

can be reduced by increasing the number, expanding the range, and increasing the density of populations. Preventing the extinction of those species listed as endangered, and arresting the continued decline of those species listed as threatened are the recovery objectives outlined in the recovery plan for these 11 mussels. The recovery plan emphasizes: (1) Protection of surviving populations of these mussels and their stream and river habitats; (2) enhancement and restoration of habitats; (3) and population management, including augmentation and reintroduction of the 11 mussels into portions of their historic ranges to obtain these recovery objectives. In determining which areas to propose as critical habitat for these 9 mussels, we considered the factors discussed in the recovery plan, as well as the mussels' historical distributions and the extent of current occupied habitats and their management potential.

We began our analysis by considering the historic ranges of the 11 mussel species. A large proportion of the Basin's streams and rivers that historically supported these mussels has been modified by existing dams and their impounded waters. Therefore, extensive portions of the upper Tombigbee River, Black Warrior River, Tallapoosa River, Alabama River, and Coosa River cannot be considered essential to the conservation of these species because they no longer provide the physical and biological features that are essential for their conservation (see "Primary Constituent Elements" section).

Free-flowing river segments and their tributaries peripheral to the known

historic range of the 11 mussels, and without any records of the species also cannot be considered to be essential to the conservation of these species (*e.g.*, Mobile/Tensas River, lower Tombigbee River, etc.) and so were not considered further. Several streams with single site occurrence records of a single species were also not considered essential because of limited habitat availability, isolation, degraded habitat, and/or low management value or potential (*e.g.*, Etowah River, Big Wills Creek, Little River, Armuchee Creek, Euharlee Creek, Limestone Creek, etc.).

We then evaluated streams and rivers within the historic ranges of these 11 species which had evidence that these mussels had occurred there at some point (*i.e.*, collection records). We eliminated from consideration areas from which there have been no collection records for several decades and/or are remote from currently occupied areas (*e.g.*, portions of the lower Alabama River, lower Cahaba River, Mulberry Fork, Noxubee River, Talladega Creek, and others). In evaluating streams for the upland combshell and southern acornshell, specifically, we considered their historic ranges (Black Warrior, Cahaba, and Coosa River drainages). We selected those areas which have the best potential for and we believe are essential to the conservation of these two mussels based on collection history, surviving mussel species assemblages, and habitat conditions.

This analysis resulted in the identification of 25 of the 26 stream or river reaches within the Basin (habitat units) occupied by 1 or more of the 11 species and that contain the primary constituent elements as indicated by the

presence and persistence of one or more of the listed mussels (Figure 1, Units 1 to 25). We believe that these areas also support darters, minnows, and other fishes that have been identified as hosts or potential hosts for one or more of the mussels, as evidenced by fish collection records (Mettee *et al.* 1996), the persistence of the mussels over extended periods of time, or field evidence of recruitment (Evans 2001, Hartfield and Jones 1990, and Herod *et al.* 2001, etc.). We consider all of these 25 of the 26 reaches essential for the conservation of these species. As discussed in the Recovery Plan, long-term conservation of these 11 mussels is unlikely in their currently reduced and fragmented state. Therefore, at a minimum, it is essential to include in this designation the reaches within the historic range that still contain mussels and the primary constituent elements of the habitat.

We then considered whether this essential area was adequate for the conservation of each of the 11 mussel species. Given that threats to the species are compounded by their limited distribution and isolation, it is unlikely that currently occupied habitat is adequate for the conservation of all 11 species. Conservation of these species requires expanding their ranges into currently unoccupied portions of their historic habitat because small, isolated, aquatic populations are subject to chance catastrophic events and to changes in human activities and land use practices that may result in their elimination. Larger, more contiguous populations can reduce the threat of extinction due to habitat fragmentation and isolation.

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