

downstream to just below Columbia, Maury County, Tennessee (Ortmann 1924); and the Buffalo River (a lower Duck River tributary) (van der Schalie 1973). Biological factors relevant to these freshwater mussels' habitat needs are discussed in the "Methods and Analysis used to Identify Proposed Critical Habitat" section of this proposed rule. We present information below on taxonomy, life history, and distribution specific to these 5 Cumberlandian mussels. Additional information can be found in our final listing determination for these mussels (62 FR 1647) and agency draft recovery plan (April 22, 2003, 68 FR 19844) (Service 2003).

Taxonomy, Life History, and Distribution

Cumberland Elktoe (Alasmidonta atropurpurea (Rafinesque 1831))

Adult Cumberlrand elktoe may reach lengths of up to 10.0 centimeters (cm) (3.9 inches (in)) (Parmalee and Bogan 1998). Gravid females (females with larvae) have been observed between October and May, but fish infected with glochidia of the Cumberland elktoe have not been encountered until March (Gordon and Layzer 1993). While glochidial infestation from this species has been recorded on 5 native fish species, glochidia successfully transformed or developed only on the northern hogsucker (*Hypentelium nigricans*) under laboratory conditions (Gordon and Layzer 1993). This species appears to prefer habitats in medium-sized streams that contain sand and mud substrata interspersed with cobbles and large boulders (Call and Parmalee 1981; Parmalee and Bogan 1998).

The Cumberland elktoe is endemic to the upper Cumberland River system in southeast Kentucky and north-central Tennessee. It appears to have historically occurred only in the main stem of the Cumberland River and primarily its southern tributaries upstream from the hypothesized original location of Cumberland Falls near Burnside, Pulaski County, Kentucky (Cicerello and Laudermilk 2001). This species has apparently been extirpated from the main stem of the Cumberland River as well as Laurel River and its tributary, Lynn Camp Creek (Service 2003). Based on recent records, the Cumberland elktoe continues to persist in 12 Cumberland River tributaries: Laurel Fork, Claiborne County, Tennessee and Whitley County, Kentucky; Marsh Creek, McCreary County, Kentucky; Sinking Creek, Laurel County, Kentucky; Big South Fork, Scott County, Tennessee, and

McCreary County, Kentucky; Rock Creek, McCreary County, Kentucky; North Fork White Oak Creek, Morgan and Fentress County, Tennessee; Clear Fork, Fentress, Morgan, and Scott Counties, Tennessee; North Prong Clear Fork and Crooked Creek, Fentress County, Tennessee; White Oak Creek, Scott County, Tennessee; Bone Camp Creek, Morgan County, Tennessee; and the New River, Scott County, Tennessee (Call and Parmalee 1981; Bakaletz 1991; Gordon 1991; Cicerello 1996; Parmalee and Bogan 1998; Cicerello and Laudermilk 2001; Ronald Cicerello, Kentucky State Nature Preserves Commission, pers. comm. 2002, 2003; Service 2003).

Oyster Mussel (Epioblasma capsaeformis (Lea 1834))

According to Parmalee and Bogan (1998), adult oyster mussels can reach lengths of up to 7.0 cm (2.8 in). Ortmann (1924) was the first to note color differences in female oyster mussel mantle pads (shell lining). The mantle color appears to be bluish or greenish white in the Clinch River, grayish to blackish in the Duck River, and nearly white in the Big South Fork population (Ortmann 1924; Service 2003). In addition, the Duck River form achieves nearly twice the size of specimens from other populations. Two small projections (microattractants) at the junction of the mantle pads serve to attract host fish. Subtle differences in the morphology of these projections or structures also exist in these two populations (J.W. Jones, Virginia Tech, pers.comm. 2002).

Spawning probably occurs in the oyster mussel in late spring or early summer (Gordon and Layzer 1989). Glochidia of the oyster mussel have been identified on seven native host fish species, including the wounded darter (*Etheostoma vulneratum*), redline darter (*E. rufilineatum*), bluebreast darter (*E. camurum*), dusky darter (*Percina sciera*), banded sculpin (*Cottus carolinae*), black sculpin (*C. baileyi*), and mottled sculpin (*C. bairdi*) (Yeager and Saylor 1995; J.W. Jones and R.J. Neves, U.S. Geological Survey (USGS), unpublished (unpub.) data 1998). Oyster mussels typically occur in sand and gravel substrate in streams ranging from medium-sized creeks to large rivers (Gordon 1991; Parmalee and Bogan 1998). They apparently prefer shallow riffles and shoals and have been found associated with water willow (*Justicia americana*) beds (Ortmann 1924; Gordon 1991; Parmalee and Bogan 1998).

The oyster mussel was one of the most widely distributed Cumberlandian

mussel species, with historical records existing from six States (Alabama, Georgia, Kentucky, North Carolina, Tennessee, and Virginia). It has apparently been eliminated from both main stems of the Cumberland and Tennessee Rivers and a large number of their tributaries (Fraley and Ahlstedt 2001; S.A. Ahlstedt, USGS, pers. comm. 2002; Service 2003). This mussel is now only extant in a handful of stream and river reaches in four States in the Tennessee and Cumberland River systems, including the Duck River, Maury and Marshall Counties, Tennessee; Powell River, Claiborne and Hancock Counties, Tennessee, and Lee County, Virginia; Clinch River, Hancock County, Tennessee, and Scott, Russell, and Tazewell Counties, Virginia; Nolichucky River, Hamblen and Cocke Counties, Tennessee; and Big South Fork of the Cumberland River, McCreary County, Kentucky, and Scott County, Tennessee (Wolcott and Neves 1990; Ahlstedt 1991; Bakaletz 1991; Gordon 1991; Ahlstedt and Tuberville 1997; S.A. Ahlstedt, pers. comm. 2002; Service 2003).

Cumberlandian Combshell (Epioblasma brevidens (Lea 1831))

Most mature Cumberlandian combshell are approximately 5 cm (2 in) in length, but may reach 8 cm (3.1 in) (Parmalee and Bogan, 1998). Spawning in this species most likely occurs in late winter (Gordon 1991). Glochidia of the Cumberlandian combshell have been identified on several native host fish species, including the wounded darter, redline darter, bluebreast darter, snubnose darter (*Etheostoma simotermum*), greenside darter (*E. blennioides*), logperch (*Percina caprodes*), banded sculpin, black sculpin, and mottled sculpin (Yeager and Saylor 1995; J.W. Jones and R.S. Neves, USGS, unpub. data 1998). This species is typically associated with riffle and shoal areas in medium to large-sized rivers (Gordon 1991; Parmalee and Bogan 1998). It is found in substrata ranging from coarse sand to cobble (Gordon 1991).

This species, like the oyster mussel, was once widely distributed, historically occurring in five States (Alabama, Kentucky, Mississippi, Tennessee, and Virginia). It has likewise apparently been eliminated from the mainstems of the Tennessee and Cumberland Rivers and several of their tributaries (Service 2003). It is now restricted to five stream reaches. The Cumberlandian combshell persists in Bear Creek, Colbert County, Alabama, and Tishomingo County, Mississippi; Powell River, Claiborne and Hancock