other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. This action is not a ''major rule'' as defined by 5 U.S.C. 804(2).

List of Subjects in 40 CFR Part 180

Environmental protection, Administrative practice and procedure, Agricultural commodities, Pesticides and pests, Reporting and recordkeeping requirements.

Dated: September 17, 2013.

Lois Rossi,

Director, Registration Division, Office of Pesticide Programs.

Therefore, 40 CFR chapter I is amended as follows:

PART 180—[AMENDED]

■ 1. The authority citation for part 180 continues to read as follows:

Authority: 21 U.S.C. 321(q), 346a and 371.

■ 2. In § 180.940, alphabetically add the following inert ingredient to the table in paragraph (a) to read as follows:

§ 180.940 Tolerance exemptions for active and inert ingredients for use in antimicrobial formulations (Food-contact surface sanitizing solutions).

* * * * *

(a) * * *

Pesticide chemical	CAS Reg. No.	Limits
* *	*	* * * *
FD&C Yellow No. 5	1934–21–0	When ready for use, the end-use concentration is not to exceed 1000 ppm.
* *	*	* * * *

* * * * *

[FR Doc. 2013–23391 Filed 9–25–13; 8:45 am]

BILLING CODE 6560–50–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

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

1018–AY06

Endangered and Threatened Wildlife and Plants; Endangered Species Status for the Fluted Kidneyshell and Slabside Pearlymussel

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine endangered species status under the Endangered Species Act of 1973 (Act), as amended, for the fluted kidneyshell (*Ptychobranchus subtentum*) and slabside pearlymussel (*Pleuronaia dolabelloides*). These two species are endemic to portions of the Cumberland and Tennessee River systems of Alabama, Kentucky, Mississippi, Tennessee, and Virginia. The effect of this regulation is to add these species to the List of Endangered and Threatened Wildlife and to implement the Federal protections provided by the Act for these species.

DATES: This rule is effective on October 28, 2013.

ADDRESSES: This final rule is available on the Internet at *http://www.regulations.gov* and at *http://www.fws.gov/cookeville.* Comments and materials we received, as well as supporting documentation we used in preparing this rule, are available for public inspection at *http://www.regulations.gov.* All of the comments, materials, and documentation that we considered in this rulemaking are available by appointment, during normal business hours, at: 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.

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:

Executive Summary

Why we need to publish a rule. Under the Endangered Species Act, a species warrants protection through listing if it is endangered or threatened throughout all or a significant portion of its range. Listing a species as an endangered or threatened species can only be completed by issuing a rule. Elsewhere in today's **Federal Register**, we designate critical habitat for the fluted kidneyshell and slabside pearlymussel.

This rule lists the fluted kidneyshell and slabside pearlymussel as endangered species.

The basis for our action. Under the Act, we may determine that a species is endangered or threatened based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined these two mussel species are facing threats based on three of these five factors (A, D, and E). Both species have been eliminated from more than 50 percent of the streams from which they were historically known, and from more than 1,000 river miles (in the Cumberland and Tennessee mainstem rivers alone) from which they were historically known due to a variety of threats, including impoundments, mining, poor water quality, excessive sedimentation, and environmental contaminants.

Peer review and public comment. We sought comments from independent specialists to ensure that our determination is based on scientifically sound data, assumptions, and analyses. We invited these peer reviewers to comment on our listing proposal. We also considered all comments and information we received during the comment period.

Previous Federal Actions

We proposed listing the fluted kidneyshell and slabside pearlymussel as endangered under the Act with critical habitat on October 4, 2012 (77 FR 60804). For a complete history of all Federal actions related to these species, please refer to the October 4, 2012, proposed listing and critical habitat rule. Elsewhere in today's **Federal Register**, we designate critical habitat for the fluted kidneyshell and slabside pearlymussel under the Act.

Background

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). The fluted kidneyshell and slabside pearlymussel, 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, State and Federal 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 northeastern Alabama, then flows across northern Alabama before turning north and flowing through western Tennessee into Kentucky and empties into the Ohio River. The greater 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. For a complete description of the species, please refer to the October 4, 2012, proposed listing and critical habitat rule (77 FR 60804).

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). Adults are filter feeders and generally orient themselves on or near the substrate surface to take in food and oxygen from the water column. Adult mussels also can obtain their food by deposit feeding, pulling in food from the sediment and its interstitial (pore) water, and pedal- (foot-) feeding directly from the sediment (Yeager *et al.* 1994, pp. 217–221; Vaughn and Hakenkamp 2001, pp. 1432–1438; Nichols *et al.* 2005, pp. 90–93). Juveniles typically burrow completely beneath the substrate surface and are deposit or pedal feeders. Until the structures for filter feeding are more fully developed, food particles that adhere to the foot while it is extended outside the shell and are moved 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).

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. Reported longevity of the fluted kidneyshell ranges from 26 to 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. It has been hypothesized that pheromones might trigger synchronous sperm release among males, because all fertilization observed by fluted kidneyshell 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 short (5 days or less) fertilization period of the fluted kidneyshell is thought to occur sometime in late summer or early fall 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 membrane-bound packets 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 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. For example, 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, such as 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 juvenile mussels 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. The fluted kidneyshell's known historical and current occurrences, by water body and county, are shown in Table 1 below (data collected from Gordon and Layzer 1989, entire; Winston and Neves 1997, entire; Parmalee and Bogan 1998, pp. 204–205; Layzer and Scott 2006, p. 481).

TABLE 1—KNOWN HISTORICAL (PRIOR TO 1980) 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.

TABLE 1—KNOWN HISTORICAL (PRIOR TO 1980) AND CURRENT OCCURRENCES FOR THE FLUTED KIDNEYSHELL—Continued

Water body	Drainage	County	State	Historical or 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.
Boiling Fork Creek	Tennessee	Franklin	TN	Historical.
Shoal Creek	Tennessee	Lauderdale, 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 (individuals that are deceased, but still have flesh attached to the shell) have been collected since circa 1980. This criterion 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 this species (26–55 years), they are still thought to occur in these areas. 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. Based on these criteria, we consider 17 of 40 populations of fluted kidneyshell to be extant. Therefore, the fluted kidneyshell has been eliminated from more than 50 percent of streams from which it was historically known.

Several 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 translocated (transferred from one location to another) from the Clinch River into three sites in the upper Duck River and into two sites in the Nolichucky River by Tennessee Wildlife Resource Agency (TWRA) biologists (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 *et al.* 2011, p. 18). The individuals collected appeared in good condition and had grown noticeably since their release (as evidenced by external shell marks) (Hubbs 2011, unpubl. data). Evidence that the reintroduced population of fluted kidneyshell was recruiting was documented in 2012, when a young unmarked sub-adult individual was found in a muskrat midden (pile or mound of shells) near Lillard's Mill in the Duck River (Hubbs 2012, pers. comm.). 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). Both reintroduction sites in the Nolichucky River have retained ''large numbers of live individuals'' (Hubbs 2012, pers. comm.). It is not known if the 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. The only population of the fluted kidneyshell known to be large, stable, and viable is in the Clinch River, but it is 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.* 2012, p. 96). 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 2005–2006 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. Given the reports presented above, at least five 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 according to recent survey efforts (Henley *et al.* 1999, p. 23; Ahlstedt *et al.* 2005, p. 9; Jones and Neves 2007, p. 477; Johnson *et al.* 2012, pp. 94–96). 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 they are likely related to agricultural impacts (Hanlon *et al.* 2009, p. 11).

In summary, the fluted kidneyshell has been eliminated from more than 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 now 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.). Further, 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), suggest that the type species of *Lexingtonia, Unio subplana* Conrad, 1837, is synonymous with *Fusconaia masoni* (Conrad, 1834). *Lexingtonia* is therefore a junior synonym of *Fusconaia* (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. For a complete description of the species, please refer to the October 4, 2012, proposed listing and critical habitat rule (77 FR 60804).

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 Caney Fork River, Tennessee, and in the Tennessee River mainstem from eastern Tennessee to western Tennessee. The slabside pearlymussel's known historical and current occurrences, by water body and county, are shown in Table 2 below (data from Gordon and Layzer 1989, entire; Winston and Neves 1997, entire; Parmalee and Bogan 1998, pp. 150–152).

TABLE 2—KNOWN HISTORICAL (PRIOR TO 1980) AND CURRENT OCCURRENCES FOR THE SLABSIDE PEARLYMUSSEL

Water body	Drainage	County	State	Historical or current
Cumberland River	Cumberland	Davidson, Smith	TN	Historical.
Rock Creek	Cumberland	McCreary	KY	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.
Spring Creek	Tennessee	Polk	TN	Historical.
Sequatchie River	Tennessee	Sequatchie	TN	Historical and Current.
Crow Creek	Tennessee	Jackson	AL	Historical.
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	Colbert	AL	Historical and Current.
Bear Creek	Tennessee	Tishomingo	MS	Historical and Current.

TABLE 2—KNOWN HISTORICAL (PRIOR TO 1980) AND CURRENT OCCURRENCES FOR THE SLABSIDE PEARLYMUSSEL—Continued

Water body	Drainage	County	State	Historical or 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.

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

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, as for the fluted kidneyshell, are generally considered extant (current) if live individuals or fresh dead specimens have been collected since circa 1980. This criterion 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 this species (approximately 40 years), they are still thought to occur in these areas.

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. Accordingly, 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, four individuals were collected in the Powell River (Johnson *et al.* 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 given survey effort (Ahlstedt *et al.* 2005, p. 8). In 2002, Eckert and Pinder (2010, pp. 23–30) observed 2 individuals in quantitative samples and 13 individuals in semi-quantitative samples in the Clinch River at Cleveland Island; 6 years later, they collected 1 individual in quantitative samples and 5 individuals in semi-quantitative samples at the same site. In 2005, approximately 20 individuals were found near Harms Mill (one of five sites surveyed) in the Elk River, Tennessee, and 13 individuals (at 2 of 5 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, the 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 the shell remains of a fresh dead juvenile in 2011 (Johnson 2011, pers. comm.). Given its longevity, small populations of this long-lived species may persist for decades, long after 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 eight 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 three of four 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 living 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 throughout the Duck River, and is found at numerous sites within a 72-rkm (45-rmi) reach of the Paint Rock River (Schilling and Williams 2002, p. 409; Ahlstedt *et al.* 2004, p. 84; Fobian *et al.* 2008, pp. 15–16; Hubbs 2012, pers. obs.). The slabside pearlymussel was reported present but rare at four of six sites sampled in the Duck River during a 2010 quantitative survey (Hubbs *et al.* 2011, pp. 19–25).

Population Estimates and Status

Current status information for most of the 13 extant populations is available from recent survey 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, with relatively good numbers and apparent viability in just two streams (Duck and Paint Rock Rivers). Two of the four largest populations in the mid-1990s have recently experienced 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).

Populations of the slabside pearlymussel appear to be declining rangewide and have been extirpated from more than 50 percent of the streams from which the species was historically known to occur. The slabside pearlymussel was considered threatened by Williams *et al.* (1993, p. 13), but is now 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.). Further, 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 Comments and Recommendations

In the proposed rule published on October 4, 2012 (77 FR 60804), we requested that all interested parties submit written comments on the proposed rule to list the fluted kidneyshell and slabside pearlymussel by December 3, 2012. We also contacted appropriate Federal and State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposal. Newspaper notices inviting general public comment were published in newspapers covering all affected counties in Alabama, Kentucky, Mississippi, Tennessee, and Virginia. During that comment period, we received one request for a public hearing in Virginia. We subsequently reopened the public comment period for the October 4, 2012, proposed rule; made available the draft economic analysis for the proposed critical habitat designation; and announced a public informational session and public hearing on the proposal, which we held on May 14, 2013 (78 FR 25041; April 29, 2013).

During the two comment periods for the proposed rule, we received seven comment letters in response to the proposed determination of endangered species status for the fluted kidneyshell and slabside pearlymussel: Two from peer reviewers, one from a Federal agency, and four from organizations or individuals. We did not receive any comments from State agencies. Four of the seven commenters supported the proposed rule. All substantive information provided during the comment period has either been incorporated directly into this final determination or is addressed below.

Peer Reviewer Comments

In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicited expert opinions from eight knowledgeable individuals with scientific expertise that included familiarity with the two mussels and their habitats, biological needs, and threats. We received responses from two of the peer reviewers.

We reviewed all comments we received from the peer reviewers for substantive issues and new information regarding the listing of the two mussels. The peer reviewers generally concurred with our conclusions and provided additional information on taxonomic classification, life history, current distribution, and threats. Peer reviewers provided minor edits and comments related to the listing of these species, which we incorporated into the final rule as appropriate. The substantive comments we received from one peer reviewer on the critical habitat designation are addressed in the final critical habitat rule published elsewhere in today's **Federal Register**.

Federal Agency Comments

(1) *Comment:* The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) in Kentucky would like to explore opportunities to focus conservation practices, including the Wildlife Habitat Incentives Program (WHIP) and the Environmental Quality Incentives Program, on water quality improvement and restoration in any areas designated as critical habitat for the fluted kidneyshell and other aquatic organisms.

Our Response: The Service concurs that Farm Bill practices implemented by the NRCS can improve water quality and benefit rare aquatic species. We will continue to work with NRCS to identify aquatic habitats for rare aquatic species that would benefit from conservation practices on private lands.

Public Comments

(2) *Comment:* Under the Multi-District Litigation (MDL) settlement agreement, the Service has failed to preserve and consider the ''warranted but precluded'' finding for this listing decision. Further, the Service did not request comments on its decision to exclude this finding, and does not in the proposed rule request public comment on whether a ''warranted but precluded'' finding might be appropriate. The failure to preserve the ''warranted by precluded'' finding negates important conservation mechanisms for the mussels by removing incentives for State and private conservation actions designed to avoid the need for listing.

Our Response: The United States Court of Appeals for the District of Columbia Circuit has recently spoken to these issues. Safari Club International moved to intervene in the MDL, arguing in part that the settlement agreements, ''establish an illegal procedure—the elimination of the Service's statutory authority to find that a proposal to list a species is warranted but precluded by higher priorities.'' On January 4, 2013, the United States Court of Appeals for the District of Columbia Circuit affirmed the District Court's holding that Safari Club International lacked standing to challenge these agreements (see *Safari Club* v. *Salazar,* 704 F.3d 972 (D.C. Cir. 2013)). Among other things, the Court held that neither the Act nor the implementing regulations require the Service to invite comment when it makes a warranted-but-precluded finding. Responding to the concern that the failure to preserve the ''warranted by precluded'' finding negates important conservation mechanisms, the Court held there is nothing to indicate that Congress intended the Act ''to allow [the Service] to delay commencing the rulemaking process for any reason other than the existence of pending or imminent proposals to list species subject to a greater degree of threat [that] would make allocation of resources to such a petition unwise.''

Further, even if additional time for conservation measures was a permissible reason for delaying the rulemaking process, we do not believe failure to preserve the ''warranted by precluded'' finding negates important conservation mechanisms for the mussels by removing incentives for State and private conservation actions designed to avoid the need for listing. As we discussed in the proposed listing rule (77 FR 60804; see Previous Federal Actions), the fluted kidneyshell has been a formal candidate for listing under the Act since 1999, and the slabside pearlymussel has been a formal candidate for listing since 1984. The MDL settlement agreements now provide predictability for stakeholders and local communities. Prior to the settlement agreements, stakeholders were unsure when the Service might pursue a listing determination on a candidate species. The settlements have allowed the Service to establish and make available to the public a multi-year schedule for listing determinations on our candidate species. Stakeholders know in advance, in some cases years in advance, when we will be reviewing these candidates to determine whether a listing proposal is still warranted. The settlements have also served to encourage proactive conservation efforts by landowners, industry groups, local communities, and government agencies. Sometimes proactive conservation efforts can make a listing under the Act no longer necessary. Candidate conservation agreements with assurances (CCAAs) can also be developed and permitted to provide regulatory assurances to participating landowners in the event that listing is still warranted. Conservation efforts developed by stakeholders may also be rolled into habitat conservation plans that provide predictability and compliance with the Act for landowners, industry groups, or local communities.

(3) *Comment:* The Service published a proposed rule that had not undergone peer review, thereby not necessarily reflecting sound science, as required by section 4 of the Act and as required under section 515(b)(2)(A) of the Information Quality Act. Rather than conducting peer review prior to publication of the proposed rule, which would allow the public to view a fully scientifically vetted proposal, the Service opted to conduct peer review contemporaneously with the public comment period. Additionally, there is no indication that the public will have an opportunity to review and comment on the rule as informed by peer review, which is troubling due to the Service relying on decades-old data (e.g., concluding a population to be extant if found post-1980).

Our Response: In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicited expert opinion from eight knowledgeable individuals with scientific expertise that included familiarity with the two mussels and their habitats, biological needs, and threats. In keeping with our policy, we contacted these peer reviewers when the proposed rule was published in the **Federal Register**. We received responses from two of the peer reviewers. We posted all of the comments we received on the October 4, 2012, proposed rule to list the fluted kidneyshell and slabside pearlymussel as endangered under the Act with critical habitat (77 FR 60804) on the Internet at *http://www.regulations.gov* under Docket No. FWS–R4–ES–2012–0004.

We reviewed all comments we received from the peer reviewers and others for substantive issues and new information regarding the listing of both mussels. The peer reviewers generally concurred with our conclusions and provided additional information on taxonomic classification, life history, current distribution, and threats. Peer reviewers provided minor edits and comments related to the listing of these species, which we incorporated into the final rule as appropriate.

Further, section 515(b)(2)(A) of the Information Quality Act requires that each Federal agency issue guidelines ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by the agency. The Service's guidelines, which are updated as of June 2012, are available on the Internet at: *http://www.fws.gov/informationquality/topics/IQAguidelines-final82307.pdf.*

(4) *Comment:* The proposed rule relies on questionable factual and scientific bases by considering populations of the two species to be ''extant'' if specimens have been observed since 1980, a period of over 30 years. This notion appears scientifically untested and misguided given the Service's conclusion that the species have been eliminated from over 50 percent of their habitat. The Service's asserted basis for relying on dated information is circular, and scientific determinations, such as whether a species is extant or endangered, should be based on current, empirical data that are measurable and repeatable.

Our Response: We are required, by statute and regulation, to base our determinations solely on the basis of the best scientific and commercial data available. 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 mussel collections were conducted in the 1980s in the Cumberland and Tennessee River systems; fewer collections were conducted post-1980. Although many of these reaches have not been surveyed since the 1980s, due to the reported longevity of these species (26–55 years; Henley *et al.* 2002, p. 19; Davis and Layzer 2012, p. 92), it is likely they still occur in those reaches.

Approximately 50 percent of the habitat for these species has been eliminated, most of which is due to impoundment, and we have not considered impounded river reaches to be ''extant'' populations.

(5) *Comment:* The preamble of the proposed rule relies in part on climate change as a factor supporting the listing decision and relies on unsubstantiated claims about the effects of climate change on the species. Additionally, such attenuated assertions of endangerment could be used to justify the listing of almost any species and do not constitute scientific evidence of endangerment.

Our Response: 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 and changes in the timing and levels of precipitation, causing more frequent and severe floods and droughts. 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).

Increases in temperature and reductions in flow can also lower dissolved oxygen levels in interstitial habitats, a condition that can be lethal to juveniles (Sparks and Strayer 1998, pp. 131–133). Even small increases in temperature can cause reductions in the survival of freshwater mussel glochidia and juveniles, and temperatures currently encountered in the temperate United States during summers are close to or above the upper thermal tolerances of early life stages of freshwater mussels (Pandolfo *et al.* 2010, pp. 965, 967). 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).

During high flows, flood scour can dislodge mussels, potentially causing them to 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). We have deleted several ''may'' statements regarding how climate change could impact freshwater mussels. We have added in citations regarding studies on how increased temperature impacts larval and juvenile mussels (see *Factor E* for a more detailed discussion).

(6) *Comment:* The proposed rule sets forth an overbroad statement of the types of activities that could constitute a ''take'' of these species. For example,

the rule identifies, ''unauthorized modification of the channel, substrate, temperature, or water flow of any stream or water body in which these species are known to occur'' and ''unauthorized discharge of chemicals or fill material into any waters in which the fluted kidneyshell and slabside pearlymussel are known to occur.'' Additionally, the Service fails to include the key qualification that an action *must* [italics added by commenter for emphasis] proximately cause actual death or injury to a species in order to qualify as ''harm'' within the meaning of ''take.''

Our Response: Section 9 of the Act and our regulations prohibit the take of endangered and threatened species, with certain exceptions. Take is defined by the Act as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is defined in our regulations at 50 CFR 17.3 to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Also in our regulations at 50 CFR 17.3, harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering.

Examples of chemical spills and their effects on mussels, including the fluted kidneyshell, are provided in the *Chemical Contaminants* section under the *Factor E* discussion below. Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Ecological Services Field Office in the State where the activity would take place.

Summary of Changes From Proposed Rule

As a result of the comments we received during the public comment periods (see above), we made the following changes to this final listing rule:

(1) We revised the description of the Tennessee River in the introduction.

(2) We added life-history information to the fluted kidneyshell background section.

(3) We updated the current status of the fluted kidneyshell to reflect recent evidence of recruitment.

(4) We revised the taxonomy section for the slabside pearlymussel.

(5) We revised the current and historical occurrences for both the fluted kidneyshell and slabside pearlymussel.

(6) We have deleted several ''may'' statements regarding how climate change could impact freshwater mussels and added in citations regarding studies on how increased temperature impacts larval and juvenile mussels (see *Factor E* for a more detailed discussion).

We note here, however, that none of these changes affected our determinations for these two species, and as proposed, in this rule we are listing both the fluted kidneyshell and slabside pearlymussel as endangered species.

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.

Factor 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.

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-river-kilometer (rkm) (562-river-mile (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 impounded behind the 36 major dams in the Tennessee River system.

Given projected human 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 historically diverse mussel faunas in the upper Cumberland and Tennessee River system streams. 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. In field studies, Powell River mussel populations were inversely correlated with coal fines in the substrate: Mussels were rare in areas with coal deposits (Kitchel *et al.* 1981, p. 21). In addition, decreased filtration times and increased movements were noted in laboratory-held mussels (Kitchel *et al.* 1981, p. 25). A quantitative study in the Powell River attributed a decline of federally listed mussels and the long-term decrease in overall species composition, since about 1980, 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. Price (2011, p. VIII–3) indicates total dissolved solids concentrations have continued to rise in the Powell and Clinch Rivers, with rapid increases in the upper Powell River, where coal mining is most prominent.

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 further describe the detrimental effects of sedimentation on these species under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence,* 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, stormwater infrastructure, 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 further describe the detrimental effects of chemicals on these species under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence,* 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). Levine *et al.* (2003, pp. 116–117) found that bridges built between 1950 and 1969 caused channel constriction and channel destabilization, resulting in mussel declines up to 300 meters (984 feet) downstream of road crossings. 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. For example, 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, ground and surface 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, and occur throughout the range of both species. Also, the threats are a result of ongoing projects 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, 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 now and into the future.

Factor 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 are not enforced. However, 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.

Factor C. Disease or Predation

Little is known about diseases in mussels (Grizzle and Brunner 2007, p. 6). Several mussel die-offs have been documented during the past 20 years across the United States (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 (e.g., nematodes and mites) and are prey for a few vertebrate species (e.g., raccoons, muskrats, otters, fish, 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).

Neves and Odum (1989, entire) determined that muskrat predation on the fluted kidneyshell represents a localized threat by 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 and, therefore, not a threat to the slabside pearlymussel or fluted kidneyshell at the species' level under current conditions.

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 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.

Factor 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.

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 NPS pollution is the leading remaining cause of water quality problems. The effects of NPS pollutants on specific waters vary and may not always be fully assessed. However, these pollutants have harmful effects on fisheries and wildlife (*http://water.epa.gov/polwaste/nps/whatis.cfm*).

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 of the CWA 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 (see discussion under *Factor A* and *Factor E*). 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 these threats to the fluted kidneyshell and slabside pearlymussel.

Factor 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 for 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). In addition, approximately 18,000 mussels of several species, including the fluted kidneyshell and 750 individuals from three endangered mussel species (tan riffleshell (*Epioblasma florentina walkeri* (=*E. 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 about 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 is thought to be physiologically isolated from respiratory functions; 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). However, a major exception to this hypothesis 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 (e.g., 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).

Chronic 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 are 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).

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's (EPA's) 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 June 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. 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. The timing of 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.* 2007a, 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.* 2007a, 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.* 2007a, p. 2094). Roundup™, technical grade glyphosate isopropylamine salt, and isopropylamine were also acutely toxic to juveniles and glochidia (Bringolf *et al.* 2007a, 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.* 2007b, p. 2101). One study determined that chlorpyrifos was toxic to both fatmucket glochidia and juveniles (Bringolf *et al.* 2007b, 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 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 these 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).

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 life cycle of the southern sandshell, *Hamiota australis,* by reducing the chance that a sight-feeding host fish will encounter the visual display of the mussel's 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. 162–164; 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).

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; see *Chemical Contaminants* section above). High levels of isolation make natural recolonization of any extirpated population unlikely.

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 habitats, and their fish hosts could include changes in stream temperature regimes and changes in the timing and levels of precipitation, causing more frequent and severe floods and droughts. Increases in temperature and reductions in flow can also lower dissolved oxygen levels in interstitial habitats, which can be lethal to juveniles (Sparks and Strayer 1998, pp. 131–133). Even small increases in temperature can cause reductions in the survival of freshwater mussel glochidia and juveniles, and temperatures currently encountered in the temperate United States during summers are close to or above the upper thermal tolerances of early life stages of freshwater mussels (Pandolfo *et al.* 2010, pp. 965, 967). 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 potentially causing them to 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). 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 other 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, particularly juveniles, through direct competition for space and resources (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 of Factor E

Other natural and manmade factors, such as alteration of natural temperature regimes below dams; 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 as exacerbated by climate change, and nonindigenous species are threats to remaining populations of the fluted kidneyshell and slabside pearlymussel across their respective ranges now and into the future.

Determination

We have carefully assessed the best scientific and commercial data available regarding the past, present, and future threats to the fluted kidneyshell and slabside pearlymussel. 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 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 fewer than 20 viable populations, and are currently at risk throughout all of their respective ranges due to ongoing threats of habitat destruction and modification (Factor A) and other natural or manmade factors affecting their continued existence (Factor E). Specifically, primary sources of stress and 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. The data show that existing regulatory mechanisms, such as the CWA, are inadequate to reduce these threats (Factor D). These threats are currently impacting these species throughout their ranges 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). When combining the effects of historical, current, and future habitat loss and degradation; historical and future 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 other 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 data, we list the fluted kidneyshell and slabside pearlymussel as endangered species in accordance with sections 3(6) and 4(a)(1) of the Act.

Resource managers have been making attempts to reintroduce the fluted kidneyshell into historical habitat over the past decade. These mussels have been translocated from the Clinch River into the upper Duck River, Nolichucky River, Big South Fork of the Cumberland River, Little Tennessee River bypass below Calderwood Dam, Indian Creek and North Fork Holston River. Despite all of these reintroduction attempts only three sites are showing signs of any success. The only population of the fluted kidneyshell known to be large, stable, and viable is in the Clinch River, but it is in a relatively short reach of river primarily in the vicinity of the Tennessee-Virginia State line. Based on recent information, the overall population status of the fluted kidneyshell is declining rangewide. We find that a threatened species status is not appropriate for the fluted kidneyshell because of its contracted range, because the threats are occurring rangewide and are not localized, because the threats are ongoing and expected to continue into the future, and because the reintroduction attempts have been unable to stop or reduce the overall population decline.

There have been no reintroductions for the slabside pearly mussel. The slabside pearlymussel has been extirpated from more than 50 percent of the streams from which the species was historically known to occur and occurs in only 13 extant populations. The overall population of the slabside pearlymussel appears to be declining rangewide, with relatively good numbers and apparent viability in just two streams (Duck and Paint Rock Rivers). 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). Therefore, we find that a threatened species status is not appropriate for the slabside pearlymussel because of its contracted range, because the threats are occurring rangewide and are not localized, because the threats are ongoing and expected to continue into the future, and because the species is declining rangewide and many populations are on the verge of extirpation.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. The threats to the survival of these species occur throughout the species' ranges and are not restricted to any particular significant portion of their ranges. Accordingly, our assessment and determination applies to these species throughout their entire ranges.

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 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 draft and final recovery plans will be available on our Web site (*http://www.fws.gov/endangered*) and from our Tennessee Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

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

When this rule is effective (see **DATES**), 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, the States of Alabama, Kentucky, Mississippi, Tennessee and Virginia will 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*.

Please let us know if you are interested in participating in recovery efforts for the fluted kidneyshell and slabside pearlymussel. Additionally, we invite you to submit any new information on these species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as 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 and threatened wildlife. The prohibitions of section 9(a)(2), 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 listing on proposed and ongoing activities within the range of listed species. 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, such as the Asian clam, that compete with or prey upon these mussel species.

(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.

Required Determinations

National Environmental Policy Act

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).

References Cited

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

Authors

The primary authors of this final rule 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.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

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

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

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

§ 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).	Entire	E	825	17.95(f)	NA
*	*	*	*	*	*	*	
Pearlymussel, slabside.	*Pleuronaia dolabelloides*.	U.S.A. (AL, KY, MS, TN, VA).	Entire	E	825	17.95(f)	NA
*	*	*	*	*	*	*	

* * * * *

Dated: September 17, 2013.

Rowan W. Gould,

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

[FR Doc. 2013–23356 Filed 9–25–13; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 622

[Docket No. 001005281–0369–02]

RIN 0648–XC885

Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic; Trip Limit Reduction

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Temporary rule; trip limit reduction.

SUMMARY: NMFS reduces the trip limit for the commercial sector of king mackerel in the eastern zone of the Gulf of Mexico (Gulf) in the northern Florida west coast subzone to 500 lb (227 kg) of king mackerel per day in or from the exclusive economic zone (EEZ). This trip limit reduction is necessary to protect the Gulf king mackerel resource.

DATES: This rule is effective noon, local time, September 25, 2013, through June 30, 2014, unless changed by further notice in the **Federal Register**.

FOR FURTHER INFORMATION CONTACT: Susan Gerhart, telephone: 727–824–5305, email: *susan.gerhart@noaa.gov.*

SUPPLEMENTARY INFORMATION: The fishery for coastal migratory pelagic fish (king mackerel, Spanish mackerel, and cobia) is managed under the Fishery Management Plan for the Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic (FMP). The FMP was prepared by the Gulf of Mexico and South Atlantic Fishery Management Councils (Councils) and is implemented under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) by regulations at 50 CFR part 622.

On April 27, 2000, NMFS implemented the final rule (65 FR 16336, March 28, 2000) that divided the king mackerel Gulf migratory group's Florida west coast subzone of the Gulf eastern zone into northern and southern subzones, and established their separate quotas. The quota for the northern Florida west coast subzone is 178,848 lb (81,124 kg) (50 CFR 622.384(b)(1)(i)(B)(*2*).

The regulations at 50 CFR 622.385(a)(2)(ii)(B)(*2*), provide that when 75 percent of the northern Florida west coast subzone's quota has been harvested until a closure of the subzone has been effected or the fishing year ends, king mackerel in or from the EEZ may be possessed on board or landed from a permitted vessel in amounts not exceeding 500 lb (227 kg) per day.

NMFS has projected that 75 percent of the quota for Gulf group king mackerel from the northern Florida west coast subzone has been reached. Accordingly, a 500-lb (227-kg) trip limit applies to vessels with a commercial permit for king mackerel that possess or land king mackerel in or from the EEZ in the northern Florida west coast subzone effective noon, local time, September 25, 2013. The 500-lb (227-kg) trip limit will remain in effect until the fishery closes or until the end of the current fishing year (June 30, 2014), whichever occurs first.

The Florida west coast subzone is that part of the eastern zone located south and west of 25°20.4′ N. lat. (a line directly east from the Miami-Dade/Monroe County, FL boundary) along the west coast of Florida to 87°31.1′ W. long. (a line directly south from the Alabama/Florida boundary). The Florida west coast subzone is further divided into northern and southern subzones. The northern subzone is that part of the Florida west coast subzone