford, Marshall, and Maury Counties, Tennessee. Approximately 27 river mi (43.7 km; 47 percent) of riparian lands that border the unit are private ownership, and 32 river mi (51.1 km; 53 percent) are public (State or local) ownership.

(ii) Map of Unit RH 13 follows:

Critical Habitat for Round Hickorynut
 RH13 Duck River; Bedford, Marshall, and Maury Counties, Tennessee



-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

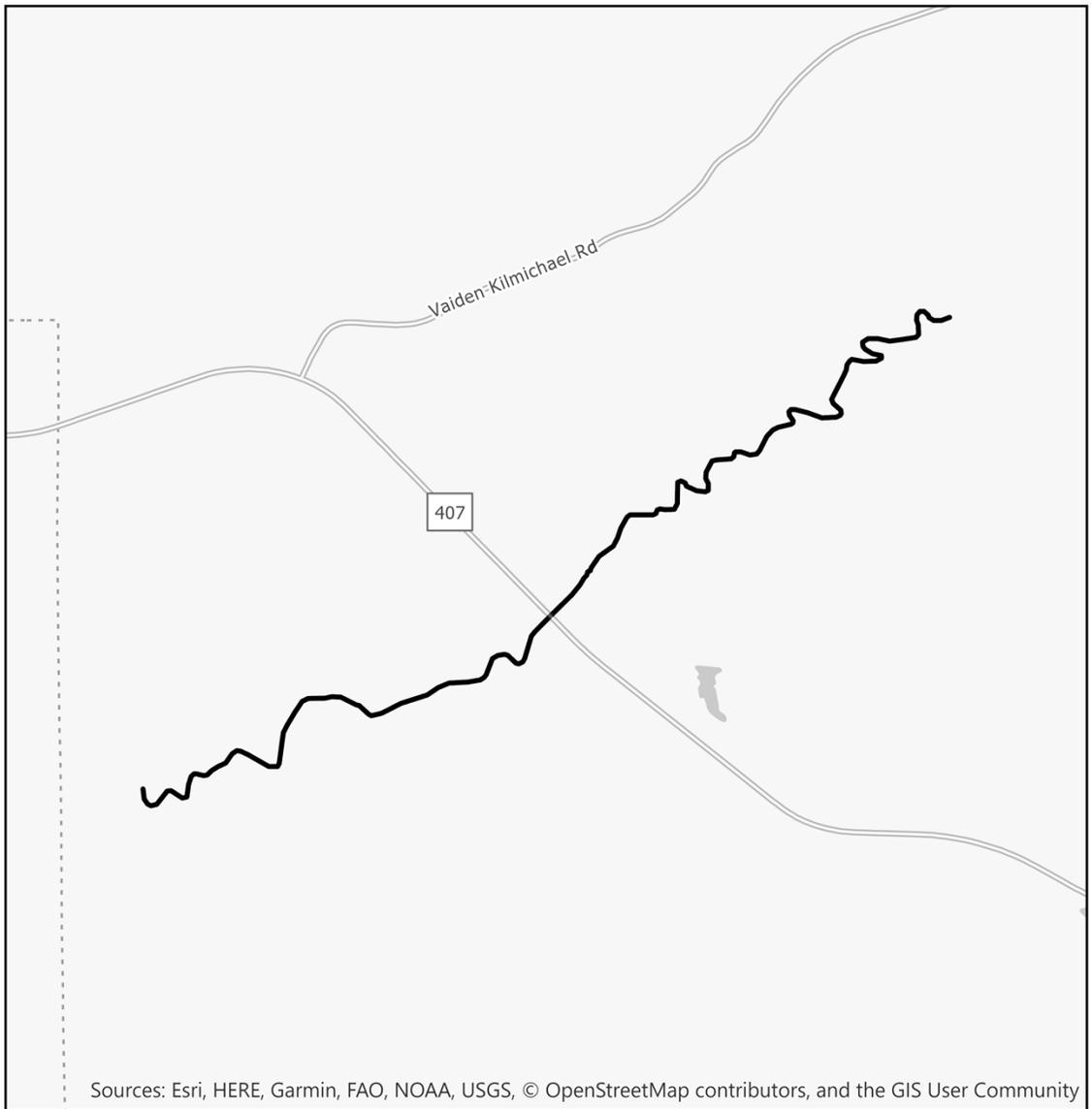


(19) Unit RH 14: Big Black River, Montgomery County, Mississippi.

(i) *General description:* Unit RH 14 consists of 4 river mi (7 km) of the Big Black River in Montgomery County, Mississippi. All of riparian lands that border the unit are private ownership.

(ii) Map of Unit RH 14 follows:

Critical Habitat for Round Hickorynut
RH14 Big Black River; Montgomery County, Mississippi



- Critical Habitat
- == Major Road
- - - County Boundary
- - - State Boundary
- River
- Waterbody

1 inch = 1 Kilometers
1 inch = 1 miles



* * * * *

Longsolid (*Fusconaia subrotunda*)

(1) Critical habitat units for the longsolid are depicted on the maps in this entry for Jackson, Madison, and Marshall Counties, Alabama; Bath, Butler, Campbell, Edmonson, Fleming, Green, Harrison, Hart, Kenton, Morgan, Nicholas, Pendleton, Robertson, Rowan, Taylor, and Warren Counties, Kentucky; Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren Counties, Pennsylvania; Claiborne, Hancock, Hawkins, Smith, Trousdale, and Wilson Counties, Tennessee; Russell, Scott, Tazewell, and Wise Counties, Virginia; and Braxton, Calhoun, Clay, Doddridge, Fayette, Gilmer, Kanawha, Ritchie, Tyler, and Wood Counties, West Virginia.

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

(i) Adequate flows, or a hydrologic flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain stream connectivity, specifically providing for the exchange of nutrients and sediment for maintenance of the mussel's and fish host's habitat and food availability, maintenance of spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats. 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).

(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) with habitats that support a diversity of freshwater mussel and native fish (such as, stable riffle-run-pool habitats that provide flow refuges consisting of predominantly silt-free, stable sand, gravel, and cobble substrates).

(iii) Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including (but not limited to): dissolved oxygen (generally above 2 to 3 parts per million (ppm)), salinity (generally below 2 to 4 ppm), and temperature (generally below 86 °Fahrenheit (°F) (30 °Celsius (°C))). Additionally, water and sediment should be low in ammonia (generally below 0.5 ppm total ammonia-nitrogen) and heavy metal concentrations, and lack excessive total suspended solids and other pollutants.

(iv) The presence and abundance of fish hosts necessary for recruitment of the longsolid (currently unknown, likely includes the minnows of the family Cyprinidae, and banded sculpin (*Cottus carolinae*)).

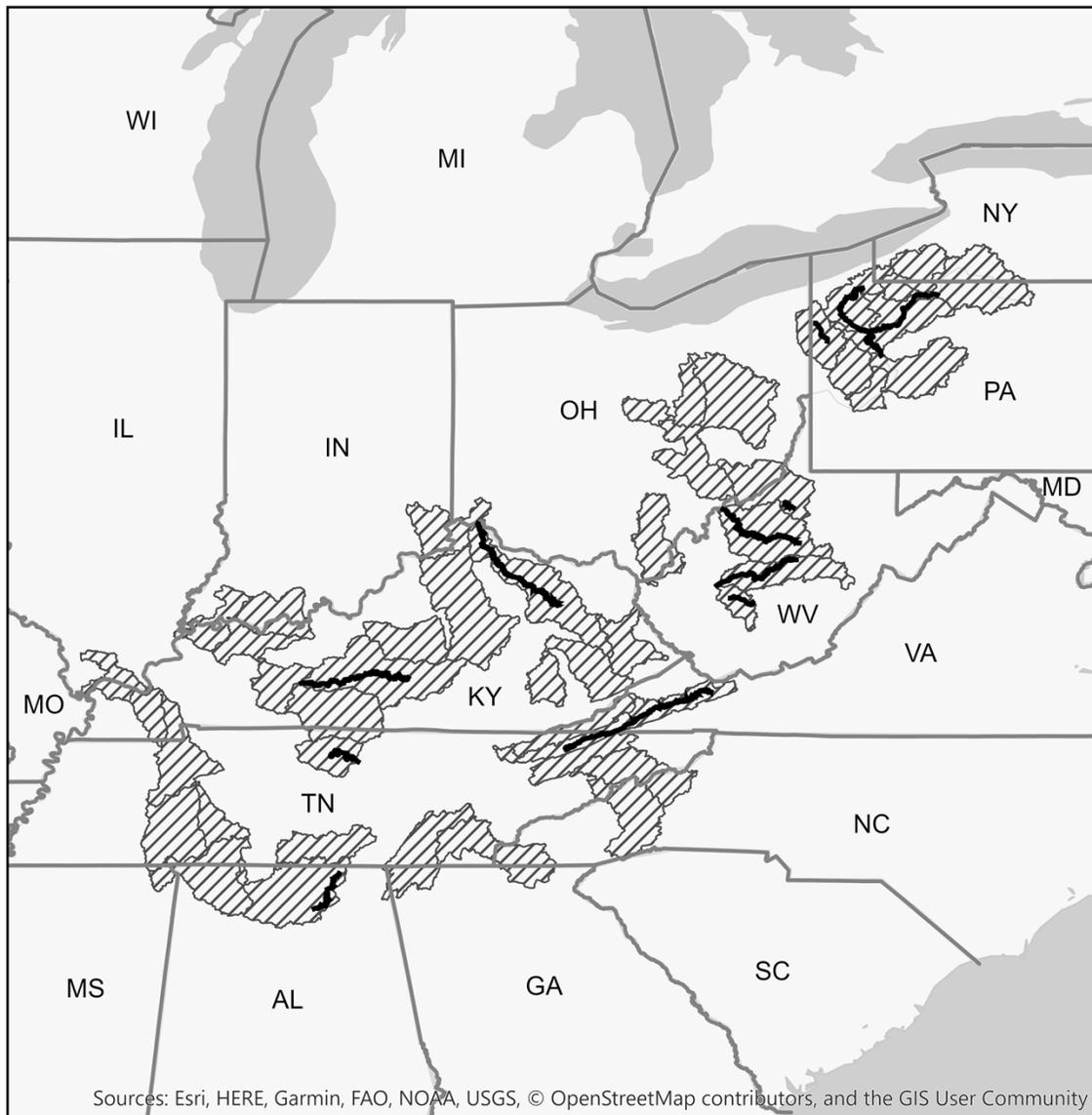
(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of the rule.

(4) *Critical habitat map units*. Data layers defining map units were created by overlaying Natural Heritage Element Occurrence data and U.S. Geological Survey

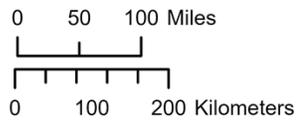
hydrologic data for stream reaches. The hydrologic data used in the critical habitat maps were extracted from the U.S. Geological Survey 1:1M scale nationwide hydrologic layer (<https://www.usgs.gov/core-science-systems/ngp/national-hydrography>) with a projection of EPSG:4269—NAD83 Geographic. Natural Heritage program and State mussel database species presence data from Pennsylvania, West Virginia, Virginia, Kentucky, Tennessee, and Alabama were used to select specific river and stream segments for inclusion in the critical habitat layer. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which each map is based are available to the public at the Service’s Internet site at <https://www.fws.gov/Asheville/>, at <http://www.regulations.gov> at Docket No. FWS–R4–ES–2020–0010, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) *Note:* Index map for the longsolid follows:

Longsolid Extant Management Units and Critical Habitat



- Critical Habitat
- Extant Management Units
- State Boundaries

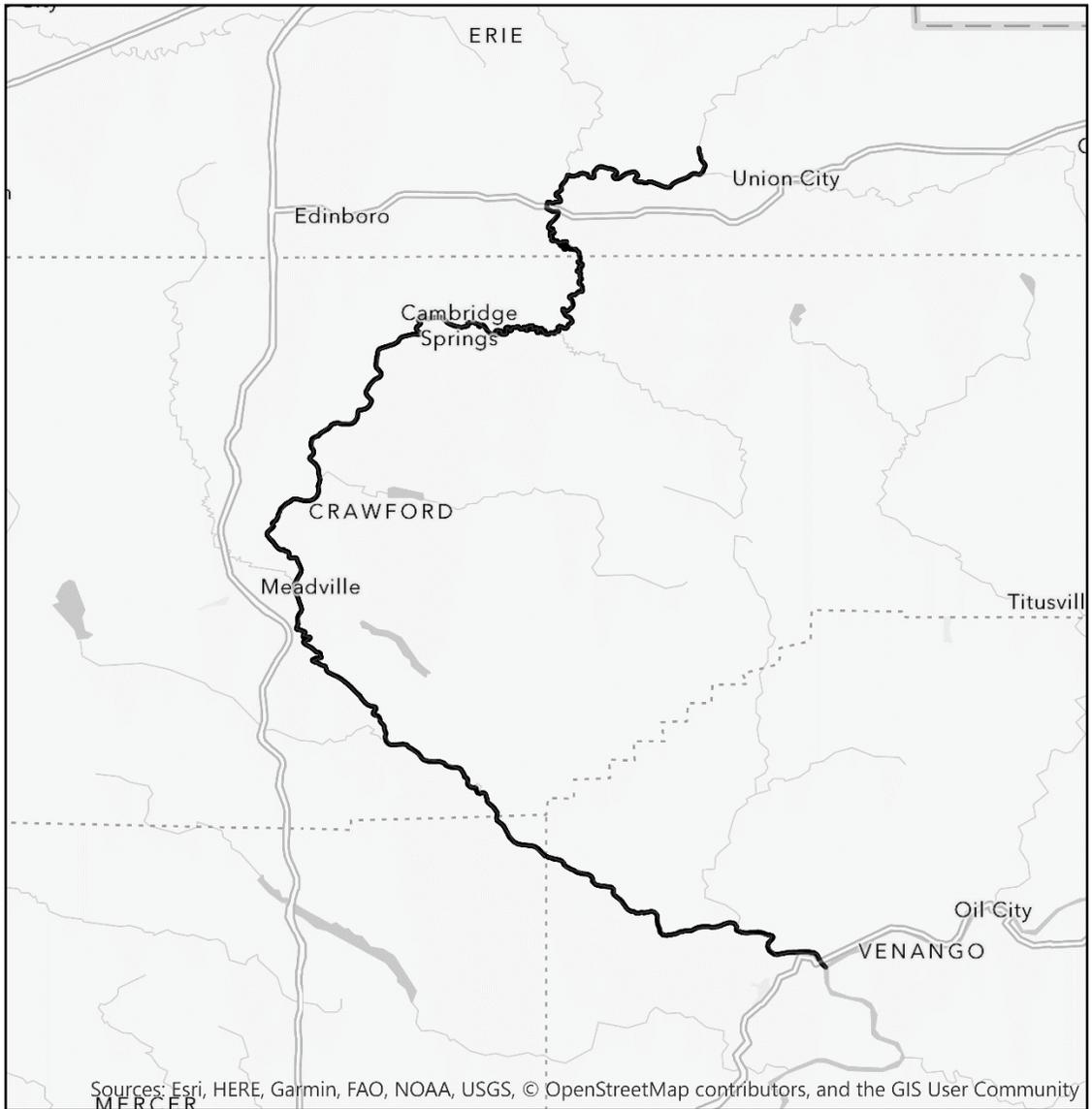


(6) Unit LS 1: French Creek; Crawford, Erie, Mercer, and Venango Counties, Pennsylvania.

(i) *General description:* Unit LS 1 consists of 120 stream mi (191.5 km) of French Creek in Crawford, Erie, Mercer, and Venango Counties, Pennsylvania. Approximately 106 stream mi (170.6 km; 76 percent) of riparian lands that border the unit are private ownership, and 14 stream mi (22.1 km; 24 percent) are public (Federal or State) ownership. This unit begins immediately downstream of the Union City Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 1 follows:

Critical Habitat for Longsolid
 LS1 French Creek; Crawford, Erie, Mercer, and Venango Counties,
 Pennsylvania



Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 13 Kilometers
 1 inch = 8 miles

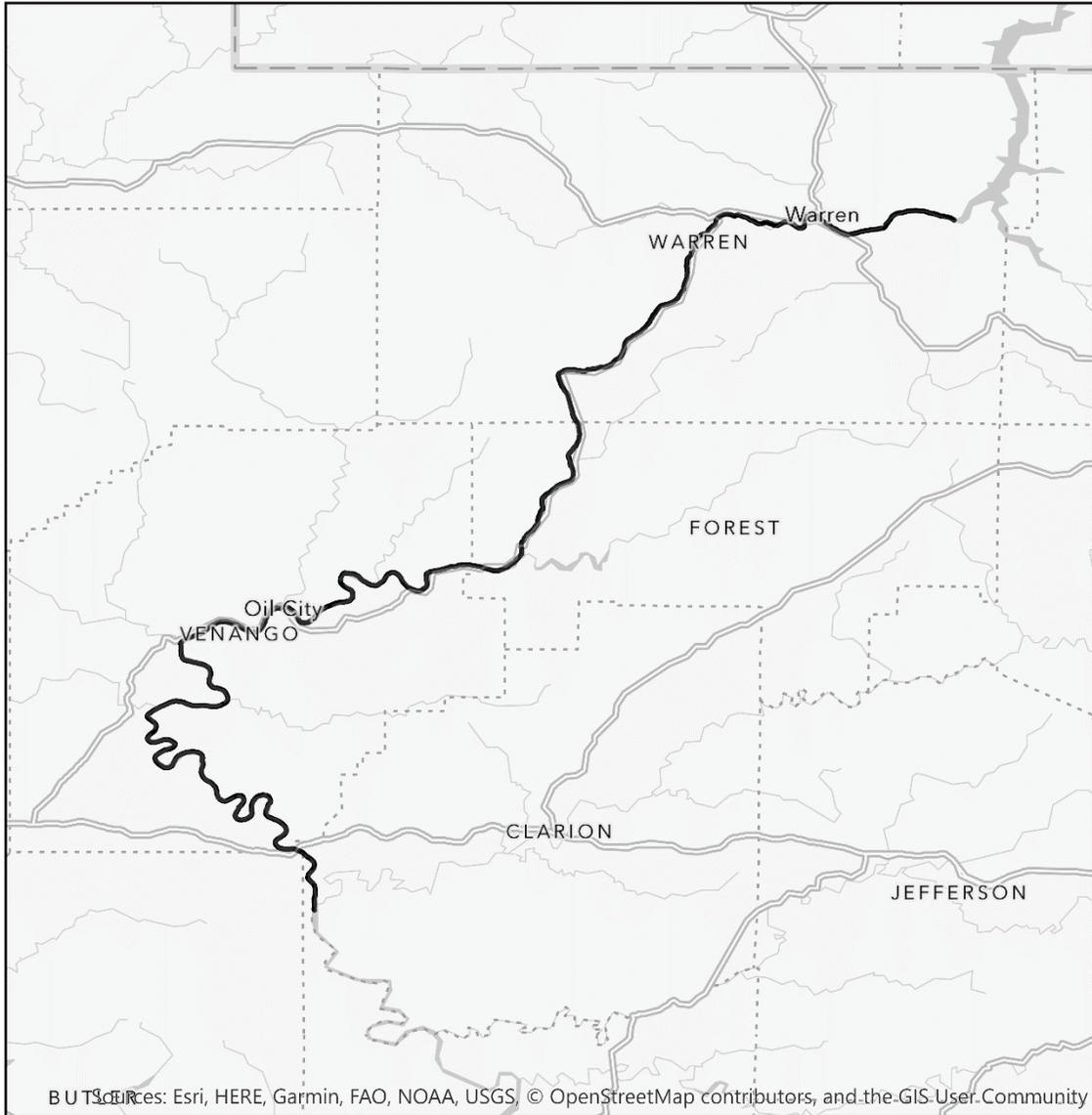


(7) Unit LS 2: Allegheny River; Clarion, Crawford, Forest, Venango, and Warren Counties, Pennsylvania.

(i) *General description:* Unit LS 2 consists of 99 river mi (159.3 km) of the Allegheny River in Clarion, Crawford, Forest, Venango, and Warren Counties, Pennsylvania. Approximately 15 river mi (24.1 km; 14 percent) of riparian lands that border the unit are private ownership, and 84 river mi (135.8 km; 86 percent) are public (Federal or State; primarily Allegheny National Forest) ownership. This unit is immediately downstream of Kinzua Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 2 follows:

Critical Habitat for Longsolid
 LS2 Allegheny River; Clarion, Crawford, Forest, Venango, and Warren
 Counties, Pennsylvania



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 22 Kilometers

1 inch = 14 miles



(8) Unit LS 3: Shenango River, Crawford and Mercer Counties, Pennsylvania.

(i) *General description:* Unit LS 3 consists of 22 river miles (mi) (35.5 kilometers (km)) of the Shenango River in Crawford County, Pennsylvania, from Pymatuning Dam downstream to the point of inundation by Shenango River Lake near Big Bend, Mercer County, Pennsylvania. Approximately 15 river mi (24.3 km; 68 percent) of riparian lands that border the unit are private ownership, and 7 river mi (11.3 km; 32 percent) are public (Federal or State) ownership. This unit is immediately downstream from the Pymatuning Dam, which is owned by the State of Pennsylvania.

(ii) Map of Unit LS 3 follows:

Critical Habitat for Longsolid LS3 Shenango River; Crawford and Mercer Counties, Pennsylvania



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 5 Kilometers
1 inch = 3 miles

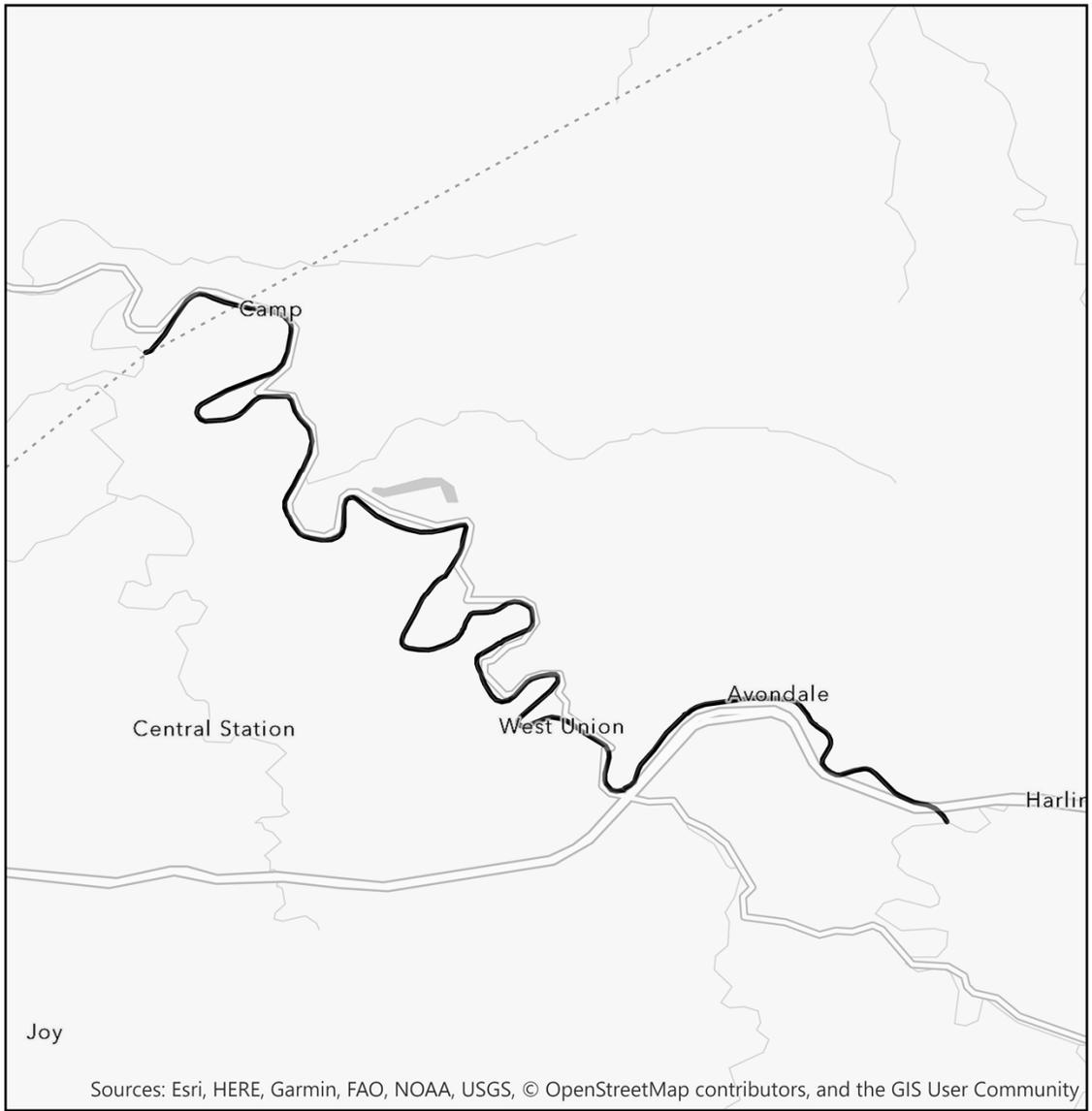


(9) Unit LS 4: Middle Island Creek; Doddridge and Tyler Counties, West Virginia.

(i) *General description:* Unit LS 4 consists of 14 stream mi (23.7 km) of Middle Island Creek in Doddridge and Tyler Counties, West Virginia. Approximately 14 stream mi (23.5 km; 99 percent) of riparian lands that border the unit are private ownership, and 0.1 stream mi (0.2 km; less than 1 percent) are public (local) ownership.

(ii) Map of Unit LS 4 follows:

Critical Habitat for Longsolid LS4 Middle Island Creek; Doddridge and Tyler Counties, West Virginia



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 3 Kilometers
1 inch = 2 miles

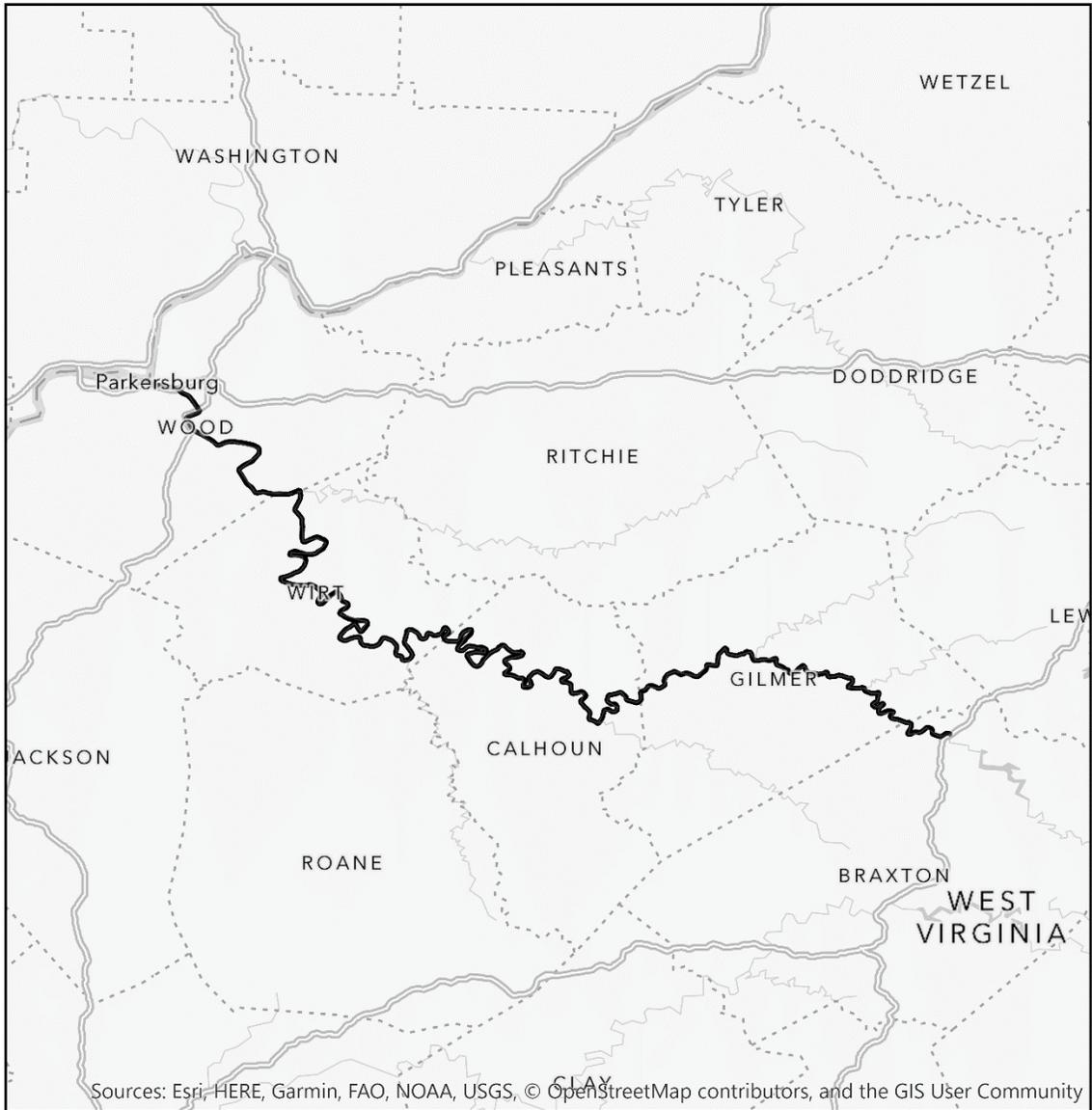


(10) Unit LS 5: Little Kanawha River; Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia.

(i) *General description:* Unit LS 5 consists of 123 river mi (198 km) of the Little Kanawha River in Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia. Approximately 122 river mi (197.2 km; 99 percent) are private ownership, and 0.5 river mi (0.9 km; 1 percent) are public (Federal or State) ownership. This unit is directly below the Burnsville Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 5 follows:

Critical Habitat for Longsolid
 LS5 Little Kanawha River; Calhoun, Gilmer, Ritchie, and Wood Counties, West Virginia



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 24 Kilometers
 1 inch = 15 miles



(11) Unit LS 6: Elk River; Braxton, Clay, and Kanawha Counties, West Virginia.

(i) *General description:* Unit LS 6 consists of 101 river mi (163 km) of the Elk River in Braxton, Clay, and Kanawha Counties, West Virginia. Approximately 93 river mi (150.3 km; 92 percent) of riparian lands that border the unit are private ownership, and 7 river mi (12.7 km; 8 percent) are public (Federal, State, or local) ownership. This unit is directly below Sutton Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 6 follows:

Critical Habitat for Longsolid
 LS6 Elk River; Braxton, Clay, and Kanawha Counties, West Virginia



-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 25 Kilometers
 1 inch = 15 miles

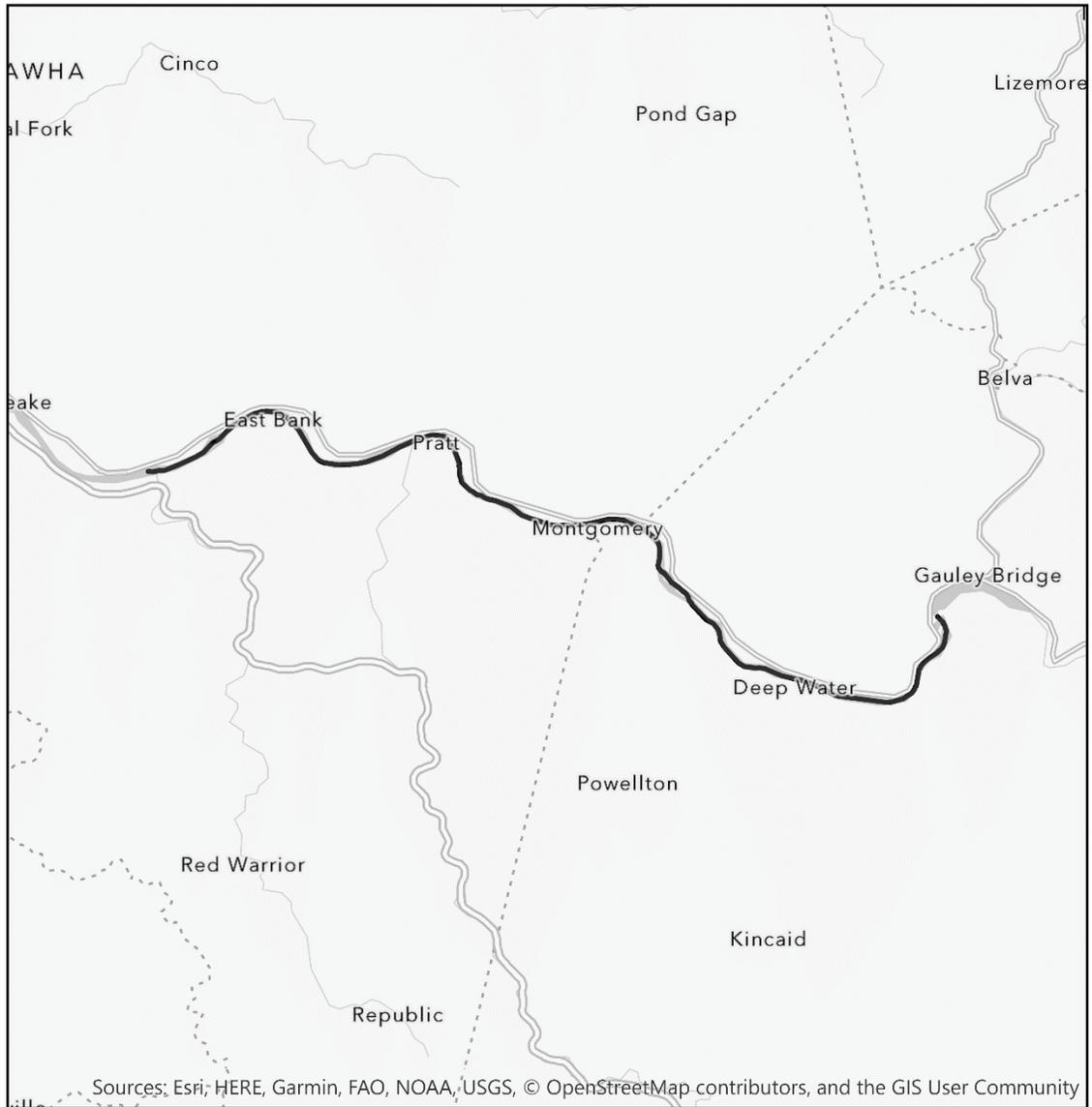


(12) Unit LS 7: Kanawha River; Fayette and Kanawha Counties, West Virginia.

(i) *General description:* Unit LS 7 consists of 21 river mi (33.9 km) of the Kanawha River in Fayette and Kanawha Counties, West Virginia. Approximately 18 river mi (29.3 km; 90 percent) of riparian lands that border the unit are private ownership, and 2 river mi (4.6 km; 10 percent) are public (Federal, State, or local) ownership. London and Marmet locks and dams within this unit are operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 7 follows:

Critical Habitat for Longsolid LS7 Kanawha River; Fayette and Kanawha Counties, West Virginia



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 7 Kilometers
1 inch = 4 miles

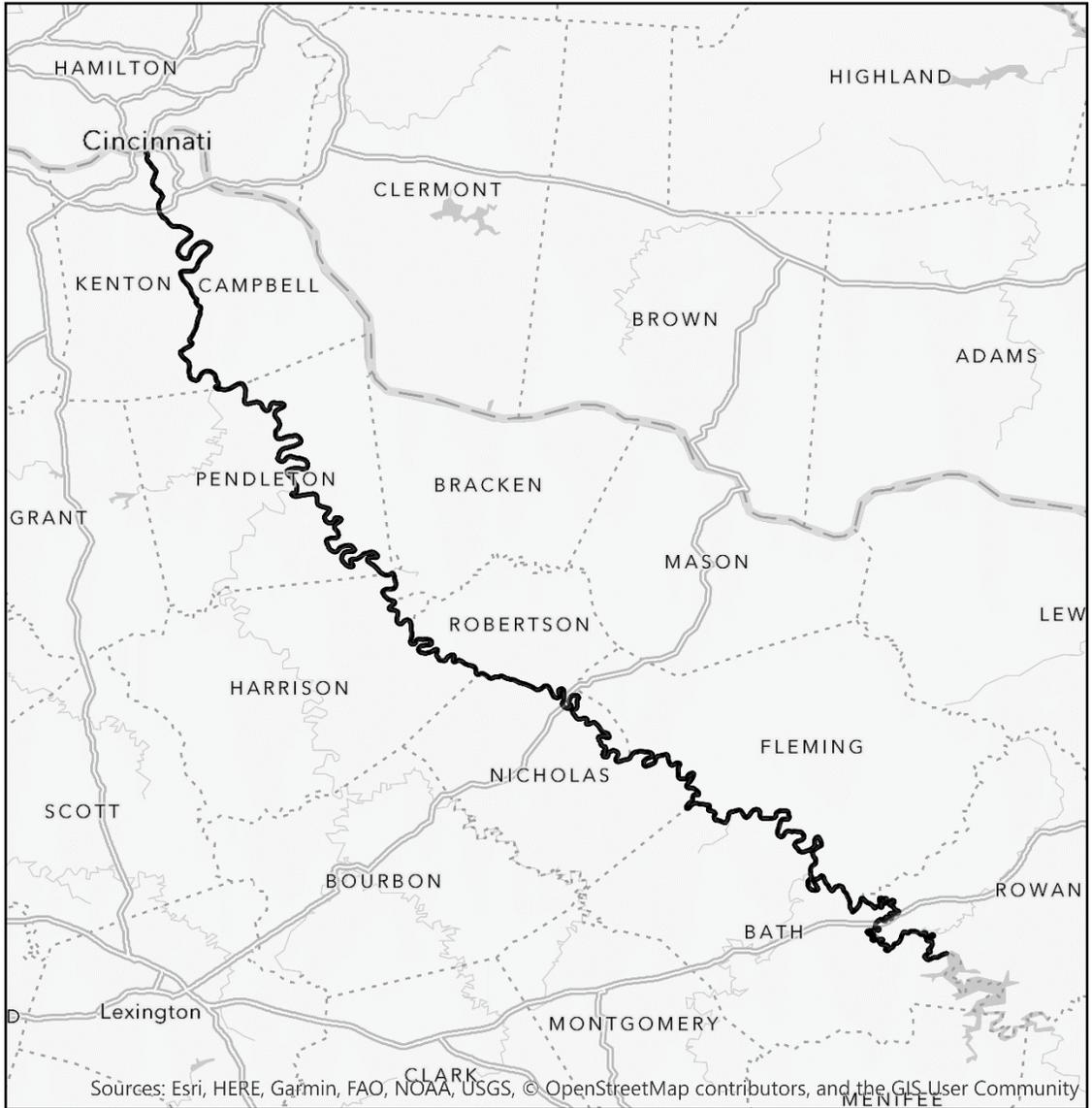


(13) Unit LS 8: Licking River; Bath, Campbell, Fleming, Harrison, Kenton, Morgan, Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky.

(i) *General description:* Unit LS 8 consists of 181 river mi (291.5 km) of the Licking River in Bath, Campbell, Fleming, Harrison, Kenton, Morgan, Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky. Approximately 161 river mi (259.7 km; 90 percent) of riparian lands that border the unit are private ownership, and 19 river mi (31.7 km; 10 percent) are public (Federal, State, or local) ownership. This unit is directly below Cave Run Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 8 follows:

**Critical Habitat for Longsolid
 LS8 Licking River; Bath, Campbell, Fleming, Harrison, Kenton, Morgan,
 Nicholas, Pendleton, Robertson, and Rowan Counties, Kentucky**



Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 25 Kilometers
 1 inch = 16 miles

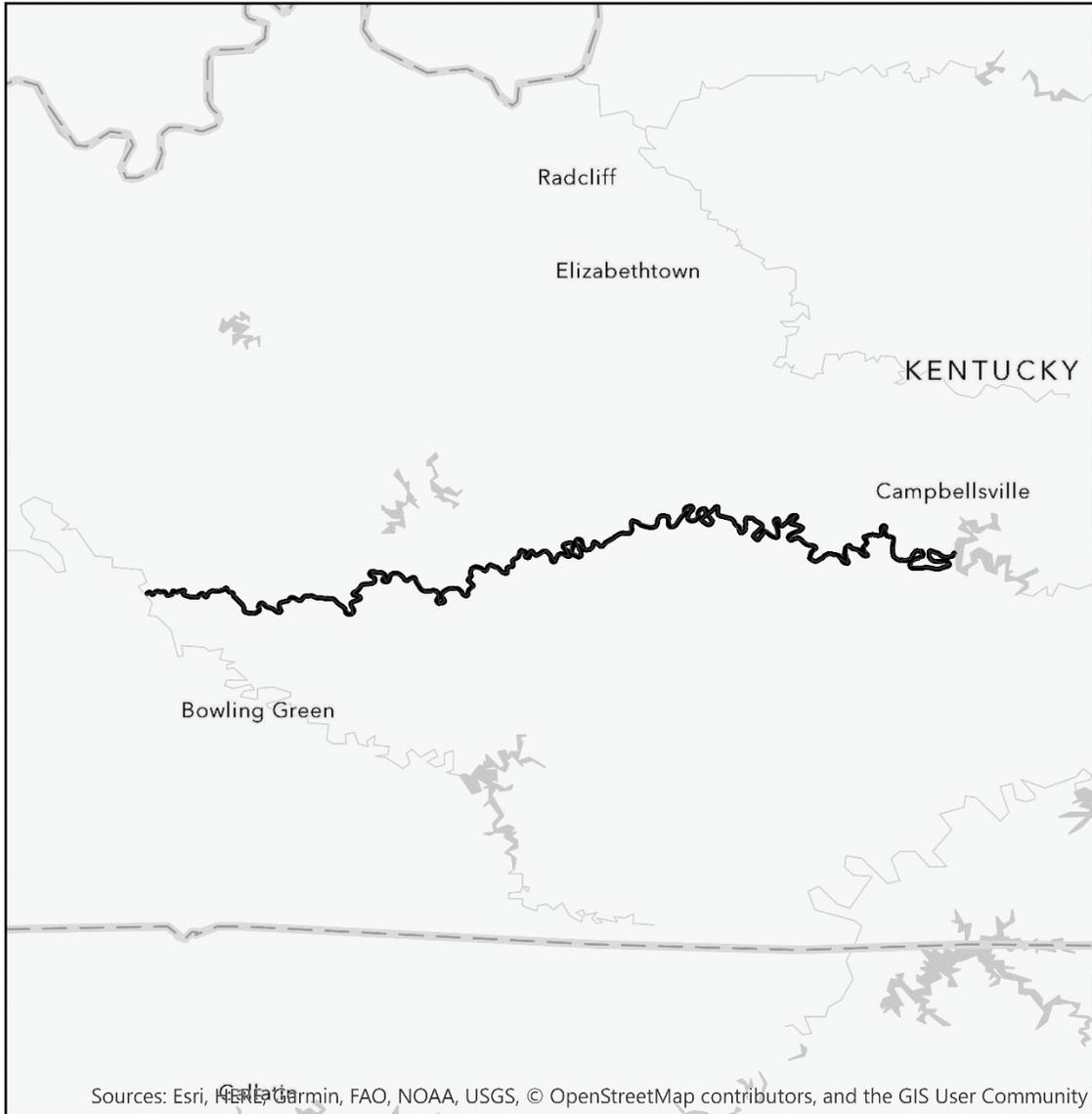


(14) Unit LS 9: Green River; Butler, Edmonson, Green, Hart, Taylor, and Warren Counties, Kentucky.

(i) *General description:* Unit LS 9 consists of 156 river mi (251.6 km) of the Green River in Butler, Edmonson, Green, Hart, Taylor, and Warren Counties, Kentucky. Approximately 105 river mi (169.2 km; 67 percent) of riparian lands that border the unit are private ownership, and 51 river mi (82.4 km; 33 percent) are public (Federal, State, or local) ownership, including Mammoth Cave National Park. This unit is directly below Green River Dam, which is operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 9 follows:

Critical Habitat for Longsolid
 LS9 Green River; Butler, Edmonson, Green, Hart, Taylor, and Warren
 Counties, Kentucky



Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 33 Kilometers
 1 inch = 21 miles

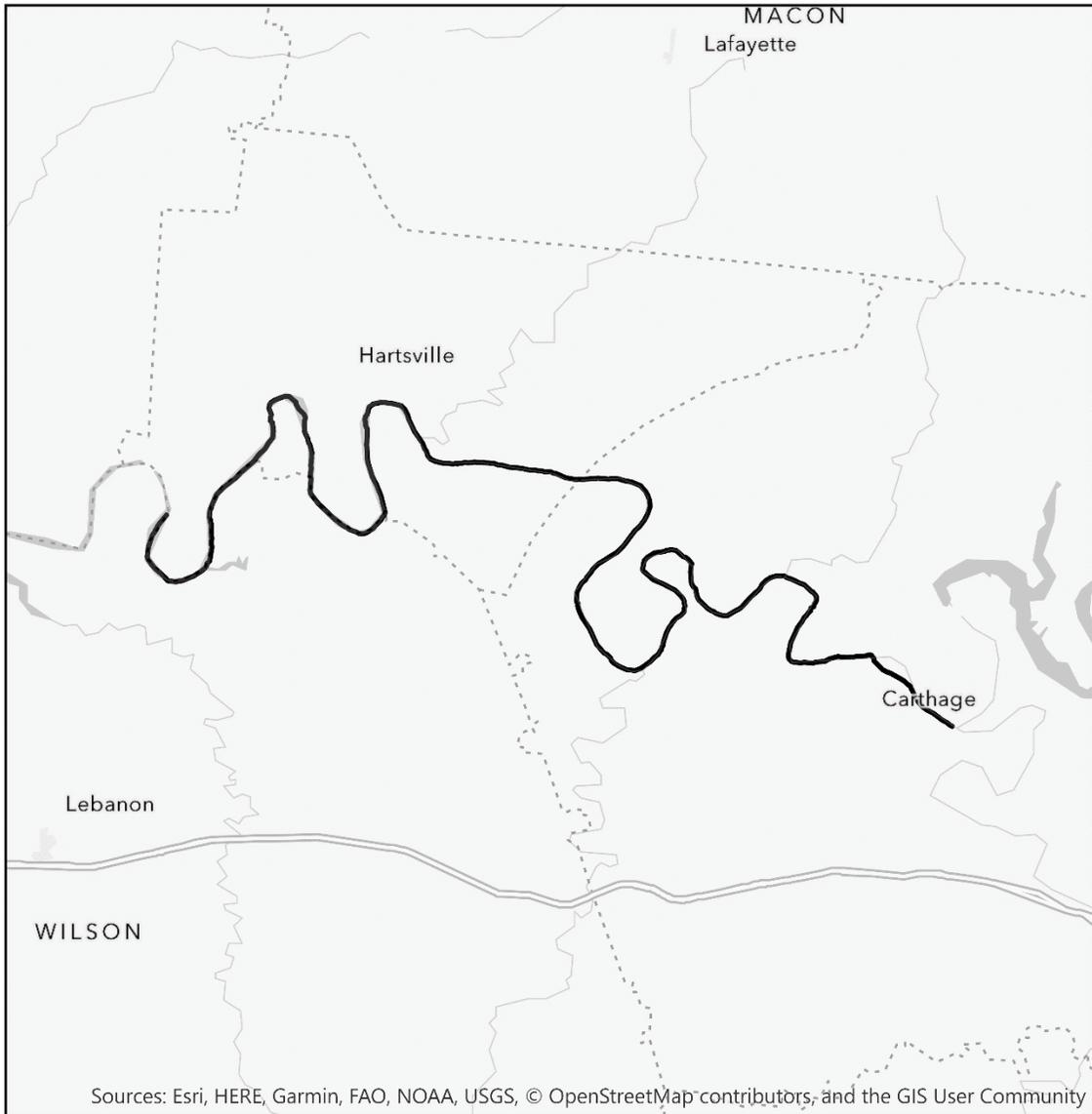


(15) Unit LS 10: Cumberland River; Smith, Trousdale, and Wilson Counties, Tennessee.

(i) *General description:* Unit LS 10 consists of 48 river mi (77.5 km) of the Cumberland River in Smith, Trousdale, and Wilson Counties, Tennessee. All riparian lands that border the river are owned by the U.S. Army Corps of Engineers (Federal; 48 river mi (77.5 km)). This unit also falls within the Tennessee Wildlife Resources Agency Rome Landing Sanctuary. Cordell Hull and Old Hickory Dams, upstream and downstream of this unit, respectively, are operated by the U.S. Army Corps of Engineers.

(ii) Map of Unit LS 10 follows:

Critical Habitat for Longsolid
LS10 Cumberland River; Smith, Trousdale, and Wilson Counties, Tennessee



-  Critical Habitat
-  Major Road
-  County Boundary
-  State Boundary
-  River
-  Waterbody

1 inch = 9 Kilometers
1 inch = 5 miles

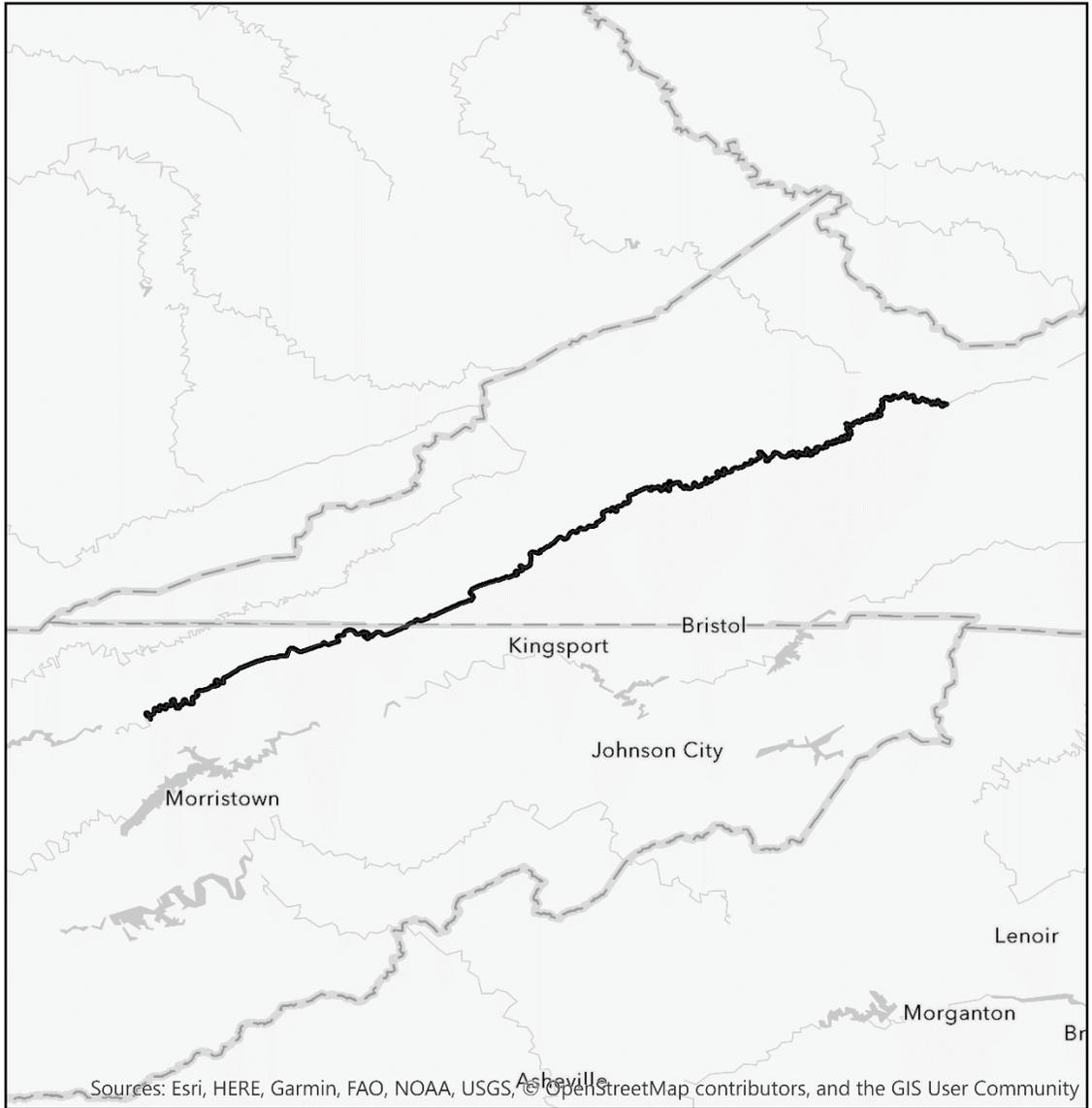


(16) Unit LS 11: Clinch River; Russell, Scott, Tazewell, and Wise Counties, Virginia; Claiborne, Hancock, and Hawkins Counties, Tennessee.

(i) *General description:* Unit LS 11 consists of 177 river mi (286.1 km) of the Clinch River in Russell, Scott, Tazewell, and Wise Counties, Virginia, and Claiborne, Hancock, and Hawkins Counties, Tennessee. Approximately 160 river mi (258.8 km; 90 percent) of riparian lands that border the unit are private ownership, and 17 river mi (27.3 km; 10 percent) are public (Federal or State) ownership. The Tennessee portion of this unit is encompassed by the Tennessee Wildlife Resources Agency Clinch River Sanctuary.

(ii) Map of Unit LS 11 follows:

Critical Habitat for Longsolid
LS11 Clinch River; Russell, Scott, Tazewell, and Wise Counties, Virginia;
Claiborne, Hancock, and Hawkins Counties, Tennessee



- Critical Habitat
- Major Road
- County Boundary
- State Boundary
- River
- Waterbody

1 inch = 45 Kilometers
 1 inch = 28 miles

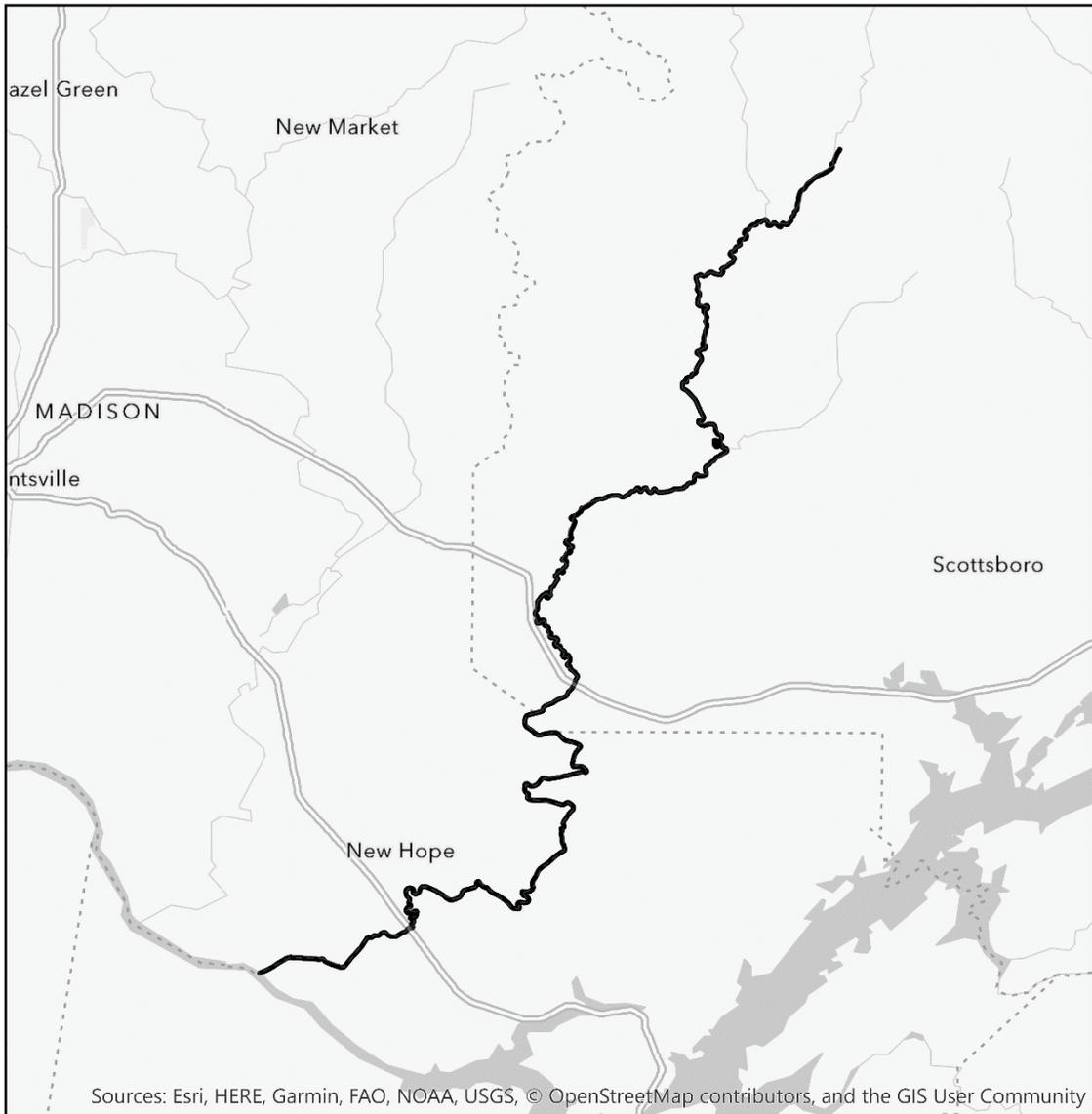


(17) Unit LS 12: Paint Rock River; Jackson, Madison, and Marshall Counties, Alabama.

(i) *General description:* Unit LS 12 consists of 58 river mi (94.5 km) of the Paint Rock River in Jackson, Madison, and Marshall Counties, Alabama. Approximately 2 river mi (4.1 km; 3 percent) of riparian lands that border the unit are private ownership, and 56 river mi (90.4 km; 97 percent) are public (Federal or State) ownership.

(ii) Map of Unit LS 12 follows:

Critical Habitat for Longsolid
 LS12 Paint Rock River; Jackson, Madison, and Marshall Counties, Alabama



- Critical Habitat
- Major Road
- - - County Boundary
- - - State Boundary
- River
- Waterbody

1 inch = 11 Kilometers
 1 inch = 7 miles



* * * * *

Aurelia Skipwith,

Director,

U.S. Fish and Wildlife Service.

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