

Priority Watersheds for Aquatic Conservation

USDA Forest Service,
Southern Region

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Executive Summary

The southern United States is a center of aquatic freshwater species and aquatic habitat diversity. Because of the South's high aquatic biodiversity and the widespread modification of its aquatic ecosystems, it contains a significant portion of our country's imperiled aquatic fauna. The increasing demand for freshwater resources generated by continued population growth and urbanization will likely result in further declines of freshwater species. Pressures on aquatic systems are unlikely to decrease in the coming decades; therefore, as more private land is developed, freshwater habitats on public lands will become increasingly more important. In this paper we identify watersheds that are critical for maintaining the aquatic biodiversity in North America and can be positively influenced by activities on National Forest lands. We also provide a framework, or roadmap, for aquatic conservation in the Southern Region of the Forest Service.

Introduction

North America's aquatic ecosystems support some of the most extraordinary biotic assemblages in the world (Abell and others 1998). In particular, the southern United States is a center of freshwater species and aquatic habitat diversity. The South has a high percentage of the fish, crayfish, amphibians, mollusks, and aquatic insect species found in North America (Benz and Collins 1997). The rich aquatic diversity of the South is the result of a warm climate, abundant water resources, diverse landforms, and a long and complex Earth history (Warren and others 1997; Master and others 1998; Robison 1986).

The decline of aquatic species in the United States is primarily attributed to habitat alteration since most freshwater ecosystems have been negatively affected, directly or indirectly, by human activities (Moyle and Leidy 1992). Channelization, impoundment, sedimentation, and flow alterations are the most common physical habitat alterations associated with the decline of aquatic species. Other human-induced impacts to aquatic species include pollution, introduced species, and over-harvesting.

Because of the South's high aquatic biodiversity and the widespread modification of its aquatic ecosystems, it contains a significant portion of our country's imperiled aquatic fauna (Shute and others 1997). A conference organized by the Tennessee Aquarium in 1994 illustrated the dramatic decline of most freshwater faunal groups in the South (Benz and Collins 1997). Freshwater conservation publications produced by The Nature Conservancy (TNC) and the World Wildlife Foundation (WWF) also indicate that the South is a center of aquatic species imperilment (Abell and others 1998, Master and others 1998).

The increasing demand for freshwater resources generated by continued population growth and urbanization will likely result in further declines of freshwater species (Moyle and Leidy 1992). Pressures on aquatic systems are unlikely to decrease in the coming decades; therefore, as more private land is developed, freshwater habitats on public lands will become increasingly more important (Folkerts 1997).

The Southern Region of the USDA Forest Service (Region 8) has national forests in 14 States and Puerto Rico. The 14 States are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia (Figure 1). National forests occur in eight physiographic provinces and 10 aquatic subregions (Edwards 1999) and provide habitat for a wide variety of aquatic species. Some National Forests provide refugia for species that have declined elsewhere.

Purpose

All aquatic habitats on National Forests in the South should be valued and managed as an important natural resource. Nevertheless, priorities must be established to promote successful conservation of this irreplaceable national resource. The purpose of this paper is to identify watersheds that are critical for maintaining the aquatic biodiversity in southern United States and can be positively influenced by activities on National Forest lands.

Process

We believe that the appropriate regional scale for identifying high-priority areas for conserving aquatic biodiversity is 4th level watersheds. This size watershed was chosen for several reasons: **1)** it is the scale at which most other federal agencies and non-profit organizations have identified areas of high conservation importance; **2)** it is the scale at which the Environmental Protection Agency (EPA) has identified priority watersheds, and **3)** it gives the individual National Forests greater latitude to identify issues and opportunities for restoration and partnerships at the Forest-level (i.e. 6th level watersheds).

To identify priority watersheds for aquatic conservation in the Southern Region of the Forest Service we used the following criteria:

- 1) TNC critical watersheds (watersheds selected by TNC as critical watersheds for conservation of imperiled fish and mussels in the United States; Master and others 1998; Figure 2)
- 2) TNC Hotspots (subbasins that contain 10 or more at-risk freshwater and mussel species; Master and others 1998; Figure 2)
- 3) Watersheds with U.S. Fish and Wildlife Service Critical Habitat designations (separated by aquatic and terrestrial species; Figure 3)
- 4) Southeast Aquatic Resources Partnership (SARP) priority watersheds (watersheds identified by SARP as key in preserving biodiversity in the southern United States; Scott Robinson Pers. Comm. Figure 4)
- 5) Watersheds containing aquatic passage inventories (USFS Center for Aquatic Technology Transfer unpublished data; Figure 5).
- 6) EPA priority watersheds (watersheds where the EPA and state partners agreed to focus to protect and restore waters; Figure 6).

We identified watersheds from highest to lowest priority based on the number of priority variables (*from 1-6 above*). Those with the highest number of variables are considered to

be the Southern Region's highest priority for maintaining aquatic diversity in the southern United States (*Table 1; Figure 7*).

One exception in the ranking criteria should be for the El Yunque National Forest. The aquatic fauna found in El Yunque is threatened throughout the Caribbean islands. On the National Forest these species benefit from the protection provided by both the Forest Service and the Commonwealth of Puerto Rico. The main threat to the species is the explosive development surrounding the National Forest. This development threatens to sever the native aquatic fauna migration routes of between the freshwater habitat on the Forest and the estuary. For this reason we suggest watershed 21010005 on the El Yunque National Forest be elevated from an order of priority of three to one (*Table 1 **).

Strategy

In order to develop and implement a fully-integrated and meaningful aquatic conservation strategy, we need to incorporate:

- 1) Other resource conservation priorities (i.e. terrestrial, soils, air, etc.).
- 2) Social priorities such as areas of high recreation, wild and scenic rivers, municipal watersheds, etc. at the 6th level HUC.
- 3) Implement the national watershed condition process (once in place).
 - (a) identify the current condition of 6th level watersheds within the priority areas
 - (b) identify opportunities to improve those watersheds
 - (c) identify partner opportunities
 - (d) prioritize 6th level watersheds for improvement projects
 - (e) select the areas that will receive focused effort to improve or maintain Watershed Condition Class (WCC)
- 4) Implement projects identified to improve or maintain WCC of selected watersheds.

Table 1. Southern Region watersheds identified as priorities (greatest priority = 1 to least priority = 3) for contributing to conservation of aquatic biodiversity in the southern United States.

8-Dig HUC #	Watershed Name	National Forest(s)	Priority
06010206	Powell	Jefferson	1
06010202	Upper Little Tennessee	Cherokee, Nantahala	1
03150104	Etowah	Chattahoochee	1
03150101	Conasauga	Chattahoochee, Cherokee	1
03150202	Cahaba	Talladega	1
05100101	Licking	Daniel Boone	1
06010205	Upper Clinch	Jefferson	1
03140103	Yellow	Conecuh	1
06020002	Hiwassee	Cherokee, Chattahoochee, Nantahala	1
06010204	Lower Little Tennessee	Cherokee, Nantahala	1
11140107	Upper Little River	Ouachita	1

06010108	Nolichucky	Cherokee, Pisgah	1
21010005	Eastern Puerto Rico	Caribbean	1*
03120003	Lower Ochlockonee	Apalachicola	2
03150106	Middle Coosa	Talladega	2
05130101	Upper Cumberland	Daniel Boone, Jefferson	2
03130011	Apalachicola	Apalachicola	2
03150110	Lower Tallapoosa	Tuskegee	2
03160110	Sipsey Fork	Bankhead	2
05130102	Rockcastle	Daniel Boone	2
06010102	South Fork Holston	Jefferson, Cherokee	2
03080102	Ocklawaha	Ocala	2
08040101	Ouachita Headwaters	Ouachita	2
11140105	Kiamichi	Ouachita	2
02070003	Cacapon-Town	George Washington	2
03140301	Upper Conecuh	Conecuh	2
03150108	Upper Tallapoosa	Talladega	2
05050001	Upper New	Jefferson	2
08040203	Upper Saline	Ouachita	2
03030003	Deep River	Uwharrie	2
03040103	Lower Yadkin	Uwharrie	2
08080203	Upper Calcasieu	Kisatchie	2
06030002	Wheeler Lake	Bankhead	2
06030005	Pickwick Lake	Bankhead	2
06010101	North Fork Holston	Jefferson	3
03170006	Pascagoula	DeSoto	3
02080201	Upper James	George Washington, Jefferson	3
03110206	Santa Fe	Osceola	3
03150102	Coosawattee	Chattahoochee	3
03150103	Oostanula	Chattahoochee	3
03150107	Lower Coosa	Talladega	3
08040102	Upper Ouachita	Ouachita	3
11140207	Lower Red	Kisatchie	3
12010004	Toledo Bend Reservoir	Sabine	3
12020002	Middle Neches	Davy Crockett, Angelina	3
12020005	Lower Angelina	Angelina, Sabine	3
02080203	Middle James-Buffalo	George Washington	3
03010101	Upper Roanoke	Jefferson	3
03060107	Stevens	Sumter	3
03070101	Upper Oconee	Oconee	3
03070103	Upper Ocmulgee	Oconee	3
03140304	Lower Conecuh	Conecuh	3
03150105	Upper Coosa	Chattahoochee, Talladega	3
03170003	Lower Chickasawhay	DeSoto	3
05050003	Greenbrier	George Washington	3
08030201	Little Tallahatchie	Holly Springs	3
08060203	Bayou Pierre	Homochitto	3
08070202	Amite	Homochitto	3
08080102	Bayou Teche	Kisatchie	3
11010014	Little Red	Ozark	3
03150109	Middle Tallapoosa	Talladega	3
05050002	Middle New	Jefferson	3
05130103	Upper Cumberland	Daniel Boone	3

05130104	South Fork Cumberland	Daniel Boone	3
08030203	Yocona	Holly Springs	3
08040103	Little Missouri	Ouachita	3
11010005	Buffalo	Ozark	3
03150201	Upper Alabama	Talladega	3

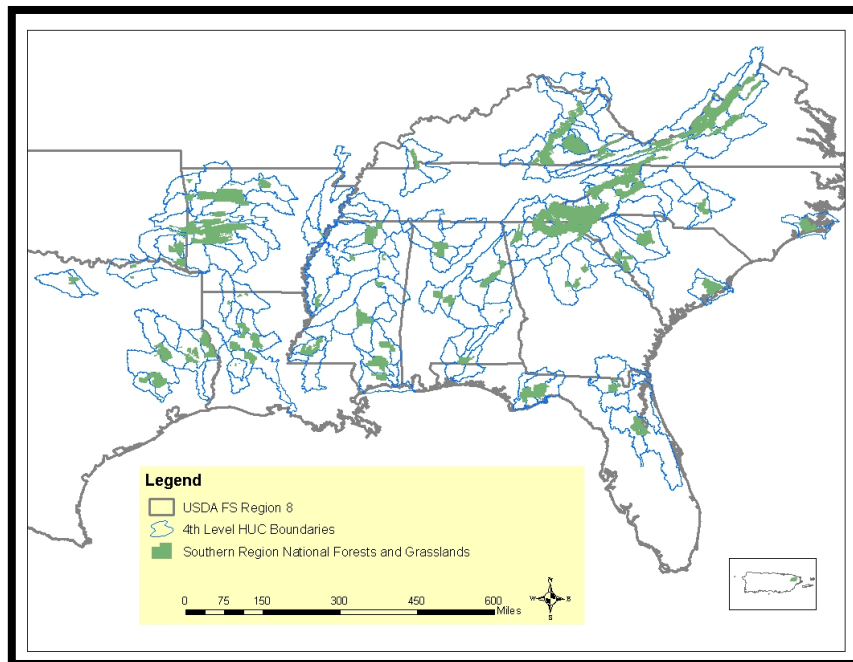


Figure 1. Fourth-level watersheds in relation to National Forests in the Southern Region.

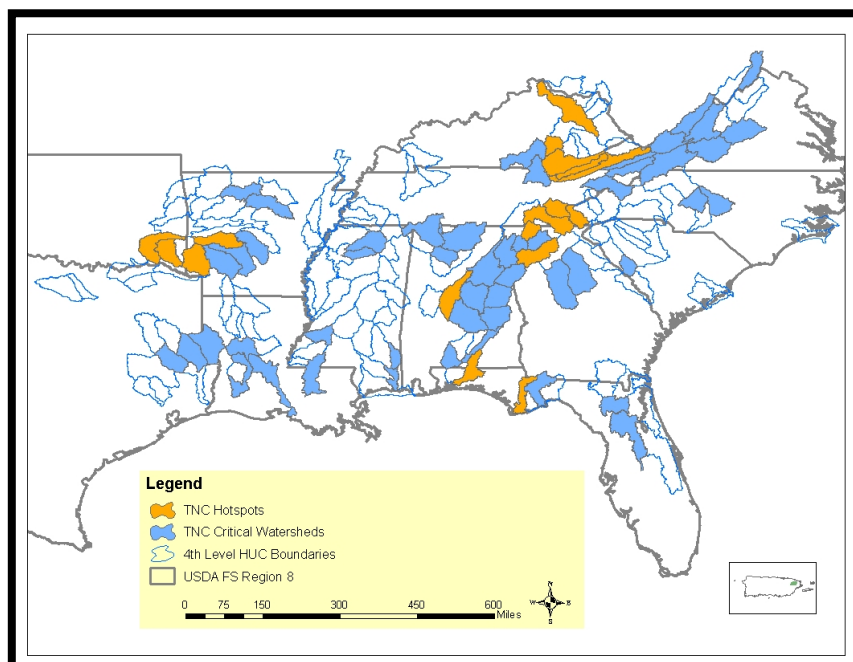


Figure 2. Fourth-level watersheds identified by TNC as critical for the conservation of aquatic species and hotspots of aquatic biodiversity in North America.

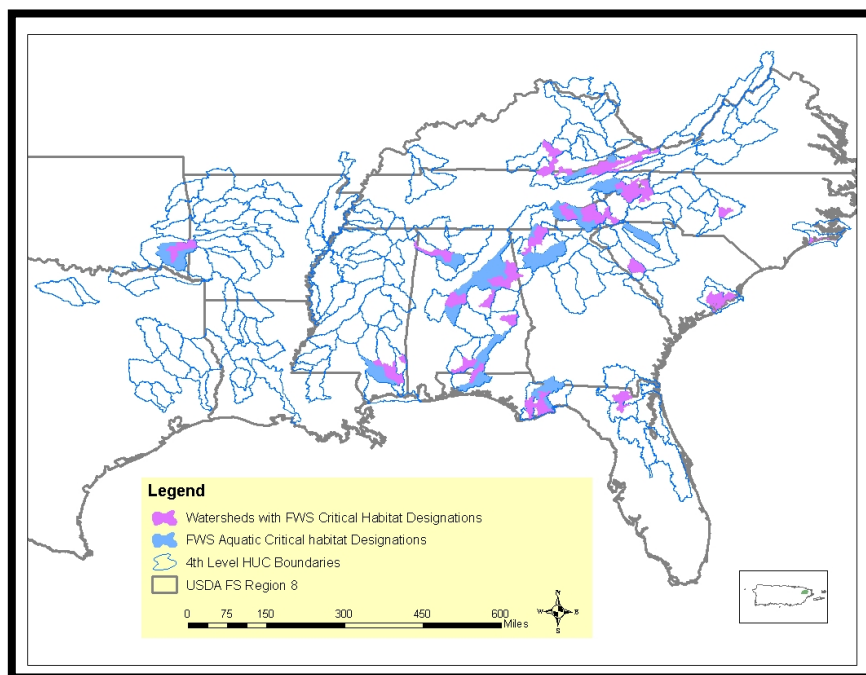


Figure 3. Fourth-level watersheds in the Southern Region that contain FWS Critical Habitat designations.

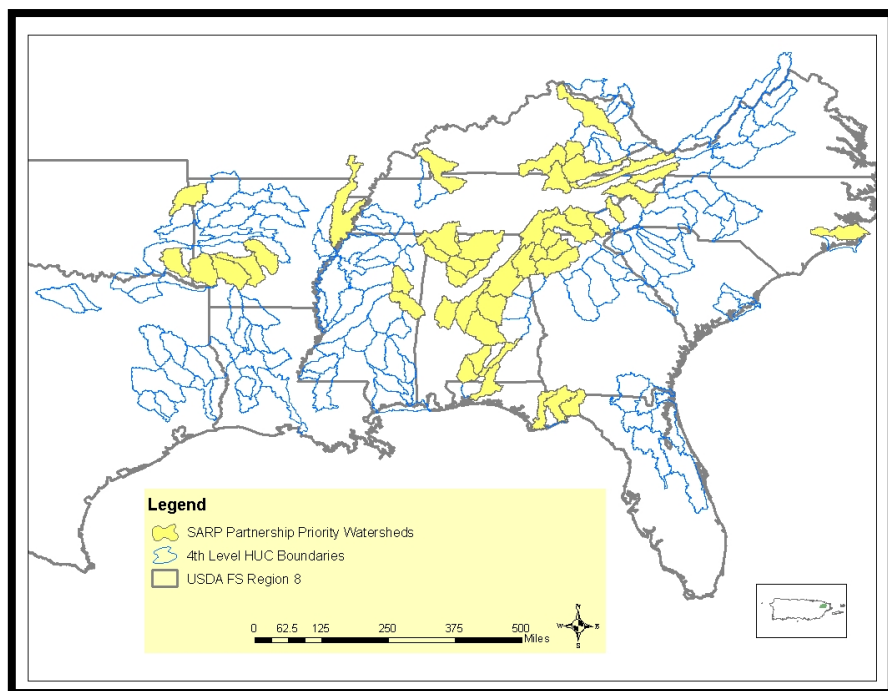


Figure 4. Fourth-level watersheds identified by SARP as key in preserving aquatic biodiversity in the southern United States.

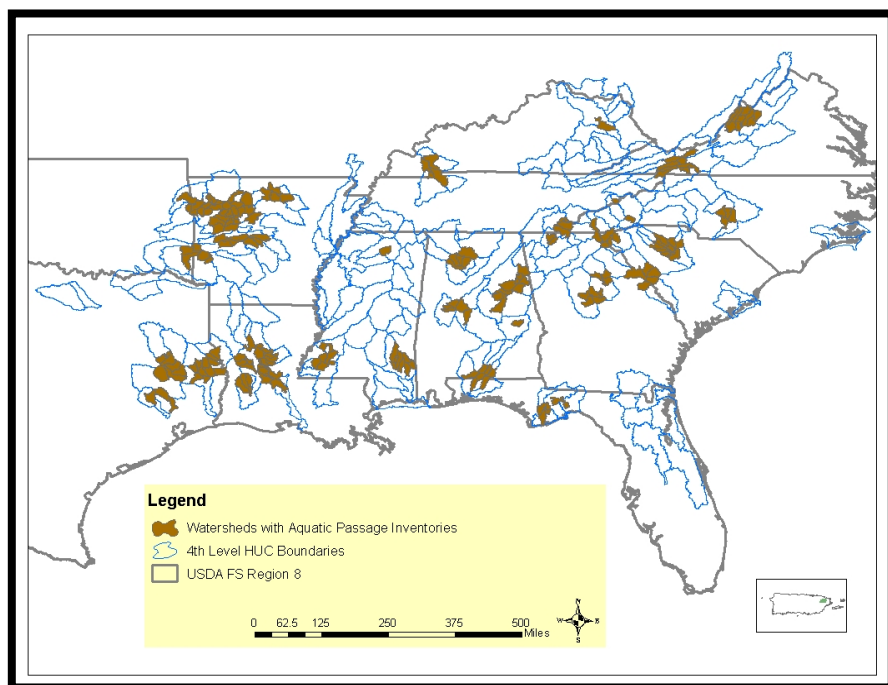


Figure 5. Fifth level watersheds in the Southern Region with aquatic passage inventories.

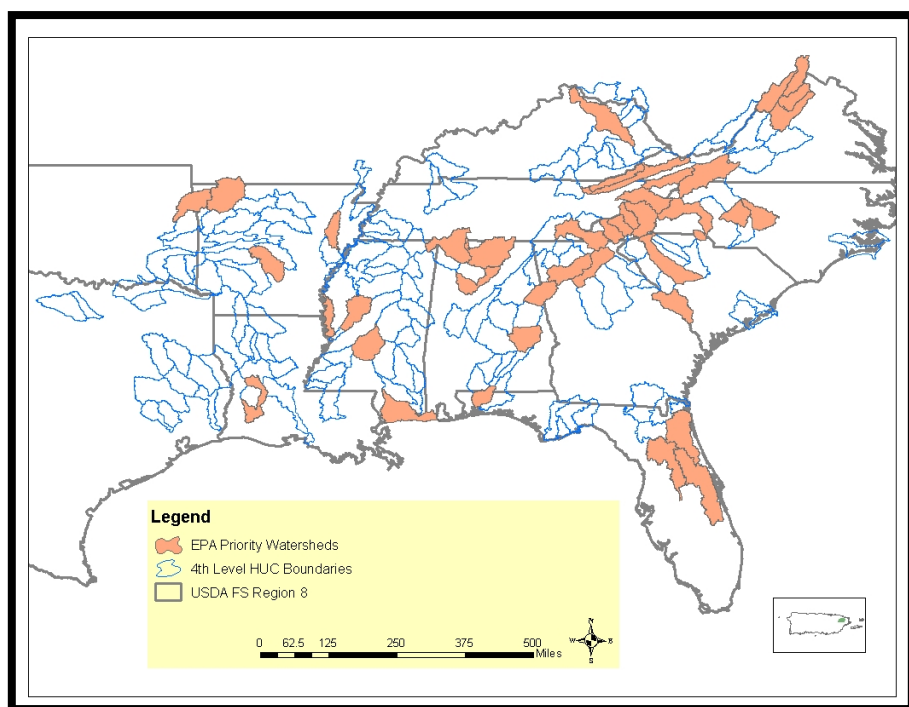


Figure 6. Fourth-level watersheds identified as priority by the EPA.

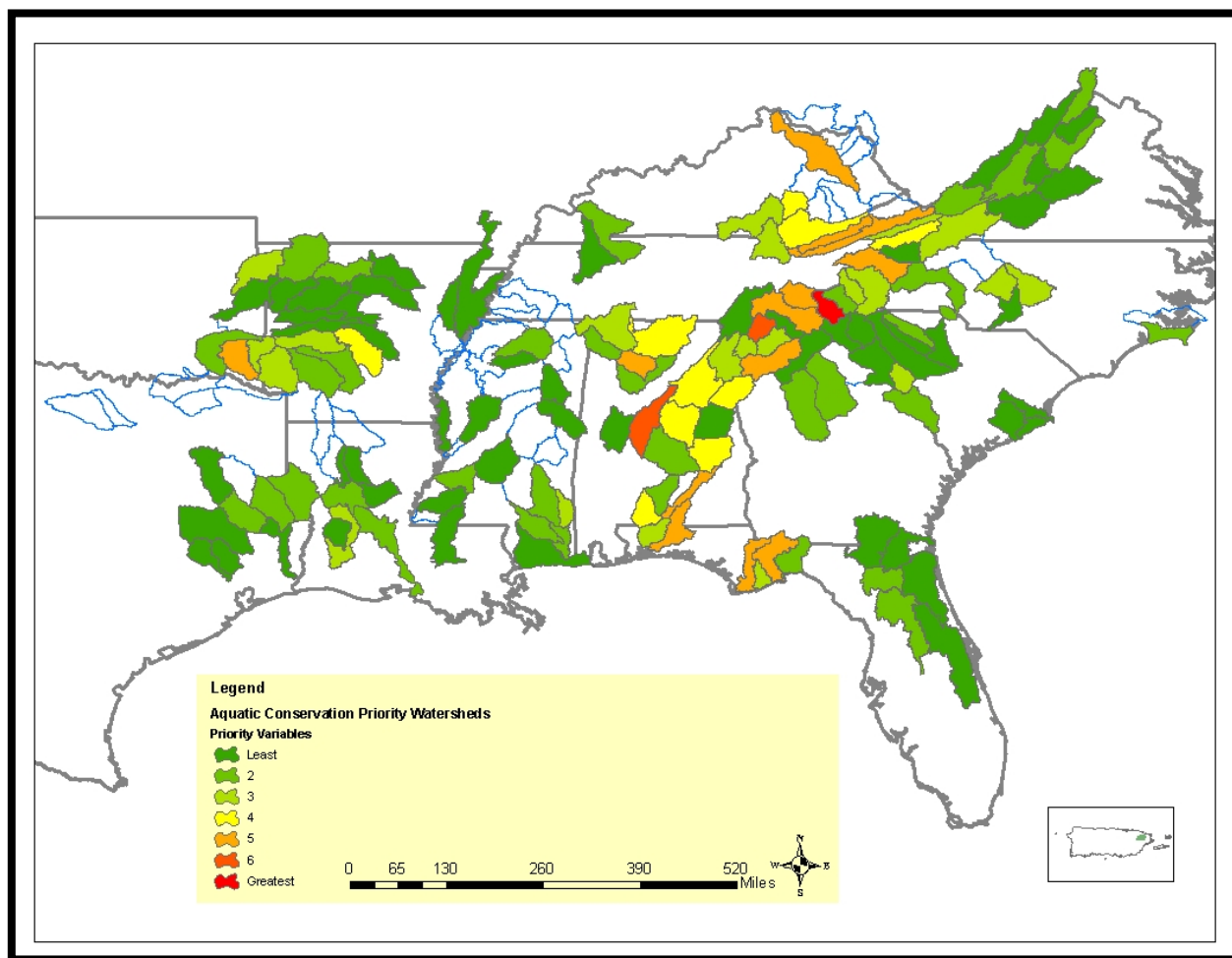


Figure 7. Fourth-level watersheds identified by the Southern Region as priority for maintaining biodiversity in the South.

References

Abell, R., D.M. Olson, E. Dinerstein, P.T. Hurley, W. Eichbaum, S. Walters, W. Wettengel, T. Alnutt, and C.J. Loucks. 1998. A conservation assessment of the freshwater ecoregions of North America. Final Report Submitted to the U.S. EPA, April 1998. World Wildlife Fund. Washington, D.C., USA.

Benz, G.W. and D.E. Collins (editors). 1997. Aquatic Fauna in Peril: The Southeastern Perspective. Special Publication 1, Southeast Aquatic Research Institute, Lenz Design and Communications, Decatur, Georgia, USA. 554 pp.

Edwards, C.J. 1999. Aquatic ecological classification of North America (Nearctic Zone) website. [Http://econ.usfs.msu.edu/gla/elc/aqsubreg.htm](http://econ.usfs.msu.edu/gla/elc/aqsubreg.htm).

Folkerts, G.W. 1997. State and Fate of the World's Aquatic Fauna. Pages 1-16 in Benz, G.W. and D.E. Collins (editors). 1997. Aquatic Fauna in Peril: The Southeastern Perspective. Special Publication 1, Southeast Aquatic Research Institute, Lenz Design and Communications, Decatur, Georgia, USA. 554 pp.

Master, L.L., S.R. Flack, and B.A. Stein (editors). 1998. Rivers of Life: Critical watersheds for protecting freshwater biodiversity. The Nature Conservancy, Arlington, Virginia, USA. 71 pp.

Moyle, P.B. and R.A. Leidy. 1992. Loss of biodiversity in aquatic ecosystems: evidence from fish faunas. Pages 127-169 in P.L. Fiedler and S.K. Jain, eds. Conservation Biology: The Theory and Practice of Nature Conservation. Chapman and Hall, New York, New York.

Moyle, P.B. and R.M. Yoshiyama. 1994. Protection of aquatic biodiversity in California: a five-tiered approach. Fisheries, Vol. 19 (2): 6-18.

Robison, H.W. 1986. Zoogeographic implications of the Mississippi River Basin. Pages 267-285 in Hocutt, C.H. and W.O. Wiley (editors). The zoogeography of North American freshwater fishes. Wiley, New York, New York, USA. 866 pp.

Shute, P.W., R.G. Biggins, and R.S. Butler. 1997. Management and conservation of rare aquatic resources: a historical perspective and recommendations for incorporating ecosystem management. Pages 445-465 in Benz, G.W. and D.E. Collins (editors). 1997. Aquatic Fauna in Peril: The Southeastern Perspective. Special Publication 1, Southeast Aquatic Research Institute, Lenz Design and Communications, Decatur, Georgia, USA. 554 pp.

Warren, M.L., Jr., P.L. Angermeier, B.M. Burr, and W.R. Haag. 1997. Decline of a diverse fish fauna: patterns of imperilment and protection in the Southeastern United States. Pages 105-164 in Benz, G.W. and D.E. Collins (editors). 1997. Aquatic Fauna in Peril: The Southeastern Perspective. Special Publication 1, Southeast Aquatic Research Institute, Lenz Design and Communications, Decatur, Georgia, USA. 554 pp.

