

AN ASSESSMENT AND STRATEGY FOR
CONSERVATION OF AQUATIC RESOURCES
ON THE DANIEL BOONE NATIONAL FOREST,
INTERIM REPORT, APRIL 2001



Center for Aquatic Technology Transfer
1650 Ramble Road
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061-0321

Prepared by the Aquatic Resource Assessment Team

Ceas. Eastern Kentucky University [personal communication]; R. Cicerello. Kentucky State Nature Preserves Commission [personal communication]).

In Kentucky, the only extant population of blotched chub (*Erimystax insignis*) and one of two populations of the sawfin shiner (*Notropis sp. cf. spectrunculus*) are found in the Big South Fork drainage. In the entire Kentucky River drainage, the only known populations of northern madtom (*Noturus stigmosus*) occupy the Middle and South Forks of the Kentucky River.

In addition, several lampreys receive conservation recognition. Two nonparasitic lampreys—the northern brook lamprey (*Ichthyomyzon fossor*) and the mountain brook lamprey (*Ichthyomyzon greeleyi*)—are found on the DBNF in the Kentucky River and Cumberland River units of the forest, respectively. For these species, concerted efforts to collect aggregated spawning adults in the spring may reveal larger numbers and wider distribution on the DBNF than are presently known (Etnier and Starnes 1993).

Mussel distribution and abundance

The Daniel Boone National Forest lies within a region, the southeastern United States, that harbors the richest freshwater mussel fauna on Earth (Williams and others 1993). Kentucky has a higher diversity of freshwater mussels than any other state except Tennessee and Alabama (Cicerello and others 1991). The running waters of the DBNF support a significant proportion of this globally unique mussel fauna. At least 67 native mussel species are known presently or historically from rivers and streams in the DBNF (Table 4). This fauna represents greater than half of the total native mussel fauna of Kentucky (Cicerello and others 1991) and 22% of the fauna of North America (Williams and others 1993).

Historically, mussel diversity was unevenly distributed among the eight DBNF drainage units. Units in the Cumberland River drainage had greater diversity—an average of 40 species per unit—than units in the Kentucky and Licking River drainages, with an average of 25 species per unit. However, because habitat destruction has resulted in the loss of many species in the Cumberland drainages, mussel diversity is relatively evenly distributed among hydrologic units. Today, Cumberland River units have an average of 25 species, and the Kentucky and Licking River units have an average of 24 (Table 4). About 67 percent of the entire Cumberland River drainage fauna is found in the Cumberland River units in the DBNF. The Kentucky and Licking River units also harbor a large proportion of the total fauna of their respective drainage basins, at 55 and 57 percent, respectively.

Mussel communities in the DBNF are composed of representatives of all major higher taxonomic groups of mussels. The family Margaritiferidae is represented by one species, the spectaclecase (*Cumberlandia monodonta*) but this species may be extirpated (Cicerello and Laudermilk 1997). All remaining species are members of the family Unionidae. Within the Unionidae, two subfamilies are currently recognized, the Anodontinae and Ambleminae (Lydeard and others 1996). The Anodontinae are represented in the DBNF by 11 species, including the genera

Alasmidonta, *Anodontoides*, *Lasmigona*, *Pegias*, *Pyganodon*, *Simpsonaias*, *Strophitus*, and *Utterbackia*. The Amblesminae is composed of at least three clades: the Lampsilini, the Pleurobemini, and a *Quadrula/Megaloniaias* clade (Lydeard and others 1996). The Lampsilini is represented by at least 32 species, including the genera *Actinoniaias*, *Epioblasma*, *Lampsilis*, *Leptodea*, *Medionidus*, *Potamilus*, *Ptychobranchnus*, *Toxolasma*, and *Villosa*. The Pleurobemi is represented by at least six species, including the genera *Elliptio* and *Pleurobema*. The genera *Fusconaia* and *Plethobasus* also may be included, but their phylogenetic positions are unresolved (Lydeard and others 1996). The *Quadrula/Megaloniaias* clade is represented by at least five species in these genera. Other genera within Amblesminae that are represented on the DBNF include *Amblesma*, *Cycloniaias*, *Dromus*, *Hemistena*, *Truncilla*, and *Tritogonia*; their systematic relationship within the subfamily is unresolved.

Presently, only one introduced bivalve, the Asian clam (*Corbicula fluminea*), is known to exist on the DBNF. *Corbicula* was introduced into the Pacific Northwest in the 1930's and has since spread across most of North America (Counts 1986). This species is abundant in most large streams on the DBNF and in degraded streams it may be the only living bivalve. *Corbicula* is absent only from isolated headwater streams. Although some have speculated that *Corbicula* may have negative effects on native bivalves, such effects are not well documented. Since its introduction into the Great Lakes from Europe, the zebra mussel, *Dreissena polymorpha*, has spread across much of eastern North America in the last 10 years (Strayer 1991). There are no confirmed sightings of the zebra mussel in the DBNF; however, the range of this species is expanding, and it may be expected to appear in the waters of the DBNF at any time. The most dense, self-sustaining populations of zebra mussels are in large, algae-rich rivers or lakes, and it is uncertain how well the zebra mussel will be able to adapt to small upland streams and rivers (Strayer 1991). However, unlike *Corbicula*, the zebra mussel is known to have serious negative effects on native mussels (Haag and others 1993), and the establishment of this species in DBNF waters would pose a significant threat to native unionids.

Table 4. Distribution of freshwater mussels in hydrologic units within the Daniel Boone National Forest proclamation boundaries. Unit boundaries are defined in the text and in figure 2.

Species	Licking River	Middle Fork Kentucky River	South Fork Kentucky River	Kentucky River-Red River	Upper Cumberland River	Rockcastle River	Cumberland River-Buck Creek	Big South Fork River
<i>Actinonaias ligamentina</i> Mucket	N	N	N	N	N ⁶	N	EX	EX
<i>Actinonaias pectorosa</i> Pheasantshell	-	-	-	-	N	N	N	N
<i>Alasmidonta atropurpurea</i> Cumberland elktoe	-	-	-	-	N	-	-	N
<i>Alasmidonta marginata</i> Elktoe	EX ²	-	-	N	EX ⁴	N	EX	N
<i>Alasmidonta viridis</i> Slippershell mussel	N	-	N	N	N	N	N	N
<i>Amblema plicata</i> Threeridge	N	N	N	N	-	N	-	-
<i>Anodontooides denigratus</i> Cumberland papershell	-	-	-	-	N	-	-	-
<i>Cumberlandia monodonta</i> Spectaclecase	-	-	-	-	EX ⁷	-	EX	-
<i>Cyclonaias tuberculata</i> Purple wartyback	N	-	EX ³	-	EX ⁸	N	N	N
<i>Dromus dromas</i> Dromedary pearlymussel	-	-	-	-	-	-	EX	EX
<i>Ellipsaria lineolata</i> Butterfly	?	-	-	-	EX ⁴	-	EX	-
<i>Elliptio crassidens</i> Elephant-ear	-	-	-	-	N ⁶	N	EX	N
<i>Elliptio dilatata</i> Spike	N	N	N	N	N	N	N	N
<i>Epioblasma arcaeformis</i> Sugarspoon	-	-	-	-	-	-	-	EX
<i>Epioblasma biemarginata</i> Angled riffleshell	-	-	-	-	-	-	-	EX
<i>Epioblasma brevidens</i> Cumbertandian combshell	-	-	-	-	-	EX	N	N
<i>Epioblasma capsaeformis</i> Oyster mussel	-	-	-	-	EX ⁴	EX	N	N
<i>Epioblasma florentina</i> Tan riffleshell	-	-	-	-	-	-	EX	-
<i>Epioblasma haysiana</i> Acornshell	-	-	-	-	-	-	EX	EX
<i>Epioblasma lewisii</i> Forkshell	-	-	-	-	-	-	EX	-

Species	Licking River	Middle Fork Kentucky River	South Fork Kentucky River	Kentucky River- Red River	Upper Cumberland River	Rockcastle River	Cumberland River- Buck Creek	Big South Fork River
<i>Epioblasma obliquata</i> Catspaw	-	-	-	-	-	-	EX	-
<i>Epioblasma torulosa rangiana</i> ^b Northern blossom	-	-	-	-	-	-	-	-
<i>Epioblasma triquetra</i> Snuffbox	N	N	N	N	-	-	N	EX
<i>Fusconaia flava</i> Wabash pigtoe	N	N	N	N	-	-	EX	-
<i>Fusconaia subrotunda</i> Long-solid	-	-	N	-	-	EX	EX	EX
<i>Hemistena lata</i> Cracking pearl mussel	-	-	-	-	-	-	EX	EX
<i>Lampsilis cardium</i> Plain pocketbook	N	N	N	N	N	N	N	N
<i>Lampsilis fasciola</i> Wavy-rayed lamp mussel	-	N	N	N	N	N	N	N
<i>Lampsilis ovata</i> Pocketbook	-	-	-	-	EX	?	EX	EX
<i>Lampsilis siliquoidea</i> Fatmucket	N	N	N	N	-	-	-	-
<i>Lampsilis teres</i> Yellow sandshell	-	-	-	EX?	-	-	-	-
<i>Lasmigona complanata</i> White heelsplitter	N	-	-	-	-	-	-	-
<i>Lasmigona costata</i> Fluted-shell	N	N	N	N	N ^a	N	N	N
<i>Leptodea fragilis</i> Fragile papershell	N	N	?	N	-	N	N	N
<i>Ligumia recta</i> Black sandshell	-	-	-	EX?	N ^a	N	EX	N
<i>Medionidus conradicus</i> Cumberland moccasins shell	-	-	-	-	EX ^a	N	N	N
<i>Megalonaias nervosa</i> Washboard	N	N	N	N	-	-	-	-
<i>Obliquaria reflexa</i> Threehorn wartyback	N	-	-	-	EX ^a	EX	-	EX
<i>Obovaria subrotunda</i> Round hickorynut	N	N	N	N	-	EX	N	N
<i>Pegius fabula</i> Little-wing pearl mussel	-	-	-	-	-	N	-	N
<i>Plethobasus cyphus</i> Sheepnose	N	-	-	-	-	-	-	-

Species	Licking River	Middle Fork Kentucky River	South Fork Kentucky River	Kentucky River- Red River	Upper Cumberland River	Rockcastle River	Cumberland River- Buck Creek	Big South Fork River
<i>Pleurobema clava</i> clubshell	-	-	-	-	-	-	-	-
<i>Pleurobema coccineum</i> Round pigtoe	N	N	N	N	-	N	EX	N
<i>Pleurobema oviforme</i> Tennessee clubshell	-	-	-	-	-	-	N	NN
<i>Pleurobema pyramidatum</i> Pyramid pigtoe	-	-	-	-	EX	-	-	EX
<i>Potamilus alatus</i> Pink heelsplitter	N	N	N	N	N ^a	N	N	N
<i>Potamilus ohioensis</i> Pink papershell	-	-	-	-	-	N ^a	N	N-
<i>Ptychobranclus fasciolaris</i> Kidneyshell	N	N	N	N	N ^a	N	N	N
<i>Ptychobranclus subtentum</i> Fluted kidneyshell	-	-	-	-	-	EX ^a	N	NN
<i>Pyganodon grandis</i> Giant floater	N	-	N	-	-	N	-	N
<i>Quadrula cylindrica</i> rabbitsfoot	-	-	EX	-	-	EX	EX	EX
<i>Quadrula metanevra</i> Monkeyface	N	-	-	-	-	-	-	EX-
<i>Quadrula pustulosa</i> Pimpleback	N	N	N	N	N ^a	N	EX	N
<i>Quadrula quadrula</i> Mapleleaf	N	-	-	N	-	-	-	-
<i>Quadrula tuberosa</i> Rough rockshell	-	-	-	-	-	-	EX	-
<i>Simpsonaias ambigua</i> Salamander mussel	P	N	N	N	-	-	-	-
<i>Strophitus undulatus</i> Creeper	N	-	N	N	-	N	-	N
<i>Toxolasma lividus</i> Purple lilliput	-	-	-	-	-	N	N	N
<i>Toxolasma parvus</i> Lilliput	-	-	-	-	-	-	-	EX
<i>Tritogonia verrucosa</i> Pistolgrip	N	N	N	N	N ^a	N	N	N
<i>Truncilla donaciformis</i> Fawnsfoot	-	-	-	-	EX ^a	-	-	EX
<i>Truncilla truncata</i> Deertoe	N	-	EX?	-	EX ^a	N	EX	EX

Species	Licking River	Middle Fork Kentucky River	South Fork Kentucky River	Kentucky River- Red River	Upper Cumberland River	Rockcastle River	Cumberland River- Buck Creek	Big South Fork River
<i>Uterbackia imbecillis</i> Paper pondshell	N	-	-	-	-	-	-	N
<i>Villosa iris</i> Rainbow	-	-	N	N	EX ^a	N	N	N
<i>Villosa lienosa</i> Little spectaclecase	N	N	N	EX?	EX	EX	EX	-
<i>Villosa taeniata</i> Painted creekshell	-	-	-	-	EX ^a	N	N	N
<i>Villosa trabalis</i> Cumberland bean	-	-	-	-	EX ^a	N	N	N
Total Extant Species (N)	28	19	23	23	16	30	23	31
Total May be Extirpated (EX?)	1	-	2	3	1	-	-	-
Total Extirpated (EX)	-	-	1	-	14	7	23	15
Total Probable (P)	1	-	-	-	-	-	-	-

N = verified extant species, P = probable occurrence (occurs upstream or downstream of proclamation boundaries), EX = considered extirpated, EX? = may be extirpated, and ? = may occur, but records are questionable.

^a Species is known to exist in the Upper Cumberland River unit only below Cumberland Falls. ^bNot recorded from Daniel Boone National Forest waters, but known to occur in parts of the Licking and Kentucky River drainages peripheral to the proclamation boundaries. Suitable habitat for establishment of populations and recovery of the species may exist within proclamation boundaries.

Mussel assemblages among drainages

The Cumberland River drainage contains representatives of two faunal elements—the Interior Basin fauna and the Cumberlandian fauna (Johnson 1978). The Interior Basin fauna is composed of species that are endemic to the Ohio River basin, as well as species more widely distributed in drainages east of the Rocky Mountains. Within DBNF proclamation boundaries, the original fauna of the Cumberland River system contained about 40 species derived from the Interior Basin fauna. Today, common members of Interior Basin fauna in the Cumberland River units include the mucket (*Actinonaias ligamentina*), threeridge, (*Amblema plicata*), spike (*Elliptio dilatata*), fluted-shell (*Lasmigona costata*), round pigtoe (*Pleurobema coccineum*), pink heelsplitter (*Potamilus alatus*), kidneyshell (*Ptychobranthus fasciolaris*), pimpleback (*Quadrula pustulosa*), creeper (*Strophitus undulatus*), and pistolgrip (*Tritogonia verrucosa*).

The Cumberlandian fauna is composed of species endemic to the Cumberland and/or Tennessee River systems. The original fauna on the Daniel Boone included about 18 Cumberlandian species. Today, the DBNF harbors at least 12 Cumberlandian species, including species endemic to the Cumberland River drainage only (Cumberland elktoe, *Alasmidonta atropurpurea* and Cumberland papershell, *Anodontoides denigratus*), and species found exclusively in the Cumberland and Tennessee River drainages: pheasantshell (*Actinonaias pectorosa*), Cumberland

combshell (*Epioblasma brevidens*), oyster mussel (*E. capsaeformis*), Cumberland moccasinshell (*Medionidus conradicus*), little-wing pearly mussel (*Pegias fabula*), Tennessee clubshell (*Pleurobema oviforme*), fluted kidneyshell (*Ptychobranchius subtentum*), purple lilliput (*Toxolasma lividus*), painted creekshell (*Villosa taeniata*), and Cumberland bean (*V. trabalis*). Cumberland Falls has acted as a barrier to upstream dispersal of mussel species in the drainage, and streams above Cumberland Falls lack many species found in the remainder of the drainage. However, one species, the Cumberland papershell (*Anodontooides denigratus*), is considered endemic to the Cumberland River drainage above the Falls.

The Licking and Kentucky River units have mussel assemblages derived exclusively from Interior Basin fauna. Common species include those listed for the Cumberland River units, with the addition of the Wabash pigtoe (*Fusconaia flava*). There are no endemic species in either drainage; and mussel faunas of both drainages are very similar. The Licking River unit contains at least 30 species, and the Kentucky River units combined contain at least 31. All but one of these species are found in both drainages and at least 25 species occur in both drainages within the proclamation boundaries of the DBNF.

Commercial importance

Historically, large streams in the DBNF supported limited commercial harvest of mussels, both for pearling and for use in the manufacture of shell buttons. The Cumberland River mainstem and the Middle Fork Kentucky River were the most heavily exploited (Wilson and Clark 1914, Dangle 1922). There is currently little or no harvest of shells in DBNF streams, and streams harboring federally listed species are off limits to commercial harvest. However, because of high prices paid for shells that are used in the cultured pearl industry, streams such as the South Fork and Middle Fork Kentucky River, Redbird River, and Rockcastle River may receive attention from commercial musselers. Other streams in Kentucky have been subjected to poaching and overharvest of mussels (Crowell and Kinman 1993). Forest Service personnel should be aware of the potential for such occurrences.

Extirpated and imperiled freshwater mussels

Streams within the DBNF proclamation boundaries have lost a large portion of their faunas over the last 50 years. Seventeen species are thought to have been extirpated from the DBNF (Table 4). However, individual drainage units have lost as many as 23 species (50 percent of their total fauna). Most extirpated species are big-river and/or Cumberlandian species. Of those extirpated, six are considered extinct throughout their range (*Epioblasma arcaeformis*, *E. biemarginata*, *E. florentina*, *E. haysiana*, *E. lewisii*, and *Quadrula tuberosa*). Most extirpations have resulted from elimination of big-river habitat by dams or water pollution from coal mining activities. *Quadrula sparsa* (Appalachian monkeyface, Federal endangered species) is listed as having occurred historically in the DBNF. This species probably never inhabited the Cumberland River drainage. The historical report of its occurrence likely was based on a misidentification of *Q. tuberosa* (R.R. Cicerello, personal communication).

The greatest known loss has been in the Cumberland River drainage, where an average of 37 percent of the fauna has been lost in each drainage unit (range = 19 to 50 percent). The direct cause of most of these extirpations was the construction of Wolf Creek dam in 1950, which eliminated all big-river habitat in this region (Cicerello and Laudermilk 1997). However, coal mining pollution has seriously affected the fauna in other streams and has greatly reduced the range of species not eliminated by impoundment. As early as 1949, fauna of the lower Big South Fork had been decimated by acid mine waste, and had declined from 38 species in 1911 (Wilson and Clark 1914) to 16 species (Neel and Allen 1964). Today, the lower, unimpounded sections of Big South Fork (Bear Creek confluence downstream) support few, if any, viable populations of mussels (Richardson 1989, Bakaletz 1991). Similarly, in 1911 the mainstem Rockcastle River was described as one in which "The mussels were excessively abundant. . . and, in favored localities. . . *Medionidus conradicus* covered the entire bottom. . ." (Wilson and Clark 1914). This stream continued to support dense, diverse mussel communities into the early 1960's. However, by 1993, seven species were considered extirpated from the mainstem (including *Medionidus conradicus*) and densities of other species, such as *Villosa trabalis*, had declined to precipitously low levels (Cicerello 1993, 1994). During the same period, the mainstem Cumberland River below Cumberland Falls declined from 16 species in 1961 to 10 species in 1993 and numbers of almost all remaining species had declined by greater than 90 percent (Cicerello and Laudermilk 1997). More recently, the Little South Fork supported one of the most diverse and abundant mussel communities remaining in the entire Cumberland River drainage until large-scale strip-mining began in the drainage in the 1980's. From 1981 to 1987, the number of live species collected in the drainage declined from 19 to 12 and at some sites in the lower river, mussels were eliminated almost completely (Starnes and Bogan 1982, Anderson and others 1991). By 1998, only nine species were found alive and four of these were represented by one or two individuals in the entire drainage (Warren and Haag 1999).

Based on available information, the Licking and Kentucky River units appear to have experienced fewer species extirpations than the Cumberland. In the Licking River unit, only one species is thought to be extirpated; in the Kentucky River units a total of six species are thought to be extirpated from one or more hydrologic units (Table 4). However, no complete surveys were conducted in any of these drainages prior to widespread habitat destruction in the mid to late 20th Century and many streams in the region were not surveyed at all until recently (Cicerello 1996a and personal communication). The only early published survey results available for the upper Kentucky River were by Dangler (1922). Several species that are absent today were reported in the upper Kentucky River, including *Cyprogenia stegaria*, *Pleurobema clava*, *Quadrula cylindrica*, and *Epioblasma torulosa rangiana*. These species and perhaps others likely occurred in most larger streams in the upper Kentucky River and Licking River drainages. The low number of known extirpations in the Licking and Kentucky River units may be a reflection of a lack of historical collections within those drainages. Species extirpations in the upper Kentucky and Licking River units are probably due mostly to water pollution from coal mines, municipal sewage, and the construction of the Cave Run and Buckhorn reservoirs on the Licking and Middle Fork Kentucky Rivers, respectively.

The remaining high-quality streams in the DBNF provide important refuge for at least 15 imperiled mussel species, including 5 federally endangered species: Cumberlandian combshell (*Epioblasma brevidens*), oyster mussel (*E. capsaeformis*), Cumberland bean (*Villosa trabalis*), Cumberland elktoe (*Alasmidonta atropurpurea*), and little-wing pearl mussel (*Pegias fabula*). On the DBNF, all of these species occur only in the Cumberland River units. The Cumberland elktoe is endemic to the Cumberland River drainage and the largest known populations of this species on Earth are found in the DBNF in Marsh Creek (Upper Cumberland River unit) and Rock Creek (Big South Fork unit). Similarly, most known large populations of the Cumberland bean occur in the DBNF in Horse Lick Creek and Sinking Creek (Rockcastle River unit), Big South Fork, and Little South Fork (Big South Fork unit). The DBNF supports the only Kentucky populations of the Cumberlandian combshell and oyster mussel in the Big South Fork and Buck Creek. The little-wing pearl mussel, occurring in Horse Lick Creek (Rockcastle River unit), Big South Fork, and Little South Fork (Big South Fork unit), is known in Kentucky outside of the forest from only one specimen found at a single site in the Cumberland River drainage in western Kentucky (Cicerello and others 1991). Although *Pegias fabula* and *Villosa trabalis* were known from the Little South Fork as recently as 1987, these species may now be extirpated from that stream (Warren and Haag 1999).

In addition to the five species known to occur within the DBNF proclamation boundaries, two other federally endangered species, the northern riffleshell (*Epioblasma torulosa rangiana*) and clubshell (*Pleurobema clava*), are known from parts of the Licking and Kentucky drainages peripheral to the proclamation boundaries. It is likely that these species once occurred in the DBNF and continued survey efforts may reveal relict populations.

Nine mussel species are considered threatened or endangered by the American Fisheries Society (AFS) (Williams and others 1993) and/or the Kentucky State Nature Preserves Commission (KNP) (1996a) and one species is considered of special concern by the KNP (Table 5). Six of these occur in the Cumberland River units and four in the Kentucky and Licking River units. The fluted kidneyshell (*Ptychobranthus subtentum*) is found in Kentucky only within the proclamation boundaries in Rock Creek, Big South Fork, Little South Fork (Big South Fork unit), Horse Lick Creek (Rockcastle River unit), and Buck Creek. The DBNF supports the best and perhaps only viable populations of Tennessee clubshell (*Pleurobema oviforme*) and purple lilliput (*Toxolasma lividus*), in Kentucky in Buck Creek, Little South Fork (Big South Fork unit), and Horse Lick Creek (Rockcastle River unit). These species are known elsewhere in Kentucky only from small populations in the Cumberland River drainage in western Kentucky (Cicerello and others 1991). The remaining imperiled species are known from other populations outside the DBNF but streams in the Forest support the most important populations of these species in the State, or the only populations in a particular drainage basin. One of the largest Kentucky populations of elktoe (*Alasmidonta marginata*) occurs in the Red River, along with an important population of the salamander mussel (*Simpsonaias ambigua*). The only known populations of snuffbox (*Epioblasma triquetra*) in the entire Kentucky River drainage are currently found on the DBNF in the Red River and in the South and Middle Fork Kentucky River units. Similarly, the only known population of the long-solid (*Fusconaia subrotunda*) is found in the South Fork Kentucky River.

Table 5. Conservation status of mussels in the Daniel Boone National Forest^a

Species	U.S. Fish and Wildlife Service	American Fisheries Soc.	Kentucky State Preserves	Nature Commission	Daniel Boone National Forest
<i>Alasmidonta atropurpurea</i> Cumberland elktoe	E	E	E	E	E
<i>Alasmidonta marginata</i> Elktoe	-	SC	T	T	C
<i>Anodontooides denigratus</i> Cumberland papershell	-	-	E	E	PS
<i>Cumberlandia monodonta</i> Spectaclecase	-	T	E	E	S
<i>Dromus dromas</i> Dromedary pearlymussel	E	E	EX	EX	E
<i>Epioblasma arcaeformis</i> Sugarspoon	-	EX	EX	EX	-
<i>Epioblasma biemarginata</i> Angled riffleshell	-	EX	E	E	-
<i>Epioblasma brevidens</i> Cumberlandian combshell	E	E	E	E	E
<i>Epioblasma capsaeformis</i> Oyster mussel	E	E	E	E	E
<i>Epioblasma flexuosa</i> Leafshell	-	EX	EX	EX	-
<i>Epioblasma florentina florentina</i> Yellow blossom	E	EX	EX	EX	E
<i>Epioblasma florentina walkeri</i> Tan riffleshell	E	E	EX	EX	E
<i>Epioblasma haysiana</i> Acornshell	-	EX	EX	EX	-
<i>Epioblasma lewisi</i> Forkshell	-	EX	EX	EX	-
<i>Epioblasma obliquata obliquata</i> Catspaw	E	E	E	E	E
<i>Epioblasma torulosa rangiana</i> Northern riffleshell	E	E	E	E	E
<i>Epioblasma triquetra</i> Snuffbox	-	T	SC	SC	S

Species	U.S. Fish and Wildlife Service	American Fisheries Soc.	Kentucky State Nature Preserves Commission	Daniel Boone National Forest
<i>Fusconaia subrotunda</i> Long-solid	-	SC	T	C
<i>Hemistena lata</i> Cracking pearlymussel	E	E	EX	E
<i>Lampsilis ovata</i> Pocketbook	-	SC	E	C
<i>Pegias fabula</i> Little-wing pearlymussel	E	E	E	E
<i>Plethobasus cyphus</i> Sheepnose	-	T	SC	S
<i>Pleurobema clava</i> Tennessee clubshell	E	E	E	E
<i>Pleurobema oviforme</i> Tennessee clubshell	-	SC	E	S
<i>Pleurobema pyramidatum</i> Pyramid pigtoe	-	T	E	-
<i>Ptychobranhus subtentum</i> Fluted kidneyshell	-	SC	T	C
<i>Quadrula cylindrica cylindrica</i> Rabbitsfoot	-	T	T	-
<i>Quadrula tuberosa</i> Rough rockshell	-	EX	EX	-
<i>Simpsonaias ambigua</i> Salamander mussel	-	SC	T	S
<i>Toxolasma lividus</i> Purple lilliput	-	SC	E	S
<i>Villosa lienosa</i> Little spectaclecase	-	CS	SC	C
<i>Villosa trabilis</i> Cumberland bean	E	E	E	E

^aStatus sources are: U.S. Fish and Wildlife Service, American Fisheries Society (Williams and others 1993), Kentucky State Nature Preserves Commission (1996b), and the Daniel Boone National Forest. E = endangered, T = threatened, SC = of special concern, EX = presumed extirpated from Kentucky or extinct, CS = currently stable, C=conservation species, S=sensitive, PS=proposed sensitive.