

Riverine Aquatic Communities
Southern Blue Ridge Mountains

Riverine aquatic habitat for our purposes encompasses the vast array of mountain rivers and streams from headwater seeps and springs through major waterways, including impoundments upon those waterways. Montane riverine habitats are important for a number of reptiles and amphibians including certain turtles, frogs, and salamanders that utilize aquatic habitats during part or all of their life cycle. These habitats are also important for a variety of mammals that are semi-aquatic and/or that have an aquatic food base (e.g., water shrews, muskrats, beavers, river otters, and certain bats). Selected bird species also rely upon aquatic habitats including rivers and streams to provide habitat or a food base, such as various waterfowl, wading birds, and certain songbirds like the Louisiana waterthrush.

Mountain rivers and streams provide a number of important habitat, life cycle, or prey components to a vast assemblage of terrestrial, semi-aquatic, and aquatic wildlife. In addition, the importance of maintaining water quality of riverine habitats cannot be overstated, both in terms of the species that rely upon rivers and streams for habitat, as well as those species which rely indirectly upon the habitat by virtue of provision of habitat for their prey. A list of priority species of conservation concern that may use bogs and associated wetlands is provided in Table 1.

Table 1. Priority species associated with montane riverine aquatic habitat.

Group	Scientific name	Common name	State status* (Federal status)
Mammals	<i>Sorex palustris</i>	Water Shrew	SC
Amphibians	<i>Cryptobranchus alleganiensis</i>	Hellbender	SC
	<i>Desmognathus marmoratus</i>	Shovel-nosed Salamander	
	<i>Eurycea guttolineata</i>	Three-lined Salamander	
	<i>Eurycea junaluska</i>	Junaluska Salamander	T
	<i>Eurycea longicauda</i>	Longtail Salamander	SC
	<i>Necturus maculosus</i>	Common Mudpuppy	SC
Reptiles	<i>Apalone spinifera spinifera</i>	Eastern Spiny Softshell	SC
	<i>Sternotherus minor</i>	Loggerhead Musk Turtle	SC
	<i>Thamnophis sauritus sauritus</i>	Common Ribbonsnake	
*Abbreviations			
T	Threatened		
E	Endangered		
SC	Special Concern		
SR	Significantly Rare		

Information concerning other fully aquatic taxa (fish, mussels, crayfish, and snails) associated with the Hiwassee, Little Tennessee, Savannah, French Broad, Watauga, New, Catawba, and Broad River basins can be found in the Wildlife Action Plan, Chapter 5B.

Location And Condition Of Habitat

Human-influenced alterations have affected much of the mountain region's riverine and floodplain habitats. Water quality and quantity have been impacted by run-off from municipalities and slope development. Dam construction has altered flows and river hydrology and morphology. Removing woody debris from streams after storm events has influenced in-stream habitat structure. The ecological condition of some mountain rivers is greatly reduced due to these impacts. However, some sections of rivers are designated High Quality Water and Outstanding Resource Water Management Zones and provide excellent opportunities for maintaining relatively pristine waterways. A map of this habitat is not provided due to scale and sensitivity issues. Each of the river basins in North Carolina are described in detail within the 'Aquatics' section of the Wildlife Action Plan (Chapter 5B). The Hiwassee, Little Tennessee, French Broad, Watauga, and New River basins in particular occur within the Southern Blue Ridge physiographic province.

Problems Affecting Species And Habitats

Water quality deterioration and loss of habitat are two of the most serious problems affecting wildlife that utilize riverine habitat. Water quality concerns, originating from both point and non-point sources have had, and continue to pose a threat directly to species that occur in riverine habitat, and indirectly through alteration of the food base or habitat. Direct and indirect impacts of decreased water quality upon wildlife associated with riverine habitat are difficult to quantify, and have not been as fully explored as have impacts upon fully aquatic species. However, there is little doubt that clean water is critical to a host of species that live in rivers and streams for a portion of their lives, and that sedimentation, channel scour, and other alterations of the physical habitat can lead to both deterioration of the habitat quality and negative impacts upon aquatic flora and fauna, which form the base of the food web for numerous wildlife species.

A condition with historic roots that still affects riverine habitat and its wildlife is the impoundment of rivers and streams for a variety of purposes including hydroelectric power generation, flood control, water supply, and recreation/aesthetics. There are miles and miles, or acres and acres of lakes and ponds that have converted lentic habitat to lotic. Again, the resultant effects have been both direct and indirect, in that habitat has been lost, and the food web has shifted, at least in portions of former riverine habitat, to species that do not depend upon flowing water. Other than measuring the direct impact of this habitat conversion, we do not know the overall impact upon the wildlife species present from the indirect effects of river or stream impoundment.

Another impact upon riverine habitat that can be construed as habitat loss, at least for some species, is through development of floodplains or riparian areas. River or stream-front development may or may not have a direct negative impact upon water or habitat quality in the stream or river, however in most instances it certainly can and does. The impacts of development adjacent to rivers and streams includes potential problems associated with direct input of contaminants and sediment, alteration of hydrologic patterns and temperature regimes, and loss of critical habitat adjacent to aquatic habitat that may be of equal importance to species that only spend a portion of their lives in the water (e.g., many amphibians).

Several of the priority species associated with riverine habitat face potential problems associated with having very limited distributions, or widely dispersed but small populations (e.g., eastern spiny softshell turtle, loggerhead musk turtle, Junaluska and longtail salamanders). Isolation or fragmentation of particular habitat stretches occupied by those species could have significant long-term effects upon the sustainability of those populations in North Carolina.

Species And Habitat Conservation Actions and Priorities For Implementation

In general the most critical conservation actions necessary to sustain populations of riverine habitat species involve protection of water quality and aquatic habitats. Immediate and continuing efforts need to be undertaken to limit water quality deterioration from point sources of pollution as well as non-point sources. Toxic chemicals and sediment are entering our waterways and having a direct negative impact upon the species in the rivers and streams, but also having significant negative impacts upon the quality of the habitat itself.

Measures to address these issues, some of which are in practice currently, such as regulation of point and non-point sources of pollution, need to be enacted and enforced. Mandatory and incentive based practices to improve water quality need to be actively pursued with cooperation from agencies and organizations at local, state and federal levels. Programs to promote vegetated buffers along rivers and streams need to be supported and intensified. River and stream ecosystem enhancement and restoration efforts and programs need to be enhanced and supported as well. Management of riverine habitats should promote the natural evolution and movement of woody and rocky structures and natural processes like bank dynamics, channel meanders, and flood regimes.

Within the frameworks afforded by state, local, federal, and private initiatives, riverine habitats need to be permanently protected from the negative impacts of development through conservation ownership (fee title or easement) of as much habitat as possible, both for long term water quality protection in our state, as well as the sustainability of wildlife populations dependent upon our rivers and streams. Also see the appropriate river basin sections in Chapter 5B of the Wildlife Action Plan for more detailed conservation recommendations by basin.

Priority Research, Survey, And Monitoring

In order to begin to plan conservation strategies for these species, we must have a better understanding of their distribution and status currently. Several of the priority species associated with riverine habitat in western North Carolina are known from only a few localities, and/or are considered rare or declining.

- **Surveys**

- Priority needs to be placed upon the conduct of baseline surveys to determine their current range and distribution (e.g. water shrew, hellbender, Junaluska and longtail salamander, mudpuppy, eastern spiny softshell, and loggerhead musk turtle).

- Secondary priority should be directed towards gathering better information about the status and distribution of more common species associated with riverine habitats (e.g., shovel-nosed, and three-lined salamanders).
- **Monitoring**
 - When we have a better understanding of the current distribution of these species, survey efforts should be re-directed into development of long-term monitoring strategies to document population trends, from which conservation strategies can be specifically designed to target those species which are experiencing declines.
- **Research**
 - Priority research topics related to these species and riverine habitats include investigations into the relationships between water quality and hydrologic regimes and population change of selected species. In particular, research needs to be conducted which will establish whether water quality declines are having a negative impact upon hellbender populations.
 - Potential studies also include efforts to determine specific flow regimes necessary to support microhabitat for particular species (e.g., Junaluska salamander) and investigations to determine the effect that beaver ponds have on downstream movement of toxins and sediment.
 - Better information is needed regarding the specific microhabitat requirements for most of the priority species in order to develop long-term conservation strategies.

Supporting References

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N.C. Natural Heritage Program (NCNHP). 2001. Descriptions of the biological themes of North Carolina, 2nd edition. N.C. Department of Environment and Natural Resources, Natural Heritage Program, Raleigh, NC.