

Statues of State Listed Freshwater Mussel Populations in North Carolina

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Abstract: From 1986 through 1994, the North Carolina Wildlife Resources Commission (NCWRC) has surveyed the state for freshwater mussel populations. To date, 215 extant populations of 27 state designated endangered, threatened, or special concern species have been documented, including 46 good, 49 fair, and 120 poor quality populations.

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There has been a dramatic nationwide decline in the distribution and abundance of freshwater mussels during the past 30 years (Williams et al. 1993). Some of the documented threats include sedimentation (Ellis 1936, Harman 1974, Loar et al. 1980, Smith 1981), contaminants (Mathis and Cummings 1973, Fuller 1974, Havlik and Marking 1987, Goudreau 1988), insecticides (Salanki and Varanka 1978), and impoundments (Stansbery 1973). Approximately 72% of the known freshwater mussel species and subspecies in the United States and Canada are now considered to be endangered, threatened, or species of special concern (Williams et al. 1993). The U.S. Fish and Wildlife Service (USFWS) estimates that 65 species of mussels may become extinct during the next 10 years (Shannon et al. 1992).

Freshwater mussel species declines have been documented in North Carolina. In the early 1900s, approximately a dozen freshwater mussel species were known from the French Broad River Basin (Ortmann 1918); today this diversity is represented by 1 live specimen which was found in a tributary of the French Broad River (USFWS unpubl. data). More recent surveys show that extirpations are occurring rapidly. For example, the Atlantic pigtoe (*Fusconaia masoni*) has been essentially extirpated from the upper 75% of the Cape Fear River Basin since the 1970s (Fuller 1973, Shelley 1987, NCWRC unpubl. data). During the past dozen years, the distribution of the Tar spiny mussel (*Elliptio steinstansana*) has been reduced to just 2 reproducing populations in tributaries of the Tar River. In the early 1980s, it was easily found above and below Rocky Mount in the Tar River (Stansbery pers. commun. 1992, Biggins pers. commun.

1993). In 1975, the green floater (*Lasmigona subviridis*) was considered a common species in North Carolina; now it is listed by the State as endangered. The green floater was considered the most common mussel species at some stations in the Neuse River below Raleigh in the 1950s (Walter 1954). Currently, there are no known extant populations of this species in the Neuse River below Raleigh. Four mussels are now on the Federal list as endangered, another is being proposed as endangered, and the U.S. Fish and Wildlife Service has identified approximately a dozen additional freshwater mussel species that may be considered for listing. Since these sensitive, filter feeding species were once abundant in many creeks and rivers and were reduced to ecological insignificance in the same areas, it is essential that local, state, and federal government agencies in cooperation with landowners give greater protection to these species.

Methods

Since 1986, the North Carolina Wildlife Resources Commission has obtained funding from the U.S. Fish and Wildlife Service, Nongame and Endangered Wildlife Program, North Carolina Recreation and Natural Heritage Trust, North Carolina Department of Transportation, U.S. Forest Service, local governments, the U.S. Department of Energy, and environmental consulting firms to survey the state's lotic habitats and natural lakes for freshwater mussel populations. Highest priority was given to habitats that included areas with high water quality as determined by the state's Division of Environmental Management, dominant land use being forestry with some agricultural and urbanizing influences, and historical freshwater mussel records. Although the survey focus was often directed toward a single species, there were efforts to document the status of all other mussel species in the study areas. When areas were surveyed for other taxa, such as endangered or threatened freshwater fish, mussel data also were acquired. This allowed for an efficient use of time and financial resources.

Whenever possible in lotic habitats, surveys by canoe were conducted from 1 bridge crossing to the next downstream bridge crossing—often more than 16 km surveyed each day. All fresh mussel shells from muskrat middens were collected, identified to species, and measured. Where muskrat middens were uncommon, live mussel diversity, abundance, and size data were collected by using a variety of techniques including searches by Scuba diving, sight searches, or tactile searches by hand. When surveys for live mussels were conducted, catch-per-unit-efforts (CPUE's) were also calculated. (A CPUE was calculated for a species at a survey station by dividing the number of individuals collected by the number of man-hours expended.)

Descriptors such as healthy, unhealthy, viable, or not viable were not used since we lack adequate knowledge to describe populations as healthy or viable. Instead, the descriptors good, fair, and poor were used. In broad, general terms, "good" populations of mussels had several age classes represented at 2 or more

survey stations at least 1.6 km apart in a subbasin, and there was evidence of recent reproduction (individuals <5 years of age). The presence of gravid females indicated that densities were high enough to allow successful transfer of sperm from males to females. "Fair" populations had these characteristics at only 1 survey station, and "poor" populations lacked these characteristics at all survey stations in a subbasin.

Results and Discussion

It is often difficult to determine where 1 population ends and another begins. In general, individuals of 1 species existing in 1 subbasin and clearly showing a high probability of genetic exchange are considered a population.

To date, 215 extant populations of 27 state designated endangered, threatened, or special concern species (Table 1) have been documented in North Car-

Table 1. Federal (USFWS 1994), state (Adams et al. 1990), and global (Williams et al. 1993) conservation statuses of endangered (E), threatened (T), and special concern (SC) freshwater mussel species with documented extant populations in North Carolina. (C2 indicates a Federal candidate, Category 2 species. E* indicates proposed endangered.)

Species	Fed.	St.	Global
Green floater (<i>Lasmigona subviridis</i>)	C2	T	T
Carolina heelsplitter (<i>Lasmigona decorata</i>)	E	E	E
Tennessee heelsplitter (<i>Lasmigona holstonia</i>)	C2	E	SC
Little-wing pearl mussel (<i>Pegias fabula</i>)	E	E	E
Brook floater (<i>Alasmidonta varicosa</i>)	C2	T	T
Triangle floater (<i>Alasmidonta undulata</i>)		T	SC
Slippershell mussel (<i>Alasmidonta viridis</i>)		E	SC
Appalachian elktoe (<i>Alasmidonta raveneliana</i>)	E*	E	E
Dwarf wedgemussel (<i>Alasmidonta heterodon</i>)	E	E	E
Squawfoot (<i>Strophitus undulatus</i>)		T	
Alewife floater (<i>Anodonta implicata</i>)		SC	
Waccamaw spike (<i>Elliptio waccamawensis</i>)	C2	T	SC
Tar spiny mussel (<i>Elliptio steinstansana</i>)	E	E	E
Roanoke slabshell (<i>Elliptio roanokensis</i>)		T	SC
Yellow lance (<i>Elliptio lanceolata</i>)	C2	T	E
Pod lance (<i>Elliptio folliculata</i>)		SC	SC
Spike (<i>Elliptio dilatata</i>)		SC	
Atlantic pigtoe (<i>Fusconaia masoni</i>)	C2	T	T
Tidewater mucket (<i>Leptodea ochracea</i>)		SC	SC
Carolina creekshell (<i>Villosa vaughaniana</i>)	C2	SC	SC
Rainbow (<i>Villosa iris</i>)		SC	
Savannah lilliput (<i>Toxolasma pullus</i>)	C2	T	T
Eastern pondmussel (<i>Ligumia nasuta</i>)		SC	SC
Eastern lampmussel (<i>Lampsilis radiata</i>)		SC	
Wavy-rayed lampmussel (<i>Lampsilis fasciola</i>)		SC	
Waccamaw lampmussel (<i>Lampsilis crocata</i>)		SC	
Yellow lampmussel (<i>Lampsilis cariosa</i>)	C2	T	T

olina's freshwaters (Figs. 1, 2). These include 46 good, 49 fair, and 120 poor quality populations. All state-listed mussel species have 6 or fewer good populations, and only 1 species has more than 8 populations considered good or fair. In general, listed species in 3 subfamilies—Ambleminae, Lampsilinae, and Anodontinae—are represented mostly by poor or fair quality populations. Since significant reproduction appears to be lacking, such populations have an increased probability of extirpation.

These 215 populations exist in 14 major river basins across the state (Fig. 3). River basins with 1 or 2 state listed species include the Catawba, Broad, New, Watauga, Nolichucky, and French Broad. River basins with 6 state listed mussel species include the Little Tennessee, Waccamaw, and Chowan. All other basins provide habitat for 8 to 10 state listed species.

Given the present statuses of freshwater mussel populations in North Carolina; the large number of small, fragmented populations; and increases in point and nonpoint sources of pollution across the state, there will probably be an

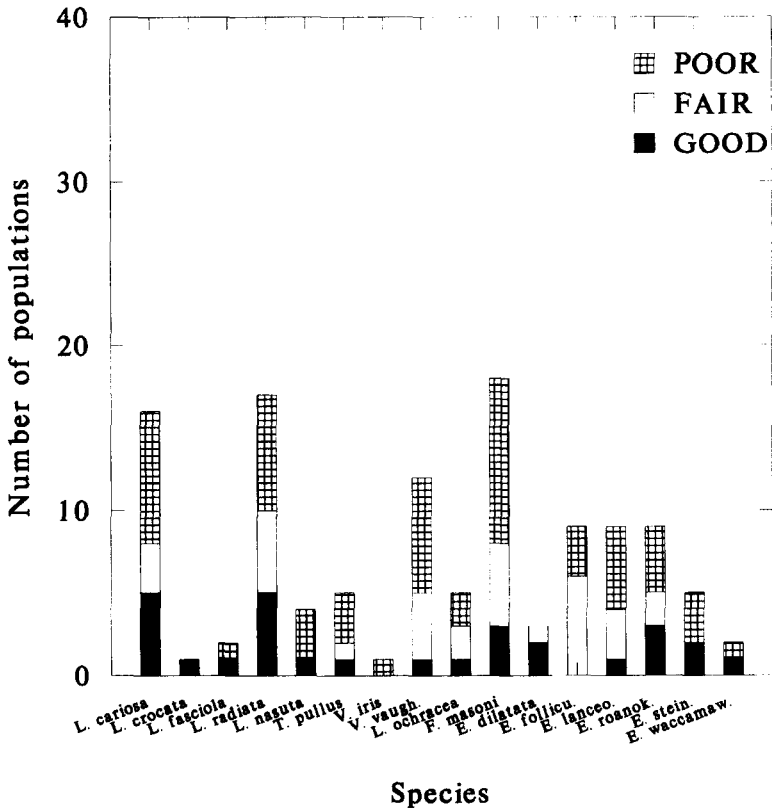


Figure 1. Number of good, fair, and poor quality populations of North Carolina's state listed mussel species in the subfamilies Ambleminae and Lampsilinae.

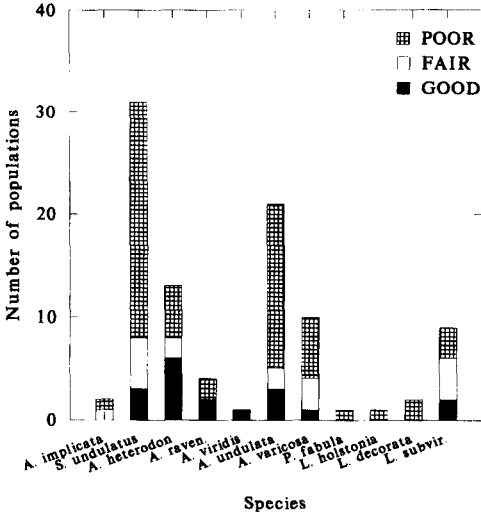


Figure 2. Number of good, fair, and poor quality populations of North Carolina's state listed mussel species in the subfamily Anodontinae.

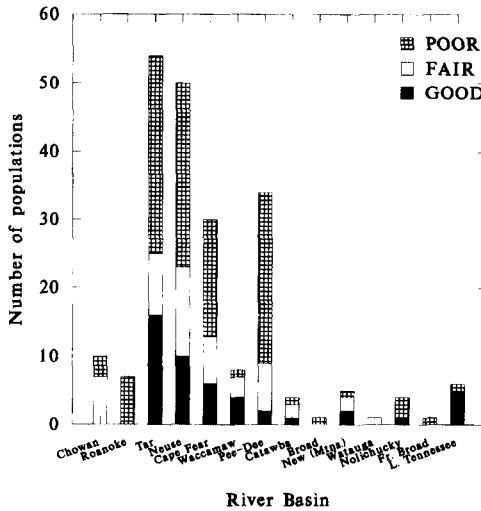


Figure 3. Number of good, fair, and poor quality populations of North Carolina's state listed mussel species in 14 major river basins.

accelerating loss of populations in the future. Therefore, particularly for species such as the yellow lance, Atlantic pigtoe, Carolina creekshell, green floater, and brook floater, federal designation of these species as endangered or threatened may be required within the next few years.

Clearly, the safety net of federal protection for freshwater mussels needs to be extended well before a species has been reduced to only 10 to 20 good populations. Otherwise, listed freshwater mussel species will be increasingly described as "basket cases" without any chance of survival.

The Southeast is considered the center of aquatic biological diversity on the North American continent (Folkerts pers. commun. 1994). Extensive inventories, monitoring, and management of freshwater mussels, other aquatic taxa, and associated wetland and terrestrial taxa in essential habitat areas are needed throughout the Southeast. Essential habitats for aquatic species, which include associated wetland and terrestrial habitats, range from approximately 100 km² to several thousand km² (NCWRC 1994). If these areas can be identified and conserved throughout the Southeast, then significant conservation of associated taxa, including other species of concern, will be better ensured.

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