DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2012–0004; 4500030113]

RIN 1018–AY06

Endangered and Threatened Wildlife and Plants; Endangered Species Status for the Fluted Kidneyshell and Slabside Pearlymussel and Designation of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the fluted kidneyshell (*Ptychobranchus subtentum*) and slabside pearlymussel (*Pleuronaia dolabelloides*) as endangered species under the Endangered Species Act of 1973, as amended (Act), and we propose to designate critical habitat for both species. These two species are endemic to portions of the Cumberland and Tennessee River systems of Alabama, Kentucky, Mississippi, Tennessee, and Virginia. In total, approximately 2,218 river kilometers (1,380 river miles) are being proposed for designation as critical habitat. The proposed critical habitat for fluted kidneyshell is located in Limestone County, Alabama; Jackson, Laurel, McCreary, Pulaski, Rockcastle, and Wayne Counties, Kentucky; Bedford, Claiborne, Cocke, Fentress, Franklin, Giles, Grainger, Greene, Hamblen, Hancock, Hickman, Humphreys, Jefferson, Knox, Lincoln, Marshall, Maury, Moore, Morgan, Overton, Perry, Pickett, Polk, Scott, and Sevier Counties, Tennessee; and Bland, Lee, Russell, Scott, Smyth, Tazewell, Washington, and Wythe Counties, Virginia. The proposed critical habitat for slabside pearlymussel is located in Colbert, Jackson, Limestone, Madison, and Marshall Counties, Alabama; Tishomingo County, Mississippi; Bedford, Bledsoe, Claiborne, Cocke, Franklin, Giles, Greene, Hamblen, Hancock, Hickman, Humphreys, Lincoln, Marion, Marshall, Maury, Moore, Perry, Polk, and Sequatchie Counties, Tennessee; and Bland, Lee, Russell, Scott, Smyth, Tazewell, Washington, and Wythe Counties, Virginia.

DATES: We will accept comments received or postmarked on or before December 3, 2012. We must receive requests for public hearings, in writing, at the address shown in the **FOR FURTHER INFORMATION CONTACT** section by November 19, 2012.

ADDRESSES: *Document availability:* This proposed rule is available on the Internet at *http://www.regulations.gov* and *http://www.fws.gov/cookeville/. Written comments:* 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 field, enter Docket No. FWS–R4–ES–2012–0004, which is the docket number for this rulemaking. Then, click the Search button. You may submit a comment by clicking on ''Comment Now!''

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R4–ES–2012–0004; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

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 the Information Requested section below for more information).

The coordinates or plot points or both from which the maps are generated are included in the administrative record for this critical habitat designation and are available at *http://www.fws.gov/cookeville, http://www.regulations.gov* at Docket No. [FWS–R4–ES–2012–0004], and at the Tennessee Ecological Services Field Office) (see **FOR FURTHER INFORMATION CONTACT**). Any additional tools or supporting information that we may develop for this critical habitat designation will also be available at the above locations.

FOR FURTHER INFORMATION CONTACT: Mary Jennings, Field Supervisor, U.S. Fish and Wildlife Service, Tennessee Ecological Services Field Office, 446 Neal Street, Cookeville, TN 38501; telephone 931–528–6481; facsimile 931–528–7075. If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION: This document consists of: (1) A proposed rule to list the fluted kidneyshell (*Ptychobranchus subtentum*) and slabside pearlymussel (*Pleuronaia dolabelloides*) as endangered species; and (2) proposed critical habitat designations for these two species.

Executive Summary

Why we need to publish a rule. Under the Act, a species or subspecies may warrant protection through listing if it is an endangered or threatened species throughout all or a significant portion of its range. Both species have been eliminated from more than 50 percent of the streams from which they were historically known, and are now limited to a handful of viable populations, all of which are facing a variety of threats, including impoundments, mining, poor water quality, excessive sedimentation, and environmental contaminants.

The basis for our action. Under the Act, a species may be determined to be endangered or threatened based on any of five factors: (A) Destruction, modification, or curtailment of its habitat or range; (B) overutilization; (C) disease or predation; (D) inadequate existing regulatory mechanisms; or (E) other natural or manmade factors. These two mussel species are facing threats due to three of these five factors (A, D, and E). The Act also requires that the Service designate critical habitat at the time of listing provided that it is prudent and determinable. We have determined that designating critical habitat is both prudent and determinable (see Critical Habitat for the Fluted Kidneyshell and Slabside Pearlymussel section below), and propose a total of approximately 2,218 river kilometers (rkm) (1,380 river miles (rmi)) of critical habitat in five States. Twenty-four units covering approximately 1,899 river kilometers (rkm) (1,181 river miles (rmi)) of critical habitat are being proposed for the fluted kidneyshell in Alabama, Kentucky, Tennessee, and Virginia. Thirteen units covering approximately 1,562 rkm (970 rmi) of critical habitat are being proposed for the slabside pearlymussel in Alabama, Mississippi, Tennessee, and Virginia.

We will seek peer review. In addition to seeking public comments, we will solicit peer review of this proposal from at least three experts knowledgeable in mussel biology and basic conservation biology principles and concepts. Because we will consider all comments and information received during the comment period, our final determinations may differ from this proposal

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or

information from other concerned governmental agencies, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

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

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

(3) Any information on the biological or ecological requirements of these species, and ongoing conservation measures for the species and their habitat.

(4) Any information regarding water quality data that may be helpful in determining the water quality parameters necessary for the fluted kidneyshell and the slabside pearlymussel.

(5) Current or planned activities in the areas occupied by these species and possible impacts of these activities on these species.

(6) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act (16 U.S.C. 1531 *et seq.*), which are:

(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.

(7) The reasons why we should or should not designate habitat as ''critical habitat'' under section 4 of the Act including whether there are threats to these species from human activity, the degree of which can be expected to increase due to the designation, and whether that increase in threat outweighs the benefit of designation such that the designation of critical habitat may not be prudent.

(8) Specific information on:

(a) The amount and distribution of habitat for the fluted kidneyshell and slabside pearlymussel;

(b) What areas, that were occupied at the time of the proposed listing and that contain features essential to the conservation of these 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 the proposed listing are essential for the conservation of these species and why.

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

(10) Information on the projected and reasonably likely impacts of climate change on these species and proposed critical habitat.

(11) Any probable economic, national security, or other relevant impacts of designating any area that may be included in the final designation; in particular, we seek information on any impacts on small entities or families, and the benefits of including or excluding areas that exhibit these impacts.

(12) 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.

(13) Any impact that critical habitat designation would have, positive or negative, on conservation efforts associated with designated nonessential experimental populations for other listed species in the lower Holston and French Broad river systems in Tennessee, or the North Fork Holston River in Virginia.

(14) Information on habitat suitability for these two mussels in the proposed units that are not occupied at the time of the proposed listing, including the Rockcastle River, Kentucky, and the Sequatchie River, Tennessee.

(15) 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 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 a threatened or endangered 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 Web site. 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.* Please include sufficient information with your comments to allow us to verify any scientific or commercial information you include.

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,* or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Tennessee Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Previous Federal Actions

The fluted kidneyshell was first identified as a candidate for protection under the Act in the October 25, 1999, **Federal Register** (64 FR 57534). Candidate species are those taxa for which the Service has sufficient information on their biological status and threats to list as an endangered or threatened species under the Act but for which the development of a listing regulation has been precluded to date by other higher priority listing activities. Candidates are assigned listing priority numbers (LPNs) based on immediacy and the magnitude of threat, as well as their taxonomic status. A lower LPN corresponds to a higher conservation priority, and we consider the LPN when prioritizing and funding conservation actions. In our 1999 (64 FR 57534), 2001 (66 FR 54808), 2002 (67 FR 40657), 2004 (69 FR 24876), 2005 (70 FR 24870), and 2006 (71 FR 53756) **Federal Register** Candidate Notices of Review, we identified the species as having an LPN of five, in accordance with our priority guidance published on September 21, 1983 (48 FR 43098). An LPN of five reflects threats that are nonimminent and high in magnitude, as well as the taxonomic classification of the fluted kidneyshell as a full species. We also determined that publication of a proposed rule to list the fluted kidneyshell was precluded by our work on higher priority listing actions. On May 11, 2004, we received a petition to list the fluted kidneyshell as an

endangered species. We published our petition finding in the 2005 Candidate Notice of Review (70 FR 24869), and have done so annually in subsequent years.

On December 6, 2007 (72 FR 69034), we changed the LPN for the fluted kidneyshell from five to two. A listing priority of two reflects threats that are both imminent and high in magnitude, as well as the taxonomic classification of the fluted kidneyshell as a full species. In our 2008 (73 FR 75176), 2009 (74 FR 57804), 2010 (75 FR 69222), and 2011 (76 FR 66370) Candidate Notices of Review, we retained a listing priority number of two for this species.

The slabside pearlymussel was first identified as a candidate for protection under the Act in the May 22, 1984, **Federal Register** (49 FR 21664). As a candidate, it was assigned a ''Category 2'' designation, which was given to those species with some evidence of vulnerability, but for which additional biological information was needed to support a proposed rule to list as endangered or threatened. In our 1989 (54 FR 554), 1991 (56 FR 58804), and 1994 (59 FR 58982) **Federal Register** Candidate Notices of Review, we retained a Category 2 designation for this species. Assigning categories to candidate species was discontinued in our Candidate Notice of Review dated February 28, 1996, and only species for which the Service had sufficient information on biological vulnerability and threats to support issuance of a proposed rule were retained as candidate species (61 FR 7596).

On October 25, 1999, we identified the slabside pearlymussel in the **Federal Register** as a candidate species with a listing priority number of five (64 FR 57534). In our 2001 (66 FR 54808), 2002 (67 FR 40657), 2004 (69 FR 24876), 2005 (70 FR 24870), 2006 (71 FR 53756), and 2007 (72 FR 69034) Candidate Notices of Review, we determined that publication of a proposed rule to list the species was precluded by our work on higher priority listing actions and retained a listing priority number of five for this species, in accordance with our priority guidance published on September 21, 1983 (48 FR 43098). We published a petition finding for slabside pearlymussel in the 2005 Candidate Notice of Review (70 FR 24870) in response to a petition received on May 11, 2004, and have published annual petition findings in subsequent Candidate Notices of Review.

On December 10, 2008 (73 FR 75176), we changed the listing priority number for the slabside pearlymussel from five to two. In our 2009 (74 FR 57804), 2010 (75 FR 69222), and 2011 (76 FR 66370) Candidate Notices of Review, we retained a listing priority number of two for this species.

Background

It is our intent to discuss only those topics directly relevant to the listing and critical habitat designations for the fluted kidneyshell and slabside pearlymussel in this proposed rule. A summary of topics relevant to this proposed rule is provided below. Additional information on both species may be found in the most recent Candidate Notice of Review, which was published October 26, 2011 (76 FR 66370).

Introduction

North American mussel fauna are more biologically diverse than anywhere else in the world, and historically numbered around 300 species (Williams *et al.* 1993, p. 6). Mussels are in decline, however, and in the past century have become more imperiled than any other group of organisms (Williams *et al.* 2008, p. 55). Approximately 72 percent of North America's mussel species are considered vulnerable to extinction or possibly extinct (Williams *et al.* 1993, p. 6). Within North America, the southeastern United States is the hot spot for mussel diversity. Seventy-five percent of southeastern mussel species are in varying degrees of rarity or possibly extinct (Neves *et al.* 1997, pp. 47–51). The central reason for the decline of mussels is the modification and destruction of their habitat, especially from dams, degraded water quality, and sedimentation (Neves *et al.* 1997, p. 60; Bogan 1998, p. 376). These two mussels, like many other southeastern mussel species, have undergone considerable reductions in total range and population density.

Most studies of the distribution and population status of the fluted kidneyshell and slabside pearlymussel presented below were conducted after the early 1960s. Gordon and Layzer (1989, entire), Winston and Neves (1997, entire), and Parmalee and Bogan (1998, pp. 204–205) give most of the references for regional stream surveys. In addition to these publications, we have obtained more current, unpublished distribution and status information from State heritage programs, agency biologists, and other knowledgeable individuals.

These two species are bivalve mussels and are endemic to the Cumberland and Tennessee River drainages. The Cumberland River drainage originates in southeastern Kentucky and flows southwest across Tennessee before turning north and reentering Kentucky to empty into the lower Ohio River. The Cumberland River drainage spans the Appalachian Plateaus and Interior Low Plateaus Physiographic Provinces. The Tennessee River originates in southwest Virginia and western North Carolina, eastern Tennessee, and northern Georgia and flows southwesterly into western Tennessee and Alabama, then turns north and flows into Kentucky, before emptying into the Ohio River. The larger Tennessee River drainage spans five physiographic provinces, including the Blue Ridge, Valley and Ridge, Appalachian Plateaus, Interior Low Plateaus, and Coastal Plain.

Fluted Kidneyshell

Taxonomy and Species Description

The fluted kidneyshell, *Ptychobranchus subtentum* (Say, 1825), is in the family Unionidae (Turgeon *et al.* 1998, p. 36). The following description, biology, and life history of the fluted kidneyshell is taken from Parmalee and Bogan (1998, pp. 204–205) and Williams *et al.* (2008, pp. 627–629). The fluted kidneyshell is a relatively large mussel that reaches about 13 centimeters (cm) (5 inches (in)) in length. The shape of the shell is roughly oval elongate, and the solid, relatively heavy valves (shells) are moderately inflated. A series of flutings (parallel ridges or grooves) characterizes the posterior slope of each valve. Shell texture is smooth and somewhat shiny in young specimens, becoming duller with age. Shell color is greenish yellow, becoming brownish with age, with several broken, wide green rays. Internally, there are two types of teeth, which are raised, interlocking structures used to stabilize opposing shell halves. The pseudocardinal teeth are stumpy and triangular in shape. The lateral teeth are relatively heavy and nearly straight, with two in the left valve and one in the right valve. The color of the nacre (mother-of-pearl) is bluish-white to dull white with a wash of salmon in the older part of the shell (beak cavity).

Habitat and Life History

Mussels generally live embedded in the bottom of rivers and other bodies of water. They siphon water into their shells and across four gills that are specialized for respiration, food collection, and brooding larvae in females. Food items include detritus (disintegrated organic debris), algae, diatoms, and bacteria (Strayer *et al.* 2004, pp. 430–431). Adult mussels can obtain their food by deposit feeding, pulling in food from the sediment and its interstitial (pore) water, and pedal-

feeding directly from the sediment (Yeager *et al.* 1994, pp. 217–221; Vaughn and Hakenkamp 2001, 1432–1438). Adults are filter feeders and generally orient themselves on or near the substrate surface to take in food and oxygen from the water column. Juveniles typically burrow completely beneath the substrate surface and are deposit or pedal (foot) feeders, meaning that they bring food particles that adhere to the foot while it is extended outside the shell inside the shell for ingestion, until the structures for filter feeding are more fully developed (Yeager *et al.* 1994, pp. 200–221; Gatenby *et al.* 1996, p. 604). However, adults are also capable of deposit feeding and may do so depending on the availability of food resources (Nichols *et al.* 2005, pp. 90–93).

Mussels tend to grow relatively rapidly for the first few years; then growth slows appreciably after sexual maturity, when energy is being diverted from growth to reproductive activities. Mussel longevity varies tremendously among species (from 4 to 5 years to well over 100 years), but most species live 10 to 50 years (Haag and Rypel 2011, pp. 230–236). Relatively large, heavy-shelled riverine species tend to be slower growing and have longer life spans. By thin-sectioning the valves, various authors have aged fluted kidneyshell from the Clinch River at 26 and 55 years (Henley *et al.* 2002, p. 19; Davis and Layzer 2012, p. 92). Females can become sexually mature at age 5 (Davis and Layzer 2012, p. 79).

The gametogenic cycle (annual cycle in the development of reproductive cells or gametes) of fluted kidneyshell, like most mussels, is probably regulated by annual temperature regimes (Davis and Layzer, p. 90). Most mussels, including the fluted kidneyshell, have separate sexes. Males expel sperm into the water column, which are drawn in by females through their incurrent apertures or siphons. It has been hypothesized that pheromones might trigger synchronous sperm release among males, because all fertilization observed by females from the Clinch River occurred in fewer than 5 days (Davis and Layzer 2012, p. 90). Fertilization takes place internally, and the resulting zygotes develop into specialized larvae, termed glochidia, inside the water tubes of the females' gills. The fluted kidneyshell, along with other members of its genus, is unique in that the marsupial portion of the outer gills (portion of a brooding female's gill which holds embryos and glochidia) are folded in a curtain-like fashion. The fluted kidneyshell is thought to have a late summer or early fall fertilization period with the glochidia overwintering. Davis and Layzer (2012, p. 90) observed embryo development within the marsupium (brood pouch) at 4 weeks after fertilization. The following spring or early summer, glochidia are released as conglutinates, which are similar to cold capsules or gelatinous containers with scores of glochidia within. Davis and Layzer (2012, p. 86) report an average of 208 conglutinates and an average fecundity (total reproductive output) of 247,000 glochidia per female. Davis and Layzer (2012, p. 92) report a skewed adult sex ratio of 1.9 females per 1 male in the Clinch River, in Tennessee, although the cause of the skewed ratio is unknown. Using the observed sex ratio and percent of females that were gravid, Davis and Layzer (2012, p. 92) hypothesized that some females go through reproductive ''pausing'' periods to acquire the energy reserves needed to produce gametes in subsequent years.

Glochidia must come into contact with a specific host fish(es) quickly in order for their survival to be ensured. Without the proper species of host fish, the glochidia will perish. Conglutinate masses often mimic food items of glochidial fish hosts in order to attract and infest potential host fishes. Fluted kidneyshell conglutinates are shaped like black fly (Simuliidae) pupae and have an adhesive end that sticks to silt-free stones on the stream bottom, with an orientation that is also similar to that of blackfly pupae (Barnhart and Roberts 1997, p. 17; Barnhart *et al.* 2008, p. 377; Williams *et al.* 2008, p. 628). Insects are common food items of many stream fishes, including the fluted kidneyshell's host fishes, which include the barcheek darter (*Etheostoma obeyense*), fantail darter (*E. flabellare*), rainbow darter (*E. caeruleum*), redline darter (*E. rufilineatum*), bluebreast darter (*E. camurum*), dusky darter (*Percina sciera*), and banded sculpin (*Cottus carolinae*). These fishes are tricked into thinking that they have an easy insect meal when in fact they have infected themselves with parasitic mussel glochidia (Parmalee and Bogan 1998, p. 205; Davis and Layzer 2012, p. 88).

After a few weeks parasitizing the host fish's gill, newly metamorphosed juveniles drop off to begin a free-living existence on the stream bottom. Unless they drop off in suitable habitat, they will perish. Thus, the complex life history of the fluted kidneyshell and other mussels has many critical steps that may prevent successful reproduction or recruitment of juveniles into existing populations or both.

The fluted kidneyshell occurs in medium-sized creeks to large rivers, inhabiting sand and gravel substrates in relatively shallow riffles and shoals with moderate to swift current (Williams *et al.* 2008, p. 628). In comparison to some co-occurring species, the fluted kidneyshell demonstrates strong habitat specificity by being associated with faster flows, greater shear stress (force of water pressure and velocity on the substrate), and low substrate embeddedness (Ostby 2005, pp. 51, 142–3).

Historical Range and Distribution

The fluted kidneyshell is a Cumberlandian Region mussel, meaning it is restricted to the Cumberland (in Kentucky and Tennessee) and Tennessee (in Alabama, Kentucky, Tennessee, and Virginia) River systems. Historically, this species occurred in the Cumberland River mainstem from below Cumberland Falls in southeastern Kentucky downstream through the Tennessee portion of the river to the vicinity of the Kentucky-Tennessee State line. In the Tennessee River mainstem it occurred from eastern to western Tennessee. Records are known from the following Cumberland River tributaries: Horse Lick Creek [KY], Middle Fork Rockcastle River [KY], Rockcastle River [KY], Buck Creek [KY], Rock Creek [KY], Kennedy Creek [KY], Little South Fork [KY], Big South Fork [KY, TN], Pitman Creek [KY], Otter Creek [KY], Wolf River [TN], Town Branch [TN], West Fork Obey River [TN], Obey River [TN], Caney Fork [TN], South Harpeth River [TN], and West Fork Red River [KY]. In addition, it is known from the following Tennessee River tributaries: South Fork Powell River [VA], Powell River [TN, VA], Indian Creek [VA], Little River [VA], Clinch River [TN, VA], Copper Creek [VA], North Fork Holston River [TN, VA], Big Moccasin Creek [VA], Middle Fork Holston River [VA], South Fork Holston River [TN, VA], Holston River [TN], Nolichucky River [TN], West Prong Little Pigeon River [TN], Tellico River [TN], French Broad River [TN], Little Tennessee River [TN], Hiwassee River [TN], Flint River [AL], Limestone Creek [AL], Elk River [AL, TN], Shoal Creek [AL], Buffalo River [TN], and Duck River [TN] (Gordon and Layzer 1989, entire; Winston and Neves 1997, entire; Parmalee and Bogan 1998, pp. 204–205; Layzer and Scott 2006, p. 481). The fluted kidneyshell's known historical and current occurrences, by water body and county, are shown in Table 1 below.

TABLE 1—KNOWN HISTORICAL AND CURRENT OCCURRENCES FOR THE FLUTED KIDNEYSHELL

Water body	Drainage	County	State	Historical or current
Cumberland River	Cumberland	McCreary, Pulaski, Russell	KY	Historical.
Cumberland River	Cumberland	Stewart	TN	Historical.
Middle Fork Rockcastle River	Cumberland	Jackson	KY	Historical and Current.
Horse Lick Creek	Cumberland	Jackson, Rockcastle	KY	Historical and Current.
Rockcastle River	Cumberland	Laurel, Pulaski, Rockcastle	KY	Historical.
Buck Creek	Cumberland	Pulaski	KY	Historical and Current.
Big South Fork Cumberland River	Cumberland	McCreary, Pulaski	KY	Historical and Current.
Big South Fork Cumberland River	Cumberland	Fentress, Morgan, Scott	TN	Historical and Current.
Rock Creek	Cumberland	McCreary	KY	Historical and Current.
Little South Fork Cumberland River	Cumberland	McCreary, Wayne	KY	Historical and Current.
Kennedy Creek	Cumberland	Wayne	KY	Historical.
Pitman Creek	Cumberland	Pulaski	KY	Historical.
Otter Creek	Cumberland	Wayne	KY	Historical.
Wolf River	Cumberland	Fentress, Pickett	TN	Historical and Current.
Town Branch	Cumberland	Pickett	TN	Historical and Current.
Obey River	Cumberland	?	TN	Historical.
West Fork Obey River	Cumberland	Overton	TN	Historical and Current.
Caney Fork River	Cumberland	?	TN	Historical.
South Harpeth River	Cumberland	Davidson	TN	Historical.
West Fork Red River	Cumberland	Todd	KY	Historical.
South Fork Powell River	Tennessee	Wise	VA	Historical.
Powell River	Tennessee	Claiborne, Hancock	TN	Historical and Current.
Powell River	Tennessee	Campbell, Union	TN	Historical.
Powell River	Tennessee	Lee	VA	Historical and Current.
Indian Creek	Tennessee	Tazewell	VA	Historical and Current.
Clinch River	Tennessee	Hancock	TN	Historical and Current.
Clinch River	Tennessee	Anderson, Claiborne, Grainger, Roane, Union.	TN	Historical.
Clinch River	Tennessee	Russell, Scott, Tazewell, Wise	VA	Historical and Current.
Little River	Tennessee	Russell, Tazewell	VA	Historical and Current.
Copper Creek	Tennessee	Scott	VA	Historical and Current.
North Fork Holston River	Tennessee	Hawkins, Sullivan	TN	Historical.
North Fork Holston River	Tennessee	Bland, Scott, Smyth, Washington	VA	Historical and Current.
Big Moccasin Creek	Tennessee	Scott	VA	Historical and Current.
Middle Fork Holston River	Tennessee	Smyth	VA	Historical and Current.
South Fork Holston River	Tennessee	Sullivan	TN	Historical.
South Fork Holston River	Tennessee	Washington	VA	Historical.
Holston River	Tennessee	Grainger, Hamblen, Jefferson, Knox	TN	Historical.
French Broad River	Tennessee	?	TN	Historical.
Tennessee River	Tennessee	Colbert, Jackson, Lauderdale	AL	Historical.
Tennessee River	Tennessee	Decatur, Knox, Meigs, Rhea	TN	Historical.
Nolichucky River	Tennessee	Greene	TN	Historical and Current.
West Prong Little Pigeon River	Tennessee	Sevier	TN	Historical.
Tellico River	Tennessee	Monroe	TN	Historical.
Little Tennessee River	Tennessee	Monroe	TN	Historical.
Hiwassee River	Tennessee	Polk	TN	Historical.
Flint River	Tennessee	Madison	AL	Historical.
Limestone Creek	Tennessee	Limestone	AL	Historical.
Elk River	Tennessee	Limestone	AL	Historical.
Elk River	Tennessee	Coffee, Franklin	TN	Historical.
Shoal Creek	Tennessee	Limestone	AL	Historical.
Duck River	Tennessee	Bedford, Marshall, Maury	TN	Historical and Current.
Buffalo River	Tennessee	Lewis	TN	Historical.

Note: A ? represents a lack of specific locational information in the museum and literature record.

Prior to 1980, the fluted kidneyshell was fairly widespread and common in many Cumberlandian Region streams based on collections in museums and from the literature record. The extirpation of this species from numerous streams within its historical range indicates that substantial population losses and range reductions have occurred.

Current Range and Distribution

In this document, populations of the fluted kidneyshell are generally considered extant (current) if live individuals or fresh dead specimens have been collected since circa 1980. This criterion (circa 1980) was chosen because a large number of collections were conducted in the 1980s in the Cumberland and Tennessee River systems and due to the longevity of these species (40–55 years), they are still thought to occur in these areas.

Some of the historical occurences have not been surveyed since the 1980s. Based on this criterion, the species appears to be limited to Horse Lick Creek [KY], Middle Fork Rockcastle River [KY], Buck Creek [KY], Rock Creek [KY], Little South Fork Cumberland River [KY], Big South Fork Cumberland River [KY, TN], Wolf River [TN], Town Branch [TN], and West Fork Obey River [TN] in the Cumberland River system; and the Powell River [TN, VA], Indian Creek [VA], Little River

[VA], Clinch River [TN, VA], Copper Creek [VA], North Fork Holston River [VA], Big Moccasin Creek [VA], Middle Fork Holston River [VA], Nolichucky River [TN], and Duck River [TN] in the Tennessee River system (see Table 1). Where two or more stream populations occur contiguously with no barriers, such as impoundments or long reaches of unoccupied habitat, they are considered single population segments or clusters. Multi-stream population segments include the Wolf River and its tributary Town Branch in the Cumberland River system, and Clinch River and Copper Creek (but not the other two upper Clinch tributaries, Indian Creek and Little River) in the Tennessee River system. Thus, we consider 17 of 40 populations of fluted kidneyshell to be extant. The fluted kidneyshell has been eliminated from more than 50 percent of streams from which it was historically known.

Other populations considered extant at the time this species was elevated to candidate status in 1999 (e.g., Rockcastle River, Kennedy Creek) are now considered to be extirpated. In addition, the population in the upper North Fork Holston River, although still large, has declined substantially since circa 2000. The North Fork Holston River population is predominately composed of large individuals, unlike the Clinch River population, which is skewed towards smaller size classes (Ostby *et al.* 2010, pp. 7, 22–24). These differences in population characteristics are a clear indication that recruitment in the Clinch River population is more observable than the population in the North Fork Holston River.

Resource managers have been making attempts to reintroduce the fluted kidneyshell into historical habitat over the past decade. In Tennessee, thousands of individuals of the species have been reintroduced into three sites in the upper Duck River, and into two sites in the Nolichucky River, by Tennessee Wildlife Resource Agency (TWRA) biologists translocating adult individuals from the Clinch River (Hubbs 2011, unpubl. data). In 2010, six individuals were collected during a quantitative survey at Lillard's Mill in the Duck River, confirming some level of survival and persistence of the reintroduced population (Hubbs 2011, unpubl. data). The individuals collected appeared in good condition and had grown noticeably since their release (as evidenced by external shell marks), but recruitment has yet to be documented (Hubbs 2011, unpubl. data). In 2008, the Kentucky Department of Fish and Wildlife Resources (KDFWR) translocated 144 individuals from the Clinch River into the Big South Fork of the Cumberland River, Kentucky (Hubbs 2011, unpubl. data). It is not known if the Nolichucky or Big South Fork reintroductions have been successful. Approximately 691 adult individuals of the species have been translocated from the Clinch River, Tennessee, into the Little Tennessee River bypass reach below Calderwood Dam, Tennessee (Moles 2012, pers. comm.). The Virginia Department of Game and Inland Fisheries (VDGIF) reintroduced 58 adults into Indian Creek, a tributary to the Clinch River, using Clinch River stock. They have also propagated and released 562 juveniles into the North Fork Holston River (Duncan 2012, pers. comm.).

The extant fluted kidneyshell populations (including the potentially reintroduced populations) in the Cumberlandian Region generally represent small, isolated occurrences. Only in the Clinch River is a population of the fluted kidneyshell known to be large, stable, and viable, but in a relatively short reach of river primarily in the vicinity of the Tennessee-Virginia State line. Jones (2012, unpub. data) estimates 500,000 to 1,000,000 individuals occur in the Clinch River from just a 32-river-kilometer (rkm) (20-river-mile (rmi)) reach (rkm 309 to 277 (rmi 172 to 192)). Live adults and juveniles have been observed over the past 10 years in shoal habitats in the upper Clinch River, Virginia, particularly at and above Cleveland Islands, and many more fresh dead shells have been collected in muskrat middens in this reach. Eckert and Pinder (2010, pp. 23–30) collected 18 individuals in quantitative samples and 11 individuals in semi-quantitative samples in the Clinch River at Cleveland Island in 2008, and 15 individuals in quantitative samples and 62 individuals in semi-quantitative samples in the Clinch River at Cleveland Island in 2002. Ostby and Angermeier (2011, entire) found two live individuals in the Little River (tributary to Clinch River). Henley *et al.* (1999, pp. 20, 22) collected live individuals at 6 of 25 sites surveyed in the Middle Fork Holston River in 1997 and 1998. The fluted kidneyshell was found in Copper Creek between creek rkm 2 and 31 (rmi 1 and 19) (Hanlon *et al.* 2009, pp. 15–17). Petty *et al.* (2006, pp. 4, 36) found the species between Copper Creek rkm 24 and 31 (rmi 15 and 19) and reported evidence of reproduction and recruitment of the species at these locations. In 2008–09, 35 live individuals were found at 5 of 21 sites sampled in the Powell River, in both Tennessee and Virginia, and there was some indication of relatively recent recruitment (Johnson *et al.* in press, Table 4). Ostby *et al.* (2010, pp. 16–20) observed 772 individuals during qualitative surveys and 10 individuals in quantitative surveys in the North Fork Holston River, Virginia.

Live fluted kidneyshell have not been collected in the Middle Fork Rockcastle River since the mid-1980s (Layzer and Anderson 1992, p. 64). Haag and Warren (2004, p. 16) collected only fresh dead shell material in Horse Lick Creek, and reported that a small, extremely vulnerable population of the fluted kidneyshell may exist there, but at very low levels that they were not able to detect. Warren and Haag (2005, pp. 1384, 1388–1396) reported a vast reduction of the once sizable Little South Fork population since the late 1980s. Live fluted kidneyshell have not been collected in the Big South Fork since the mid-1980s (Ahlstedt *et al.* 2003–2004, p. 65). In 2010, two individuals were found in Buck Creek and collected for future propagation efforts (McGregor 2010, unpub. data). Live fluted kidneyshell have not been collected in Rock Creek since 1988 (Layzer and Anderson 1992, p. 68). Layzer and Anderson (1992, p. 22) collected fluted kidneyshell at two sites in the West Fork Obey River. A small but recruiting population occurs in the Wolf River, Tennessee, based on 2005–06 sampling (Moles *et al.* 2007, p. 79). This may be the best population remaining in the entire Cumberland River system, where most populations are very restricted in range and are highly imperiled. Given its longevity, small populations of this long-lived species may persist for decades despite total recruitment failure. Therefore, at least 5 of the extant populations may be functionally extirpated (e.g., Horse Lick Creek, Middle Fork Rockcastle River, Little South Fork Cumberland River, Rock Creek, West Fork Obey River).

Population Estimates and Status

Extirpated from both the Cumberland and Tennessee River mainstems, the fluted kidneyshell has been eliminated from approximately 50 percent of the total number of streams from which it was historically known. Population size data gathered during the past decade or two indicate that the fluted kidneyshell is rare in nearly all extant populations, the Clinch River being a notable exception. The fluted kidneyshell is particularly imperiled in Kentucky. Haag and Warren (2004, p. 16) reported that a small, extremely vulnerable population of the fluted kidneyshell may exist in Horse Lick Creek, but at

extremely low levels that they were not able to detect. They only collected fresh dead shell material in Horse Lick Creek. The vast reduction of the once sizable Little South Fork population since the late 1980s (Warren and Haag 2005, pp. 1384, 1388–1396) and the tenuous status of the other Cumberland River system populations put the species at risk of total extirpation from that Cumberland River system. In addition, the populations in the Powell River (post-1980) and the Middle Fork (post-1995) and upper North Fork (post-2000) Holston Rivers in Virginia have declined in recent years based on recent survey efforts (Henley *et al.* 1999, p. 23; Ahlstedt *et al.* 2005, p. 9; Jones and Neves 2007, p. 477; Johnson *et al.* in press). Populations of the fluted kidneyshell remain locally abundant in certain reaches of the North Fork Holston River but are reduced in overall range within the river (Ostby and Neves 2005, 2006a, and 2006b, entire; Dinkins 2010a, p. 3–1). Declines in mussel community abundance in the North Fork Holston River have been in the form of several die-offs. The cause for the observed die-offs is unknown (Jones and Neves 2007, p. 479), but may be related to agricultural runoff (Hanlon *et al.* 2009, p. 11).

In summary, the fluted kidneyshell has been eliminated from approximately 50 percent of the total number of streams from which it was historically known. Populations in Buck Creek, Little South Fork, Horse Lick Creek, Powell River, and North Fork Holston River have clearly declined over the past two decades. Based on recent information, the overall population status of the fluted kidneyshell rangewide is declining. A few populations are considered to be viable (e.g., Wolf, Clinch, Little, North Fork Holston Rivers). However, all other populations are of questionable viability, with some on the verge of extirpation (e.g., Horse Lick and Rock Creeks). Newly reintroduced populations will hopefully begin to reverse the overall downward trend of this species.

The fluted kidneyshell was considered a species of special concern by Williams *et al.* (1993, p. 14), but two decades later is considered endangered in a reassessment of the North American mussel fauna by the Endangered Species Committee of the American Fisheries Society (Butler 2012, pers. comm.). The fluted kidneyshell is listed as a species of Greatest Conservation Need (GCN) in the Kentucky, Tennessee, and Virginia State Wildlife Action Plans (KDFWR 2005; TWRA 2005; VDGIF 2005).

Slabside Pearlymussel

Taxonomy and Species Description

The taxonomic status of the slabside pearlymussel (family Unionidae) as a distinct species is undisputed within the scientific community. The species is recognized as *Lexingtonia dolabelloides* (I. Lea, 1840) in the ''Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks, Second Edition'' (Turgeon *et al.* 1998, p. 35). However, there are currently differing opinions on the appropriate genus to use for the species. Genetic analyses by Bogan *et al.* (unpublished data), as cited by Williams *et al.* (2008, p. 584), suggests that the type genus of *Lexingtonia, Unio subplana* Conrad, 1837, is synonymous with *Fusconaia masoni* (Conrad, 1834). *Lexingtonia* is therefore a junior synonym of *Fusconaia,* making *Lexingtonia* no longer available as a valid genus of mussel under the rules of the International Code of Zoological Nomenclature (Williams 2011, pers. comm.). Analyses by Campbell *et al.* (2005, pp. 141, 143, 147) and Campbell and Lydeard (2012a, pp. 3–6, 9; 2012b, pp. 25–27, 30, 34) suggest that ''*Lexingtonia'' dolabelloides,* ''*Fusconaia'' barnesiana,* and ''*Pleurobema'' gibberum* do not correspond to their currently assigned genera but form a closely related group. Williams *et al.* (2008, pp. 584–593) and Campbell and Lydeard (2012b, pp. 30, 34) picked the next available genus name for *dolabelloides,* which appears to be *Pleuronaia* (Frierson 1927). Based on this latest information, we currently consider *Pleuronaia* to be the most appropriate generic name for the slabside pearlymussel.

The following description, biology, and life history of the slabside pearlymussel is taken from data summarized in Parmalee and Bogan (1998, pp. 150–152). The slabside pearlymussel is a moderately sized mussel that reaches about 9 cm (3.5 in) in length. The shape of the shell is subtriangular, and the very solid, heavy valves are moderately inflated. Shell texture is smooth and somewhat shiny in young specimens, becoming duller with age. Shell color is greenish yellow, becoming brownish with age, with a few broken green rays or blotches, particularly in young individuals. Internally, the pseudocardinal teeth are triangular or blade-like in shape. The lateral teeth are slightly curved, with two in the left valve and one in the right valve. The color of the nacre is white, or rarely, straw-colored.

Habitat and Life History

General life history information for the slabside pearlymussel is similar to that given for the fluted kidneyshell above. Samples from approximately 150 shells of the slabside pearlymussel from the North Fork Holston River were thin-sectioned for age determination. The maximum age exceeded 40 years (Grobler *et al.* 2005, p. 65).

The slabside pearlymussel utilizes all four gills as a marsupium for its glochidia. It is thought to have a spring or early summer fertilization period with the glochidia being released during the late summer in the form of conglutinates. Slabside pearlymussel conglutinates have not been described. The slabside pearlymussel's host fishes include 11 species of minnows (popeye shiner, *Notropis ariommus;* rosyface shiner, *N. rubellus;* saffron shiner, *N. rubricroceus;* silver shiner, *N. photogenis;* telescope shiner, *N. telescopus;* Tennessee shiner, *N. leuciodus;* whitetail shiner, *Cyprinella galactura;* striped shiner, *Luxilus chrysocephalus;* warpaint shiner, *L. coccogenis;* white shiner, *L. albeolus;* and eastern blacknose dace, *Rhinichthys atratulus*) (Kitchel 1985 and Neves 1991 *in* Parmalee and Bogan 1998, pp. 150–152; Jones and Neves 2002, pp. 18–20).

The slabside pearlymussel is primarily a large creek to large river species, inhabiting sand, fine gravel, and cobble substrates in relatively shallow riffles and shoals with moderate current (Parmalee and Bogan 1998, p. 152; Williams *et al.* 2008, p. 590). This species requires flowing, well-oxygenated waters to thrive.

Historical Range and Distribution

Historically, the slabside pearlymussel occurred in the lower Cumberland River mainstem from the vicinity of the Kentucky State line downstream to the the Caney Fork River, Tennessee, and in the Tennessee River mainstem from eastern Tennessee to western Tennessee. Records are known from two Cumberland River tributaries, the Caney Fork [TN] and Red Rivers [KY, TN]. In addition, it is known from 30 Tennessee River system tributaries, including the South Fork Powell River [VA], Powell River [TN, VA], Puckell Creek [VA], Clinch River [TN, VA], North Fork Holston River [TN, VA], Big Moccasin Creek [VA], Middle Fork Holston River [VA], South Fork Holston River [TN], Holston River [TN], Nolichucky River [TN], West Prong Little Pigeon River [TN], French Broad River [TN], Tellico River [TN], Little Tennessee River [TN], Hiwassee River [TN], Sequatchie River [TN],

Larkin Fork [AL], Estill Fork [AL], Hurricane Creek [AL], Paint Rock River [AL], Flint River [AL], Flint Creek [AL], Limestone Creek [AL], Elk River [AL, TN], Sugar Creek [AL], Bear Creek [AL, MS], North Fork Creek [TN], Big Rock Creek [TN], Buffalo River [TN], and Duck River [TN] (Gordon and Layzer 1989, entire; Winston and Neves 1997, entire; Parmalee and Bogan 1998, pp. 150–152). The slabside pearlymussel's known historical and current occurrences, by water body and county, are shown in Table 2 below.

TABLE 2—KNOWN HISTORICAL AND CURRENT OCCURRENCES FOR THE SLABSIDE PEARLYMUSSEL

Water body	Drainage	County	State	Historical or current
Cumberland River	Cumberland	Davidson, Smith	TN	Historical.
Caney Fork River	Cumberland	?	TN	Historical.
Red River	Cumberland	Logan	KY	Historical.
Red River	Cumberland	?	TN	Historical.
South Fork Powell River	Tennessee	Wise	VA	Historical.
Powell River	Tennessee	Claiborne	TN	Historical.
Powell River	Tennessee	Hancock	TN	Historical and Current.
Powell River	Tennessee	Lee	VA	Historical and Current.
Puckell Creek	Tennessee	Lee	VA	Historical.
Clinch River	Tennessee	Hancock	TN	Historical and Current.
Clinch River	Tennessee	Anderson, Campbell, Claiborne, Knox	TN	Historical.
Clinch River	Tennessee	Russell, Scott, Tazewell, Wise	VA	Historical and Current.
North Fork Holston River	Tennessee	Hawkins, Sullivan	TN	Historical.
North Fork Holston River	Tennessee	Bland, Scott, Smyth, Washington	VA	Historical and Current.
Big Moccasin Creek	Tennessee	Russell, Scott	VA	Historical and Current.
Middle Fork Holston River	Tennessee	Smyth, Washington, Wythe	VA	Historical and Current.
South Fork Holston River	Tennessee	Sullivan	TN	Historical.
Holston River	Tennessee	?	TN	Historical.
French Broad River	Tennessee	Sevier	TN	Historical.
Tennessee River	Tennessee	Colbert, Jackson, Lauderdale	AL	Historical.
Tennessee River	Tennessee	Hamilton, Hardin, Knox, Meigs, Rhea	TN	Historical.
Nolichucky River	Tennessee	Cocke, Greene, Hamblen	TN	Historical and Current.
West Prong Little Pigeon River	Tennessee	Sevier	TN	Historical.
Tellico River	Tennessee	Monroe	TN	Historical.
Little Tennessee River	Tennessee	Monroe	TN	Historical.
Hiwassee River	Tennessee	Polk	TN	Historical and Current.
Sequatchie River	Tennessee	Sequatchie	TN	Historical and Current.
Larkin Fork	Tennessee	Jackson	AL	Historical and Current.
Estill Fork	Tennessee	Jackson	AL	Historical and Current.
Hurricane Creek	Tennessee	Jackson	AL	Historical and Current.
Paint Rock River	Tennessee	Jackson, Madison, Marshall	AL	Historical and Current.
Flint River	Tennessee	Madison	AL	Historical.
Flint Creek	Tennessee	Morgan	AL	Historical.
Limestone Creek	Tennessee	Limestone	AL	Historical.
Elk River	Tennessee	Limestone	AL	Historical and Current.
Elk River	Tennessee	Lincoln	TN	Historical and Current.
Elk River	Tennessee	Coffee, Franklin, Moore	TN	Historical.
Sugar Creek	Tennessee	Limestone	AL	Historical.
Bear Creek	Tennessee	Franklin	AL	Historical and Current.
Bear Creek	Tennessee	Tishomingo	MS	Historical and Current.
Duck River	Tennessee	Bedford, Hickman, Marshall, Maury	TN	Historical and Current.
Duck River	Tennessee	Coffee	TN	Historical.
North Fork Creek	Tennessee	Bedford	TN	Historical.
Big Rock Creek	Tennessee	Marshall	TN	Historical.
Buffalo River	Tennessee	Humphreys, Perry	TN	Historical and Current.
Buffalo River	Tennessee	Lewis	TN	Historical.

Based on collections made in the early 1900s, the slabside pearlymussel was historically fairly widespread and common in many Cumberlandian Region streams. However, its decline in certain streams may have begun before European colonization. The slabside pearlymussel was considered rare by mussel experts as early as 1970 (Stansbery 1971, p.13), which represents the first attempt to compile such a list. The extirpation of this species from numerous streams within its historical range indicates that substantial population losses and range reductions have occurred.

Current Range and Distribution

In this document, populations of the slabside pearlymussel are generally considered extant (current) if live individuals or fresh dead specimens have been collected since circa 1980. This criterion (circa 1980) was chosen because a large number of collections were conducted in the 1980s in the Cumberland and Tennessee River systems and due to the longevity of these species (40–55 years), they are still thought to occur in these areas.

Some of the historical occurences have not been surveyed since the 1980s. Based on this criterion, extant populations remain in the Powell River [TN, VA], Clinch River [TN, VA], North Fork Holston River [VA], Nolichucky River [TN], Big Moccasin Creek [VA], Middle Fork Holston River [VA], Hiwassee River [TN], Sequatchie River [TN], Paint Rock River [AL], Larkin Fork [AL], Estill Fork [AL], Hurricane Creek [AL], Elk River [AL, TN], Buffalo River [TN], Duck River [TN], and Bear Creek

[AL, MS] (see Table 2). Where two or more stream populations occur contiguously with no absolute barriers (e.g., large impoundments) or long reaches of unoccupied habitat, they are considered to represent a single population segment. The Paint Rock River system (including Larkin Fork, Estill Fork, and Hurricane Creek) is considered a single population segment or cluster but it occurs only in the lower mile or so of the three tributary streams. Thus, we consider 13 of 30 populations of the slabside pearlymussel to be extant. The slabside pearlymussel has been eliminated from more than 50 percent of streams from which it was historically known.

The extant occurrences in the Tennessee River system represent 11 isolated populations. Population size data gathered during the past two decades indicate that the slabside pearlymussel is rare (experienced surveyors may find four or fewer specimens per site of occurrence) in about half of its extant populations. Only a few individuals have been found in the Powell River since 1988; therefore, this population is considered extremely rare (Ahlstedt *et al.* 2005, p. 9). In 2009, 4 individuals were collected in the Powell River (Johnson 2010, p. 39). A single live individual was found in 2006 in Big Moccasin Creek, Virginia (Ostby *et al.* 2006, p. 3). The slabside pearlymussel is uncommon to rare in the Clinch River, with only a few individuals found per effort (Ahlstedt *et al.* 2005, p. 8). Eckert and Pinder (2010, pp. 23–30) collected 1 individual in quantitative samples and 5 individuals in semi-quantitative samples in the Clinch River at Cleveland Island in 2008, and 2 individuals in quantitative samples and 13 individuals in semi-quantitative samples in the Clinch River at Cleveland Island in 2002. In 2005, approximately 20 individuals were found near Harms Mill (one of five sites surveyed) in the Elk River, Tennessee, and 13 individuals (at two of five survey sites, spanning approximately 48 rkm (30 rmi)) were found in 2008 (Howard 2009, pers. comm.; Tennessee Valley Authority (TVA) 2009, p. 59). In 2002, one live individual was found in the Hiwassee River (Ahlstedt 2003, p. 3). The slabside pearlymussel was last found in the Sequatchie River 2 miles north of Dunlap, Tennessee, in 1980 (Hatcher and Ahlstedt 1982, p. 9). A small population is limited to Bear Creek in Mississippi, its only occurrence in that State (Jones 2012, pers. comm.). In 2009, TVA collected 9 individuals at one site in Bear Creek (TVA 2010, p. 69). This population is recruiting as evidenced by collection of fresh dead juvenile shells in 2011 (Johnson 2011, pers. comm.). Given its longevity, small populations of this long-lived species may persist for decades despite total recruitment failure. The species has undergone decline in the North and Middle Forks of the Holston River (Jones and Neves 2005, pp. 8–9). This is especially true for the North Fork, where the species has been nearly eliminated (Hanlon 2006, unpub. data). The cause for the observed die-offs is unknown (Jones and Neves 2007, p. 479). Ostby *et al.* (2010, pp. 16–20) observed 8 individuals in qualitative surveys at one site, but did not observe the species in quantitative surveys in the Upper North Fork Holston River. Slabside pearlymussels have declined at 3 of 4 survey sites on the Middle Fork Holston River (Henley 2011, pers. comm.). A single valve of a fresh dead specimen was found in the Nolichucky River in 2011 (Dinkins 2010b, p. 2–1). In 2011, TVA collected one live individual in the Buffalo River (Wales 2012, pers. comm.).

The Duck and Paint Rock Rivers appear to have the best populations remaining rangewide based on population size and the evidence of recent recruitment. The slabside pearlymussel is found at numerous sites in the Duck River within a 64-rkm (40-rmi) reach, and is found at numerous sites within a 72-rkm (45-rmi) reach of the Paint Rock River (Ahlstedt *et al.* 2004, p. 84; Fobian *et al.* 2008, pp. 15–16). A 2010 quantitative survey of the Duck River found the slabside pearlymussel present but rare at 4 of 6 sites sampled (Hubbs *et al.* 2011, pp. 19–25).

Population Estimates and Status

A recent study of major population centers concluded that all populations of the species were fairly similar in genetic structure (Grobler *et al.* 2005, p. 1). However, the population in the Duck River was deemed relatively distinct enough from those in the middle (i.e., Paint Rock River) and upper (i.e., Clinch, North and Middle Forks Holston Rivers) Tennessee River system to warrant recognition as a distinct management unit.

Current status information for most of the 13 extant populations is available from recent periodic sampling efforts (sometimes annually) and other field studies. Comprehensive surveys have taken place in the Middle and North Forks Holston River, Paint Rock River, and Duck River in the past several years. Based on this information, the overall population of the slabside pearlymussel appears to be declining rangewide, and the species remains in relatively good numbers and appears viable in just two streams (Duck and Paint Rock Rivers). Two of the four largest populations in the mid-1990s have undergone drastic recent declines (i.e., North and Middle Forks Holston Rivers), especially in the North Fork. Most of the other populations are of questionable viability and may be on the verge of extirpation (e.g., Powell and Hiwassee Rivers; Big Moccasin Creek).

The slabside pearlymussel was considered threatened by Williams *et al.* (1993, p. 13), but two decades later is considered endangered in a reassessment of the North American mussel fauna by the Endangered Species Committee of the American Fisheries Society (Butler 2012, pers. comm.). The slabside pearlymussel is listed as a species of Greatest Conservation Need (GCN) in the Alabama, Mississippi, Tennessee, and Virginia State Wildlife Action Plans (Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, 2005; KDFWR 2005; Mississippi Department of Wildlife, Fisheries and Parks, 2005; TWRA 2005; VDGIF 2005).

Summary of Factors Affecting the Species

Section 4 of the Act, and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following 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; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above factors, singly or in combination. Each of these factors is discussed below.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The decline of the fluted kidneyshell and slabside pearlymussel in the Cumberlandian Region and other mussel species in the eastern United States is primarily the result of habitat loss and degradation. Chief among the causes of decline are impoundments, gravel and coal mining, sedimentation, water pollution, and stream channel alterations (Neves 1993, pp. 4–5;

Williams *et al.* 1993, p. 7; Neves *et al.* 1997, pp. 60–78).

Impoundments

Impoundments result in the dramatic modification of riffle and shoal habitats and the resulting loss of mussel resources, especially in larger rivers. Impoundment impacts are most profound in riffle and shoal areas, which harbor the largest assemblages of mussel species, including the fluted kidneyshell and slabside pearlymussel. Mussels are relatively immobile and, therefore, require a stable substrate to survive and reproduce, and are particularly susceptible to channel instability (Neves *et al.* 1997, p. 23) and alteration in the dynamic processes involved in maintaining stream stability. Dams interrupt most of a river's ecological processes by modifying flood pulses; controlling impounded water elevations; altering water flow, sediments, nutrients, energy inputs, and outputs; increasing depth; decreasing habitat heterogeneity; and decreasing bottom stability due to subsequent sedimentation. In addition, dams can also seriously alter downstream water quality and riverine habitat and negatively impact tailwater mussel populations. These changes include thermal alterations immediately below dams; changes in channel characteristics, habitat availability, and flow regime; daily discharge fluctuations; increased silt loads; and altered host fish communities. For these above-mentioned reasons, the reproductive process of riverine mussels is generally disrupted by impoundments, making them unable to successfully reproduce and recruit under reservoir conditions. Coldwater releases from large non-navigational dams and scouring of the river bed from highly fluctuating, turbulent tailwater flows have also been implicated in the demise of mussel faunas (see critical habitat descriptions for Units FK19 and FK20, below).

The damming of rivers has been a major factor contributing to the demise of mussels (Bogan 1993, p. 604). Dams eliminate or reduce river flow within impounded areas, trap silts and cause sediment deposition, alter water temperature and dissolved oxygen levels, change downstream water flow and quality, affect normal flood patterns, and block upstream and downstream movement of mussels and their host fishes (Bogan 1993, p. 604; Vaughn and Taylor 1999, pp. 915–917; Watters 1999, pp. 261–264; McAllister *et al.* 2000, p. iii; Marcinek *et al.* 2005, pp. 20–21). Below dams, mollusk declines are associated with changes and fluctuation in flow regime, scouring and erosion, reduced dissolved oxygen levels, reduced food availability, water temperature alteration, and changes in resident fish assemblages (Williams *et al.* 1993, p. 7; Neves *et al.* 1997, pp. 63–64; Watters 1999, pp. 261–264; Marcinek *et al.* 2005, pp. 20–21; Moles and Layzer 2008, p. 220). Because rivers are linear systems, these alterations can cause mussel declines for many miles below the dam (Moles and Layzer 2008, p. 220; Vaughn and Taylor 1999, p. 916).

Population losses due to impoundments have probably contributed more to the decline of the fluted kidneyshell, slabside pearlymussel, and other Cumberlandian Region mussels than has any other single factor. The majority of the Cumberland and Tennessee River mainstems and many of their largest tributaries are now impounded, and therefore, are unsuitable for Cumberlandian Region mussels. For example, approximately 90 percent of the 904-rkm (562-rmi) length of the Cumberland River downstream of Cumberland Falls is either impounded (three locks and dams and Wolf Creek Dam) or otherwise adversely impacted by coldwater discharges from Wolf Creek Dam. Other major U.S. Army Corps of Engineers (Corps) impoundments on Cumberland River tributaries (e.g., Obey River, Caney Fork) have inundated over 161 rkm (100 rmi) of riverine habitat for the fluted kidneyshell and the slabside pearlymussel. Layzer *et al.* (1993, p. 68) reported that 37 of the 60 mussel species present in the Caney Fork River pre-impoundment have been extirpated. By 1971, approximately 3,700 rkm (2,300 rmi) (about 20 percent) of the Tennessee River and its tributaries with drainage areas of 65 square rkm (25 square rmi) or greater were impounded by the TVA (TVA 1971, p. 5). The subsequent completion of additional major impoundments on tributary streams (e.g., Duck River in 1976, Little Tennessee River in 1979) significantly increased the total river kilometers (miles) impounded behind the 36 major dams in the Tennessee River system.

Given projected population increases and the need for municipal water supply, other proposals for small impoundment construction are likely in the future within the Cumberland and Tennessee River systems.

Mining and Commercial Navigation

Instream gravel mining has been implicated in the destruction of mussel populations. Negative impacts associated with gravel mining include stream channel modifications (e.g., altered habitat, disrupted flow patterns, sediment transport), water quality modifications (e.g., increased turbidity, reduced light penetration, increased temperature), macroinvertebrate population changes (e.g., elimination, habitat disruption, increased sedimentation), and changes in fish populations (e.g., impacts to spawning and nursery habitat, food web disruptions) (Kanehl and Lyons 1992, pp. 26–27).

Gravel mining activities negatively impact the habitat of the fluted kidneyshell in Buck Creek, one of the few remaining populations of this species in the entire Cumberland River system. Gravel mining activities also negatively impact the habitat of the slabside pearlymussel in the Powell and Elk Rivers in the Tennessee River system.

Channel modification for commercial navigation has been shown to increase flood heights (Belt 1975, p. 684), partly as a result of an increase in stream bed slope (Hubbard *et al.* 1993, p. 137). Flood events are exacerbated, conveying large quantities of sediment, potentially with adsorbed contaminants, into streams. Channel maintenance often results in increased turbidity and sedimentation that often smothers mussels (Stansbery 1970, p. 10).

Heavy metal-rich drainage from coal mining and associated sedimentation has adversely impacted upper Cumberland and Tennessee River system streams with historically diverse mussel faunas. Strip mining continues to threaten mussel habitats in coal field drainages of the Cumberland Plateau, including streams harboring small fluted kidneyshell populations (e.g., Horse Lick Creek, Little South Fork, Powell River, Indian Creek). Portions of the upper Tennessee River system are also influenced by coal mining activities. Powell River mussel populations were inversely correlated with coal fines in the substrate; when coal fines were present, decreased filtration times and increased movements were noted in laboratory-held mussels (Kitchel *et al.* 1981, p. 25). In a quantitative study in the Powell River, a decline of federally listed mussels and the long-term decrease in overall species composition since about 1980 was attributed to general stream degradation due primarily to coal mining activities in the headwaters (Ahlstedt and Tuberville 1997, pp. 74–76). Numerous gray-water and black-water spill events have been documented in the Powell and Clinch River drainages over the past several years. The habitats of Fluted

kidneyshell, slabside pearlymussel, and other mussels in the Clinch and Powell rivers are increasingly being threatened by coal mining activities.

Oil and Natural Gas Development

Oil and natural gas resources are present in some of the watersheds that are known or historically were known to support the fluted kidneyshell and slabside pearlymussel, including the Clinch, Powell, and Big South Fork Rivers. Exploration and extraction of these energy resources has the potential to result in increased siltation, a changed hydrograph (flow regime), and altered water quantity and quality even at a distance from the mine or well field. Although oil and natural gas extraction generally occurs away from the river, extensive road and pipeline networks are required to construct and maintain wells and transport the extracted resources. These road and pipeline networks frequently cross or occur near tributaries, contributing sediment to the receiving waterway. In addition, the construction and operation of wells may result in the illegal discharge of chemical contaminants and subsurface minerals.

Sedimentation

Sedimentation is one of the most significant pollution problems for aquatic organisms (Waters 1995, pp. 2–3), and has been determined to be a major factor in mussel declines (Ellis 1936, pp. 39–40). Sources of silt and sediment include poorly designed and executed timber harvesting operations and associated activities; complete clearing of riparian vegetation for agricultural, silvicultural, or other purposes; and those construction, mining, and other practices that allow exposed earth to enter streams. Agricultural activities, specifically an increase in cattle grazing and the resultant nutrient enrichment and loss of riparian vegetation along the stream, are responsible for much of the sediment (Fraley and Ahlstedt 2000, p. 193; Hanlon *et al.* 2009, pp. 11–12).

Heavy sediment loads can destroy mussel habitat, resulting in a corresponding shift in mussel fauna (Brim Box and Mossa 1999, p. 100). Excessive sedimentation can lead to rapid changes in stream channel position, channel shape, and bed elevation (Brim Box and Mossa 1999, p. 102). Sedimentation has also been shown to impair the filter feeding ability of mussels, and high amounts of suspended sediments can dilute their food source (Dennis 1984, p. 212). We will describe the detrimental actions of sedimentation in Factor E, below.

Chemical Contaminants

Chemical contaminants are ubiquitous throughout the environment and are considered a major threat in the decline of mussel species (Richter *et al.* 1997, p. 1081; Strayer *et al.* 2004, p. 436; Wang *et al.* 2007a, p. 2029; Cope *et al.* 2008, p. 451). Chemicals enter the environment through both point and nonpoint discharges including spills, industrial sources, municipal effluents, and agricultural runoff. These sources contribute organic compounds, heavy metals, pesticides, and a wide variety of newly emerging contaminants to the aquatic environment. As a result, water and sediment quality can be degraded to the extent that mussel habitats and populations are adversely impacted. We will describe the detrimental actions of chemicals in Factor E, below.

Other Stream Channel Alterations

Other stream channel alterations that can impact mussel habitats include bridges, other road crossing structures, and activities that lower water tables (withdrawals). Culverts can act as barriers to fish passage (Wheeler *et al.* 2005, p. 149), particularly by increasing flow velocity (Warren and Pardew 1998, p. 637). Stream channels become destabilized when improperly designed culverts or bridges change the morphology and interrupt the transport of woody debris, substrate, and water (Wheeler *et al.* 2005, p. 152). Water withdrawals for irrigation, municipal, and industrial water supplies are an increasing concern. U.S. water consumption doubled from 1960 to 2000, and is likely to increase further (Naiman and Turner 2000, p. 960). Therefore, we anticipate road crossings, water withdrawals, and potential stream dewatering to be threats to the habitat of the fluted kidneyshell and slabside pearlymussel.

Summary of Factor A

Habitat loss and degradation negatively impact the fluted kidneyshell and slabside pearlymussel. Severe degradation from impoundments, gravel and coal mining, oil and natural gas development, sedimentation, chemical contaminants, and stream channel alterations threaten the stream habitat and water quality on which these species depend. Contaminants associated with coal mining (metals, other dissolved solids), municipal effluents (bacteria, nutrients, pharmaceuticals), and agriculture (fertilizers, pesticides, herbicides, and animal waste) cause degradation of water quality and habitats through increased acidity and conductivity, instream oxygen deficiencies, excess nutrification, and excessive algal growths. Furthermore, these threats faced by the fluted kidneyshell and slabside pearlymussel are imminent; the result of ongoing projects that are expected to continue indefinitely, therefore perpetuating these impacts. As a result of the imminence of these threats, combined with the vulnerability of the remaining small, isolated populations to extirpation from natural and manmade threats, we have determined that the present or threatened destruction, modification, or curtailment of the habitat and range of these species represents a threat to both the fluted kidneyshell and slabside pearlymussel.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The fluted kidneyshell and slabside pearlymussel are not commercially valuable species, but may be increasingly sought by collectors, due to their increasing rarity. Although scientific collecting is not thought to represent a significant threat, localized populations could become impacted, and possibly extirpated, by overcollecting, particularly if regulations governing collection activity (currently scientific collection is controlled by the States through the issuance of collection permits; see Factor D below) are not enforced.

In summary, the fluted kidneyshell and slabside pearlymussel are not commercially utilized but might be increasingly sought for scientific or educational purposes as their rarity becomes known. We do not consider overutilization for commercial, recreational, scientific, or educational purposes to be a threat to either species now or likely to become a threat in the future.

C. Disease or Predation

Little is known about diseases in mussels (Grizzle and Brunner 2007, p. 6). Several mussel dieoffs have been documented during the past 20 years (Neves 1987, pp. 8–11). Although the ultimate cause is unknown, some researchers believe that disease may be a factor. Warren and Haag (2005, p. 1394) hypothesized that declines in the Little South Fork Cumberland River, Kentucky, mussel fauna, including the once abundant fluted kidneyshell population, may have been at least partially attributed to disease, but no definitive cause has been determined. We have no specific documentation indicating that disease poses a threat to slabside pearlymussel populations.

Juvenile and adult mussels are prey items for some invertebrate predators and parasites (for example, nematodes and mites), and are prey for a few vertebrate species (for example, raccoons, muskrats, otters, and turtles) (Hart and Fuller 1974, pp. 225–240). Mussel parasites include water mites, trematodes, oligochaetes, leeches, copepods, bacteria, and protozoa (Grizzle and Brunner 2007, p. 6). Generally, parasites are not suspected of being a major limiting factor (Oesch 1984, p. 16); however, Gangloff *et al.* (2008, pp. 28–30) found that reproductive output and physiological condition were negatively correlated with mite and trematodes abundance, respectively. Stressors that reduce fitness may make mussels more susceptible to parasites (Butler 2007, p. 90).

Muskrat predation on the fluted kidneyshell represents a localized threat, as determined by Neves and Odum (1989, entire) in the upper North Fork Holston River in Virginia. They concluded that muskrat predation could limit the recovery potential of endangered mussel species or contribute to the local extirpation of already depleted mussel populations. Although other mammals (e.g., raccoon, mink) occasionally feed on mussels, the threat from these predators is not considered to be significant. Predation does occur, but it is considered to be a normal aspect of the species' population dynamics.

In summary, there is little information on disease in mussels, and disease is not currently considered to be a threat to the fluted kidneyshell or slabside pearlymussel and it is not likely to become so in the future. Although predation does occur and impacts local populations, we conclude that predation is not a threat to these species as a whole or likely to become so in the future.

D. The Inadequacy of Existing Regulatory Mechanisms

The objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA) (33 U.S.C. 1251 *et seq.*), is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources. The CWA has a stated goal that ''* * * wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983.'' States are responsible for setting and implementing water quality standards that align with the requirements of the CWA. Overall, implementation of the CWA could benefit both mussel species through the point and nonpoint programs.

Nonpoint source (NPS) pollution comes from many diffuse sources, unlike pollution from industrial and sewage treatment plants. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it transports natural and human-made pollutants to lakes, rivers, wetlands, coastal waters and ground waters. States report that nonpoint source pollution is the leading remaining cause of water quality problems. The effects of nonpoint source pollutants on specific waters vary and may not always be fully assessed. However, these pollutants have harmful effects on fisheries and wildlife (*http://www.epa.gov/owow_keep/NPS/whatis.html*).

Sources of NPS pollution within the watersheds occupied by both mussels include agriculture, clearing of riparian vegetation, urbanization, road construction, and other practices that allow bare earth to enter streams. The Service has no information concerning the implementation of the CWA regarding NPS pollution specific to protection of both mussels. However, insufficient implementation could become a threat to both mussel species if they continue to decline in numbers.

The fluted kidneyshell and slabside pearlymussel continue to decline due to the effects of habitat destruction, poor water quality, contaminants, and other factors. However, there is no specific information known about the sensitivity of these mussels to common point source pollutants like industrial and municipal pollutants and very little information on other freshwater mussels. Because there is very little information known about water quality parameters necessary to fully protect freshwater mussels, such as the fluted kidneyshell and slabside pearlymussel, it is difficult to determine whether the CWA is adequately addressing the habitat and water quality threats to these species. However, given that a goal of the CWA is to establish water quality standards that protect shellfish and given that documented declines of these mussel species still continue due to poor water quality and other factors, we take a conservative approach in favor of the species and conclude that the CWA has been insufficient to significantly reduce or remove the threats to the fluted kidneyshell and slabside pearlymussel. We invite public comment on this matter, and solicit information especially regarding water quality data that may be helpful in determining the water quality parameters necessary for these species' survival (see Information Requested, item #4).

Summary of Factor D

In summary, the CWA has a stated goal to establish water quality standards that protect aquatic species, including the fluted kidneyshell and slabside pearlymussel. However, the CWA has generally been insufficient at protecting mussels, and adequate water quality criteria that are protective of all life stages, particularly glochidia and juveniles, may not be established. Little information is known about specific sensitivities of mussels to various pollutants, but both species continue to decline due to the effects of habitat destruction, poor water quality, contaminants, and other factors. Based on our analysis of the best available scientific and commercial data, we conclude that the current implementation of the provisions under the CWA to protect water quality for aquatic species is inadequate to reduce or remove threats to the fluted kidneyshell and slabside pearlymussel throughout all of their range.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Altered Temperature Regimes

Natural temperature regimes can be altered by impoundments, water releases from dams, industrial and municipal effluents, and changes in riparian habitat. Critical thermal limits for survival and normal functioning of many mussel species are unknown. High temperatures can reduce dissolved oxygen concentrations in the water, which slows growth, reduces glycogen stores, impairs respiration, and may inhibit reproduction (Hart and Fuller 1974, pp. 240–241). Low temperatures can significantly delay or prevent metamorphosis (Watters and O'Dee 1999, pp. 454–455). Water temperature increases have been documented to shorten the period of glochidial encystment, reduce the speed in which they turn upright, increase oxygen consumption, and slow burrowing and movement responses (Hart and Fuller 1974, pp. 240–241; Bartsch *et al.* 2000, p. 237; Watters *et al.* 2001, p. 546; Schwalb and Pusch 2007, pp. 264–265). Several studies have documented the influence of temperature on the timing of aspects of mussel reproduction (for example, Gray *et al.* 2002, p. 156; Allen *et al.* 2007, p. 85; Steingraeber *et al.* 2007, pp. 303–309). Peak glochidial

releases are associated with water temperature thresholds that can be thermal minimums or thermal maximums, depending on the species (Watters and O'Dee 2000, p. 136). Abnormal temperature changes may cause particular problems to mussels whose reproductive cycles may be linked to fish reproductive cycles Young and Williams 1984, entire).

Chemical Contaminants

Chemical spills can be especially devastating to mussels because they may result in exposure of a relatively immobile species to extremely elevated contaminant concentrations that far exceed toxic levels and any water quality standards that might be in effect. Some notable spills that released large quantities of highly concentrated chemicals resulting in mortality to mussels and host fish include a kill on the Clinch River at Carbo, Virginia, from a power plant alkaline fly ash pond spill in 1967, and a sulfuric acid spill in 1970 (Crossman *et al.* 1973, p. 6). Approximately 18,000 mussels of several species, including the fluted kidneyshell and 750 individuals from three endangered mussel species (tan riffleshell, *Epioblasma florentina walkeri;* purple bean, *Villosa perpurpurea;* and rough rabbitsfoot, *Quadrula cylindrica strigillata*), were eliminated from the upper Clinch River near Cedar Bluff, Virginia, in 1998, when an overturned tanker truck released approximately 6,100 liters (1,600 gallons) of a chemical used in rubber manufacturing (Jones *et al.* 2001, p. 20; Schmerfeld 2006, p. 12). These are not the only instances where chemical spills have resulted in the loss of high numbers of mussels (Neves 1991, p. 252; Jones *et al.* 2001, p. 20; Brown *et al.* 2005, p. 1457; Schmerfeld 2006, pp. 12–13), but are provided as examples of the serious threat chemical spills pose to mussel species, such as the fluted kidneyshell and slabside pearlymussel.

Cope *et al.* (2008, p. 451) evaluated the pathways of exposure to environmental pollutants for all four mollusk life stages (free glochidia, encysted glochidia, juveniles, and adults) and found that each life stage has both common and unique characteristics that contribute to observed differences in contaminant exposure and sensitivity. Very little is known of the potential mechanisms and consequences of waterborne toxicants on sperm viability. However, Watters (2011) demonstrated that the spermatozeugmata (sperm ball) produced and released by male mussels are sensitive to varying levels of salinity. When exposed to high enough salinity levels, the spermatozeugmata disassociate and can be rendered nonviable if they disassociate prior to entering a female mussel. This may pose yet another significant challenge for mussels to successfully fertilize eggs and promote recruitment if exposed to elevated salinity or conductivity levels in the ambient water column.

In the female mollusk, the marsupial region of the gill currently is thought to be physiologically isolated from respiratory functions, and this isolation may provide some level of protection from contaminant interference with a female's ability to achieve fertilization or brood glochidia (Cope *et al.* 2008, p. 454). A major exception to this assertion is with chemicals that act directly on the neuroendocrine pathways controlling reproduction (see discussion below). Nutritional and ionic exchange is possible between a brooding female and her glochidia, providing a route for chemicals (accumulated or waterborne) to disrupt biochemical and physiological pathways (such as maternal calcium transport for construction of the glochidial shell).

Juvenile mussels typically remain burrowed beneath the sediment surface for 2 to 4 years. Residence beneath the sediment surface necessitates deposit (pedal) feeding and a reliance on interstitial (pore) water for dissolved oxygen (Watters 2007, p. 56). The relative importance of juvenile fluted kidneyshell and slabside pearlymussel exposure to contaminants in overlying surface water, interstitial (pore) water, whole sediment, or food has not been adequately assessed. Exposure to contaminants from each of these routes varies with certain periods and environmental conditions (Cope *et al.* 2008, pp. 453, 457).

The primary routes of exposure to contaminants for adult fluted kidneyshell and slabside pearlymussel are surface water, sediment, interstitial (pore) water, and diet; adults can be exposed when either partially or completely burrowed in the substrate (Cope *et al.* 2008, p. 453). Adult mussels have some ability to detect certain toxicants in the water and close their valves to avoid exposure (Van Hassel and Farris 2007, p. 6). Adult mussel toxicity and relative sensitivity (exposure and uptake of toxicants) may be reduced at high rather than at low toxicant concentrations because uptake is affected by the prolonged or periodic toxicant avoidance responses (when the avoidance behavior can no longer be sustained for physiological reasons) (Cope *et al.* 2008, p. 454). Toxicity results based on low-level exposure of adults are similar to estimates for glochidia and juveniles for some toxicants (for example, copper). The duration of any toxicant avoidance response by an adult mussel is likely to be affected by several variables, such as species, age, shell thickness and gape, properties of the toxicant, and water temperature. There is a lack of information on toxicant response(s) specific to adult mussels (including the fluted kidneyshell and slabside pearlymussel), but results of tests using glochidia and juveniles may be valuable for protecting adults (Cope *et al.* 2008, p. 454).

Exposure to lower concentrations of contaminants, more likely to be found in aquatic environments, can also adversely affect mussels and result in the decline of mussel species. Such concentrations may not be immediately lethal, but over time, can result in mortality, reduced filtration efficiency, reduced growth, decreased reproduction, changes in enzyme activity, and behavioral changes to all mussel life stages. Frequently, procedures that evaluate the 'safe' concentration of an environmental contaminant (e.g., national water quality criteria) do not have data for mussel species or exclude data that is available for mussels (March *et al.* 2007, pp. 2066–2067, 2073).

Current research is now focusing on the contaminant sensitivity of mussel glochidia and newly-released juvenile mussels (Goudreau *et al.* 1993, pp. 219–222; Jacobson *et al.* 1997, p. 2390; Valenti *et al.* 2005, pp. 1244–1245; Valenti *et al.* 2006, pp. 2514–2517; March *et al.* 2007, pp. 2068–2073; Wang *et al.* 2007b, pp. 2041–2046) and juveniles (Augspurger *et al.* 2003, p. 2569; Bartsch *et al.* 2003, p. 2561; Mummert *et al.* 2003, p. 2549; Valenti *et al.* 2005, pp. 1244–1245; Valenti *et al.* 2006, pp. 2514–2517; March *et al.* 2007, pp. 2068–2073; Wang *et al.* 2007b, pp. 2041–2046; Wang *et al.* 2007c, pp. 2053–2055) to such contaminants as ammonia, metals, chlorine, and pesticides.

One chemical that is particularly toxic to early life stages of mussels is ammonia. Sources of ammonia include agriculture (animal feedlots and nitrogenous fertilizers), municipal wastewater treatment plants, and industrial waste (Augspurger *et al.* 2007, p. 2026) as well as precipitation and natural processes (i.e., decomposition of organic nitrogen) (Goudreau *et al.* 1993, p. 212; Hickey and Martin 1999, p. 44; Augspurger *et al.* 2003, p. 2569; Newton 2003, p. 1243). Therefore, ammonia is considered a limiting factor for survival and recovery of some mussel species

due to its ubiquity in aquatic environments and high level of toxicity, and because the highest concentrations typically occur within microhabitats inhabited by mussels (Augspurger *et al.* 2003, p. 2574). In addition, studies have shown that ammonia concentrations increase with increasing temperature and low flow conditions (Cherry *et al.* 2005, p. 378; Cooper *et al.* 2005, p. 381), which may be exacerbated by the effects of climate change, and may cause ammonia to become more problematic for juvenile mussels.

Mussels are also affected by heavy metals (Keller and Zam 1991, p. 543) such as cadmium, chromium, copper, mercury, and zinc, which can negatively affect biological processes such as growth, filtration efficiency, enzyme activity, valve closure, and behavior (Keller and Zam 1991, p. 543; Naimo 1995, pp. 351–355; Jacobson *et al.* 1997, p. 2390; Valenti *et al.* 2005, p. 1244). Heavy metals occur in industrial and wastewater effluents and are often a result of atmospheric deposition from industrial processes and incinerators. Glochidia and juvenile mussels have recently been studied to determine the acute and chronic toxicity of copper to these life stages (Wang *et al.* 2007b, pp. 2036–2047; Wang *et al.* 2007c, pp. 2048–2056). The chronic values determined for copper for survival and growth of juveniles are below the Environmental Protection Agency (EPA) 1996 chronic water quality criterion for copper (Wang *et al.* 2007c, pp. 2052–2055). March (2007, pp. 2066 and 2073) identified that copper water quality criteria and modified State water quality standards may not be protective of mussels.

Mercury is another heavy metal that has the potential to negatively affect mussel populations, and it is receiving attention due to its widespread distribution and potential to adversely impact the environment. Mercury has been detected throughout aquatic environments as a product of municipal and industrial waste and atmospheric deposition from coal burning plants. Valenti *et al.* (2005, p. 1242) determined that for rainbow mussel, *Villosa iris,* glochidia were more sensitive to mercury than juvenile mussels, and that reduced growth in juveniles is seen when observed concentrations are higher than EPA's criteria for mercury. Based on these data, we believe that EPA's water quality standards for mercury should be protective of juvenile mussels and glochidia, except in cases of illegal dumping, permit violations, or spills. However, impacts to mussels from mercury toxicity may be occurring in some streams. According to the National Summary Data reported by States to the EPA, 4,716 monitored waters do not meet EPA standards for mercury in the United States (*http://iaspub.epa.gov/waters10/attains_nation_cy.control?p_report_type=T,* accessed 6/28/2012). Acute mercury toxicity was determined to be the cause of extirpation of a diverse mussel fauna for a 112-rkm (70-rmi) portion of the North Fork Holston River (Brown *et al.* 2005, pp. 1455–1457).

In addition to ammonia, agricultural sources of chemical contaminants include two broad categories that have the potential to adversely impact mussel species: nutrients and pesticides. Nutrients (such as nitrogen and phosphorus) can impact streams when their concentrations reach levels that cannot be assimilated, a condition known as over-enrichment. Nutrient over-enrichment is primarily a result of runoff from livestock farms, feedlots, and heavily fertilized row crops (Peterjohn and Correll 1984, p. 1471). Over-enriched conditions are exacerbated by low-flow conditions, such as those experienced during typical summer-season flows and that might occur with greater frequency and magnitude as a result of climate change. Bauer (1988, p. 244) found that excessive nitrogen concentrations can be detrimental to the adult pearl mussel (*Margaritifera margaritifera*), as was evident by the positive linear relationship between mortality and nitrate concentration. Also, a study of mussel life span and size (Bauer 1992, p. 425) showed a negative correlation between growth rate and eutrophication, and longevity was reduced as the concentration of nitrates increased. Nutrient over-enrichment can result in an increase in primary productivity, and the subsequent respiration depletes dissolved oxygen levels. This may be particularly detrimental to juvenile mussels, which inhabit the interstitial spaces in the substrate, where lower dissolved oxygen concentrations are more likely than on the sediment surface where adults tend to live (Sparks and Strayer 1998, pp. 132–133).

Elevated concentrations of pesticide frequently occur in streams due to runoff, overspray application to row crops, and lack of adequate riparian buffers. Agricultural pesticide applications and the reproductive and early life stages of mussels often coincide in the spring and summer, and thus impacts to mussels due to pesticides may be increased (Bringolf *et al.* 2007c, p. 2094). Little is known regarding the impact of currently used pesticides to mussels even though some pesticides, such as glyphosate (e.g., Roundup™), are used globally. Recent studies tested the toxicity of glyphosate, its formulations, and a surfactant (MON 0818) used in several glyphosate formulations, to early life stages of the fatmucket (*Lampsilis siliquoidea*) (Bringolf *et al.* 2007c, p. 2094). Studies conducted with juvenile mussels and glochidia determined that the surfactant (MON 0818) was the most toxic of the compounds tested and that fatmucket glochidia were the most sensitive of organisms tested to date (Bringolf *et al.* 2007c, p. 2094). Roundup™), technical grade glyphosate isopropylamine salt, and isopropylamine were also acutely toxic to juveniles and glochidia (Bringolf *et al.* 2007c, p. 2097). The impacts of other pesticides including atrazine, chlorpyrifos, and permethrin on glochidia and juvenile life stages have also recently been studied (Bringolf *et al.* 2007a, p. 2101). This study determined that chlorpyrifos was toxic to both fatmucket glochidia and juveniles (Bringolf *et al.* 2007a, p. 2104). The above results indicate the potential toxicity of commonly applied pesticides and the threat to mussel species as a result of the widespread use of these pesticides. All of these pesticides are commonly used throughout the range of the fluted kidneyshell and slabside pearlymussel.

Pharmaceutical chemicals used in commonly consumed drugs are increasingly found in surface waters downstream from municipal effluents. A recent nationwide study sampling 139 stream sites in 30 States detected the presence of numerous pharmaceuticals, hormones, and other organic wastewater contaminants downstream from urban development and livestock production areas (Kolpin *et al.* 2002, pp. 1208–1210). Exposure to waterborne and, potentially to sediment, toxicant chemicals that act directly on the neuroendocrine pathways controlling reproduction can cause premature release of viable or nonviable glochidia. For example, the active ingredient in many human prescription anti-depressant drugs belonging to the class of selective serotonin reuptake inhibitors may exert negative reproductive effects on mussels because of their action on serotonin and other neuroendocrine pathways (Cope *et al.* 2008, pp. 455). These waterborne chemicals alter mussel behavior and influence successful attachment of glochidia on fish hosts and, therefore, may have population level implications for the fluted kidneyshell and slabside pearlymussel.

This information indicates it is likely that chemical contaminants have contributed to declining fluted

kidneyshell and slabside pearlymussel populations, and will likely continue to be a threat to these species in the future. These threats result from spills that are immediately lethal to species, as well as chronic contaminant exposure, which results in death, reduced growth, or reduced reproduction of fluted kidneyshell and slabside pearlymussel.

Sedimentation

Impacts resulting from sediments have been noted for many components of aquatic communities. For example, sediments have been shown to abrade or suffocate periphyton (organisms attached to underwater surfaces); affect respiration, growth, reproductive success, and behavior of aquatic insects and mussels; and affect fish growth, survival, and reproduction (Waters 1995, pp. 173–175). When in high silt environments, mussels may keep their valves closed more often, resulting in reduced feeding activity (Ellis 1936, p. 30).

Increased turbidity from suspended sediment can reduce or eliminate juvenile mussel recruitment (Negus 1966, p. 525; Box and Mossa 1999, pp. 101–102). Many mussel species use visual cues to attract host fishes; such a reproductive strategy depends on clear water for success. For example, increased turbidity may impact the southern sandshell, *Hamiota australis,* life cycle by reducing the chance that a sight-feeding host fish will encounter the visual display of its superconglutinate lure (Haag *et al.* 1995, p. 475; Blalock-Herod *et al.* 2002, p. 1885). If the superconglutinate is not encountered by a host within a short time period, the glochidia will become nonviable (O'Brien and Brim Box 1999, p. 133). Also, evidence suggests that conglutinates of the southern kidneyshell (another species of *Ptychobranchus, P. jonesi*), once released from the female mussel in an attempt to lure potential host fish, must adhere to hard surfaces in order to be seen by its fish host. If the surface becomes covered in fine sediments, the conglutinate cannot attach and is swept away (Hartfield and Hartfield 1996, p. 373).

Population Fragmentation and Isolation

Population isolation prohibits the natural interchange of genetic material between populations, and small population size reduces the reservoir of genetic diversity within populations, which can lead to inbreeding depression (Allendorf and Luikart 2007, pp. 117–146). Small, isolated populations, therefore, are more susceptible to environmental pressures, including habitat degradation and stochastic events, and thus are the most susceptible to extinction (Primack 2008, pp. 151–153). It is likely that some populations of the fluted kidneyshell and slabside pearlymussel are below the effective population size (Soulé 1980, pp. 162–264; Allendorf and Luikart 2007, pp. 147–170) required to maintain long-term genetic and population viability.

The present distribution and status of the fluted kidneyshell in the upper Cumberland River system in Kentucky may provide an excellent example of the detrimental bottleneck effect resulting when a minimum viable population size is not maintained. A once large population of this species occurred throughout the upper Cumberland River mainstem below Cumberland Falls and in several larger tributary systems. In this region, there were no absolute barriers to genetic interchange among its subpopulations (and those of its host fishes) that occurred in various streams. With the completion of Wolf Creek Dam in the late 1960s, the mainstem population was soon extirpated, and the remaining populations isolated by the filling of Cumberland Reservoir. Whereas small, isolated, tributary populations of imperiled short-lived species (e.g., most fishes) would have died out within a decade or so after impoundment, the long-lived fluted kidneyshell would potentially take decades to expire post-impoundment. Without the level of genetic interchange the species experienced historically (i.e., without the reservoir barrier), isolated populations may be slowly dying out. The fluted kidneyshell and slabside pearlymussel were similarly isolated by the completion of multiple reservoirs in the Tennessee River system. Even given the improbable absence of anthropogenic impacts, we may lose smaller isolated populations of the fluted kidneyshell and slabside pearlymussel to the devastating consequences of below-threshold effective population size (the minimum population size that is needed for the population to reproduce and continue to be viable). In reality, degradation of these isolated stream reaches and the resulting decline in suitable habitat is contributing to the decline of both species.

Random Catastrophic Events

The remaining populations of the fluted kidneyshell and slabside pearlymussel are generally small and geographically isolated. The patchy distribution pattern of populations in short river reaches makes them much more susceptible to extirpation from single catastrophic events, such as toxic chemical spills. Such a spill occurred in the upper Clinch River in 1998, killing many fluted kidneyshell and thousands of specimens of other mussel species, including three federally listed species (Henley *et al.* 2002, entire). High levels of isolation makes natural recolonization of any extirpated population impossible.

Climate Change

Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms ''climate'' and ''climate change'' are defined by the Intergovernmental Panel on Climate Change (IPCC). ''Climate'' refers to the mean (average) and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

There is a growing concern that climate change may lead to increased frequency of severe storms and droughts (McLaughlin *et al.* 2002, p. 6074; Cook *et al.* 2004, p. 1015; Golladay *et al.* 2004, p. 504). Specific effects of climate change to mussels, their habitat, and their fish hosts could include changes in stream temperature regimes, the timing and levels of precipitation causing more frequent and severe floods and droughts, and nonindigenous species introductions. Increases in temperature and reductions in flow may also lower dissolved oxygen levels in interstitial habitats which can be lethal to juveniles (Sparks and Strayer 1998, pp. 131–133). Effects to mussel populations from these environmental changes could include reduced abundance and biomass, altered species composition, and reduced host fish availability (Galbraith *et al.* 2010, pp. 1180–1182). The present conservation status, complex life

histories, and specific habitat requirements of mussels suggest that they may be quite sensitive to the effects of climate change (Hastie *et al.* 2003, p. 45).

During high flows, flood scour can dislodge mussels where they may be injured, buried, swept into unsuitable habitats, or stranded and perish when flood waters recede (Vannote and Minshall 1982, p. 4105; Tucker 1996, p. 435; Hastie *et al.* 2001, pp. 107–115; Peterson *et al.* 2011, unpaginated). During drought, stream channels may become disconnected pools where mussels are exposed to higher water temperatures, lower dissolved oxygen levels, and easier collection by predators, or channels may become dewatered entirely. Increased human demand and competition for surface and ground water resources for irrigation and consumption during drought can cause drastic reductions in stream flows and alterations to hydrology (Golladay *et al.* 2004, p. 504; Golladay *et al.* 2007, unpaginated). Extended droughts occurred in the Southeast during 1998 to 2002, and again in 2006 to 2008. The effects of these recent droughts on these mussels are unknown; however, substantial declines in mussel diversity and abundance as a direct result of drought have been documented in southeastern streams (Golladay *et al.* 2004, pp. 494–503; Haag and Warren 2008, p. 1165).

Nonindigenous Species

The Asian clam (*Corbicula fluminea*) has been introduced to the Cumberland and Tennessee River drainages and may be adversely affecting the fluted kidneyshell and slabside pearlymussel through direct competition for space and resources. The Asian clam may pose a direct threat to native mussels, particularly as juveniles, as a competitor for resources such as food, nutrients, and space (Neves and Widlak 1987, p. 6). Dense populations of Asian clams may ingest large numbers of unionid sperm, glochidia, and newly metamorphosed juveniles, and may actively disturb sediments, reducing habitable space for juvenile native mussels or displacing them downstream (Strayer 1999, p. 82; Yeager *et al.* 2000, pp. 255–256).

Asian clam densities vary widely in the absence of native mussels or in patches with sparse mussel concentrations, but Asian clam density is rarely observed to be high in dense mussel beds, indicating that the clam is unable to successfully invade small-scale habitat patches with high unionid biomass (Vaughn and Spooner 2006, pp. 334–335). The invading clam, therefore, appears to preferentially invade sites where mussels are already in decline (Strayer 1999, pp. 82–83; Vaughn and Spooner 2006, pp. 332–336) and does not appear to be a causative factor in the decline of mussels in dense beds. However, an Asian clam population that thrives in previously stressed, sparse mussel populations might exacerbate unionid imperilment through competition and impeding mussel population expansion (Vaughn and Spooner 2006, pp. 335–336).

Summary for Factor E

We have determined that other natural and manmade factors, such as alteration of natural temperature regimes; chemical contaminants; sedimentation; small, isolated populations; and low genetic diversity, combined with localized extinctions from point source pollution or accidental toxic chemical spills, habitat modification and progressive degradation by nonpoint source pollutants, natural catastrophic changes to habitat through flood scour or drought, and nonindigenous species are threats to remaining populations of the fluted kidneyshell and slabside pearlymussel across their respective ranges.

Proposed Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the fluted kidneyshell and slabside pearlymussel. Section 3(6) of the Act defines an endangered species as ''any species which is in danger of extinction throughout all or a significant portion of its range,'' and section 3(20) of the Act defines a threatened species as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' As described in detail above, these two species occupy only portions of their historical ranges, are limited to a handful of viable populations, and are currently at risk throughout all of their respective ranges due to ongoing threats of habitat destruction and modification (Factor A), inadequacy of existing regulatory mechanisms (Factor D), and other natural or manmade factors affecting their continued existence (Factor E). Specifically, these threats include impoundments, mining, oil and gas exploration, sedimentation, chemical contaminants, temperature regime alterations, recurring drought and flooding, population fragmentation and isolation, loss of fish hosts, and the introduced Asian clam. We believe these threats are currently impacting these species and are projected to continue and potentially worsen in the future.

Species with small ranges, few populations, and small or declining population sizes are the most vulnerable to extinction (Primack 2008, p. 137). The effects of certain factors, particularly habitat degradation and loss, catastrophic events, and introduced species, increase in magnitude when population size is small (Soulé 1987, pp. 33, 71; Primack 2008, pp. 133–135, 152). We believe that, when combining the effects of historical, current, and future habitat loss and degradation; historical and ongoing drought; and the exacerbating effects of small and declining population sizes and curtailed ranges, the fluted kidneyshell and slabside pearlymussel are in danger of extinction throughout all of their ranges. In addition, any factor (i.e., habitat loss or natural and manmade factors) that results in a further decline in habitat or individuals may be problematic for the long-term recovery of these species.

Therefore, based on the best available scientific and commercial information, we propose to list the fluted kidneyshell and slabside pearlymussel as endangered species throughout all of their ranges. We believe that, when combining the effects of historical, current, and future habitat loss and degradation; historical and ongoing drought; and the exacerbating effects of small and declining population sizes and curtailed ranges, the fluted kidneyshell and slabside pearlymussel are in danger of extinction throughout all of their ranges. Furthermore, we examined both species to analyze if any significant portions of their ranges may warrant a different status. However, because of their limited and curtailed ranges, and uniformity of the threats throughout their entire respective ranges, we find there are no significant portions of any of the species' ranges that may warrant a different determination of status.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened 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, and local agencies; private organizations; and individuals. The Act encourages cooperation with the States and requires that recovery actions be carried out for all listed

species. The protection measures required of Federal agencies and the prohibitions against certain activities involving listed wildlife are discussed in Effects of Critical Habitat Designation and are further 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. Subsection 4(f) of the Act requires 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 includes the development of a recovery outline shortly after a species is listed, preparation of a draft and final recovery plan, and revisions to the plan as significant new information becomes available. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. The recovery plan identifies site-specific management actions that will achieve recovery of the species, measurable criteria that determine when a species may be downlisted or delisted, 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 (comprised of species experts, Federal and State agencies, nongovernment 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 Web site (*http://www.fws.gov/endangered*), or from our Tennessee Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

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

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

Although the fluted kidneyshell and slabside pearlymussel 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 this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened 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 formal consultation with the Service.

Federal agency actions within the species habitat that may require conference or consultation or both as described in the preceding paragraph include management of and any other landscape altering activities on Federal lands administered by the U.S. Forest Service; issuance of section 404 CWA permits by the U.S. Army Corps of Engineers; licensing of hydroelectric dams, and construction and management of gas pipeline and power line rights-of-way approved by the Federal Energy Regulatory Commission; issuance of 26a permits by the Tennessee Valley Authority; construction and maintenance of roads or highways funded by the Federal Highway Administration; and land management practices administered by the U.S. Department of Agriculture. It has been the experience of the Service from consultations on other species, however, that nearly all section 7 consultations have been resolved so that the species have been protected and the project objectives have been met.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. The prohibitions, codified at 50 CFR 17.21 for endangered wildlife, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. Under the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378), it is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 17.32 for threatened species. With regard to endangered wildlife, a permit must be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

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 species proposed for listing. The following activities could potentially result in a violation of

section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the species, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

(2) Introduction of nonnative species that compete with or prey upon these mussel species, such as the zebra mussel (*Dreissena polymorpha*) and Asian clam (*Corbicula fluminea*).

(3) Unauthorized modification of the channel, substrate, temperature, or water flow of any stream or water body in which these species are known to occur.

(4) Unauthorized discharge of chemicals or fill material into any waters in which the fluted kidneyshell and slabside pearlymussel are known to occur.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Tennessee Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Requests for copies of the regulations concerning listed animals and general inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, 1875 Century Boulevard, Suite 200, Atlanta, GA 30345; telephone: 404–679–7140; facsimile: 404–679–7081.

Critical Habitat for the Fluted Kidneyshell and Slabside Pearlymussel

Background

It is our intent to discuss below only those topics directly relevant to the designation of critical habitat for the fluted kidneyshell and slabside pearlymussel in this section of the proposed rule.

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.

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

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner seeks or requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to 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 is listed must contain physical or biological features (PBFs) which are (1) 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 PBFs that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical and biological features within an area, we focus on the principal biological or physical constituent elements (primary constituent elements such as roost sites, nesting grounds, seasonal wetlands, water quality, tide, soil type) that are essential to the conservation of the species. Primary constituent elements are the specific elements of PBFs that provide for a species' life-history processes.

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. We designate critical habitat in areas outside the geographical area occupied by a species only when a designation limited to its range would be inadequate to ensure the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific and commercial 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 developed during the listing process for the species. Additional information sources may include articles in peer-reviewed journals, conservation plans developed by States and counties, scientific status surveys and studies, biological assessments, or other unpublished materials and expert opinion or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. Climate change will be a particular challenge for biodiversity because the interaction of additional stressors associated with climate change and current stressors may push species beyond their ability to survive (Lovejoy 2005, pp. 325–326).

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 insure their actions are not likely to jeopardize the continued existence of any endangered or threatened species, and (3) the prohibitions of section 9 of the Act if actions occurring in these areas may affect the species. 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 would continue to contribute to recovery of these species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation would not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available at the time of 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 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 designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat to the species, or (2) such designation of critical habitat would not be beneficial to the species.

As discussed above under Factor B, there is currently no imminent threat of take attributed to collection or vandalism for these species, and identification and mapping of critical habitat is not expected to initiate any such threat. In the absence of finding that the designation of critical habitat would increase threats to a species, if there are any benefits to a critical habitat designation, then a prudent finding is warranted. The potential benefits of designation include: (1) Triggering consultation under section 7 of the Act, in new areas for actions in which there may be a Federal nexus where it would not otherwise occur because, for example, it is or has become unoccupied or the occupancy is in question; (2) focusing conservation activities on the most essential features and areas; (3) providing educational benefits to State or county governments or private entities; and (4) preventing people from causing inadvertent harm to the species. Therefore, because we have determined that the designation of critical habitat will not likely increase the degree of threat to the species and may provide some measure of benefit, we find that designation of critical habitat is prudent for the fluted kidneyshell and slabside pearlymussel.

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 two species 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) Information sufficient to perform required analyses of the impacts of the designation is lacking, or

(ii) The biological needs of the species are not sufficiently well known to permit identification of an area as 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. This and other information represent the best scientific data available and led us to conclude that critical habitat is determinable for these two species.

Physical and Biological Features

In accordance with sections 3(5)(A)(i) and 4(b)(1)(A) of the Act and the regulations at 50 CFR 424.12, in determining which areas within the geographical area occupied at the time of listing to propose as critical habitat, we consider the PBFs essential to the conservation of the species which may require special management considerations or protection. These include, but are not limited to:

(1) Space for individual and population growth and for normal behavior;

(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;

(3) Cover or shelter;

(4) Sites for breeding, reproduction, or rearing (or development) of offspring; and

(5) Habitats that are protected from disturbance or are representative of the historic, geographical, and ecological distributions of a species.

We derive the specific PBFs required for the fluted kidneyshell and slabside pearlymussel based on their biological needs. Little is known of the specific habitat requirements of these two mussel species other than they require flowing water, stable stream channels, adequate water quality, and fish hosts for development of larva to metamorphose into juvenile mussels. To identify the physical and biological needs of the species, we have relied on current conditions at locations where the species survive, the limited information available on these two mussels and their close relatives, and factors associated with the decline and extirpation of these and other mussels from portions of the Cumberland and Tennessee River systems. Additional information can be found in the Background section of this proposed rule. We have determined that the following PBFs are essential for the fluted kidneyshell and slabside pearlymussel.

Space for Individual and Population Growth and for Normal Behavior

The fluted kidneyshell and slabside pearlymussel are historically associated with the Cumberland and Tennessee River drainages in Alabama, Kentucky, Mississippi, Tennessee, and Virginia. Mussels generally live embedded in the bottom of stable streams and other bodies of water, and within riffle areas of sufficient current velocities to remove finer sediments and provide well-oxygenated waters. The fluted kidneyshell is primarily a medium-sized creek to large river species, inhabiting sand and gravel substrates in relatively shallow riffles and shoals with moderate to swift current (Parmalee and Bogan 1998, p. 205). In comparison to co-occurring species, the fluted kidneyshell demonstrates strong habitat specificity. It is associated with faster flows, greater baseflow shear stress, and low substrate embeddedness (Ostby 2005, pp. 51, 142–143). The slabside pearlymussel is primarily a large creek to large river species, inhabiting sand, fine gravel, and cobble substrates in relatively

shallow riffles and shoals with moderate current (Parmalee and Bogan 1998, p. 152).

Fluted kidneyshell and slabside pearlymussel, similar to other mussels, are dependent on areas with flow refuges where shear stress is relatively low, although the fluted kidneyshell is more tolerant of shear stress than other species, and sediments remain stable during flood events (Layzer and Madison 1995, p. 341; Strayer 1999, pp. 468 and 472; Hastie *et al.* 2001, pp. 111–114). Flow refuges conceivably allow relatively immobile mussels such as the fluted kidneyshell and slabside pearlymussel to remain in the same general location throughout their entire lives.

Natural river or creek channel stability are achieved by allowing the river or creek to develop a stable dimension, pattern, and profile such that, over time, channel features are maintained and the river or creek system neither aggrades nor degrades. Channel instability occurs when the scouring process leads to degradation, or excessive sediment deposition results in aggradation. Stable rivers and creeks consistently transport their sediment load, both in size and type, associated with local deposition and scour (Rosgen 1996, p. 1–3). Sedimentation has been determined to be a major factor in habitat destruction, resulting in corresponding shift in mussel fauna (Brim Box and Mossa 1999, p. 102). Stable stream bottom substrates not only provide space for populations of these mussel species, but also provide cover and shelter and sites for breeding, reproduction, and growth of offspring.

Habitat conditions described in the previous paragraphs provide space, cover, shelter, and sites for breeding, reproduction, and growth of offspring for the fluted kidneyshell and slabside pearlymussel. These habitats are dynamic and are formed and maintained by water quantity, channel features (dimension, pattern, and profile), and sediment input to the system through periodic flooding, which maintains connectivity and interaction with the flood plain. Changes in one or more of these parameters can result in channel degradation or aggradation, with serious effects to mussels.

Therefore, based on the information above, we identify riffles of large creeks and rivers with sand, gravel, and cobble substrates; areas of moderate to high amount of flow, but with refugia of low shear stress; stream channel stability; and floodplain connectivity to be PBFs for both of these species.

Food, Water, Air, Light, Minerals, or Other Nutritional or Physiological Requirements

Mussels, such as these two species, siphon water into their shells and across four gills that are specialized for respiration, food collection, and brooding larvae in females. Food items include detritus (disintegrated organic debris), algae, diatoms, and bacteria (Strayer *et al.* 2004, pp. 430–431). Encysted glochidia are nourished by their fish hosts and feed for a period of one week to several months. Nutrient uptake by glochidia is not well understood, but probably occurs through the microvillae of the mantle (Watters 2007, p. 55). For the first several months, juvenile mussels partially employ pedal (foot) feeding, extracting bacteria, algae, and detritus from the sediment, although they also may filter interstitial (pore) water (Yeager *et al.* 1994, pp. 217–221). However, their gills are rudimentary and generally incapable of filtering particles (Watters 2007, p. 56). Adult mussels also can obtain their food by deposit feeding, pulling in food from the sediment and its interstitial (pore) water and pedal feeding directly from the sediment (Yeager *et al.* 1994, pp. 217–221; Vaughn and Hakenkamp 2001, pp. 1432–1438). Food availability and quality for the fluted kidneyshell and slabside pearlymussel in their habitats are affected by habitat stability, floodplain connectivity, flow, and water and sediment quality. Excessive sedimentation has been shown to impair the filter feeding ability of mussels. When in high silt environments, mussels may keep their valves closed more often, resulting in reduced feeding activity (Ellis 1936, p. 30), and high amounts of suspended sediments can dilute their food source (Dennis 1984, p. 212). Adequate food availability and quality is essential for normal behavior, growth, and viability during all life stages of these two species. Excessive sedimentation often results in fine silt particles culminating within interstitial spaces, embedding and even concretizing the substrate and virtually altering habitat to such a degree that it becomes uninhabitable for mussels, particularly juveniles.

The fluted kidneyshell and slabside pearlymussel are riverine species that depend upon adequate water flow. Continuously flowing water is a habitat feature associated with both of these species. Flowing water maintains the stream bottom habitats where these species are found, transports food items to the sedentary juvenile and adult life stages, removes wastes, and provides oxygen for respiration. A natural flow regime that includes periodic flooding and maintains connectivity and interaction with the floodplain is critical for the exchange of nutrients, movement of and spawning activities for potential fish hosts, and maintenance of flow refuges in riffle and run habitats. Further, riffle areas are often defined by an abundance and diversity of organisms that likely have dependent and competitive interactions yet unknown, but that are important for riffle-dwelling mussel species such as the fluted kidneyshell and slabside pearlymussel.

The ranges of standard physical and chemical water quality parameters (such as temperature, dissolved oxygen, pH, and conductivity) that define suitable habitat conditions for the two species have not been investigated or are poorly understood. However, as relatively sedentary animals, mussels must tolerate the full range of such parameters that occur naturally within the streams where they persist. The pathways of exposure to a variety of environmental pollutants for all four mussel life stages (free and encysted glochidia, juveniles, and adults) and differences in exposure and sensitivity were previously discussed (see Factor A). Environmental contamination is a causal (contributing) factor in the decline of mussel populations.

We currently believe that most numeric standards for pollutants and water quality parameters (for example, dissolved oxygen, pH, and heavy metals) that have been adopted by the States under the CWA represent levels that are essential to the conservation of both mussels. The Service is currently in consultation with the EPA to evaluate the protectiveness of criteria approved in EPA's water quality standards for endangered and threatened species and their critical habitats as described in the Memorandum of Agreement that our agencies signed in 2001 (66 FR 11201, February 22, 2001). Other factors that can potentially alter water quality are droughts and periods of low flow, nonpoint source runoff from adjacent land surfaces (for example, excessive amounts of sediments, nutrients, and pesticides), point source discharges from municipal and industrial wastewater treatment facilities (for example, excessive amounts of ammonia, chlorine, and metals), thermal and flow modifications resulting from hydropower generation, and random spills or unregulated discharge events. This could be particularly harmful during drought conditions, when flows are depressed and pollutants are more concentrated.

Both the amount (flow) and the physical and chemical conditions (water quality) where both species currently exist vary widely according to season, precipitation events, and seasonal human activities within the watershed. Conditions across their historical ranges vary even more due to watershed size, geology, geography, and differences in human population densities and land uses. In general, both of the species survive in areas where the magnitude, frequency, duration, and seasonality of water flow are adequate to maintain stable habitats (for example, sufficient flow to remove fine particles and sediments without causing degradation), and where water quality is adequate for year-round survival (for example, moderate to high levels of dissolved oxygen, low to moderate input of nutrients, and relatively unpolluted water and sediments). Therefore, based on the information above, we identify adequate food items for all life stages, sufficient water flow, and adequate water quality to be PBFs for both of these species.

Sites for Breeding, Reproduction, or Rearing

Mussels require a host fish for transformation of larval mussels (glochidia) to juvenile mussels (Williams *et al.* 2008, p. 68). Thus, the presence of the appropriate host fishes to complete the reproductive life cycle is essential to the conservation of these two mussels. The known host fishes of the fluted kidneyshell include: barcheek darter (*Etheostoma obeyense*), fantail darter (*E. flabellare*), rainbow darter (*E. caeruleum*), redline darter (*E. rufilineatum*), bluebreast darter (*E. camurum*), dusky darter (*Percina sciera*), and banded sculpin (*Cottus carolinae*). The known host fishes of the slabside pearlymussel include: popeye shiner (*Notropis ariommus*), rosyface shiner (*N. rubellus*), saffron shiner (*N. rubricroceus*), silver shiner (*N. photogenis*), telescope shiner (*N. telescopus*), Tennessee shiner (*N. leuciodus*), whitetail shiner (*Cyprinella galactura*), striped shiner (*Luxilus chrysocephalus*), warpaint shiner (*L. coccogenis*), white shiner (*L. albeolus*), and eastern blacknose dace (*Rhinichthys atratulus*). There are likely other suitable host fishes that have not yet been studied or confirmed.

Juvenile mussels require stable bottom habitats for growth and survival. Fluted kidneyshell and slabside pearlymussel juveniles require stable habitats with adequate water quantity and quality as previously described for growth and survival. Excessive sediments or dense growth of filamentous algae can expose juvenile mussels to entrainment or predation and be detrimental to the survival of juvenile mussels (Hartfield and Hartfield 1996, pp. 372–374). Geomorphic instability can result in the loss of interstitial habitats and juvenile mussels due to scouring or deposition (Hartfield 1993, pp. 372–373). Water quality, sediment quality, stable habitat, health of fish hosts, and diet (of all life stages) all influence survival of each life stage and subsequent reproduction and recruitment (Cope *et al.* 2008, p. 452).

Periodic floodplain connectivity that occurs during wet years provides habitats for spawning and foraging activities for fish hosts that require floodplain habitats for successful reproduction and recruitment to adulthood. Barko *et al.* (2006, pp. 252–256) found that several fish host or potential host species (none of which are documented hosts for the fluted kidneyshell or slabside pearlymussel) benefited from resource exploitation of floodplain habitats that were not typically available for use during years of normal flows. Furthermore, Kwak (1988, pp. 243–247) and Slipke and Maceina (2005, p. 289) indicated that periodic inundation of floodplain habitats increased successful fish reproduction, which leads to increased availability of native host fishes for mussel reproduction. However, Rypel *et al.* (2009, p. 502) indicated that mussels tended to exhibit minimal growth during high flow years. Therefore, optimal flooding of these habitats would not be too frequent and may need to occur at similar frequencies to that of the natural hydrologic regime of the rivers and creeks inhabited by the fluted kidneyshell and slabside pearlymussel.

Natural temperature regimes can be altered by impoundments, water releases from dams, industrial and municipal effluents, and changes in riparian habitat. Critical thermal limits for survival and normal functioning of many mussel species are unknown. High temperatures can reduce dissolved oxygen concentrations in the water, which slows growth, reduces glycogen stores, impairs respiration, and may inhibit reproduction (Hart and Fuller 1974, pp. 240–241). Low temperatures can significantly delay or prevent metamorphosis (Watters and O'Dee 1999, pp. 454–455). Water temperature increases have been documented to shorten the period of glochidial encystment, reduce the speed in which they turn upright, increase oxygen consumption, and slow burrowing and movement responses (Hart and Fuller 1974, pp. 240–241; Bartsch *et al.* 2000, p. 237; Watters *et al.* 2001, p. 546; Schwalb and Pusch 2007, pp. 264–265). Several studies have documented the influence of temperature on the timing of aspects of mussel reproduction (for example, Gray *et al.* 2002, p. 156; Allen *et al.* 2007, p. 85; Steingraeber *et al.* 2007, pp. 303–309). Peak glochidial releases are associated with water temperature thresholds that can be thermal minimums or maximums, depending on the species (Watters and O'Dee 2000, p. 136). Abnormal temperature changes may cause particular problems to mussels whose reproductive cycles may be linked to fish reproductive cycles (for example, Young and Williams 1984, entire). Therefore, based on the information above, we identify health of fish hosts, water quality, sediment quality, stable habitat, food for all life stages, periodic flooding of floodplain habitat, and a natural temperature regime to be PBFs for both of these species.

Primary Constituent Elements for the Fluted Kidneyshell and Slabside Pearlymussel

Under the Act and its implementing regulations, we are required to identify the PBFs essential to the conservation of these mussel species in areas occupied at the time of listing, focusing on the features' primary constituent elements (PCEs). We consider PCEs to be the elements of PBFs that provide for a species' life-history processes and are essential to the conservation of the species.

Based on the above needs and our current knowledge of the life history, biology, and ecology of the species and the habitat requirements for sustaining the essential life-history functions of the species, we have determined that the PCEs for the fluted kidneyshell and slabside pearlymussel are:

(1) Riffle habitats within large, geomorphically stable stream channels (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation).

(2) Stable substrates of sand, gravel, and cobble with low to moderate amounts of fine sediment and containing flow refugia with low shear stress.

(3) A natural hydrologic flow regime (the magnitude, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found, and connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for habitat maintenance, food availability for all life stages, and spawning habitat for native fishes.

(4) Water quality with low levels of pollutants and including a natural temperature regime, pH (between 6.0 to 8.5), oxygen content (not less than 5.0 milligrams per liter (mg/L)), hardness, and turbidity necessary for normal behavior, growth, and viability of all life stages.

(5) The presence of abundant fish hosts necessary for recruitment of the fluted kidneyshell and slabside pearlymussel.

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 29 occupied units we are proposing for designation as critical habitat for the fluted kidneyshell (16) and slabside pearlymussel (13) will require some level of management to address the current and future threats to the PBFs of the species. Of the 29 total occupied units, a portion of 5 units are located on the Daniel Boone National Forest (DBNF), 14 are almost entirely on private land, 1 is located on the Big South Fork National River and Recreational Area (BSFNRRA), 1 is located on the Cherokee National Forest (CNF), and 8 units have mixed ownership with private, State park, and national wildlife refuge lands.

Due to their location on the DBNF, at least a portion of 5 of the 29 occupied proposed critical habitat units are being managed and protected under DBNF's Land and Resource Management Plan (LRMP), and the Hiwassee River unit is protected under CNF's LRMP (United States Forest Service (USFS) 2004a, pp. 1–14; 2004b, entire). The LRMPs are implemented through a series of project-level decisions based on appropriate site-specific analysis and disclosure. The LRMPs do not contain a commitment to select any specific project; rather, they set up a framework of desired future conditions with goals, objectives, and standards to guide project proposals. Projects are proposed to solve resource management problems, move the forest environment toward desired future conditions, and supply goods and services to the public (USFS 2004a, pp. 1–14). The LRMPs contain a number of protective standards that in general are designed to avoid and minimize potential adverse effects to the fluted kidneyshell, slabside pearlymussel, and federally listed species; however, the DBNF and CNF would continue to conduct project-specific section 7 consultations under the Act when their activities may adversely affect the fluted kidneyshell, slabside pearlymussel, and other federally listed species or adversely modify their designated critical habitats.

Fourteen of the 29 occupied proposed critical habitat units are located almost entirely on private property and are not presently under the special management or protection provided by a legally operative plan or agreement for the conservation of the species.

One of the 29 occupied proposed critical habitat units (Big South Fork Cumberland River) is located almost entirely on Federal lands within the BSFNRRA. Land and resource management decisions and activities within the BSFNRRA are guided by the National Park Service General Management Plan, Field Management Plan, and Draft Non-Federal Oil and Gas Management Plan (NPS 2005, entire; NPS 2006, pp. 1–12; NPS 2011, entire).

Eight of the 29 occupied proposed critical habitat units (Clinch and Duck Rivers) have mixed ownership with private, State park, and national wildlife refuge lands. These lands are operated under various plans that may or may not provide the special management or protection provided by a legally operative plan or agreement for the conservation of these species.

Various activities in or adjacent to each of the occupied critical habitat units described in this proposed rule may affect one or more of the PCEs. Some of these activities include, but are not limited to, those discussed in the Summary of Factors Affecting the Species, above (e.g., impoundments, gravel and coal mining, water pollution, invasive species; see Factors A, D, and E, above). Other activities that may affect PBFs in the proposed critical habitat units include those listed in Available Conservation Measures above.

Management activities that could ameliorate threats on both Federal and non-Federal lands include, but are not limited to: Use of BMPs designed to reduce sedimentation, erosion, and stream bank alteration; moderation of surface and ground water withdrawals to maintain natural flow regimes; increase of stormwater management and reduction of stormwater flows into the systems; preservation of headwater streams; regulation of off-road vehicle use; and reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water.

In summary, we find that the areas we are proposing as occupied critical habitat for the fluted kidneyshell and slabside pearlymussel contain the PBFs necessary for the species, and that these features may require special management considerations or protection. Special management consideration or protection may be required to eliminate, or to reduce to negligible levels, the threats affecting the PBFs of each unit. Additional discussion of threats facing individual units is provided in the individual unit descriptions below.

Criteria Used To Identify Critical Habitat

As required by section 4(b) of the Act, we use the best scientific and commercial data to designate critical habitat. We review available information pertaining to the habitat requirements of the species. In accordance with the Act and its implementing regulation at 50 CFR 424.12(e), we consider whether designating additional areas—outside those currently occupied as well as those occupied at the time of listing (if listing occurs before designation of a species' critical habitat)—are necessary to ensure the conservation of the species. We are proposing to designate critical habitat in areas within the geographic area currently occupied by the species. We also are proposing to designate specific areas outside the geographic area currently occupied by the species, which were historically occupied but are presently unoccupied, because such areas are essential for the conservation of the species.

We began our analysis by considering historical and current ranges of both species. We used various sources including published literature and museum collection databases, as well as surveys, reports, and field notes prepared by biologists (see Background section). We then identified the specific areas that are occupied by both mussels and that contain one or more of the PBFs. We defined occupied habitat as those stream reaches known to be currently occupied by either of the two species. To identify the currently occupied stream reaches, we used post-1980 survey data. To identify the unoccupied stream reaches, we used survey data between the late 1800s and 1979. Therefore, if a species was known to occur in an area prior to 1980, but was not collected since then, the stream reach is considered unoccupied. This criterion was chosen because a large number of collections were conducted in the 1980s in the Cumberland and Tennessee River systems. Some of the historical occurrences have not been surveyed since the 1980s. However, because of the longevity of these species

(40–55 years), they are still thought to occur in these areas.

We then evaluated occupied stream reaches to delineate the probable upstream and downstream extent of each species' distribution. Known occurrences for some mussel species are extremely localized, and rare mussels can be difficult to locate. In addition, stream habitats are highly dependent upon upstream and downstream channel habitat conditions for their maintenance. Therefore, where more than one occurrence record of a particular species was found within a stream reach, we considered the entire reach between the uppermost and lowermost locations as occupied habitat.

We then considered whether this essential area was adequate for the conservation of both species. Small, isolated, aquatic populations are subject to chance catastrophic events and to changes in human activities and land use practices that may result in their elimination. Larger, more contiguous populations can reduce the threat of extinction due to habitat fragmentation and isolation. For these reasons, we believe that conservation of the fluted kidneyshell, but not the slabside pearlymussel, requires expanding its range into currently unoccupied portions of its historical habitat. Given that threats to the fluted kidneyshell are compounded by its limited distribution and isolation, it is unlikely that currently occupied habitat is adequate for its conservation. The range of the fluted kidneyshell has been severely curtailed, occupied habitats are limited and isolated, and population sizes are generally small (see Summary of Factors Affecting the Species). For example, the fluted kidneyshell is no longer believed to occur in the Rockcastle, Hiwassee, Elk, Holston, or French Broad rivers. The inclusion of essential unoccupied areas will provide habitat for population reintroduction and will decrease the risk of extinction. Based on the best scientific data available, we believe these areas not currently occupied by the fluted kidneyshell are essential for their conservation.

However, we eliminated from consideration as unoccupied critical habitat the Red and Harpeth River drainages; the Caney Fork, mainstem Cumberland, mainstem Tennessee, Tellico, Obey, South Fork Powell, South Fork Holston, West Prong Little Pigeon, Little Tennessee Rivers; and Kennedy, Pittman, Otter, Flint, Sugar, Limestone, Shoal, Puckell, North Fork, and Big Rock Creeks for both of these mussels. These areas are not essential for the conservation of the mussels and were eliminated from consideration because of stream channel alterations, a limited amount of available habitat coupled with being isolated from other populations, a lack of a native mussel fauna, poor habitat or water quality, or a lack of available fish hosts.

All of the stream habitat areas proposed as unoccupied critical habitat have sufficient water quality and fish hosts necessary for the fluted kidneyshell. The stream reaches also lack major anthropogenic disturbances, and have potential for reoccupation by the species through future reintroduction efforts. Based on the above factors, all unoccupied stream reaches included in the proposed designations for the fluted kidneyshell are essential for its conservation.

Following the identification of occupied and unoccupied stream reaches, the next step was to delineate the probable upstream and downstream extent of each species' distribution. We used USGS 1:100,000 digital stream maps to delineate these boundaries of proposed critical habitat units according to the criteria explained below. The upstream boundary of a unit in a stream is the first perennial, named tributary confluence, a road-crossing bridge, or a permanent barrier to fish passage (such as a dam) above the upstream-most current occurrence record. The confluence of a tributary typically marks a significant change in the size of the stream and is a logical and recognizable upstream terminus. When a named tributary was not available, a road-crossing bridge was used to mark the boundary. Likewise, a dam or other barrier to fish passage marks the upstream extent to which mussels may disperse via their fish hosts. The downstream boundary of a unit in a stream is the confluence of a named tributary, or the upstream extent of an impoundment, below the downstream-most occurrence record. In the unit descriptions, distances between landmarks marking the upstream or downstream extent of a stream segment are given in river kilometers and equivalent miles, as measured tracing the course of the stream, not straight-line distance.

Because mussels are naturally restricted by certain physical conditions within a stream reach (i.e., flow, substrate), they may be unevenly distributed within these habitat units. Uncertainty on upstream and downstream distributional limits of some populations may have resulted in small areas of occupied habitat excluded from, or areas of unoccupied habitat included in, the designation. We recognize that both historical and recent collection records upon which we relied are incomplete, and that there may be river segments or small tributaries not included in this proposed designation that harbor small, limited populations of one or both species considered in this designation, or that others may become suitable in the future. The exclusion of such areas does not diminish their potential individual or cumulative importance to the conservation of these species. However, we believe that, with proper management, each of the 37 critical habitat units (24 fluted kidneyshell units, and 13 slabside pearlymussel units; 10 overlap between the two species) are capable of supporting one or both of these mussel species, and that populations within occupied units will serve as source populations for artificial reintroduction into unoccupied units, as well as assisted or natural migration into adjacent undesignated or designated streams within each river drainage. The habitat areas contained within the units described below constitute our best evaluation of areas needed for the conservation of these species at this time. Critical habitat may be revised for any or all of these species should new information become available.

The areas proposed for critical habitat below include only stream channels within the ordinary high-water line, and do not contain developed areas or structures. 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 PBFs in the adjacent critical habitat.

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 in the rule portion. 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–2012–0004, on our Internet site at *http://www.fws.gov/cookeville,* and at

the Fish and Wildlife office responsible for the designation (see **FOR FURTHER INFORMATION CONTACT** above).

Proposed Critical Habitat Designation

In total, we are proposing a total of 37 critical habitat units encompassing approximately 2,218 rkm (1,380 rmi) in Alabama, Kentucky, Mississippi, Tennessee, and Virginia—10 of the units overlap and are proposed as critical habitat for both species. For the fluted kidneyshell, we are proposing 24 critical habitat units encompassing approximately 1,899 rkm (1,181 rmi) of stream channel in Alabama, Kentucky, Tennessee, and Virginia. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the fluted kidneyshell. The 24 areas we propose as critical habitat are as follows: (1) Horse Lick Creek, KY; (2) Middle Fork Rockcastle River, KY; (3) Rockcastle River, KY; (4) Buck Creek, KY; (5) Rock Creek, KY; (6) Little South Fork Cumberland River, KY; (7) Big South Fork Cumberland River, KY, TN; (8) Wolf River and Town Branch, TN; (9) West Fork Obey River, TN; (10) Indian Creek, VA; (11) Little River [tributary to the Clinch River], VA; (12) North Fork Holston River, VA; (13) Middle Fork Holston River, VA; (14) Big Moccasin Creek, VA; (15) Copper Creek, VA; (16) Clinch River, TN, VA; (17) Powell River, TN, VA; (18) Nolichucky River, TN; (19) Holston River, TN; (20) French Broad River, TN; (21) Hiwassee River, TN; (22) Elk River, AL, TN; (23) Duck River, TN; and (24) Buffalo River, TN.

We are proposing 13 critical habitat units encompassing approximately 1,562 rkm (970 rmi) of stream channel in Alabama, Mississippi, Tennessee, and Virginia for the slabside pearlymussel. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the slabside pearlymussel. The 13 areas we propose as critical habitat are as follows: (1) North Fork Holston River, VA; (2) Middle Fork Holston River, VA; (3) Big Moccasin Creek, VA; (4) Clinch River, TN, VA; (5) Powell River, TN, VA; (6) Nolichucky River, TN; (7) Hiwassee River, TN; (8) Sequatchie River, TN; (9) Paint Rock River, AL; (10) Elk River, AL, TN; (11) Bear Creek, AL, MS; (12) Duck River, TN; and (13) Buffalo River, TN.

Unit name, location, and the approximate stream length of each proposed critical habitat unit are shown in Table 3 for the fluted kidneyshell and Table 4 for the slabside pearlymussel. The proposed critical habitat units include the stream channels within the ordinary high-water line only. For this purpose, we have applied the definition found at 33 CFR 329.11, and consider the ordinary high-water mark on nontidal rivers to be the line on the shore established by the fluctuations of water and indicated by physical characteristics, such as a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding areas.

States were granted ownership of lands beneath navigable waters up to the ordinary high-water line upon achieving Statehood (*Pollard* v. *Hagan,* 44 U.S. (3 How.) 212 (1845)). Prior sovereigns or the States may have made grants to private parties that included lands below the ordinary high-water mark of some navigable waters that are included in this proposal. We believe that most, if not all, lands beneath the navigable waters included in this proposed rule are owned by the States. The lands beneath most nonnavigable waters included in this proposed rule are in private ownership. In Alabama, the riparian landowner owns the stream to the middle of the channel for non-navigable streams. Riparian lands along the waters are either in private ownership, or are owned by county, State, or Federal entities. Lands under county, State, and Federal ownership consist of managed conservation areas, and are considered to have some level of protection.

TABLE 3—FLUTED KIDNEYSHELL OCCUPANCY STATUS AND RIPARIAN LANDS OWNERSHIP ADJACENT TO THE PROPOSED CRITICAL HABITAT UNITS

Unit	Location	Occupied by species	Private ownership rkm (rmi)	Federal, state, county, city ownership rkm (rmi)	Total length rkm (rmi)
FK1	Horse Lick Creek, KY	Yes	3.6 (2.3)	15.8 (10.1)	19.4 (12.4)
FK2	Middle Fork Rockcastle River, KY	Yes	6.0 (3.7)	6.5 (4.0)	12.5 (7.7)
FK3	Rockcastle River, KY	No	11.7 (7.3)	58.2 (36.2)	69.9 (43.5)
FK4	Buck Creek, KY	Yes	59.7 (37.1)	1.3 (0.8)	61.0 (37.9)
FK5	Rock Creek, KY	Yes	1.5 (0.9)	17.7 (11.0)	19.2 (11.9)
FK6	Little South Fork Cumberland River, KY	Yes	61.1 (38.0)	4.4 (2.7)	65.5 (40.7)
FK7	Big South Fork Cumberland River, KY, TN	Yes	1.5 (1.0)	90.0 (55.9)	91.5 (56.9)
FK8	Wolf River and Town Branch, TN	Yes	38.7 (24.0)	5.7 (3.5)	44.4 (27.5)
FK9	West Fork Obey River, TN	Yes	19.3 (12.0)	0	19.3 (12.0)
FK10	Indian Creek, VA	Yes	6.7 (4.2)	0	6.7 (4.2)
FK11	Little River, VA	Yes	50.4 (31.3)	0	50.4 (31.3)
FK12	North Fork Holston River, VA	Yes	66.4 (41.3)	0.9 (0.5)	67.3 (41.8)
FK13	Middle Fork Holston River, VA	Yes	89.0 (55.3)	0	89.0 (55.3)
FK14	Big Moccasin Creek, VA	No	33.1 (20.6)	0	33.1 (20.6)
FK15	Copper Creek, VA	Yes	55.5 (34.5)	0	55.5 (34.5)
FK16	Clinch River, TN, VA	Yes	256.3 (159.2)	6.4 (4.0)	262.7 (163.2)
FK17	Powell River, TN, VA	Yes	152.4 (94.7)	0.3 (0.2)	152.7 (94.9)
FK18	Nolichucky River, TN	No	50.9 (31.6)	0.9 (0.6)	51.9 (32.2)
FK19	Holston River, TN	No	85.1 (52.9)	0	85.1 (52.9)
FK20	French Broad River, TN	No	54.4 (33.8)	1.7 (1.1)	56.1 (34.9)
FK21	Hiwassee River, TN	No	0	24.4 (15.2)	24.4 (15.2)
FK22	Elk River, AL, TN	No	162.8 (101.2)	1.5 (0.9)	164.3 (102.1)
FK23	Duck River, TN	Yes	284.0 (176.5)	63.5 (39.4)	347.5 (215.9)
FK24	Buffalo River, TN	No	50.0 (31.0)	0	50.0 (31.0)
Total					1,899.4 (1,180.5)

TABLE 4—OCCUPANCY AND OWNERSHIP OF RIPARIAN LANDS ADJACENT TO THE PROPOSED CRITICAL HABITAT UNITS FOR THE SLABSIDE PEARLYMUSSEL

Unit	Location	Occupied	Private ownership rkm (rmi)	Federal, state, county, city ownership rkm (rmi)	Total length rkm (rmi)
SP1	North Fork Holston River, VA	Yes	66.4 (41.3)	0.9 (0.5)	67.3 (41.8)
SP2	Middle Fork Holston River, VA	Yes	89.0 (55.3)	0	89.0 (55.3)
SP3	Big Moccasin Creek, VA	Yes	33.1 (20.6)	0	33.1 (20.6)
SP4	Clinch River, TN, VA	Yes	256.3 (159.2)	6.4 (4.0)	262.7 (163.2)
SP5	Powell River, TN, VA	Yes	152.4 (94.7)	0.3 (0.2)	152.7 (94.9)
SP6	Nolichucky River, TN	Yes	50.9 (31.6)	0.9 (0.6)	51.9 (32.2)
SP7	Hiwassee River, TN	Yes	0	24.4 (15.2)	24.4 (15.2)
SP8	Sequatchie River, TN	Yes	151.5 (94.1)	0	151.5 (94.1)
SP9	Paint Rock River, AL	Yes	119.2 (74.1)	5.8 (3.6)	125.0 (77.7)
SP10	Elk River, AL, TN	Yes	162.8 (101.2)	1.5 (0.9)	164.3 (102.1)
SP11	Bear Creek, AL, MS	Yes	36.3 (22.5)	6.1 (3.8)	42.4 (26.3)
SP12	Duck River, TN	Yes	284.0 (176.5)	63.5 (39.4)	347.5 (215.9)
SP13	Buffalo River, TN	Yes	50.0 (31.0)	0	50.0 (31.0)
Total					1,561.8 (970.3)

Eleven critical habitat units proposed for both the fluted kidneyshell and slabside pearlymussel are currently designated as critical habitat under the Act for other species, including the purple bean (*Villosa perpurpurea*), oyster mussel (*Epioblasma capsaeformis*), Cumberlandian combshell (*E. brevidens*), Cumberland elktoe (*Alasmidonta atropurpurea*), rough rabbitsfoot (*Quadrula cylindrica strigillata*), slender chub (*Erimystax cahni*), and yellowfin madtom (*Noturus flavipinnis*) (42 FR 45526, 42 FR 47840, 69 FR 53136), or are proposed as critical habitat under the Act for the rabbitsfoot (*Q. c. cylindrica*) (see Table 5). The proposed units for the fluted kidneyshell and slabside pearlymussel completely or partially overlap existing units in the Powell, Clinch, Nolichucky, Big South Fork Cumberland, Duck, and Paint Rock Rivers and in the Buck, Rock, Indian, Copper, and Bear Creeks; however, the exact unit descriptions (lengths) differ due to mapping refinement since the earlier designations. No other critical habitat units proposed for these species have been designated or proposed as critical habitat for other species under the Act.

Three critical habitat units proposed for the fluted kidneyshell and slabside pearlymussel are currently designated under section 10(j) of the Act as nonessential experimental populations for other species, including the yellowfin madtom in the North Fork Holston River, VA; and 15 mussels, 1 snail, and 5 fishes in the lower Holston and French Broad Rivers, TN (53 FR 29335, 72 FR 52434, see Table 5).

All of the critical habitat units proposed for the fluted kidneyshell and slabside pearlymussel contain historical or extant records of federally listed or proposed species, except for the Wolf River and Town Branch and West Fork Obey River, TN (see Table 6).

TABLE 5—CRITICAL HABITAT UNITS PROPOSED FOR THE FLUTED KIDNEYSHELL AND SLABSIDE PEARLYMUSSEL WHICH ARE CURRENTLY DESIGNATED OR PROPOSED AS CRITICAL HABITAT FOR OTHER FEDERALLY LISTED SPECIES

Unit (Unit No.)	Species	Critical habitat	Nonessential experimental population	Length of overlap rkm (rmi)
Buck Creek (FK4)	Oyster mussel, Cumberlandian combshell.	69 FR 53136		61 (38)
Rock Creek (FK5)	Cumberland elktoe	69 FR 53136		19 (12)
Big South Fork Cumberland River (FK7).	Oyster mussel, Cumberlandian combshell, Cumberland elktoe.	69 FR 53136		92 (57)
Indian Creek (FK10)	Purple bean, Oyster mussel, Cumberlandian combshell, Rough rabbitsfoot.	69 FR 53136		7 (4)
North Fork Holston River (FK12, SP1).	Yellowfin madtom		53 FR 29335	58 (36)
Copper Creek (FK15)	Purple bean, Oyster mussel, Cumberlandian combshell, Rough rabbitsfoot, Yellowfin madtom.	69 FR 53136, 42 FR 45526, 42 FR 47840		21 (13) 56 (35) 56 (35)
Clinch River (FK16, SP4)	Purple bean, Oyster mussel, Cumberlandian combshell, Rough rabbitsfoot, Slender chub, Yellowfin madtom.	69 FR 53136, 42 FR 45526, 42 FR 47840		263 (163) 263 (163) 263 (163)
Powell River (FK17, SP5)	Purple bean, Cumberlandian combshell, Oyster mussel, Rough rabbitsfoot, Slender chub, Yellowfin madtom.	69 FR 53136, 42 FR 45526, 42 FR 47840		153 (95) 153 (95) 153 (95)

TABLE 5—CRITICAL HABITAT UNITS PROPOSED FOR THE FLUTED KIDNEYSHELL AND SLABSIDE PEARLYMUSSEL WHICH ARE CURRENTLY DESIGNATED OR PROPOSED AS CRITICAL HABITAT FOR OTHER FEDERALLY LISTED SPECIES—Continued

Unit (Unit No.)	Species	Critical habitat	Nonessential experimental population	Length of overlap rkm (rmi)
Nolichucky River (FK18, SP6)	Oyster mussel, Cumberlandian combshell.	69 FR 53136		8 (5)
Holston River (FK19)	15 Mussels, 1 Snail, and 5 Fishes		72 FR 52434	85 (53)
French Broad River (FK20)	15 Mussels, 1 Snail, and 5 Fishes		72 FR 52434	56 (35)
Paint Rock River (SP9)	Rabbitsfoot	TBD		80 (50)
Bear Creek (SP11)	Oyster mussel, Cumberlandian combshell, Rabbitsfoot.	69 FR 53136		42 (26) 234 (136)
Duck River (FK23, SP12)	Oyster mussel, Cumberlandian combshell, Rabbitsfoot.	69 FR 53136		74 (46) 234 (146)
Total				1221 (760)

TABLE 6—FEDERALLY LISTED OR PROPOSED SPECIES WITH HISTORICAL OR EXTANT RECORDS FROM THE PROPOSED CRITICAL HABITAT UNIT STREAMS FOR THE FLUTED KIDNEYSHELL AND SLABSIDE PEARLYMUSSEL

Unit	Location	Federally listed or proposed species present	
FK1	Horse Lick Creek, KY	Cumberland bean	*Villosa trabalis.*
		littlewing pearlymussel	*Pegias fabula.*
FK2	Middle Fork Rockcastle River, KY	Cumberland bean	*Villosa trabalis.*
FK3	Rockcastle River, KY	Cumberland bean	*Villosa trabalis.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
FK4	Buck Creek, KY	Cumberland bean	*Villosa trabalis.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
		snuffbox	*Epioblasma triquetra.*
		yellow blossom	*Epioblasma florentina florentina.*
FK5	Rock Creek, KY	Cumberland elktoe	*Alasmidonta atropurpurea.*
FK6	Little South Fork Cumberland River, KY	Cumberland bean	*Villosa trabalis.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
		snuffbox	*Epioblasma triquetra.*
		palezone shiner	*Notropis albizonatus.*
FK7	Big South Fork Cumberland River, KY	Cumberland bean	*Villosa trabalis.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		Cumberland elktoe	*Alasmidonta atropurpurea.*
		dromedary pearlymussel	*Dromus dromas.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
		spectaclecase	*Cumberlandia monodonta.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		duskytail darter	*Etheostoma percnurum.*
FK8	Wolf River and Town Branch, TN	None.	
FK9	West Fork Obey River, TN	None.	
FK10	Indian Creek, VA	purple bean	*Villosa perpurpurea.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
FK11	Little River, VA	finerayed pigtoe	*Fusconaia cuneolus.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
FK12, SP1	North Fork Holston River, VA	littlewing pearlymussel	*Pegias fabula.*
		purple bean	*Villosa perpurpurea.*
		rough rabbitsfoot	*Quadrula cylindrica strigillata.*
		shiny pigtoe	*Fusconaia cor.*
		snuffbox	*Epioblasma triquetra.*
		spotfin chub	*Erimonax monachus.*
FK13, SP2	Middle Fork Holston River, VA	littlewing pearlymussel	*Pegias fabula.*
		shiny pigtoe	*Fusconaia cor.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		yellow blossom	*Epioblasma florentina florentina.*
		spotfin chub	*Erimonax monachus.*

TABLE 6—FEDERALLY LISTED OR PROPOSED SPECIES WITH HISTORICAL OR EXTANT RECORDS FROM THE PROPOSED CRITICAL HABITAT UNIT STREAMS FOR THE FLUTED KIDNEYSHELL AND SLABSIDE PEARLYMUSSEL—Continued

Unit	Location	Federally listed or proposed species present	
FK14, SP3	Big Moccasin Creek, VA	finerayed pigtoe	*Fusconaia cuneolus.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
		rough rabbitsfoot	*Quadrula cylindrica strigillata.*
FK15	Copper Creek, VA	finerayed pigtoe	*Fusconaia cuneolus.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
		purple bean	*Villosa perpurpurea.*
		rough rabbitsfoot	*Quadrula cylindrica strigillata.*
		shiny pigtoe	*Fusconaia cor.*
		duskytail darter	*Etheostoma percnurum*
.....	.....	yellowfin madtom	*Noturus flavipinnis.*
FK16, SP4	Clinch River, TN, VA	Appalachian monkeyface	*Quadrula sparsa.*
		birdwing pearlymussel	*Lemiox rimosus.*
		cracking pearlymussel	*Hemistena lata.*
		Cumberland bean	*Villosa trabalis.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		Cumberland monkeyface	*Quadrula intermedia.*
		dromedary pearlymussel	*Dromus dromas.*
		fanshell	*Cyprogenia stegaria.*
		finerayed pigtoe	*Fusconaia cuneolus.*
		green blossom pearlymussel	*Epioblasma torulosa gubernaculum.*
		littlewing pearlymussel	*Pegias fabula.*
		oyster mussel	*Epioblasma capsaeformis.*
		pink mucket	*Lampsilis abrupta.*
		purple bean	*Villosa perpurpurea.*
		rayed bean	*Villosa fabalis.*
		rough pigtoe	*Pleurobema plenum.*
		rough rabbitsfoot	*Quadrula cylindrica strigillata.*
		sheepnose	*Plethobasus cyphyus.*
		shiny pigtoe	*Fusconaia cor.*
		snuffbox	*Epioblasma triquetra.*
		spectaclecase	*Cumberlandia monodonta.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		yellow blossom	*Epioblasma florentina florentina.*
		pygmy madtom	*Noturus stanauli.*
		slender chub	*Erimystax cahni.*
FK17, SP5	Powell River, TN, VA	Appalachian monkeyface	*Quadrula sparsa.*
		birdwing pearlymussel	*Lemiox rimosus.*
		cracking pearlymussel	*Hemistena lata.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		Cumberland monkeyface	*Quadrula intermedia.*
		dromedary pearlymussel	*Dromus dromas.*
		finerayed pigtoe	*Fusconaia cuneolus.*
		green blossom pearlymussel	*Epioblasma torulosa gubernaculum.*
		oyster mussel	*Epioblasma capsaeformis.*
		purple bean	*Villosa perpurpurea.*
		rayed bean	*Villosa fabalis.*
		rough rabbitsfoot	*Quadrula cylindrica strigillata.*
		sheepnose	*Plethobasus cyphyus.*
		shiny pigtoe	*Fusconaia cor.*
		snuffbox	*Epioblasma triquetra.*
		spectaclecase	*Cumberlandia monodonta.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		white wartyback	*Plethobasus cicatricosus.*
		yellow blossom	*Epioblasma florentina florentina.*
		slender chub	*Erimystax cahni.*
		yellowfin madtom	*Noturus flavipinnis.*
FK18, SP6	Nolichucky River, TN	Cumberlandian combshell	*Epioblasma brevidens.*
		green blossom pearlymussel	*Epioblasma torulosa gubernaculum.*
		pink mucket	*Lampsilis abrupta.*
		rayed bean	*Villosa fabalis.*
		spectaclecase	*Cumberlandia monodonta.*
		snail darter	*Percina tanasi.*
FK19	Holston River, TN	Appalachian Monkeyface	*Quadrula sparsa.*
		birdwing pearlymussel	*Lemiox rimosus.*
		cracking pearlymussel	*Hemistena lata.*

TABLE 6—FEDERALLY LISTED OR PROPOSED SPECIES WITH HISTORICAL OR EXTANT RECORDS FROM THE PROPOSED CRITICAL HABITAT UNIT STREAMS FOR THE FLUTED KIDNEYSHELL AND SLABSIDE PEARLYMUSSEL—Continued

Unit	Location	Federally listed or proposed species present	
		Cumberlandian combshell	*Epioblasma brevidens.*
		Cumberland monkeyface	*Quadrula intermedia.*
		dromedary pearlymussel	*Dromus dromas.*
		green blossom pearlymussel	*Epioblasma torulosa gubernaculum.*
		oyster mussel	*Epioblasma capsaeformis.*
		ring pink	*Obovaria retusa.*
		sheepnose	*Plethobasus cyphyus.*
		snuffbox	*Epioblasma triquetra.*
		spectaclecase	*Cumberlandia monodonta.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		turgid blossom pearlymussel	*Epioblasma turgidula.*
		white wartyback	*Plethobasus cicatricosus.*
		yellow blossom	*Epioblasma florentina florentina.*
		slender chub	*Erimystax cahni.*
		snail darter	*Percina tanasi.*
FK20	French Broad River, TN	cracking pearlymussel	*Hemistena lata.*
		dromedary pearlymussel	*Dromus dromas.*
		fanshell	*Cyprogenia stegaria.*
		orangefoot pimpleback	*Plethobasus cooperianus.*
		oyster mussel	*Epioblasma capsaeformis.*
		pink mucket	*Lampsilis abrupta.*
		ring pink	*Obovaria retusa.*
		rough pigtoe	*Pleurobema plenum.*
		sheepnose	*Plethobasus cyphyus.*
		shiny pigtoe	*Fusconaia cor.*
		tubercled blossom pearlymussel	*Epioblasma torulosa torulosa.*
		yellow blossom	*Epioblasma florentina florentina.*
		snail darter	*Percina tanasi.*
FK21, SP7	Hiwassee River, TN	Appalachian monkeyface	*Quadrula sparsa.*
		Cumberland bean	*Villosa trabalis.*
		dromedary pearlymussel	*Dromus dromas.*
		orangefoot pimpleback	*Plethobasus cooperianus.*
		oyster mussel	*Epioblasma capsaeformis.*
		rough pigtoe	*Pleurobema plenum.*
		sheepnose	*Plethobasus cyphyus.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		tubercled blossom pearlymussel	*Epioblasma torulosa torulosa.*
		yellow blossom	*Epioblasma florentina florentina.*
SP8	Sequatchie River, TN	Anthony's riversnail	*Athearnia anthonyi.*
		snuffbox	*Epioblasma triquetra.*
		spectaclecase	*Cumberlandia monodonta.*
		snail darter	*Percina tanasi.*
SP9	Paint Rock River, AL	Alabama lampmussel	*Lampsilis virescens.*
		Cumberland bean	*Villosa trabalis.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		finerayed pigtoe	*Fusconaia cuneolus.*
		pale lilliput	*Toxolasma cylindrellus.*
		pink mucket	*Lampsilis abrupta.*
		shiny pigtoe	*Fusconaia cor.*
		snuffbox	*Epioblasma triquetra.*
		yellow blossom	*Epioblasma florentina florentina.*
		palezone shiner	*Notropis albizonatus.*
		snail darter	*Percina tanasi.*
		rabbitsfoot	*Quadrula cylindrica cylindrica.*
FK22, SP10	Elk River, AL, TN	Alabama lampmussel	*Lampsilis virescens.*
		birdwing pearlymussel	*Lemiox rimosus.*
		cracking pearlymussel	*Hemistena lata.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		Cumberland monkeyface	*Quadrula intermedia.*
		dromedary pearlymussel	*Dromus dromas.*
		fanshell	*Cyprogenia stegaria.*
		finerayed pigtoe	*Fusconaia cuneolus.*
		littlewing pearlymussel	*Pegias fabula.*
		pale lilliput	*Toxolasma cylindrellus.*
		rabbitsfoot	*Quadrula c. cylindrica.*
		rayed bean	*Villosa fabalis.*
		shiny pigtoe	*Fusconaia cor.*

TABLE 6—FEDERALLY LISTED OR PROPOSED SPECIES WITH HISTORICAL OR EXTANT RECORDS FROM THE PROPOSED CRITICAL HABITAT UNIT STREAMS FOR THE FLUTED KIDNEYSHELL AND SLABSIDE PEARLYMUSSEL—Continued

Unit	Location	Federally listed or proposed species present	
SP11	Bear Creek, AL, MS	snuffbox	*Epioblasma triquetra.*
		spectaclecase	*Cumberlandia monodonta.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		tubercled blossom pearlymussel	*Epioblasma torulosa torulosa.*
		turgid blossom pearlymussel	*Epioblasma turgidula.*
		yellow blossom	*Epioblasma florentina florentina.*
		boulder darter	*Etheostoma wapiti.*
		snail darter	*Percina tanasi.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		finerayed pigtoe	*Fusconaia cuneolus.*
		oyster mussel	*Epioblasma capsaeformis.*
		pink mucket	*Lampsilis abrupta.*
FK23, SP12	Duck River, TN	snuffbox	*Epioblasma triquetra.*
		turgid blossom pearlymussel	*Epioblasma turgidula.*
		yellow blossom	*Epioblasma florentina florentina.*
		rabbitsfoot	*Quadrula c. cylindrica.*
		birdwing pearlymussel	*Lemiox rimosus.*
		clubshell	*Pleurobema clava.*
		cracking pearlymussel	*Hemistena lata.*
		Cumberlandian combshell	*Epioblasma brevidens.*
		Cumberland monkeyface	*Quadrula intermedia.*
		littlewing pearlymussel	*Pegias fabula.*
		orangefoot pimpleback	*Plethobasus cooperianus.*
		oyster mussel	*Epioblasma capsaeformis.*
		pale lilliput	*Toxolasma cylindrellus.*
		pink mucket	*Lampsilis abrupta.*
		rayed bean	*Villosa fabalis.*
		sheepnose	*Plethobasus cyphyus.*
FK24, SP13	Buffalo River, TN	snuffbox	*Epioblasma triquetra.*
		spectaclecase	*Cumberlandia monodonta.*
		tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri).*
		tubercled blossom pearlymussel	*Epioblasma torulosa torulosa.*
		turgid blossom pearlymussel	*Epioblasma turgidula.*
		winged mapleleaf	*Quadrula fragosa.*
		yellow blossom	*Epioblasma florentina florentina.*
		pygmy madtom	*Noturus stanauli.*
		rabbitsfoot	*Quadrula c. cylindrica.*
		pale lilliput	*Toxolasma cylindrellus.*
		spotfin chub	*Erimonax monachus.*
		rabbitsfoot	*Quadrula c. cylindrica.*

For each stream reach proposed as a critical habitat unit, the upstream and downstream boundaries are described generally below. More precise definitions are provided in the Proposed Regulation Promulgation at the end of this proposed rule. Fluted kidneyshell and slabside pearlymussel status and distribution for each critical habitat unit was previously described in the **Background** section.

Fluted Kidneyshell and Slabside Pearlymussel Proposed 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 must contain PBFs which are (1) essential to the conservation of the species and (2) which may require special management considerations or protection. For those units occupied by either the fluted kidneyshell, slabside pearlymussel, or both species, we describe the principal PCEs essential to the conservation of the species and the special management considerations or protections that may be needed for each unit below.

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. For those units unoccupied by the fluted kidneyshell, or slabside pearlymussel, we are proposing to designate these units because we have determined that they are essential for the conservation of the species due to the need to re-establish the species within other portions of its historical range in order to reduce threats from stochastic events.

For five of the units (Big Moccasin Creek, Nolichucky, Hiwassee, Elk, and Buffalo Rivers), we are designating critical habitat for the slabside pearlymussel under prong one of the Act (occupied), while at the same time designating the unit under prong two of the Act for the fluted kidneyshell species (unoccupied). Therefore, the principal PCEs and special management considerations or protections given for these units only apply to the species for which the unit is occupied critical habitat (slabside pearlymussel).

Unit FK1: Horse Lick Creek, Rockcastle and Jackson Counties, Kentucky

Proposed Unit FK1 encompasses approximately 19 rkm (12 rmi) of Horse Lick Creek, in Rockcastle and Jackson Counties, KY. It includes the mainstem of Horse Lick Creek from its confluence with the Rockcastle River upstream to Clover Bottom Creek. The unit is within the Cumberland River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the fluted kidneyshell at the time of listing. This unit is located almost entirely on private lands; however, approximately 16 rkm (10 rmi) are federal lands within the DBNF. Land and resource management decisions and activities within the DBNF are guided by DBNF's LRMP (USFS 2004a, pp. 1–14).

The channel within proposed Unit FK1 is relatively stable, with an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish host(s) for the fluted kidneyshell, are known from this unit (PCE 5).

Within proposed Unit FK1, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects associated with legacy coal mines and coal mining activities, silviculture-related activities, natural gas and oil exploration activities in headwater reaches, illegal off-road vehicle use and other recreational activities, and nonpoint source pollution originating in headwater reaches.

Unit FK2: Middle Fork Rockcastle River, Jackson County, Kentucky

Proposed Unit FK2 includes 12.5 rkm (7.7 rmi) of the Middle Fork Rockcastle River from its confluence with the Rockcastle River upstream to its confluence with Indian Creek and Laurel Fork in Jackson County, KY. The unit is within the Cumberland River system and is proposed as occupied critical habitat for the fluted kidneyshell. About half of this unit (approximately 6 rkm (4 rmi)) is in public ownership (DBNF), and half is in private ownership. Land and resource management decisions and activities within the DBNF are guided by DBNF's LRMP (USFS 2004a, pp. 1–14).

The channel within proposed Unit FK2 is relatively stable and has an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3).

Within this unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects caused by resource extraction (coal mining, silviculture, natural gas and oil exploration activities), agricultural activities (livestock), lack of adequate riparian buffers, construction and maintenance of State and county roads, illegal off-road vehicle use, nonpoint source pollution arising from a wide variety of human activities, and potentially canopy loss caused by infestations of the hemlock wooly adelgid, *Adelges tsugae,* an invasive pest threatening eastern hemlock trees (*Tsuga canadensis*) in the eastern United States. Hemlocks are an important component of riparian vegetation throughout the range of the two mussels.

Unit FK3: Rockcastle River, Pulaski, Laurel, and Rockcastle Counties, Kentucky

Proposed Unit FK3 includes approximately 70 rkm (43 rmi) of the Rockcastle River from the backwaters of Lake Cumberland near its confluence with Cane Creek along the Laurel and Pulaski County line, KY, upstream to its confluence with Horse Lick Creek along the Laurel and Rockcastle County line, KY. The unit is within the Cumberland River system and is considered unoccupied by the fluted kidneyshell at the time of listing, but within the species' historical range. Live fluted kidneyshell have not been collected within proposed Unit 3 since 1911; however, it persists in adjacent tributaries such as Horse Lick Creek and shell material has been found as recently as 1985 (Wilson and Clark 1914 and Thompson 1985 *in* Cicerello 1993, p. 12). In 2010, surveys of the Rockcastle River showed that the river had a diverse mussel fauna, including the federally endangered Cumberland bean (McGregor 2010, unpubl. data).

We consider this unit essential for the conservation of the fluted kidneyshell due to the need to re-establish the species within other portions of its historical range in order to reduce threats from stochastic events. Therefore, this unit is proposed as unoccupied critical habitat for the fluted kidneyshell. A portion of this unit (approximately 12 rkm (7 rmi)) is in private ownership, but the majority is in public ownership (DBNF). Land and resource management decisions and activities within the DBNF are guided by DBNF's LRMP (USFS 2004a, pp. 1–14).

Unit FK4: Buck Creek, Pulaski County, Kentucky

Proposed Unit FK4 includes approximately 61 rkm (38 rmi) of Buck Creek from State Route 192 upstream to Route 328, Pulaski County, KY. The unit is within the Cumberland River basin and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. A portion of this unit (1.3 rkm (0.8 rmi)) is in public ownership (DBNF), but the majority is in private ownership. Land and resource management decisions and activities within the DBNF are guided by DBNF's LRMP (USFS 2004a, pp. 1–14). The unit completely overlaps existing critical habitat for the oyster mussel and Cumberlandian combshell (69 FR 53136).

The channel within proposed Unit FK4 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish host(s) for the fluted kidneyshell, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects associated with instream gravel mining, silviculture-related activities, illegal off-road vehicle use and other recreational activities, and nonpoint source pollution from agricultural and developmental activities.

Unit FK5: Rock Creek, McCreary County, Kentucky

Proposed Unit FK5 includes approximately 19 rkm (12 rmi) of Rock Creek from its confluence with White Oak Creek upstream to the low water crossing at rkm 25.6 (rmi 15.9) in McCreary County, KY. The unit is within the Cumberland River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. A portion of this unit (1.5 rkm (0.9 rmi)) is in private ownership, but the majority is in public ownership (DBNF). Land and resource management decisions and activities within the DBNF are guided by DBNF's LRMP (USFS 2004a, pp. 1–14). The unit completely overlaps existing critical habitat for the Cumberland elktoe (69 FR 53136).

The channel within proposed Unit FK5 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1),

with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish host(s) for the fluted kidneyshell, are known from this unit (PCE 5).

Within this unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects caused by resource extraction (coal mining, silviculture, natural gas and oil exploration activities), agricultural activities (livestock), lack of adequate riparian buffers, construction and maintenance of State and county roads, illegal off-road vehicle use, nonpoint source pollution arising from a wide variety of human activities, and potentially canopy loss caused by infestations of the hemlock wooly adelgid.

Unit FK6: Little South Fork Cumberland River, McCreary and Wayne Counties, Kentucky

Proposed Unit FK6 includes 65.5 rkm (40.7 rmi) of the Little South Fork Cumberland River from its confluence with the Big South Fork Cumberland River, where it is the dividing line between Wayne and McCreary Counties, upstream to its confluence with Dobbs Creek in Wayne County, KY. The unit is within the Cumberland River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. A portion of this unit (4.4 rkm (2.7 rmi)) is in public ownership (DBNF), but the majority is in private ownership. Land and resource management decisions and activities within the DBNF are guided by DBNF's LRMP (USFS 2004a, pp. 1–14).

The channel within proposed Unit FK6 is relatively stable, with an abundance of riffle habitats (PCE 1), relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish host(s) for the fluted kidneyshell, are known from this unit (PCE 5).

Within this unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects caused by resource extraction (coal mining, silviculture, natural gas and oil exploration activities), agricultural activities (livestock), lack of adequate riparian buffers, construction and maintenance of State and county roads, illegal off-road vehicle use, nonpoint source pollution arising from a wide variety of human activities, and potentially canopy loss caused by infestations of the hemlock wooly adelgid.

Unit FK7: Big South Fork Cumberland River, Fentress, Morgan, and Scott Counties, Tennessee, and McCreary County, Kentucky

Proposed Unit FK7 includes a combined total of 92.0 rkm (57.1 rmi) of the Big South Fork of the Cumberland River, Clear Fork of the New River, and the New River in Tennessee and Kentucky. Proposed Unit FK7 includes approximately 45 rkm (28 rmi) of the Big South Fork Cumberland River from its confluence with Laurel Crossing Branch downstream of Big Shoals, McCreary County, KY, upstream to its confluence with Clear Fork and of the New River, Scott County, TN. This unit also includes 32.3 rkm (20.0 rmi) of Clear Fork from its confluence with the Big South Fork and New River in Scott County, TN, upstream to its confluence with Crooked Creek along the Fentress and Morgan County line, TN. This unit also includes 14.7 rkm (9.1 rmi) of the New River from its confluence with the Big South Fork upstream to the Highway 27 Bridge crossing in Scott County, TN. The unit is within the Cumberland River system and is proposed as occupied critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. A portion of this unit (92 rkm (57 rmi)) has been designated as critical habitat for the Cumberlandian combshell, oyster mussel, and Cumberland elktoe (69 FR 53136).

This unit is located almost entirely on federal lands within the BSFNRRA. Land and resource management decisions and activities within the BSFNRRA are guided by the National Park Service General Management Plan, Field Management Plan, and Draft Non-Federal Oil and Gas Management Plan (NPS 2005, entire; NPS 2006, pp. 1–12; NPS 2011, entire).

The channel within proposed Unit FK7 is relatively stable, with relatively silt-free sand and gravel substrates (PCE 2) and adequate instream flows (PCE 3). A diverse fish fauna, including fish host(s) for the fluted kidneyshell, are known from this unit (PCE 5).

Within this unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects caused by resource extraction (coal mining, silviculture, natural gas and oil exploration activities), lack of adequate riparian buffers, construction and maintenance of roads, recreational horse riding, illegal off-road vehicle use, nonpoint source pollution arising from a wide variety of human activities, and potential canopy loss caused by infestations of the hemlock wooly adelgid.

Unit FK8: Wolf River and Town Branch, Pickett and Fentress Counties, Tennessee

Proposed Unit FK8 includes 41.0 rkm (25.5 rmi) of the Wolf River from its inundation at Dale Hollow Lake in Pickett County, TN, upstream to its confluence with Delk Creek in Fentress County, TN, and 3.4 rkm (2.0 rmi) of Town Branch from its confluence with Wolf River upstream to its headwaters in Pickett County, TN. The unit is within the Cumberland River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. A portion of this unit (6 rkm (4 rmi)) is in public ownership (Corps lands adjacent to Dale Hollow Reservoir and Sgt. Alvin C. York State Historic Park), but the majority is in private ownership.

The channel within proposed Unit FK8 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2) and adequate instream flows (PCE 3). A diverse fish fauna, including fish host(s) for the fluted kidneyshell, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects associated with coal mining, silviculture-related activities, natural gas and oil exploration activities in headwater reaches, agricultural activities (livestock), lack of adequate riparian buffers, construction and maintenance of State and county roads, off-road vehicle use and other recreational activities, nonpoint source pollution originating in headwater reaches, and potential canopy loss caused by infestations of the hemlock wooly adelgid.

Unit FK9: West Fork Obey River, Overton County, Tennessee

Proposed Unit FK9 includes approximately 19 rkm (12 rmi) of the West Fork Obey River from the Highway 52 Bridge crossing upstream to its confluence with Dry Hollow Creek in Overton County, TN. The unit is within the Cumberland River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. This unit is located almost entirely on private

land, except for any small amount that is publicly owned in the form of bridge crossings and road easements.

The channel within proposed Unit FK9 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish host(s) for the fluted kidneyshell, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects associated with coal mining, silviculture-related activities, natural gas and oil exploration activities in headwater reaches, off-road vehicle use and other recreational activities, agricultural activities (livestock), lack of adequate riparian buffers, construction and maintenance of State and county roads, nonpoint source pollution originating in headwater reaches, and potential canopy loss caused by infestations of the hemlock wooly adelgid.

Unit FK10: Indian Creek, Tazewell County, Virginia

Proposed Unit FK10 includes 6.7 rkm (4.2 rmi) of Indian Creek from its confluence with the Clinch River upstream to the fourth Norfolk Southern Railroad crossing at Van Dyke in Tazewell County, VA. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements. The unit completely overlaps critical habitat for the Cumberlandian combshell, rough rabbitsfoot, purple bean, and oyster mussel (69 FR 53136).

The channel within proposed Unit FK10 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects associated with residential development, coal mining, silviculture-related activities, natural gas and oil exploration activities in headwater reaches, illegal off-road vehicle use and other recreational activities, and nonpoint source pollution originating in headwater reaches.

Unit FK11: Little River, Russell and Tazewell Counties, Virginia

Proposed Unit FK11 includes approximately 50 rkm (31 rmi) of Little River from its confluence with the Clinch River in Russell County, VA, upstream to its confluence with Liberty and Maiden Spring Creeks in Tazewell County, VA. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by fluted kidneyshell at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements. The Nature Conservancy also owns a small portion of adjacent property.

The channel within proposed Unit FK11 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell and slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell and its habitats may require special management considerations or protection to address potential adverse effects associated with silviculture-related activities, natural gas and oil exploration activities in headwater reaches, and nonpoint source pollution originating in headwater reaches.

Unit FK12 and SP1: North Fork Holston River, Smyth and Bland Counties, Virginia

Proposed Unit FK12 and SP1 includes approximately 67 rkm (42 rmi) of the North Fork Holston River from its confluence with Beaver Creek, upstream of Saltville, in Smyth County, VA, upstream to Ceres, Bland County, VA. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by both species at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings, road easements, and a small portion that is adjacent to the George Washington and Jefferson National Forests. The Nature Conservancy and the Virginia Outdoors Foundation also own a small portion of adjacent property. A portion of this unit (58 rkm (36 rmi)) has been designated as a nonessential experimental population (NEP) for the yellowfin madtom (53 FR 29335).

The channel within proposed Unit FK12 and SP1 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell and slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell, slabside pearlymussel, and their habitats may require special management considerations or protection to address potential adverse effects associated with agricultural activities (livestock), silviculture-related activities, natural gas and oil exploration activities in headwater reaches, lack of adequate riparian buffers, construction and maintenance of State and county roads, and nonpoint source pollution originating in headwater reaches.

Unit FK13 and SP2: Middle Fork Holston River, Washington, Smyth, and Wythe Counties, Virginia

Proposed Unit FK13 and SP2 includes approximately 89 rkm (55 rmi) of the Middle Fork Holston River from its inundation at South Holston Lake in Washington County, VA, upstream to its headwaters in Wythe County, VA. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by both the fluted kidneyshell and slabside pearlymussel at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements.

The channel within proposed Unit FK13 and SP2 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell and slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell, slabside pearlymussel, and their habitats may require special management considerations or protection to address potential adverse effects associated with agricultural

activities, lack of adequate riparian buffers, silviculture-related activities, and nonpoint source pollution.

Unit FK14 and SP3: Big Moccasin Creek, Scott and Russell Counties, Virginia

Proposed Unit FK14 and SP3 includes approximately 33 rkm (21 rmi) of Big Moccasin Creek from the Highway 71 Bridge crossing in Scott County, VA, upstream to the Route 612 Bridge crossing near Collinwood in Russell County, VA. The unit is within the Tennessee River system and is proposed as critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by slabside pearlymussel at the time of listing. This unit is considered unoccupied by the fluted kidneyshell, but within the species' historical range. Live fluted kidneyshell have not been collected in Big Moccasin Creek since the early 1900s (Ortmann 1918, p. 608). However, this unit is proposed for critical habitat for the fluted kidneyshell because it is considered essential for the conservation of the species. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements.

The channel within proposed Unit FK14 and SP3 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the slabside pearlymussel and its habitats may require special management considerations or protection to address potential adverse effects associated with agricultural activities (livestock), lack of adequate riparian buffers, silviculture-related activities, natural gas and oil exploration activities in headwater reaches, illegal off-road vehicle use and other recreational activities, and nonpoint source pollution originating in headwater reaches.

Unit FK15: Copper Creek, Scott County, Virginia

Proposed Unit FK15 includes 55.5 rkm (34.5 rmi) of Copper Creek from its confluence with the Clinch River upstream to the Highway 71 Bridge crossing in Scott County, VA. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell. This unit is included in the geographical area occupied by the species at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements. A portion of this unit (21 rkm (13 rmi)) has been designated as critical habitat for the Cumberlandian combshell, rough rabbitsfoot, purple bean, and oyster mussel, and a portion of this unit (55.5 rkm (34.5 rmi)) has been designated as critical habitat for the yellowfin madtom (42 FR 45526, 42 FR 47840, 69 FR 53136).

The channel within proposed Unit FK15 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell and its habitat may require special management considerations or protection to address potential adverse effects associated with agricultural activities (livestock), silviculture-related activities, lack of adequate riparian buffers, construction and maintenance of State and county roads, and nonpoint source pollution originating in headwater reaches.

Unit FK16 and SP4: Clinch River, Hancock County, Tennessee, and Scott, Russell, and Tazewell Counties, Virginia

Proposed Unit FK16 and SP4 includes approximately 263 rkm (163 rmi) of the Clinch River from rkm 255 (rmi 159) immediately below Grissom Island in Hancock County, TN, upstream to its confluence with Indian Creek near Cedar Bluff, Tazewell County, VA. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by both species at the time of listing. Approximately 6 rkm (4 rmi) of this unit is in public ownership, including portions of the Kyles Ford State Managed Area, George Washington National Forest, Jefferson National Forest, Cleveland Barrens State Natural Area Preserve (SNAP), and the Pinnacle SNAP. The Nature Conservancy also owns a small portion of adjacent property. The unit completely overlaps critical habitat for the Cumberlandian combshell, rough rabbitsfoot, purple bean, and oyster mussel, and the entire length of this unit has been designated as critical habitat for the slender chub and yellowfin madtom (42 FR 45526, 42 FR 47840, 69 FR 53136).

The channel within proposed Unit FK16 and SP4 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell and slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell, slabside pearlymussel, and their habitats may require special management considerations or protection to address potential adverse effects associated with coal mining, silviculture-related activities, natural gas and oil exploration activities in headwater reaches, agricultural activities (livestock), lack of adequate riparian buffers, construction and maintenance of State and county roads, and nonpoint source pollution originating in headwater reaches.

Unit FK17 and SP5: Powell River, Claiborne and Hancock Counties, Tennessee, and Lee County, Virginia

Proposed Unit FK17 and SP5 includes approximately 153 rkm (95 rmi) of the Powell River from the U.S. 25E Bridge in Claiborne County, TN, upstream to rkm 256 (rmi 159) (upstream of Rock Island in the vicinity of Pughs) in Lee County, VA. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by both species at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings, road easements, and a small portion that is adjacent to the Cedars SNAP. The Nature Conservancy also owns a small portion of adjacent property. The unit completely overlaps critical habitat for the Cumberlandian combshell, rough rabbitsfoot, purple bean, and oyster mussel, and the entire length of this unit has been designated as critical habitat for the slender chub and yellowfin madtom (42 FR 45526, 42 FR 47840, 69 FR 53136).

The channel within proposed Unit FK17 and SP5 is relatively stable, with instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell and slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell, slabside pearlymussel, and

their habitats may require special management considerations or protection to address potential adverse effects associated with coal mining, silviculture-related activities, natural gas and oil exploration activities in headwater reaches, agricultural activities (livestock), lack of adequate riparian buffers, construction and maintenance of State and county roads, and nonpoint source pollution originating in headwater reaches.

Unit FK18 and SP6: Nolichucky River, Cocke, Hamblen, and Greene Counties, Tennessee

Proposed Unit FK18 and SP6 includes approximately 52 rkm (32 rmi) of the Nolichucky River from rkm 14 (rmi 9), approximately 0.6 rkm (0.4 rmi) upstream of Enka Dam, where it divides Hamblen and Cocke Counties, TN, upstream to its confluence with Pigeon Creek, just upstream of the Highway 321 Bridge crossing, in Greene County, TN. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by slabside pearlymussel at the time of listing. This unit is considered unoccupied by the fluted kidneyshell at the time of listing, but within the species' historical range. Live fluted kidneyshell have not been collected in the Nolichucky River since the mid-1960s (Tennessee Natural Heritage Inventory Program Database, accessed 2012). However, the TWRA has reintroduced the species into at least two sites in the Nolichucky River by translocating adult individuals from the Clinch River (Hubbs 2011, unpubl. data). It is not known if the reintroductions have been successful. This unit is proposed for critical habitat for the fluted kidneyshell because it is considered essential for the conservation of the species. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings, road easements, and a small portion that is within Mullins Island Wildlife Management Area. A portion of this unit (8 rkm (5 rmi)) has been designated as a critical habitat for the oyster mussel and Cumberlandian combshell (69 FR 53136).

The channel within proposed Unit FK18 and SP6 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the slabside pearlymussel and its habitats may require special management considerations or protection to address potential adverse effects associated with agricultural activities, silviculture-related activities, rock mining, lack of adequate riparian buffers, construction and maintenance of State and county roads, and nonpoint source pollution originating in headwater reaches.

Unit FK19: Holston River, Knox, Grainger, and Jefferson Counties, Tennessee

Proposed Unit FK19 includes approximately 85 rkm (53 rmi) of the Holston River from its confluence with the French Broad River in Knox County, TN, upstream to the base of Cherokee Dam at rkm 83.7 (rmi 52.3) along the Grainger and Jefferson County, TN, line. The unit is within the Tennessee River system. This unit is considered unoccupied by the fluted kidneyshell and slabside pearlymussel, but within the species' historical ranges. Live fluted kidneyshell have not been collected in the Holston River since the early 1900s (Ortmann 1918, p. 614). As discussed below, we consider Unit FK19 essential for the conservation of the fluted kidneyshell, but not the slabside pearlymussel, and so it is proposed as critical habitat only for the fluted kidneyshell. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements. The unit completely overlaps a designated nonessential experimental population for 15 mussels, 1 snail, and 5 fishes (72 FR 52434).

We consider this unit essential for the conservation of the fluted kidneyshell due to the need to re-establish the species within other portions of its historical range in order to reduce threats from stochastic events. Although live fluted kidneyshell have not been collected in the Holston River since the early 1900s (Ortmann 1918, p. 614), TVA has improved conditions for aquatic species within this unit. Between 1988 and 1995, TVA implemented reservoir release improvements below Cherokee Dam on the Holston River. These improvements included the establishment of minimum flows and increasing the amount of dissolved oxygen in the tailwater below the reservoir (Scott *et al.* 1996, p. 21).

The unit does currently support populations of three federally listed species (threatened snail darter and endangered pink mucket and sheepnose). In addition, other mussel species co-occur with these species along with a diverse fish fauna, including hosts for the fluted kidneyshell. These host fishes are bottom-dwelling species that are able to move into refugia of low flows during high discharges from the hydropower dam upstream. Therefore, the fluted kidneyshell glochidia may come into contact and infest the host fishes. The slabside pearlymussel and its host fishes are known from the French Broad River drainage; however, hydropower operations make this habitat unsuitable for mid-water column fishes, such as the shiners that are hosts for the slabside pearlymussel (Layzer and Scott 2006, pp. 481, 488–9). Therefore, we are not designating Unit FK19 as critical habitat for the slabside pearlymussel at this time.

Unit FK20: French Broad River, Knox and Sevier Counties, Tennessee

Proposed Unit FK20 includes approximately 56 rkm (35 rmi) of the French Broad River from its confluence with the Holston River in Knox County, TN, upstream to the base of Douglas Dam at rkm 51.7 (rmi 32.3) in Sevier County, TN. The unit is within the Tennessee River system. This unit is considered unoccupied by the fluted kidneyshell and slabside pearlymussel, but within the species' historical ranges. Fluted kidneyshell are only known from archaeological records in the French Broad River (Parmalee 1988 in Layzer and Scott 2006, pp. 481–482). As discussed below, we consider Unit FK20 essential for the conservation of the fluted kidneyshell, but not the slabside pearlymussel, and so it is proposed as critical habitat only for the fluted kidneyshell. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements and a small portion that is within Forks of the River Wildlife Management Area. The unit completely overlaps a nonessential experimental population for 15 mussels, 1 snail, and 5 fishes (72 FR 52434).

We consider this unit essential for the conservation of the fluted kidneyshell due to the need to re-establish the species within other portions of its historical range in order to reduce threats from stochastic events. Fluted kidneyshell are only known from archaeological records in the French Broad River (Parmalee 1988 in Layzer and Scott 2006, p. 481–482). However, between 1987 and 1995, TVA implemented reservoir release improvements below Douglas Dam on the French Broad River. These

improvements included the establishment of minimum flows and increasing the amount of dissolved oxygen in the tailwater below the reservoir (Scott *et al.* 1996, p. 11–12), improving conditions for the fluted kidneyshell and other aquatic species.

The unit does currently support populations of the federally threatened snail darter and endangered pink mucket. In addition, other mussel species co-occur with these species and a diverse fish fauna, including hosts for the fluted kidneyshell. These host fishes are bottom-dwelling species that are able to move into refugia of low flows during high discharges from the hydropower dam upstream. Therefore, the fluted kidneyshell glochidia may come into contact and infest the host fishes. The slabside pearlymussel and its host fishes are known from the French Broad River drainage; however, hydropower operations make this habitat unsuitable for mid-water column fishes, such as the shiners that are hosts for the slabside pearlymussel (Layzer and Scott 2006, pp. 481, 488–9). Therefore, we are not designating Unit FK20 as critical habitat for the slabside pearlymussel at this time.

Unit FK21 and SP7: Hiwassee River, Polk County, Tennessee

Proposed Unit FK21 and SP7 includes approximately 24 rkm (15 rmi) of the Hiwassee River from the Highway 315 Bridge crossing upstream to the Highway 68 Bridge crossing in Polk County, TN. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by slabside pearlymussel at the time of listing. This unit is considered unoccupied by the fluted kidneyshell at the time of listing, but within the species' historical range. Fluted kidneyshell are only known from archaeological records in the Hiwassee River (Parmalee and Bogan 1998, p. 205). This unit is considered essential for the conservation of the fluted kidneyshell. A portion of this unit is considered a ''cut-off'' reach, because most of the water flow bypasses the reach through a tunnel from Apalachia Dam to the Apalachia powerhouse for the production of electricity. This unit is located entirely on federal lands within the Cherokee National Forest. Land and resource management decisions and activities within the CNF are guided by CNF's LRMP (USFS 2004b, pp. 28–37, entire).

The channel within proposed Unit FK21 and SP7 has an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2). Diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the slabside pearlymussel and its habitats may require special management considerations or protection to address potential adverse effects associated with silviculture-related activities, nonpoint source pollution, water diversion through Apalachia tunnel, and potential canopy loss caused by infestations of the hemlock wooly adelgid. Another threat to the species and their habitat which may require special management of the PCEs includes the potential for significant changes in the existing flow regime and water quality due to upstream impoundment As discussed in Summary of Factors Affecting the Species, under ''Impoundments,'' mollusk declines below dams are associated with changes and fluctuation in flow regime, scouring and erosion, reduced dissolved oxygen levels and water temperatures, and changes in resident fish assemblages. These alterations can cause mussel declines for many miles below the dam.

Unit SP8: Sequatchie River, Marion, Sequatchie, and Bledsoe Counties, Tennessee

Proposed Unit SP8 includes approximately 151 rkm (94 rmi) of the Sequatchie River from the Highway 41, 64, 72, 2 Bridge crossing in Marion County, TN, upstream to the Ninemile Cross Road Bridge crossing in Bledsoe County, TN. The unit is within the Tennessee River system. This unit is included in the geographical area occupied by slabside pearlymussel at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements.

Proposed Unit SP8 has an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this unit, the slabside pearlymussel and its habitat may require special management considerations or protection to address potential adverse effects caused by agricultural activities, coal mining, silvicultural activities, lack of adequate riparian buffers, construction and maintenance of State and county roads, and nonpoint source pollution arising from a wide variety of human activities.

Unit SP9: Paint Rock River, Madison, Marshall, and Jackson Counties, Alabama

Proposed Unit SP9 includes approximately 86 rkm (53 rmi) of the Paint Rock River from the Highway 431 Bridge crossing along the Madison and Marshall County line, AL, upstream to and including approximately 11 rkm (7 rmi) of the tributary headwaters of Larkin Fork upstream to its confluence with Bear Creek; approximately 13 rkm (8 rmi) of Estill Fork upstream to its confluence with Bull Run; and approximately 16 rkm (10 rmi) of Hurricane Creek upstream to its confluence with Turkey Creek in Jackson County, AL. The unit is within the Tennessee River system and is proposed critical habitat for the slabside pearlymussel. The unit is included in the geographical area occupied by the slabside pearlymussel at the time of listing. Approximately 6 rkm (4 rmi) of this unit is federally or State-owned and adjacent to the Fern Cave National Wildlife Refuge and Walls of Jericho State Management Area; the remainder is privately owned, including a small parcel owned by the Alabama Land Trust. A portion of this unit (80 rkm (50 rmi)) has been proposed as critical habitat for the rabbitsfoot.

The channel within proposed Unit SP9 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the slabside pearlymussel and its habitat may require special management considerations or protection to address potential adverse effects associated with agricultural activities, silvicultural activities, off-road vehicle use and other recreational activities, and nonpoint source pollution originating in headwater reaches.

Unit FK22 and SP10: Elk River, Limestone County, Alabama, and Giles, Lincoln, Franklin, and Moore Counties, Tennessee

Proposed Unit FK22 and SP10 includes approximately 164 rkm (102 rmi) of the Elk River from its inundation at Wheeler Lake in Limestone County, AL, upstream to its confluence with Farris Creek at the dividing line between Franklin and Moore Counties, TN. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and

slabside pearlymussel. This unit is included in the geographical area occupied by slabside pearlymussel at the time of listing. This unit is considered unoccupied by the fluted kidneyshell, but within the species' historical range. Live fluted kidneyshell have not been collected in the Elk River since the late-1960s (Isom *et al.* 1973, p. 440). The unit is considered essential for the conservation of the fluted kidneyshell. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements and a small portion that is within TVA-owned lands near Wheeler Reservoir.

Proposed Unit FK22 and SP10 has an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the slabside pearlymussel and its habitats may require special management considerations or protection to address potential adverse effects associated with hydropower generation from Tims Ford Dam, agriculture, nonpoint source pollution, and instream gravel mining. Another threat to the species and their habitat which may require special management of the PCEs includes the potential for significant changes in the existing flow regime and water quality due to upstream impoundment. As discussed in Summary of Factors Affecting the Species, under ''Impoundments,'' mollusk declines below dams are associated with changes and fluctuation in flow regime, scouring and erosion, reduced dissolved oxygen levels and water temperatures, and changes in resident fish assemblages. These alterations can cause mussel declines for many miles below the dam.

Unit SP11: Bear Creek, Colbert County, Alabama, and Tishomingo County, Mississippi

Proposed Unit SP11 includes approximately 42 rkm (26 rmi) of Bear Creek from its inundation at Pickwick Lake at rkm 37 (rmi 23) in Colbert County, AL, upstream through Tishomingo County, MS, and ending at the Mississippi/Alabama State line. The unit is within the Tennessee River system and is proposed critical habitat for the slabside pearlymussel. This unit is included in the geographical area occupied by the slabside pearlymussel at the time of listing. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements, and that within Tishomingo State Park and the Natchez Trace Parkway. The unit completely overlaps critical habitat for the oyster mussel and Cumberlandian combshell (69 FR 53136; August 31, 2004) and a portion (42 rkm (26 rmi)) of this unit has been proposed as critical habitat for the rabbitsfoot (69 FR 53136).

The channel within proposed Unit SP11 has an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the slabside pearlymussel and its habitat may require special management considerations or protection to address potential adverse effects associated with releases from upstream impoundments, agriculture, and nonpoint source pollution originating in headwater reaches.

Unit FK23 and SP12: Duck River, Humphreys, Perry, Hickman, Maury, Marshall, and Bedford Counties, Tennessee

Proposed Unit FK23 and SP12 includes approximately 348 rkm (216 rmi) of the Duck River from its inundation at Kentucky Lake in Humphreys County, TN, upstream to its confluence with Flat Creek near Shelbyville in Bedford County, TN. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by both species at the time of listing. The fluted kidneyshell population is a result of a successful reintroduction program implemented by TWRA and other conservation partners. Approximately 64 rkm (39 rmi) of this unit is federally or State-owned and adjacent to the Tennessee National Wildlife Refuge, Natchez Trace Parkway, Yanahli Wildlife Management Area, and Henry Horton State Park; the remainder is privately owned. A portion of this unit (74 rkm (46 rmi)) has been designated as a critical habitat for the oyster mussel and Cumberlandian combshell (69 FR 53136) and a portion of this unit (234 rkm (146 rmi)) has been proposed as critical habitat for the rabbitsfoot.

The channel within proposed Unit FK23 and SP12 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the fluted kidneyshell and slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the fluted kidneyshell, slabside pearlymussel, and their habitats may require special management considerations or protection to address potential adverse effects associated with agricultural activities (livestock), water withdrawals, lack of adequate riparian buffers, construction and maintenance of State and county roads, and nonpoint source pollution originating in headwater reaches.

Unit FK24 and SP13: Buffalo River, Humphreys and Perry Counties, Tennessee

Proposed Unit FK24 and SP13 includes approximately 50 rkm (31 rmi) of the Buffalo River from its confluence with the Duck River in Humphreys County, TN, upstream to its confluence with Cane Creek in Perry County, TN. The unit is within the Tennessee River system and is proposed critical habitat for the fluted kidneyshell and slabside pearlymussel. This unit is included in the geographical area occupied by slabside pearlymussel at the time of listing. This unit is considered unoccupied by the fluted kidneyshell, but within the species' historical range. Live fluted kidneyshell have not been collected in the Buffalo River since the early 1920s (Ortmann 1924, p. 28). The unit is considered essential for the conservation of the fluted kidneyshell. This unit is located almost entirely on private land, except for any small amount that is publicly owned in the form of bridge crossings and road easements.

The channel within proposed Unit FK24 and SP13 is relatively stable, with excellent instream habitat (PCE 1). There is an abundance of riffle habitats (PCE 1), with relatively silt-free sand and gravel substrates (PCE 2), and adequate instream flows (PCE 3). A diverse fish fauna, including fish hosts for the slabside pearlymussel, are known from this unit (PCE 5).

Within this proposed unit, the slabside pearlymussel and its habitats may require special management considerations or protection to address potential adverse effects associated with agriculture and nonpoint source pollution.

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.

Decisions by the 5th and 9th Circuit Courts of Appeal have invalidated our regulatory definition of ''destruction or adverse modification'' (50 CFR 402.02) (see *Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife Service,* 378 F. 3d 1059 (9th Cir. 2004) and *Sierra Club* v. *U.S. Fish and Wildlife Service,* 245 F.3d 434, 442 (5th Cir. 2001)), and we do not rely on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat. Under the provisions of the Act, we determine destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the 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 CWA 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 or authorized, do not require section 7 consultation.

As a result of section 7 consultation, we document compliance with the requirements of section 7(a)(2) 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, or 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 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 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where we have listed a new species or subsequently designated critical habitat that may be affected and the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law). Consequently, Federal agencies sometimes may need to request reinitiation of consultation with us on actions for which formal consultation has been completed, if those actions with discretionary involvement or control may affect subsequently listed species or designated critical habitat.

Application of the ''Adverse Modification'' Standard

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that alter the PBFs to an extent that appreciably reduces the conservation value of critical habitat for fluted kidneyshell or slabside pearlymussel. As discussed above, the role of critical habitat is to support life-history needs and provide for the conservation of these 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 destroy or adversely modify such habitat, or that may be affected by such designation.

Activities that may affect critical habitat, when carried out, funded, or authorized by a Federal agency, should result in consultation for the fluted kidneyshell or slabside pearlymussel. These activities include, but are not limited to:

(1) Actions that would alter the geomorphology of their stream and river habitats. Such activities could include, but are not limited to, instream excavation or dredging, impoundment, channelization, sand and gravel mining, clearing riparian vegetation, and discharge of fill materials. These activities could cause aggradation or degradation of the channel bed elevation or significant bank erosion and result in entrainment or burial of these mussels, and could cause other direct or cumulative adverse effects to these species and their life cycles.

(2) Actions that would significantly alter the existing flow regime where these species occur. Such activities could include, but are not limited to; impoundment, urban development, water diversion, water withdrawal, water draw-down, and hydropower generation. These activities could eliminate or reduce the habitat necessary for growth and reproduction of these mussels and their fish hosts.

(3) Actions that would significantly alter water chemistry or water quality (for example, temperature, pH, contaminants, and excess nutrients). Such activities could include, but are not limited to, 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). These activities could alter water conditions that are beyond the tolerances of these mussels and their fish hosts or both, and result in direct or cumulative adverse effects to the species throughout their life cycles.

(4) Actions that would significantly alter stream bed material composition and quality by increasing sediment deposition or filamentous algal growth. Such activities could include, but are not limited to, 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. These activities could eliminate or reduce habitats necessary for the growth and reproduction of these mussels or their fish hosts or both, by causing excessive sedimentation and burial of the species or their habitats, or nutrification leading to excessive filamentous algal growth. Excessive filamentous algal growth can cause reduced nighttime dissolved oxygen levels through respiration, and prevent juvenile mussels from settling into stream sediments.

Exemptions

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

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete an integrated natural resources management plan (INRMP) by November 17, 2001. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Each INRMP includes:

(1) An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;

(2) A statement of goals and priorities;

(3) A detailed description of management actions to be implemented to provide for these ecological needs; and

(4) A monitoring and adaptive management plan.

Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) amended the Act to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) now provides: ''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 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 lands with a completed INRMP within the proposed critical habitat designation.

Exclusions

Application of 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 that determination, 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.

Under section 4(b)(2) of the Act, we may exclude an area from designated critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. In considering whether to exclude a particular area from the designation, we identify the benefits of including the area in the designation, identify the benefits of excluding the area from the designation, and evaluate whether the benefits of exclusion outweigh the benefits of inclusion. If the analysis indicates that the benefits of exclusion outweigh the benefits of inclusion, the Secretary may exercise his discretion to exclude the area only if such exclusion would not result in the extinction of the species.

Economic Impacts

Under section 4(b)(2) of the Act, we consider the economic impacts of specifying any particular area as critical habitat. In order to consider economic impacts, we are preparing an analysis of the economic impacts of the proposed critical habitat designation and related factors.

We will announce the availability of the draft economic analysis as soon as it is completed. At that time, copies of the draft economic analysis will be available for downloading from the Internet at *http://www.regulations.gov,* or by contacting the Tennessee Ecological Services Field Office directly (see **FOR FURTHER INFORMATION CONTACT**). During the development of a final designation, we will consider economic impacts, public comments, and other new information, and areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

National Security Impacts

Under section 4(b)(2) of the Act, we consider whether there are lands owned or managed by the Department of Defense where a national security impact might exist. In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for the fluted kidneyshell and slabside pearlymussel are not owned or managed by the Department of Defense, and, therefore, we anticipate no impact on national security.

Other Relevant Impacts

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts on national security. We consider a number of factors, including whether the landowners have developed any HCPs or other management plans for the area, or whether there are conservation partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at any tribal issues, 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 HCPs or other management plans for the fluted kidneyshell or slabside pearlymussel, and the proposed designation does not include any tribal lands or trust resources. Therefore, we anticipate no impact on tribal lands or HCPs from this proposed critical habitat designation.

Nonessential Experimental Populations

Congress made significant changes to the Act, with the addition of section 10(j) in 1982, which provides for the designation of specific reintroduced populations of listed species as ''experimental populations.'' This section was designed to provide us with an innovative means to introduce a listed species into unoccupied habitat within its historical range when doing so would foster the conservation and

recovery of the species. Experimental populations provide us with a flexible, proactive means to meet recovery criteria while not alienating stakeholders, such as other agencies, municipalities, and landowners, whose cooperation is essential for eventual success of the reintroduced population.

Section 10(j) increases our flexibility in managing an experimental population by allowing us to treat a population as a threatened species, regardless of the species' status elsewhere in its range. Threatened species status gives us more discretion in developing and implementing management programs and special regulations for a population and allows us to develop any regulations we consider necessary and advisable to provide for the conservation of a threatened species under Section 4(d) of the Act. This flexibility allows us to manage the experimental population in a manner that will ensure that current and future land, water, or air uses and activities will not be unnecessarily restricted and the population can be managed for recovery purposes.

When we designate a population as experimental, section 10(j) of the Act requires that we determine whether that population is either essential or nonessential to the continued existence of the species, on the basis of the best available information. Nonessential experimental populations (NEPs) located outside the National Wildlife Refuge System or National Park System lands are treated, for the purposes of section 7 of the Act, as if they are proposed for listing as a threatened species, while on National Wildlife Refuges or National Parks the species is treated as a threatened species. Section 7(a)(2) of the Act, which requires Federal agencies to ensure that their activities are not likely to jeopardize the continued existence of a listed species, would not apply except on National Wildlife Refuge System and National Park System lands. Experimental populations determined to be ''essential'' to the survival of the species would remain subject to the consultation provisions of section 7(a)(2) of the Act.

As mentioned earlier in the unit descriptions and referenced in Table 5, there are two nonessential experimental populations (NEPs) for listed aquatic species that overlap with the proposed critical habitat designation. These include the NEP for the yellowfin madtom in the North Fork of the Holston River (53 FR 29335), which overlaps with Unit FK12 and SP1, and the NEP for 21 listed aquatic species (including the yellowfin madtom) in the lower French Broad and Holston Rivers (72 FR 52434), which overlaps with Units FK19 and FK20. These NEPs were not established specifically for the conservation of the fluted kidneyshell or slabside pearlymussel, which were candidate species when the NEPs were published, but rather to promote the reintroduction of their target listed species into historical habitat. They were developed with the support of numerous partners, including the Tennessee Wildlife Resources Agency, Tennessee Valley Authority, Virginia Department of Game and Inland Fisheries, and others. We would need to amend the NEPs through the rulemaking process in order for the fluted kidneyshell and slabside pearlymussel to be included.

The North Fork of the Holston River is considered occupied by both the slabside pearlymussel and the fluted kidneyshell, and presently contains numerous PCEs (see ''Proposed Critical Habitat Designation'') and is therefore being proposed as critical habitat. The lower Holston River (below Cherokee Dam) and French Broad River (below Douglas Dam) are being proposed as unoccupied habitat for the fluted kidneyshell because we have determined these river reaches are essential to the conservation of the species.

Accordingly, at this time the Secretary does not propose to exert his discretion to exclude any areas from the final designation based on other relevant impacts. However, we recognize that exclusion of river reaches covered by these NEPs from critical habitat may continue to encourage conservation and reintroduction efforts for numerous imperiled aquatic species in the upper Tennessee River Basin. Therefore, we are requesting information on whether the benefits of the exclusion of river reaches covered by these NEPs would outweigh the benefits of inclusion under section 4(b)(2) of the Act. Based on information received during the comment period, the Secretary may reconsider exclusion in the final rule.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our proposed listing determination and critical habitat designation are based on scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment during this public comment period on this proposed rule.

We will consider all comments and information received during this comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Public Hearings

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in the **FOR FURTHER INFORMATION CONTACT** section. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Required Determinations

Regulatory Planning and Review (Executive Orders 12866 and 13563)

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) will review all significant rules. The Office of Information and Regulatory Affairs has determined that this rule is not significant.

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 rule in a manner consistent with these requirements.

Regulatory Flexibility Act

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 (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 such businesses as 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 forestry and logging operations with fewer than 500 employees and annual business less than $7 million. To determine whether small entities may be affected, we will consider 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.

Importantly, the incremental impacts of a rule must be *both* significant and substantial to prevent certification of the rule under the RFA and to require the preparation of an initial regulatory flexibility analysis. If a substantial number of small entities are affected by the proposed critical habitat designation, but the per-entity economic impact is not significant, the Service may certify. Likewise, if the per-entity economic impact is likely to be significant, but the number of affected entities is not substantial, the Service may also certify.

Under the RFA, as amended, and following recent court decisions, Federal agencies are only required to evaluate the potential incremental impacts of rulemaking on those entities directly regulated by the rulemaking itself, and not the potential impacts to indirectly affected 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 by the Agency is not likely to adversely modify critical habitat. Therefore, only Federal action agencies are directly subject to the specific regulatory requirement (avoiding destruction and adverse modification) imposed by critical habitat designation. Under these circumstances, it is our position that only Federal action agencies will be directly regulated by this designation. Therefore, because Federal agencies are not small entities, the Service may certify that the proposed critical habitat rule will not have a significant economic impact on a substantial number of small entities.

We acknowledge, however, that in some cases, third-party proponents of the action subject to permitting or funding may participate in a section 7 consultation, and thus may be indirectly affected. We believe it is good policy to assess these impacts if we have sufficient data before us to complete the necessary analysis, whether or not this analysis is strictly required by the RFA. While this regulation does not directly regulate these entities, in our draft economic analysis we will conduct a brief evaluation of the potential number of third parties participating in consultations on an annual basis in order to ensure a more complete examination of the incremental effects of this proposed rule in the context of the RFA.

In conclusion, we believe that, based on our interpretation of directly regulated entities under the RFA and relevant case law, this designation of critical habitat will only directly regulate Federal agencies, which are not by definition small business entities. As such, certify that, if promulgated, this designation of critical habitat would not have a significant economic impact on a substantial number of small business entities. Therefore, an initial regulatory flexibility analysis is not required. However, although not necessarily required by the RFA, in our draft economic analysis for this proposal we will consider and evaluate the potential effects to third parties that may be involved with consultations with Federal action agencies related to this action.

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. We do not expect the designation of this proposed critical habitat designation to significantly affect energy supplies, distribution, or use. Natural gas and oil exploration and development activities occur or could potentially occur in all proposed critical habitat units. However, compliance with State regulatory requirements or voluntary best management practices would be expected to minimize impacts of natural gas and oil exploration and development in the areas of proposed critical habitat for both species. The measures for natural gas and oil exploration and development are generally not considered a substantial cost compared with overall project costs and are already being implemented by oil and gas companies.

Coal mining occurs or could potentially occur in proposed critical habitat units in Kentucky, Tennessee, and Virginia, and was identified as an activity that may have adverse effects on these species and their habitat. Incidental take for listed species associated with surface coal mining activities is currently covered under a programmatic, non-jeopardy biological opinion between the Office of Surface Mining and the Service, completed in 1996 (Service 1996, entire). The biological opinion covers existing, proposed, and future endangered and threatened species that may be affected by the implementation and administration of surface coal mining programs under the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 *et seq.*). Through its analysis, the Service concluded that the proposed action (surface coal mining and reclamation activities) was not likely to jeopardize the continued existence of any threatened, endangered, or proposed species or result in adverse modification of designated or proposed critical habitat. Based on this conclusion, we do not anticipate that the designation of critical habitat would constitute a significant energy action, and have therefore not completed a Statement of Energy Effects. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment as warranted.

Hydropower generation occurs upstream of proposed critical habitat units in the mainstem Holston, French Broad, Hiwassee, and Elk Rivers. Incidental take for listed species (which does not include the fluted kidneyshell and slabside pearlymussel), associated

with hydropower generation, is currently covered under two programmatic, non-jeopardy biological opinions between the Tennessee Valley Authority (TVA) and the Service, completed in 2004 and 2006 (Service, 2004, entire; Service 2006, entire). These biological opinions cover TVA's routine operations and maintenance of water control structures in the Tennessee River System and species that were listed at that time. The Service concluded that the proposed action (operation and maintenance activities at TVA dams—including hydropower generation) was not likely to jeopardize continued existence of any listed species. Based on our experience with the currently listed species and their critical habitat, we do not anticipate this action will qualify as a significant energy action, and therefore we have not prepared a Statement of Energy Effects at this time. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment as warranted.

Unfunded Mandates Reform Act

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

(1) This 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 [T]ribal 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 [T]ribal 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; AFDC 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 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 of the Act. 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 the proposed designation of critical habitat for the fluted kidneyshell or slabside pearlymussel would significantly or uniquely affect small governments because these mussel species occur primarily in State-owned river channels, or in remote privately owned stream channels. As such, a Small Government Agency Plan is not required. We will, however, further evaluate this issue as we conduct our economic analysis and revise this assessment if appropriate.

Takings—Executive Order 12630

In accordance with Executive Order 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we have analyzed the potential takings implications of designating critical habitat for the fluted kidneyshell and slabside pearlymussel in a takings implications assessment. Critical habitat designation 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. The takings implications assessment concludes that this designation of critical habitat for these species does not pose significant takings implications for lands within or affected by the designation.

Federalism—Executive Order 13132

In accordance with Executive Order 13132 (Federalism), this proposed rule does not have significant Federalism effects. A federalism summary impact statement is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of, this proposed critical habitat designation with appropriate State resource agencies in Alabama, Kentucky, Mississippi, Tennessee, and Virginia. The designation may have some benefit to these governments because the areas that contain the PBFs essential to the conservation of the species are more clearly defined, and the features of the habitat necessary to 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 local governments in long-range planning (rather than having them 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) 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 does 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. This proposed rule uses standard property descriptions and identifies the PBFs within the designated areas to assist the public in understanding the habitat needs of the fluted kidneyshell and slabside pearlymussel.

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

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

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

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), need not be prepared in connection with listing a species as endangered or threatened under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

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 as defined by NEPA in connection with listing a species or 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)).

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:

(a) Be logically organized;

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

(c) Use clear language rather than jargon;

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

(e) 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 the **ADDRESSES** section. 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.

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994, Government-to-Government Relations with Native American Tribal Governments (59 FR 22951), E.O. 13175, 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 there are no Tribal lands currently occupied by the species that contain the features essential for the conservation of, and no Tribal lands that are essential for the conservation of, these two species. Therefore, we have not proposed designation of critical habitat for these species on Tribal lands.

References Cited

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

Authors

The primary authors of this package are the staff members of the Tennessee 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; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

2. Amend § 17.11(h) by adding entries for ''Kidneyshell, fluted'' and ''Pearlymussel, slabside'' in alphabetical order under ''CLAMS'' to the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*	*	
CLAMS							
*	*	*	*	*	*	*	
Kidneyshell, fluted	*Ptychobranchus subtentum.*	U.S.A. (AL, KY, TN, VA).	NA	E	.....	17.95(f)	NA
*	*	*	*	*	*	*	
Pearlymussel, slabside	*Pleuronaia dolabelloides.*	U.S.A. (AL, KY, MS, TN, VA).	NA	E	.....	17.95(f)	NA

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*

3. In § 17.95, amend paragraph (f) by adding entries for ''Fluted Kidneyshell (*Ptychobranchus subtentum*)'' and ''Slabside Pearlymussel (*Pleuronaia dolabelloides*)'' in that order immediately following the entry for Altamaha spinymussel (*Elliptio spinosa*), to read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(f) *Clams and Snails.*

* * * * *

Fluted Kidneyshell (*Ptychobranchus subtentum*)

(1) Critical habitat units are depicted on the maps below for Limestone County, Alabama; Jackson, Laurel, McCreary, Pulaski, Rockcastle, and Wayne Counties, Kentucky; Bedford, Claiborne, Cocke, Fentress, Franklin, Giles, Grainger, Greene, Hamblen, Hancock, Hickman, Humphreys, Jefferson, Knox, Lincoln, Marshall, Maury, Moore, Morgan, Overton, Perry, Pickett, Polk, Scott, and Sevier Counties, Tennessee; and Bland, Lee, Russell, Scott, Smyth, Tazewell, Washington, and Wythe Counties, Virginia.

(2) Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of fluted kidneyshell consist of five components:

(i) Riffle habitats within large, geomorphically stable stream channels (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation).

(ii) Stable substrates of sand, gravel, and cobble with low to moderate amounts of fine sediment and containing flow refugia with low shear stress.

(iii) A natural hydrologic flow regime (magnitude, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found, and connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for habitat maintenance, food availability for all life stages, and spawning habitat for native fishes.

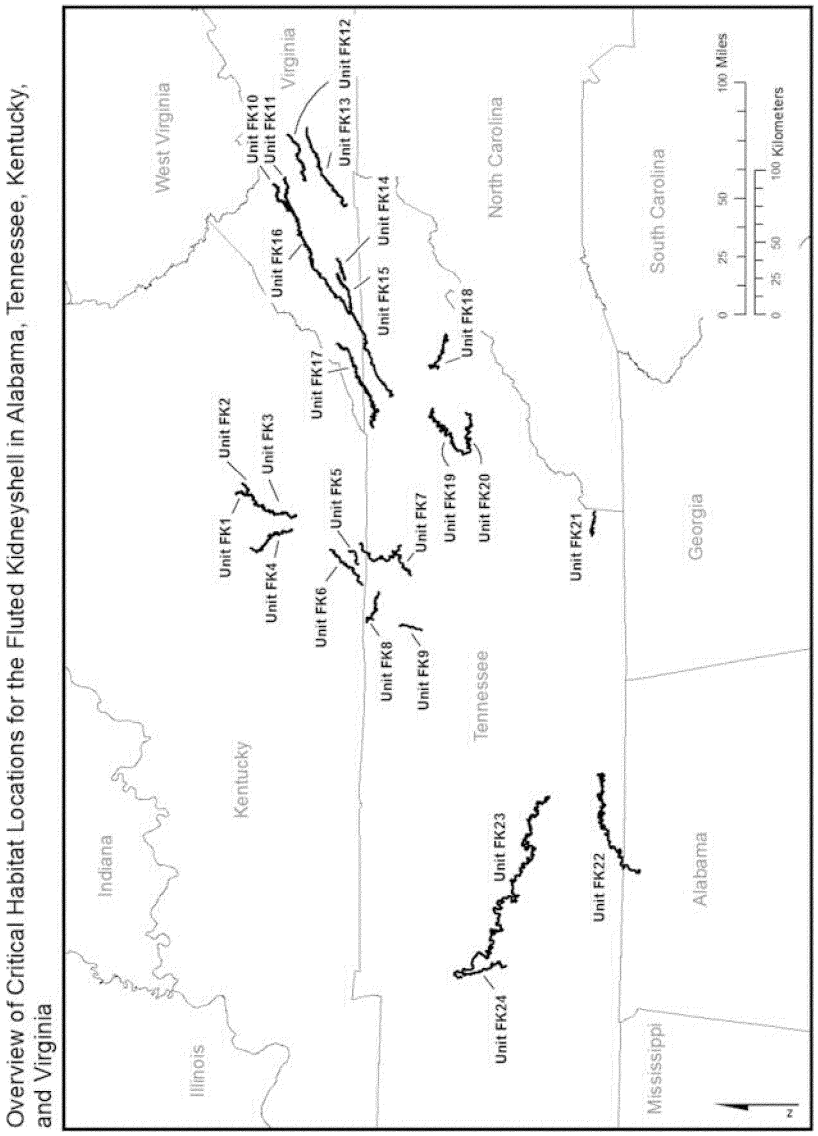
(iv) Water quality with low levels of pollutants and including a natural temperature regime, pH (between 6.0 to 8.5), oxygen content (not less than 5.0 milligrams/liter), hardness, and turbidity necessary for normal behavior, growth, and viability of all life stages.

(v) The presence of abundant fish hosts necessary for recruitment of the fluted kidneyshell.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, dams, 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 with USGS National Hydrography Dataset (NHD^+) GIS data. The 1:100,000 river reach (route) files were used to calculate river kilometers and miles. ESRIs ArcGIS 10.0 software was used to determine longitude and latitude coordinates using decimal degrees. The projection used in mapping all units was USA Contiguous Albers Equal Area Conic USGS version, NAD 83, meters. The following data sources were referenced to identify features (like roads and streams) used to delineate the upstream and downstream extents of critical habitat units: NHD^+ flowline and waterbody data, 2011 Navteq roads data, USA Topo ESRI online basemap service, DeLorme Atlas and Gazetteers, and USGS 7.5 minute topographic maps. 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 field office Internet site (*http://www.fws.gov/cookeville*), *http://www.regulations.gov* at Docket No. FWS–R4–ES–2012–0004, and at the Service's Tennessee Fish and Wildlife Office. 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.

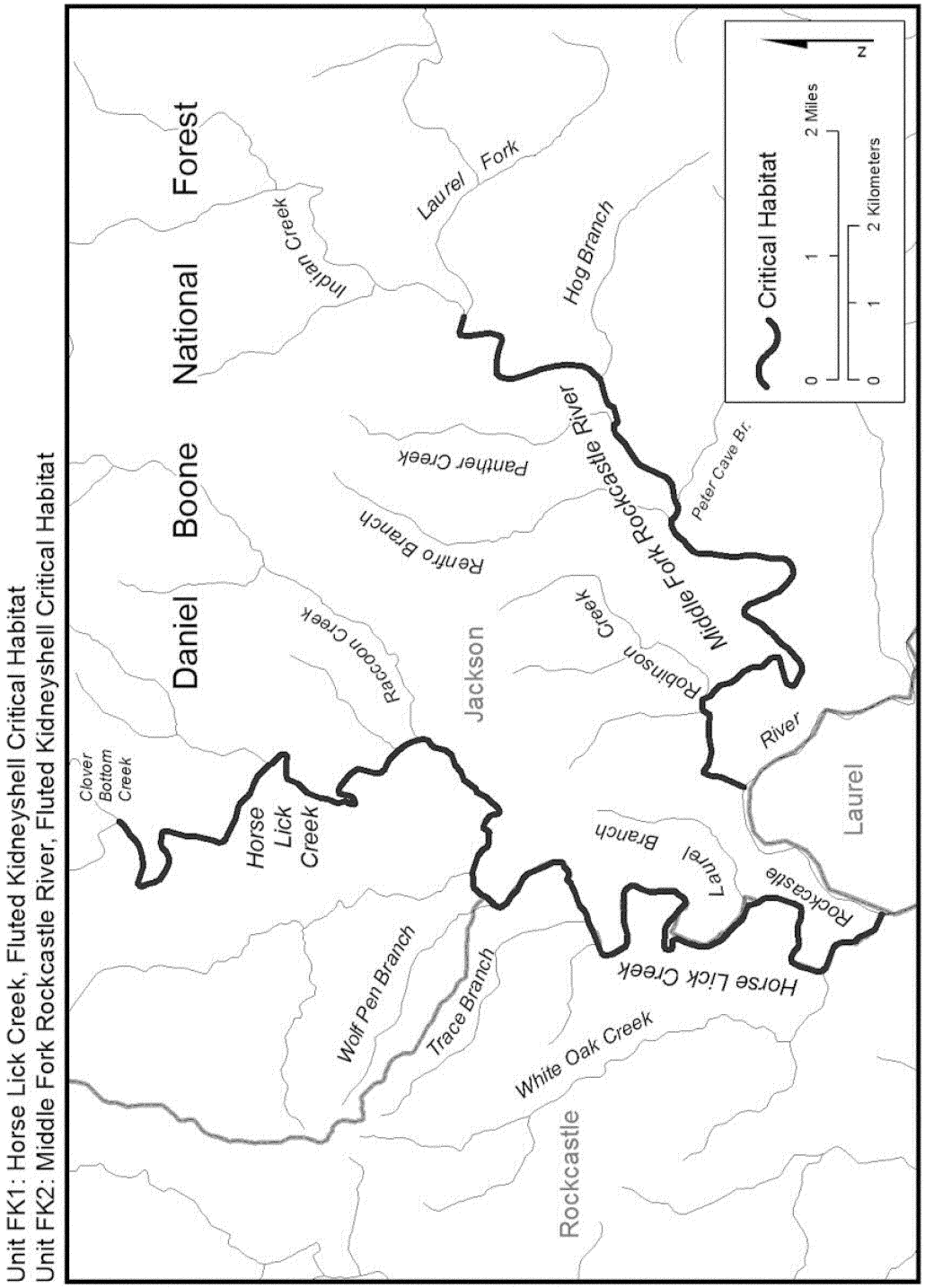
(5) An overview of critical habitat locations for the fluted kidneyshell in Alabama, Tennessee, Kentucky, and Virginia follows:



(6) Unit FK1: Horse Lick Creek, Rockcastle and Jackson Counties, Kentucky.

(i) The unit includes approximately 19 river kilometers (rkm) (12 river miles (rmi)) of Horse Lick Creek, in Rockcastle and Jackson Counties, KY. It includes the mainstem of Horse Lick Creek from its confluence with the Rockcastle River (−84.13780, 37.31991) upstream to Clover Bottom Creek (−84.12200, 37.40879).

(ii) Map of Units FK1 and FK2 follows:



(7) Unit FK2: Middle Fork Rockcastle River, Jackson County, Kentucky.

(i) The unit includes 12.5 rkm (7.7 rmi) of the Middle Fork Rockcastle River from its confluence with the Rockcastle River (−84.11895, 37.33581) upstream to its confluence with Indian Creek and Laurel Fork E (−84.04897, 37.36765) in Jackson County, KY.

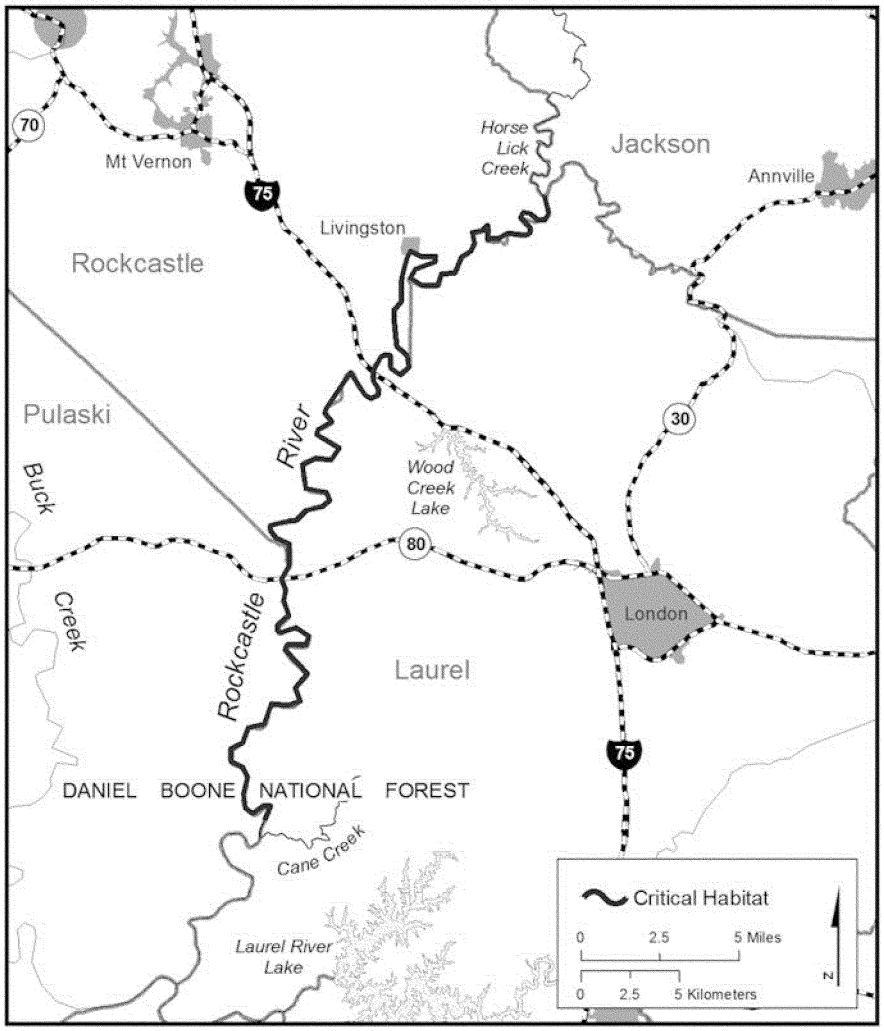
(ii) Map of Units FK1 and FK2 is provided at paragraph (6)(ii) of this entry.

(8) Unit FK3: Rockcastle River, Pulaski, Laurel, and Rockcastle Counties, Kentucky.

(i) The unit includes approximately 70 rkm (43 rmi) of the Rockcastle River from the backwaters of Lake Cumberland near its confluence with Cane Creek along the Laurel and Pulaski County line, KY (−84.30594, 37.03423), upstream to its confluence with Horse Lick Creek along the Laurel and Rockcastle County line, KY (−84.13766, 37.31944).

(ii) Map of Unit FK3 follows:

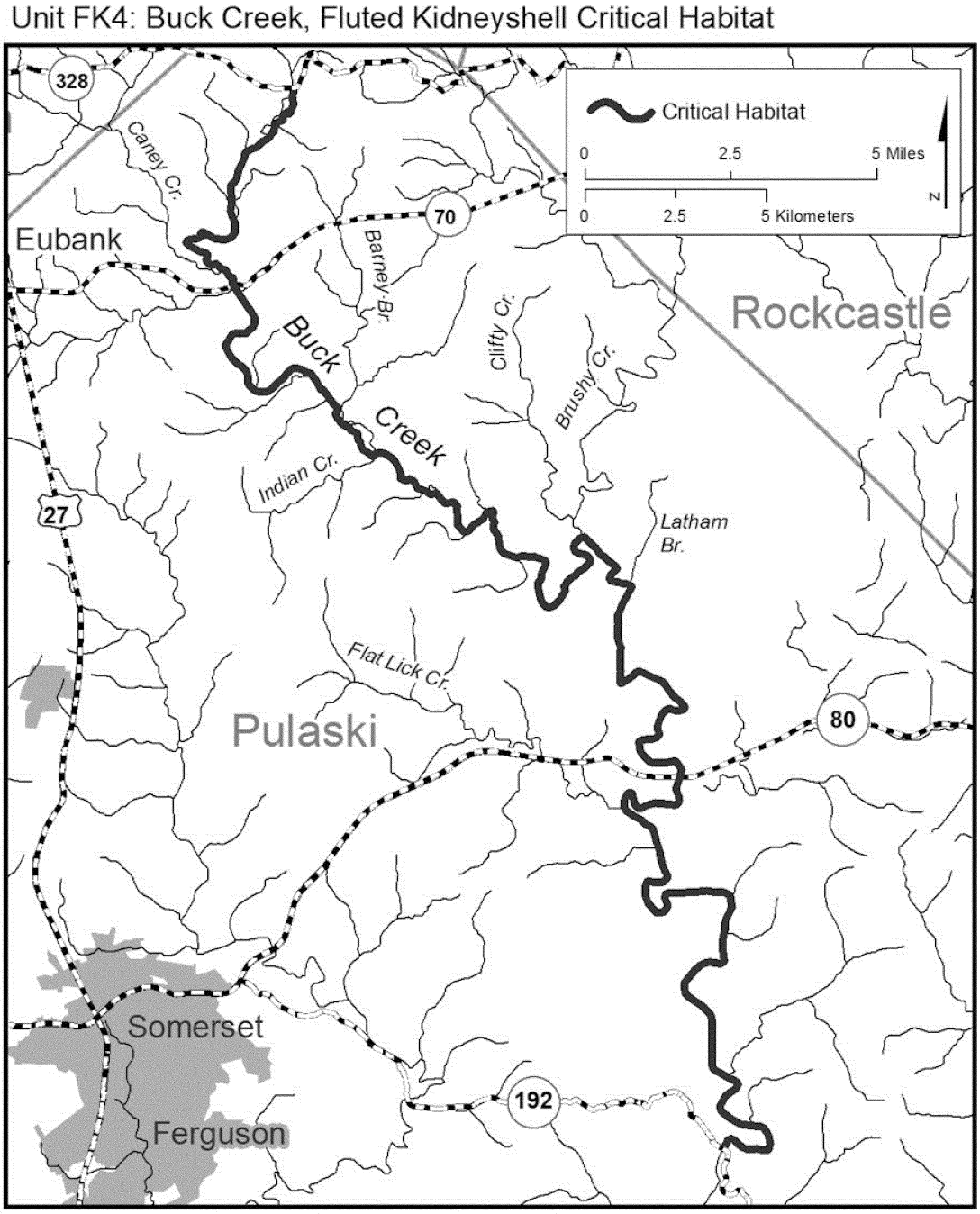
Unit FK3: Rockcastle River, Fluted Kidneyshell Critical Habitat



(9) Unit FK4: Buck Creek, Pulaski County, Kentucky.

(i) This unit includes 61 rkm (38 rmi) of Buck Creek from State Route 192 (−84.42681, 37.05977) upstream to Route 328 (−84.55492, 37.32430), Pulaski County, KY.

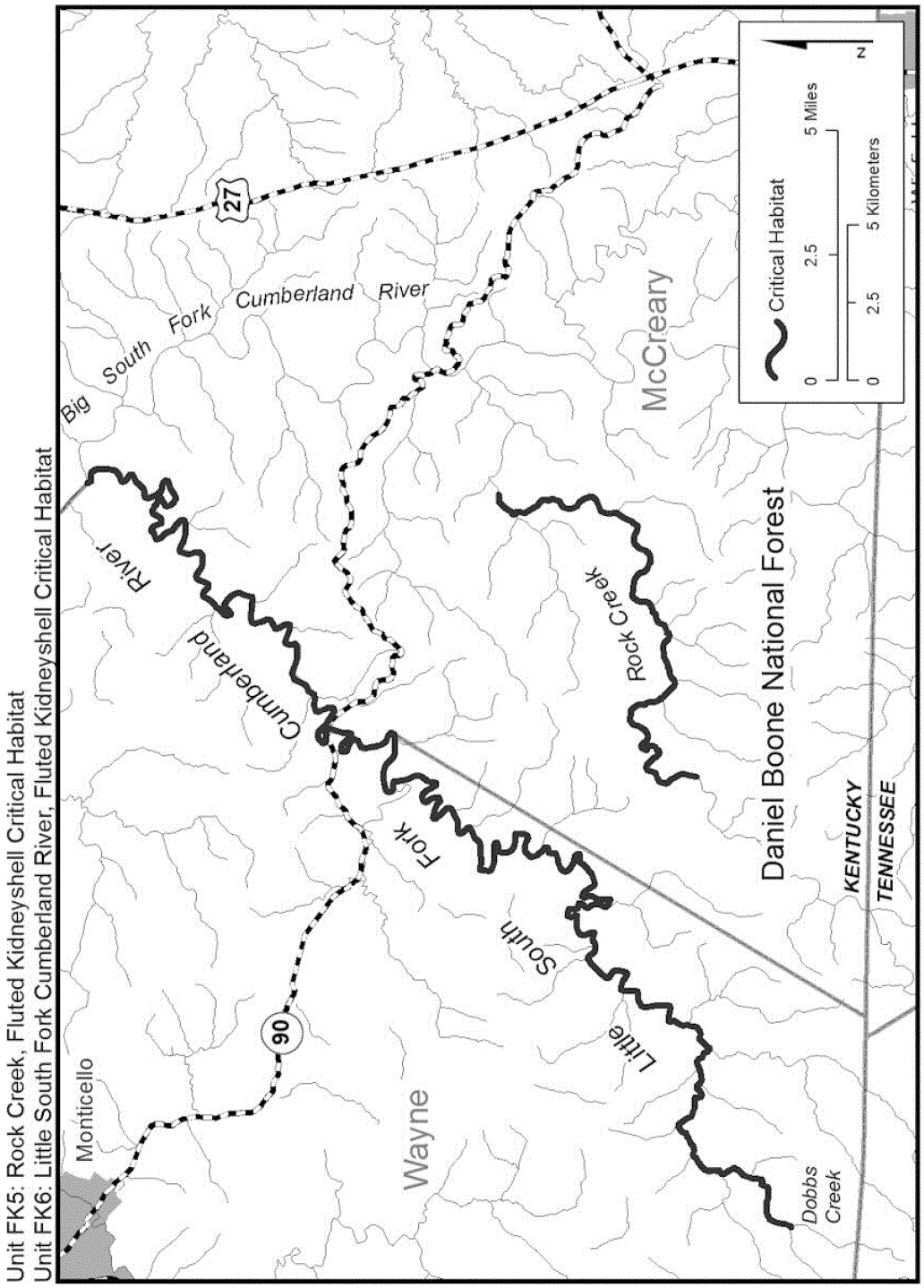
(ii) Map of Unit FK4 follows:



(10) Unit FK5: Rock Creek, McCreary County, Kentucky.

(i) The unit includes approximately 19 rkm (12 rmi) of Rock Creek from its confluence with White Oak Creek (−84.69103, 36.65145) upstream to the low water crossing at rkm 25.6 (rmi 15.9) (−84.58888, 36.70800) in McCreary County, KY.

(ii) Map of Units FK5 and FK6 follows:



(11) Unit FK6: Little South Fork Cumberland River, McCreary and Wayne Counties, Kentucky.

(i) The unit includes 65.5 rkm (40.7 rmi) of the Little South Fork Cumberland River from its confluence with the Big South Fork Cumberland River (−84.58269, 36.82690), where it is the dividing line between Wayne and McCreary Counties, upstream to its confluence with Dobbs Creek (−84.85344, 36.62588) in Wayne County, KY.

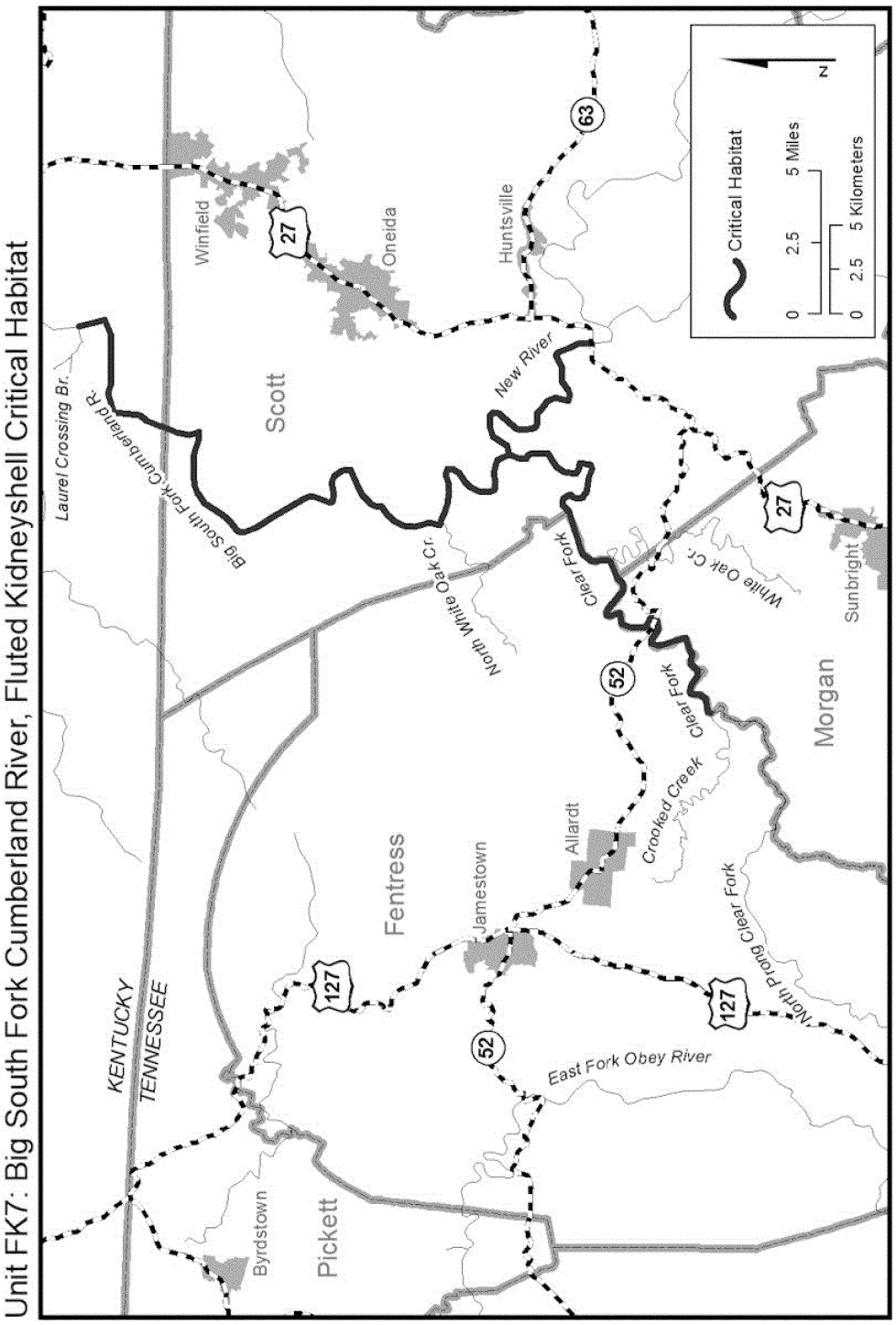
(ii) Map of Units FK5 and FK6 is provided at paragraph (10)(ii) of this entry.

(12) Unit FK7: Big South Fork Cumberland River, Fentress, Morgan, and Scott Counties, Tennessee, and McCreary County, Kentucky.

(i) The unit includes approximately 45 rkm (28 rmi) of the Big South Fork of the Cumberland River from its confluence with Laurel Crossing Branch downstream of Big Shoals (−84.53642, 36.64114), McCreary County, KY, upstream to its confluence with Clear Fork and of the New River (−84.62394, 36.42475), Scott County, TN. This unit also includes 32.3 rkm (20.0 rmi) of Clear Fork from its confluence with the Big South Fork and New River (−84.62394, 36.42475) in Scott County, TN, upstream to its confluence with Crooked Creek (−84.78637, 36.32533) along the Fentress and Morgan County

line, TN. This unit also includes 14.7 rkm (9.1 rmi) of the New River from its confluence with the Big South Fork (−84.62394, 36.42475) upstream to the Highway 27 Bridge crossing (−84.55290, 36.38279) in Scott County, TN.

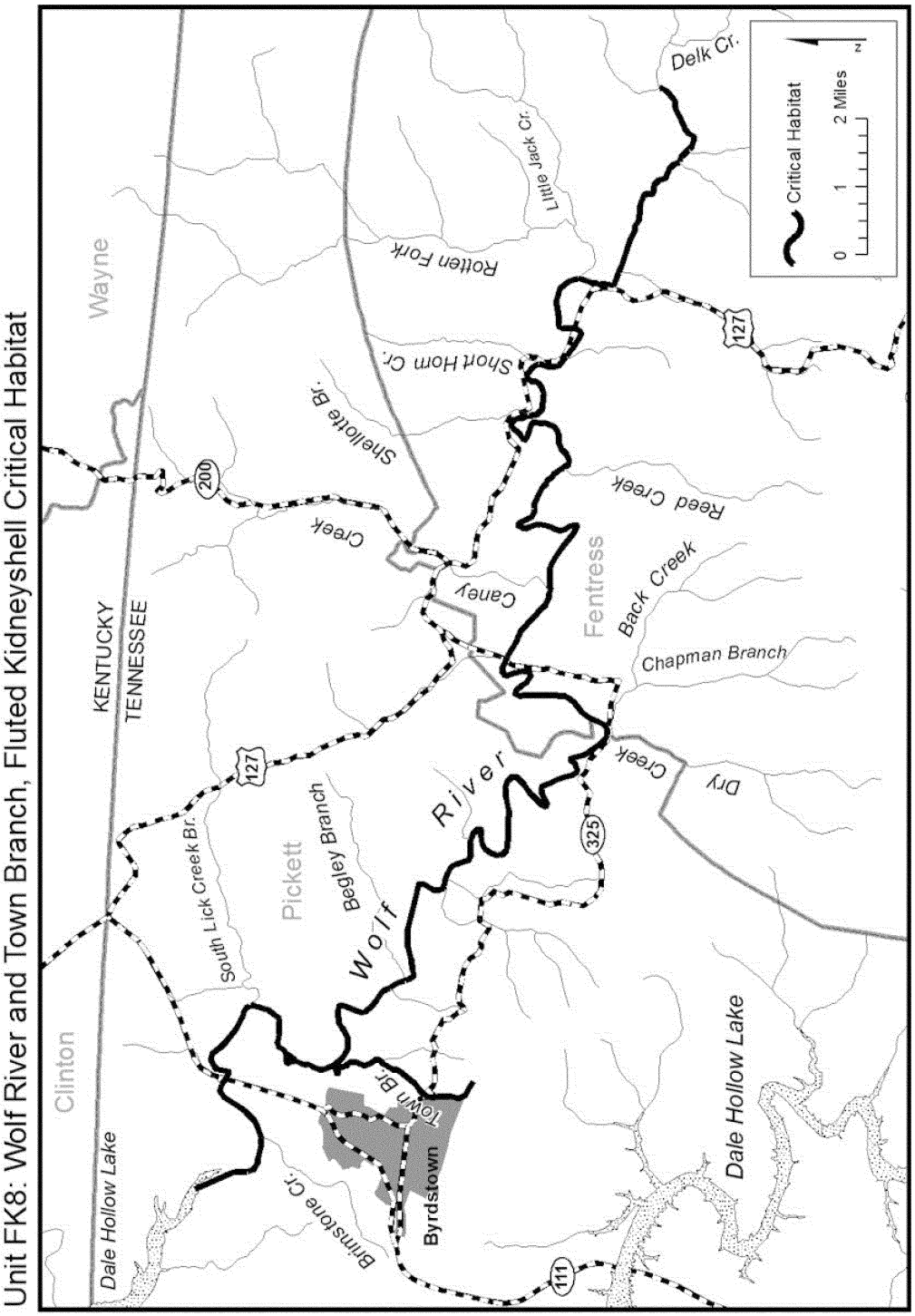
(ii) Map of Unit FK7 follows:



(13) Unit FK8: Wolf River and Town Branch, Pickett and Fentress Counties, Tennessee.

(i) The unit includes 41.0 rkm (25.5 rmi) of the Wolf River from its inundation at Dale Hollow Lake (−85.14414, 36.60670) in Pickett County, TN, upstream to its confluence with Delk Creek (−84.91064, 36.52784) in Fentress County, TN. This unit also includes 3.4 rkm (2.0 rmi) of Town Branch from its confluence with Wolf River (−85.11787, 36.58321) upstream to its headwaters (−85.12136, 36.55947) in Pickett County, TN.

(ii) Map of Unit FK8 follows:

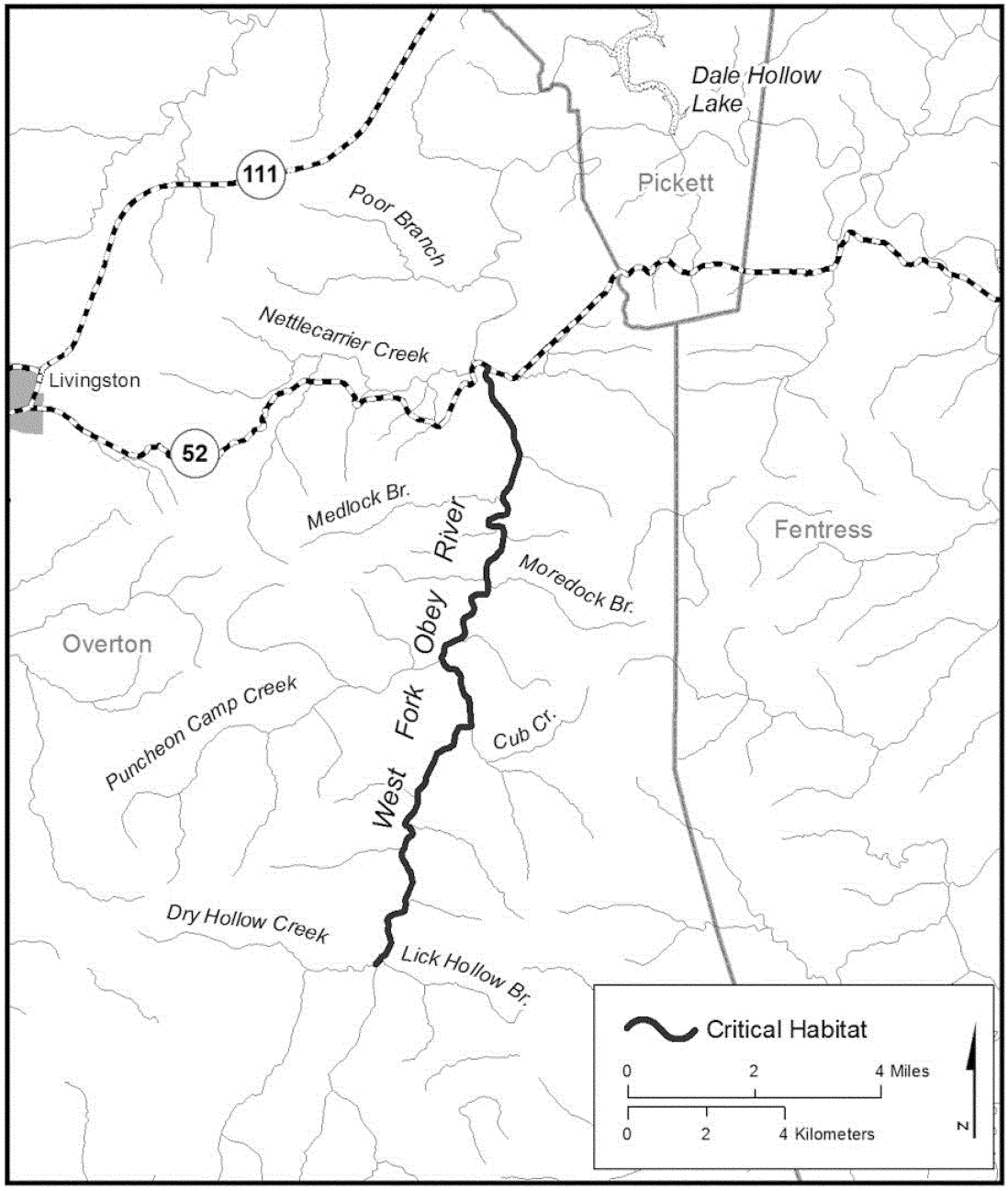


(14) Unit FK9: West Fork Obey River, Overton County, Tennessee.

(i) The unit includes approximately 19 rkm (12 rmi) of the West Fork Obey River from the Highway 52 Bridge crossing (−85.17410, 36.39731) upstream to its confluence with Dry Hollow Creek (−85.20747, 36.25989) in Overton County, TN.

(ii) Map of Unit FK9 follows:

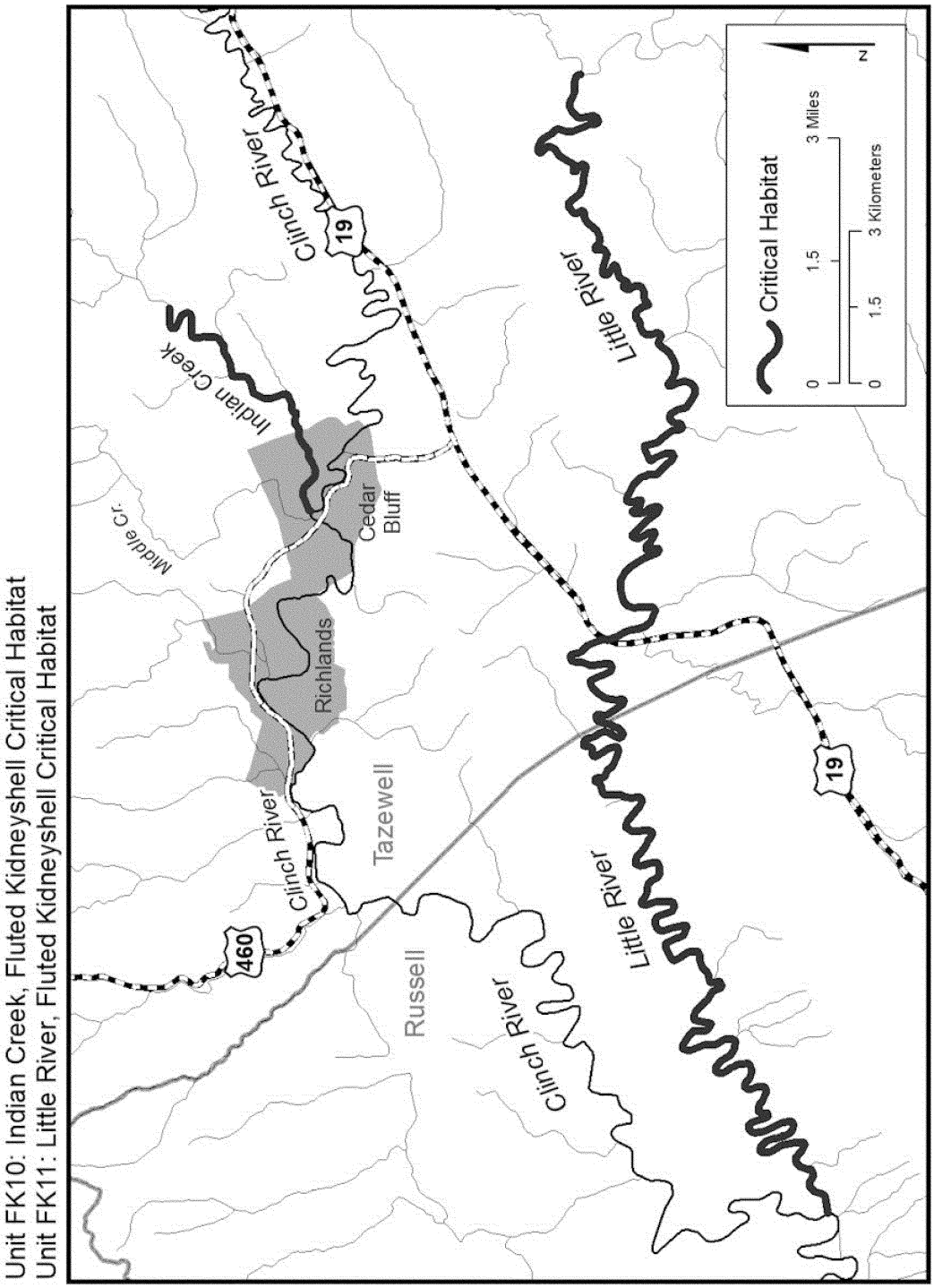
Unit FK9: West Fork Obey River, Fluted Kidneyshell Critical Habitat



(15) Unit FK10: Indian Creek, Tazewell County, Virginia.

(i) The unit includes 6.7 rkm (4.2 rmi) of Indian Creek from its confluence with the Clinch River (−81.76608, 37.08893) upstream to the fourth Norfolk Southern Railroad crossing at Van Dyke (−81.71975, 37.11206) in Tazewell County, VA.

(ii) Map of Units FK10 and FK11 follows:



(16) Unit FK11: Little River, Russell and Tazewell Counties, Virginia.

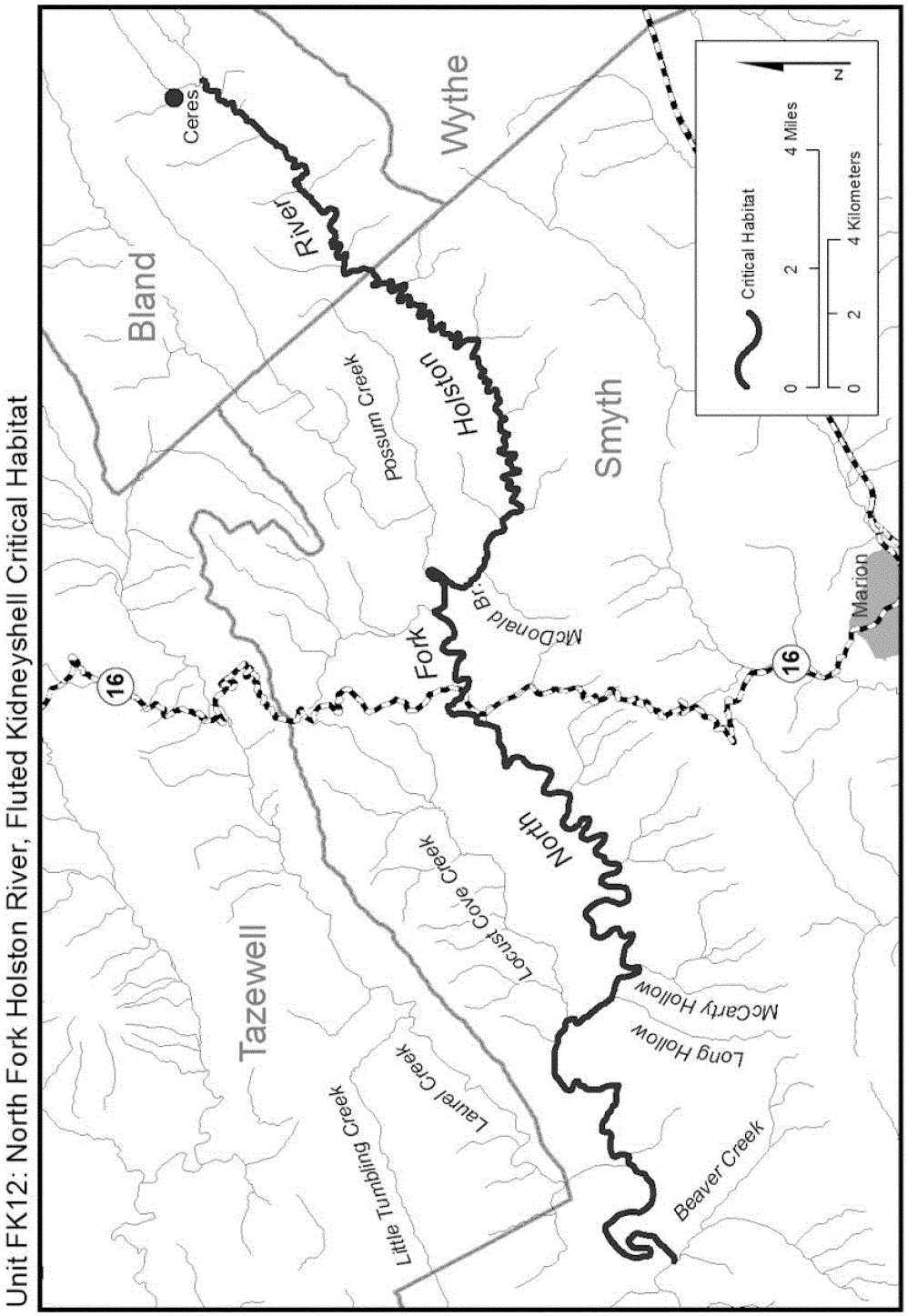
(i) The unit includes approximately 50 rkm (31 rmi) of Little River from its confluence with the Clinch River (−81.92582, 37.00223) in Russell County, VA, upstream to its confluence with Liberty and Maiden Spring Creeks (−81.67240, 37.03760) in Tazewell County, VA.

(ii) Map of Units FK10 and FK11 is provided at paragraph (15)(ii) of this entry.

(17) Unit FK12: North Fork Holston River, Smyth and Bland Counties, Virginia.

(i) The unit includes approximately 67 rkm (42 rmi) of the North Fork Holston River from its confluence with Beaver Creek (−81.70277, 36.90825), upstream of Saltville, in Smyth County, VA, upstream to Ceres (−81.33775, 37.01035), Bland County, VA.

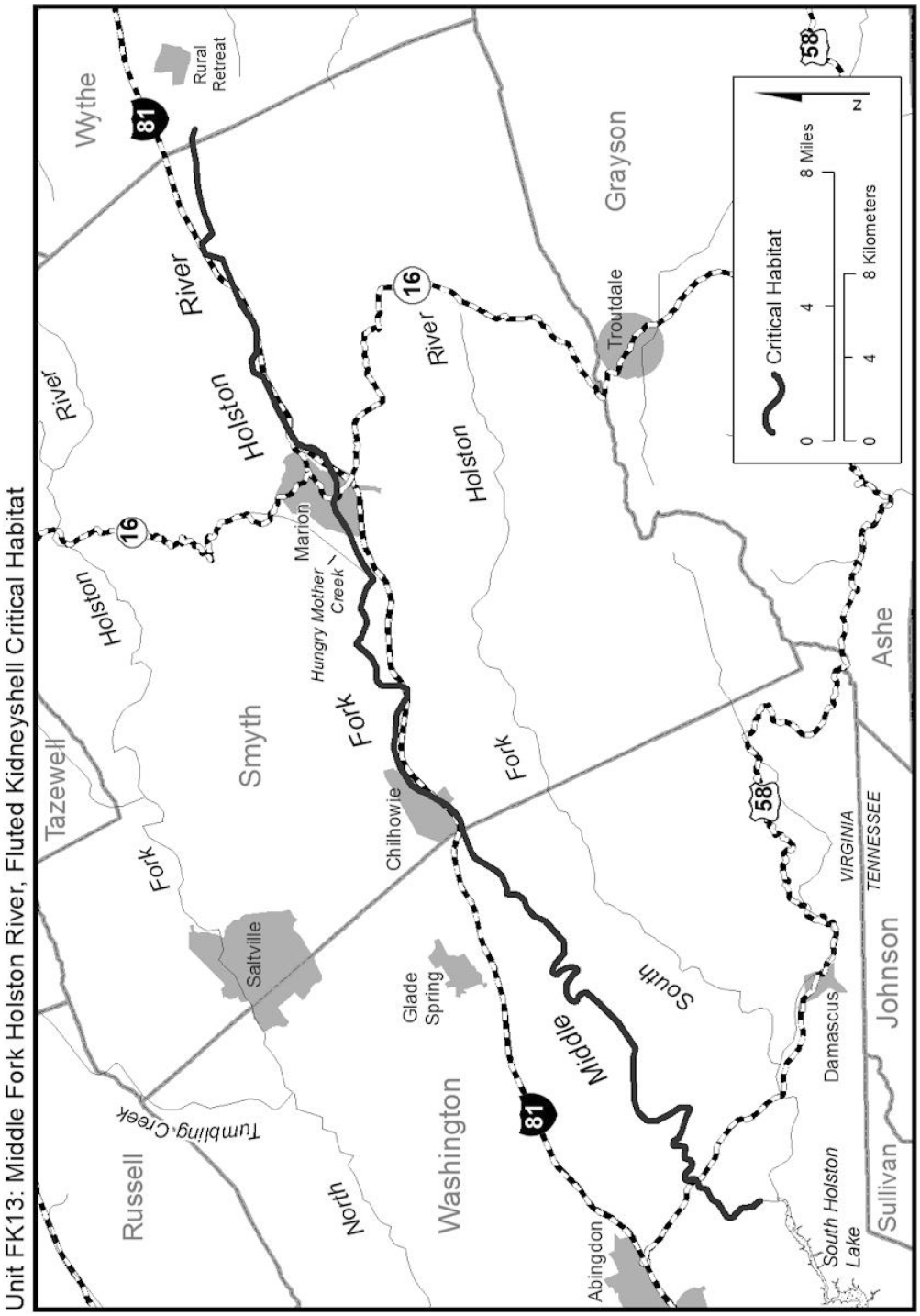
(ii) Map of Unit FK12 follows:



(18) Unit FK13: Middle Fork Holston River, Washington, Smyth, and Wythe Counties, Virginia.

(i) The unit includes approximately 89 rkm (55 rmi) of the Middle Fork Holston River from its inundation at South Holston Lake (−81.90427, 36.66338) in Washington County, VA, upstream to its headwaters (−81.31345, 36.88666) in Wythe County, VA.

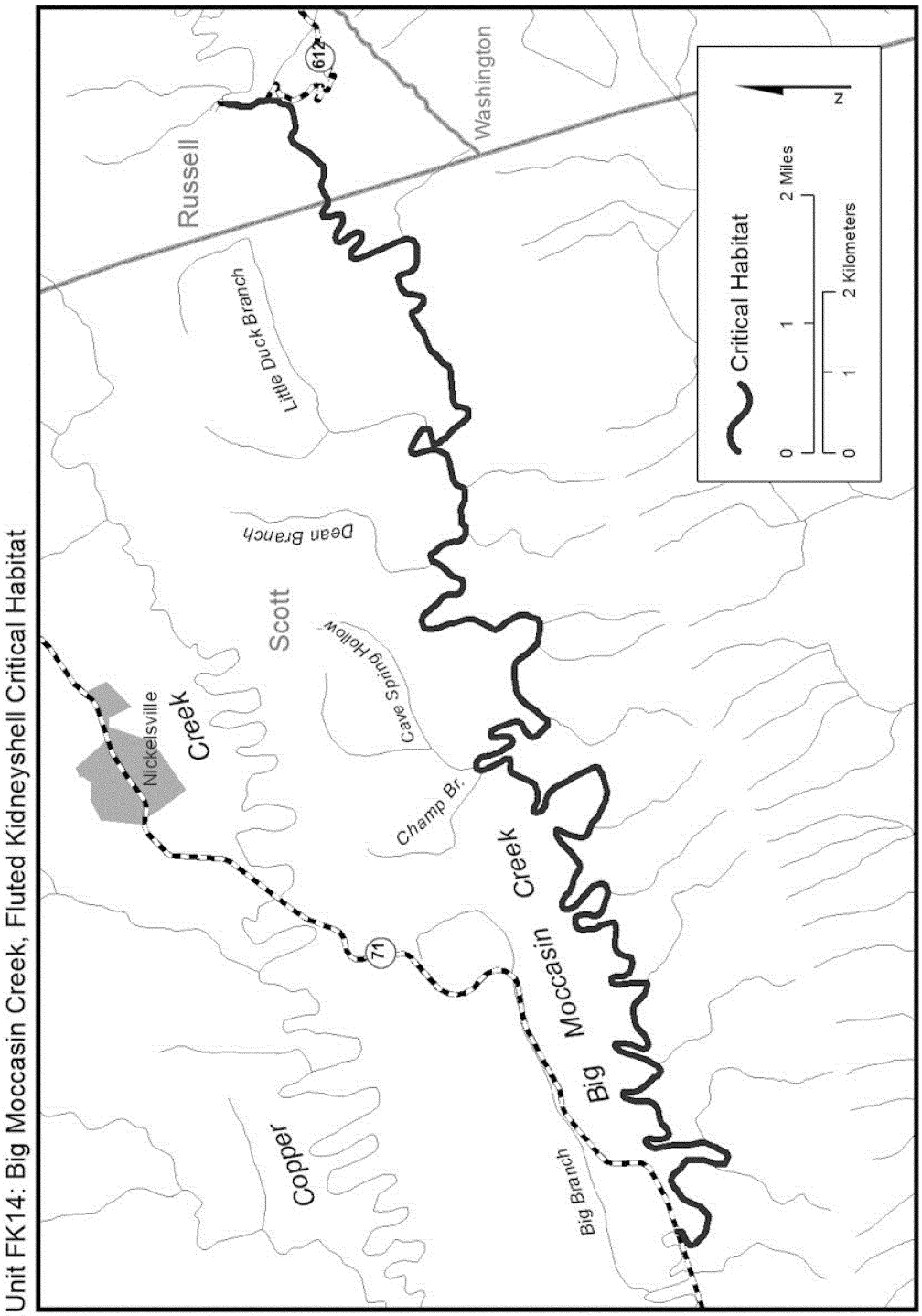
(ii) Map of Unit FK13 follows:



(19) Unit FK14: Big Moccasin Creek, Scott and Russell Counties, Virginia.

(i) The unit includes approximately 33 rkm (21 rmi) of Big Moccasin Creek from the Highway 71 Bridge crossing (−82.48361, 36.69109) in Scott County, VA, upstream to the Route 612 Bridge crossing (−82.32348, 36.73740) near Collinwood in Russell County, VA.

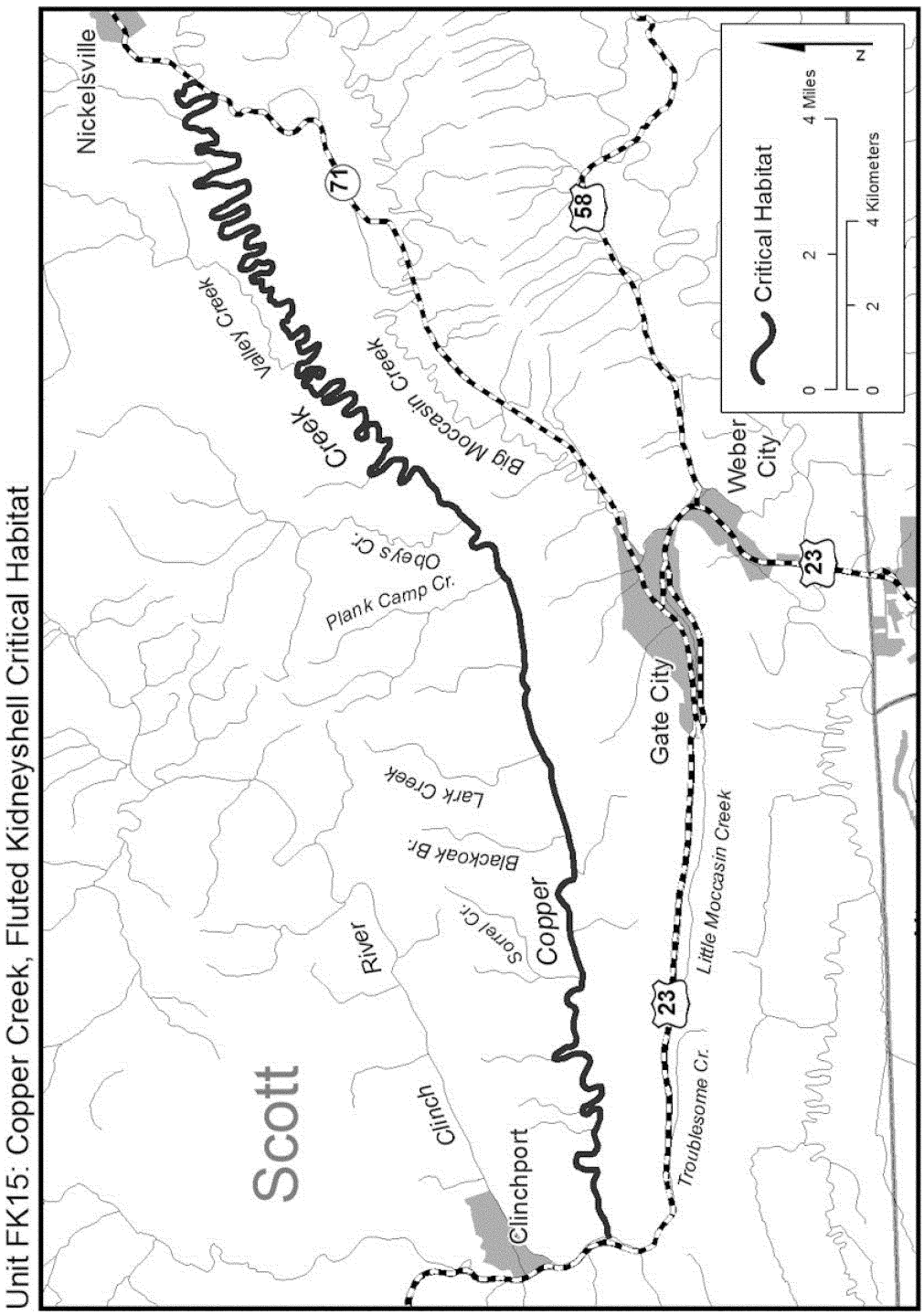
(ii) Map of Unit FK14 follows:



(20) Unit FK15: Copper Creek, Scott County, Virginia.

(i) The unit includes 55.5 rkm (34.5 rmi) of Copper Creek from its confluence with the Clinch River (−82.74538, 36.65544) upstream to the Highway 71 Bridge crossing (−82.43514, 36.73473) in Scott County, VA.

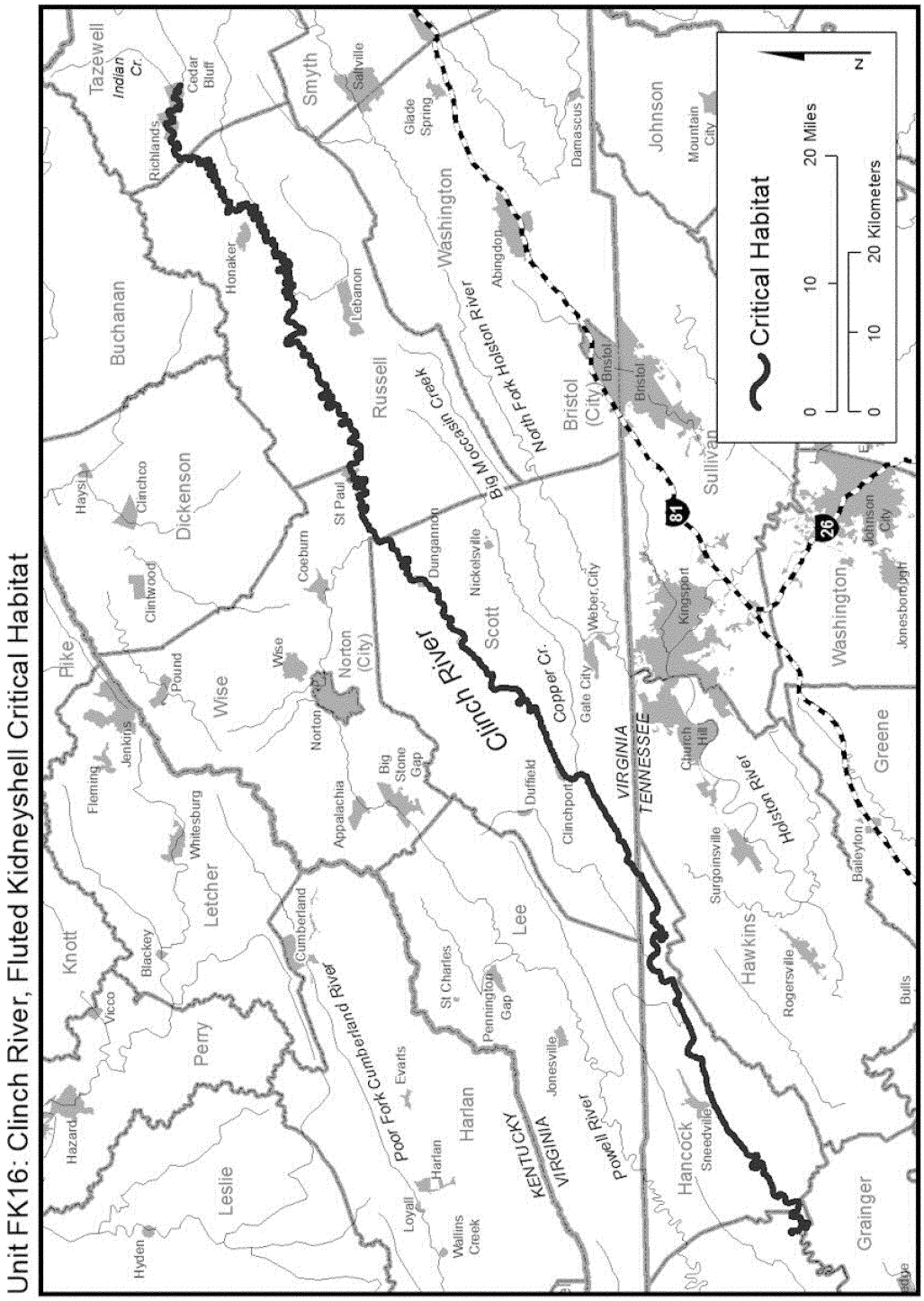
(ii) Map of Unit FK15 follows:



(21) Unit FK16: Clinch River, Hancock County, Tennessee, and Scott, Russell, and Tazewell Counties, Virginia.

(i) The unit includes 263 rkm (163 rmi) of the Clinch River from rkm 255 (rmi 159) immediately below Grissom Island (−83.40106, 36.43081) in Hancock County, TN, upstream to its confluence with Indian Creek near Cedar Bluff (−81.74999, 37.07995), Tazewell County, VA.

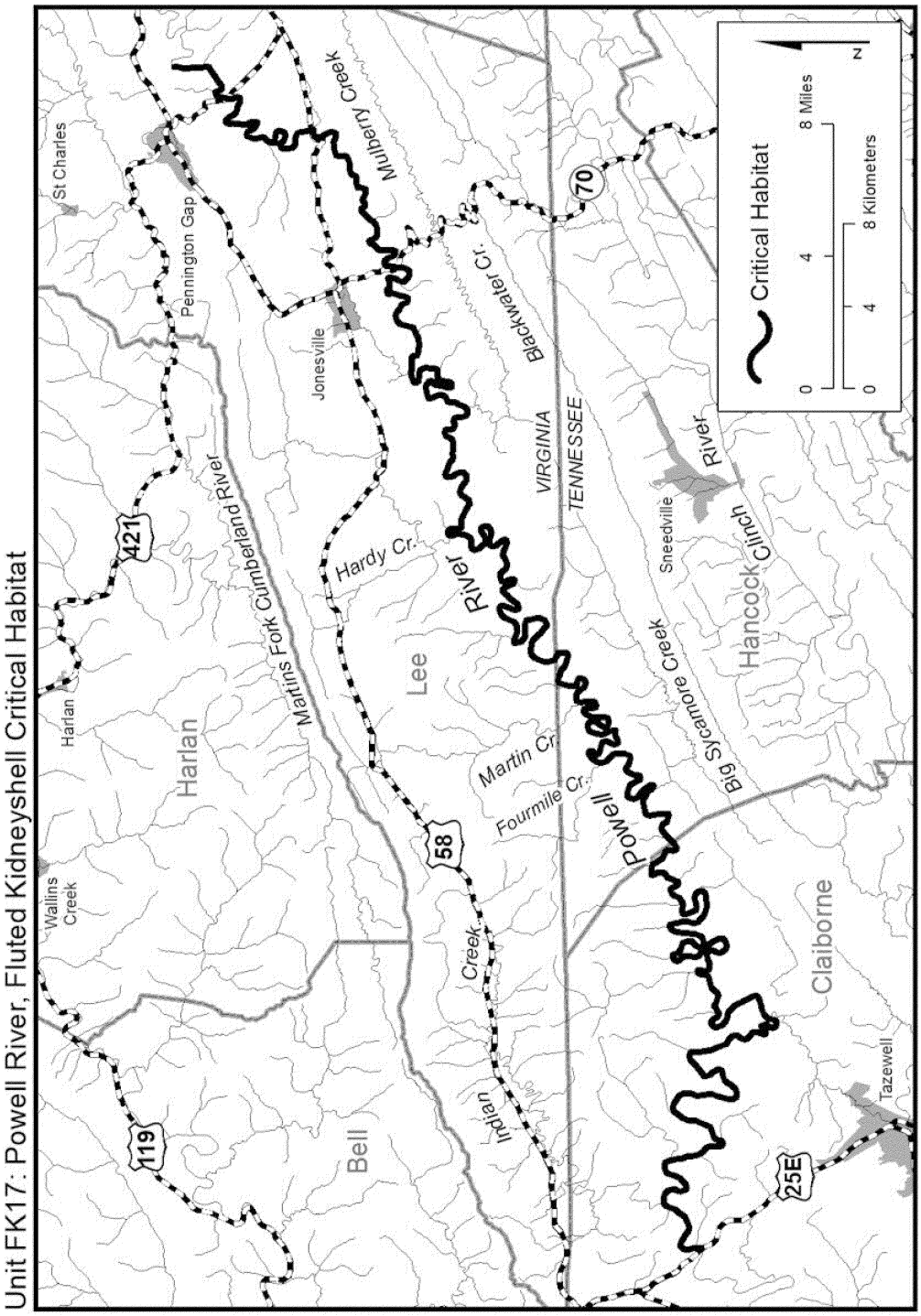
(ii) Map of Unit FK16 follows:



(22) Unit FK17: Powell River, Claiborne and Hancock Counties, Tennessee, and Lee County, Virginia.

(i) The unit includes approximately 153 rkm (95 rmi) of the Powell River from the U.S. 25E Bridge (−83.63102, 36.54143) in Claiborne County, TN, upstream to rkm 256 (rmi 159) (−82.98111, 36.75730, upstream of Rock Island in the vicinity of Pughs) in Lee County, VA.

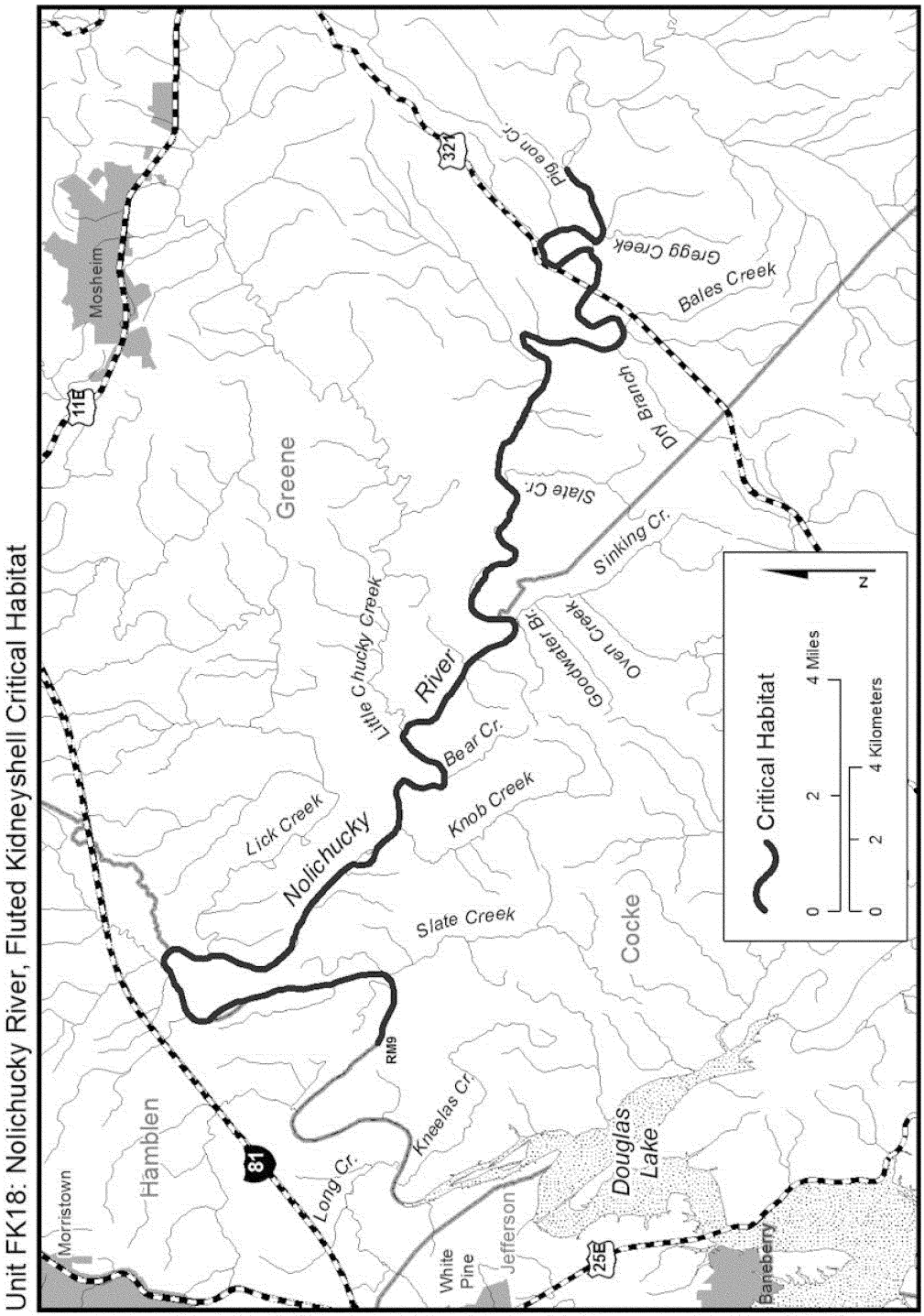
(ii) Map of Unit FK17 follows:



(23) Unit FK18: Nolichucky River, Cocke, Hamblen, and Greene Counties, Tennessee.

(i) The unit includes approximately 52 rkm (32 rmi) of the Nolichucky River from rkm 14 (rmi 9), approximately 0.6 rkm (0.4 rmi) upstream of Enka Dam (−83.19630, 36.12970), where it divides Hamblen and Cocke Counties, TN, upstream to its confluence with Pigeon Creek, just upstream of the Highway 321 Bridge crossing (−82.92926, 36.07545), in Greene County, TN.

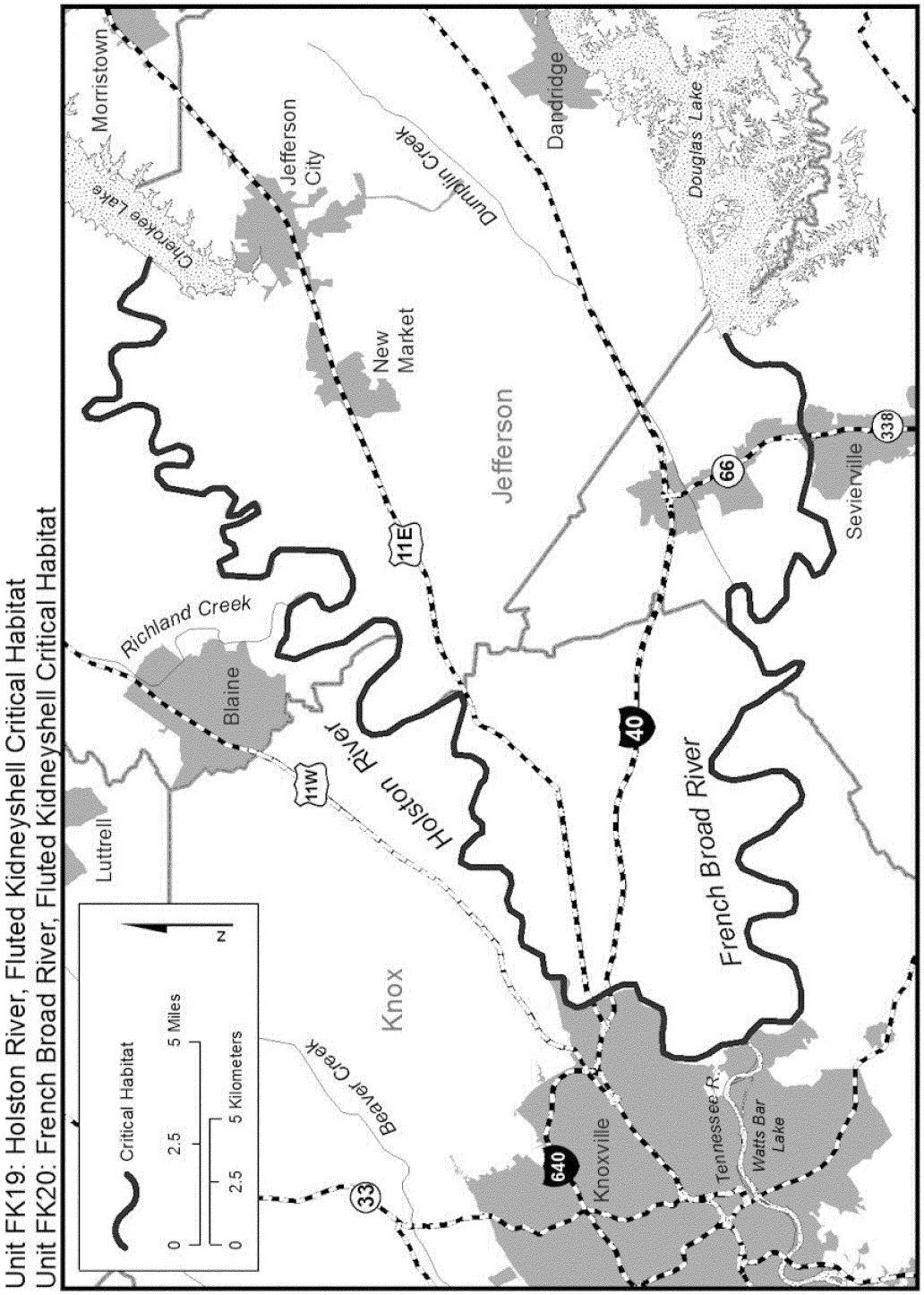
(ii) Map of Unit FK18 follows:



(24) Unit FK19: Holston River, Knox, Grainger, and Jefferson Counties, Tennessee.

(i) The unit includes approximately 85 rkm (53 rmi) of the Holston River from its confluence with the French Broad River (−83.84967, 35.95903) in Knox County, TN, upstream to the base of Cherokee Dam at rkm 83.7 (rmi 52.3) (−83.49855, 36.16666) along the Grainger and Jefferson County, TN, line.

(ii) Map of Units FK19 and FK20 follows:



(25) Unit FK20: French Broad River, Knox and Sevier Counties, Tennessee.

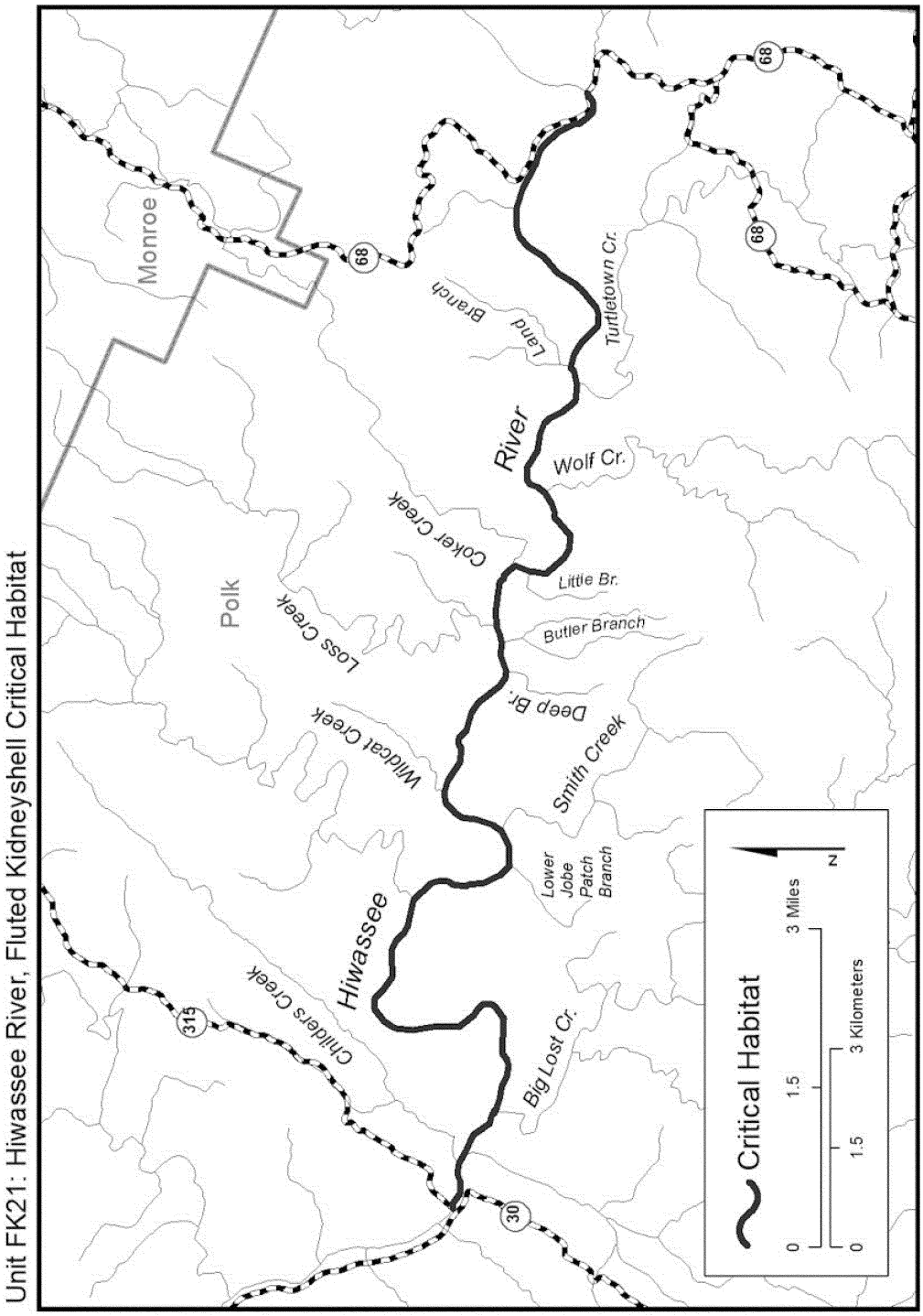
(i) The unit includes approximately 56 rkm (35 rmi) of the French Broad River from its confluence with the Holston River (−83.84967, 35.95903) in Knox County, TN, upstream to the base of Douglas Dam at rkm 51.7 (rmi 32.3) (−83.53821, 35.96073) in Sevier County, TN.

(ii) Map of Units FK19 and FK20 is provided at paragraph (24)(ii) of this entry.

(26) Unit FK21: Hiwassee River, Polk County, Tennessee.

(i) The unit includes approximately 24 rkm (15 rmi) of the Hiwassee River from the Highway 315 Bridge crossing (−84.50234, 35.18875) upstream to the Highway 68 Bridge crossing (−84.31728, 35.16811) in Polk County, TN.

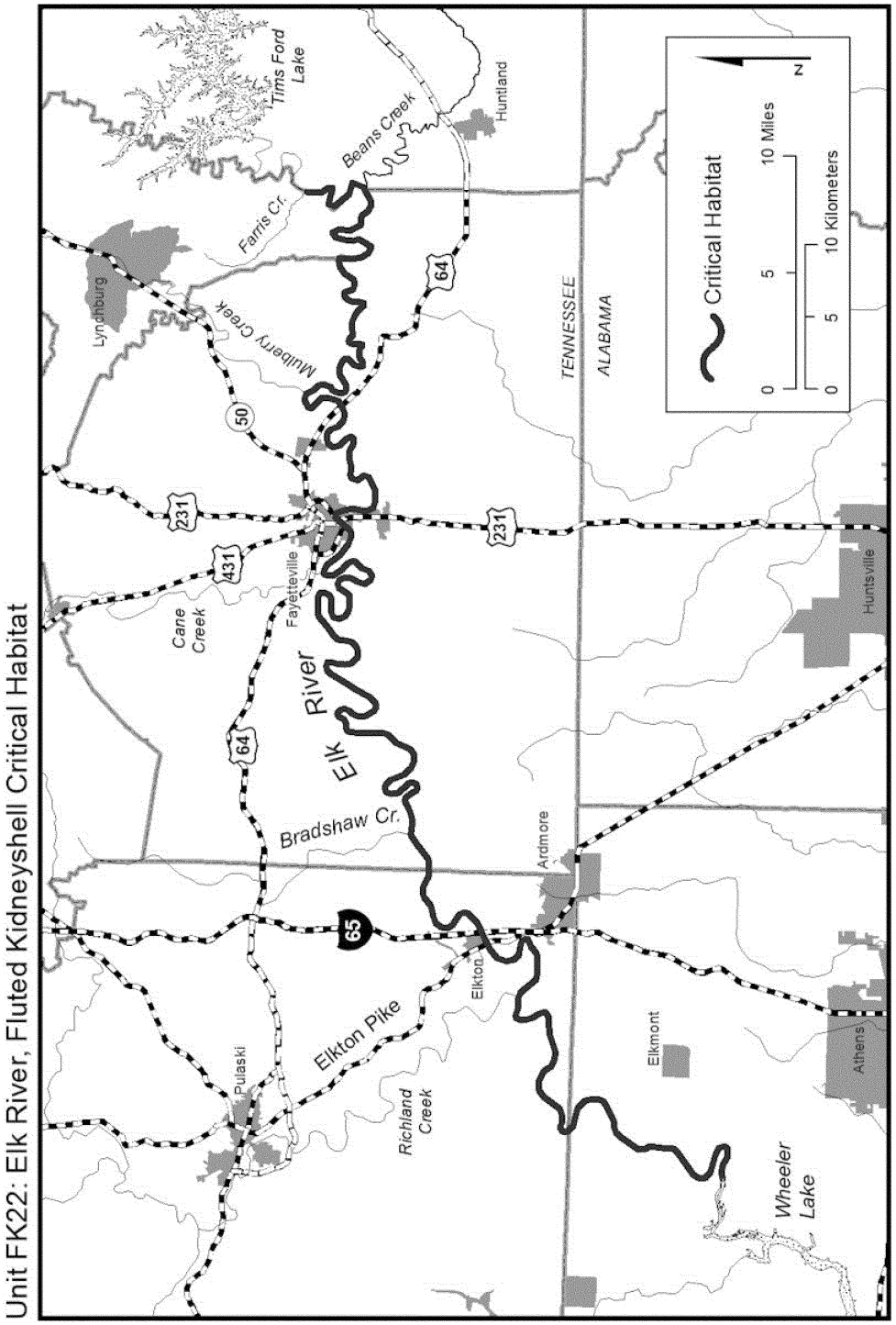
(ii) Map of Unit FK21 follows:



(27) Unit FK22: Elk River, Limestone County, Alabama, and Giles, Lincoln, Franklin, and Moore Counties, Tennessee.

(i) The unit includes approximately 164 rkm (102 rmi) of the Elk River from its inundation at Wheeler Lake (−87.06503, 34.89788) in Limestone County, AL, upstream to its confluence with Farris Creek (−86.31996, 35.16288) at the dividing line between Franklin and Moore Counties, TN.

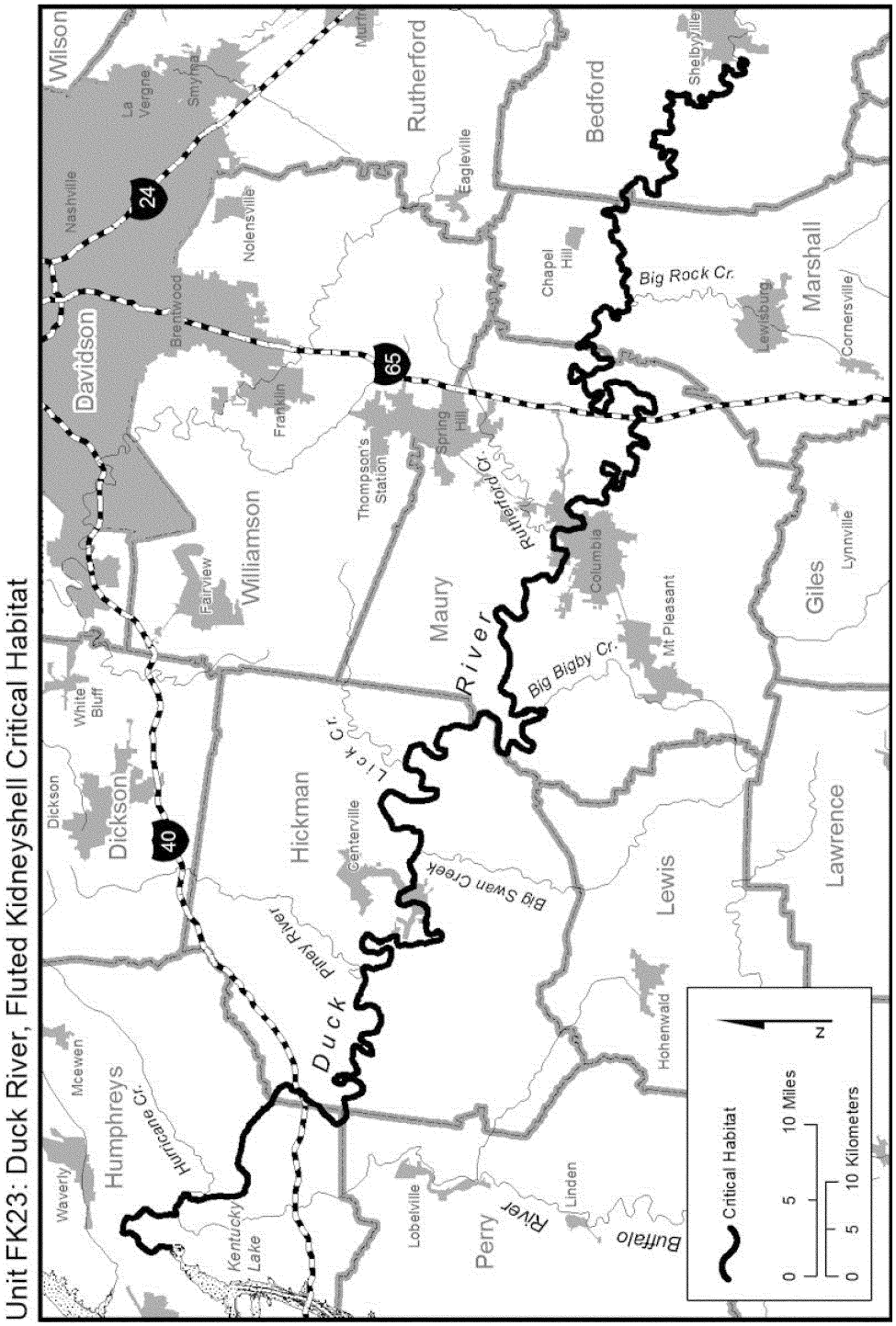
(ii) Map of Unit FK22 follows:



(28) Unit FK23: Duck River, Humphreys, Perry, Hickman, Maury, Marshall, and Bedford Counties, Tennessee.

(i) The unit includes approximately 348 rkm (216 rmi) of the Duck River from its inundation at Kentucky Lake (−87.88011, 36.00244) in Humphreys County, TN, upstream to its confluence with Flat Creek (−86.48778, 35.47209) near Shelbyville in Bedford County, TN.

(ii) Map of Unit FK23 follows:

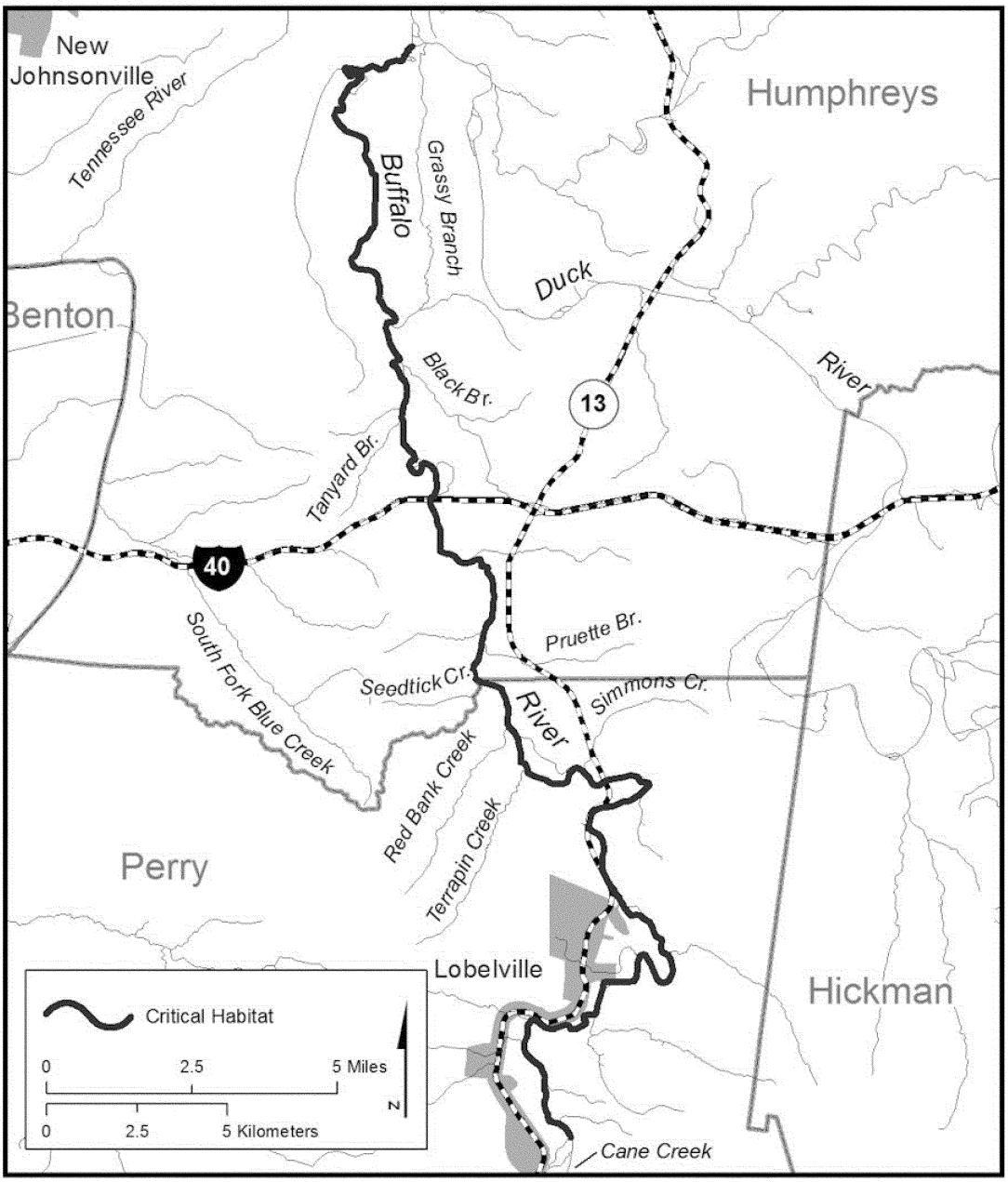


(29) Unit FK24: Buffalo River, Humphreys and Perry Counties, Tennessee.

(i) The unit includes 50 rkm (31 rmi) of the Buffalo River from its confluence with the Duck River (−87.84261, 35.99477) in Humphreys County, TN, upstream to its confluence with Cane Creek (−87.78718, 35.72298) in Perry County, TN.

(ii) Map of Unit FK24 follows:

Unit FK24: Buffalo River, Fluted Kidneyshell Critical Habitat



Slabside Pearlymussel (*Pleuronaia dolabelloides*)

(1) Critical habitat units are depicted on the maps below for Colbert, Jackson, Limestone, Madison, and Marshall Counties, Alabama; Tishomingo County, Mississippi; Bedford, Bledsoe, Claiborne, Cocke, Franklin, Giles, Greene, Hamblen, Hancock, Hickman, Humphreys, Lincoln, Marion, Marshall, Maury, Moore, Perry, Polk, and Sequatchie Counties, Tennessee; and Bland, Lee, Russell, Scott, Smyth, Tazewell, Washington, and Wythe Counties, Virginia.

(2) Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of slabside pearlymussel consist of five components:

(i) Riffle habitats within large, geomorphically stable stream channels (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation).

(ii) Stable substrates of sand, gravel, and cobble with low to moderate amounts of fine sediment and containing flow refugia with low shear stress.

(iii) A natural hydrologic flow regime (magnitude, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found, and connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for habitat maintenance, food availability for all life stages, and spawning habitat for native fishes.

(iv) Water quality with low levels of pollutants and including a natural

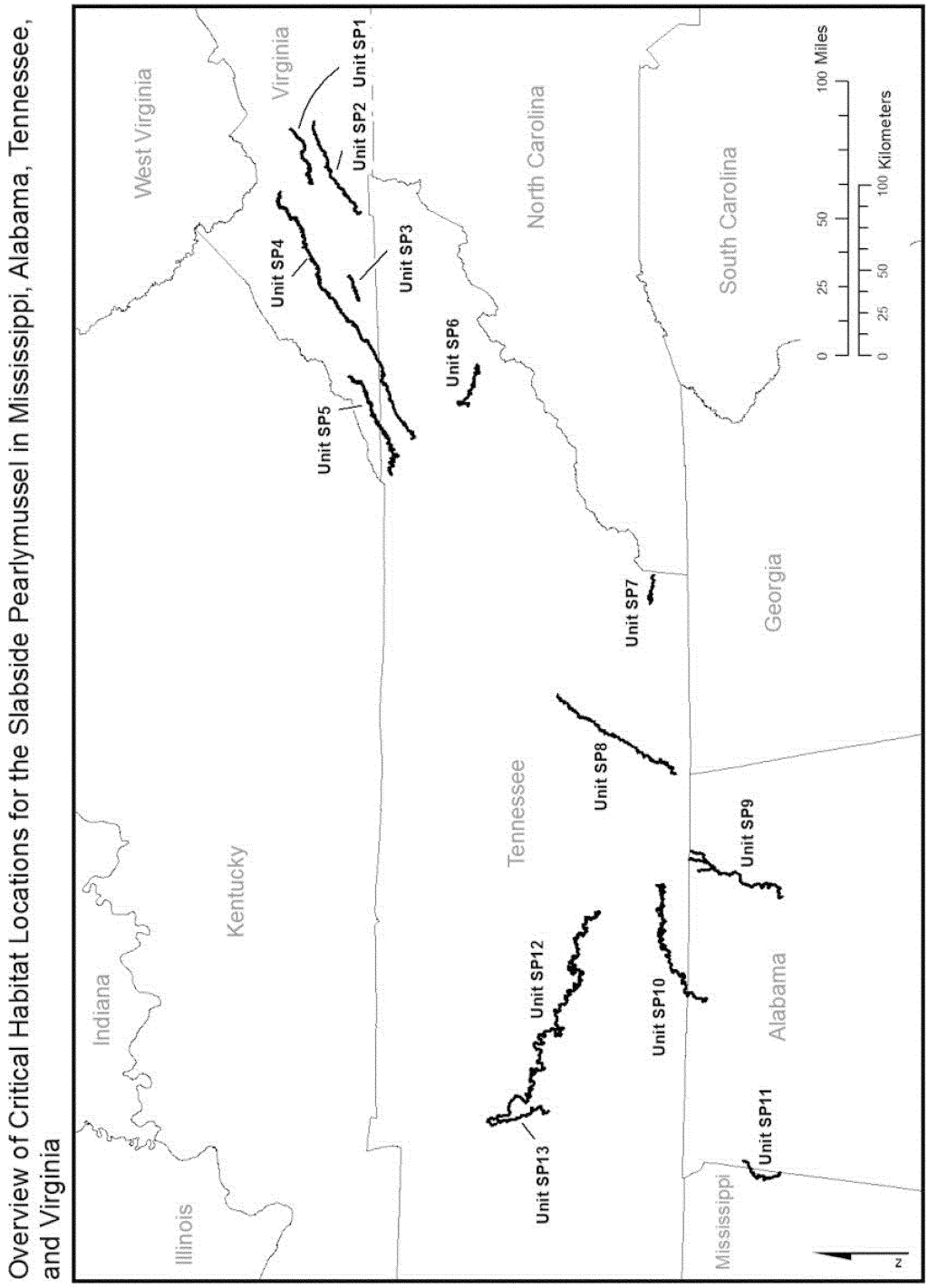
temperature regime, pH (between 6.0 to 8.5), oxygen content (not less than 5.0 milligrams/liter), hardness, and turbidity necessary for normal behavior, growth, and viability of all life stages.

(v) The presence of abundant fish hosts necessary for recruitment of the slabside pearlymussel.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, dams, 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 with USGS National Hydrography Dataset (NHD+) GIS data. The 1:100,000 river reach (route) files were used to calculate river kilometers and miles. ESRIs ArcGIS 10.0 software was used to determine longitude and latitude coordinates using decimal degrees. The projection used in mapping all units was USA Contiguous Albers Equal Area Conic USGS version, NAD 83, meters. The following data sources were referenced to identify features (like roads and streams) used to delineate the upstream and downstream extents of critical habitat units: NHD+ flowline and waterbody data, 2011 Navteq roads data, USA Topo ESRI online basemap service, DeLorme Atlas and Gazetteers, and USGS 7.5 minute topographic maps. 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 field office Internet site (*http://www.fws.gov/cookeville), http://www.regulations.gov* at Docket No. FWS–R4–ES–2012–0004, and at the Service's Tennessee Fish and Wildlife Office. 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.

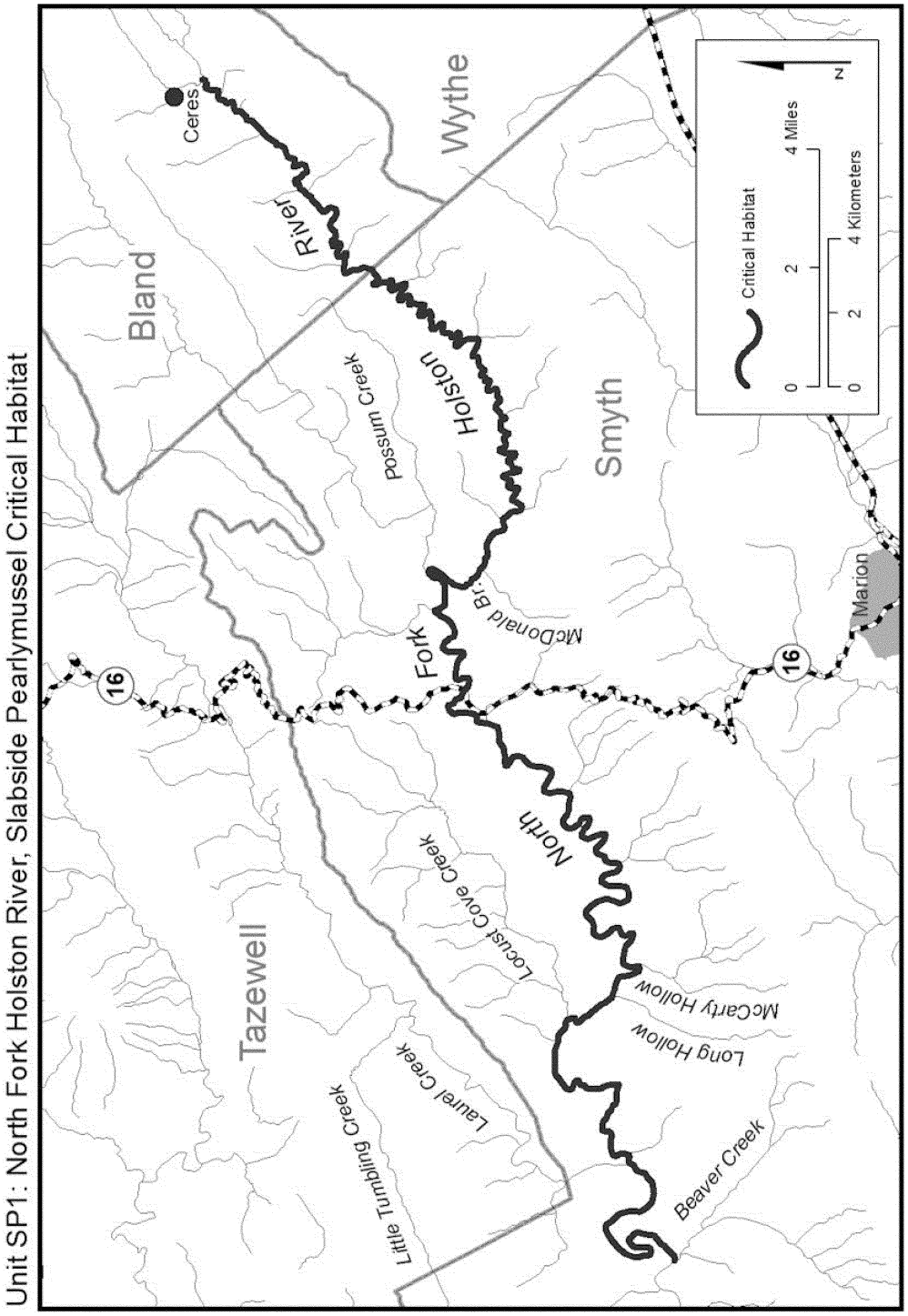
(5) An overview of critical habitat locations for the slabside pearlymussel in Mississippi, Alabama, Tennessee, and Virginia follows:



(6) Unit SP1: North Fork Holston River, Smyth and Bland Counties, Virginia.

(i) The unit includes approximately 67 river kilometers (rkm) (42 river miles (rmi)) of the North Fork Holston River from its confluence with Beaver Creek (−81.70277, 36.90825), upstream of Saltville, in Smyth County, VA, upstream to Ceres (−81.33775, 37.01035), Bland County, VA.

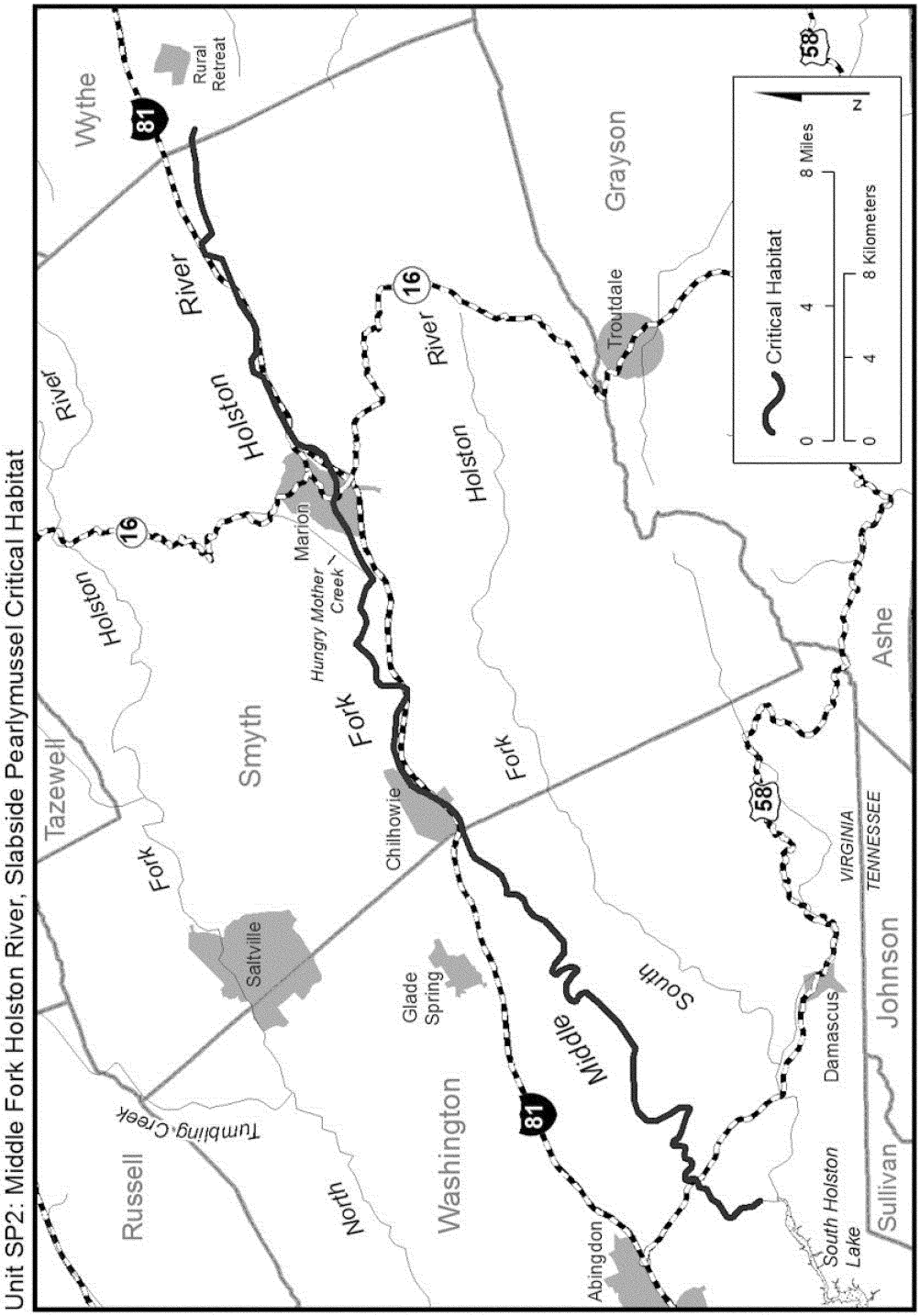
(ii) Map of Unit SP1 follows:



(7) Unit SP2: Middle Fork Holston River, Washington, Smyth, and Wythe Counties, Virginia.

(i) The unit includes approximately 89 rkm (55 rmi) of the Middle Fork Holston River from its inundation at South Holston Lake (−81.90427, 36.66338) in Washington County, VA, upstream to its headwaters (−81.31345, 36.88666) in Wythe County, VA.

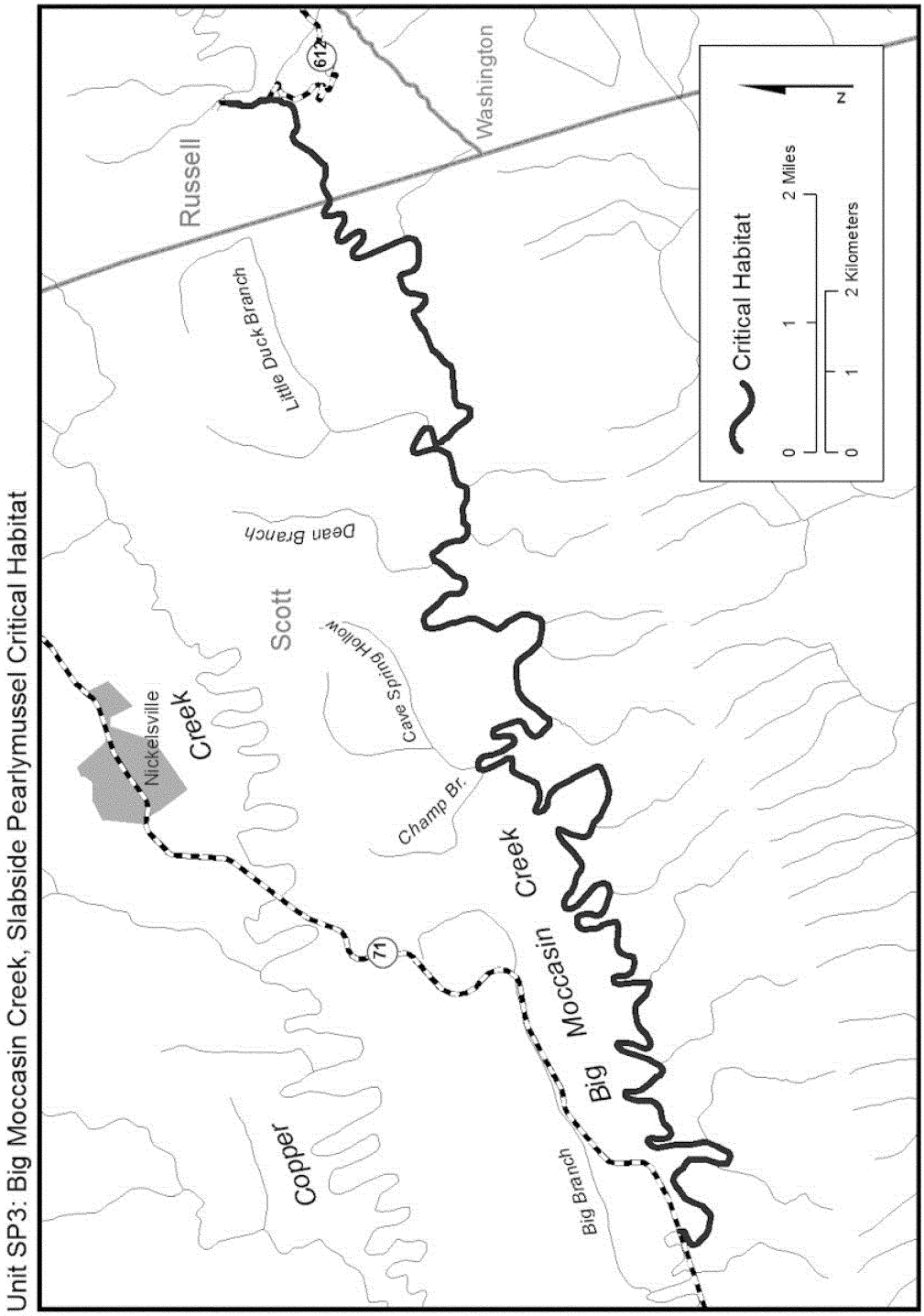
(ii) Map of Unit SP2 follows:



(8) Unit SP3: Big Moccasin Creek, Scott and Russell Counties, Virginia.

(i) The unit includes approximately 33 rkm (21 rmi) of Big Moccasin Creek from the Highway 71 Bridge crossing (−82.48361, 36.69109) in Scott County, VA, upstream to the Route 612 Bridge crossing (−82.32348, 36.73740) near Collinwood in Russell County, VA.

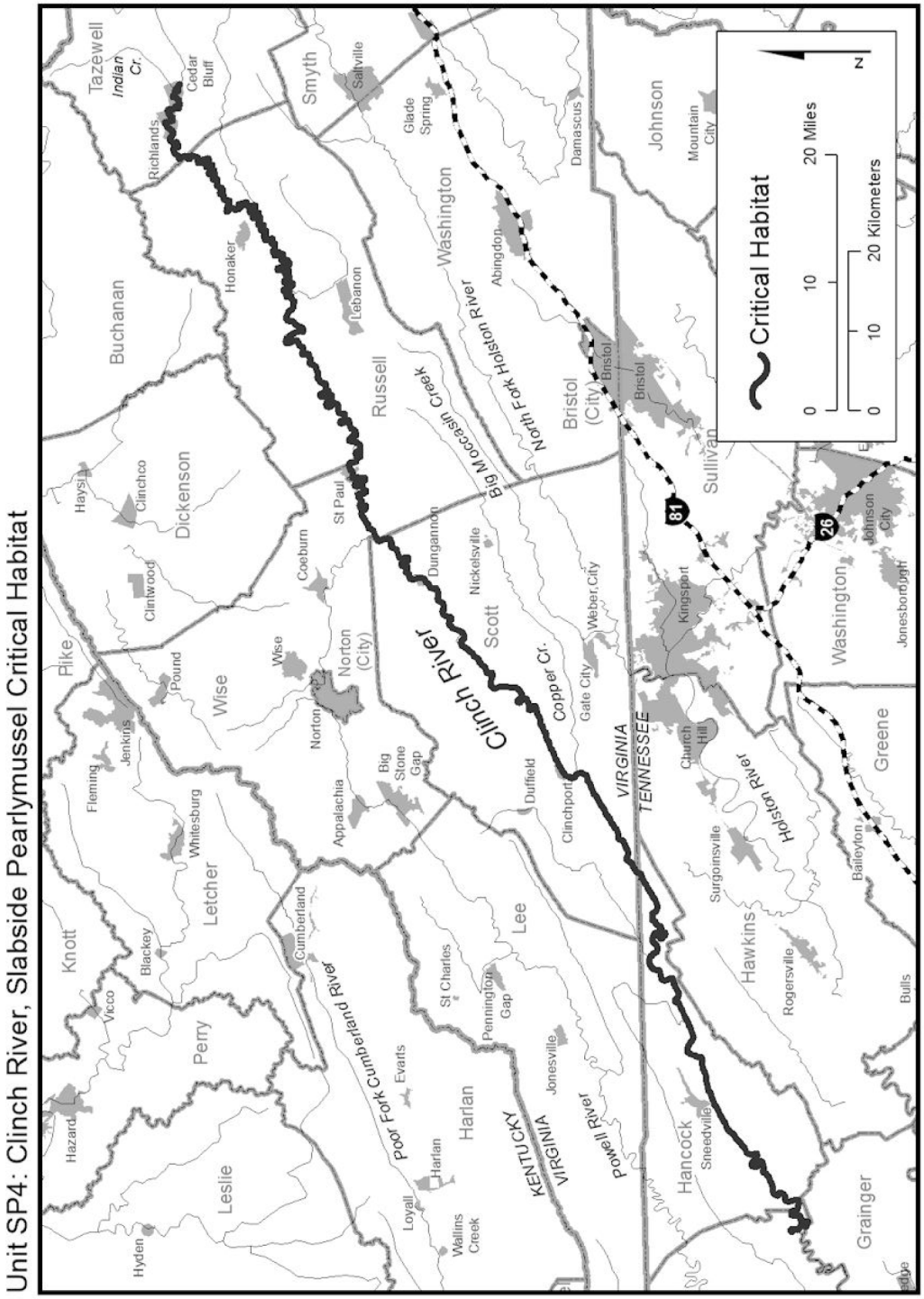
(ii) Map of Unit SP3 follows:



(9) Unit SP4: Clinch River, Hancock County, Tennessee, and Scott, Russell, and Tazewell Counties, Virginia.

(i) The unit includes 263 rkm (163 rmi) of the Clinch River from rkm 255 (rmi 159) immediately below Grissom Island (−83.40106, 36.43081) in Hancock County, TN, upstream to its confluence with Indian Creek near Cedar Bluff (−81.74999, 37.07995), Tazewell County, VA.

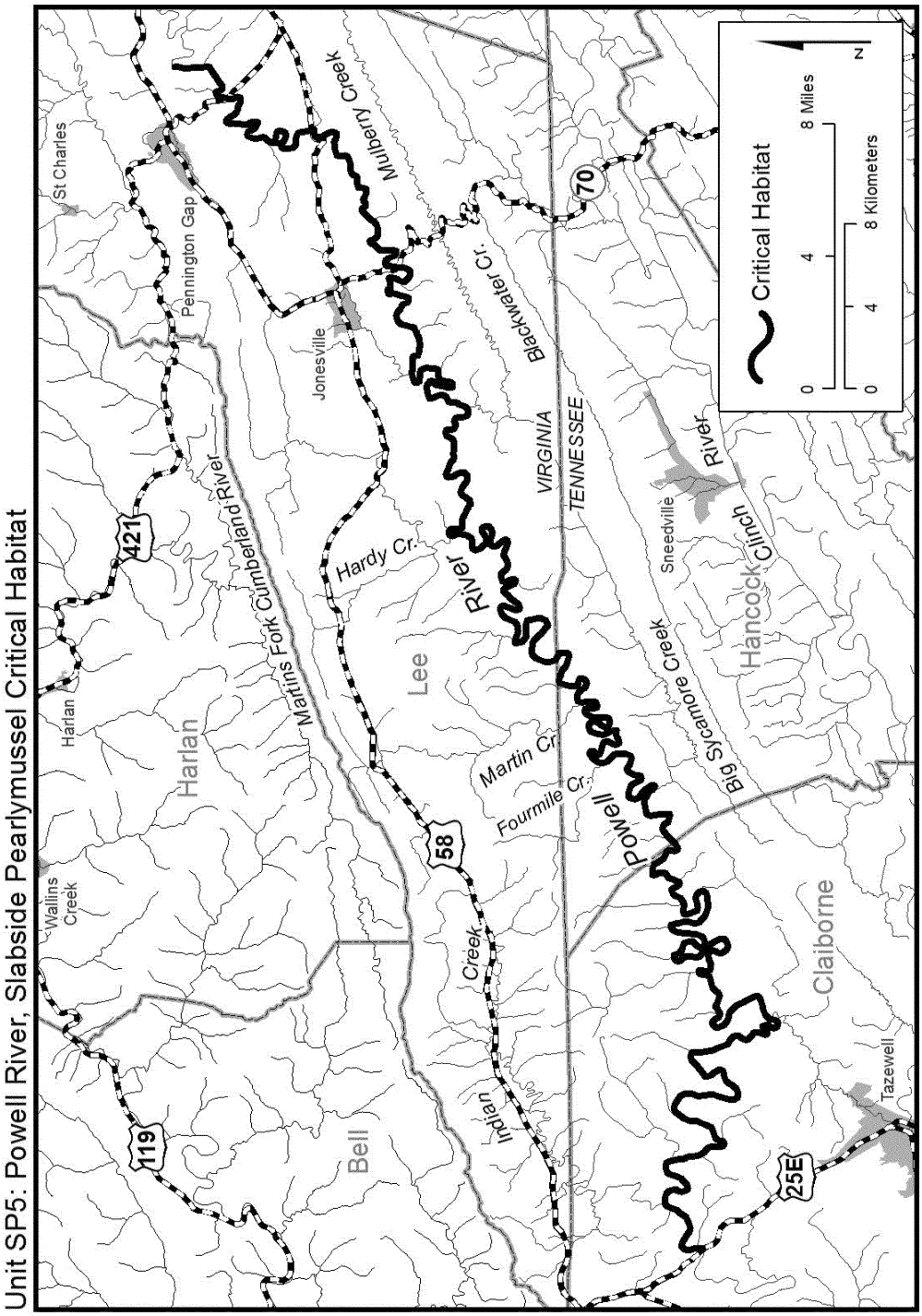
(ii) Map of Unit SP4 follows:



(10) Unit SP5: Powell River, Claiborne and Hancock Counties, Tennessee, and Lee County, Virginia.

(i) The unit includes approximately 153 rkm (95 rmi) of the Powell River from the U.S. 25E Bridge (−83.63102, 36.54143) in Claiborne County, TN, upstream to rkm 256 (rmi 159) (−82.98111, 36.75730, upstream of Rock Island in the vicinity of Pughs) in Lee County, VA.

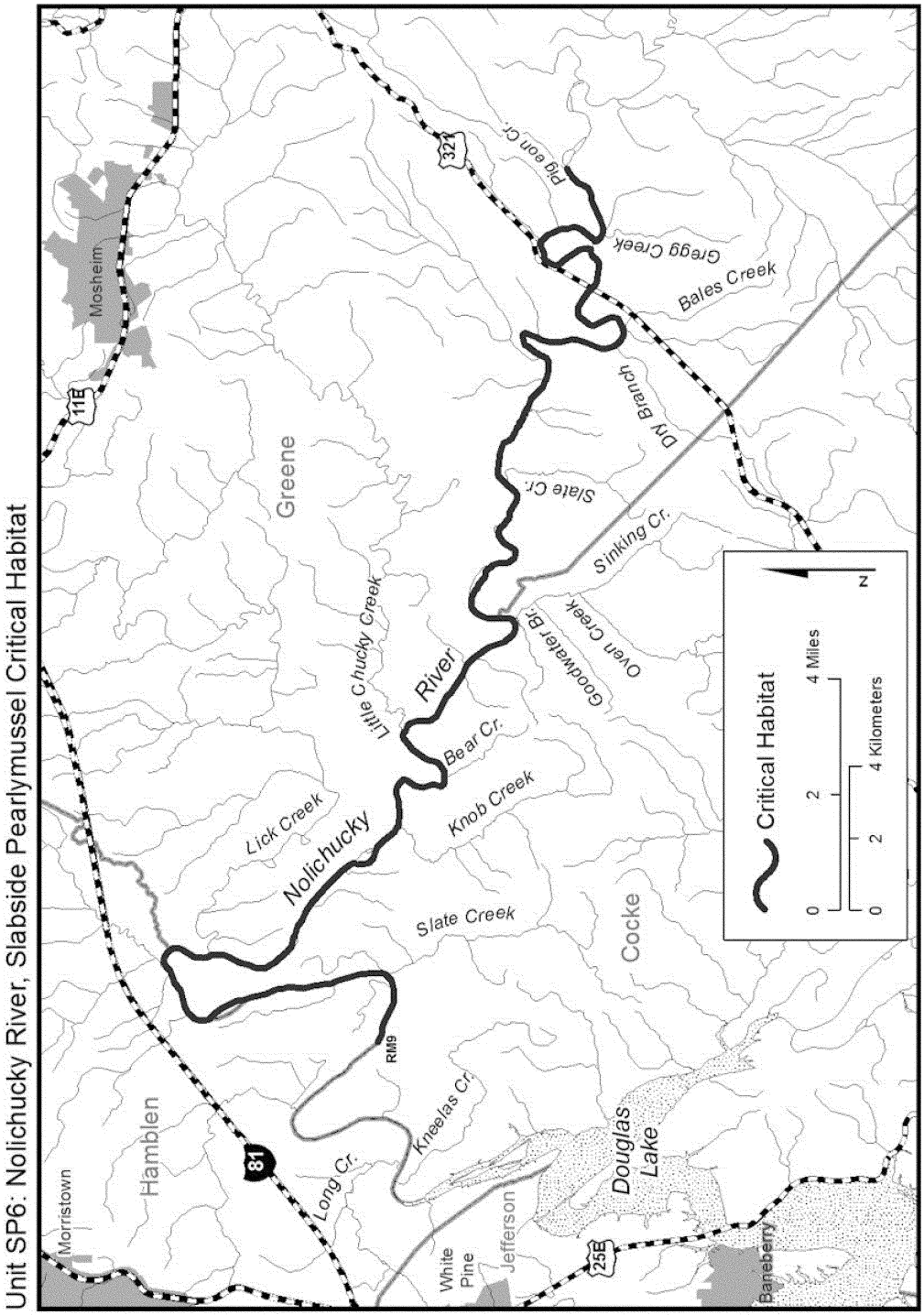
(ii) Map of Unit SP5 follows:



(11) Unit SP6: Nolichucky River, Cocke, Hamblen, and Greene Counties, Tennessee.

(i) The unit includes approximately 52 rkm (32 rmi) of the Nolichucky River from rkm 14 (rmi 9), approximately 0.6 rkm (0.4 rmi) upstream of Enka Dam (−83.19630, 36.12970), where it divides Hamblen and Cocke Counties, TN, upstream to its confluence with Pigeon Creek, just upstream of the Highway 321 Bridge crossing (−82.92926, 36.07545), in Greene County, TN.

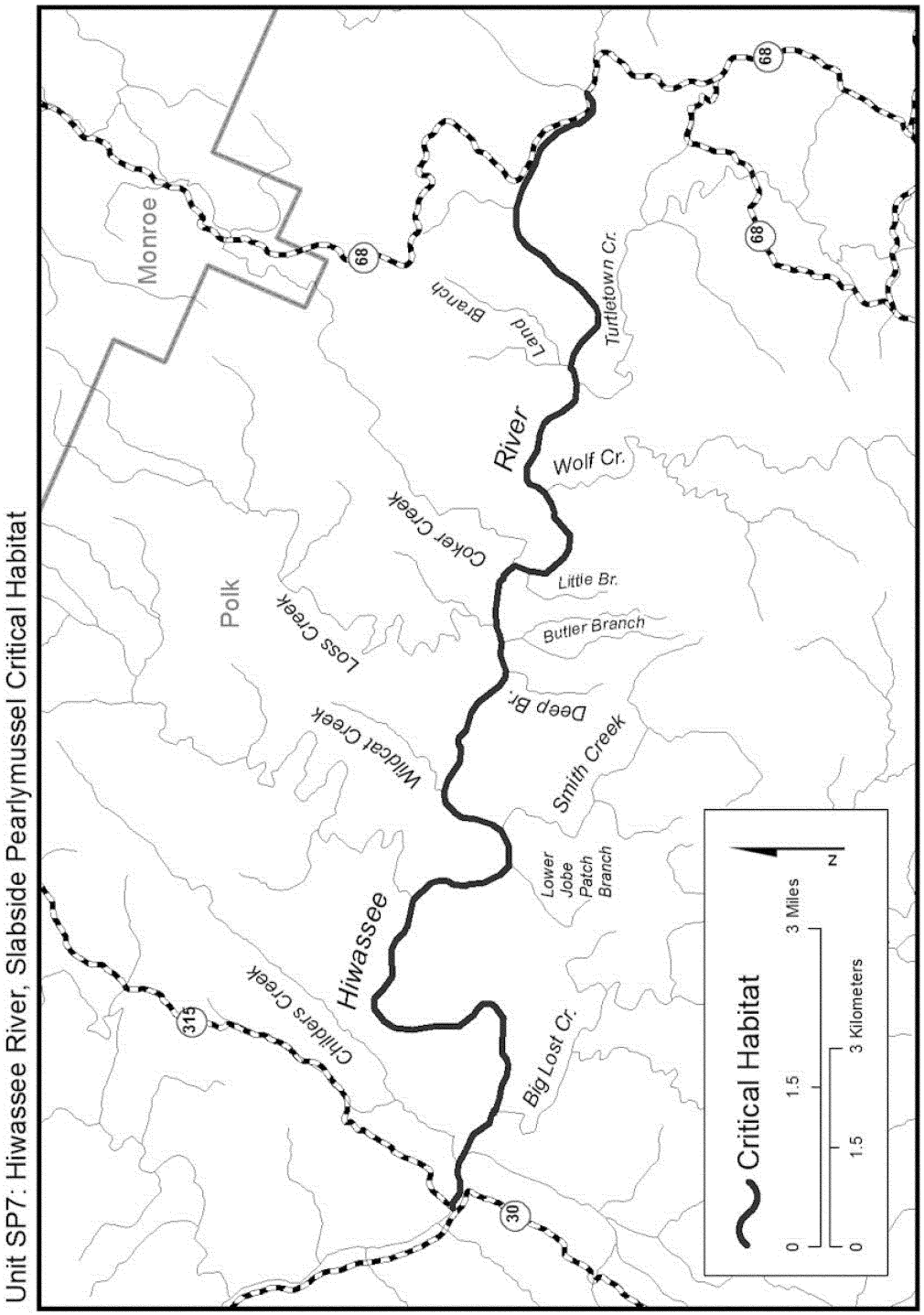
(ii) Map of Unit SP6 follows:



(12) Unit SP7: Hiwassee River, Polk County, Tennessee.

(i) The unit includes approximately 24 rkm (15 rmi) of the Hiwassee River from the Highway 315 Bridge crossing (−84.50234, 35.18875) upstream to the Highway 68 Bridge crossing (−84.31728, 35.16811) in Polk County, TN.

(ii) Map of Unit SP7 follows:

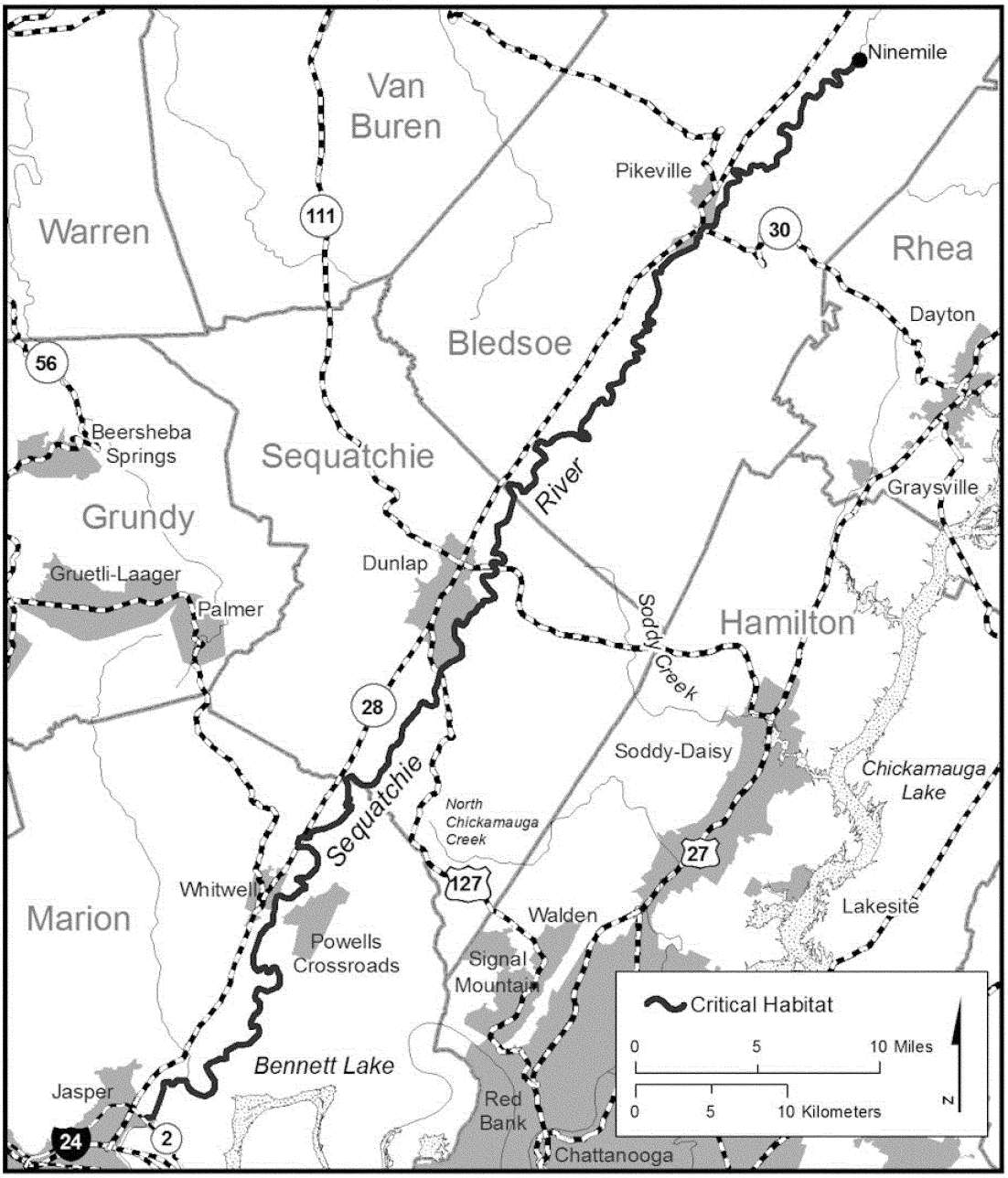


(13) Unit SP8: Sequatchie River, Marion, Sequatchie, and Bledsoe Counties, Tennessee.

(i) The unit includes approximately 151 rkm (94 rmi) of the Sequatchie River from the Highway 41, 64, 72, 2 Bridge crossing (−85.60583, 35.06576) in Marion County, TN, upstream to the Ninemile Cross Road Bridge crossing (−85.08304, 35.69162) in Bledsoe County, TN.

(ii) Map of Unit SP8 follows:

Unit SP8: Sequatchie River, Slabside Pearlymussel Critical Habitat

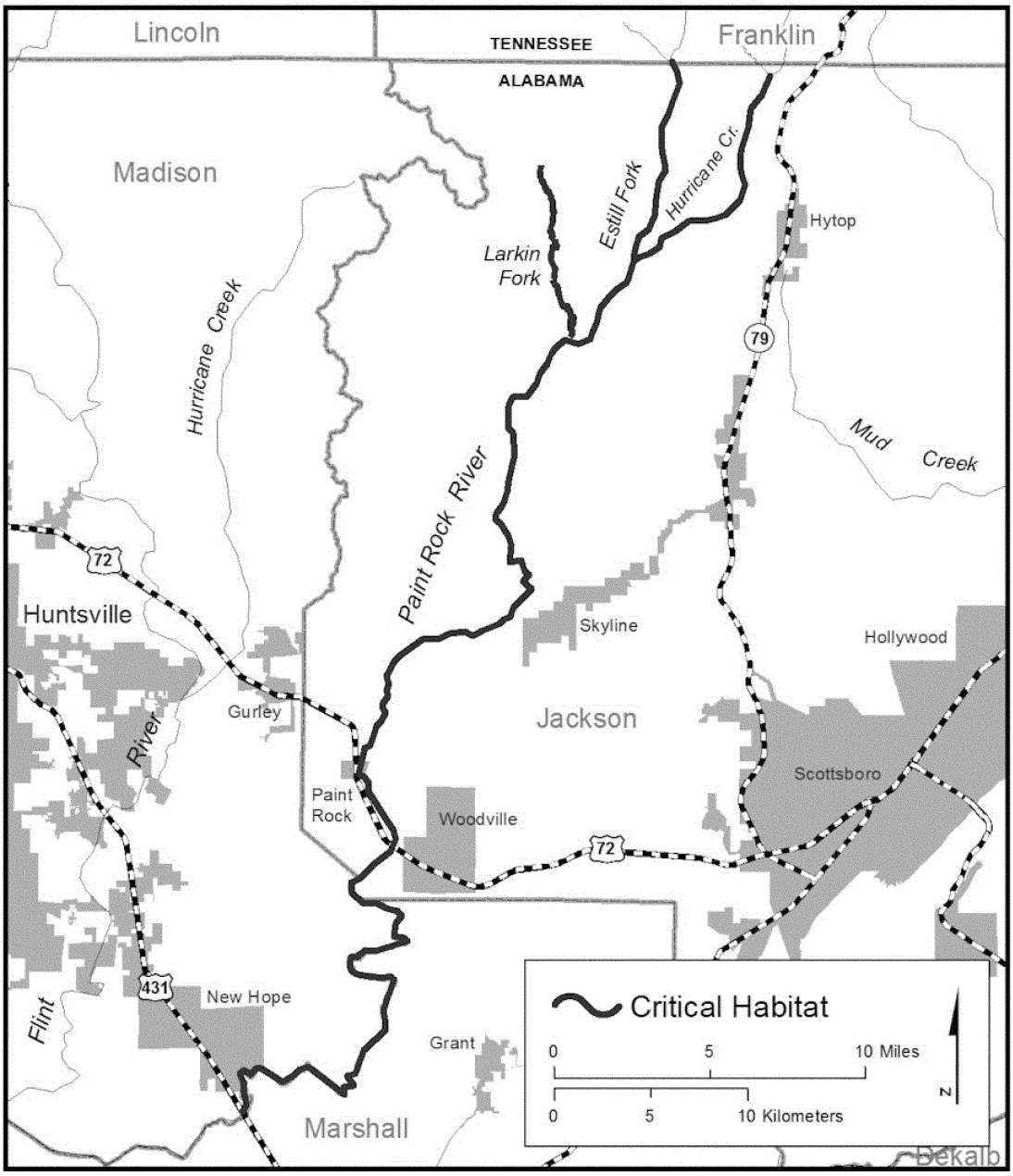


(14) Unit SP9: Paint Rock River, Madison, Marshall, and Jackson Counties, Alabama.

(i) The unit includes approximately 86 rkm (53 rmi) of the Paint Rock River from the Highway 431 Bridge crossing (−86.39109, 34.49926) along the Madison and Marshall County line, AL, upstream to Estill Fork (−86.17048, 34.89811); approximately 11 rkm (7 rmi) of Larkin Fork from its confluence with the Paint Rock River (−86.20833, 34.86218) upstream to its confluence with Bear Creek (−86.22512, 34.94205) in Jackson County, AL. This unit also includes approximately 13 rkm (8 rmi) of Estill Fork from its confluence with the Paint Rock River (−86.17048, 34.89813) upstream to its confluence with Bull Run (−86.15283, 34.99118) in Jackson County, AL. This unit also includes approximately 16 rkm (10 rmi) of Hurricane Creek from its confluence with the Paint Rock River (−86.17048, 34.89813) upstream to its confluence with Turkey Creek (−86.09441, 34.98370) in Jackson County, AL.

(ii) Map of Unit SP9 follows:

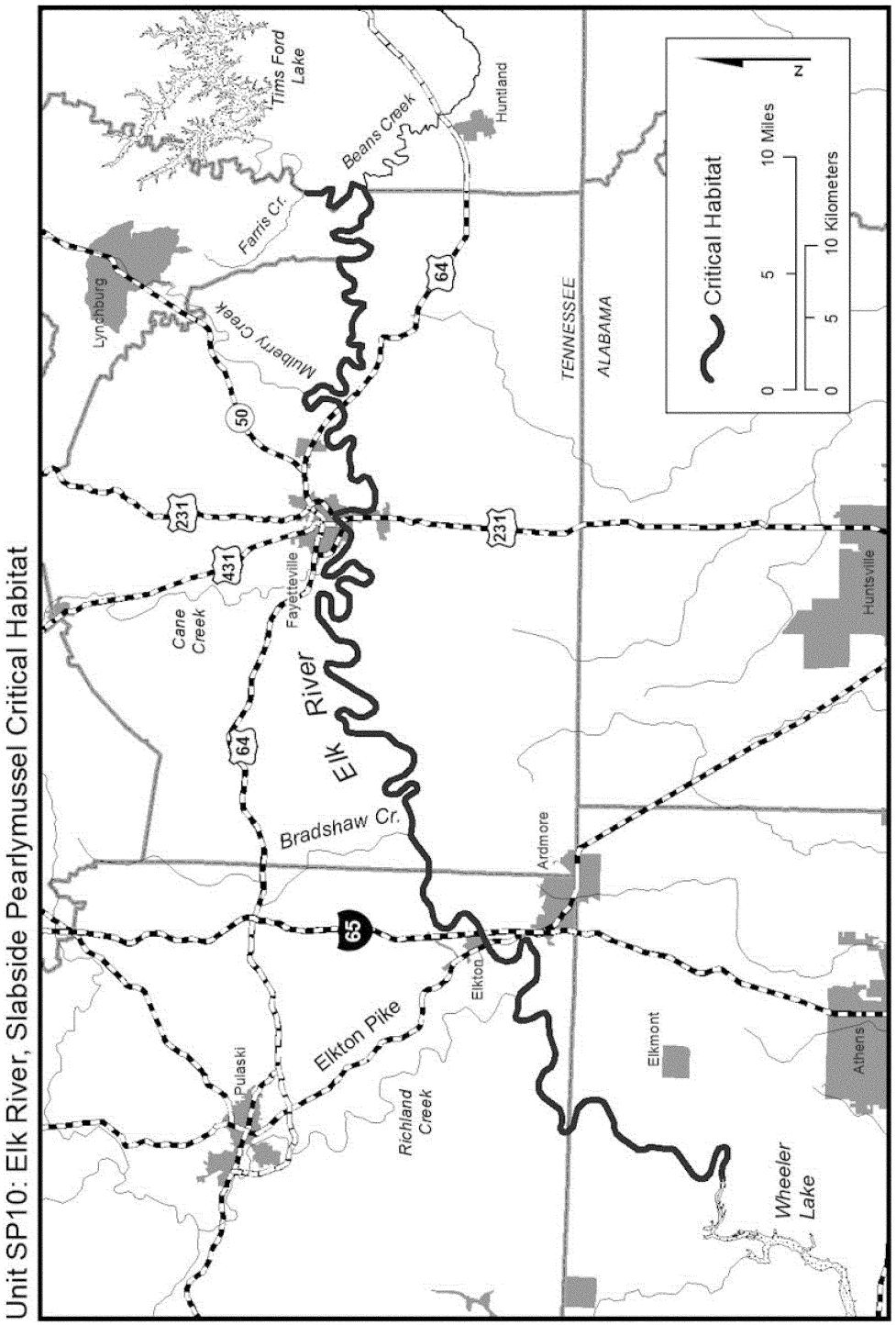
Unit SP9: Paint Rock River, Slabside Pearlymussel Critical Habitat



(15) Unit SP10: Elk River, Limestone County, Alabama, and Giles, Lincoln, Franklin, and Moore Counties, Tennessee.

(i) The unit includes approximately 164 rkm (102 rmi) of the Elk River from its inundation at Wheeler Lake (−87.06503, 34.89788) in Limestone County, AL, upstream to its confluence with Farris Creek (−86.31996, 35.16288) at the dividing line between Franklin and Moore Counties, TN.

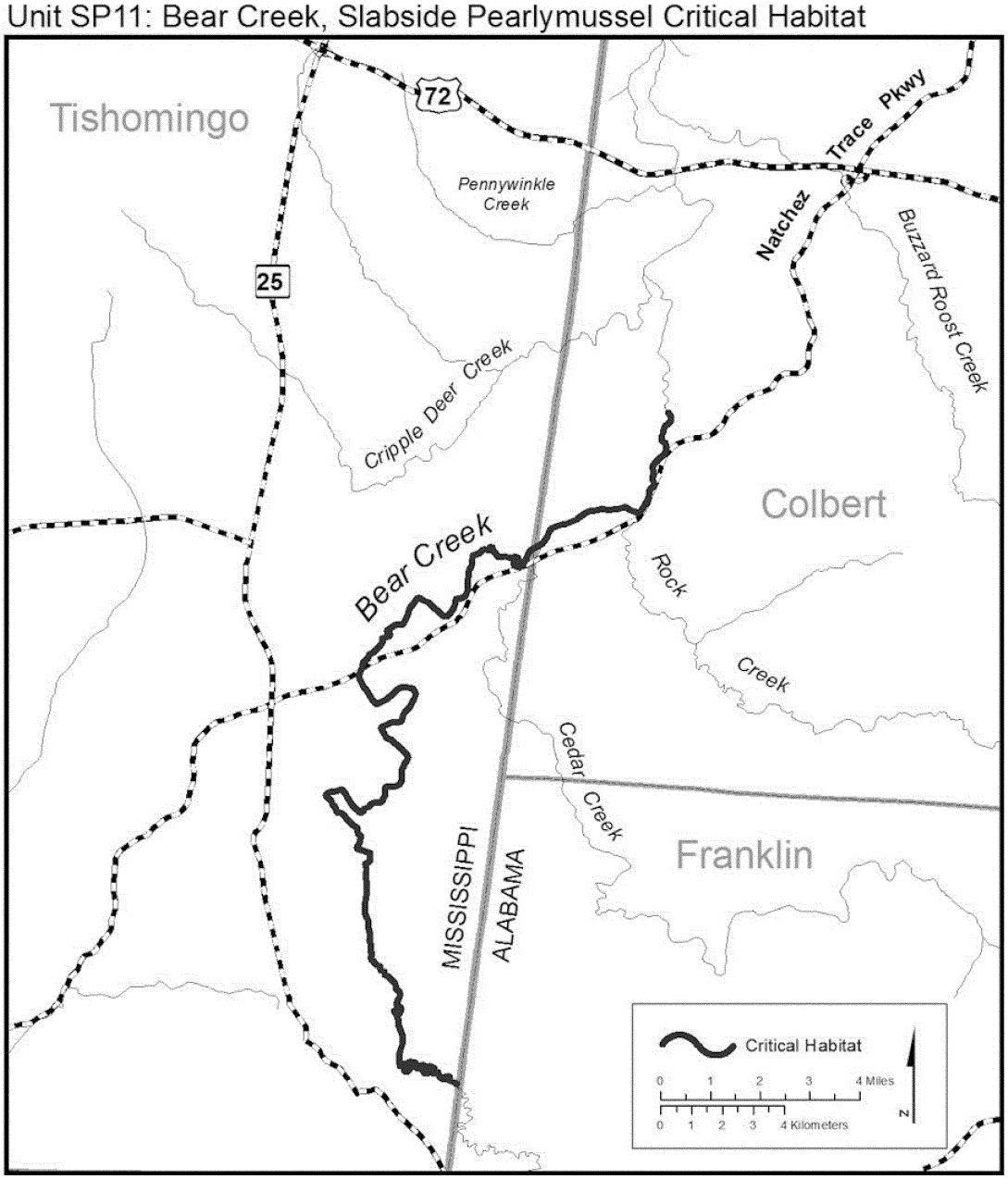
(ii) Map of Unit SP10 follows:



(16) Unit SP11: Bear Creek, Colbert County, Alabama, and Tishomingo County, Mississippi.

(i) The unit includes approximately 42 rkm (26 rmi) of Bear Creek from its inundation at Pickwick Lake at rkm 37 (rmi 23) (−88.08373, 34.68909) in Colbert County, AL, upstream through Tishomingo County, MS, and ending at the Mississippi-Alabama State line (−88.15388, 34. 49139).

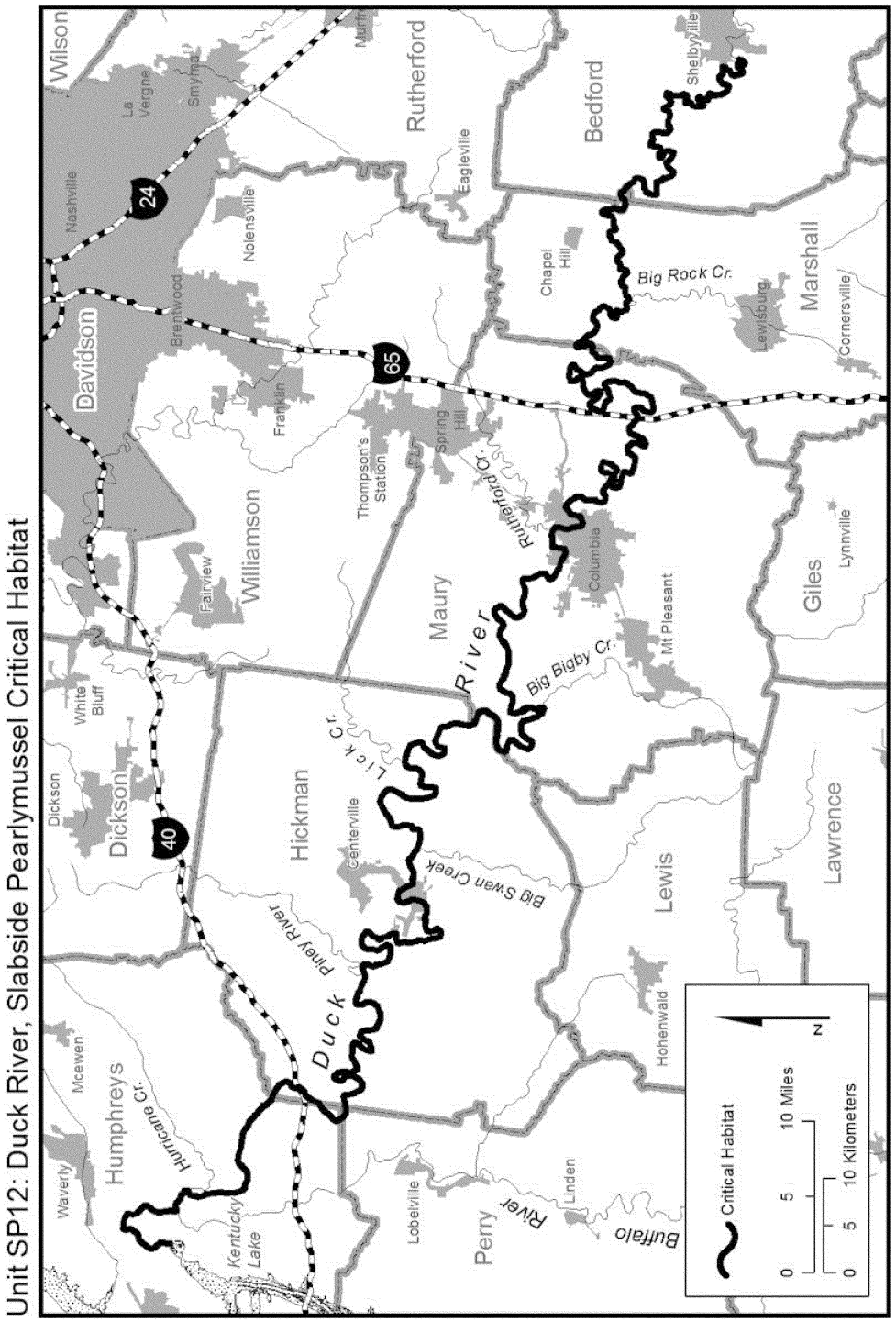
(ii) Map of Unit SP11 follows:



(17) Unit SP12: Duck River, Humphreys, Perry, Hickman, Maury, Marshall, and Bedford Counties, Tennessee.

(i) The unit includes approximately 348 rkm (216 rmi) of the Duck River from its inundation at Kentucky Lake (−87.88011, 36.00244) in Humphreys County, TN, upstream to its confluence with Flat Creek (−86.48778, 35.47209) near Shelbyville in Bedford County, TN.

(ii) Map of Unit SP12 follows:

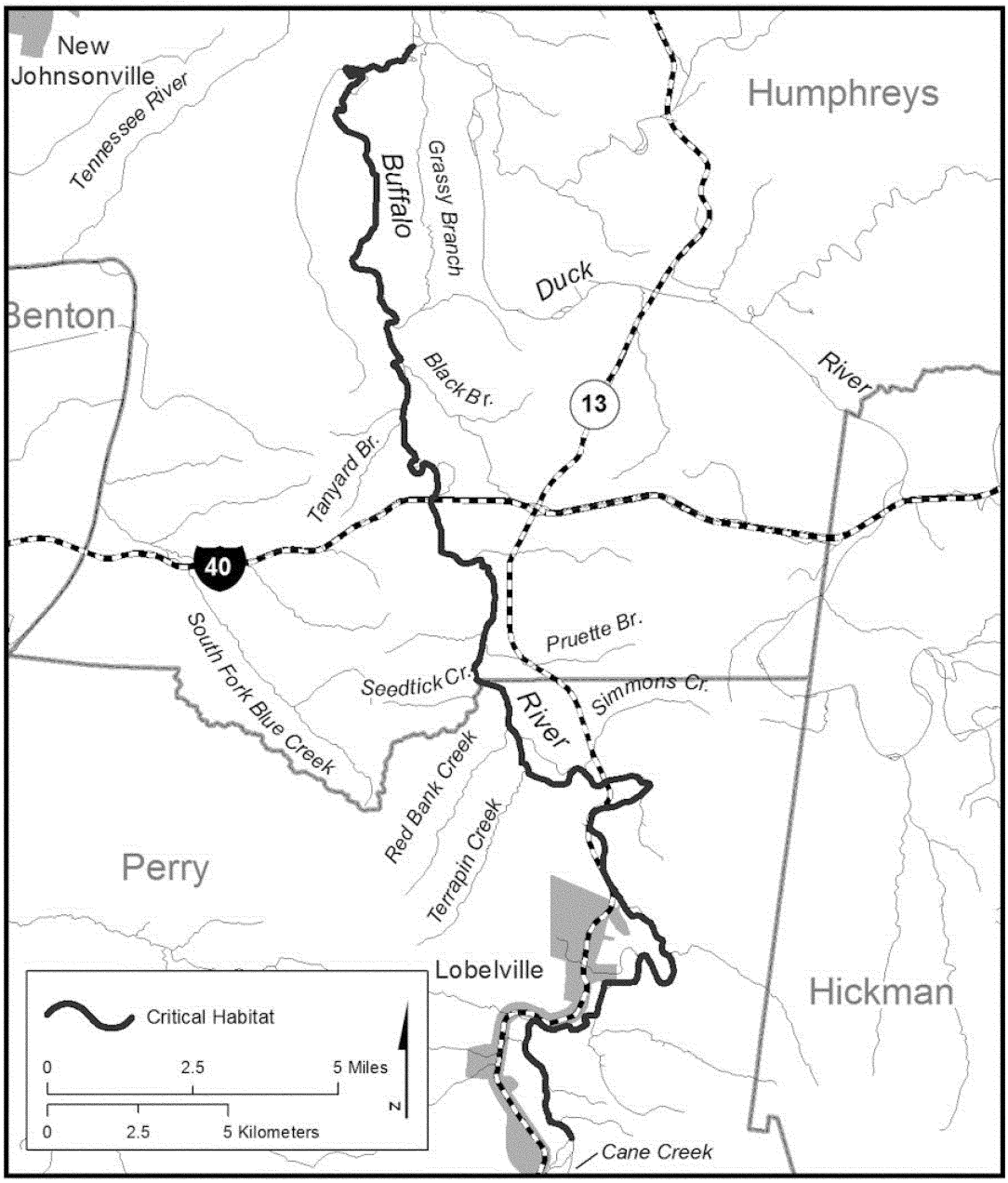


(18) Unit SP13: Buffalo River, Humphreys and Perry Counties, Tennessee.

(i) The unit includes 50 rkm (31 rmi) of the Buffalo River from its confluence with the Duck River (−87.84261, 35.99477) in Humphreys County, TN, upstream to its confluence with Cane Creek (−87.78718, 35.72298) in Perry County, TN.

(ii) Map of Unit SP13 follows:

Unit SP13: Buffalo River, Slabside Pearlymussel Critical Habitat



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Dated: September 17, 2012.

Michael J. Bean,

Acting Principal Deputy Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 2012–24019 Filed 10–3–12; 8:45 am]

BILLING CODE 4310–55–P