A Conservation Assessment of

Freshwater Fauna and Habitat in the Southern National Forests

US Department of Agriculture
Forest Service
Southern Region

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Edited by

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Conserving Our Aquatic Resources

A Message from Elizabeth Estill, Regional Forester, Southern Region, USDA Forest Service

A Conservation Assessment of Freshwater Fauna and Habitat in the Southern National Forests is an important milestone and the first step in developing a comprehensive and strategic view of the conservation of aquatic biota in the Southern Region of the Forest Service. The national forest lands in this region can be found in fourteen states and Puerto Rico, the entire area of which is considered nationally to be a biological hotspot for aquatic species. The mixed ownership patterns, degree of competing uses, and the sheer complexity of the systems found in the South present a substantial challenge for future long-term conservation of our aquatic resources.

This publication will be a cornerstone for us to focus attention and priorities where they are most needed. The report points to a clear need for collaboration between the public and private sectors in the conservation of these resources, both by the professionals within the Forest Service as well as by our partners.

This assessment is a snapshot of the aquatic resources of the Southern National Forests and is an important tool for us to use as our region redefines the long term management of the national forests in the South. It is intended to be a "living" document updated periodically to reflect the progress in the conservation of aquatic systems. I invite you to review and comment on this work and to visit your Southern National Forests to see, first-hand, the wonderfully diverse aquatic systems that we have to offer and to roll up your sleeves to help conserve our aquatic resources for the future.

ELIZABETH ESTILL

August, 2001

Table of Contents

Figures and Tables

Executive Overview

The southern United States has one of the most diverse assemblages of fish, crayfish, amphibians, mollusks, and aquatic insect species in North America. Unfortunately, this region also has a high proportion of imperiled aquatic species. In response to the Natural Resource Agenda and the growing concerns for the conservation of aquatic biological diversity, the US Forest Service, Southern Region compiled information to:

1) identify areas in Southern Region that support outstanding aquatic resources including rare and imperiled species and unique habitats
2) determine the role of the Forest Service in conserving freshwater biological diversity in the Southern Region, especially in relation to the critical watersheds and sites selected by The Nature Conservancy and other groups, and
3) identify gaps in the knowledge of the distributions and habitat needs of aquatic species to provide direction for future inventories.

Four discriminators (number of threatened and endangered aquatic species, number of sensitive aquatic species, The Nature Conservancy's Critical Watershed rank, and change in human population) were used to rank subbasins (watersheds that range from 400 to 700 square miles in size) that support outstanding aquatic resources and to evaluate information on the distribution and habitat needs of aquatic species on or near national forest lands. Subbasins were ranked as either high, medium, or low priority, based on the sum of the four discriminators.

This assessment identified 18 high priority subbasins that contain national forest lands in the Southern Region. Of the 18 priority subbasins, 11 have been identified as "watershed hot spots" (subbasins that contain 10 or more at-risk freshwater fish and mussel species) by The Nature Conservancy. National forests in these subbasins have the greatest potential for significant contributions to the conservation and restoration of aquatic biodiversity. Subbasins in these national forests should be considered the most sensitive to land management activities and should receive the highest priority for aquatic inventories, monitoring, and research.

Ten subbasins that ranked medium and five subbasins that ranked low in this assessment also were listed as watershed hotspots, which suggests that aquatic biodiversity on or near national forest lands does not necessarily reflect the aquatic biodiversity of the subbasin. It does however, demonstrate the need for the Forest Service to be an active partner with other federal and state agencies, local residents, businesses, industry, non-profit organizations, and other interested groups to enhance biological diversity conservation in all relevant subbasins.

One of the most prominent conclusions of this assessment is the lack of basic information on the distribution and habitat needs of aquatic species on the national forests in the Southern Region. In many cases, national forests lack adequate information on individual species as well as entire taxonomic groups (i.e. fish, amphibians, reptiles). It is critical that the Forest Service make the commitment to address and resolve this issue.

One area in this assessment that was underestimated, in terms of biological diversity conservation, is the Caribbean National Forest. Studies of the freshwater shrimp fauna in Puerto Rico indicated that many of the species on the Caribbean National Forest are imperiled. It is essential for the Forest Service to develop cooperative relationships and partnerships with other federal and state agencies, and other interested parties to insure the conservation of this unique fauna.

This assessment includes specific recommendations to ensure the conservation of aquatic biological diversity on national forests in the Southern Region. These recommendations should be used in conjunction with results of other assessments and analyses, such as watershed assessments, road analysis, and ecosystem analysis, to set regional priorities and direction.

Forward

This conservation assessment is the first step in an ongoing process to identify areas where the Forest Service should focus aquatic conservation efforts in the Southern Region. Information synthesized in this assessment was used to prioritize areas that support outstanding aquatic resources and to evaluate our knowledge of the distribution and habitat needs of aquatic species on or near national forest lands.

Since the compilation of the data in this assessment in 1998, the Forest Service has addressed, or is in the process of addressing, many of the most significant issues identified in this assessment. Programs initiated since 1998 include: watershed assessments (watershed scale: 40,000 to 250,000 ac), riparian prescriptions for inclusion in forest plan revisions, roads analysis, and a National Fish and Wildlife Foundation grant to fill in data gaps.

Watershed Assessments

Watershed assessments have been completed for national forests in Alabama, Arkansas, Georgia, Kentucky, South Carolina, Tennessee, and Virginia. Variables used to assess watershed condition were land use (urban, agriculture, forested), recreation pressure, point sources of pollution, impaired waters, and hydrologic modification. Variables used to assess watershed sensitivity were erodible soils, public water supply, aquatic fauna information (number of threatened, endangered, and sensitive species; total number of fish species; and total number of fish endemic to a subregion and the proportion of endemics in the total fish assemblage), and riparian health.

Endemism (not used as a variable in this conservation assessment) was selected as a variable in the watershed assessments to identify areas of biological distinctiveness. Endemism is correlated with beta-diversity (a measure of species replacement along environmental gradients), which is an indicator of biological complexity (Abell et al. 2000) and was identified as one of the ecological attributes common to extinction prone species in Virginia (Angermeier 1995). Scott and Helfman (in prep) found that replacement of endemics with more cosmopolitan species was a significant factor in the homogenization of fish assemblages in southern Appalachians. Therefore,

measures of endemism in the watershed assessments may identify additional areas of biological concern not identified in this conservation assessment.

These watershed assessments are, or will be, used to guide decisions made when land management plans are revised. They also should be used to help evaluate effects of project level activities on aquatic systems. Watershed assessments should be updated as information becomes available. Additional information on all aquatic fauna will strengthen these assessments and thus make them a much more useful and powerful tool in the future.

Riparian Management Prescription

The Southern Region also has assembled a team to develop a riparian management prescription to be incorporated into southern Appalachian forest plan revisions. The purpose of the riparian prescription is to establish standards for managing riparian areas as a distinct management area where riparian-dependent resources and values are given priority. Riparian Prescription Areas include all wetlands, ponds, and lakes, as well as streams and adjacent riparian ecosystems. Implementation of a carefully crafted riparian prescription is designed to ensure the conservation of aquatic biodiversity on and near national forest lands and also will contribute to the overall health of aquatic communities in their respective subbasins.

Roads Analysis

The USDA Forest Service Roads Analysis policy (1999) was developed as an integrated ecological, social, and economic approach to transportation planning. The approach assesses both existing and future roads to provide science-based information and inform management decisions about the benefits and risks of constructing new roads, relocating or decommissioning unneeded roads and continuing road maintenance.

Roads analysis will use existing information from ecosystem analysis or assessments and also may be integrated as components of watershed analysis and landscape assessments. The analysis is a six-step process based on road-related issues and analysis questions. The steps include: 1) setting up the analysis (identification team and structure of analysis), 2) describing the road system, 3) identifying issues (public and agency), 4) assessing benefits, problems, and risks, 5) describing opportunities and setting priorities, and 6) documenting and reporting the analysis. The overall objective of Roads analysis is to provide decision makers with information to manage road systems that are safe, responsive to public needs and have minimal negative impact on ecological resources. The results of this conservation assessment are intended to help identify priority subbasins for aquatic conservation attention.

National Fish and Wildlife Foundation Grant

The National Fish and Wildlife Foundation awarded a grant to the Southern Region of the Forest Service in January 1999 to help fill in some of the data gaps identified in this assessment. A total of 22 projects were funded on nine National Forests in the Southern Region. This grant has provided the Southern Region the opportunity to collect some of the additional data needed to better manage the southern National Forests and to forge critical partnerships.

The projects included inventories and surveys of streams, springs, and caves on national forests in Alabama, Kentucky, Tennessee, Florida, Virginia, Arkansas, Oklahoma, North Carolina, and Texas. These surveys focus on a variety of aquatic species including crayfish, fish, turtles, mussels, and dragonflies. Two examples of projects and partnerships are: 1) National Forests in Alabama, in partnership with the State of Alabama State Lands Division, inventoried aquatic cave fauna on the Bankhead National Forest and 2) the George Washington and Jefferson National Forests in Virginia partnered with the Jackson River Restoration Foundation and the Virginia Department of Game and Inland Fisheries to develop a current physical and biological characterization of the Jackson River.

Final Comments

Finally, Forest Service land management plans are developed under the direction of the National Forest Management Act of 1976 and planning regulations. Forests operating under the 1982 planning regulations are required to select and monitor management indicator species to assess the relationship between land use practices and trends in species populations.

The assessment of aquatic communities, rather than single species, may be a better indicator of stream condition because the relationships between habitat and many aquatic species are complex, and poorly understood. A single-species approach for assessing the effects of land use practices on aquatic communities is not the most efficient use of limited resources and may not yield meaningful results. Temporal and spatial variation in species distributions and abundance, both within and among populations, is often difficult to interpret and may be more a function of natural environmental pressures (i.e. predation, competition, drought, floods, etc) rather than anthropogenic stressors.

The species composition of assemblages also may exhibit considerable temporal and spatial variation. Nevertheless, an assemblage-level assessment should be a more robust discriminator because it includes the response of numerous species to environmental pressures rather than that of a single species. A number of techniques for

assemblage-level assessments have been developed, including multimetric and multivariate methods (Karr 1991; Hawkins et al. 2000).

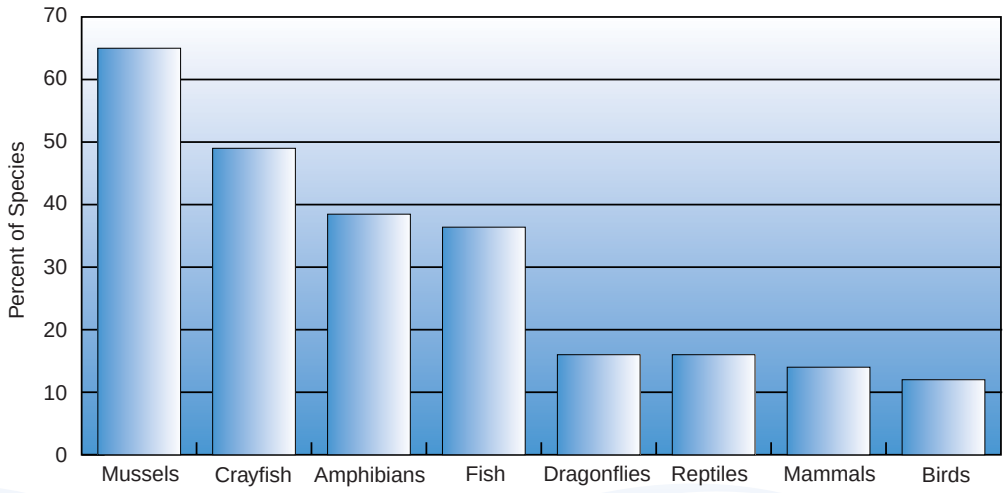
Although significant effort should be focused on identifying species composition (Scott and Helfman in prep), species that are endemic, rare, or habitat specialists should continue to receive special attention. Many organisms with one or more of these latter traits are particularly susceptible to environmental degradation.

Introduction

North America's aquatic ecosystems support some of the most extraordinary biotic assemblages in the world (Abell et al. 1998). In particular, the southern United States (hereinafter referred to as the South) 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 found in the South is the result of a warm climate, abundant water resources, diverse landforms, and a long and complex Earth history (Warren et al. 1997; Master et al. 1998; Robison 1986).

Until recently, conservation biology mainly focused on terrestrial species and their habitats while aquatic biodiversity was generally ignored (Moyle and Leidy 1992; Abell et al. 1998). In recent years, there has been a growing concern for the conservation of aquatic species, communities, and ecosystems that has resulted in numerous studies and publications on the status of freshwater species and habitats. Lists of imperiled species indicate that freshwater taxa are overwhelmingly more endangered than their terrestrial counterparts (Williams and Neves 1992; Stein and Flack 1997; Master et al. 1998; Figure 1). The decline of aquatic species

Figure 1. Proportion of U.S. species at risk by animal group (The Nature Conservancy 1997).



in the United States is primarily attributed to habitat alteration given that most freshwater ecosystems have been negatively affected, directly or indirectly, by human activities (Moyle and Leidy 1992).

Because of the South's high aquatic biodiversity and the widespread modification of its aquatic ecosystems, it also contains a significant portion of our country's imperiled aquatic fauna (Shute et al. 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). This is also supported by The Nature Conservancy (TNC) and World Wildlife Fund (WWF) publications (Abell et al. 1998; Master et al. 1998).

Environmental Protection Agency (EPA) data show that the human population in much of the South increased by more than seven percent between 1980 and 1990 (US EPA 1997). 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 expected to increase 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 has 35 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 2). 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

Figure 2. National Forests in the Southern Region

provide refugia for species that have declined elsewhere.

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 efforts during this era of decreasing federal budgets and work forces. The purpose of this assessment is to compile available information on aquatic fauna, habitats, and conservation status. This assessment addresses threats to aquatic communities in subbasins (watersheds that range from 400 to 700 square miles in size; Table 1) containing national forest lands but includes only those species occurring on or near national forests.

The objectives of this assessment are:

1. To identify subbasins in the Southern Region that support outstanding aquatic resources including rare and imperiled species and unique habitats.
2. To determine the role of the Forest Service in conserving freshwater biodiversity in the South, especially in relation to the critical watersheds and sites selected by TNC and other groups.
3. To identify gaps in our knowledge of the distributions and habitat needs of aquatic species to provide direction for future inventories.

Table 1. National uniform systems for defining hydrologic units (HU).

HUC is the Hydrologic Unit Code, HUC LENGTH is the number of digits in the HUC, and RELATIVE SIZE/NUMBER is the sizes of Hyrologic Units (approximations and are not used as classification criteria).

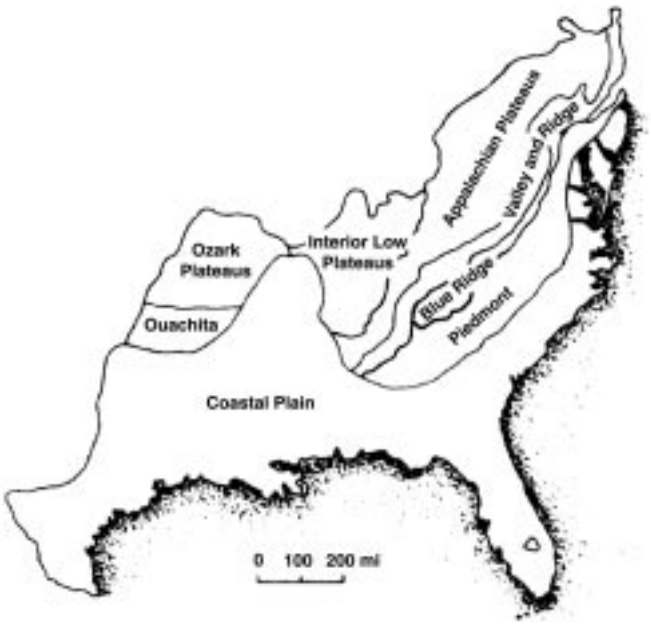
Hydrologic Unit	HUC Field	HUC Length†	Relative Size/Number‡	Examples
Region	1st	2 digits	21 across the U.S.	South Atlantic - Gulf HUC = 03
Subregion	2nd	4 digits	222 across U.S.	Alabama River HUC = 0315
River Basin	3rd	6 digits	352 across U.S.	Coosa - Tallapoosa HUC = 031501
Subbasin	4th	8 digits	400-700 sq. mi.	Conasauga River
Watershed	5th	10 digits	40k-250k acres	Jacks River
Subwatershed	6th	12 digits	10k-40k acres	Rough Creek
Drainage Area	7th	14 digits	3k-10k acres	Upper Rough Creek
Site or Project Area	8th	16 digits	<3k acres	trib. of Rough Creek

Background

National forests in the southern United States were established after passage of the Weeks Act in 1911. The Weeks Act authorized federal land acquisition in eastern states to regulate the flow of navigable streams and for the production of timber. National forest lands in the South were purchased primarily from private landowners and tend to be located in upland areas. Bottomland valleys were considered valuable agriculture land and usually remained in private ownership. As a result, most southern national forests contain numerous headwater and larger streams but few of the larger rivers.

Nevertheless, national forests in the Southern Region span several physiographic provinces and thus contain a wide diversity of aquatic habitats. The physiographic provinces in which the southern national forests occur are the Appalachian Plateaus, Blue Ridge, Coastal Plain, Interior Low Plateaus, Ouachita Mountains, Ozark Plateaus, Piedmont, and Valley and Ridge (Fenneman 1937; Hunt 1967; Figure 3).

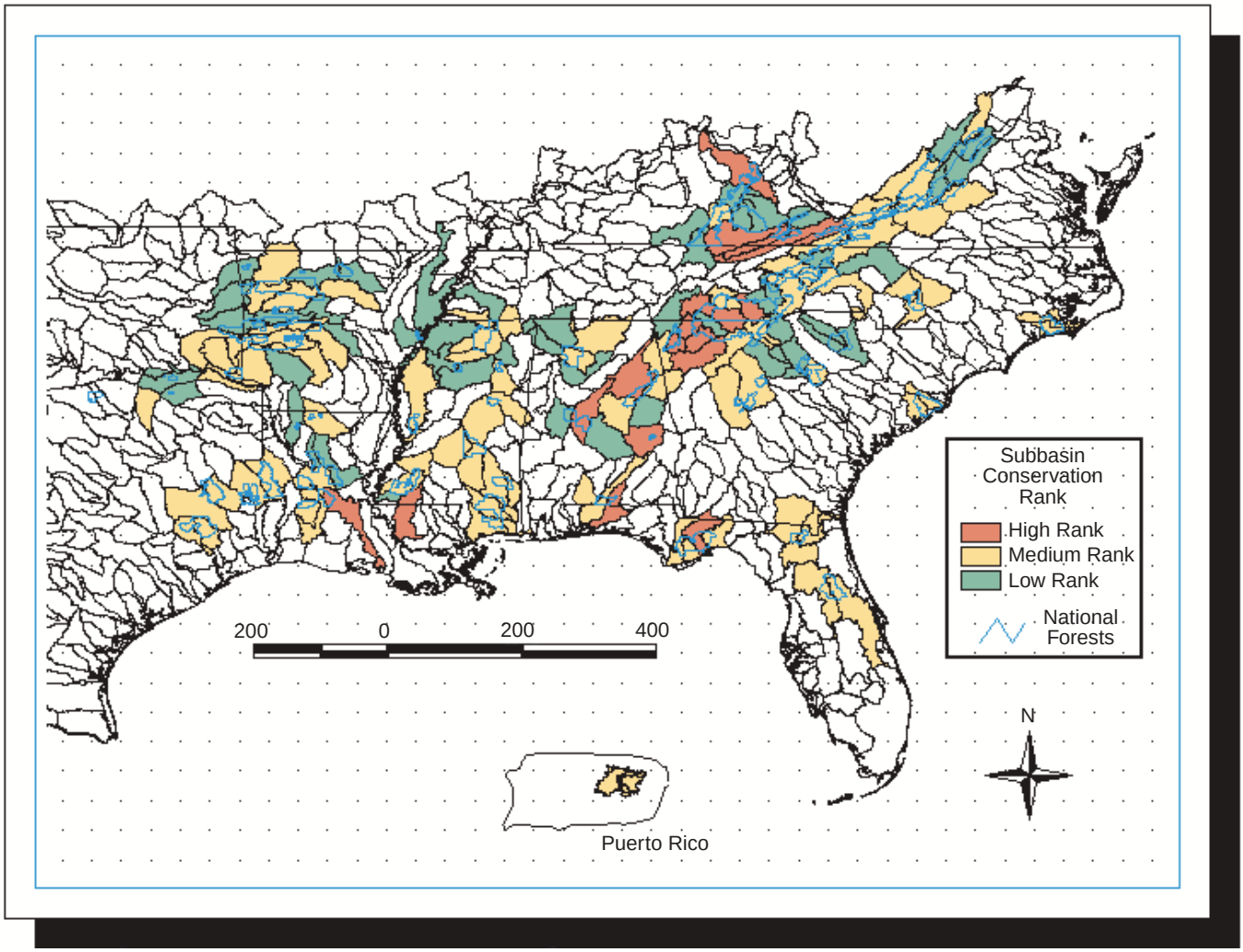
Figure 3. Physiographic Provinces of the Southern United States.



Physiographic provinces are characterized by differences in climate, soils, vegetation, lithology, and geologic history.

Southern national forests are located in 10 of the 15 aquatic subregions (Edwards 1999; Appendix A) in the southern United States: Caribbean, Chesapeake Bay, Florida Gulf, Interior Highlands, Mississippi Embayment, Mobile Bay, South Atlantic, Tennessee-Cumberland, Texas Gulf, and Upper Mississippi (Figure 4). Aquatic subregions are defined as major drainage systems that have unique fish species assemblages with similarity indices (see Hauer and Lamberti 1996) of less than 70 percent (Edwards 1999). National forests generally span more than one aquatic subregion. For example, the Sabine National Forest is located in the Texas Gulf aquatic subregion and the George Washington - Jefferson National Forest is located within the Chesapeake, Upper Mississippi, and Tennessee-Cumberland aquatic subregions.

Figure 4. Subbasins in the Southern Region showing conservation rank.



Physiography and Aquatic Habitats

Blue Ridge, and Valley and Ridge

National forests in the Appalachian Mountains are located in the Blue Ridge and the Valley and Ridge physiographic provinces. Brook trout (*Salvelimus fontinalis*) are generally the first fish to inhabit the upper reaches of Appalachian headwaters, followed by dace (*Rhinichthys* spp.), sculpin (*Cottus* spp.), and darters (*Etheostoma* spp.) further downstream. Burton and Odum (1945) found that temperature, gradient, and stream size are important factors in determining the fish community in Appalachian streams. Large elevation gradients in streams result in fish species replacements over relatively short distances. In general, salamanders, crayfish, and aquatic insects occupy high-gradient streams that are too small to support fish populations. Furthermore, aquatic insect groups (i.e. mayflies, stoneflies and caddisflies) reach their highest diversity in rocky headwater streams (Morse et al. 1997).

The geology of the Blue Ridge is predominantly metamorphosed sedimentary rocks and granite, and streams form a dendritic pattern. Small, high-gradient streams with numerous riffles and waterfalls characterize this province. In a natural state, the water in these streams is low in productivity, extremely clear, and water temperatures remain cool year round (Etnier and Starnes 1993). Because of the geology of the Blue Ridge, streams are notably affected acidification from both human and natural sources and suffer from chronic acidification (Kaufmann 1988). Historic misuse of the land is still evident in many Blue Ridge streams. National forests with land in the Blue Ridge are the Cherokee, Chattahoochee, George Washington, Nantahala, Pisgah, and Sumter.

The Valley and Ridge province is characterized by sedimentary rocks such as sandstone, shale, and limestone. Karst features, such as springs and caves, are relatively numerous. Larger streams follow the valleys between parallel ridges, and high-gradient tributaries enter the valley streams at right angles forming a trellis drainage pattern. Valley streams have moderate to low gradients. Because of the limestone geology, valley streams are relatively productive, and aquatic vegetation such as water willow (*Justicia* sp.) and riverweed (*Podostemum ceratophyllum*) is abundant in shallow areas (Etnier and Starnes 1993). Acid

precipitation is more likely to have a negative effect on higher elevation streams because soils on the ridge tops in the Valley and Ridge lack the buffering capacity of those found in the valleys (SAMAB 1996). National forests with land in the Valley and Ridge are the Cherokee, Chattahoochee, George Washington, Jefferson, and Talladega.

Piedmont

The Piedmont physiographic region is an erosionally reduced subdivision of the Appalachian Mountains characterized by its underlying metamorphic and igneous rocks, saprolite mantel, and clay-silt covering (Jenkins and Burkhead 1994). Stream habitats in the Piedmont vary considerably and may exhibit characteristics of both the Valley and Ridge (upper Piedmont) and Coastal Plain (lower Piedmont). Upper Piedmont streams are generally low to moderate in gradient, moderate proportion of riffles and runs, and fine to moderate substrata (i.e. silt, sand, gravel, and rubble; Jenkins and Burkhead 1994). Lower Piedmont streams tend to be slower moving, relatively few riffles and runs, and fine substrata (i.e. silt, sand, clay detritus; Jenkins and Burkhead 1994).

Streams in the Piedmont also have been substantially affected by human activities. Early European settlers typically cleared forests to grow corn or cotton for several years and then abandoned the fields because of high rates of erosion and depletion of soil fertility. Soil erosion was extremely high during the 19th and early 20th centuries which resulted in heavy sediment loads in the streams and rivers (Mulholland and Lenat 1992). Despite a reduction in soil erosion during the past 50 years, high sediment loads remain in streams and rivers. Recent urbanization in the South has been concentrated in the Piedmont, creating new sediment problems for streams (Mulholland and Lenat 1992). National forests with land in the Piedmont are the Oconee, Pisgah, Sumter, Talladega, and Uwharrie. These forests are important because they contain remnants of relatively natural stream systems that are beginning to recover from past land use practices.

Coastal Plain

Coastal Plain stream systems are often separated into two categories: red rivers that originate in the mountains or Upper Piedmont and blackwater streams that originate in the Coastal Plain or Lower Piedmont (Kellison et al. 1998). Red rivers are so named because their waters in flood stage are reddish or brownish as a result of sediment transport from upland sources. Blackwater streams are the most common stream type in the Coastal Plain and characterized by high dissolved organic carbon concentration that imparts a dark color and high acidity (Smock and Gilinsky 1992; Kellison et al. 1998).

Coastal Plain streams are generally low-gradient, warm water streams with numerous pools and few riffles (Felley 1992). Substrates are generally organic soils or loose shifting sands that are prone

to displacement during storms. Debris dams and snags are important components of coastal streams because they provide stable substrates for invertebrates, provide refuge and foraging areas for vertebrates, and affect water velocity and flooding patterns (Smock and Gilinsky 1992).

Extensive floodplains develop, even along headwater streams, and channels are often braided throughout their floodplains. Floodplains are an integral component of these streams, and many aquatic species move into floodplains during floods for spawning or other needs (Hodges 1998, Smock and Gilinsky 1992).

Most fish species found in blackwater streams are typical of slow-flowing, deep-water habitats (Smock and Gilinsky 1992). Species richness for macroinvertebrates can be very high. Usually Diptera (flies) make up the greatest proportion of taxa but Trichoptera (caddisflies) are also well represented. Only a few species of mollusks occur in the smaller acidic streams (i.e. fingernail clams), but abundance increases with stream size and calcium levels (Smock and Gilinsky 1992).

In general, headwater streams in the Coastal Plain have higher species richness than headwater streams in the Appalachians, which may be related to a milder climate and lack of steep elevation gradients (Paller 1994). Because these streams support many species that are uncommon or absent in larger streams, headwater streams in the southern Coastal Plain contribute substantially to regional biodiversity.

National Forests play an important role in providing habitat for both aquatic and wetland species in the Coastal Plain. National forests and grasslands found in the Coastal Plain are the Angelina, Apalachicola, Bienville, Conecuh, Croatan, Davy Crockett, Delta, DeSoto, Francis Marion, Holly Springs, Homochitto, Kisatchie, Ocala, Osceola, Sabine, St. Francis, Sam Houston, Talladega, Tombigbee, Tuskegee, and the Caddo-Lyndon B. Johnson National Grasslands.

Appalachian Plateaus and Interior Low Plateau

Much of the Daniel Boone National Forest in Kentucky and the Bankhead National Forest in Alabama is located in the Appalachian Plateaus province, Cumberland Plateaus section. The geology in this area is dominated by sandstone, shales, and moderately abundant coal deposits. Streams in this area are generally meandering with low to moderate gradients and have substrates of sand, sandstone, and shale bedrock (Etnier and Starnes 1993). In their natural state, the water is clear and low in productivity. During the summer months, flow in the large streams is usually sustained, but many headwater tributaries experience zero base flows during dry periods (Mettee et al. 1996). Waterfalls are numerous, and riparian vegetation is predominantly hemlock (*Tsuga canadensis*) and rhododendron (*Rhododendron* spp.; Etnier and Starnes

1993). Active and abandoned, surface and deep coal mines are common throughout the Cumberland Plateau. Unfortunately, the extraction of coal has been the cause of much water-quality degradation via heavy siltation and acid mine drainage.

Small portions of the Daniel Boone and Bankhead National Forests are also located in the Interior Low Plateaus province, Highland Rim section. Geologically, this area is composed primarily of limestones, chert, and some shales. Streams in this region are characterized by coarse chert gravel and sand substrates interspersed with bedrock areas, moderate gradients, clear waters, and moderate to low productivity and limited aquatic vegetation (Etnier and Starnes 1993). Because of its limestone geology, this province is rich in cave and spring habitats.

Ozark Plateaus and Ouachita Mountains

The Ozark National Forest is located in the Ozark Plateaus province. The Ozark Plateaus is similar in structure to the Cumberland Plateau, but the geology is predominantly limestone, dolomite, sandstone, and shales. The area has rugged, flat-topped mountains with long, deep valleys; steep cliffs and ledges; and clear, spring-fed streams (Robison and Buchanan 1988) that may completely dry up during the summer months. Karst limestone features such as caves, natural tunnels, and sinkholes are common in the Ozark Plateaus (USDA FS 1999).

The Ouachita National Forest is located in the Ouachita Mountains province. This area is similar in structure to the Valley and Ridge province because it has a series of long, parallel ridges and valleys that create a trellis stream pattern. The geology is predominantly sandstone and shale. Few large rivers occur in either the Ouachita Mountains or Ozark Plateaus provinces.

Puerto Rico

The Caribbean National Forest is the largest, relatively undisturbed tract of forested habitat left in Puerto Rico. It contains some of the last remaining intact watersheds with streams that run from montane origins downstream to marine estuaries. Eight major rivers drain the Caribbean National Forest. The area receives a large amount of rain (120 inches annually), and stream flow is highly variable depending on the season. The streams are generally clear at low flows but transport high sediment loads during high flows. Landslides are the primary contributors of sediment in the streams on the forest (Hemphill and Garcia, in prep). Caribbean streams physically resemble high elevation streams of the Appalachian Mountains (Leftwich personal communication). The predominant fauna in headwater streams on the Caribbean National Forest are species of migratory shrimp. Other species commonly found are goby (*Sicydium plumier*), and freshwater crab (*Epilobocera sinuatifrons*; Garcia personal communication).

Despite an abundant rainfall, the demand for water in Puerto Rico is exceeding the available supply. Twelve municipal water supply dams presently occur on the forest, and more will likely be proposed in the future.

Stream Habitats

Freshwater habitats are commonly divided into three categories: lentic, which includes standing water such as lakes and swamps; lotic, which encompasses all inland running waters from headwater streams to large rivers; and subterranean, which includes groundwater habitats such as springs and caves (Ward 1992). Lotic systems are linked on a longitudinal gradient from the headwaters to the upper end of estuaries; thus, processes occurring upstream influence the physical, chemical, and biological processes throughout the aquatic system (Vannote et al. 1980; Adams and Hackney 1992). Lotic habitats have a higher aquatic biodiversity than lentic habitats because they are more permanent in ecological and evolutionary time scales (Williams and Neves 1992). In riverine systems, species diversity generally increases from small headwater habitats downstream to large rivers. This may be the result of an increasing variety and availability of habitats and food resources as a stream becomes larger (Adams and Hackney 1992).

Subterranean Habitats

Subterranean, or underground, aquatic habitats include springs and caves and are widely distributed in the southern states, especially in karst geology. Karst areas are common in the Ozark Plateaus, Valley and Ridge, Interior Low Plateaus, and Coastal Plain physiographic provinces. Caves and springs are characterized as being extremely stable but diverse systems.

Caves occur in a variety of rock types, and range in size from a single small room to large interconnecting passages (often miles in length) and with multiple levels (Hobbs 1992). Caves with streams are referred to as active caves and are classified according to the nature of the stream. “Influent caves” have streams flowing into them, “effluent caves” have streams flowing out of them, and “through caves” have a stream entering and leaving the cave. Southern states with the greatest number of caves are Kentucky with 3,770, Tennessee with about 3,000, and Virginia with 2,502. Louisiana and South Carolina have the least number of caves in the South with fewer than 10 each (Hobbs 1992).

Cave communities generally are regarded as simple systems with few species and low productivity. Since caves lack sunlight, cave communities depend on organic material from the surface as a source of energy. Animals that inhabit caves are often divided into categories ranging from troglobites that are morphologically adapted to cave habitats and cannot live elsewhere, to trogloxenes that may occur in caves but live part of their life on the surface (Barr 1963). Troglobitic species include planarians,

collembola, isopods, amphipods, shrimp, crayfish, salamanders, and fish (Hobbs 1992).

Springs are unique habitats characterized by clear water and relatively consistent temperatures and flows (Hargis 1995, Hubbs 1995). Spring characteristics may range from deep artesian systems to minor seeps, and thousands of springs contribute mineral rich waters to streams in the South (Hobbs 1992). Springs are considered source of high-quality drinking water in the South and, unfortunately, are often drastically altered for human use (Etnier 1997).

Many species have evolved in the stable and isolationed environment of springs. Aquatic species commonly found in small springs include amphipods, isopods, snails, salamanders, and fingernail clams. Fish inhabit larger spring habitats and spring runs. Large springs commonly have one group of species adapted to the spring proper and another group downstream (Hubbs 1995). The Ocala National Forest in Florida has numerous large springs that flow through limestone cave systems. Marine fish such as rays (*Dasyatis* spp.) and mullet (*Mugil* spp.) often migrate up these spring runs, and they are occasionally used by manatees (*Trichechus manatus*). The springs are inhabited by several endemic species including coldwater darter (*Etheostoma ditrema*), pygmy sculpin (*Cottus pygmaeus*), big-cheeked cave crayfish (*Procambarus delicatus*), and several species of hydrobiid snails.

Lakes, Ponds, and Wetlands

Lentic habitats in the South include natural lakes, impoundments, and wetlands. Natural lakes are not as common in the South as in the northern United States. Natural lakes found on national forests are Carolina bays, cypress ponds, solution lakes, and lakes formed in river floodplains. The term “wetland” encompasses a variety of freshwater aquatic habitats found on national forests in the South such as bottomland hardwood forests, wooded swamps, pocosins, meadows, mountain fens, pitcher plant bogs, and flatwoods.

Carolina bays, found in the Coastal Plain from North Carolina to northeastern Florida, are shallow, elliptical depressions characterized by evergreen “bay” vegetation (Crisman 1992, Sharitz and Gresham 1998). Carolina bays are primarily filled from precipitation, and thus may be dry part of the year. The majority of Carolina bays do not support permanent fish populations because of their ephemeral nature. The absence of predatory fish allows amphibians to become exceptionally abundant in some Carolina bays. Many other species also utilize bays for breeding and feeding.

Physical alterations, such as draining and agriculture, have greatly reduced the number of Carolina bays. Sharitz and Gresham (1998) list the Croatan National Forest as having some of the best remaining examples of Carolina bays in North Carolina. The Francis Marion

National Forest in South Carolina also has numerous Carolina bays.

Rivers also form lakes and wetlands in floodplains during storm events. Erosional and depositional processes that occur during floods form landscape features such as oxbow lakes, natural levees, potholes, and sloughs. The St. Francis National Forest on the Mississippi River, the Delta National Forest on the Big Sunflower River, and the Davy Crockett National Forest on the Neches River contain good examples of floodplain wetlands and lakes.

Solution lakes are generally associated with karst geology and are represented on southern national forests by limestone sinks and sagponds in the Valley and Ridge, Appalachian Plateaus, and Ozark Plateaus physiographic provinces, and by subtropical lakes and sinkhole ponds in Florida and Alabama. Sagponds and sinks are generally small (< 2.4 ac), shallow (< 3 ft) ponds that are formed when the overlying ground sinks into collapsed caverns in deep deposits of dolomite (Crisman 1992). Florida solution lakes are abundant on the Ocala National Forest, which has about 31,000 acres of lakes. The majority of these lakes are shallow, low-nutrient systems (Crisman 1992). Generally solution lakes are clear, soft, and acidic (pH = 4-6), and some are stained by tannic acids leached from surrounding watersheds (USDA FS 1998). Even though these small ponds fluctuate seasonally and frequently dry completely, they provide important breeding habitat for numerous amphibian species.

Mountain fens, often referred to as bogs or glades, are a unique and uncommon wetland found in the Blue Ridge, Valley and Ridge, Appalachian Plateaus, Ozark Plateaus, and Ouachita Mountains physiographic provinces (Moorhead and Rossell 1998). Fens generally occur in four landscape positions: headwaters of mountain streams, slopes intercepting the water table, stream valleys no longer subject to flooding, and isolated areas over resistant rock strata. Soils, vegetation, and hydrologic characteristics vary considerably, depending on topographic location. Beaver (*Castor fiber*) are important in shaping successional patterns of some fens by occasionally flooding and creating an open canopy.

Fens often contain temporary pools that are utilized by a variety of breeding amphibians. The limited aquatic invertebrate surveys conducted in mountain fens found true flies to be well represented. Fens are important habitat for bog turtles (*Clemmys muhlenbergii*) on the Nantahala, Cherokee, and Chattahoochee National Forests. Many fens have been destroyed by land use activities such as development, grazing, logging, mining, and other activities that disrupt the water table (Moorhead and Rossell 1998).

Wooded swamps occur primarily in the Coastal Plain and frequently hold water for most or all of the year. Dominant overstory tree species in southern swamps include bald cypress (*Taxodium distichum*) and pond cypress (*Taxodium distichum nutans*), Atlantic white cedar (*Chamaecyparis thyodes*), and various tupelo of species (*Nyssa* spp.; Conner

and Buford 1998). Swamps often experience low oxygen levels, especially in areas that are heavily shaded; winds sheltered, and exhibit high levels of nutrients and decaying material. Swamps are often a harsh environment for animals because anaerobic conditions can persist for long periods, and water levels can fluctuate.

Most fish that inhabit swamps are moderately tolerant of degraded water quality (Hoover and Kilgore 1998). Bowfin (*Amia calva*), gar (*Lepisosteus* spp.), and some topminnows (*Fundulus* spp.) have physical adaptations allowing them to survive in water with low oxygen levels. Swamps serve as important spawning and feeding sites for fish, especially during floods (Wharton et al. 1982). A study of larval fish in the Big Sunflower River basin in Mississippi found that flooded bottomland hardwoods were the primary habitat for the larvae of some species, especially black bass (*Micropterus* spp.) and darters. Since most of the Big Sunflower basin has been converted to open farmland, the Delta National Forest is especially important because it provides the some of the only bottomland hardwood habitat left for spawning fish (Hoover and Kilgore 1998).

Many other types of wetland communities occur on national forests in the South. Flatwoods typically occur on poorly drained soils in the Coastal Plain on broad, flat areas between larger drainages (Harms et al. 1998). Wet prairies, meadows, and pitcher plant bogs occur within flatwoods forests on the Coastal Plain. Seepage slopes may occur between flatwoods and swamps. Wetland areas may also develop near natural and constructed lakes and ponds.

Impoundments are a common feature in the South, and most of them have been constructed in the last 50 years (Benke 1990). Reservoirs and ponds were built for a variety of reasons including water supply, recreation, flood control, navigation, and hydropower generation. Typically, large reservoirs were constructed in narrow, steeply sloped river reaches with broad, branching upstream valleys (Soballe et al. 1992). While few have been built in low-lying coastal areas, many large reservoirs occur on or near southern national forests in upland areas. Small ponds and impoundments occur on all national forests, some of which were constructed by the Soil Conservation Service for flood control.

When an impoundment is created, a new biotic community, adapted to lentic conditions, replaces the riverine community. Many lakes and ponds on national forests are managed for recreational fishing and are often limed and fertilized to increased fish production. Many birds, reptiles, amphibians, and mammals also utilize these artificial lakes. Species that inhabit impoundments are rarely imperiled in the South because lentic habitats are relatively abundant (Etnier 1997). Construction of small ponds and lakes (less than 40 acres) has inundated about 0.5 percent of the land surface in the Southern United States (Menzell and Cooper 1992).

Impoundments also affect the downstream biotic community. Some formerly warm water streams now contain cold water sections that are stocked with trout. Other rivers have sections that have been de-watered (left without flowing water) by hydropower diversions. The Hiwassee River on the Cherokee National Forest has both a de-watered section of river and a cold-water trout fishery below a dam.

Biogeography

The South contains some of the world's most diverse aquatic communities (Shute et al. 1997). The diversity of freshwater life is not randomly distributed around the world because the species composition of any region is reflective of the past climatic and geologic stability (Robison 1986; Master et al. 1998). One reason for the high diversity of species in the South is that the region was not glaciated during the Pleistocene era, allowing aquatic species to persist and evolve over time (Adams and Hackney 1992; lsphording and Fitzpatrick 1992). The Licking and Kentucky Rivers, near the Daniel Boone National Forest in Kentucky, may have been the only rivers in the Southern Region that were directly affected by glaciers (Hocutt et al. 1986).

Although glaciers did expand into most of the South, glaciation influenced the distributions of many aquatic species. During the Pleistocene era, glaciers eliminated life in northern areas and forced biota into more southern habitats through a combination of direct physical displacement and modifications of ecological conditions (Robison 1986). Streams in the northern portion of the unglaciated South, such as the Ozark Plateaus and the Ouachita and Appalachian Mountains, served as refugia for some species during glacial periods (Cross et al. 1986). Many disjunct populations of boreal aquatic species in the South are thought to be relicts of populations that moved northward as the glaciers melted (Robison 1986).

Sea levels have fluctuated over time, sometimes falling as low as the continental shelf in the South. Coastal Plain drainages, now separated from each other, may have been connected periodically. During times of drainage connectivity, species may have been able to migrate between drainages (Hocutt et al. 1986).

Fishes are the dominant freshwater vertebrate species in the South and are found in a variety of habitats including streams, swamps, lakes, springs, and caves. The Southern United States contains over 600 species of native freshwater fishes (Etnier 1997, Warren personal communication). Aquatic subregions in North America with the highest fish richness include the Tennessee-Cumberland with 232 species and the Mississippi Embayment with 224 species (Table 2). In contrast, some subregions in the western states have

Table 2. Number of native freshwater fish, mussels, and crayfish found in each southern aquatic subregion (USDA FS 1999).

Other data from Abell et al. (1998) Aquatic "Ecoregions" may not fully correspond with aquatic subregion boundaries used in this assessment (Edwards 1999) so data is approximate. See figure 4 for map of aquatic subregions.

Aquatic Subregion	No. native fish species	No. native crayfish sp.	No. native mussel sp.
Chesapeake	105	22	14
South Atlantic	191	59	56
Florida Gulf	118	38	28
Mobile	206	65	60
Mississippi Embayment	224	63	57
Upper Mississippi	208	122	49
Tennessee-Cumberland	232	125	65
Interior Highlands	203	73	57
Texas Gulf	132	46	29
Caribbean (Puerto Rico)	7	15*	0

* 14 species of freshwater shrimp and 1 species of freshwater crab (Garcia personal communication)

less than 10 fish species (Abell et al. 1998). The highest fish diversity in the South occurs in Tennessee and Alabama, although most States have at least 119 species (Warren et al. 1997). Aquatic subregions with the most endemic fish species are the Mobile and the South Atlantic, each with 48 species (Table 3).

Invertebrates make up 95 percent of the world's fauna, and roughly 70 to 80 percent of this fauna is composed of insects (Wilson 1988). Thorpe and Covich (1991) estimated the aquatic invertebrate fauna in the United States and Canada includes more than 10,000 species. All major phyla of invertebrates, except Echinodermata, have freshwater representatives (Williams and Neves 1992). Insects, mollusks, crustaceans, and mites are particularly rich in species. Invertebrates serve important roles in freshwater ecosystems as food for vertebrate species, grazers of algae, links in the life cycles of parasites, and processors of organic materials (Strayer 1998).

About 91 percent of freshwater mussels, 53 percent of fingernail clams, and 61 percent of freshwater snails known from the United States occur in the South, and new species are still being described. Early naturalists described species based on shell characteristics, which vary in shape and color (even in the same river) that resulted in many species with multiple names. The taxonomy of freshwater mollusks is still being debated and many taxonomists are currently using electrophoretic analyses to determine species (Parmalee and Bogan 1998, Williams and Mulvey 1997).

Table 3. Number of endemic freshwater fish, mussels and crayfish found in each southern aquatic subregion (USDA FS 1999).

Other data from Abell et al. (1998) Aquatic Ecoregions" may not fully correspond with aquatic subregion boundaries used in this assessment (Edwards 1999) so data is approximate. See figure 4 for map of aquatic subregions.

Aquatic Subregion	No. native fish species	No. native mussel sp.	No. native crayfish sp.
Chesapeake	7	4	0
South Atlantic	48	19	39
Florida Gulf	15	14	30
Mobile	48	17	39
Mississippi Embayment	11	2	33
Upper Ms	24	17	23
Tennessee-Cumberland	27	20	40
Interior Highlands	26	11	37
Texas Gulf	6	5	12
Caribbean (Puerto Rico)	0	2*	0

* 1 species of freshwater shrimp and 1 species of freshwater crab (Garcia personal communication)

Aquatic subregions with the highest number of native mussel species are the Tennessee-Cumberland (125 species) and the Upper Mississippi (122 species; Table 2). Aquatic subregions with the highest number of endemic mussel species are the Tennessee-Cumberland (20 species), the South Atlantic (19 species), and the Mobile and Upper Mississippi (17 species each; Table 3). The Mobile Basin is the center of freshwater snail diversity in the South (approximately 118 species; Neves et al. 1997).

Aquatic mollusks in the Southern States inhabit in a wide variety of permanent and seasonal aquatic habitats. Freshwater mussels and snails reach their highest diversity and abundance in larger rivers (Pennak 1989). Fingernail clams, small bivalves that live in lakes, streams, and ephemeral aquatic habitats, generally are highly adaptable and often inhabit stressful habitats where other mollusks cannot survive, such as cold springs, ephemeral aquatic habitats, and blackwater streams (Herrington 1962; Pennak 1989).

Freshwater crustaceans consist of a variety of taxonomic groups including crayfish, shrimp, isopods, and amphipods, and may be found in almost any type of freshwater habitat in the South (Schuster 1997). Like freshwater mussels and fish, the South harbors the highest number of crayfish species in the United States (Taylor et al. 1996). Crayfish richness follows similar zoogeographic patterns as fish and mussels, although represented by fewer species (Abell et al.

1998). The highest numbers of species are found in the Tennessee-Cumberland, Mobile, Mississippi Embayment, and South Atlantic aquatic subregions (Table 2). The highest numbers of endemic crayfish species occur in the Tennessee-Cumberland (40 species), and Mobile (39 species) and South Atlantic, (39 species; Table 3).

Freshwater crustaceans inhabit four general habitat types: caves and subterranean water (mostly amphipods, isopods, and shrimp); streams; lakes, ponds, and ditches; and burrows (mostly crayfish; Hobbs 1981). Crayfish often make up a large proportion of the biomass in aquatic systems and are a major food resource for carnivorous vertebrates. Their widespread success in colonizing aquatic habitats may be related to their ability to feed on a wide variety of items (Distefano 1993). Species that build burrows spend a significant portion of their lives underground and are able to access the water table in many areas lacking permanent standing water (Taylor et al. 1996). Freshwater migratory shrimp dominate streams on the Caribbean National Forest in Puerto Rico. A freshwater crab species is also common in these streams.

The distinction between terrestrial and aquatic insects is rather arbitrary, but Merritt and Cummins (1984) define aquatic insects as those with one or more life stages associated with aquatic habitats and frequently encountered in collections made from aquatic environments. About 40 percent of the North American aquatic insect fauna is represented in the Southern United States (Morse et al. 1997). Many aquatic insect species are endemic to the South, including more than 44 stoneflies, 168 caddisflies, 84 mayflies, and 42 dragonflies. Aquatic insects exhibit an array of morphological, physiological, and behavioral adaptations enabling them to inhabit virtually all types of aquatic habitats including hot and cold springs, temporary ponds, water-filled tree holes and pitcher plant fronds, intermittent streams, and permanent bodies of water (Ward 1992). Rarely are conditions in any freshwater habitat so extreme as to exclude all aquatic insects.

The South has a rich amphibian fauna with about 150 described species and more species awaiting formal taxonomic description (Keister 1971). Most of the native amphibians in the South are salamanders (68 percent). Centers of amphibian species richness and endemism in the southern States include the Appalachian Mountains, the Coastal Plain, and the Ouachita Mountains and Ozark Plateaus (Dodd 1997). Among the southern States, Georgia has the highest number of amphibian species (81), and Texas and Kentucky have the lowest number (49).

The typical amphibian life cycle consists of an aquatic egg and larval stage and metamorphosis into a terrestrial adult; however, some species remain aquatic as adults. Large aquatic salamanders include hellbenders (*Cryptobranchus* spp.) and waterdogs (*Necturus* spp.). Other smaller aquatic salamanders that inhabit small streams and seeps include dusky (*Desmognathus* spp.), shovelnose (*Leurognathus marmoratus*), spring

(*Gyrinophilus porphyriticus*), and brook salamanders (*Eurycea* spp.; Conant 1975). Salamanders that inhabit vegetated ponds and swamps in the Coastal Plain include amphiumas (*Amphiuma* spp.) and sirens (*Siren* spp). Frogs use a variety of wetland habitats for reproduction, but fewer frog species are found in flowing-water habitats (Dodd 1997). Many amphibians require fishless habitats for breeding. The dusky gopher frog (*Rana capito servosa*), which is found on the Conecuh National Forest in Alabama, requires ponds that are absent of fish for successful reproduction.

Many reptiles in the South also are dependent on aquatic habitats (Wilson 1995). Riverine and pond species, such as map turtles (*Graptemys* spp.), musk turtles (*Sternotherus* spp.), snapping turtles (Cheldridae), and alligators (*Alligator mississippiensis*), spend most of their time in the water and only leave the water to bask or nest. Species such as water snakes (*Nerodia* spp.), bog turtle, and crayfish snakes (*Regina* spp.) are dependent on aquatic habitats for food and cover. Many other species are primarily terrestrial but often utilize wetland areas. The South contains the greatest diversity of freshwater turtles in the United States (Buhlman and Gibbons 1997). Twenty-three species of turtles are found in Alabama alone as compared to 10 species found in the northeastern United States (Lydeard and Mayden 1995).

Aquatic habitats also provide critical habitat for many bird species in the South (Ford et al. 1997). Waterfowl, wading birds, bald eagles, ospreys, kingfishers, songbirds, and many other species use rivers, streams and associated bottomland wetlands, and impoundments. For many migratory species, the South provides an important link between boreal breeding habitats and tropical winter habitats. Important waterfowl habitat areas in the South include the lower Mississippi River Valley, the Gulf Coast, and the Middle-Upper Atlantic Coast. National forests located in the priority areas include the Croatan, Francis Marion, Kisatchie, Delta, and St. Francis (USDA FS 1996).

About 100 mammal species are endemic to the Southern United States (Harvey and Clark 1997). While many of these species are closely associated with aquatic ecosystems, few are considered truly aquatic. Species found on southern national forests that live primarily in aquatic habitats are beaver, river otter (*Lutra Canadensis*), muskrat (*Ondatra zibethicus*), West Indian manatee, and water shrew (*Sorex palustris*).

Imperilment

Because of the widespread modification of freshwater habitats in the South, many aquatic species have declined (Benz and Collins 1997). When European settlers arrived in the South in the early 1600's, they began altering aquatic habitats by building mill ponds on small streams, draining wetlands for agriculture, removing wood from streams, building roads along and crossing streams, and using slash and burn agriculture methods (Morse et al. 1997, Williams 1989). Beaver, a species that creates habitat for many plants and other animals, were trapped out of the region by the late 1700's (Hackney and Adams 1992).

Although logging occurred for years in scattered locations around the South, large-scale removal of timber began in the 1880's. By 1920, most of the South had been extensively logged and left with 90 million acres of cutover land (Williams 1989). Loggers during this time period paid little attention to water quality or stream protection. Heavy cutting near streams produced a large amount of sedimentation and reduced the amount of large wood in streams. Many logging roads and railroads were built near perennial streams or in ephemeral stream channels. Splash dams were constructed on some streams to store logs until they were flushed downstream to a mill (SAMAB 1996).

Moyle and Leidy (1992) placed human abuses of aquatic ecosystems into five categories: competition for water, habitat alteration, pollution, introduction of exotic species, and commercial exploitation. Historically, water has been considered inexhaustible in the South, and demands for water supplies have been easily met. Most of the South operates under the "riparian right" doctrine, which entitles landowners to make reasonable use of water that flows through their land. Many States have modified this doctrine, developing water usage policies with minimum flow requirements. Although water usage has been declining in the United States since 1980, expanding development and urbanization in the South is expected increase the demand on water supplies (SAMAB 1996). Georgia currently is involved in negotiations with Alabama and Florida concerning water allocation for the shared river basins that serve their water needs. In Puerto Rico, population growth and development have created a demand for water that exceeds the current capabilities of existing sources. Many

streams on or near the Caribbean National Forest already have multiple dams that supply water for municipal and industrial uses (Hemphill and Garcia, in prep).

Habitat alteration is probably the major cause of decline of aquatic diversity in the South. Habitat alterations include activities that change aquatic environments or habitat suitability for aquatic species (i.e. channelization and dam construction). Although humans have been modifying North American streams and rivers for centuries, the most dramatic modifications did not begin until the early 19th century (Benke 1990). In the last 100 years, various government agencies and power companies have built numerous large and small reservoirs, and few southern rivers have escaped impoundment (Benke 1990, Shute et al. 1997, US EPA 1997). The construction of dams has converted most of the large rivers in the South into a series of regulated pools (Soballe et al. 1992).

Dams have directly and indirectly affected aquatic species and communities on many southern national forests. Dams modify the ecological processes of streams, including the flow of water, sediment, nutrients, energy, and community composition (Ligon et al. 1995) and transforms shallow, free-flowing streams into deep, slow moving pools. Aquatic species adapted to free-flowing water are replaced by those more suited to a lentic environment. Dams may affect downstream waters by changing flow and sediment regimes, as well as water temperatures and dissolved oxygen levels (determined by the outlet location in the dam). Water released off the bottom of a reservoir may be cold and low in oxygen (Yeager 1993). These changes in the natural characteristics of a river fragments habitats and can be barriers to species dispersal, gene flow, and recolonization of many aquatic species (Neves and Angermeier 1990). Even small dams, such as mill dams and those built by the Soil Conservation Service for flood control, may be barriers to some species.

The long-term viability of many riverine species isolated by impoundments is questionable (Neves and Angermeier 1990). National forests in the South contain many streams with aquatic species that have been isolated by impoundments. For example, populations of the endangered smoky madtom (*Noturus baileyi*) and the threatened yellowfin madtom (*Noturus flavipinnis*) became isolated in Citico Creek on the Cherokee National Forest after construction of impoundments on the Little Tennessee River. Populations of rare freshwater mussels and the flattened musk turtle (*Sternotherus depressus*) were isolated in the Sipsey Fork drainage on the Bankhead National Forest after creation of Lewis Smith Lake. Leopard darter (*Percinia pantherina*) populations also have been isolated by impoundments in the Little River drainage on the Ouachita National Forest.

Channelization is the realignment of a stream channel, usually for flood control, and has been a common practice in the South. Negative effects of channelization on aquatic biodiversity include reduction of habitat niches, modification of the

hydrologic cycle, loss of adjacent wetlands and riparian vegetation, and water quality degradation (Simpson et al. 1982). When the natural dynamics of a stream are severely altered by channelization, the stream will adjust by developing headcuts upstream of the channelized section. Headcuts are characterized by extensive bank erosion, loss of riparian trees, degraded stream channels, unstable substrates, and wide channels with shallow flows (Hartfield 1993). Headcuts may continue upstream for years after a channelization project has been completed. For example, the Homochitto National Forest in Mississippi is still experiencing headcuts in streams stemming from a channelization project on the Homochitto River in the late 1930's. Channelization can also cause fragmentation of habitats and species (Moyle and Leidy 1992).

Pollution, in terms of freshwater ecosystems, can be defined as the discharge of materials that adversely affect the quality of aquatic plant and animal life (Maitland and Morgan 1997). Water pollution is generally divided into two categories: point sources (waste discharges emanating from a discrete point) and nonpoint sources (unconfined and diffuse sources of pollution; McDaniel 1993). Since enactment of the Clean Water Act in 1972, many rivers in the South are showing improved water quality resulting from the regulation of point source pollution (SAMAB 1996) and the EPA has identified nonpoint source pollution as the remaining water quality concern. Aquatic species populations can often recover from catastrophic pollution events provided that there is a source of colonists. As habitats become increasingly fragmented and isolated, catastrophic events have the ability to permanently eliminate local populations.

Aquatic habitats on national forests in the South are usually more affected by nonpoint sources of pollution than by point sources. Major nonpoint sources are the result of erosion from ground disturbing activites, agricultural practices, and rural development. Air pollution also has affected aquatic systems in some areas. Sulfur dioxide emissions from copper smelting operations in the 1800's denuded vegetation and severely impacted aquatic species in the Ocoee River drainage in Tennessee. Most deposition of air pollution, however, cannot be traced to a single source. Acid precipitation, fallout from burning fossil fuels, may be deposited great distances from its source. Sulfate is the major source of the acid deposition in the northern portion of the southern Appalachians as well as the higher elevations (SAMAB 1996). Acid deposition in the St. Mary's River on the George Washington National Forest has resulted in a 38-percent loss of aquatic invertebrate taxa in the river (Kirk personal communication).

Other pollutants that affect aquatic habitats on the national forests in the South include: brine and chemicals from oil and gas operations, acid mine drainage, sediment, nutrients from agricultural practices, pesticides, heavy metals, and temperature changes. Oil wells are common on many southern national

forests and often affect nearby streams. Past oil well operations on the Homochitto National Forest in Mississippi were identified as the source of brine and tailing contamination in National Forest streams. New directional drilling techniques have led to widespread redevelopment of old oil fields and may be a future concern on some national forests.

Nutrients and other nonpoint source pollution from agricultural practices affect aquatic habitats on national forests in parts of the rural South. For example, Georgia, Arkansas, North Carolina, Alabama, Mississippi, and Texas lead the nation in income derived from poultry production (National Agricultural Statistics Service 1997). Poultry by-products, such as manure, used litter, and dead birds, have been traditionally used for agricultural fertilizer. Water pollution results from by-products leaching into surface- or ground- water.

Sediment is probably the most pervasive nonpoint pollution that affects streams on national forests. Sedimentation is caused by soil erosion from ground-disturbing activities such as roads, poorly designed or nonbuffered land use activities, mining, and construction. Many historic roads on national forests were built in poor locations (i.e. along streams); many of which are still in use today. Sedimentation can negatively affect aquatic ecosystems by reducing habitat complexity and diversity.

The introduction of nonindigenous aquatic organisms has been so widespread in North America that few natural communities remain unaffected by these species. Negative effects from introductions include displacement of native species through competition, extirpation through predation or disease, and reduction of biodiversity through habitat degradation or change (Williams and Neves 1992). Homogenization of aquatic faunas occurs as nonindigenous species are introduced across the region into historically diverse communities (Angermeier 1994). The most notable replacement of native species by exotic species occurs in altered environments that provide the introduced species an ecological advantage (Moyle and Leidy 1992). The U.S. Geological Survey reports that over 500 nonindigenous fish taxa have been introduced into the United States (Nico and Fuller 1998). The South Atlantic and Florida Gulf subregions have 205 recorded nonindigenous fish species. Many introductions to enhance sport fishing resulted in western native fish transplanted into eastern waters, and vice versa (Courtenay and Moyle 1992). Bait bucket releases, escapes from fish farms, and releases from private aquaria are also sources of introductions.

Commercial exploitation generally has not been a factor in the decline of most freshwater aquatic species in the South. Some big-river game fish species such as paddlefish and sturgeon, however, have declined because of overfishing and habitat loss. Freshwater mussels historically were exploited for pearls and buttons, which may have negatively impacted their populations. Presently, common species of mussels can be collected and sold in some southern states; however,

this activity takes place on large rivers and reservoirs and does not affect populations on national forests. Some amphibian and reptile populations have been affected by collections for biological laboratories and the pet industry (Dodd 1997).

Extinction of species rarely happens quickly, but rather the process is incremental, with total extinction preceded by local loss of populations (Angermeier 1995). For most endangered species, their status is the result of multiple, cumulative, long-term effects, even though particular causes are often cited (Moyle and Leidy 1992). Species with limited ecological and geographical ranges are thought to be vulnerable to extinction in both aquatic and terrestrial systems. Rarity is a natural phenomenon, and although small ranges and low abundances of some aquatic species may be a product of human activities, a great many are natural (Gaston and Lawton 1990).

Faunal groups that are species-rich tend to have more rare than common species (Sheldon 1988). Rare species generally fit into three categories: taxa with broad distribution but locally small population sizes, those taxa with patchy distributions but relatively large local populations, and those taxa with patchy distributions and low individual abundance (Fiedler and Ahouse 1992).

Within the United States, imperilment of southern fishes is second only to that of western fishes (Master et al. 1998). Williams et al. (1989) list about-one third of the species in North America as either having or needing protection in at least some portion of their range. Warren et al. (1997) found that drainage units with the highest numbers of unique fishes also had the highest percentages of imperiled fishes. The Tennessee-Cumberland and Coosa-Tallapoosa drainages have the highest number of imperiled fish species in the South.

Warren et al. (1997) found that fish families in the Southeast with disproportionately high levels of imperilment characteristically live in isolated wetland habitats, groundwater habitats, or benthic habitats. Angermeier (1995) found an association between extirpation of fish species in Virginia and three ecological characteristics: diadromy, limited physiographic range, and limited range of water sizes. According to Etnier (1997), sedimentation and alteration of habitats (primarily impoundments and channelization) are responsible for about 75 percent of fish species declines in the South.

Invertebrates make up 95 percent of the world's biodiversity; however, with the exception of the few well-studied species of mussels, crayfishes, and insects, it is not known how many invertebrate species are declining, endangered, or extinct (Strayer 1998). Invertebrate species most at risk are probably those with small ranges that live in habitats that have been negatively altered by humans. Because little is known about the distribution and ecology of many freshwater invertebrates, it is difficult to identify the major threats to their existence. Invertebrates make up

a high proportion of aquatic fauna and their well being must be measured in order to preserve aquatic biodiversity (Wilson 1988).

Few extensive surveys were historically conducted on southern freshwater mollusks, making it difficult to make inferences about the changes in diversity, abundance, and distribution over the last 100 years (Neves et al. 1997). Freshwater mussels and snails both reached their highest diversity in the shoal habitat of medium and large rivers, particularly in the Mobile and Tennessee-Cumberland subregions. Unfortunately, most shoal habitat in rivers has been destroyed by impoundments and channelization. Within the Mobile Basin, 26 species and 4 genera of snails are presumed to be extinct and only 25 percent of the freshwater mussel fauna in the United States are considered to have stable populations (Williams et al. 1992).

Until recently, little attention was given to the decline and disappearance of the aquatic gastropods in the South. As a result, the status of freshwater snails in most southern drainages is virtually unknown, and only a few species have been federally listed as threatened or endangered species (Neves et al. 1997). The distribution of fingernail clams is even less well known than that of the freshwater mussels and snails, and the conservation status of most species is unknown (Neves et al. 1997).

Many crustacean species have small distributions. More than 65 crayfish species are currently known only from one locality or river drainage (Taylor et al. 1996). Because of their limited distributions, many crayfish species have high global ranks. The Nature Conservancy considers 51 percent of United States crayfish species to be at risk (Stein and Flack 1997). However, there is some dispute over their sensitivity to environmental disturbances (Schuster 1997). Little is known about the distribution and ecology of some of the crustacean taxonomic groups; thus, their conservation status cannot be determined. As a result, a number of taxonomic groups have no species currently listed or being considered for Federal listing as threatened or endangered (Schuster 1997).

Changes in the historic distribution and abundance of aquatic insects in the South cannot be determined because few extensive surveys were conducted before the 1930's. The southern logging boom and associated deforestation, fires, and sedimentation occurred before much was known about aquatic insect fauna (Morse et al. 1997). Because the knowledge of aquatic insect distributions, population sizes, and habitat requirements in the South is incomplete, it is difficult to be certain whether species are extinct, rare, or in danger of extinction. However, some aquatic insect species are thought to be rare and possibly imperiled. Morse et al. (1997) included 153 taxa on a list of rare caddisflies, mayflies, stoneflies, and dragonflies in the South.

Nymphal stages of some aquatic insects are particularly vulnerable to adverse modifications to their habitat such as

siltation, oxygen depletion, chemical pollution, or thermal changes. Like with other aquatic groups, imperiled insects often depend on habitats that have been negatively changed by humans. Most aquatic insects hatch into terrestrial forms for a short portion of their lives; therefore, they also depend on suitable riparian habitat as well as suitable aquatic habitat.

Although many amphibian species are in dire need of a conservation program and management, no coordinated large-scale status assessment has been prepared for the group. LaClaire (1997) includes 51 taxa in a list of imperiled amphibians in the southeast, of which about 37 species are aquatic or depend on aquatic habitats for part of their life history. Habitat destruction and fragmentation probably are responsible for some of the declines in amphibian populations. In the South, Florida and Arkansas have both suffered high losses of wetland habitat (US EPA 1997). Florida alone has lost over 9 million acres of wetlands (Dodd, Jr. 1997). Since many amphibians require a certain mix of aquatic and terrestrial habitats, the loss of one habitat may affect a species even if the other habitat is still available. For example, dusky gopher frogs utilize gopher tortoise burrows outside the breeding season. Conversion of longleaf pine (*Pinus taeda*) stands to slash pine (*Pinus elliottii*) has negatively affected gopher tortoise habitat, which in turn has negatively affected gopher frogs.

Buhlman and Gibbons (1997) estimate that about 62 percent of the southern aquatic reptile fauna is significantly declining in at least a portion of their range. Reasons for the decline include collection of some species for the pet trade, destruction and fragmentation of wetland and riverine habitats, habitat fragmentation by roads, alteration and development of salt marsh habitats, and destruction of adjacent terrestrial habitats needed by semiaquatic species. Species that inhabit rivers are the most imperiled group of aquatic reptiles (Buhlman and Gibbons 1997).

More than 80 percent of mammalian species in the southeast are listed at some level of concern throughout all, or a portion of their ranges (Harvey and Clark 1997). Reasons for decline include habitat loss and degradation or other human-related factors. Imperiled mammals associated with freshwater aquatic habitats in the South include the West Indian manatee, Florida panther (*Puma concolor coryi*), Florida black bear (*Ursus americanus floridanus*), Louisiana black bear (*U.*americanus *luteolus*), water shrew, gray bat (*Myotis sodalis*), and Indiana bat (*M. grisescens*).

Of the many habitats used by birds in the South, probably none are more threatened with destruction and degradation than those that depend on aquatic habitats (Ford et al. 1997). Since pre-colonial times, there have been extensive losses of bottomland forests and wetlands in the South. For example, Toledo Bend and Sam Rayburn reservoirs in Texas inundated about 247,100 acres along the Sabine and Angelina Rivers, much of which was once bottomland hardwood forests (Dickson 1997). Researchers in

Louisiana and east Texas found that bird densities in mature bottomland hardwood stands were two to four times greater than densities in upland pine and pine/hardwood stands. Bird species that are doing well in the South today include those associated with open water, a habitat that has increased during the past century (Dickson 1997).

Conservation Assessment and Prioritization

A common problem for resource agencies and conservation organizations is how to use limited resources such as time, money, and energy to most effectively manage and protect biological diversity. Setting conservation priorities is one of the most crucial and difficult tasks that conservationists face (Angermeier and Winston 1997; Shute et al. 1997). Most aquatic conservation efforts have been focused on single-species management and habitat preservation. Although this approach has had some successes, it has failed to preserve many populations or aquatic biodiversity in general (Sheldon 1988; Angermeier and Schlosser 1995; Shute et al. 1997). The term "biodiversity" is often misused as a synonym for "species diversity" (Meffe and Carroll 1997). Species diversity is a measure of the total number of species in a habitat or community; whereas, biodiversity encompasses several organizational levels within each of three distinct hierarchies: taxonomic, genetic, and ecological (Angermeier 1995).

It is now widely recognized that aquatic biodiversity, especially rare elements, would be better protected by concentrating on higher levels within the biodiversity hierarchy, such as communities and ecosystems (Moyle and Yoshiyama 1994; Angermeier and Schlosser 1995; Shute et al. 1997). Protecting communities would conserve most elements of biodiversity more effectively and efficiently than single-species management (Angermeier and Schlosser 1995). Unfortunately, a consistent protocol for classifying aquatic communities is not yet available, although several organizations and researchers have been working on the problem (Lammert et al. 1996; Maxwell et al. 1995; Angermeier and Winston 1997; Seelbach et al. 1997). Ecologists recognize the tremendous variation in aquatic communities, but there is little agreement on how many aquatic community types exist or how different two communities must be to be considered distinct types (Angermeier and Winston 1997).

Many articles have suggested that watersheds are appropriate aquatic ecosystem units for setting conservation priorities (Maxwell et al. 1995; US EPA 1997; Master et al. 1998). The term "watershed" refers to any area of land across which surface water drains to a common point. This common usage of the term could relate to a land area as large as the

Mississippi River watershed or as small as a few acres.

The term "watershed" also has a technical meaning that has been adopted for use by federal agencies, state agencies, academia, and nongovernmental organizations. A "watershed" is defined within a hierarchy (hydrologic unit) that divides land into progressively smaller, nested drainages. A nationally uniform system for defining hydrologic units (HU) was initially developed in the mid-1970's by the U.S. Geologic Survey and has since been modified (Table 1).

Subbasins (see Table 1) are useful ecological units because, in most cases, the physical and chemical state of a stream reflects topographic and geomorphic characteristics. Land use practices within drainages have the potential to affect aquatic species and habitats, both directly and indirectly. However, this relationship may be less pronounced in areas with karst geology, porous soils, or flat terrain with swamps and marshes because stream conditions in these areas tend to be less correlated with drainage characteristics (Hughes and Omernick 1981).

The geoclimatic processes that created subbasins have influenced for the distribution of many aquatic organisms. Species that spend their entire life cycles in aquatic habitats, such as fish, mussels, and some crayfish, tend to have similar distribution patterns. These patterns often correlate with aquatic ecological units because they have been shaped by many of the same forces over evolutionary time (Maxwell et al. 1995; Warren et al. 1997; Abell et al. 1998). However, distributions of more mobile aquatic species, such as insects, reptiles, and amphibians, are less likely to be correlated with subbasins and other aquatic ecological units. For example, analysis of caddisfly distributions in the Interior Highlands found that the caddisfly assemblages in three different aquatic subregions were not significantly different (USDA FS 1999). Distributions of species that inhabit subterranean systems also are less correlated with subbasins because groundwater systems may span several surface drainages (Maxwell et al. 1995).

Complete protection of aquatic habitats and biodiversity within a HU requires control over the entire upstream network and surrounding landscape. Even then, aerial pollution can threaten aquatic organisms (Maitland and Morgan 1997, Sheldon 1988). Most subbasins in the South have multiple landowners, aquatic habitats, and species within their watersheds; thus, successful conservation can only be achieved by cooperative efforts and effective, integrated land-use planning on a regional scale (Shute et al. 1997).

Many authors have suggested attributes to consider when evaluating areas for aquatic conservation purposes (Angermeier and Winston 1997; Maitland and Morgan 1997; Meffe and Carroll 1997; Shute et al. 1997; Warren et al. 1997; Abell et al. 1998; Master et al. 1998; US EPA 1999,). The following attributes are the most commonly suggested:

1. Condition of area or watershed.
2. Diversity and uniqueness of habitats.
3. Species diversity and number of endemic species.
4. Ownership complexity and protection.
5. Degree of rarity including declining species, communities, and habitats.
6. Conservation rank of habitats and viability of populations.
7. Small but unique or important habitats.
8. Representativeness of the region.
9. Feasibility of effective conservation.

These nine attributes may vary in importance, depending on the objectives of a conservation effort. For example, if the objective is to choose areas that will represent the aquatic biodiversity of a region, agencies and other interested groups may focus on watersheds that are still in good condition with viable species populations. However, if the objective is to choose areas for habitat and species restoration, watersheds in poor condition might be selected. Some groups have developed attribute-scoring systems to help them rank and select aquatic habitats according to their objectives. However, according to Maitland and Morgan (1997), any method of evaluation should be seen as an aid to human judgment rather than as a complete answer.

Several agencies and other interested groups have recently completed assessments of aquatic resources in the South. Federal and state agencies produced aquatic resource reports as part of large-scale assessments of the southern Appalachian Mountains (SAMAB 1996) and Interior Highlands (USDA FS 1999). The Nature Conservancy and the Southern Appalachian Forest Coalition conducted ecoregional planning for the southern Blue Ridge physiographic province that included an assessment of rare aquatic species and habitats (TNC 1999). The Southern Appalachian Forest Coalition and Pacific Rivers Council sponsored a "rapid assessment" of the best aquatic diversity/integrity areas associated with national forests in the southern Appalachian Mountains (McLarney 1999). Each state in the South has prepared a Unified Watershed Assessment (1998) as part of the President's Clean Water Action Plan. The purpose of the Unified Watershed Assessments was to identify watersheds needing restoration, watersheds needing preventive action to sustain water quality and aquatic ecosystems, and pristine or sensitive watersheds on federal lands needing protection.

The WWF recently published a conservation assessment of the freshwater ecoregions of North America (Abell et al. 1998.). The ecoregions are based on Maxwell et al. (1995) and defined as relatively large areas of water that contain a geographically distinct assemblage of natural communities. To set priorities for conservation, WWF considered both the biological distinctiveness and conservation status of each ecoregion. Most southern aquatic subregions are ranked as global in biological distinctiveness importance and as endangered or critical

in conservation status (Table 4). The Nature Conservancy analyzed fish and mussel distribution data to select critical watersheds in the United States for protecting freshwater biodiversity (Master et al. 1998). Approximately 56 percent of their 327 critical watersheds occur in southern states.

Table 4. Biological distinctiveness and conservation status of southern aquatic subregions (from Abell et al. 1998).

Biological Distinctiveness was determined based on 4 main criteria: species richness, species endemism, rare ecological and evolutionary phenomena, and global rarity of habitat type. Conservation Status was determined based on 7 criteria: degree of land cover alteration, water quality degradation, alteration of hydrographic integrity, degree of habitat fragmentation, additional losses of intact original habitat, effects of introduced species, and direct species exploitation. Likelihood of Future Threats was based on experts opinion.

Aquatic Subregion	Biological Distinctiveness Importance	Conservation Status Category	Likelihood of Future Threats
Chesapeake	Continental	Endangered	High
South Atlantic	Global	Critical	High
Florida Gulf	Continental	Rel. Stable - Critical	Medium - High
Mobile	Global	Critical	High
Mississippi Embayment	Global	Critical	High
Upper Mississippi	Global	Vulnerable	Low
Tennessee-Cumberland	Global	Endangered	High
Interior Highlands	Bioregional	Rel. Intact-Stable	Low - Medium
Texas Gulf	Continental	Vulnerable	Medium
Caribbean	not ranked	not ranked	not ranked

Assessment Methods

Over the last several years, the Forest Service has shifted its focus from individual site and species management to ecosystem management. To help assess aquatic ecosystems, the Forest Service developed a hierarchy of aquatic ecological units in North America (Maxwell et al. 1995). Aquatic ecological units follow subbasin boundaries and are delineated based on native aquatic species distributions (primarily fish). In this assessment, we used the subregion level of Maxwell's hierarchy, which is the smallest scale that has been completed. Aquatic subregions are defined as major drainage systems that have unique fish species assemblages with similarity indices of less than 70 percent (Edwards 1999).

Each of the national forests in the Southern Region was further divided into subbasins (eight-digit HU). The subbasin (Table 1) was chosen because this is recommended as the appropriate scale for regional aquatic ecosystem assessments (US EPA 1997; Master et al. 1998; USGS 1999).

A questionnaire was developed, and each national forest was asked to provide information about their subbasins and aquatic species distributions. Information requested for each subbasin included: National Forest ownership, land ownership pattern, water quality, occurrence of rare aquatic species, threatened and endangered species recovery potential, biological distinctiveness, public interest and support, and sources of habitat degradation.

To determine gaps in knowledge of aquatic fauna distributions, national forests were asked to estimate the percentage of habitat (in 10-percent increments) in each subbasin for which they have adequate distributional surveys for fish, mussels, snails, crayfish, amphibians, and reptiles. Forests also were asked to estimate the percentage of stream area in each subbasin for which they have characterized the physical habitat units using a standardized survey methodology such as basinwide or representative reach estimates.

The global ranking system, developed by TNC and used by state Natural Heritage Programs, was used to identify rare species in this assessment. Each species in TNC system is given a rank ranging from G1, extremely rare throughout its range, to G5, very common. Species designated as rare in this assessment include all aquatic taxa that are ranked

G1 through G3. Species ranked G3/G4 are not included. National forests were instructed to include rare species that are known to occur, or suspected to occur, on or near national forest land. "Near national forest land" is rather vague but generally means one of the following: downstream within a distance where Forest Service activities could potentially effect habitats or species, within a groundwater system with cave entrances or springs near national forests, or semi-aquatic species with known locations near National Forests (insects, amphibians, reptiles, mammals).

Sources of data for rare species locations included state Natural Heritage Programs, U.S. Fish and Wildlife Service, Forest Service, published books and journal articles, and unpublished survey data. Plants were not included in the assessment because there is some confusion over which species should be considered "aquatic."

The conservation rank of a subbasin was determined by using four discriminators: the number of federally listed threatened, endangered, and proposed species; number of sensitive species; TNC critical watershed designation; and human population change. A scoring system was developed for each discriminator.

Number of Federally Listed Threatened, Endangered, or Proposed (T&E) Species *– Data Source*: U.S. Fish and Wildlife Service, state Natural Heritage Programs, Forest Service. *Rationale*: Under the Endangered Species Act, the Forest Service is legally responsible for management and protection of T&E species and habitat. This discriminator includes species known to occur on or nearby National Forest System land. Within a stream or river, T&E species found downstream of national forest land are included if forest management activities could potentially affect species or habitat. Plant species are not included. The T&E species score is determined as follows:

No known T&E species = 0 points.
1 - 2 known T&E species = 1 point.
3 - 5 known T&E species = 2 points.
> 5 known T&E species = 3 points.

Number of Sensitive Species *– Data Source*: State Natural Heritage Programs, Forest Service, and faunal reference books (for example Etnier and Starnes 1993). *Rationale*: The Forest Service has legal responsibilities for managing rare species and habitat. This discriminator includes all freshwater species ranked G1 to G3 using TNC global ranking system, excluding the T&E species. It does not include plant species or those species ranked as G3/G4. This discriminator includes species known to occur on or near national forest land. Within a stream or river, sensitive species found downstream of national forest land are included if forest management activities could potentially affect species or habitat. The sensitive species score is determined as follows:

No known Sensitive species = 0 points.
1 - 5 known Sensitive species = 1 point.
> 5 known Sensitive species = 2 point.

The Nature Conservancy Critical Watersheds – *Data Source*: Master et al. (1998). *Rationale*: TNC analyzed fish and mussel species distribution data to select 327 critical subbasins in the United States. Freshwater snails, crayfish, and aquatic insects were not included because distributional data for these species is limited. Protection and restoration of TNC critical watersheds would conserve at least two populations of almost all imperiled fish and mussel species in the United States. According to Master et al. (1998), this set of watersheds is not a definitive list to protect all freshwater biodiversity, but provides a starting point for conservation action. The TNC critical watershed score is determined as follows:

Not designated as a critical watershed = 0 points.

Designated as a critical watershed = 1 point.

Human Population Change – *Data Source*: US EPA 1999 (U.S. Census Bureau data). *Rationale*: This is an indicator of possible increased pressure on aquatic resources from development and increased public interest within a subbasin. This discriminator is the human population change within a subbasin from 1980 to 1990. The population score is determined as follows:

≤ 7 percent increase = 0 points.

> 7 percent increase = 1 point.

Conservation Rank Score = Number of T&E Species + Number of Sensitive Species + TNC Critical Watershed number + Human Population Change.

Subbasins were grouped into categories based on Conservation Rank Scores as follows:

Low Conservation Rank includes scores 0 - 2.

Medium Conservation Rank includes scores 3 - 5.

High Conservation Rank includes scores 6 - 7.

Results and Discussion

Aquatic Fauna Distribution & Habitat Data Gaps

One of the common issues mentioned by authors in the recently published "Aquatic Fauna in Peril: the Southeastern Perspective" (Benz and Collins 1997) is the lack of basic information for most aquatic species. Historically, extensive biological inventories were not conducted in most southern aquatic ecosystems (Neves et al. 1997). As a result, the rich aquatic fauna of the South is still poorly known, especially the invertebrate groups. Wise management of aquatic resources is difficult without adequate information on the distribution and life history of aquatic species.

On average, national forests in the Southern Region estimated that they have adequate fish distribution data for about 43 percent of the habitat in each subbasin, although this number ranged from zero to 90 percent (Appendix B). Because of the traditional emphasis on recreational fishing, most national forests have good fish distribution and population data for ponds, lakes, and trout streams.

The national forests may have interpreted this question as meaning distribution data collected by the forest, rather than adequate fish distribution data from all available sources. As a result, they may have underestimated the percentage of streams with adequate fish distribution data. More is known about fish than any other aquatic organism because of their size, abundance, economic importance, and comparative ease of capture and identification (Karr 1981). Natural resource agencies and universities have extensive (temporal and spatial) fish collection records. As a result, many field guides and atlases for fish are currently available. Most southern states either have an adequate book on their respective freshwater fishes with identification keys and distribution maps, or one in preparation or press. Many state and federal agencies, museums, and universities are in the process of placing their fish data into computer databases and Geographic Information System (GIS) and some of this data is currently obtainable through the Internet.

Most reptiles and amphibians are considered to be "terrestrial wildlife," although we have included a few aquatic species in this assessment. Many amphibian and reptile inventories have been conducted in the South, but much of the information remains unpublished and generally

unavailable (Dodd 1997). Several amphibian and reptile field guides currently are available, and amateur herpetologists collect much distributional information. However, most national forests have only conducted surveys for rare species. On average, national forests estimate that they have adequate amphibian and reptile distribution data for only five percent of the habitat in each subbasin (range = 0 - 40%; Appendix B).

Until recently, aquatic invertebrate groups were generally ignored except by taxonomists and researchers specializing in various groups. Aquatic invertebrates tend to be less well known than vertebrates because of their small size, cryptic habits, taxonomy problems, and general lack of interest to the public. Most of the larger invertebrate species inhabiting southern lakes and streams probably have been discovered and described, but new species of insects, large crustaceans, and mollusks are still being described (Strayer 1998). Small aquatic invertebrates that live in unusual habitats are not well known. Distributions of some invertebrate groups are difficult to determine because only a few taxonomic experts can identify them to species.

Few extensive historic surveys were conducted for southern freshwater mollusk taxa (Neves et al. 1997). Early naturalists primarily were interested in describing new species; therefore, they collected mussels and snails from large rivers and tended to neglect the smaller streams that are now prominent features of southern national forests. As a result of the emphasis on large streams, little historic distribution data exists for mollusks in most national forest streams.

Freshwater mussels have attracted much attention in the last 20 years because of the high number of imperiled species. Freshwater mussel books, with distribution maps and identification keys, are now available for some southern states including Arkansas (Harris and Gordon 1990), Florida (Heard 1979), Louisiana (Vidrine 1993), Puerto Rico (Van Der Schalie 1948), Tennessee (Parmalee and Bogan 1998), and Texas (Howells et al. 1996). Knowledge of mussel distributions varies greatly by individual national forests. On average, national forests estimate that they have adequate freshwater mussel distribution data for about 38 percent of the habitat in each subbasin (range = 0 – 90%; Appendix B).

Less is known about the distribution of other freshwater mollusks. Snails and fingernail clams have not attracted as much attention because few species are federally listed as threatened or endangered. Conducting distributional surveys for this group is difficult because the taxonomy is still undetermined, and adequate identification keys and distribution maps are not available. Nevertheless, national forests estimate that they have adequate snail distribution data for about 12 percent of the habitat in each subbasin (range = 0 – 90%; Appendix B).

Comprehensive distributional surveys of fingernail clams in the United States have not been conducted, mostly because of their small size, difficulty of identification, and lack of public interest. Neves et al.

(1997) recommend that more extensive and intensive sampling of permanent and ephemeral habitats is needed to determine the distribution of fingernail clam species.

Most research on freshwater crustaceans in the South has been focused on economically important shrimp and crayfish species that are raised for bait and human consumption (Schuster 1997). Less than one-quarter of crayfish species have common names (Williams et al. 1989). Distributional surveys have been conducted for many noncommercial species, but the information is not readily available. For instance, crayfish publications with distribution maps and identification keys exist for many Southern States including Arkansas (Bouchard and Robison 1980), Florida (Hobbs 1942), Georgia (Hobbs 1981), Kentucky (Rhoades 1944), Louisiana (Penn 1959), Oklahoma (Reimer 1969), Tennessee (Bouchard 1972), and West Virginia (Jezerinac et al. 1995); however, most of these are now out-of-print or difficult to find. Agencies and researchers in some Southern States are now working on crayfish distributions and should produce publications in the near future. Few national forests have conducted systematic surveys to determine the crayfish species that occur within their boundaries. On average, national forests estimate that they have adequate crayfish distribution data for about 11 percent of the habitat in each subbasin (range = 0 – 90%; Appendix B).

Other freshwater crustaceans include shrimp, isopods, amphipods, ostracods, cladocerans, and branchiopods. The taxonomy of many of these groups is still in great flux (Schuster 1997). However, isopods and amphipods, despite their small size, are among the most studied of North American freshwater crustacea (Hobbs 1992). Most national forests have not inventoried these groups, although distribution data is available for many species. Streams on the Caribbean National Forest are dominated by freshwater shrimp species, and the forest has adequate inventory information for about nine percent of the habitat.

New aquatic insect species are found every year in the South, but little is known about the distribution, ecology, life history, and habitat requirements of many species (Morse et al. 1997). Finding and identifying aquatic insects is often difficult because of their small size, cryptic habits, and taxonomy problems. Distributional data for aquatic insects has not been compiled for the South and is scattered in various university, museum, and agency files. Identification guides for North American aquatic insects (i.e. Merritt and Cummins 1984) are widely available, and some southern states have publications with identification keys and distribution maps.

On average, national forests estimate that they have adequate aquatic insect distribution data for about 10 percent of the habitat in each subbasin (range = 0 – 80%; Appendix B). Many aquatic habitats on national forests such as small streams, seeps, and springs have not been adequately surveyed for insects (Morse et al. 1997). Some national forests and many state agencies are sampling

aquatic insects as part of a rapid bio-assessment protocol for monitoring stream health but aquatic insects are generally identified to taxonomic family rather than species.

Complete inventories of all aquatic habitats have not been completed on national forests. On average, national forests estimated that they have adequate stream habitat data for about 12 percent of the habitat in each subbasin (range = 0 – 90%; Appendix B). Aquatic habitats such as southern mountain fens, pitcher plant bogs, swamps, ephemeral ponds, springs, seeps, and bays have not been well surveyed.

Basic life history and ecology information is lacking for most aquatic species, even those as well known as fish. Without adequate life history information, we cannot determine the viability of populations or the habitat needed to support all life stages.

Rare Species

Rare aquatic species found on or near national forests in the South include 87 fish, 46 crustaceans, 111 mollusks, 9 amphibians, 4 birds, 7 reptiles, 27 insects, and 3 mammals. Of the 157 subbasins included in southern national forests, 138 are inhabited by at least one rare aquatic species (Appendix C and D). Subbasins with the most rare species primarily occur in the Tennessee/Cumberland and Mobile subregions. The Upper Cumberland on the Daniel Boone and Jefferson National Forests contains 41 rare species, the greatest number of rare aquatic taxa found on or near any national forest land in the South. Scientific names are listed in Tables 5-8.

Rare fish species found on or near southern national forests include 5 sturgeon, 31 minnows, 37 darters, 7 madtoms, 2 cavefish, 1 lamprey, 1 bass, 2 suckers, and 1 topminnow (Table 5). Darters and minnows account for 79 percent of our rare fish species. The greatest numbers of rare fish species are endemic to the Tennessee/Cumberland (17 species), Mobile (15 species), and Interior Highlands (12 species). Warren et al. (1997) found that drainages in the South that have a high number of endemic species also have the highest percentages of imperiled species. One-fourth of the rare fish species on our list are federally listed as threatened or endangered species.

Of the 87 rare fish taxa, 7 inhabit big rivers, 33 inhabit medium rivers, 20 inhabit creeks, 16 inhabit both creeks and medium rivers, 8 inhabit headwater streams and spring runs, 2 inhabit caves, and 1 inhabits lentic or slow moving water (Table 5). Species that prefer big and medium river habitat generally are found peripheral to, or downstream of, southern national forests. Many rare species, including most darters, madtoms, and sturgeons, are benthic or bottom dwellers. Degradation of streams often affects benthic species first because they are in contact with any pollutants that are deposited on the substrate (Warren et al. 1997). Examples of rare fish species for which national forests provide much of the remaining high-quality habitat are yellowfin, smoky, Caddo, and

Table 5. Characteristics of rare fish species on or near national forests in the South.

Species	Common Name	Stat	Endemic	Habitat
Acipenser brevirostrum	shortnose sturgeon	e	-	br, anadr
Acipenser fulvescens	lake sturgeon	s	-	br
Scaphirhynchus albus	pallid sturgeon	e	-	br
caphirhynchus suttkusi	Alabama sturgeon	p	Mobile	br
cipenser o. desotoi	Gulf sturgeon	t	-	br, anadr
Notropis cahabae	Cahaba shiner	e	Mobile	mr
Notropis albizonatus	palezone shiner	e	Tn-Cumb	mr
Notropis girardi	Arkansas River shiner	t	-	mr
Notropis semperasper	roughhead shiner	s	Chesapeake	cr, mr
Semotilus lumbee	sandhills chub	s	S. Atlantic	hw
Cyprinella zanema	Santee chub	s	S. Atlantic	cr
Notropis hypsilepsis	highscale shiner	s	Mobile	cr
yprinella xaenura	Altamaha shiner	s	S. Atlantic	cr, mr
Cyprinella callisema	Okmulgee shiner	s	S. Atlantic	mr
Cyprinella callitaenia	bluestripe shiner	s	Fl Gulf	mr
Hybopsis lineapunctata	lined chub	s	Mobile	cr
Notropis melanostomus	blackmouth shiner	s	Fl Gulf	lentic
Phenacobius teretulus	Kanawha minnow	s	Upper MS	cr, mr
Notropis sp. sawfin	sawfin shiner	s	Tn-Cumb	mr
Phoxinus tennesseensis	Tennessee dace	s	Tn-Cumb	hw
Phenacobius crassilabrum	fatlips minnow	s	Tn-Cumb	cr
Notropis ariommus	popeye shiner	s	-	mr
Notropis perpallidus	peppered shiner	s	Int. Highlands	mr
Notropis ozarcanus	Ozark shiner	s	Int. Highlands	cr, mr
Notropis otenburgeri	Kiamichi shiner	s	Int. Highlands	cr
teronotropis hubbsi	bluehead shiner	s	Int. Highlands	cr, le
Hybognathus nuchalis	Ms silvery minnow	s	-	br
Notropis uranoscopus	skygazer shiner	s	-	cr, mr
Notropis sabinae	Sabine shiner	s	-	cr, mr
Notropis bairdi	Red River shiner	s	-	mr, br
Lythrurus snelsoni	Ouachita mountain shiner	s	Int. Highlands	cr, mr
Cyprinella leedsi	bannerfin shiner	s	-	mr
Cyprinella caerulea	blue shiner	t	Mobile	mr, cr
Phoxinus cumberlandensis	blackside dace	t	Tn-Cumb	hw
Cyprinella monacha	spotfin chub	t	Tn-Cumb	mr
Erimystax cahni	slender chub	t	Tn-Cumb	mr
Ichthyomyzon greeliyi	mountain brook lamprey	s	-	cr
Percina pantherina	leopard darter	t	Int. Highlands	cr, mr
Percina tanasi	snail darter	t	Tn-Cumb	mr

Species	Common Name	Stat	Endemic	Habitat
Percina aurolineata	goldline darter	t	Mobile	mr
Etheostoma scotti	Cherokee darter	t	Mobile	cr
Percina gymnocephala	Appalachia darter	s	Upper MS	cr
Etheostoma bellator	Warrior darter	s	Mobile	cr
Etheostoma davisoni	Choctawhatchee darter	s	Fl Gulf	cr
Etheostoma moorei	yellowcheek darter	s	Int. Highlands	hw, cr
Percina uranidea	stargazing darter	s	-	mr
Percina nasuta	longnose darter	s	Int. Highlands	cr, mr
Ammocrypta clara	western sand darter	s	-	mr
Crystallaria asprella	crystal darter	s	-	mr
Etheostoma pallididorsum	paleback darter	s	Int. Highlands	hw
Etheostoma raneyi	Yazoo darter	s	Ms Embaymnt	cr
Etheostoma vulneratum	wounded darter	s	Tn-Cumb	mr
Etheostoma acuticeps	sharphead darter	s	Tn-Cumb	mr
Percina squamata	olive darter	s	Tn-Cumb	mr
Percina macrocephala	longhead darter	s	-	mr
Percina burtoni	blotchside logperch	s	Tn-Cumb	mr
Etheostoma cinereum	ashy darter	s	Tn-Cumb	mr
Etheostoma maculatum	spotted darter	s	-	mr
Ammocrypta pelucida	Eastern sand darter	s	-	mr, cr
Etheostoma n. susanae	Cumberland johnny darter	s	Tn-Cumb	hw, cr
Etheostoma osburni	candy darter	s	Upper MS	cr
Percina lenticula	freckled darter	s	-	mr
Etheostoma trisella	trispot darter	s	Mobile	cr
Etheostoma ditrema	coldwater darter	s	Mobile	spr
Etheostoma brevirostrum	holiday darter	s	Mobile	cr
Etheostoma percnurum	duskytail darter	e	Tn-Cumb	mr
Etheostoma etowahae	Etowah darter	e	Mobile	cr
Etheostoma collis	Carolina darter	s	S. Atlantic	cr
Percina jenkinsi	Conasauga logperch	e	Mobile	mr
Percina antesella	amber darter	e	Mobile	mr
Percina rex	Roanoke logperch	e	S. Atlantic	mr
Etheostoma tippecanoe	Tippecanoe darter	s	-	mr
Etheostoma cragini	Arkansas darter	s	-	sp, hw
Percina palmaris	bronze darter	s	Mobile	mr, cr
Amblyopsis rosae	Ozark cavefish	t	Int. Highlands	cave
Typhlichthys subterraneus	southern cavefish	s	-	cave
Noturus baileyi	smoky madtom	e	Tn-Cumb	cr
Noturus lachneri	Ouachita madtom	s	Int. Highlands	cr, mr
Noturus gilberti	orangefin madtom	s	Chesapeake	cr, mr
Noturus munitus	frecklebelly madtom	s	-	mr

Species	Common Name	Stat	Endemic	Habitat
Noturus taylori	Caddo madtom	s	Int. Highlands	cr, mr
Noturus stigmosus	northern madtom	s	-	mr
Noturus flavipinnis	yellowfin madtom	t	Tn-Cumb	cr
Moxostoma lachneri	greater jumprock	s	Fl Gulf	cr
Cycleptus elongatus	blue sucker	s	-	br, mr
Fundulus euryzonus	broadstripe topminnow	s	Ms Embaymnt	cr
Micropterus notius	Suwannee bass	s	Fl Gulf	mr

STAT = Status

e = federally-listed as endangered species.

t = federally-listed as threatened species.

p = species proposed for federal-listing as threatened or endangered.

s = sensitive, species globally ranked by The Nature Conservancy as G1-G3.

Habitat

anadr = anadromous (lives in saltwater, spawns in freshwater)

br = big river

mr = medium river

cr = creek

hw = headwater stream

sp = spring

cave = cave

Endemic to Aquatic Subregions (figure 4)

Chesapeake = Chesapeake

S. Atlantic = South Atlantic

Fl Gulf = Florida Gulf

Mobile = Mobile

Ms Embayment = Mississippi Embayment

Upper MS = Upper Mississippi

Tn-Cumb = Tennessee/Cumberland

Int. Highlands = Interior Highlands

Tx Gulf = Texas Gulf

Caribbean = Caribbean

Data Sources

Etnier 1997.

Etnier and Starnes 1993.

Jenkins and Burkhead 1994.

Lee et al. 1980 et seq.

Mettee et al. 1996.

Page and Burr 1991.

Robison and Buchanan 1988.

TNC 1997b.

Table 6. Characteristics of rare aquatic mollusk species found on or near national forests in the South.

Species	Common Name	Stat	Endemic	Habitat
Alasmidonta atropurpurea	Cumberland elktoe	e	Tn-Cumb	cr, mr
Alasmidonta raveneliana	Appalachian elktoe	e	Tn-Cumb	mr
Alasmidonta varicosa	brook floater	s	-	cr, mr
Alasmidonta wrightiana	Ochlockonee arc-mussel	s	Fl Gulf	mr
Amblema neislerii	fat threeridge	e	Fl Gulf	mr, br
Amblema p. perplicata	roundlake	s	-	mr, br
Anodontoides denigratus	Cumberland papershell	s	Tn-Cumb	cr
Anodontoides radiatus	rayed creekshell	s	-	cr, mr
Arcidens confragosus	rock-pocketbook	s	-	mr, br
Arkansia wheeleri	Ouachita rock-pocketbook	e	Int. Highlands	mr
umberlandia monodonta	spectaclecase	s	-	br, mr
Cyprogenia aberti	western fanshell	s	Int. Highlands	mr
Cyprogenia stegaria	fanshell	e	-	br, mr
Dromus dromas	dromedary pearlymussel	e	Tn-Cumb	br, mr
Elliptio ahenea	southern lance	s	-	mr
Elliptio arctata	delicate spike	s	Mobile	mr, cr
Elliptio lanceolata	yellow lance	s	-	mr, cr
Elliptoideus sloatianus	purple bankclimber	t	Fl Gulf	mr, br
Epioblasma brevidens	Cumberland combshell	e	Tn-Cumb	mr, br
Epioblasma capsaeformis	oyster mussel	e	Tn-Cumb	mr, br
Epioblasma f. florentina	yellow blossom	e	-	mr, br
Epioblasma f. walkeri	tan riffleshell	e	Tn-Cumb	mr, cr
Epioblasma metastriata	upland combshell	e	Mobile	mr, cr
Epioblasma othcaloogensis	southern acornshell	e	Mobile	mr, cr
Epioblasma t. gubernaculum	green blossom	e	Tn-Cumb	mr
pioblasma t. rangiana	northern riffleshell	e	-	mr, br
Epioblasma t. torulosa	tubercled blossom	e	-	mr, br
Epioblasma triquetra	snuffbox	s	Tn-Cumb	mr, br
Fusconaia askewi	Texas pigtoe	s	Tx Gulf	mr
usconaia barnesiana	Tennessee pigtoe	s	Tn-Cumb	mr, br
Fusconaia cor	shiny pigtoe	e	Tn-Cumb	mr, br
Fusconaia cuneolus	fine-rayed pigtoe	e	Tn-Cumb	mr, br
Fusconaia lananensis	triangle pigtoe	s	Tx Gulf	cr, mr
Fusconaia masoni	Atlantic pigtoe	s	-	mr, cr
Fusconaia subrotunda	long-solid	s	Tn-Cumb	mr, br
Fusconaia succissa	purple pigtoe	s	Fl Gulf	cr, mr
Hemistena lata	cracking pearlymussel	e	-	br, mr
Lampsilis abrupta	pink mucket	e	-	br
Lampsilis altilis	fine-lined pocketbook	t	Mobile	cr, mr

Species	Common Name	Stat	Endemic	Habitat
Lampsilis hydiana	Louisiana fatmucket	s	-	mr, br
Lampsilis perovalis	orange-nacre mucket	t	Mobile	cr, mr
Lampsilis powelli	Arkansas fatmucket	t	Int. Highlands	mr
Lampsilis satura	sandbank pocketbook	s	-	mr, br
Lampsilis subangulata	shiny-rayed pocketbook	e	Fl Gulf	mr
Lasmigona decorata	Carolina heelsplitter	e	S. Atlantic	cr
Lasmigona holstonia	Tennessee heelsplitter	s	-	cr, mr
Lasmigona subviridis	green floater	s	-	mr, cr
Lemiox rimosus	birdwing pearlymussel	e	Tn-Cumb	br, mr
Leptodea leptodon	scaleshell	p	-	mr, br
Lexingtonia dolabelloides	slabside pearlymussel	s	Tn-Cumb	mr, br
Margaritifera hembeli	Louisiana pearlshell	t	Ms Embaymnt	cr
Medionidus acutissimus	Alabama moccasinshell	t	Mobile	cr, mr
Medionidus parvulus	Coosa moccasinshell	e	Mobile	cr, mr
Medionidus penicillatus	gulf moccasinshell	e	Fl Gulf	cr, mr
Medionidus simpsonianus	Ochlocknee moccasinshell	e	Fl Gulf	mr
Megalonaias boykiana	round washboard	s	Fl Gulf	mr
Obovaria jacksoniana	southern hickorynut	s	-	mr
Obovaria retusa	ring pink	e	-	br
Obovaria subrotunda	round hickorynut	s	-	mr, br
Pegias fabula	little-wing pearlymussel	e	Tn-Cumb	cr, mr
Plethobasus cicatricosus	white wartyback	e	-	br
Plethobasus cooperianus	orange-foot pimpleback	e	-	br
Plethobasus cyphyus	sheepnose	s	-	mr, br
Pleurobema beadleanum	Mississippi pigtoe	s	Ms Embaymnt	mr
Pleurobema clava	clubshell	e	-	mr, br
Pleurobema collina	James spinymussel	e	Chesapeake	cr, mr
Pleurobema cordatum	Ohio pigtoe	s	-	br
Pleurobema decisum	southern clubshell	e	Mobile	mr, cr
Pleurobema furvum	dark pigtoe	e	Mobile	cr, mr
Pleurobema georgianum	southern pigtoe	e	Mobile	cr, mr
Pleurobema oviforme	Tennessee clubshell	s	Tn-Cumb	mr, br
Pleurobema perovatum	ovate clubshell	e	Mobile	mr, cr
Pleurobema plenum	rough pigtoe	e	-	br, mr
Pleurobema pyramidatum	pyramid pigtoe	s	-	mr, br
Pleurobema pyriforme	oval pigtoe	e	Fl Gulf	cr, mr
Pleurobema riddelli	Louisiana pigtoe	s	-	mr
Potamilus amphichaenus	Texas heelsplitter	s	Tx Gulf	mr
Ptychobranchus jonesi	southern kidneyshell	s	Fl Gulf	cr, mr
Ptychobranchus greeni	triangular kidneyshell	e	Mobile	cr, mr
Pyganodon gibbosa	inflated floater	s	S. Atlantic	lentic

Species	Common Name	Stat	Endemic	Habitat
Quadrula c. strigillata	rough rabbitsfoot	e	Tn-Cumb	mr
Quadrula houstonensis	smooth pimpleback	s	-	mr
Quadrula metanevra	monkeyface	s	-	mr
Quadrula pustulosa mortoni	western pimpleback	s	-	mr
Quadrula rumphiana	ridge mapleleaf	s	Mobile	mr
Quadrula sparsa	Appalachian monkeyface	e	Tn-Cumb	br
Simpsonaias ambigua	salamander mussel	s	-	mr
Strophitus connasaugaensis	Alabama creekmussel	s	Mobile	cr, mr
Strophitus subvexus	southern creekmussel	s	-	cr, mr
Toxolasma lividus	purple lilliput	s	-	mr, br
Toxolasma pullus	Savannah lilliput	s	S. Atlantic	lentic, cr
Utterbackia peggyae	Florida floater	s	Fl Gulf	cr, mr
Villosa arkansasensis	Ouachita creekshell	s	Int. Highlands	mr
Villosa australis	southern sandshell	s	Fl Gulf	cr, mr
Villosa choctawensis	Choctaw bean	s	Fl Gulf	cr, mr
Villosa nebulosa	Alabama rainbow	s	Mobile	cr, mr
Villosa perpurpurea	purple bean	e	Tn-Cumb	mr
Villosa trabalis	Cumberland bean	e	Tn-Cumb	cr, mr
Villosa v. umbrans	Coosa creekshell	s	Mobile	cr, mr
Villosa vaughaniana	Carolina creekshell	s	S. Atlantic	cr, mr
Villosa villosa	downy rainbow	s	-	cr, mr
Aphaostracon pyncus	dense hydrobe snail	s	S. Atlantic	sp
Elimia crenatella	lacey elimia snail	t	Mobile	mr, cr
Fontigens tartarea	organ cavesnail	s	Upper Ms	cave
Fontigens turritella	Greenbrier cavesnail	s	Upper Ms	cave
Io fluvialis	spiny riversnail	s	Tn-Cumb	mr, br
Leptoxis crassa	boulder snail	s	Tn-Cumb	mr, br
Leptoxis praerosa	onyx rocksnail	s	-	mr, br
Leptoxis taeniata	painted rocksnail	t	Mobile	mr, cr
Lioplax cyclostomaformis	cylindrical lioplax snail	e	Mobile	mr
Tulotoma magnifica	tulotoma snail	e	Mobile	mr, br

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s = sensitive, species globally ranked by The Nature Conservancy as G1-G3.

Habitat

br = big river

mr = medium river

cr = creek

sp = spring

cave = cave

lentic = pond or other slow water habitat

Endemic to Aquatic Subregions (figure 4)

Chesapeake = Chesapeake; S. Atlantic = South Atlantic; Fl Gulf = Florida Gulf; Mobile = Mobile; Ms Embaymnt = Mississippi Embayment; Upper Ms = Upper Mississippi; Tn-Cumb = Tennessee/Cumberland; Int. Highlands = Interior Highlands; Tx Gulf = Texas Gulf

Data Sources

Burch 1973; Burch 1989; Deyrup and Franz 1994; Harris and Gordon 1990; Howells et al. 1996; Neves 1991; Parmalee and Bogan 1998; TNC 1997a; Turgeon et al. 1988; Vidrine 1993

Table 7. Characteristics of rare crustacean species found on or near national forests in the South.

Species	Common Name	Status	Habitat
Cambarus batchi	Bluegrass crayfish	s	burrows
Cambarus bouchardi	Big South Fork crayfish	s	streams
Cambarus causeyi	crayfish	s	streams,burrow
Cambarus chaugaensis	Oconee stream crayfish	s	streams
Cambarus englishi	crayfish	s	streams
Cambarus extraneus	Chickamauga crayfish	s	streams
Cambarus georgiae	Little Tn crayfish	s	streams
Cambarus veteranus	crayfish	s	streams
Cambarus parrishi	Hiwassee headwaters cray.	s	streams
Cambarus reburrus	French Broad crayfish	s	streams
Fallicambarus byersi	lavender burrowing cray.	s	burrows
Fallicambarus danielae	speckled burrowing cray.	s	burrows
Fallicambarus gordoni	crayfish	s	burrows
Fallicambarus harpi	crayfish	s	burrows
Fallicambarus jeanae	crayfish	s	burrows
Fallicambarus strawni	crayfish	s	burrows
Faxonella blairi	crayfish	s	lentic
Hobbseus attenuatus	Pearl riverlet crayfish	s	lentic
Orconectes hathawayi	Teche painted crayfish	s	streams
Orconectes maletae	Kisatchie painted crayfish	s	streams
Orconectes menae	crayfish	s	streams
Orconectes williamsi	crayfish	s	streams
Procambarus barbiger	Jackson Prairie crayfish	s	burrows
Procambarus delicatus	bigcheek cave crayfish	s	subterranean
Procambarus fitzpatricki	spinytail crayfish	s	burrows
Procambarus jaculus	javelin crayfish	s	lentic/burrows
Procambarus lecontei	Mobile crayfish	s	streams
Procambarus orcinus	Woodville karst cave cray.	s	subterranean
Procambarus nechesae	crayfish	s	lentic/burrows
Procambarus nigrocinctus	crayfish	s	streams

Species	Common Name	Status	Habitat
Procambarus plumimanus	crayfish	s	lentic/burrows
Procambarus reimeri	crayfish	s	lentic/burrows
Procambarus tenuis	crayfish	s	streams/burrow
Crangonx hobbsi	amphipod	s	subterranean
Stygobromus cumberlandus	Cumberland cave amphipod	s	subterranean
Stygobromus emarginatus	amphipod	s	subterranean
Stygobromus fergusoni	amphipod	s	subterranean
Stygobromus gracilipes	Shenandoa Valley cave amphipod	s	subterranean
Stygobromus montanus	amphipod	s	subterranean
Stygobromus morrisoni	Morrison's cave amphipod	s	subterranean
Stygobromus mundus	Bath Co. cave amphipod	s	subterranean
Stygobromus nanus	amphipod	s	subterranean
Stygobromus parvus	amphipod	s	subterranean
Stygobromus pollustus	amphipod	s	subterranean
Stygobromus redactus	amphipod	s	subterranean
Stygobromus sp. 7	amphipod	s	subterranean
Stygobromus spinatus	amphipod	s	subterranean
Caecidotea holsingeri	isopod	s	subterranean

Status:

e = federally-listed as endangered species.

t = federally-listed as threatened species.

p = species proposed for federal-listing as threatened or endangered.

s = sensitive, species globally ranked by The Nature Conservancy as G1-G3.

Data Sources

Deyrup and Franz 1994.

Fitzpatrick Jr. 1983.

Hobbs Jr. 1981.

Hobbs Jr. 1989.

Hoffman 1991.

Robison 1997.

TNC 1997a.

Williams et al. 1989.

Table 8. Characteristics of rare aquatic amphibian, reptile, mammal, bird, and insect species found on or near national forests in the South.

Species	Common Name	Status	Habitat
AMPHIBIANS			
Ambystoma cingulatum	flatwoods salamander	t	wet flatwoods
Eurycea junaluska	Junaluska salamander	s	streams
Eurycea tynerensis	Oklahoma salamander	s	springs, streams
Gyrinophilus subterraneus	West Virginia spring salamander	s	caves
Necturus sp.	Black Warrior waterdog	s	streams
Notopthalmus perstriatus	striped newt	s	temp. ponds
Rana capito aesopus	Florida gopher frog	s	temp. ponds
Rana capito capito	Carolina gopher frog	s	temp. ponds
Rana capito sevosa	Dusky gopher frog	s	temp. ponds
REPTILES			
Alligator mississippiensis	alligator	t	various aquatic
Clemmys muhlenbergii	bog turtle	s	wet meadows
Graptemys barbouri	Barbour's map turtle	s	rivers
Graptemys ernsti	Escambia map turtle	s	large streams, rivers
Graptemys flavimaculata	yellow-blotched map turtle	t	rivers
Pseudomys concinna suwanniensis	Suwanee river cooter	s	rivers, lakes
Sternotherus depressus	flattened musk turtle	t	streams
BIRDS			
Grus canadensis pulla	MS sandhill crane	e	wet savannas
Haliaeetus leucocephalus	bald eagle	t	lakes, rivers
Mycteria americana	wood stork	e	swamps, ponds
Sterna antillarum athalassos	interior least tern	e	river sandbars
MAMMALS			
Neofiber alleni	round-tailed muskrat	s	shallow marsh
Sorex palustris punctulatus	southern water shrew	s	small rocky streams
Trichetus manatus	West Indian manatee	t	estuaries, rivers
INSECTS			
Hydraena maureenae	Maureen's hydraenan minute moss beetle	s	caves
Agapetus jocassee	caddisfly	s	headwate streams
Manophylax butleri	Butler's cliffline caddisfly	s	wet sandstone rockfaces
Paduniella neartica	Nearctic paduniellan caddisfly	s	headwater streams
Cordulegaster sayi	Say's spiketail	s	spring seepages

Species	Common Name	Status	Habitat
Gomphus consanguis	Cherokee clubtail	s	streams
Gomphus diminutus	diminutive clubtail	s	sand-bottomed streams
Gomphus parvidens	friendly clubtail	s	streams
Gomphus septima	Septima's clubtail	s	small/medium rivers
Gomphus viridifrons	green-faced clubtail	s	medium/large rivers
Macromia margarita	Nantahala belted skimmer	s	small/medium rivers
Ophiogomphus edmundo	Edmund's snaketail	s	rivers
Ophiogomphus howei	pygmy snaketail	s	large rivers
Ophiogomphus incurvatus	Appalachian snaketail	s	streams
Progomphus bellei	Variegated clubtail	s	sand-bottomed lakes & spring seepages
Somatochlora calverti	Calvert's emerald	s	spring seepages
Somatochlora margarita	Texas emerald	s	streams
Stylurus townesi	Townes' clubtail	s	small rivers
Macrocotyle hoffmasteri	Hoffmaster's	s	caves
Dannella provonshai	mayfly	s	streams
Homoeoneuria cahabensis	Cahaba sand-filtering mayfly	s	sandy rivers
Leptophlebia johnsoni	Johnson's pronggill mayfly	s	small streams
Allocapnia jeanae	a winter stonefly	s	intermittent streams
Allocapnia ozarkana	a winter stonefly	s	intermittent streams
Leuctra szczytkai	schoolhouse springs leuctran stonefly	s	springs
Megaleuctra williamsae	William's rare winter stonefly	s	springs
Taeniopteryx nelsoni	Nelson's early black stonefly	s	small streams

Status:

e = federally-listed as endangered species.

t = federally-listed as threatened species.

p = species proposed for federal-listing as threatened or endangered.

s = sensitive, species globally ranked by The Nature Conservancy as G1-G3.

Data Sources

Carle 1982
Deyrup and Franz 1994
Harvey and Clark 1997
Hoffman 1991
Morse et al. 1997
Poulton and Stewart 1991
TNC 1997a
TNC 1997b
TNC 1999
Wiggins 1996
Wilson 1995

Ouachita madtoms; candy, holiday, leopard, warrior, and duskytail darters; Kiamichi and Ouachita Mountain shiners; and blackside dace.

The two cavefish species are specialized for life in underground waters. Both are eyeless and unpigmented, spending their entire lives in the pitch-black cave environment (Robison and Buchanan 1988). Caves are particularly susceptible to human disturbances, and subterranean habitats and species are under threat worldwide. Some of these species, such as the Suwannee bass, the coldwater darter, and the Arkansas darter, are adapted to springs or clean spring-fed streams.

Rare freshwater mollusk species that are found on or near national forests in the South include 101 species of mussels and 10 species of snails (Table 6). Aquatic subregions with the most rare endemic species include the Tennessee-Cumberland (23 species), Mobile (20 species), and Florida Gulf (13 species). Aquatic subregions are delineated based primarily on fish distributions and may not apply as well to freshwater mollusk distributions (Edwards 1999).

Of the 111 rare mollusk species, 64 species inhabit medium to large rivers, 42 species inhabit creeks, 1 species inhabits springs, 2 species inhabit caves, and 2 species inhabit lentic habitats (Table 6). Species that inhabit medium or large rivers generally are found downstream of national forests. For example, none of the 24 rare mollusks listed for the upper Clinch subbasin are found on the Jefferson National Forest, but many occur within a mile downstream.

Lentic species include the inflated floater, which is found in lakes and other slow flowing water on the Oconee National Forest in Georgia, and the Savannah lilliput. This species is typically found ponds and lakes but inhabits one stream on the Uwharrie National Forest in North Carolina. A few mollusk species occur only on national forests. The dense hydrobe is a tiny aquatic snail with an entire range that consists of one spring on the Ocala National Forest in Florida.

A large number (44 percent) of the rare mollusk species are federally listed as threatened or endangered. Some of the threatened or endangered mollusk species for which we provide much of the remaining stream habitat are the Louisiana pearlshell, Carolina heelsplitter, Cumberland elktoe, Cumberland bean, little-wing pearlymussel, southern pigtoe, dark pigtoe, fine-lined pocketbook, orange-nacre mucket, Alabama moccasinshell, and triangular kidneyshell.

Rare freshwater crustaceans that are found on or near national forests in the South include 31 crayfish, 13 amphipods, and 1 isopod. None of the migratory shrimp species that inhabit streams on the Caribbean National Forest were included because they have not been assigned global ranks. With the current rate of habitat loss in the Caribbean region, some of these species probably qualify for Federal protection status. Crustacean distributions also do not correspond very well to aquatic subregion

boundaries in the South. Most rare species are endemic to much smaller areas or drainages. None of the seven crustacean species found in the South that are federally listed as threatened or endangered are known to occur on national forests.

Of the 45 rare crustaceans, 13 inhabit streams, 9 inhabit primarily burrows, 2 inhabit lentic environments, 5 inhabit a variety of habitats, and 16 inhabit underground (subterranean) habitats (Table 7). Primary burrowers construct and live in complex underground burrows and only occasionally appear above ground. Because of their secretive nature, they are difficult to capture and our list probably is missing some species. National forests in the South provide habitat for rare burrowing crayfish such as the Jackson Prairie crayfish, found on the Bienville National Forest in Mississippi.

The large number of amphipods listed from the George Washington National Forest in Virginia and West Virginia are found in cave systems near the forest, but few have been found on national forest lands (Appendix C and D). Two crayfish, the Woodville karst cave crayfish and the bigcheek cave crayfish, inhabit subterranean water on the Apalachicola and Ocala National Forests in Florida.

Rare aquatic insects on our list include 1 beetle, 3 caddisflies, 3 mayflies, 5 stoneflies, and 14 dragonflies (Table 8). Because of the status and distribution of most species is not known, our list of rare aquatic insects is probably incomplete. Some species suspected to occur on national forests were not included because their reported collection site was not specific enough to place it in a particular subbasin.

Most of the rare aquatic insects inhabit lotic habitats. Of the 15 dragonflies, 2 inhabit medium to large rivers, 4 inhabit small rivers, 5 inhabit streams, 3 inhabit springs or seepage areas, and 1 inhabits ponds and lakes. National forests provide many habitats for insects that are becoming increasingly rare on private land such as clean springs, seepage areas, swamps, and small streams with clean substrate. For example, the variegated clubtail inhabits small, spring-fed, sand bottomed streams on the Conecuh National Forest.

Most of the rare mayflies, stoneflies, and caddisflies inhabit well-oxygenated small streams or springs. These species are known for their sensitivity to water quality and are often known from only a few locations. For example, Johnson's prong-gill mayfly is only known from one site on the Jefferson National Forest and a few locations in New England and Canada. Butler's cliffline caddisfly inhabits a unique aquatic habitat, wet sandstone rock faces, on the Daniel Boone National Forest.

Seven rare aquatic reptiles are found on national forests in the South. The alligator was once near extinction but has now recovered due to conservation efforts. It is still federally listed as threatened due to its similarity in appearance to the American crocodile and is found in most Deep South Coastal Plain streams and ponds. The flattened musk turtle is endemic to

the upper Black Warrior drainage, and its best remaining habitat is found on the Bankhead National Forest. It inhabits clean streams with abundant mollusk populations. Habitat destruction and water quality problems are considered the primary reason for its decline in other portions of its range. Other rare riverine turtles found on or near national forest land include Barbour's map turtle, which is endemic to the Apalachicola drainage in Florida; the Suwannee cooter, also found in Florida; the yellow-blotched sawback turtle, endemic to the Pascagoula River system in Mississippi; and the Escambia map turtle, endemic to the Florida Gulf subregion.

The bog turtle inhabits mountain meadows and fens in the southern Blue Ridge including locations on the Nantahala, Cherokee, and Chattahoochee National Forests. They are typically found in open areas with slow-moving streams, ditches, and boggy areas. One site on national forest land is a wetland created by a road and a former beaver pond. Succession and tree canopy closure in mountain fens pose threats to bog turtle habitat. Activities such as the draining of wetlands, ditching of wet meadows, overgrazing, prevention of beaver activity, development, and illegal collecting for the pet trade are contributing to the decline of this species (Buhlman and Gibbons 1997).

Rare species of aquatic amphibians that occur on national forests in the South include six salamander species and three frog subspecies. Some taxa live in aquatic habitats for only a portion of their life cycle while others spend their entire lives in aquatic habitats. The Black Warrior waterdog is a totally aquatic species and lives in medium to large streams with an abundance of hiding places such as leaf litter, rocks, and logs. The Junaluska salamander and Oklahoma salamander live primarily in small streams and springs, but will sometimes venture across terrestrial habitat on rainy nights (Wilson 1995). The flatwoods salamander, striped newt, and gopher frog subspecies are primarily terrestrial species that require ponds for breeding. The West Virginia spring salamander inhabits permanent streams and pools in one limestone cave.

Rare aquatic bird species include the bald eagle, wood stork, Mississippi sandhill crane, and interior least tern. Bald eagle habitat is usually associated with rivers and lakes. National forests in the South provide some nesting and roosting habitat, but most of the subbasins listed for this species primarily serve as occasional foraging habitat in the winter (Appendix C and D). The wood stork is a large, colonial wading bird that inhabits freshwater and brackish wetlands and nests in cypress and mangrove swamps. The populations in Alabama, Florida, Georgia, and North and South Carolina are listed as endangered. The major limiting factor for this species is thought to be loss of suitable foraging habitats. The Osceola National Forest provides breeding habitat and the Francis Marion, Oconee, Apalachicola, Osceola, and Ocala National Forests provide foraging habitat for this species.

The Mississippi sandhill crane is an endangered subspecies that inhabits open savannahs and wetlands in a small section of southern Mississippi. It feeds on aquatic animals and plants. The De-Soto National Forest is located on the edge of this species' range in Jackson County, Mississippi. The interior least tern is another endangered subspecies found in the Central United States. It nests on barren sandbars along the Mississippi River and the lower part of the St. Francis River on the St. Francis National Forest in Arkansas. Threats to this subspecies include loss of sandbar nesting habitat due to floods, channelization, and impoundment of rivers.

Only three aquatic mammal species are included on our list of rare species. The endangered West Indian manatee occasionally visits the Ocala and Apalachicola National Forests in Florida and inhabits shallow coastal waters, estuaries, and rivers. Historically, manatee populations were severely reduced by hunting, but currently, most mortality is due to collisions with pleasure boats (Clark and Harvey 1997). The round-tailed muskrat also is found on national forests in Florida, and its preferred habitat is shallow marshes with emergent vegetation (Lefebvre and Tilmant 1992). The water shrew is a northern boreal species that moved south during the last ice age and now occurs in the southern Appalachians as a series of disjunct populations at high elevations (Handley 1991). The water shrew is an excellent swimmer and inhabits small, rocky streams where it feeds on aquatic insects and other invertebrates (Harvey and Clark 1997). Populations are found on the George Washington National Forest in Virginia and the Nantahala National Forest in North Carolina.

Conservation Rank of Subbasins

The continental United States contains 2,111 subbasins, and southern national forests are located within 155 of these subbasins. On average, each national forest includes portions of five subbasins. The Ouachita National Forest is located in the most subbasins (13), and small national forests such as the Caribbean and Tuskegee are located in only one subbasin (Appendix A).

In order to assist in determining where to focus freshwater conservation activities, national forest land in each subbasin was evaluated and assigned a conservation rank. Conservation rank is defined, in this document, as the amount of risk associated with implementation of Forest Service management activities in relation to freshwater species and habitats. Subbasins were characterized as having low, medium, or high conservation rank; 53 (34 percent) of the subbasins were classified as low conservation rank, 84 (54 percent) were classified as medium conservation rank, and 18 (12 percent) were classified as high conservation rank (Figure 4; Table 9).

Less than half of the subbasins in most of the aquatic subregions fell in the high conservation rank category. Subbasins in the Tennessee/Cumberland and Mobile

Table 9. Conservation Rank of subbasins on national forests in the South.

Subbasins in bold type are those identified as "watershed hot spots" (subbasins that contain 10 or more at-risk freshwater fish and mussel species) by TNC (Masters et al. 1998).

HUC	Subbasin	National Forest(s)	T&E Species	Sensitive sp.	TNC Critical WS	Population	Total Score	Other	Final Score	Conservation Rank
03120003	Lower Ochlockonee	Apalachicola	3	2	1	1	7		7	H
03150101	**Conasauga**	Chattahoochee, Cherokee	3	2	1	1	7		7	H
03150106	Middle Coosa	Talladega	3	2	1	0	6	HV	7	H
03150202	**Cahaba**	Talladega	3	2	1	1	7		7	H
05100101	**Licking**	Daniel Boone	3	2	1	0	6	HV	7	H
06020002	**Hiwassee**	Cherokee, Chattahoochee, Nantahala	2	2	1	1	6	HV	7	H
03140103	**Yellow**	Conecuh	2	2	1	1	6		6	H
03150102	Coosawattee	Chattahoochee	2	1	1	1	5	HV	6	H
03150103	Oostanaula	Chattahoochee	1	2	1	1	5	LC	6	H
03150104	**Etowah**	Chattahoochee	2	1	1	1	5	LC	6	H
03150110	Lower Tallapoosa	Tuskegee	2	2	1	1	6		6	H
05130101	**Upper Cumberland**	Daniel Boone, Jefferson	3	2	1	0	6		6	H
06010101	**North Fork Holston**	Jefferson	3	2	1	0	6		6	H
06010202	**Upper Little Tennessee**	Cherokee, Nantahala	2	2	1	1	6		6	H
06010205	**Upper Clinch**	Jefferson	3	2	1	0	6		6	H
06010206	**Powell**	Jefferson	3	2	1	0	6		6	H
08070202	Amite	Homochitto	1	1	1	1	4	LC,HV	6	H
08080102	Bayou Teche	Kisatchie	1	1	1	0	3	LC, HV, WF	6	H
12020002	Middle Neches	Davy Crockett, Angelina	1	2	1	1	5		5	M
12020005	Lower Angelina	Angelina, Sabine	1	2	1	1	5		5	M
03020106	Bogue-Core Sounds	Croatan	2	1	0	1	4	WF	5	M
03020204	Lower Neuse	Croatan	2	1	0	1	4	WF	5	M
03060107	Stevens	Sumter	1	1	1	1	4	SP	5	M
03070101	Upper Oconee	Oconee	1	1	1	1	4	HV	5	M
03080102	Ocklawaha	Ocala	2	1	1	1	5		5	M
03110206	Santa Fe	Osceola	2	1	1	1	5		5	M
03120001	Apalachee Bay-St Marks	Apalachicola	2	2	0	1	5		5	M
03130011	**Apalachicola**	Apalachicola	3	1	1	0	5		5	M
03150107	Lower Coosa	Talladega	2	1	1	1	5		5	M
03160110	Sipsey Fork	Bankhead	3	1	1	0	5		5	M

HUC	Subbasin	National Forest(s)	T&E Species	Sensitive sp.	TNC Critical WS	Population	Total Score	Other	Final Score	Conservation Rank
03170006	Pascagoula	DeSoto	2	2	1	0	5		5	M
05130102	**Rockcastle**	Daniel Boone	2	2	1	0	5		5	M
06010102	South Fork Holston	Jefferson, Cherokee	2	2	1	0	5		5	M
06010105	Upper French Broad	Cherokee, Pisgah	2	2	0	1	5		5	M
06010204	**Lower Little Tennessee**	Cherokee, Nantahala	2	1	1	0	4	SP	5	M
08040203	Upper Saline	Ouachita	1	1	1	1	4	HV	5	M
11140207	Lower Red-Lake Iatt	Kisatchie	1	2	1	0	4	SP	5	M
11140105	**Kiamichi**	Ouachita	1	2	1	0	4		4	M
1140107	**Upper Little River**	Ouachita	1	2	1	0	4		4	M
11140109	**Lower Little River**	Ouachita	2	2	0	0	4		4	M
12010004	Toledo Bend Reservoir	Sabine	1	2	1	0	4		4	M
12030202	Lower Trinity-Kickapoo	Sam Houston	1	2	0	1	4		4	M
02070003	Cacapon-Town	George Washington	1	1	1	1	4		4	M
02080201	Upper James	George Washington, Jefferson	1	2	1	0	4		4	M
03010101	Upper Roanoke	Jefferson	1	1	1	0	3	HV	4	M
03040103	Lower Yadkin	Uwharrie	1	0	1	1	3	HV	4	M
03050112	Santee	Francis Marion	2	0	0	1	3	LC	4	M
03070103	Upper Ocmulgee	Oconee	1	1	1	1	4		4	M
03070204	St Mary's	Osceola	2	1	0	1	4		4	M
03110201	Upper Suwannee	Osceola	2	1	0	1	4		4	M
03130001	Upper Chattahoochee	Chattahoochee	0	1	0	1	2	LC, HV	4	M
03150108	Upper Tallapoosa	Talladega	1	1	1	1	4		4	M
03170004	Upper Leaf	DeSoto	1	1	0	0	2	LC,HV	4	M
03170007	Black	DeSoto	1	2	0	1	4		4	M
03170009	MS Coastal	DeSoto	2	2	0	0	4		4	M
03180002	Middle Pearl-Strong	Bienville	1	1	0	1	3	HV	4	M
06030002	Wheeler Lake	Bankhead	0	0	1	1	2	LC, HV	4	M
08030203	Yocona	Holly Springs	1	0	1	1	3	LC	4	M
08030207	Big Sunflower	Delta	2	1	0	0	3	WF	4	M
08030208	Lower Yazoo	Delta	1	1	0	0	2	LC, WF	4	M
08040101	**Ouachita Headwaters**	Ouachita	1	2	1	0	4		4	M
08040102	Upper Ouachita	Ouachita	1	2	1	0	4		4	M
08040206	Bayou D'arbonne	Kisatchie	1	1	0	1	3	WF	4	M
08060203	Bayou Pierre	Homochitto	1	1	1	0	3	LC	4	M
11010014	Little Red	Ozark	1	1	1	1	4		4	M

HUC	Subbasin	National Forest(s)	T&E Species	Sensitive sp.	TNC Critical WS	Population	Total Score	Other	Final Score	Conservation Rank
11010001	Beaver Reservoir	Ozark	1	1	0	1	3		3	M
11110201	Frog-Mulberry	Ozark	1	1	0	1	3		3	M
11110202	Dardanelle Reservoir	Ozark	1	1	0	1	3		3	M
11110206	Fourche LaFave	Ouachita	1	1	0	0	2	LC	3	M
11140106	Pecan-Waterhole	Ouachita	1	1	0	0	2	WF	3	M
11140108	Mountain Fork	Ouachita	1	2	0	0	3		3	M
12030106	E. Fork Trinity	LBJ N. Grasslands	1	1	0	1	3		3	M
12040101	W. Fork San Jacinto	Sam Houston	1	1	0	1	3		3	M
12040103	E. Fork San Jacinto	Sam Houston	1	1	0	1	3		3	M
21010005	Eastern Puerto Rico	Caribbean	0	0	1	1	2	HV	3	M
02080203	Middle James-Buffalo	George Washington	1	1	1	0	3		3	M
03030003	Deep River	Uwharrie	0	1	1	1	3		3	M
03040104	Upper Pee Dee	Uwharrie	1	2	0	0	3		3	M
03050101	Upper Catawba	Pisgah	0	1	0	1	2	HV	3	M
03050201	Cooper	Francis Marion	2	0	0	1	3		3	M
03060102	Tugaloo	Chattahoochee, Nantahala, Sumter	1	1	0	1	3		3	M
03080101	Upper St Johns	Ocala	1	1	0	1	3		3	M
03130013	New	Apalachicola	2	1	0	0	3		3	M
03140104	Blackwater	Conecuh	1	1	0	1	3		3	M
03140301	Upper Conecuh	Conecuh	1	1	1	0	3		3	M
03140304	**Lower Conecuh**	Conecuh	1	1	1	0	3		3	M
03150105	Upper Coosa	Chattahoochee, Talladega	0	2	1	0	3		3	M
03160104	Tibbee	Tombigbee	1	1	0	0	2	LC	3	M
03160108	Noxubee	Tombigbee	2	1	0	0	3		3	M
03170003	Lower Chickasawhay	DeSoto	1	1	1	0	3		3	M
03170005	Lower Leaf	DeSoto	1	2	0	0	3		3	M
03180001	Upper Pearl	Tombigbee, Bienville	1	1	0	0	2	LC	3	M
05050001	Upper New	Jefferson	0	2	1	0	3		3	M
05050002	Middle New	Jefferson	0	1	1	0	2	LC	3	M
05050003	Greenbrier	George Washington	0	2	1	0	3		3	M
06010108	**Nolichucky**	Cherokee, Pisgah	1	1	1	0	3		3	M
08010207	Upper Hatchie	Holly Springs	1	0	0	1	2	LC	3	M
08010210	Wolf	Holly Springs	1	0	0	1	2	HV	3	M
08030201	Little Tallahatchie	Holly Springs	1	1	1	0	3		3	M
08060205	Homochitto	Homochitto	1	1	0	0	2	LC	3	M
08080203	Upper Calcasieu	Kisatchie	0	1	1	0	2	WF	3	M

HUC	Subbasin	National Forest(s)	T&E Species	Sensitive sp.	TNC Critical WS	Population	Total Score	Other	Final Score	Conservation Rank
08080204	Whisky Chitto	Kisatchie	0	1	0	1	2	WF	3	M
11010005	**Buffalo**	Ozark	0	1	1	0	2		2	L
11110103	**Illinois**	Ozark	0	1	0	1	2		2	L
11110105	Poteau	Ouachita	0	1	0	1	2		2	L
11140203	Loggy Bayou	Kisatchie	0	0	0	0	0	LC,WF	2	L
02070005	South Fork Shenandoah	George Washington	0	1	0	1	2		2	L
02070006	North Fork Shenandoah	George Washington	0	1	0	1	2		2	L
03040101	Upper Yadkin	Pisgah	0	1	0	1	2		2	L
03050106	Lower Broad	Sumter	1	0	0	1	2		2	L
03050107	Tyger	Sumter	0	0	0	1	1	LC	2	L
03050108	Enoree	Sumter	0	0	0	1	1	LC	2	L
03060101	Seneca	Nantahala, Sumter	0	1	0	1	2		2	L
03060103	Upper Savannah	Sumter	1	1	0	0	2		2	L
03150109	Middle Tallapoosa	Talladega	0	1	1	0	2		2	L
03160102	Town	Tombigbee	1	1	0	0	2		2	L
03160109	Mulberry Fork	Bankhead	1	1	0	0	2		2	L
05100201	North Fork Kentucky	Daniel Boone	1	0	0	0	1	LC	2	L
05100202	Middle Fork Kentucky	Daniel Boone	0	1	0	0	1	LC	2	L
05100204	Upper Kentucky	Daniel Boone	1	1	0	0	2		2	L
05130103	**U. Cumberland-Cumb. Lake**	Daniel Boone	1	0	1	0	2		2	L
05130104	**South Fork Cumberland**	Daniel Boone	1	0	1	0	2		2	L
06010103	Watauga	Cherokee, Pisgah	1	1	0	0	2		2	L
06010203	Tuckasegee	Nantahala	1	1	0	0	2		2	L
06020001	**Middle TN-Chickamauga**	Chattahoochee	0	2	0	0	2		2	L
06020003	Ocoee	Cherokee, Chattahoochee	1	1	0	0	2		2	L
08020100	Lower Mississippi-Memphis	St. Francis	1	0	0	0	1	WF	2	L
08020203	Lower St. Francis	St. Francis	1	0	0	0	1	WF	2	L
08030202	Tallahatchie	Tombigbee	1	0	0	0	1	LC	2	L
08040103	**Little Missouri**	Ouachita	0	1	1	0	2		2	L
08060206	Buffalo	Homochitto	1	1	0	0	2		2	L
11110104	Robert S. Kerr Reservoir	Ozark	1	1	0	0	2		2	L
11010004	Middle White	Ozark	0	1	0	0	1		1	L
11110203	Lake Conway-Point Remove	Ozark	0	0	0	1	1		1	L

HUC	Subbasin	National Forest(s)	T&E Species	Sensitive sp.	TNC Critical WS	Population	Total Score	Other	Final Score	Conservation Rank
11110204	Petit Jean	Ouachita, Ozark	0	0	0	1	1		1	L
11110207	Lower Ark-Maumelle	Ouachita	0	0	0	0	0	HV	1	L
11140101	Bois D'arc-Island	Caddo N. Grasslands	1	0	0	0	1		1	L
02070001	South Branch Potomac	George Washington	0	1	0	0	1		1	L
02080202	Maury	George Washington	1	0	0	0	1		1	L
03060104	Broad	Chattahoochee	0	0	0	1	1		1	L
03150201	Upper Alabama	Talladega	0	0	1	0	1		1	L
03160113	Lower Black Warrior	Talladega	0	1	0	0	1		1	L
05070202	Upper Levisa	Jefferson	0	1	0	0	1		1	L
05100203	South Fork Kentucky	Daniel Boone	0	1	0	0	1		1	L
06010106	Pigeon	Cherokee, Pisgah	1	0	0	0	1		1	L
06030005	Pickwick Lake	Bankhead	0	0	1	0	1		1	L
08010208	Lower Hatchie	Holly Springs	1	0	0	0	1		1	L
08020304	Big	Ozark	1	0	0	0	1		1	L
08030204	Coldwater	Holly Springs	1	0	0	0	1		1	L
08030205	Yalobusha	Tombigbee	1	0	0	0	1		1	L
08040303	Dugdemona	Kisatchie	0	0	0	0	0	WF	1	L
08040304	Little River	Kisatchie	0	1	0	0	1		1	L
11140301	Sulpher Headwaters	Caddo N. Grasslands	0	0	0	0	0		0	L
06030006	Bear	Bankhead	0	0	0	0	0		0	L
11140208	Saline Bayou	Kisatchie	0	0	0	0	0		0	L

Definitions and data sources for Table 9.

8-Dig HUC # = number assigned to 4th level or 8-digit hydrologic unit code watersheds (subbasins). Data Source: EPA 1999 (U.S. Geological Survey data).

Watershed Name = name of 8-digit hydrologic unit watersheds (subbasins). Data Source: EPA 1999 (U.S. Geological Survey data).

T&E Species = number of aquatic federally-listed threatened, endangered and proposed species found on or near National Forest land within an 8-digit HUC watershed. Data Source: Forest Service, state Natural Heritage Programs, U.S. Fish and Wildlife Service. Does not include plant species.
0 = 0 species 1 = 1 - 2 species 2 = 3 - 5 species
3 = > 5 species

Sensitive sp. = number of aquatic species ranked G1 - G3 (The Nature Conservancy global ranking system) that are not included in the T&E category above. Found on or near National Forest land within an 8-digit HUC watershed. Data Source: Forest Service, state Natural Heritage Programs. Does not include plants or species ranked G3/G4.
0 = 0 species 1 = 1 - 5 species 2 = > 5 species

TNC Critical WS = 8-digit HUC watersheds selected by the Nature Conservancy as Critical Watersheds for conservation of imperiled fish and mussel species in the United States. Data Source: Master et al. 1998.
0 = no critical watershed designation
1 = critical watershed designation

Population = Human population change from 1980 - 1990 within the 8-digit HUC watershed. Data Source: EPA 1999 (U.S. Census Bureau data).
0 = ≤ 7 percent increase. 1 = > 7 percent increase.

Total Score = T&E Species + Sensitive sp. + TNC Critical WS + Population. Scores range from 0 - 7.

Other = other watershed indicators used to adjust Total Scores.
WF = watersheds on Forests designated as priority waterfowl areas (data source: USDA FS 1996)
HV = watershed with a high vulnerability to stressors such as pollutant loadings (data source: US EPA 1999)
LC = watersheds with more serious water quality problems (data source: US EPA 1999)
SP = provides habitat for a very rare T&E species.

Biotic Rank = watersheds are grouped into biotic rank categories based on Total Score and Other indicators.
L = low biotic rank, includes Total scores 0 - 2.
M = medium biotic rank, includes Total scores 3 - 5.
H = high biotic rank, includes Total scores 6 - 7.

aquatic subregions had the greatest percentage of subbasins with a high conservation rank. The WWF categorized the conservation status of the Tennessee/ Cumberland as Endangered and the Mobile as Critical with a high likelihood of future threats for both (Abell et al. 1998; Table 4). The Interior Highlands aquatic subregion had the greatest percentage of subbasins with a low Conservation rank.

Southern national forests in all states except Arkansas and South Carolina have at least one subbasin with a high conservation rank. The WWF categorized the conservation status of the Ozark Highlands and Ouachita Highlands (Interior Highlands aquatic subregion) as relatively intact and relatively stable with a low and medium likelihood of future threats, respectively (Abell et al. 1998; Table 4). National forests in Virginia and Georgia have the most subbasins with a high conservation rank.

The results of this ranking system, when combined with knowledge of other subbasin attributes such as condition, can be used to set regional priorities and guide allocation of funds for a variety of activities such as watershed restoration, resource protection, species recovery efforts, acquisition of additional information, and more detailed assessment of smaller sized watersheds. These ranks should be used as a tool to address program objectives, such as, restoration activities, or resource protection.

Unlike national forests in the western United States that have large consolidated tracts of land, southern national forests usually contain many private land inholdings. Rarely does the Forest Service own entire drainages in the Southern Region. With few exceptions, less than 30 percent of most subbasins are in national forest ownership. Since the majority of national forest streams and other aquatic habitats are vulnerable to other activities occurring within a subbasin, they can only be conserved by cooperative efforts and effective, integrated land-use planning on a regional scale (Shute et al. 1997). In order to improve the conditions of our watersheds, it is incumbent upon the national forests in the South to work collaboratively with all landowners and other agencies within those watersheds.

Conclusions and Recommendations

The conservation ranks identified 18 priority subbasins (subbasins with a high Conservation Rank) that contain national forest lands in the Southern Region. Of the 18 priority subbasins, 11 have been identified as "watershed hot spots" (subbasins that contain 10 or more at-risk freshwater fish and mussel species) by TNC (Masters et al. 1998; Table 9). National forests in these subbasins have the greatest potential for significant contributions to the conservation and restoration of aquatic biodiversity. Subbasins in these national forests should be considered the most sensitive to land management activities and should receive the highest priority for aquatic inventories, monitoring, and research.

Ten subbasins that ranked medium and five subbasins that ranked low in the conservation ranking also were listed as watershed hot spots (Table 9). This suggests that aquatic biodiversity on or near national forest lands does not necessarily reflect the aquatic biodiversity of the subbasin. It does however, clearly demonstrate the need for the Forest Service to be an active partner with other federal and state agencies, local residents, businesses, industry, non-profit organizations, and other interested groups to enhance biodiversity conservation in all relevant subbasins, including those with a low conservation ranking.

Forests and districts should consider the following actions to conserve aquatic biodiversity on national forests in the Southern Region, starting with priority watersheds:

National Forest Level

- Recognize priority subbasins in forest and resource plan revisions.
- Use watershed analyses to identify and characterize the major ecological attributes and processes in the watersheds.
- Develop and validate (via monitoring) cumulative effects models to better understand the effect of management activities on aquatic communities.
- Develop and implement standardized, valid monitoring protocols. Focus monitoring efforts to address specific objectives that are linked to specific questions.
- Work with state agencies to focus on native species in areas containing unique or imperiled communities or species rather than stocking of nonnative species.

- Develop prescriptions to protect or restore riparian areas and riparian-dependent species.
- Incorporate these recommendations into revisions and amendments of all forest plans.
- Continue to develop public education programs that promote the conservation of aquatic resources.
- Develop cooperative relationships and partnerships with other federal and state agencies, nonprofit organizations, and interested parties to protect, maintain, enhance, and restore aquatic communities and habitat.

Watershed and Project Levels

- Evaluate transportation systems and upgrade or close roads that are poorly designed, located, or maintained.
- Close or relocate unpaved roads in sensitive areas such as riparian, sinkholes, seeps, and springs.
- Remove, relocate, or upgrade road crossings that obstruct movement of fish or other aquatic biota within and among watersheds (e.g. undersized culverts, fords).
- Evaluate recreation developments in sensitive areas and close or rehabilitate sites exhibiting unacceptable resource damage.
- Restrict the construction of new roads and trails in sensitive areas such as riparian, sinkholes, seeps, and springs.
- Allocate sufficient resources to curtail the use and development of unauthorized horse, mountain bike, hiking, and off-highway vehicle trails.

One of the findings of this assessment is the lack of basic information on the distribution and habitat needs of aquatic species on the national forests in the Southern Region. In many cases, national forests are implementing land management plans not only with inadequate information on individual species but also without any information on entire taxonomic groups (i.e. fish, amphibians, reptiles). Considering the recent declines in federal budgets and work forces, particularly those related to fish and wildlife resources, this shortcoming is understandable if not acceptable. The Forest Service must make the commitment to address and resolve these issues. Specific recommendations to address these deficiencies are:

- Allocate resources to inventory species and habitats in high priority subbasins.
- Gather, store, and maintain data from all available sources in the Natural Resource Information System electronic database and GIS.
- Increase support and development of the US Forest Service Center for Aquatic Technology Transfer (CATT) to assist national forest personnel in the collection, analysis, and interpretation of information on aquatic resources in the Southern Region.
- Expand additional technical centers including support for additional CATT units across the South to better meet the needs of all of the national forests in Southern Region.

- Continue or expand partnerships with universities, private organizations, and the US Forest Service Southern Research Station.
- Provide support for the publication of information on distribution, life histories, identification, etc of aquatic organisms.

Although issues related to the conservation of biodiversity are important for all national forests, the issues on the Caribbean National Forest are particularly acute and were significantly underrepresented in this assessment. Studies of freshwater shrimp and fishes in Puerto Rico have demonstrated that dams, culverts, water delivery systems, unregulated and illegal harvest, and other anthropogenic pressures (i.e. pollution, dredging) are imperiling many species on the Caribbean National Forest and throughout their range (Garcia and Hemphill in prep; Hemphill and Garcia in prep). Because much of the threat to the biodiversity in Puerto Rico is from outside the Caribbean National Forest, it is critical that the forest develop cooperative relationships and partnerships with other federal and state agencies, and other interested parties.

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Appendix A

Subbasins (U.S. EPA 1999) and aquatic subregions (Edwards 1999) that occur on national forests in the South.

Aquatic Subregion	HUC #	Subbasin	States	National Forests
Chesapeake	02070001	South Branch Potomac	VA	George Washington
Chesapeake	02070003	Cacapon-Town	WV	George Washington
Chesapeake	02070005	South Fork Shenandoah	VA	George Washington
Chesapeake	02070006	North Fork Shenandoah	VA	George Washington
Chesapeake	02080201	Upper James	VA, WV	George Washington/ Jefferson
Chesapeake	02080202	Maury	VA	George Washington
Chesapeake	02080203	Middle James-Buffalo	VA	George Washington
Chesapeake	03010101	Upper Roanoke	VA	Jefferson
Chesapeake	03020106	Bogue-Core Sounds	NC	Croatan
Chesapeake	03020204	Lower Neuse	NC	Croatan
South Atlantic	03030003	Deep	NC	Uwharrie
South Atlantic	03040101	Upper Yadkin	NC	Pisgah
South Atlantic	03040103	Lower Yadkin	NC	Uwharrie
South Atlantic	03040104	Upper Pee Dee	NC	Uwharrie
South Atlantic	03050101	Upper Catawba	NC	Pisgah
South Atlantic	03050106	Lower Broad	SC	Sumter
South Atlantic	03050107	Tyger	SC	Sumter
South Atlantic	03050108	Enoree	SC	Sumter
South Atlantic	03050112	Santee	SC	Francis Marion
South Atlantic	03050201	Cooper	SC	Francis Marion
South Atlantic	03060101	Seneca	NC, SC	Nantahala/Sumter
South Atlantic	03060102	Tugaloo	GA, NC, SC	Chattahooche/ Nantahala/Sumter
South Atlantic	03060103	Upper Savannah	SC	Sumter
South Atlantic	03060104	Broad	GA	Chattahoochee
South Atlantic	03060107	Stevens	SC	Sumter
South Atlantic	03070101	Upper Oconee	GA	Oconee

Aquatic Subregion	HUC #	Subbasin	States	National Forests
South Atlantic	03070103	Upper Ocmulgee	GA	Oconee
South Atlantic	03070204	St Mary's	FL	Osceola
South Atlantic	03080101	Upper St Johns	FL	Ocala
South Atlantic	03080102	Ocklawaha	FL	Ocala
Florida Gulf	03110201	Upper Suwannee	FL	Osceola
Florida Gulf	03110206	Santa Fe	FL	Osceola
Florida Gulf	03120001	Apalachee Bay-St. Marks	FL	Appalachicola
Florida Gulf	03120003	Lower Ochlockonee	FL	Appalachicola
Florida Gulf	03130001	Upper Chattahoochee	GA	Chattahoochee
Florida Gulf	03130011	Apalachicola	FL	Appalachicola
Florida Gulf	03130013	New	FL	Appalachicola
Florida Gulf	03140103	Yellow	AL	Conecuh
Florida Gulf	03140104	Blackwater	AL	Conecuh
Florida Gulf	03140301	Upper Conecuh	AL	Conecuh
Florida Gulf	03140304	Lower Conecuh	AL	Conecuh
Mobile	03150101	Conasauga	GA, Tn	Chattahoochee/Cherokee
Mobile	03150102	Coosawattee	GA	Chattahoochee
Mobile	03150103	Oostanaula	GA	Chattahoochee
Mobile	03150104	Etowah	GA	Chattahoochee
Mobile	03150105	Upper Coosa	Al, GA	Talladega/Chattahoochee
Mobile	03150106	Middle Coosa	AL	Talladega
Mobile	03150107	Lower Coosa	AL	Talladega
Mobile	03150108	Upper Tallapoosa	AL	Talladega
Mobile	03150109	Middle Tallapoosa	AL	Talladega
Mobile	03150110	Lower Tallapoosa	AL	Tuskegee
Mobile	03150201	Upper Alabama	AL	Talladega
Mobile	03150202	Cahaba	AL	Talladega
Mobile	03160102	Town	MS	Tombigbee
Mobile	03160104	Tibbee	MS	Tombigbee
Mobile	03160108	Noxubee	MS	Tombigbee
Mobile	03160109	Mulberry	AL	Bankhead
Mobile	03160110	Sipsey Fork	AL	Bankhead
Mobile	03160113	Lower Black Warrior	AL	Talladega
Ms Embayment	03170003	Lower Chickasawhay	MS	De Soto
Ms Embayment	03170004	Upper Leaf	MS	De Soto
Ms Embayment	03170005	Lower Leaf	MS	De Soto
Ms Embayment	03170006	Pascagoula	MS	De Soto
Ms Embayment	03170007	Black	MS	De Soto
Ms Embayment	03170009	Mississippi Coastal	MS	De Soto
Ms Embayment	03180001	Upper Pearl	MS	Tombigbee/Bienville
Ms Embayment	03180002	Middle Pearl-Strong	MS	Bienville

Aquatic Subregion	HUC #	Subbasin	States	National Forests
Upper Mississippi	05050001	Upper New	VA	Jefferson
Upper Mississippi	05050002	Middle New	VA, WV	Jefferson
Upper Mississippi	05050003	Greenbrier	WV, VA	George Washington
Upper Mississippi	05070202	Upper Levisa	VA	Jefferson
Upper Mississippi	05100101	Licking	KY	Daniel Boone
Upper Mississippi	05100201	North Fork Kentucky	KY	Daniel Boone
Upper Mississippi	05100202	Middle Fork Kentucky	KY	Daniel Boone
Upper Mississippi	05100203	South Fork Kentucky	KY	Daniel Boone
Upper Mississippi	05100204	Upper Kentucky	KY	Daniel Boone
Tn-Cumberland	05130101	Upper Cumberland	KY	Daniel Boone/Jefferson
Tn-Cumberland	05130102	Rockcastle	KY	Daniel Boone
Tn-Cumberland	05130103	Upper Cumberland-Cumberland Lake	KY	Daniel Boone
Tn-Cumberland	05130104	South Fork Cumberland	KY	Daniel Boone
Tn-Cumberland	06010101	North Fork Holston	VA	Jefferson
Tn-Cumberland	06010102	South Fork Holston	TN, VA	Cherokee/Jefferson
Tn-Cumberland	06010103	Watauga	TN, NC	Cherokee/Pisgah
Tn-Cumberland	06010105	Upper French Broad	TN, NC	Cherokee/Pisgah
Tn-Cumberland	06010106	Pigeon	TN, NC	Cherokee/Pisgah
Tn-Cumberland	06010108	Nolichucky	TN, NC	Cherokee/Pisgah
Tn-Cumberland	06010202	Upper Little Tn	GA, NC	Cherokee/Nantahala
Tn-Cumberland	06010203	Tuckasegee	NC	Nantahala
Tn-Cumberland	06010204	Lower Little Tn	TN, NC	Cherokee/Nantahala
Tn-Cumberland	06010205	Upper Clinch	VA	Jefferson
Tn-Cumberland	06010206	Powell	VA	Jefferson
Tn-Cumberland	06020001	Middle Tn-Chickamauga	GA	Chattahoochee
Tn-Cumberland	06020002	Hiwassee	GA, TN, NC	Chattahoochee/Cherokee/-Nantahala
Tn-Cumberland	06020003	Ocoee	GA, TN	Chattahoochee/Cherokee
Tn-Cumberland	06030002	Wheeler Lake	AL	Bankhead
Tn-Cumberland	06030005	Pickwick Lake	AL	Bankhead
Tn-Cumberland	06030006	Bear	AL	Bankhead
Ms Embayment	08010207	Upper Hatchie	MS	Holly Springs
Ms Embayment	08010208	Lower Hatchie	MS	Holly Springs
Ms Embayment	08010210	Wolf	MS	Holly Springs
Ms Embayment	08020100	Lower MS/Memphis	AR	St Francis
Interior Highlands	08020203	Lower St. Francis	AR	St Francis
Ms Embayment	08020304	Big	AR	Ozark
Ms Embayment	08030201	Little Tallahatchie	MS	Holly Springs
Ms Embayment	08030202	Tallahatchie	MS	Tombigbee
Ms Embayment	08030203	Yocona	MS	Holly Springs
Ms Embayment	08030204	Coldwater	MS	Holly Springs

Aquatic Subregion	HUC #	Subbasin	States	National Forests
Ms Embayment	08030205	Yalobusha	MS	Tombigbee
Ms Embayment	08030207	Big Sunflower	MS	Delta
Ms Embayment	08030208	Lower Yazoo	MS	Delta
Interior Highlands	08040101	Ouachita Headwaters	AR	Ouachita
Interior Highlands	08040102	Upper Ouachita	AR	Ouachita
Interior Highlands	08040103	Little Missouri	AR	Ouachita
Interior Highlands	08040203	Upper Saline	AR	Ouachita
Interior Highlands	08040206	Bayou D'Arbonne	LA	Kisatchie
Ms Embayment	08040303	Dugdemona	LA	Kisatchie
Ms Embayment	08040304	Little River	LA	Kisatchie
Ms Embayment	08060203	Bayou Pierre	MS	Homochitto
Ms Embayment	08060205	Homochitto	MS	Homochitto
Ms Embayment	08060206	Buffalo	MS	Homochitto
Ms Embayment	08070202	Amite	MS	Homochitto
Ms Embayment	08080102	Bayou Teche	LA	Kisatchie
Texas Gulf	08080203	Upper Calcasieu	LA	Kisatchie
Texas Gulf	08080204	Whisky Chitto	LA	Kisatchie
Interior Highlands	11010001	Beaver Reservoir	AR	Ozark
Interior Highlands	11010004	Middle White	AR	Ozark
Interior Highlands	11010005	Buffalo	AR	Ozark
Interior Highlands	11010014	Little Red	AR	Ozark
Interior Highlands	11110103	Illinois	AR	Ozark
Interior Highlands	11110104	Robert S. Kerr Reservoir	AR	Ozark
Interior Highlands	11110105	Poteau	AR, OK	Ouachita
Interior Highlands	11110201	Frog-Mulberry	AR	Ozark
Interior Highlands	11110202	Dardanelle Reservoir	AR	Ozark
Interior Highlands	11110203	Lake Conway-Pt Remove	AR	Ozark
Interior Highlands	11110204	Petit Jean	AR	Ouachita/Ozark
Interior Highlands	11110206	Fourche La Fave	AR	Ouachita
Interior Highlands	11110207	Lower Ark-Maumelle	AR	Ouachita
Interior Highlands	11140101	Bois D'arc-Island	TX	Caddo NG
Interior Highlands	11140105	Kiamichi	OK	Ouachita
Interior Highlands	11140106	Pecan-Waterhole	OK	Ouachita
Interior Highlands	11140107	Upper Little	OK	Ouachita
Interior Highlands	11140108	Mountain Fork	OK, AR	Ouachita
Interior Highlands	11140109	Lower Little	OK, AR	Ouachita
Interior Highlands	11140203	Loggy Bayou	LA	Kisatchie
Interior Highlands	11140207	Lower Red-Lake Iatt	LA	Kisatchie
Interior Highlands	11140208	Saline Bayou	LA	Kisatchie
Interior Highlands	11140301	Sulphur Headwaters	TX	Caddo NG
Texas Gulf	12010004	Toledo Bend Reservoir	TX	Sabine

Aquatic Subregion	HUC #	Subbasin	States	National Forests
Texas Gulf	12020002	Middle Neches	TX	Davy Crockett/Angelina
Texas Gulf	12020005	Lower Angelina	TX	Angelina/Sabine
Texas Gulf	12030106	East Fork Trinity	TX	L.B.J. NG
Texas Gulf	12030202	Lower Trinity-Kickapoo	TX	Sam Houston
Texas Gulf	12040101	West Fork San Jacinto	TX	Sam Houston
Texas Gulf	12040103	East Fork San Jacinto	TX	Sam Houston
Caribbean	21010005	Eastern Puerto Rico	PR	Caribbean

Appendix B

Percentage of each subbasin for which adequate distributional data exists for aquatic species groups. Stream Hab represents the percentage of stream habitat for which physical data is available.

Subbasin	State	Fish	Mussel	Snail	Crayfish	Insect	Amphib	Reptile	Stream Hab
South Branch Potomac	VA	50	0	0	0	60	0	0	0
Cacapon-Town	WV	40	20	10	0	10	0	0	0
South Fork Shenandoah	VA	70	10	0	0	30	40	0	10
North Fork Shenandoah	VA	70	10	0	0	50	30	10	10
Upper James	VA	60	50	0	0	40	10	0	10
Maury	VA	60	60	0	0	60	10	0	60
Middle James-Buffalo	VA	60	60	0	0	60	10	0	60
Upper Roanoke	VA	50	60	0	0	30	10	0	30
Bogue-Core Sounds	NC	60	90	90	90	0	0	0	0
Lower Neuse	NC	60	90	90	90	0	0	0	0
Deep River	NC	50	90	90	90	0	0	0	0
Upper Yadkin	NC	0	0	0	0	0	0	0	0
Lower Yadkin	NC	50	90	90	90	0	0	0	0
Upper Pee Dee	NC	50	90	90	90	0	0	0	0
Upper Catawba	NC	50	50	0	0	0	0	0	10
Lower Broad	SC	10	0	0	0	0	0	0	0
Tyger	SC	5	0	0	0	0	0	0	0
Enoree	SC	5	0	0	0	0	0	0	0
Santee	SC	30	0	0	0	0	0	0	0
Cooper	SC	20	0	0	0	0	0	0	0
Seneca	NC	0	0	0	0	0	0	0	0
Seneca	SC	20	10	0	0	0	0	0	0
Tugaloo	GA	60	60	20	30	50	30	10	10
Tugaloo	SC	40	10	0	0	10	0	0	0
Tugaloo	NC	80	80	0	0	0	10	0	40

Subbasin	State	Fish	Mussel	Snail	Crayfish	Insect	Amphib	Reptile	Stream Hab
Upper Savannah	SC	40	10	0	0	10	0	0	0
Broad	GA	50	10	0	0	0	0	0	0
Stevens	SC	10	60	0	0	0	0	0	0
Upper Oconee	GA	50	60	0	0	0	20	10	0
Upper Ocmulgee	GA	60	60	0	0	0	10	10	0
St Mary's	FL	10	10	10	10	0	0	20	0
Upper St Johns	FL	50	50	70	70	0	0	70	0
Ocklawaha	FL	50	50	10	10	0	0	70	0
Upper Suwannee	FL	10	10	10	10	0	0	20	0
Santa Fe	FL	10	10	10	10	0	0	20	0
Apalachee Bay-St Marks	FL	20	20	10	10	0	0	20	0
Lower Ochlockonee	FL	40	40	10	50	0	0	50	0
Upper Chattahoochee	GA	70	50	20	20	30	10	10	10
Apalachicola	FL	50	50	10	10	0	0	70	0
New	FL	20	20	10	10	0	0	20	0
Yellow	AL	50	90	80	10	10	30	30	0
Blackwater	AL	50	90	80	10	10	30	30	0
Upper Conecuh	AL	40	90	80	10	10	30	30	0
Lower Conecuh	AL	40	90	80	10	10	30	30	0
Conasauga	GA	80	80	30	30	30	10	10	10
Conasauga	TN	20	90	0	0	0	10	0	90
Coosawattee	GA	40	20	0	0	0	0	0	0
Oostanaula	GA	60	20	20	20	20	0	0	0
Etowah	GA	80	60	20	10	20	0	0	0
Upper Coosa	GA	60	20	20	10	10	0	0	0
Upper Coosa	AL	50	70	70	0	10	10	10	0
Middle Coosa	AL	50	80	70	0	10	10	10	0
Lower Coosa	AL	50	80	70	0	10	10	10	0
Upper Tallapoosa	AL	50	80	0	0	10	10	10	0
Middle Tallapoosa	AL	50	50	0	10	10	10	10	0
Lower Tallapoosa	AL	90	90	0	0	20	30	30	0
Upper Alabama	AL	50	10	0	0	10	10	10	0
Cahaba	AL	50	80	70	0	10	20	20	0
Town	MS	20	0	0	0	0	0	0	0
Tibbee	MS	30	0	0	0	0	0	0	0
Noxubee	MS	20	10	0	0	0	0	0	10
Mulberry Fork	AL	20	10	10	0	10	20	20	0
Sipsey Fork	AL	80	90	70	0	10	30	30	0
Lower Black Warrior	AL	50	80	80	0	10	10	10	0

Subbasin	State	Fish	Mussel	Snail	Crayfish	Insect	Amphib	Reptile	Stream Hab
Lower Chickasawhay	MS	10	0	0	0	0	0	0	0
Upper Leaf	MS	10	0	0	0	0	0	0	0
Lower Leaf	MS	10	0	0	0	0	0	0	0
Pascagoula	MS	10	0	0	0	0	0	0	0
Black	MS	30	0	0	0	0	0	0	10
MS Coastal	MS	10	0	0	0	0	0	0	10
Upper Pearl	MS	0	0	0	0	0	0	0	0
Middle Pearl-Strong	MS	10	0	0	0	0	0	0	0
Upper New	VA	40	30	0	0	30	10	0	10
Middle New	VA	40	30	0	0	30	10	0	10
Greenbrier	WV	30	20	0	10	10	0	0	0
Upper Levisa	VA	50	20	0	0	50	10	0	30
Licking	KY	10	10	0	0	0	10	0	10
North Fork Kentucky	KY	0	10	0	0	0	0	0	0
Middle Fork Kentucky	KY	10	10	0	0	0	0	0	0
South Fork Kentucky	KY	10	10	0	0	0	0	0	0
Upper Kentucky	KY	10	10	0	0	10	10	0	10
Upper Cumberland	KY	20	30	10	10	10	0	0	10
Upper Cumberland	KY	50	0	0	0	0	0	0	0
Rockcastle	KY	10	10	10	10	10	0	0	10
U. Cumberland-Cumb. Lake	KY	0	10	0	0	0	0	0	0
South Fork Cumberland	KY	10	0	0	0	0	0	0	0
North Fork Holston	VA	50	50	10	0	40	10	0	60
South Fork Holston	VA	50	50	0	0	40	10	0	60
South Fork Holston	TN	70	0	0	0	0	0	10	90
Watauga	NC	0	0	0	0	0	0	0	0
Watauga	TN	70	0	0	0	0	0	10	90
Upper French Broad	NC	80	10	0	0	0	10	0	10
Upper French Broad	TN	50	20	0	0	0	0	0	90
Pigeon	TN	10	90	90	0	0	0	0	90
Pigeon	NC	90	10	0	0	0	10	0	0
Nolichucky	NC	80	80	0	0	0	10	0	10
Nolichucky	TN	60	20	0	0	0	10	10	90
Upper Little Tennessee	GA	80	20	20	20	20	20	10	0

Subbasin	State	Fish	Mussel	Snail	Crayfish	Insect	Amphib	Reptile	Stream Hab
Upper Little Tennessee	NC	80	80	0	0	0	10	0	10
Tuckasegee	NC	80	40	0	0	0	0	0	10
Lower Little Tennessee	TN	40	50	0	0	0	20	20	90
Lower Little Tennessee	NC	80	10	0	0	0	10	0	10
Upper Clinch	VA	50	60	10	0	50	10	0	50
Powell	VA	50	60	0	0	50	10	0	50
Middle Tn-Chickamauga	GA	60	30	20	10	10	0	0	0
Hiwassee	TN	50	90	50	20	0	10	10	90
Hiwassee	GA	70	30	30	30	30	10	10	10
Hiwassee	NC	80	40	0	0	0	10	0	10
Ocoee	GA	50	20	0	0	0	0	0	0
Ocoee	TN	40	90	0	0	0	10	10	90
Wheeler Lake	AL	20	0	0	0	10	10	10	0
Pickwick Lake	AL	20	0	0	0	10	10	10	0
Bear	AL	20	0	0	0	10	10	10	0
Upper Hatchie	MS	0	0	0	0	0	0	0	0
Lower Hatchie	MS	0	0	0	0	0	0	0	0
Wolf	MS	10	0	0	0	0	0	0	10
Lower Mississippi-Memphis	AR	10	20	0	0	0	0	0	0
Lower St. Francis	AR	90	80	0	0	0	0	0	0
Big	AR	90	80	0	0	0	0	0	0
Little Tallahatchie	MS	50	10	0	0	0	0	0	10
Tallahatchie	MS	20	0	0	0	0	0	0	0
Yocona	MS	10	0	0	0	0	0	0	0
Coldwater	MS	0	0	0	0	0	0	0	0
Yalobusha	MS	20	0	0	0	0	0	0	0
Big Sunflower	MS	10	80	0	0	0	0	0	0
Lower Yazoo	MS	20	80	0	0	0	0	0	0
Ouachita Headwaters	AR	20	70	0	30	10	0	0	10
Upper Ouachita	AR	20	0	0	20	0	0	0	0
Little Missouri	AR	80	80	0	30	10	0	0	10
Upper Saline	AR	40	80	0	20	10	0	0	10
Bayou D'arbonne	LA	70	80	0	20	20	0	0	20
Dugdemona	LA	30	60	0	0	10	0	0	20
Little River	LA	40	60	0	20	50	0	0	30
Bayou Pierre	MS	10	0	0	0	0	0	0	0
Homochitto	MS	30	10	0	0	0	0	0	20
Buffalo	MS	10	0	0	0	0	0	0	0

Subbasin	State	Fish	Mussel	Snail	Crayfish	Insect	Amphib	Reptile	Stream Hab
Amite	MS	10	0	0	0	0	0	0	0
Bayou Teche	LA	80	90	0	20	60	0	0	30
Upper Calcasieu	LA	20	60	0	10	10	0	0	0
Whisky Chitto	LA	80	40	0	10	80	0	0	20
Beaver Reservoir	AR	10	0	0	0	0	0	0	10
Middle White	AR	50	50	0	0	30	0	0	30
Buffalo	AR	30	30	0	10	10	0	0	20
Little Red	AR	80	0	0	80	0	0	0	0
Illinois	AR	70	50	0	0	20	30	0	30
Robert S. Kerr Reservoir	AR	10	0	0	0	0	0	0	0
Poteau	AR/OK	10	90	0	20	0	0	0	0
Frog-Mulberry	AR	50	50	0	0	10	0	0	20
Dardanelle Reservoir	AR	30	30	0	10	0	0	0	10
Lake Conway-Point Remove	AR	50	0	0	10	0	0	0	0
Petit Jean	AR	20	0	0	20	10	0	0	10
Petit Jean	AR	10	0	0	0	0	0	0	0
Fourche LaFave	AR	10	40	0	20	0	0	0	0
Lower Ark-Maumelle	AR	0	0	0	10	0	0	0	0
Bois D'arc-Island	TX	60	0	0	0	0	0	0	10
Kiamichi	OK	10	90	0	0	0	0	0	0
Pecan-Waterhole	AR/OK	30	30	0	0	0	0	0	0
Upper Little River	OK	30	90	0	0	0	0	0	0
Mountain Fork	AR/OK	10	0	0	0	10	0	0	10
Lower Little River	AR/OK	30	90	0	20	10	0	0	10
Loggy Bayou	LA	20	20	0	10	0	0	0	0
Lower Red-Lake Iatt	LA	90	90	0	30	50	0	0	30
Saline Bayou	LA	40	80	0	0	0	0	0	10
Sulpher Headwaters	TX	10	0	0	0	0	0	0	0
Toledo Bend Reservoir	TX	50	10	0	10	30	0	0	0
Middle Neches	TX	80	40	0	10	60	0	0	10
Lower Angelina	TX	50	40	0	10	30	0	0	10
E. Fork Trinity	TX	50	10	0	0	0	0	0	0
Lower Trinity-Kickapoo	TX	50	20	0	10	10	0	0	10
W. Fork San Jacinto	TX	70	20	0	0	10	0	0	0
E. Fork San Jacinto	TX	70	20	0	0	10	0	0	0
Eastern Puerto Rico	PR	10	0	0	20	0	0	0	10

Appendix C

Rare aquatic species, sorted by Subbasin, found on or near national forests in the South.

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Alasmidonta varicosa	S	02070001	X	8	VA	MUSSEL
Gomphus viridifrons	S	02070001	P	8	VA	DRAGONFLY
Sorex palustris punctulatus	S	02070001	P	8	VA	MAMMAL
Alasmidonta varicosa	S	02070003	P	8	WV	MUSSEL
Haliaeetus leucocephalus	T	02070003	P	8	WV	BIRD
Lasmigona subviridis	S	02070003	P	8	WV	MUSSEL
Stygobromus morrisoni	S	02070003	P	8	WV	AMPHIPOD
Stygobromus sp. Nov. (sp. 7)	S	02070005	P	8	VA	AMPHIPOD
Alasmidonta varicosa	S	02070006	P	8	VA	MUSSEL
Lasmigona subviridis	S	02070006	P	8	VA	MUSSEL
Stygobromus gracilipes	S	02070006	P	8	VA	AMPHIPOD
Alasmidonta varicosa	S	02080201	X	8	VA	MUSSEL
Fusconaia masoni	S	02080201	P	8	VA	MUSSEL
Gomphus viridifrons	S	02080201	P	8	VA	DRAGONFLY
Haliaeetus leucocephalus	T	02080201	P	8	VA	BIRD
Hydraena maureenae	S	02080201	P	8	VA	BEETLE
Notropis semperasper	S	02080201	P	8	VA	FISH
Noturus gilberti	S	02080201	P	8	VA	FISH
Pleurobema collina	E	02080201	P	8	VA	MUSSEL
Sorex palustris punctulatus	S	02080201	P	8	VA	MAMMAL
Stygobromus fergusoni	S	02080201	P	8	VA	AMPHIPOD
Stygobromus morrisoni	S	02080201	P	8	VA	AMPHIPOD
Stygobromus mundus	S	02080201	P	8	VA	AMPHIPOD
Pleurobema collina	E	02080202	X	8	VA	MUSSEL
Elliptio lanceolata	S	02080203	P	8	VA	MUSSEL
Lasmigona subviridis	S	02080203	P	8	VA	MUSSEL
Pleurobema collina	E	02080203	P	8	VA	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Elliptio lanceolata	S	03010101	X	8	VA	MUSSEL
Fusconaia masoni	S	03010101	X	8	VA	MUSSEL
Noturus gilberti	S	03010101	P	8	VA	FISH
Percina rex	E	03010101	P	9	VA	FISH
Stygobromus fergusoni	S	03010101	P	8	VA	AMPHIPOD
Acipenser brevirostrum	E	03020106	P	11	NC	FISH
Alligator mississippiensis	T	03020106	P	11	NC	REPTILE
Fusconaia masoni	S	03020106	P	11	NC	MUSSEL
Haliaeetus leucocephalus	T	03020106	P	11	NC	BIRD
Procambarus plumimanus	S	03020106	P	11	NC	CRAYFISH
Rana capito capito	S	03020106	P	11	NC	AMPHIBIAN
Toxolasma pullus	S	03020106	P	11	NC	MUSSEL
Acipenser brevirostrum	E	03020204	P	11	NC	FISH
Alligator mississippiensis	T	03020204	P	11	NC	REPTILE
Haliaeetus leucocephalus	T	03020204	P	11	NC	BIRD
Procambarus plumimanus	S	03020204	P	11	NC	CRAYFISH
Rana capito capito	S	03020204	P	11	NC	AMPHIBIAN
Gomphus diminutus	S	03030003	P	11	NC	DRAGONFLY
Gomphus septima	S	03030003	P	11	NC	DRAGONFLY
Ophiogomphus incurvatus	S	03040101	P	11	NC	DRAGONFLY
Haliaeetus leucocephalus	T	03040103	P	11	NC	BIRD
Alasmidonta varicosa	S	03040104	P	11	NC	MUSSEL
Etheostoma collis	S	03040104	P	11	NC	FISH
Fusconaia masoni	S	03040104	P	11	NC	MUSSEL
Haliaeetus leucocephalus	T	03040104	P	11	NC	BIRD
Lasmigona subviridis	S	03040104	P	11	NC	MUSSEL
Semotilus lumbee	S	03040104	P	11	NC	FISH
Toxolasma pullus	S	03040104	P	11	NC	MUSSEL
Villosa vaughaniana	S	03040104	P	11	NC	MUSSEL
Alasmidonta varicosa	S	03050101	P	11	NC	MUSSEL
Cyprinella zanema	S	03050101	P	11	NC	FISH
Haliaeetus leucocephalus	T	03050106	P	12	SC	BIRD
Acipenser brevirostrum	E	03050112	P	12	SC	FISH
Ambystoma cingulatum	T	03050112	P	12	SC	AMPHIBIAN
Haliaeetus leucocephalus	T	03050112	P	12	SC	BIRD
Mycteria americana	E	03050112	P	12	SC	BIRD
Acipenser brevirostrum	E	03050201	P	12	SC	FISH
Ambystoma cingulatum	T	03050201	P	12	SC	AMPHIBIAN
Haliaeetus leucocephalus	T	03050201	P	12	SC	BIRD
Mycteria americana	E	03050201	P	12	SC	BIRD
Agapetus jocassee	S	03060101	P	11	NC	CADDISFLY

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Agapetus jocassee	S	03060102	P	11	NC	CADDISFLY
Alasmidonta varicosa	S	03060102	P	3	GA	MUSSEL
Alasmidonta varicosa	S	03060102	P	12	SC	MUSSEL
Cambarus chaugaensis	S	03060102	P	3	GA	CRAYFISH
Cambarus chaugaensis	S	03060102	P	12	SC	CRAYFISH
Haliaeetus leucocephalus	T	03060102	P	3	GA	BIRD
Moxostoma lachneri	S	03060102	P	3	GA	FISH
Notropis hypsilepsis	S	03060102	P	3	GA	FISH
Alasmidonta varicosa	S	03060103	P	12	SC	MUSSEL
Lasmigona decorata	E	03060103	P	12	SC	MUSSEL
Alasmidonta varicosa	S	03060107	P	12	SC	MUSSEL
Haliaeetus leucocephalus	T	03060107	P	12	SC	BIRD
Lasmigona decorata	E	03060107	P	12	SC	MUSSEL
Cyprinella xaenura	S	03070101	P	3	GA	FISH
Haliaeetus leucocephalus	T	03070101	P	3	GA	BIRD
Mycteria americana	E	03070101	P	3	GA	BIRD
Cyprinella callisema	S	03070103	P	3	GA	FISH
Haliaeetus leucocephalus	T	03070103	P	3	GA	BIRD
Pyganodon gibbosa	S	03070103	P	3	GA	MUSSEL
Alligator mississippiensis	T	03070204	P	5	FL	REPTILE
Ambystoma cingulatum	T	03070204	P	5	FL	AMPHIBIAN
Haliaeetus leucocephalus	T	03070204	P	5	FL	BIRD
Mycteria americana	E	03070204	P	5	FL	BIRD
Neofiber alleni	S	03070204	P	5	FL	MAMMAL
Alligator mississippiensis	T	03080101	P	5	FL	REPTILE
Aphaostracon pyncus	S	03080101	P	5	FL	SNAIL
Haliaeetus leucocephalus	T	03080101	P	5	FL	BIRD
Mycteria americana	E	03080101	P	5	FL	BIRD
Neofiber alleni	S	03080101	P	5	FL	MAMMAL
Notopthalmus perstriatus	S	03080101	P	5	FL	AMPHIBIAN
Pleurobema pyriforme	S	03080101	P	5	FL	MUSSEL
Procambarus delicatus	S	03080101	P	5	FL	CRAYFISH
Pseudemys c. suwanniensis	S	03080101	P	5	FL	REPTILE
Rana capito aesopus	S	03080101	P	5	FL	AMPHIBIAN
Trichechus manatus	E	03080101	P	5	FL	MAMMAL
Alligator mississippiensis	T	03080102	P	5	FL	REPTILE
Elliptio ahenea	S	03080102	P	5	FL	MUSSEL
Haliaeetus leucocephalus	T	03080102	P	5	FL	BIRD
Mycteria americana	E	03080102	P	5	FL	BIRD
Neofiber alleni	S	03080102	P	5	FL	MAMMAL
Notopthalmus perstriatus	S	03080102	P	5	FL	AMPHIBIAN

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Rana capito aesopus	S	03080102	P	5	FL	AMPHIBIAN
Alligator mississippiensis	T	03110201	P	5	FL	REPTILE
Ambystoma cingulatum	T	03110201	P	5	FL	AMPHIBIAN
Haliaeetus leucocephalus	T	03110201	P	5	FL	BIRD
Mycteria americana	E	03110201	P	5	FL	BIRD
Neofiber alleni	S	03110201	P	5	FL	MAMMAL
Notopthalmus perstriatus	S	03110201	P	5	FL	AMPHIBIAN
Alligator mississippiensis	T	03110206	P	5	FL	REPTILE
Ambystoma cingulatum	T	03110206	P	5	FL	AMPHIBIAN
Haliaeetus leucocephalus	T	03110206	P	5	FL	BIRD
Mycteria americana	E	03110206	P	5	FL	BIRD
Neofiber alleni	S	03110206	P	5	FL	MAMMAL
Alligator mississippiensis	T	03120001	P	5	FL	REPTILE
Ambystoma cingulatum	T	03120001	P	5	FL	AMPHIBIAN
Crangonx hobbsi	S	03120001	P	5	FL	AMPHIPOD
Haliaeetus leucocephalus	T	03120001	P	5	FL	BIRD
Mycteria americana	E	03120001	P	5	FL	BIRD
Neofiber alleni	S	03120001	P	5	FL	MAMMAL
Notopthalmus perstriatus	S	03120001	P	5	FL	AMPHIBIAN
Procambarus orcinus	S	03120001	P	5	FL	CRAYFISH
Progomphus bellei	S	03120001	P	5	FL	DRAGONFLY
Rana capito aesopus	S	03120001	P	5	FL	AMPHIBIAN
Somatochlora calverti	S	03120001	P	5	FL	DRAGONFLY
Acipenser o. desotoi	T	03120003	P	5	FL	FISH
Alasmidonta wrightiana	S	03120003	P	5	FL	MUSSEL
Alligator mississippiensis	T	03120003	P	5	FL	REPTILE
Ambystoma cingulatum	T	03120003	P	5	FL	AMPHIBIAN
Cordulegaster sayi	S	03120003	P	5	FL	DRAGONFLY
Cyprinella leedsi	S	03120003	P	5	FL	FISH
Haliaeetus leucocephalus	T	03120003	P	5	FL	BIRD
Lampsilis subangulata	E	03120003	P	5	FL	MUSSEL
Medionidus penicillatus	E	03120003	P	5	FL	MUSSEL
Medionidus simpsonianus	E	03120003	P	5	FL	MUSSEL
Megalonaias boykiana	S	03120003	P	5	FL	MUSSEL
Mycteria americana	E	03120003	P	5	FL	BIRD
Neofiber alleni	S	03120003	P	5	FL	MAMMAL
Pleurobema pyriforme	E	03120003	P	5	FL	MUSSEL
Progomphus bellei	S	03120003	P	5	FL	DRAGONFLY
Pseudemys c. suwanniensis	S	03120003	P	5	FL	REPTILE
Somatochlora calverti	S	03120003	P	5	FL	DRAGONFLY
Trichechus manatus	T	03120003	P	5	FL	MAMMAL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Utterbackia peggyae	S	03120003	P	5	FL	MUSSEL
Villosa villosa	S	03120003	P	5	FL	MUSSEL
Cyprinella callitaenia	S	03130001	P	3	GA	FISH
Macromia margarita	S	03130001	P	3	GA	DRAGONFLY
Ophiogomphus edmundo	S	03130001	P	3	GA	DRAGONFLY
Ophiogomphus incurvatus	S	03130001	P	3	GA	DRAGONFLY
Acipenser o. desotoi	T	03130011	P	5	FL	FISH
Alasmidonta wrightiana	S	03130011	P	5	FL	MUSSEL
Alligator mississippiensis	T	03130011	P	5	FL	REPTILE
Amblema neislerii	E	03130011	P	5	FL	MUSSEL
Ambystoma cingulatum	T	03130011	P	5	FL	AMPHIBIAN
Elliptoideus sloantianus	T	03130011	P	5	FL	MUSSEL
Graptemys barbouri	S	03130011	P	5	FL	REPTILE
Haliaeetus leucocephalus	T	03130011	P	5	FL	BIRD
Lampsilis subangulata	E	03130011	P	5	FL	MUSSEL
Micropterus notius	S	03130011	P	5	FL	FISH
Mycteria americana	E	03130011	P	5	FL	BIRD
Neofiber alleni	S	03130011	P	5	FL	MAMMAL
Trichechus manatus	T	03130011	P	5	FL	MAMMAL
Alligator mississippiensis	T	03130013	P	5	FL	REPTILE
Ambystoma cingulatum	T	03130013	P	5	FL	AMPHIBIAN
Haliaeetus leucocephalus	T	03130013	P	5	FL	BIRD
Mycteria americana	E	03130013	P	5	FL	BIRD
Neofiber alleni	S	03130013	P	5	FL	MAMMAL
Pleurobema pyriforme	E	03130013	P	5	FL	MUSSEL
Acipenser o. desotoi	T	03140103	P	1	AL	FISH
Alligator mississippiensis	T	03140103	P	1	AL	REPTILE
Etheostoma davisoni	S	03140103	P	1	AL	FISH
Fusconaia succissa	S	03140103	P	1	AL	MUSSEL
Graptemys ernsti	S	03140103	P	1	AL	REPTILE
Haliaeetus leucocephalus	T	03140103	P	1	AL	BIRD
Ptychobranchus jonesi	S	03140103	P	1	AL	MUSSEL
Rana capito sevosa	S	03140103	P	1	AL	AMPHIBIAN
Villosa australis	S	03140103	P	1	AL	MUSSEL
Villosa choctawensis	S	03140103	P	1	AL	MUSSEL
Alligator mississippiensis	T	03140104	P	1	AL	REPTILE
Progomphus bellei	S	03140104	P	1	AL	DRAGONFLY
Rana capito sevosa	S	03140104	P	1	AL	AMPHIBIAN
Stylurus townesi	S	03140104	P	1	AL	DRAGONFLY
Alligator mississippiensis	T	03140301	P	1	AL	REPTILE
Rana capito sevosa	S	03140301	P	1	AL	AMPHIBIAN

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Alligator mississippiensis	T	03140304	P	1	AL	REPTILE
Etheostoma davisoni	S	03140304	P	1	AL	FISH
Graptemys ernsti	S	03140304	P	1	AL	REPTILE
Haliaeetus leucocephalus	T	03140304	P	1	AL	BIRD
Rana capito sevosa	S	03140304	P	1	AL	AMPHIBIAN
Cyprinella caerulea	T	03150101	P	3	GA	FISH
Cyprinella caerulea	T	03150101	P	4	TN	FISH
Elliptio arctata	S	03150101	P	3	GA	MUSSEL
Epioblasma metastriata	E	03150101	P	3	GA	MUSSEL
Epioblasma metastriata	E	03150101	P	4	TN	MUSSEL
Epioblasma othcaloogensis	E	03150101	P	3	GA	MUSSEL
Etheostoma brevirostrum	S	03150101	P	3	GA	FISH
Etheostoma brevirostrum	S	03150101	P	4	TN	FISH
Etheostoma ditrema	S	03150101	P	3	GA	FISH
Etheostoma ditrema	S	03150101	P	4	TN	FISH
Etheostoma trisella	S	03150101	P	3	GA	FISH
Etheostoma trisella	S	03150101	P	4	TN	FISH
Gomphus consanguis	S	03150101	P	3	GA	DRAGONFLY
Hybopsis lineapunctata	S	03150101	P	3	GA	FISH
Hybopsis lineapunctata	S	03150101	P	4	TN	FISH
Lampsilis altilis	T	03150101	P	3	GA	MUSSEL
Lampsilis altilis	T	03150101	P	4	TN	MUSSEL
Lasmigona holstonia	S	03150101	P	3	GA	MUSSEL
Lasmigona holstonia	S	03150101	P	4	TN	MUSSEL
Medionidus acutissimus	T	03150101	P	3	GA	MUSSEL
Medionidus acutissimus	T	03150101	P	4	TN	MUSSEL
Medionidus parvulus	E	03150101	P	3	GA	MUSSEL
Medionidus parvulus	E	03150101	P	4	TN	MUSSEL
Noturus munitus	S	03150101	P	4	TN	FISH
Ophiogomphus edmundo	S	03150101	P	3	GA	DRAGONFLY
Percina antesella	E	03150101	P	3	GA	FISH
Percina antesella	E	03150101	P	4	TN	FISH
Percina jenkinsi	E	03150101	P	3	GA	FISH
Percina jenkinsi	E	03150101	P	4	TN	FISH
Percina lenticula	S	03150101	P	3	GA	FISH
Percina palmaris	S	03150101	P	3	GA	FISH
Percina palmaris	S	03150101	P	4	TN	FISH
Pleurobema decisum	E	03150101	P	3	GA	MUSSEL
Pleurobema georgianum	E	03150101	P	3	GA	MUSSEL
Pleurobema georgianum	E	03150101	P	4	TN	MUSSEL
Pleurobema perovatum	E	03150101	P	3	GA	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Ptychobranchus greeni	E	03150101	P	3	GA	MUSSEL
Ptychobranchus greeni	E	03150101	P	4	TN	MUSSEL
Strophitus connasaugaensis	S	03150101	P	3	GA	MUSSEL
Strophitus connasaugaensis	S	03150101	P	4	TN	MUSSEL
Villosa nebulosa	S	03150101	P	3	GA	MUSSEL
Villosa nebulosa	S	03150101	P	4	TN	MUSSEL
Villosa v. umbrans	S	03150101	P	3	GA	MUSSEL
Villosa v. umbrans	S	03150101	P	4	TN	MUSSEL
Epioblasma othcaloogensis	E	03150102	P	3	GA	MUSSEL
Etheostoma brevirostrum	S	03150102	P	3	GA	FISH
Percina aurolineata	T	03150102	P	3	GA	FISH
Percina palmaris	S	03150102	P	3	GA	FISH
Pleurobema decisum	E	03150102	P	3	GA	MUSSEL
Gomphus consanguis	S	03150103	P	3	GA	DRAGONFLY
Lasmigona holstonia	S	03150103	P	3	GA	MUSSEL
Percina palmaris	S	03150103	P	3	GA	FISH
Pleurobema decisum	E	03150103	P	3	GA	MUSSEL
Ptychobranchus greeni	E	03150103	P	3	GA	MUSSEL
Quadrula rumphiana	S	03150103	P	3	GA	MUSSEL
Strophitus connasaugaensis	S	03150103	P	3	GA	MUSSEL
Villosa nebulosa	S	03150103	P	3	GA	MUSSEL
Villosa v. umbrans	S	03150103	P	3	GA	MUSSEL
Etheostoma brevirostrum	S	03150104	P	3	GA	FISH
Etheostoma etowahae	E	03150104	P	3	GA	FISH
Etheostoma scotti	T	03150104	P	3	GA	FISH
Noturus munitus	S	03150104	P	3	GA	FISH
Percina antesella	E	03150104	P	3	GA	FISH
Percina lenticula	S	03150104	P	3	GA	FISH
Percina palmaris	S	03150104	P	3	GA	FISH
Pleurobema decisum	E	03150104	X	3	GA	MUSSEL
Pleurobema perovatum	E	03150104	X	3	GA	MUSSEL
Etheostoma ditrema	S	03150105	P	3	GA	FISH
Etheostoma trisella	S	03150105	P	3	GA	FISH
Haliaeetus leucocephalus	T	03150105	P	1	AL	BIRD
Lasmigona holstonia	S	03150105	P	1	AL	MUSSEL
Lioplax cyclostomaformis	E	03150105	X	3	GA	SNAIL
Percina palmaris	S	03150105	P	1	AL	FISH
Percina palmaris	S	03150105	P	3	GA	FISH
Strophitus connasaugaensis	S	03150105	P	1	AL	MUSSEL
Villosa nebulosa	S	03150105	P	1	AL	MUSSEL
Villosa v. umbrans	S	03150105	P	3	AL	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Anodontoides radiatus	S	03150106	P	1	AL	MUSSEL
Cyprinella caerulea	T	03150106	P	1	AL	FISH
Elimia crenatella	T	03150106	P	1	AL	SNAIL
Epioblasma metastriata	E	03150106	X	1	AL	MUSSEL
Epioblasma othcaloogensis	E	03150106	X	1	AL	MUSSEL
Etheostoma brevirostrum	S	03150106	P	1	AL	FISH
Haliaeetus leucocephalus	T	03150106	P	1	AL	BIRD
Lampsilis altilis	T	03150106	P	1	AL	MUSSEL
Lasmigona holstonia	S	03150106	P	1	AL	MUSSEL
Leptoxis taeniata	T	03150106	P	1	AL	SNAIL
Lioplax cyclostomaformis	E	03150106	X	1	AL	SNAIL
Medionidus acutissimus	T	03150106	X	1	AL	MUSSEL
Medionidus parvulus	E	03150106	X	1	AL	MUSSEL
Ophiogomphus incurvatus	S	03150106	P	1	AL	DRAGONFLY
Percina palmaris	S	03150106	P	1	AL	FISH
Pleurobema decisum	E	03150106	X	1	AL	MUSSEL
Pleurobema georgianum	E	03150106	P	1	AL	MUSSEL
Pleurobema perovatum	E	03150106	X	1	AL	MUSSEL
Ptychobranchus greeni	E	03150106	X	1	AL	MUSSEL
Strophitus connasaugaensis	S	03150106	P	1	AL	MUSSEL
Tulotoma magnifica	E	03150106	P	1	AL	SNAIL
Villosa nebulosa	S	03150106	P	1	AL	MUSSEL
Villosa v. umbrans	S	03150106	P	1	AL	MUSSEL
Haliaeetus leucocephalus	T	03150107	P	1	AL	BIRD
Hybopsis lineapunctata	S	03150107	P	1	AL	FISH
Lampsilis altilis	T	03150107	P	1	AL	MUSSEL
Strophitus connasaugaensis	S	03150107	P	1	AL	MUSSEL
Tulotoma magnifica	E	03150107	P	1	AL	SNAIL
Villosa nebulosa	S	03150107	P	1	AL	MUSSEL
Cambarus englishi	S	03150108	P	1	AL	CRAYFISH
Hybopsis lineapunctata	S	03150108	P	1	AL	FISH
Lampsilis altilis	T	03150108	P	1	AL	MUSSEL
Percina palmaris	S	03150108	P	1	AL	FISH
Villosa v. umbrans	S	03150108	P	1	AL	MUSSEL
Cambarus englishi	S	03150109	P	1	AL	CRAYFISH
Hybopsis lineapunctata	S	03150109	P	1	AL	FISH
Percina palmaris	S	03150109	P	1	AL	FISH
Alligator mississippiensis	T	03150110	P	1	AL	REPTILE
Crystallaria asprella	S	03150110	P	1	AL	FISH
Elliptio arctata	S	03150110	P	1	AL	MUSSEL
Hybognathus nuchalis	S	03150110	P	1	AL	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Lampsilis altilis	T	03150110	P	1	AL	MUSSEL
Notropis uranoscopus	S	03150110	P	1	AL	FISH
Percina lenticula	S	03150110	P	1	AL	FISH
Pleurobema decisum	E	03150110	P	1	AL	MUSSEL
Pleurobema perovatum	E	03150110	P	1	AL	MUSSEL
Strophitus subvexus	S	03150110	P	1	AL	MUSSEL
Villosa nebulosa	S	03150110	P	1	AL	MUSSEL
Crystallaria asprella	S	03150202	P	1	AL	FISH
Epioblasma metastriata	E	03150202	X	1	AL	MUSSEL
Epioblasma othcaloogensis	E	03150202	X	1	AL	MUSSEL
Gomphus parvidens	S	03150202	X	1	AL	DRAGONFLY
Haliaeetus leucocephalus	T	03150202	P	1	AL	BIRD
Homoeoneuria cahabensis	S	03150202	P	1	AL	MAYFLY
Hybognathus nuchalis	S	03150202	P	1	AL	FISH
Lampsilis altilis	T	03150202	X	1	AL	MUSSEL
Lampsilis perovalis	T	03150202	X	1	AL	MUSSEL
Leptoxis taeniata	T	03150202	X	1	AL	SNAIL
Medionidus acutissimus	T	03150202	X	1	AL	MUSSEL
Medionidus parvulus	E	03150202	X	1	AL	MUSSEL
Notropis cahabae	E	03150202	P	1	AL	FISH
Notropis uranoscopus	S	03150202	P	1	AL	FISH
Noturus munitus	S	03150202	P	1	AL	FISH
Obovaria jacksoniana	S	03150202	P	1	AL	MUSSEL
Percina lenticula	S	03150202	P	1	AL	FISH
Pleurobema decisum	E	03150202	X	1	AL	MUSSEL
Pleurobema perovatum	E	03150202	X	1	AL	MUSSEL
Ptychobranchus greeni	E	03150202	X	1	AL	MUSSEL
Quadrula metanevra	S	03150202	P	1	AL	MUSSEL
Quadrula rumphiana	S	03150202	P	1	AL	MUSSEL
Scaphirynchus suttkusi	P	03150202	P	1	AL	FISH
Strophitus subvexus	S	03150202	P	1	AL	MUSSEL
Alligator mississippiensis	T	03160104	P	7	MS	REPTILE
Haliaeetus leucocephalus	T	03160104	P	7	MS	BIRD
Strophitus subvexus	S	03160104	P	7	MS	MUSSEL
Alligator mississippiensis	T	03160108	P	7	MS	REPTILE
Haliaeetus leucocephalus	T	03160108	P	7	MS	BIRD
Pleurobema decisum	E	03160108	P	7	MS	MUSSEL
Strophitus subvexus	S	03160108	P	7	MS	MUSSEL
Necturus sp.	S	03160109	P	1	AL	AMPHIBIAN
Sternotherus depressus	T	03160109	P	1	AL	REPTILE
Elliptio arctata	S	03160110	P	1	AL	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Epioblasma metastriata	E	03160110	X	1	AL	MUSSEL
Etheostoma bellator	S	03160110	P	1	AL	FISH
Haliaeetus leucocephalus	T	03160110	P	1	AL	BIRD
Lampsilis altilis	T	03160110	P	1	AL	MUSSEL
Lampsilis perovalis	T	03160110	P	1	AL	MUSSEL
Medionidus acutissimus	T	03160110	P	1	AL	MUSSEL
Medionidus parvulus	E	03160110	P	1	AL	MUSSEL
Necturus sp.	S	03160110	P	1	AL	AMPHIBIAN
Pleurobema decisum	E	03160110	X	1	AL	MUSSEL
Pleurobema furvum	E	03160110	P	1	AL	MUSSEL
Pleurobema perovatum	E	03160110	X	1	AL	MUSSEL
Ptychobranchus greeni	E	03160110	P	1	AL	MUSSEL
Sternotherus depressus	T	03160110	P	1	AL	REPTILE
Strophitus subvexus	S	03160110	P	1	AL	MUSSEL
Villosa nebulosa	S	03160110	P	1	AL	MUSSEL
Hybognathus nuchalis	S	03160113	P	1	AL	FISH
Alligator mississippiensis	T	03170003	P	7	MS	REPTILE
Graptemys flavimaculata	T	03170003	P	7	MS	REPTILE
Hobbseus attenuatus	S	03170003	P	7	MS	CRAYFISH
Notropis melanostomus	S	03170003	P	7	MS	FISH
Percina lenticula	S	03170003	P	7	MS	FISH
Procambarus lecontei	S	03170003	P	7	MS	CRAYFISH
Alligator mississippiensis	T	03170004	P	7	MS	REPTILE
Elliptio arctata	S	03170004	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03170004	P	7	MS	MUSSEL
Procambarus barbiger	S	03170004	P	7	MS	CRAYFISH
Strophitus subvexus	S	03170004	P	7	MS	MUSSEL
Alligator mississippiensis	T	03170005	P	7	MS	REPTILE
Elliptio arctata	S	03170005	P	7	MS	MUSSEL
Graptemys flavimaculata	T	03170005	P	7	MS	REPTILE
Hobbseus attenuatus	S	03170005	P	7	MS	CRAYFISH
Notropis melanostomus	S	03170005	P	7	MS	FISH
Percina lenticula	S	03170005	P	7	MS	FISH
Pleurobema beadleanum	S	03170005	P	7	MS	MUSSEL
Procambarus lecontei	S	03170005	P	7	MS	CRAYFISH
Acipenser o. desotoi	T	03170006	P	7	MS	FISH
Alligator mississippiensis	T	03170006	P	7	MS	REPTILE
Fallicambarus byersi	S	03170006	P	7	MS	CRAYFISH
Fallicambarus danielae	S	03170006	P	7	MS	CRAYFISH
Graptemys flavimaculata	T	03170006	P	7	MS	REPTILE
Grus canadensis pulla	E	03170006	P	7	MS	BIRD

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Haliaeetus leucocephalus	T	03170006	P	7	MS	BIRD
Hobbseus attenuatus	S	03170006	P	7	MS	CRAYFISH
Notropis melanostomus	S	03170006	P	7	MS	FISH
Percina lenticula	S	03170006	P	7	MS	FISH
Procambarus fitzpatricki	S	03170006	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170006	P	7	MS	CRAYFISH
Acipenser o. desotoi	T	03170007	P	7	MS	FISH
Alligator mississippiensis	T	03170007	P	7	MS	REPTILE
Anodontoides radiatus	S	03170007	P	7	MS	MUSSEL
Elliptio arctata	S	03170007	P	7	MS	MUSSEL
Fallicambarus gordoni	S	03170007	P	7	MS	CRAYFISH
Hobbseus attenuatus	S	03170007	P	7	MS	CRAYFISH
Notropis melanostomus	S	03170007	P	7	MS	FISH
Percina lenticula	S	03170007	P	7	MS	FISH
Pleurobema beadleanum	S	03170007	P	7	MS	MUSSEL
Procambarus fitzpatricki	S	03170007	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170007	P	7	MS	CRAYFISH
Acipenser o. desotoi	T	03170009	P	7	MS	FISH
Alligator mississippiensis	T	03170009	P	7	MS	REPTILE
Anodontoides radiatus	S	03170009	P	7	MS	MUSSEL
Elliptio arctata	S	03170009	P	7	MS	MUSSEL
Fallicambarus byersi	S	03170009	P	7	MS	CRAYFISH
Fallicambarus danielae	S	03170009	P	7	MS	CRAYFISH
Grus canadensis pulla	E	03170009	P	7	MS	BIRD
Hobbseus attenuatus	S	03170009	P	7	MS	CRAYFISH
Notropis melanostomus	S	03170009	P	7	MS	FISH
Percina lenticula	S	03170009	P	7	MS	FISH
Pleurobema beadleanum	S	03170009	P	7	MS	MUSSEL
Procambarus fitzpatricki	S	03170009	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170009	P	7	MS	CRAYFISH
Rana capito sevosa	S	03170009	P	7	MS	AMPHIBIAN
Alligator mississippiensis	T	03180001	P	7	MS	REPTILE
Elliptio arctata	S	03180001	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03180001	P	7	MS	MUSSEL
Procambarus jaculus	S	03180001	P	7	MS	CRAYFISH
Strophitus subvexus	S	03180001	P	7	MS	MUSSEL
Acipenser o. desotoi	T	03180002	P	7	MS	FISH
Alligator mississippiensis	T	03180002	P	7	MS	REPTILE
Elliptio arctata	S	03180002	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03180002	P	7	MS	MUSSEL
Procambarus jaculus	S	03180002	P	7	MS	CRAYFISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Strophitus subvexus	S	03180002	P	7	MS	MUSSEL
Gomphus viridifrons	S	05050001	P	8	VA	DRAGONFLY
Leptophlebia johnsoni	S	05050001	P	8	VA	MAYFLY
Megaleuctra williamsae	S	05050001	P	8	VA	STONEFLY
Phenacobius teretulus	S	05050001	P	8	VA	FISH
Stygobromus fergusoni	S	05050001	P	8	VA	AMPHIPOD
Taeniopteryx nelsoni	S	05050001	P	8	VA	STONEFLY
Etheostoma osburni	S	05050002	P	8	VA	FISH
Phenacobius teretulus	S	05050002	P	8	VA	FISH
Stygobromus redactus	S	05050002	P	8	VA	AMPHIPOD
Caecidotea holsingeri	S	05050003	P	8	WV	ISOPOD
Cambarus n.veteranus	S	05050003	P	8	WV	CRAYFISH
Etheostoma osburni	S	05050003	P	8	WV	FISH
Fontigens tartarea	S	05050003	P	8	WV	SNAIL
Fontigens turritella	S	05050003	P	8	WV	SNAIL
Gyrinophilus subterraneus	S	05050003	P	8	WV	AMPHIBIAN
Lasmigona subviridis	S	05050003	P	8	WV	MUSSEL
Macrocotyle hoffmasteri	S	05050003	P	8	WV	FLATWORM
Percina gymnocephala	S	05050003	P	8	WV	FISH
Phenacobius teretulus	S	05050003	P	8	WV	FISH
Stygobromus emarginatus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus nanus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus parvus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus pollustus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus redactus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus spinatus	S	05050003	P	8	WV	AMPHIPOD
Etheostoma nigrum susanae	S	05070202	P	8	VA	FISH
Gomphus viridifrons	S	05070202	P	8	VA	DRAGONFLY
Ammocrypta pellucida	S	05100101	P	2	KY	FISH
Cyprogenia stegaria	E	05100101	X	2	KY	MUSSEL
Epioblasma t. rangiana	E	05100101	P	2	KY	MUSSEL
Epioblasma t. torulosa	E	05100101	P	2	KY	MUSSEL
Epioblasma triquetra	S	05100101	P	2	KY	MUSSEL
Etheostoma tippecanoe	S	05100101	P	2	KY	FISH
Haliaeetus leucocephalus	T	05100101	P	2	KY	BIRD
Noturus stigmosus	S	05100101	P	2	KY	FISH
Plethobasus cyphyus	S	05100101	P	2	KY	MUSSEL
Pleurobema clava	E	05100101	X	2	KY	MUSSEL
Pleurobema plenum	E	05100101	P	2	KY	MUSSEL
Simpsonaias ambigua	S	05100101	P	2	KY	MUSSEL
Epioblasma t. rangiana	E	05100201	X	2	KY	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Pleurobema clava	E	05100201	X	2	KY	MUSSEL
Ammocrypta pellucida	S	05100202	P	2	KY	FISH
Etheostoma maculatum	S	05100202	P	2	KY	FISH
Noturus stigmosus	S	05100202	P	2	KY	FISH
Obovaria subrotunda	S	05100202	P	2	KY	MUSSEL
Simpsonaias ambigua	S	05100202	P	2	KY	MUSSEL
Ammocrypta pellucida	S	05100204	P	2	KY	FISH
Cyprogenia stegaria	E	05100204	X	2	KY	MUSSEL
Epioblasma triquetra	S	05100204	P	2	KY	MUSSEL
Madeophylax sp 1	S	05100204	P	2	KY	CADDISFLY
Obovaria subrotunda	S	05100204	P	2	KY	MUSSEL
Simpsonaias ambigua	S	05100204	P	2	KY	MUSSEL
Acipenser fulvescens	S	05130101	P	2	KY	FISH
Alasmidonta atropurpurea	E	05130101	P	2	KY	MUSSEL
Anodontoides denigratus	S	05130101	P	2	KY	MUSSEL
Cambarus batchi	S	05130101	P	2	KY	CRAYFISH
Cambarus bouchardi	S	05130101	P	2	KY	CRAYFISH
Cumberlandia monodonta	S	05130101	P	2	KY	MUSSEL
Dromus dromas	E	05130101	P	2	KY	MUSSEL
Epioblasma brevidens	E	05130101	P	2	KY	MUSSEL
Epioblasma capsaeformis	E	05130101	P	2	KY	MUSSEL
Epioblasma f. florentina	E	05130101	P	2	KY	MUSSEL
Epioblasma f. walkeri	E	05130101	X	2	KY	MUSSEL
Epioblasma o. obliquata	E	05130101	P	2	KY	MUSSEL
Epioblasma triquetra	S	05130101	P	2	KY	MUSSEL
Etheostoma cinereum	S	05130101	P	2	KY	FISH
Etheostoma nigrum susanae	S	05130101	P	2	KY	FISH
Etheostoma percnurum	E	05130101	P	2	KY	FISH
Etheostoma tippecanoe	S	05130101	P	2	KY	FISH
Fusconaia subrotunda	S	05130101	P	2	KY	MUSSEL
Haliaeetus leucocephalus	T	05130101	P	2	KY	BIRD
Hemistena lata	E	05130101	P	2	KY	MUSSEL
Ichthyomyzon greeleyi	S	05130101	P	2	KY	FISH
Lampsilis abrupta	E	05130101	X	2	KY	MUSSEL
Leptoxis praerosa	S	05130101	P	2	KY	SNAIL
Madeophylax sp 1	S	05130101	P	2	KY	CADDISFLY
Notropis albizonatus	E	05130101	P	2	KY	FISH
Notropis sp. (sawfin)	S	05130101	P	2	KY	FISH
Obovaria retusa	E	05130101	P	2	KY	MUSSEL
Ophiogomphus howei	S	05130101	P	2	KY	DRAGONFLY
Pegias fabula	E	05130101	P	2	KY	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Percina burtoni	S	05130101	P	2	KY	FISH
Percina macrocephala	S	05130101	P	2	KY	FISH
Percina squamata	S	05130101	P	2	KY	FISH
Phoxinus cumberlandensis	T	05130101	P	2	KY	FISH
Phoxinus cumberlandensis	T	05130101	P	8	KY	FISH
Plethobasus cicatricosus	E	05130101	X	2	KY	MUSSEL
Plethobasus cooperianus	E	05130101	X	2	KY	MUSSEL
Pleurobema clava	E	05130101	X	2	KY	MUSSEL
Pleurobema oviforme	S	05130101	P	2	KY	MUSSEL
Pleurobema plenum	E	05130101	P	2	KY	MUSSEL
Quadrula sparsa	E	05130101	P	2	KY	MUSSEL
Toxolasma lividus	S	05130101	P	2	KY	MUSSEL
Typhlichthys subterraneus	S	05130101	P	2	KY	FISH
Villosa trabalis	E	05130101	P	2	KY	MUSSEL
Cambarus batchi	S	05130102	P	2	KY	CRAYFISH
Epioblasma brevidens	E	05130102	P	2	KY	MUSSEL
Epioblasma capsaeformis	E	05130102	P	2	KY	MUSSEL
Epioblasma triquetra	S	05130102	P	2	KY	MUSSEL
Etheostoma cinereum	S	05130102	P	2	KY	FISH
Etheostoma tippecanoe	S	05130102	P	2	KY	FISH
Fusconaia subrotunda	S	05130102	P	2	KY	MUSSEL
Ichthyomyzon greeleyi	S	05130102	P	2	KY	FISH
Madeophylax sp 1	S	05130102	P	2	KY	CADDISFLY
Pegias fabula	E	05130102	P	2	KY	MUSSEL
Phoxinus cumberlandensis	T	05130102	P	2	KY	FISH
Pleurobema oviforme	S	05130102	P	2	KY	MUSSEL
Toxolasma lividus	S	05130102	P	2	KY	MUSSEL
Villosa trabalis	E	05130102	P	2	KY	MUSSEL
Cyprogenia stegaria	E	05130103	X	2	KY	MUSSEL
Phoxinus cumberlandensis	T	05130104	P	2	KY	FISH
Dromus dromas	E	06010101	P	8	VA	MUSSEL
Epioblasma capsaeformis	E	06010101	P	8	VA	MUSSEL
Epioblasma t. gubernaculum	E	06010101	P	8	VA	MUSSEL
Epioblasma triquetra	S	06010101	P	8	VA	MUSSEL
Fusconaia barnesiana	S	06010101	P	8	VA	MUSSEL
Fusconaia cor	E	06010101	P	8	VA	MUSSEL
Io fluvialis	S	06010101	P	8	VA	SNAIL
Lasmigona holstonia	S	06010101	P	8	VA	MUSSEL
Lexingtonia dolabelloides	S	06010101	P	8	VA	MUSSEL
Noturus flavippinis	T	06010101	X	8	VA	FISH
Pegias fabula	E	06010101	P	8	VA	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Percina burtoni	S	06010101	P	8	VA	FISH
Percina macrocephala	S	06010101	P	8	VA	FISH
Phoxinus tennesseensis	S	06010101	P	8	VA	FISH
Pleurobema oviforme	S	06010101	P	8	VA	MUSSEL
Quadrula c. strigillata	E	06010101	X	8	VA	MUSSEL
Toxolasma lividus	S	06010101	P	8	VA	MUSSEL
Clemmys muhlenbergii	S	06010102	P	4	TN	REPTILE
Epioblasma f. walkeri	E	06010102	P	8	VA	MUSSEL
Etheostoma acuticeps	S	06010102	P	4	TN	FISH
Etheostoma acuticeps	S	06010102	P	8	VA	FISH
Fusconaia barnesiana	S	06010102	P	8	VA	MUSSEL
Haliaeetus leucocephalus	T	06010102	P	4	TN	BIRD
Io fluvialis	S	06010102	P	4	TN	SNAIL
Lasmigona holstonia	S	06010102	P	8	VA	MUSSEL
Leptophlebia johnsoni	S	06010102	P	8	VA	MAYFLY
Lexingtonia dolabelloides	S	06010102	P	8	VA	MUSSEL
Megaleuctra williamsae	S	06010102	P	8	VA	STONEFLY
Percina burtoni	S	06010102	P	4	TN	FISH
Percina burtoni	S	06010102	X	8	VA	FISH
Percina macrocephala	S	06010102	P	4	TN	FISH
Percina macrocephala	S	06010102	P	8	VA	FISH
Phenacobius crassilabrum	S	06010102	P	8	VA	FISH
Phoxinus tennesseensis	S	06010102	P	4	TN	FISH
Phoxinus tennesseensis	S	06010102	P	8	VA	FISH
Pleurobema oviforme	S	06010102	P	8	VA	MUSSEL
Quadrula c. strigillata	E	06010102	X	8	VA	MUSSEL
Taeniopteryx nelsoni	S	06010102	P	8	VA	STONEFLY
Haliaeetus leucocephalus	T	06010103	P	4	TN	BIRD
Percina macrocephala	S	06010103	P	4	TN	FISH
Percina squamata	S	06010103	P	4	TN	FISH
Phoxinus tennesseensis	S	06010103	P	4	TN	FISH
Acipenser fulvescens	S	06010105	P	11	NC	FISH
Agapetus jocassee	S	06010105	P	11	NC	CADDISFLY
Alasmidonta raveneliana	E	06010105	X	11	NC	MUSSEL
Cambarus reburrus	S	06010105	P	11	NC	CRAYFISH
Clemmys muhlenbergii	S	06010105	P	11	NC	REPTILE
Cyprinella monacha	T	06010105	X	11	NC	FISH
Epioblasma capsaeformis	E	06010105	X	11	NC	MUSSEL
Etheostoma vulneratum	S	06010105	P	11	NC	FISH
Gomphus parvidens	S	06010105	P	11	NC	DRAGONFLY
Lasmigona holstonia	S	06010105	P	11	NC	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Macromia margarita	S	06010105	P	11	NC	DRAGONFLY
Pegius fabula	E	06010105	X	11	NC	MUSSEL
Percina burtoni	S	06010105	P	11	NC	FISH
Percina macrocephala	S	06010105	X	11	NC	FISH
Percina squamata	S	06010105	P	11	NC	FISH
Percina squamata	S	06010105	P	4	TN	FISH
Toxolasma lividus	S	06010105	X	11	NC	MUSSEL
Alasmidonta raveneliana	E	06010106	X	11	NC	MUSSEL
Pegius fabula	E	06010106	X	11	NC	MUSSEL
Alasmidonta raveneliana	E	06010108	P	11	NC	MUSSEL
Alasmidonta raveneliana	E	06010108	P	4	TN	MUSSEL
Etheostoma acuticeps	S	06010108	P	11	NC	FISH
Etheostoma acuticeps	S	06010108	P	4	TN	FISH
Io fluvialis	S	06010108	P	4	TN	SNAIL
Percina burtoni	S	06010108	P	11	NC	FISH
Percina squamata	S	06010108	P	11	NC	FISH
Percina squamata	S	06010108	P	4	TN	FISH
Alasmidonta raveneliana	E	06010202	P	11	NC	MUSSEL
Cambarus georgiae	S	06010202	P	3	GA	CRAYFISH
Cambarus georgiae	S	06010202	P	11	NC	CRAYFISH
Clemmys muhlenbergii	S	06010202	P	11	NC	REPTILE
Cyprinella monacha	T	06010202	P	11	NC	FISH
Etheostoma vulneratum	S	06010202	P	11	NC	FISH
Fusconaia barnesiana	S	06010202	P	11	NC	MUSSEL
Gomphus parvidens	S	06010202	P	11	NC	DRAGONFLY
Ichthyomyzon greeleyi	S	06010202	P	3	GA	FISH
Pegius fabula	E	06010202	P	11	NC	MUSSEL
Percina squamata	S	06010202	P	11	NC	FISH
Sorex palustris punctulatus	S	06010202	P	11	NC	MAMMAL
Alasmidonta raveneliana	E	06010203	P	11	NC	MUSSEL
Cambarus reburrus	S	06010203	P	11	NC	CRAYFISH
Cyprinella monacha	T	06010203	P	11	NC	FISH
Etheostoma vulneratum	S	06010203	P	11	NC	FISH
Percina squamata	S	06010203	P	11	NC	FISH
Epioblasma f. florentina	E	06010204	X	4	TN	MUSSEL
Etheostoma percnurum	E	06010204	P	4	TN	FISH
Eurycea junaluska	S	06010204	P	11	NC	AMPHIBIAN
Eurycea junaluska	S	06010204	P	4	TN	AMPHIBIAN
Haliaeetus leucocephalus	T	06010204	P	4	TN	BIRD
Leptoxis crassa	S	06010204	P	4	TN	SNAIL
Noturus baileyi	E	06010204	P	4	TN	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Noturus flavipinnis	T	06010204	P	4	TN	FISH
Percina burtoni	S	06010204	P	4	TN	FISH
Cottus baileyi	S	06010205	P	8	VA	FISH
Cumberlandia monodonta	S	06010205	P	8	VA	MUSSEL
Cyprogenia stegaria	E	06010205	P	8	VA	MUSSEL
Dromus dromas	E	06010205	P	8	VA	MUSSEL
Epioblasma capsaeformis	E	06010205	P	8	VA	MUSSEL
Epioblasma f. walkeri	E	06010205	P	8	VA	MUSSEL
Epioblasma t. gubernaculum	E	06010205	P	8	VA	MUSSEL
Epioblasma triquetra	S	06010205	P	8	VA	MUSSEL
Etheostoma tippecanoe	S	06010205	P	8	VA	FISH
Fusconaia barnesiana	S	06010205	P	8	VA	MUSSEL
Fusconaia cor	E	06010205	P	8	VA	MUSSEL
Fusconaia cuneolus	E	06010205	P	8	VA	MUSSEL
Hemistena lata	E	06010205	P	8	VA	MUSSEL
Io fluvialis	S	06010205	P	8	VA	SNAIL
Lasmigona holstonia	S	06010205	P	8	VA	MUSSEL
Lemiox rimosus	E	06010205	P	8	VA	MUSSEL
Lexingtonia dolabelloides	S	06010205	P	8	VA	MUSSEL
Noturus flavippinis	T	06010205	P	8	VA	FISH
Pegias fabula	E	06010205	P	8	VA	MUSSEL
Percina burtoni	S	06010205	P	8	VA	FISH
Percina macrocephala	S	06010205	P	8	VA	FISH
Plethobasus cyphyus	S	06010205	P	8	VA	MUSSEL
Pleurobema cordatum	S	06010205	P	8	VA	MUSSEL
Pleurobema oviforme	S	06010205	P	8	VA	MUSSEL
Pleurobema plenum	E	06010205	X	8	VA	MUSSEL
Quadrula c. strigillata	E	06010205	P	8	VA	MUSSEL
Quadrula sparsa	E	06010205	P	8	VA	MUSSEL
Stygobromus cumberlandus	S	06010205	P	8	VA	AMPHIPOD
Toxolasma lividus	S	06010205	P	8	VA	MUSSEL
Villosa perpurpurea	E	06010205	P	8	VA	MUSSEL
Dromus dromas	E	06010206	P	8	VA	MUSSEL
Epioblasma capsaeformis	E	06010206	X	8	VA	MUSSEL
Epioblasma triquetra	S	06010206	P	8	VA	MUSSEL
Erimystax cahni	T	06010206	P	8	VA	FISH
Etheostoma tippecanoe	S	06010206	X	8	VA	FISH
Fusconaia barnesiana	S	06010206	P	8	VA	MUSSEL
Fusconaia cor	E	06010206	P	8	VA	MUSSEL
Fusconaia cuneolus	E	06010206	P	8	VA	MUSSEL
Hemistena lata	E	06010206	P	8	VA	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Lemiox rimosus	E	06010206	P	8	VA	MUSSEL
Lexingtonia dolabelloides	S	06010206	P	8	VA	MUSSEL
Noturus flavippinis	T	06010206	P	8	VA	FISH
Percina burtoni	S	06010206	X	8	VA	FISH
Plethobasus cyphyus	S	06010206	P	8	VA	MUSSEL
Pleurobema oviforme	S	06010206	P	8	VA	MUSSEL
Quadrula c. strigillata	E	06010206	P	8	VA	MUSSEL
Quadrula sparsa	E	06010206	P	8	VA	MUSSEL
Stygobromus cumberlandus	S	06010206	P	8	VA	AMPHIPOD
Cambarus extraneus	S	06020001	P	3	GA	CRAYFISH
Etheostoma cinereum	S	06020001	P	3	GA	FISH
Etheostoma vulneratum	S	06020001	P	3	GA	FISH
Ichthyomyzon greeleyi	S	06020001	P	3	GA	FISH
Notropis ariommus	S	06020001	P	3	GA	FISH
Percina squamata	S	06020001	P	3	GA	FISH
Phenacobius crassilabrum	S	06020001	P	3	GA	FISH
Cambarus parrishi	S	06020002	P	3	GA	CRAYFISH
Cambarus parrishi	S	06020002	P	11	NC	CRAYFISH
Clemmys muhlenbergii	S	06020002	P	3	GA	REPTILE
Epioblasma f. florentina	E	06020002	X	4	TN	MUSSEL
Epioblasma f. walkeri	E	06020002	P	4	TN	MUSSEL
Haliaeetus leucocephalus	T	06020002	P	3	GA	BIRD
Ichthyomyzon greeleyi	S	06020002	P	3	GA	FISH
Lexingtonia dolabelloides	S	06020002	P	4	TN	MUSSEL
Percina burtoni	S	06020002	P	4	TN	FISH
Percina squamata	S	06020002	P	11	NC	FISH
Percina squamata	S	06020002	P	4	TN	FISH
Percina tanasi	T	06020002	P	4	TN	FISH
Phoxinus tennesseensis	S	06020002	P	4	TN	FISH
Pleurobema oviforme	S	06020002	P	4	TN	MUSSEL
Sorex palustris punctulatus	S	06020002	P	11	NC	MAMMAL
Villosa trabalis	E	06020002	P	4	TN	MUSSEL
Haliaeetus leucocephalus	T	06020003	P	3	GA	BIRD
Haliaeetus leucocephalus	T	06020003	P	4	TN	BIRD
Percina tanasi	T	06020003	P	4	TN	FISH
Phoxinus tennesseensis	S	06020003	P	4	TN	FISH
Alligator mississippiensis	T	08010207	P	7	MS	REPTILE
Alligator mississippiensis	T	08010208	P	7	MS	REPTILE
Alligator mississippiensis	T	08010210	P	7	MS	REPTILE
Alligator mississippiensis	T	08020100	P	10	AR	REPTILE
Sterna antillarum athalassos	E	08020100	P	10	AR	BIRD

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Alligator mississippiensis	T	08020203	P	10	AR	REPTILE
Leptodea leptodon	P	08020203	X	10	AR	MUSSEL
Sterna antillarum athalassos	E	08020203	P	10	AR	BIRD
Alligator mississippiensis	T	08020304	P	10	AR	REPTILE
Alligator mississippiensis	T	08030201	P	7	MS	REPTILE
Anodontoides radiatus	S	08030201	P	7	MS	MUSSEL
Arcidens confragosus	S	08030201	P	7	MS	MUSSEL
Etheostoma raneyi	S	08030201	P	7	MS	FISH
Haliaeetus leucocephalus	T	08030201	P	7	MS	BIRD
Alligator mississippiensis	T	08030202	P	7	MS	REPTILE
Alligator mississippiensis	T	08030203	P	7	MS	REPTILE
Alligator mississippiensis	T	08030204	P	7	MS	REPTILE
Alligator mississippiensis	T	08030205	P	7	MS	REPTILE
Haliaeetus leucocephalus	T	08030205	P	7	MS	BIRD
Alligator mississippiensis	T	08030207	P	7	MS	REPTILE
Arcidens confragosus	S	08030207	P	7	MS	MUSSEL
Haliaeetus leucocephalus	T	08030207	P	7	MS	BIRD
Pleurobema pyramidatum	S	08030207	P	7	MS	MUSSEL
Scaphirhynchus albus	E	08030207	P	7	MS	FISH
Haliaeetus leucocephalus	T	08030208	P	7	MS	BIRD
Etheostoma pallididorsum	S	08040101	P	9	AR/OK	FISH
Haliaeetus leucocephalus	T	08040101	P	9	AR	BIRD
Lampsilis powelli	T	08040101	P	9	AR/OK	MUSSEL
Notropis perpallidus	S	08040101	P	9	AR/OK	FISH
Noturus taylori	S	08040101	P	9	AR/OK	FISH
Orconectes menae	S	08040101	P	9	AR/OK	CRAYFISH
Procambarus reimeri	S	08040101	P	9	AR/OK	CRAYFISH
Procambarus tenuis	S	08040101	P	9	AR/OK	CRAYFISH
Cyprogenia aberti	S	08040102	P	9	AR/OK	MUSSEL
Etheostoma pallididorsum	S	08040102	P	9	AR/OK	FISH
Fallicambarus harpi	S	08040102	P	9	AR/OK	CRAYFISH
Fallicambarus jeanae	S	08040102	P	9	AR/OK	CRAYFISH
Haliaeetus leucocephalus	T	08040102	P	9	AR	BIRD
Notropis perpallidus	S	08040102	P	9	AR/OK	FISH
Noturus taylori	S	08040102	P	9	AR/OK	FISH
Fallicambarus jeanae	S	08040103	P	9	AR/OK	CRAYFISH
Notropis perpallidus	S	08040103	P	9	AR/OK	FISH
Noturus taylori	S	08040103	P	9	AR/OK	FISH
Cyprogenia aberti	S	08040203	P	9	AR/OK	MUSSEL
Lampsilis powelli	T	08040203	P	9	AR/OK	MUSSEL
Notropis perpallidus	S	08040203	P	9	AR/OK	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Noturus lachneri	S	08040203	P	9	AR	FISH
Ammocrypta clara	S	08040206	P	6	LA	FISH
Haliaeetus leucocephalus	T	08040206	P	6	LA	BIRD
Obovaria jacksoniana	S	08040206	P	6	LA	MUSSEL
Strophitus subvexus	S	08040206	P	6	LA	MUSSEL
Notropis sabinae	S	08040304	P	6	LA	FISH
Alligator mississippiensis	T	08060203	P	7	MS	REPTILE
Crystallaria asprella	S	08060203	P	7	MS	FISH
Alligator mississippiensis	T	08060205	P	7	MS	REPTILE
Crystallaria asprella	S	08060205	P	7	MS	FISH
Homoeoneuria cahabensis	S	08060205	P	7	MS	MAYFLY
Procambarus jaculus	S	08060205	P	7	MS	CRAYFISH
Alligator mississippiensis	T	08060206	P	7	MS	REPTILE
Procambarus jaculus	S	08060206	P	7	MS	CRAYFISH
Alligator mississippiensis	T	08070202	P	7	MS	REPTILE
Fundulus euryzonus	S	08070202	P	7	MS	FISH
Haliaeetus leucocephalus	T	08080102	P	6	LA	BIRD
Leuctra szczytkai	S	08080102	P	6	LA	STONEFLY
Margaritifera hembeli	T	08080102	P	6	LA	MUSSEL
Pteronotropis hubbsi	S	08080102	P	6	LA	FISH
Orconectes hathawayi	S	08080203	P	6	LA	CRAYFISH
Ammocrypta clara	S	08080204	P	6	LA	FISH
Notropis sabinae	S	08080204	P	6	LA	FISH
Obovaria jacksoniana	S	08080204	P	6	LA	MUSSEL
Allocapnia jeanae	S	11010001	P	10	AR	STONEFLY
Allocapnia ozarkana	S	11010001	P	10	AR	STONEFLY
Amblyopsis rosae	T	11010001	P	10	AR	FISH
Notropis ozarcanus	S	11010001	P	10	AR	FISH
Orconectes williamsi	S	11010001	P	10	AR	CRAYFISH
Percina nasuta	S	11010001	P	10	AR	FISH
Notropis ozarcanus	S	11010004	P	10	AR	FISH
Percina uranidea	S	11010004	P	10	AR	FISH
Typhlichthys subterraneus	S	11010004	P	10	AR	FISH
Notropis ozarcanus	S	11010005	P	10	AR	FISH
Etheostoma moorei	S	11010014	P	10	AR	FISH
Haliaeetus leucocephalus	T	11010014	P	10	AR	BIRD
Percina nasuta	S	11010014	P	10	AR	FISH
Etheostoma cragini	S	11110103	P	10	AR	FISH
Eurycea tynerensis	S	11110103	P	10	AR	AMPHIBIAN
Notropis ozarcanus	S	11110103	P	10	AR	FISH
Notropis girardi	T	11110104	P	10	AR	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Paduniella nearctica	S	11110104	P	10	AR	CADDISFLY
Percina nasuta	S	11110104	P	10	AR	FISH
Notropis ortenburgeri	S	11110105	P	9	AR/OK	FISH
Procambarus tenuis	S	11110105	P	9	AR/OK	CRAYFISH
Stygobromus montanus	S	11110105	P	9	AR/OK	AMPHIPOD
Dannella provonshai	S	11110201	P	10	AR	MAYFLY
Lampsilis hydiana	S	11110201	P	10	AR	MUSSEL
Leptodea leptodon	P	11110201	X	10	AR	MUSSEL
Paduniella nearctica	S	11110201	P	10	AR	CADDISFLY
Percina nasuta	S	11110201	P	10	AR	FISH
Cambarus causeyi	S	11110202	P	10	AR	CRAYFISH
Notropis girardi	T	11110202	P	10	AR	FISH
Paduniella nearctica	S	11110202	P	10	AR	CADDISFLY
Percina nasuta	S	11110202	P	10	AR	FISH
Haliaeetus leucocephalus	T	11110206	P	9	AR	BIRD
Lampsilis hydiana	S	11110206	P	9	AR/OK	MUSSEL
Leptodea leptodon	P	11110206	P	9	AR/OK	MUSSEL
Obovaria jacksoniana	S	11110206	P	9	AR/OK	MUSSEL
Haliaeetus leucocephalus	T	11140101	P	13	TX	BIRD
Arkansia wheeleri	E	11140105	P	9	AR/OK	MUSSEL
Crystallaria asprella	S	11140105	P	9	AR/OK	FISH
Lampsilis hydiana	S	11140105	P	9	AR/OK	MUSSEL
Notropis ortenburgeri	S	11140105	P	9	AR/OK	FISH
Notropis perpallidus	S	11140105	P	9	AR/OK	FISH
Obovaria jacksoniana	S	11140105	P	9	AR/OK	MUSSEL
Quadrula metanevra	S	11140105	P	9	AR/OK	MUSSEL
Villosa arkansasensis	S	11140105	P	9	AR/OK	MUSSEL
Alligator mississippiensis	T	11140106	P	9	AR/OK	REPTILE
Ammocrypta clara	S	11140106	P	9	AR/OK	FISH
Crystallaria asprella	S	11140106	P	9	AR/OK	FISH
Haliaeetus leucocephalus	T	11140106	P	9	AR	BIRD
Notropis bairdi	S	11140106	P	9	AR/OK	FISH
Sterna antillarum athalassos	E	11140106	P	9	AR/OK	BIRD
Arkansia wheeleri	E	11140107	P	9	AR/OK	MUSSEL
Faxonella blairi	S	11140107	P	9	AR/OK	CRAYFISH
Haliaeetus leucocephalus	T	11140107	P	9	AR	BIRD
Lampsilis hydiana	S	11140107	P	9	AR/OK	MUSSEL
Lythrurus snelsoni	S	11140107	P	9	AR/OK	FISH
Notropis ortenburgeri	S	11140107	P	9	AR/OK	FISH
Notropis perpallidus	S	11140107	P	9	AR/OK	FISH
Obovaria jacksoniana	S	11140107	P	9	AR/OK	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Percina pantherina	T	11140107	P	9	AR/OK	FISH
Pleurobema cordatum	S	11140107	P	9	AR/OK	MUSSEL
Pteronotropis hubbsi	S	11140107	P	9	AR/OK	FISH
Villosa arkansasensis	S	11140107	P	9	AR/OK	MUSSEL
Haliaeetus leucocephalus	T	11140108	P	9	AR	BIRD
Lampsilis hydiana	S	11140108	P	9	AR/OK	MUSSEL
Leptodea leptodon	P	11140108	P	9	AR/OK	MUSSEL
Lythrurus snelsoni	S	11140108	P	9	AR/OK	FISH
Notropis ortenburgeri	S	11140108	P	9	AR/OK	FISH
Notropis perpallidus	S	11140108	P	9	AR/OK	FISH
Obovaria jacksoniana	S	11140108	P	9	AR/OK	MUSSEL
Percina pantherina	T	11140108	P	9	AR/OK	FISH
Pteronotropis hubbsi	S	11140108	P	9	AR/OK	FISH
Stygobromus montanus	S	11140108	P	9	AR/OK	AMPHIPOD
Villosa arkansasensis	S	11140108	P	9	AR/OK	MUSSEL
Ammocrypta clara	S	11140109	P	9	AR/OK	FISH
Arkansia wheeleri	E	11140109	P	9	AR/OK	MUSSEL
Crystallaria asprella	S	11140109	P	9	AR/OK	FISH
Fallicambarus strawni	S	11140109	P	9	AR/OK	CRAYFISH
Lampsilis abrupta	E	11140109	P	9	AR/OK	MUSSEL
Leptodea leptodon	P	11140109	P	9	AR/OK	MUSSEL
Lythrurus snelsoni	S	11140109	P	9	AR/OK	FISH
Notropis bairdi	S	11140109	P	9	AR/OK	FISH
Notropis ortenburgeri	S	11140109	P	9	AR/OK	FISH
Notropis perpallidus	S	11140109	P	9	AR/OK	FISH
Percina pantherina	T	11140109	P	9	AR/OK	FISH
Pteronotropis hubbsi	S	11140109	P	9	AR/OK	FISH
Ammocrypta clara	S	11140207	P	6	LA	FISH
Cycleptus elongatus	S	11140207	P	6	LA	FISH
Leuctra szczytkai	S	11140207	P	6	LA	STONEFLY
Margaritifera hembeli	T	11140207	P	6	LA	MUSSEL
Notropis sabinae	S	11140207	P	6	LA	FISH
Obovaria jacksoniana	S	11140207	P	6	LA	MUSSEL
Orconectes maletae	S	11140207	P	6	LA	CRAYFISH
Alligator mississippiensis	T	12010004	P	13	TX	REPTILE
Ammocrypta clara	S	12010004	P	13	TX	FISH
Arcidens confragosus	S	12010004	P	13	TX	MUSSEL
Cycleptus elongatus	S	12010004	P	13	TX	FISH
Fusconaia askewi	S	12010004	P	13	TX	MUSSEL
Haliaeetus leucocephalus	T	12010004	P	13	TX	BIRD
Notropis sabinae	S	12010004	X	13	TX	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Pleurobema riddelli	S	12010004	P	13	TX	MUSSEL
Potamilus amphichaenus	S	12010004	P	13	TX	MUSSEL
Somatochlora margarita	S	12010004	P	13	TX	DRAGONFLY
Alligator mississippiensis	T	12020002	P	13	TX	REPTILE
Arcidens confragosus	S	12020002	P	13	TX	MUSSEL
Cycleptus elongatus	S	12020002	P	13	TX	FISH
Fusconaia askewi	S	12020002	P	13	TX	MUSSEL
Haliaeetus leucocephalus	T	12020002	P	13	TX	BIRD
Lampsilis hydiana	S	12020002	P	13	TX	MUSSEL
Notropis sabinae	S	12020002	P	13	TX	FISH
Potamilus amphichaenus	S	12020002	P	13	TX	MUSSEL
Procambarus nechesae	S	12020002	P	13	TX	CRAYFISH
Procambarus nigrocinctus	S	12020002	P	13	TX	CRAYFISH
Somatochlora margarita	S	12020002	P	13	TX	DRAGONFLY
Alligator mississippiensis	T	12020005	P	13	TX	REPTILE
Amblema plicata perplicata	S	12020005	P	13	TX	MUSSEL
Arcidens confragosus	S	12020005	X	13	TX	MUSSEL
Cycleptus elongatus	S	12020005	P	13	TX	FISH
Fusconaia lananensis	S	12020005	P	13	TX	MUSSEL
Haliaeetus leucocephalus	T	12020005	P	13	TX	BIRD
Lampsilis hydiana	S	12020005	P	13	TX	MUSSEL
Notropis sabinae	S	12020005	X	13	TX	FISH
Pleurobema riddelli	S	12020005	P	13	TX	MUSSEL
Quadrula pustulosa mortoni	S	12020005	P	13	TX	MUSSEL
Somatochlora margarita	S	12020005	P	13	TX	DRAGONFLY
Arcidens confragosus	S	12030106	X	13	TX	MUSSEL
Haliaeetus leucocephalus	T	12030106	P	13	TX	BIRD
Somatochlora margarita	S	12030106	P	13	TX	DRAGONFLY
Alligator mississippiensis	T	12030202	P	13	TX	REPTILE
Arcidens confragosus	S	12030202	X	13	TX	MUSSEL
Fusconaia askewi	S	12030202	P	13	TX	MUSSEL
Lampsilis hydiana	S	12030202	P	13	TX	MUSSEL
Lampsilis satura	S	12030202	P	13	TX	MUSSEL
Pleurobema riddelli	S	12030202	P	13	TX	MUSSEL
Potamilus amphichaenus	S	12030202	P	13	TX	MUSSEL
Somatochlora margarita	S	12030202	P	13	TX	DRAGONFLY
Alligator mississippiensis	T	12040101	P	13	TX	REPTILE
Cycleptus elongatus	S	12040101	P	13	TX	FISH
Fusconaia lananensis	S	12040101	P	13	TX	MUSSEL
Haliaeetus leucocephalus	T	12040101	P	13	TX	BIRD
Notropis sabinae	S	12040101	P	13	TX	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Somatochlora margarita	S	12040101	P	13	TX	DRAGONFLY
Alligator mississippiensis	T	12040103	P	13	TX	REPTILE
Cycleptus elongatus	S	12040103	P	13	TX	FISH
Fusconaia lananensis	S	12040103	P	13	TX	MUSSEL
Notropis sabinae	S	12040103	P	13	TX	FISH
Quadrula houstonensis	S	12040103	P	13	TX	MUSSEL
Somatochlora margarita	S	12040103	P	13	TX	DRAGONFLY

Appendix D

Rare aquatic species, sorted by species type, found on or near national forests in the South.

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Ambystoma cingulatum	T	03050112	P	12	SC	AMPHIBIAN
Ambystoma cingulatum	T	03050201	P	12	SC	AMPHIBIAN
Ambystoma cingulatum	T	03070204	P	5	FL	AMPHIBIAN
Ambystoma cingulatum	T	03110201	P	5	FL	AMPHIBIAN
Ambystoma cingulatum	T	03110206	P	5	FL	AMPHIBIAN
Ambystoma cingulatum	T	03120001	P	5	FL	AMPHIBIAN
Ambystoma cingulatum	T	03120003	P	5	FL	AMPHIBIAN
Ambystoma cingulatum	T	03130011	P	5	FL	AMPHIBIAN
Ambystoma cingulatum	T	03130013	P	5	FL	AMPHIBIAN
Eurycea junaluska	S	06010204	P	4	TN	AMPHIBIAN
Eurycea junaluska	S	06010204	P	11	NC	AMPHIBIAN
Eurycea tynerensis	S	11110103	P	10	AR	AMPHIBIAN
Gyrinophilus subterraneus	S	05050003	P	8	WV	AMPHIBIAN
Necturus sp.	S	03160109	P	1	AL	AMPHIBIAN
Necturus sp.	S	03160110	P	1	AL	AMPHIBIAN
Notopthalmus perstriatus	S	03080101	P	5	FL	AMPHIBIAN
Notopthalmus perstriatus	S	03080102	P	5	FL	AMPHIBIAN
Notopthalmus perstriatus	S	03110201	P	5	FL	AMPHIBIAN
Notopthalmus perstriatus	S	03120001	P	5	FL	AMPHIBIAN
Rana capito aesopus	S	03080101	P	5	FL	AMPHIBIAN
Rana capito aesopus	S	03080102	P	5	FL	AMPHIBIAN
Rana capito aesopus	S	03120001	P	5	FL	AMPHIBIAN
Rana capito capito	S	03020106	P	11	NC	AMPHIBIAN
Rana capito capito	S	03020204	P	11	NC	AMPHIBIAN
Rana capito sevosa	S	03140103	P	1	AL	AMPHIBIAN
Rana capito sevosa	S	03140104	P	1	AL	AMPHIBIAN
Rana capito sevosa	S	03140301	P	1	AL	AMPHIBIAN

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Rana capito sevosa	S	03140304	P	1	AL	AMPHIBIAN
Rana capito sevosa	S	03170009	P	7	MS	AMPHIBIAN
Crangonx hobbsi	S	03120001	P	5	FL	AMPHIPOD
Stygobromus cumberlandus	S	06010205	P	8	VA	AMPHIPOD
Stygobromus cumberlandus	S	06010206	P	8	VA	AMPHIPOD
Stygobromus emarginatus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus fergusoni	S	02080201	P	8	VA	AMPHIPOD
Stygobromus fergusoni	S	03010101	P	8	VA	AMPHIPOD
Stygobromus fergusoni	S	05050001	P	8	VA	AMPHIPOD
Stygobromus gracilipes	S	02070006	P	8	VA	AMPHIPOD
Stygobromus montanus	S	11110105	P	9	AR/OK	AMPHIPOD
Stygobromus montanus	S	11140108	P	9	AR/OK	AMPHIPOD
Stygobromus morrisoni	S	02070003	P	8	WV	AMPHIPOD
Stygobromus morrisoni	S	02080201	P	8	VA	AMPHIPOD
Stygobromus mundus	S	02080201	P	8	VA	AMPHIPOD
Stygobromus nanus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus parvus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus pollustus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus redactus	S	05050002	P	8	VA	AMPHIPOD
Stygobromus redactus	S	05050003	P	8	WV	AMPHIPOD
Stygobromus sp. Nov. (sp. 7)	S	02070005	P	8	VA	AMPHIPOD
Stygobromus spinatus	S	05050003	P	8	WV	AMPHIPOD
Hydraena maureenae	S	02080201	P	8	VA	BEETLE
Grus canadensis pulla	E	03170006	P	7	MS	BIRD
Grus canadensis pulla	E	03170009	P	7	MS	BIRD
Haliaeetus leucocephalus	T	02070003	P	8	WV	BIRD
Haliaeetus leucocephalus	T	02080201	P	8	VA	BIRD
Haliaeetus leucocephalus	T	03020106	P	11	NC	BIRD
Haliaeetus leucocephalus	T	03020204	P	11	NC	BIRD
Haliaeetus leucocephalus	T	03040103	P	11	NC	BIRD
Haliaeetus leucocephalus	T	03040104	P	11	NC	BIRD
Haliaeetus leucocephalus	T	03050106	P	12	SC	BIRD
Haliaeetus leucocephalus	T	03050112	P	12	SC	BIRD
Haliaeetus leucocephalus	T	03050201	P	12	SC	BIRD
Haliaeetus leucocephalus	T	03060102	P	3	GA	BIRD
Haliaeetus leucocephalus	T	03060107	P	12	SC	BIRD
Haliaeetus leucocephalus	T	03070101	P	3	GA	BIRD
Haliaeetus leucocephalus	T	03070103	P	3	GA	BIRD
Haliaeetus leucocephalus	T	03070204	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03080101	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03080102	P	5	FL	BIRD

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Haliaeetus leucocephalus	T	03110201	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03110206	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03120001	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03120003	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03130011	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03130013	P	5	FL	BIRD
Haliaeetus leucocephalus	T	03140103	P	1	AL	BIRD
Haliaeetus leucocephalus	T	03140304	P	1	AL	BIRD
Haliaeetus leucocephalus	T	03150105	P	1	AL	BIRD
Haliaeetus leucocephalus	T	03150106	P	1	AL	BIRD
Haliaeetus leucocephalus	T	03150107	P	1	AL	BIRD
Haliaeetus leucocephalus	T	03150202	P	1	AL	BIRD
Haliaeetus leucocephalus	T	03160104	P	7	MS	BIRD
Haliaeetus leucocephalus	T	03160108	P	7	MS	BIRD
Haliaeetus leucocephalus	T	03160110	P	1	AL	BIRD
Haliaeetus leucocephalus	T	03170006	P	7	MS	BIRD
Haliaeetus leucocephalus	T	05100101	P	2	KY	BIRD
Haliaeetus leucocephalus	T	05130101	P	2	KY	BIRD
Haliaeetus leucocephalus	T	06010102	P	4	TN	BIRD
Haliaeetus leucocephalus	T	06010103	P	4	TN	BIRD
Haliaeetus leucocephalus	T	06010204	P	4	TN	BIRD
Haliaeetus leucocephalus	T	06020002	P	3	GA	BIRD
Haliaeetus leucocephalus	T	06020003	P	3	GA	BIRD
Haliaeetus leucocephalus	T	06020003	P	4	TN	BIRD
Haliaeetus leucocephalus	T	08030201	P	7	MS	BIRD
Haliaeetus leucocephalus	T	08030205	P	7	MS	BIRD
Haliaeetus leucocephalus	T	08030207	P	7	MS	BIRD
Haliaeetus leucocephalus	T	08030208	P	7	MS	BIRD
Haliaeetus leucocephalus	T	08040101	P	9	AR	BIRD
Haliaeetus leucocephalus	T	08040102	P	9	AR	BIRD
Haliaeetus leucocephalus	T	08040206	P	6	LA	BIRD
Haliaeetus leucocephalus	T	08080102	P	6	LA	BIRD
Haliaeetus leucocephalus	T	11010014	P	10	AR	BIRD
Haliaeetus leucocephalus	T	11110206	P	9	AR	BIRD
Haliaeetus leucocephalus	T	11140101	P	13	TX	BIRD
Haliaeetus leucocephalus	T	11140106	P	9	AR	BIRD
Haliaeetus leucocephalus	T	11140107	P	9	AR	BIRD
Haliaeetus leucocephalus	T	11140108	P	9	AR	BIRD
Haliaeetus leucocephalus	T	12010004	P	13	TX	BIRD
Haliaeetus leucocephalus	T	12020002	P	13	TX	BIRD
Haliaeetus leucocephalus	T	12020005	P	13	TX	BIRD

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Haliaeetus leucocephalus	T	12030106	P	13	TX	BIRD
Haliaeetus leucocephalus	T	12040101	P	13	TX	BIRD
Mycteria americana	E	03050112	P	12	SC	BIRD
Mycteria americana	E	03050201	P	12	SC	BIRD
Mycteria americana	E	03070101	P	3	GA	BIRD
Mycteria americana	E	03070204	P	5	FL	BIRD
Mycteria americana	E	03080101	P	5	FL	BIRD
Mycteria americana	E	03080102	P	5	FL	BIRD
Mycteria americana	E	03110201	P	5	FL	BIRD
Mycteria americana	E	03110206	P	5	FL	BIRD
Mycteria americana	E	03120001	P	5	FL	BIRD
Mycteria americana	E	03120003	P	5	FL	BIRD
Mycteria americana	E	03130011	P	5	FL	BIRD
Mycteria americana	E	03130013	P	5	FL	BIRD
Sterna antillarum athalassos	E	08020100	P	10	AR	BIRD
Sterna antillarum athalassos	E	08020203	P	10	AR	BIRD
Sterna antillarum athalassos	E	11140106	P	9	AR/OK	BIRD
Agapetus jocassee	S	03060101	P	11	NC	CADDISFLY
Agapetus jocassee	S	03060102	P	11	NC	CADDISFLY
Agapetus jocassee	S	06010105	P	11	NC	CADDISFLY
Madeophylax sp 1	S	05100204	P	2	KY	CADDISFLY
Madeophylax sp 1	S	05130101	P	2	KY	CADDISFLY
Madeophylax sp 1	S	05130102	P	2	KY	CADDISFLY
Paduniella nearctica	S	11110104	P	10	AR	CADDISFLY
Paduniella nearctica	S	11110201	P	10	AR	CADDISFLY
Paduniella nearctica	S	11110202	P	10	AR	CADDISFLY
Cambarus batchi	S	05130101	P	2	KY	CRAYFISH
Cambarus batchi	S	05130102	P	2	KY	CRAYFISH
Cambarus bouchardi	S	05130101	P	2	KY	CRAYFISH
Cambarus causeyi	S	11110202	P	10	AR	CRAYFISH
Cambarus chaugaensis	S	03060102	P	3	GA	CRAYFISH
Cambarus chaugaensis	S	03060102	P	12	SC	CRAYFISH
Cambarus englishi	S	03150108	P	1	AL	CRAYFISH
Cambarus englishi	S	03150109	P	1	AL	CRAYFISH
Cambarus extraneus	S	06020001	P	3	GA	CRAYFISH
Cambarus georgiae	S	06010202	P	3	GA	CRAYFISH
Cambarus georgiae	S	06010202	P	11	NC	CRAYFISH
Cambarus n.veteranus	S	05050003	P	8	WV	CRAYFISH
Cambarus parrishi	S	06020002	P	3	GA	CRAYFISH
Cambarus parrishi	S	06020002	P	11	NC	CRAYFISH
Cambarus reburrus	S	06010105	P	11	NC	CRAYFISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Cambarus reburrus	S	06010203	P	11	NC	CRAYFISH
Fallicambarus byersi	S	03170006	P	7	MS	CRAYFISH
Fallicambarus byersi	S	03170009	P	7	MS	CRAYFISH
Fallicambarus danielae	S	03170006	P	7	MS	CRAYFISH
Fallicambarus danielae	S	03170009	P	7	MS	CRAYFISH
Fallicambarus gordoni	S	03170007	P	7	MS	CRAYFISH
Fallicambarus harpi	S	08040102	P	9	AR/OK	CRAYFISH
Fallicambarus jeanae	S	08040102	P	9	AR/OK	CRAYFISH
Fallicambarus jeanae	S	08040103	P	9	AR/OK	CRAYFISH
Fallicambarus strawni	S	11140109	P	9	AR/OK	CRAYFISH
Faxonella blairi	S	11140107	P	9	AR/OK	CRAYFISH
Hobbseus attenuatus	S	03170003	P	7	MS	CRAYFISH
Hobbseus attenuatus	S	03170005	P	7	MS	CRAYFISH
Hobbseus attenuatus	S	03170006	P	7	MS	CRAYFISH
Hobbseus attenuatus	S	03170007	P	7	MS	CRAYFISH
Hobbseus attenuatus	S	03170009	P	7	MS	CRAYFISH
Orconectes hathawayi	S	08080203	P	6	LA	CRAYFISH
Orconectes maletae	S	11140207	P	6	LA	CRAYFISH
Orconectes menae	S	08040101	P	9	AR/OK	CRAYFISH
Orconectes williamsi	S	11010001	P	10	AR	CRAYFISH
Procambarus barbiger	S	03170004	P	7	MS	CRAYFISH
Procambarus delicatus	S	03080101	P	5	FL	CRAYFISH
Procambarus fitzpatricki	S	03170006	P	7	MS	CRAYFISH
Procambarus fitzpatricki	S	03170007	P	7	MS	CRAYFISH
Procambarus fitzpatricki	S	03170009	P	7	MS	CRAYFISH
Procambarus jaculus	S	03180001	P	7	MS	CRAYFISH
Procambarus jaculus	S	03180002	P	7	MS	CRAYFISH
Procambarus jaculus	S	08060205	P	7	MS	CRAYFISH
Procambarus jaculus	S	08060206	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170003	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170005	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170006	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170007	P	7	MS	CRAYFISH
Procambarus lecontei	S	03170009	P	7	MS	CRAYFISH
Procambarus nechesae	S	12020002	P	13	TX	CRAYFISH
Procambarus nigrocinctus	S	12020002	P	13	TX	CRAYFISH
Procambarus orcinus	S	03120001	P	5	FL	CRAYFISH
Procambarus plumimanus	S	03020106	P	11	NC	CRAYFISH
Procambarus plumimanus	S	03020204	P	11	NC	CRAYFISH
Procambarus reimeri	S	08040101	P	9	AR/OK	CRAYFISH
Procambarus tenuis	S	08040101	P	9	AR/OK	CRAYFISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Procambarus tenuis	S	11110105	P	9	AR/OK	CRAYFISH
Cordulegaster sayi	S	03120003	P	5	FL	DRAGONFLY
Gomphus consanguis	S	03150101	P	3	GA	DRAGONFLY
Gomphus consanguis	S	03150103	P	3	GA	DRAGONFLY
Gomphus diminutus	S	03030003	P	11	NC	DRAGONFLY
Gomphus parvidens	S	03150202	X	1	AL	DRAGONFLY
Gomphus parvidens	S	06010105	P	11	NC	DRAGONFLY
Gomphus parvidens	S	06010202	P	11	NC	DRAGONFLY
Gomphus septima	S	03030003	P	11	NC	DRAGONFLY
Gomphus viridifrons	S	02070001	P	8	VA	DRAGONFLY
Gomphus viridifrons	S	02080201	P	8	VA	DRAGONFLY
Gomphus viridifrons	S	05050001	P	8	VA	DRAGONFLY
Gomphus viridifrons	S	05070202	P	8	VA	DRAGONFLY
Macromia margarita	S	03130001	P	3	GA	DRAGONFLY
Macromia margarita	S	06010105	P	11	NC	DRAGONFLY
Ophiogomphus edmundo	S	03130001	P	3	GA	DRAGONFLY
Ophiogomphus edmundo	S	03150101	P	3	GA	DRAGONFLY
Ophiogomphus howei	S	05130101	P	2	KY	DRAGONFLY
Ophiogomphus incurvatus	S	03040101	P	11	NC	DRAGONFLY
Ophiogomphus incurvatus	S	03130001	P	3	GA	DRAGONFLY
Ophiogomphus incurvatus	S	03150106	P	1	AL	DRAGONFLY
Progomphus bellei	S	03120001	P	5	FL	DRAGONFLY
Progomphus bellei	S	03120003	P	5	FL	DRAGONFLY
Progomphus bellei	S	03140104	P	1	AL	DRAGONFLY
Somatochlora calverti	S	03120001	P	5	FL	DRAGONFLY
Somatochlora calverti	S	03120003	P	5	FL	DRAGONFLY
Somatochlora margarita	S	12010004	P	13	TX	DRAGONFLY
Somatochlora margarita	S	12020002	P	13	TX	DRAGONFLY
Somatochlora margarita	S	12020005	P	13	TX	DRAGONFLY
Somatochlora margarita	S	12030106	P	13	TX	DRAGONFLY
Somatochlora margarita	S	12030202	P	13	TX	DRAGONFLY
Somatochlora margarita	S	12040101	P	13	TX	DRAGONFLY
Somatochlora margarita	S	12040103	P	13	TX	DRAGONFLY
Stylurus townesi	S	03140104	P	1	AL	DRAGONFLY
Acipenser brevirostrum	E	03020106	P	11	NC	FISH
Acipenser brevirostrum	E	03020204	P	11	NC	FISH
Acipenser brevirostrum	E	03050112	P	12	SC	FISH
Acipenser brevirostrum	E	03050201	P	12	SC	FISH
Acipenser fulvescens	S	05130101	P	2	KY	FISH
Acipenser fulvescens	S	06010105	P	11	NC	FISH
Acipenser o. desotoi	T	03120003	P	5	FL	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Acipenser o. desotoi	T	03130011	P	5	FL	FISH
Acipenser o. desotoi	T	03140103	P	1	AL	FISH
Acipenser o. desotoi	T	03170006	P	7	MS	FISH
Acipenser o. desotoi	T	03170007	P	7	MS	FISH
Acipenser o. desotoi	T	03170009	P	7	MS	FISH
Acipenser o. desotoi	T	03180002	P	7	MS	FISH
Amblyopsis rosae	T	11010001	P	10	AR	FISH
Ammocrypta clara	S	08040206	P	6	LA	FISH
Ammocrypta clara	S	08080204	P	6	LA	FISH
Ammocrypta clara	S	11140207	P	6	LA	FISH
Ammocrypta clara	S	12010004	P	13	TX	FISH
Ammocrypta clara	S	11140106	P	9	AR/OK	FISH
Ammocrypta clara	S	11140109	P	9	AR/OK	FISH
Ammocrypta pellucida	S	05100101	P	2	KY	FISH
Ammocrypta pellucida	S	05100202	P	2	KY	FISH
Ammocrypta pellucida	S	05100204	P	2	KY	FISH
Cottus baileyi	S	06010205	P	8	VA	FISH
Crystallaria asprella	S	03150110	P	1	AL	FISH
Crystallaria asprella	S	03150202	P	1	AL	FISH
Crystallaria asprella	S	08060203	P	7	MS	FISH
Crystallaria asprella	S	08060205	P	7	MS	FISH
Crystallaria asprella	S	11140105	P	9	AR/OK	FISH
Crystallaria asprella	S	11140106	P	9	AR/OK	FISH
Crystallaria asprella	S	11140109	P	9	AR/OK	FISH
Cycleptus elongatus	S	11140207	P	6	LA	FISH
Cycleptus elongatus	S	12010004	P	13	TX	FISH
Cycleptus elongatus	S	12020002	P	13	TX	FISH
Cycleptus elongatus	S	12020005	P	13	TX	FISH
Cycleptus elongatus	S	12040101	P	13	TX	FISH
Cycleptus elongatus	S	12040103	P	13	TX	FISH
Cyprinella caerulea	T	03150101	P	3	GA	FISH
Cyprinella caerulea	T	03150101	P	4	TN	FISH
Cyprinella caerulea	T	03150106	P	1	AL	FISH
Cyprinella callisema	S	03070103	P	3	GA	FISH
Cyprinella callitaenia	S	03130001	P	3	GA	FISH
Cyprinella leedsi	S	03120003	P	5	FL	FISH
Cyprinella monacha	T	06010105	X	11	NC	FISH
Cyprinella monacha	T	06010202	P	11	NC	FISH
Cyprinella monacha	T	06010203	P	11	NC	FISH
Cyprinella xaenura	S	03070101	P	3	GA	FISH
Cyprinella zanema	S	03050101	P	11	NC	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Erimystax cahni	T	06010206	P	8	VA	FISH
Etheostoma acuticeps	S	06010102	P	4	TN	FISH
Etheostoma acuticeps	S	06010102	P	8	VA	FISH
Etheostoma acuticeps	S	06010108	P	4	TN	FISH
Etheostoma acuticeps	S	06010108	P	11	NC	FISH
Etheostoma bellator	S	03160110	P	1	AL	FISH
Etheostoma brevirostrum	S	03150101	P	3	GA	FISH
Etheostoma brevirostrum	S	03150101	P	4	TN	FISH
Etheostoma brevirostrum	S	03150102	P	3	GA	FISH
Etheostoma brevirostrum	S	03150104	P	3	GA	FISH
Etheostoma brevirostrum	S	03150106	P	1	AL	FISH
Etheostoma cinereum	S	05130101	P	2	KY	FISH
Etheostoma cinereum	S	05130102	P	2	KY	FISH
Etheostoma cinereum	S	06020001	P	3	GA	FISH
Etheostoma collis	S	03040104	P	11	NC	FISH
Etheostoma cragini	S	11110103	P	10	AR	FISH
Etheostoma davisoni	S	03140103	P	1	AL	FISH
Etheostoma davisoni	S	03140304	P	1	AL	FISH
Etheostoma ditrema	S	03150101	P	3	GA	FISH
Etheostoma ditrema	S	03150101	P	4	TN	FISH
Etheostoma ditrema	S	03150105	P	3	GA	FISH
Etheostoma etowahae	E	03150104	P	3	GA	FISH
Etheostoma maculatum	S	05100202	P	2	KY	FISH
Etheostoma moorei	S	11010014	P	10	AR	FISH
Etheostoma nigrum susanae	S	05070202	P	8	VA	FISH
Etheostoma nigrum susanae	S	05130101	P	2	KY	FISH
Etheostoma osburni	S	05050002	P	8	VA	FISH
Etheostoma osburni	S	05050003	P	8	WV	FISH
Etheostoma pallididorsum	S	08040101	P	9	AR/OK	FISH
Etheostoma pallididorsum	S	08040102	P	9	AR/OK	FISH
Etheostoma percnurum	E	05130101	P	2	KY	FISH
Etheostoma percnurum	E	06010204	P	4	TN	FISH
Etheostoma raneyi	S	08030201	P	7	MS	FISH
Etheostoma scotti	T	03150104	P	3	GA	FISH
Etheostoma tippecanoe	S	05100101	P	2	KY	FISH
Etheostoma tippecanoe	S	05130101	P	2	KY	FISH
Etheostoma tippecanoe	S	05130102	P	2	KY	FISH
Etheostoma tippecanoe	S	06010205	P	8	VA	FISH
Etheostoma tippecanoe	S	06010206	X	8	VA	FISH
Etheostoma trisella	S	03150101	P	3	GA	FISH
Etheostoma trisella	S	03150101	P	4	TN	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Etheostoma trisella	S	03150105	P	3	GA	FISH
Etheostoma vulneratum	S	06010105	P	11	NC	FISH
Etheostoma vulneratum	S	06010202	P	11	NC	FISH
Etheostoma vulneratum	S	06010203	P	11	NC	FISH
Etheostoma vulneratum	S	06020001	P	3	GA	FISH
Fundulus euryzonus	S	08070202	P	7	MS	FISH
Hybognathus nuchalis	S	03150110	P	1	AL	FISH
Hybognathus nuchalis	S	03150202	P	1	AL	FISH
Hybognathus nuchalis	S	03160113	P	1	AL	FISH
Hybopsis lineapunctata	S	03150101	P	3	GA	FISH
Hybopsis lineapunctata	S	03150101	P	4	TN	FISH
Hybopsis lineapunctata	S	03150107	P	1	AL	FISH
Hybopsis lineapunctata	S	03150108	P	1	AL	FISH
Hybopsis lineapunctata	S	03150109	P	1	AL	FISH
Ichthyomyzon greeleyi	S	05130101	P	2	KY	FISH
Ichthyomyzon greeleyi	S	05130102	P	2	KY	FISH
Ichthyomyzon greeleyi	S	06010202	P	3	GA	FISH
Ichthyomyzon greeleyi	S	06020001	P	3	GA	FISH
Ichthyomyzon greeleyi	S	06020002	P	3	GA	FISH
Lythrurus snelsoni	S	11140107	P	9	AR/OK	FISH
Lythrurus snelsoni	S	11140108	P	9	AR/OK	FISH
Lythrurus snelsoni	S	11140109	P	9	AR/OK	FISH
Micropterus notius	S	03130011	P	5	FL	FISH
Moxostoma lachneri	S	03060102	P	3	GA	FISH
Notropis albizonatus	E	05130101	P	2	KY	FISH
Notropis ariommus	S	06020001	P	3	GA	FISH
Notropis bairdi	S	11140106	P	9	AR/OK	FISH
Notropis bairdi	S	11140109	P	9	AR/OK	FISH
Notropis cahabae	E	03150202	P	1	AL	FISH
Notropis girardi	T	11110104	P	10	AR	FISH
Notropis girardi	T	11110202	P	10	AR	FISH
Notropis hypsilepsis	S	03060102	P	3	GA	FISH
Notropis melanostomus	S	03170003	P	7	MS	FISH
Notropis melanostomus	S	03170005	P	7	MS	FISH
Notropis melanostomus	S	03170006	P	7	MS	FISH
Notropis melanostomus	S	03170007	P	7	MS	FISH
Notropis melanostomus	S	03170009	P	7	MS	FISH
Notropis ortenburgeri	S	11110105	P	9	AR/OK	FISH
Notropis ortenburgeri	S	11140105	P	9	AR/OK	FISH
Notropis ortenburgeri	S	11140107	P	9	AR/OK	FISH
Notropis ortenburgeri	S	11140108	P	9	AR/OK	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Notropis ortenburgeri	S	11140109	P	9	AR/OK	FISH
Notropis ozarcanus	S	11010001	P	10	AR	FISH
Notropis ozarcanus	S	11010004	P	10	AR	FISH
Notropis ozarcanus	S	11010005	P	10	AR	FISH
Notropis ozarcanus	S	11110103	P	10	AR	FISH
Notropis perpallidus	S	08040101	P	9	AR/OK	FISH
Notropis perpallidus	S	08040102	P	9	AR/OK	FISH
Notropis perpallidus	S	08040103	P	9	AR/OK	FISH
Notropis perpallidus	S	08040203	P	9	AR/OK	FISH
Notropis perpallidus	S	11140105	P	9	AR/OK	FISH
Notropis perpallidus	S	11140107	P	9	AR/OK	FISH
Notropis perpallidus	S	11140108	P	9	AR/OK	FISH
Notropis perpallidus	S	11140109	P	9	AR/OK	FISH
Notropis sabinae	S	08040304	P	6	LA	FISH
Notropis sabinae	S	08080204	P	6	LA	FISH
Notropis sabinae	S	11140207	P	6	LA	FISH
Notropis sabinae	S	12010004	X	13	TX	FISH
Notropis sabinae	S	12020002	P	13	TX	FISH
Notropis sabinae	S	12020005	X	13	TX	FISH
Notropis sabinae	S	12040101	P	13	TX	FISH
Notropis sabinae	S	12040103	P	13	TX	FISH
Notropis semperasper	S	02080201	P	8	VA	FISH
Notropis sp. (sawfin)	S	05130101	P	2	KY	FISH
Notropis uranoscopus	S	03150110	P	1	AL	FISH
Notropis uranoscopus	S	03150202	P	1	AL	FISH
Noturus baileyi	E	06010204	P	4	TN	FISH
Noturus flavipinnis	T	06010204	P	4	TN	FISH
Noturus flavippinis	T	06010101	X	8	VA	FISH
Noturus flavippinis	T	06010205	P	8	VA	FISH
Noturus flavippinis	T	06010206	P	8	VA	FISH
Noturus gilberti	S	02080201	P	8	VA	FISH
Noturus gilberti	S	03010101	P	8	VA	FISH
Noturus lachneri	S	08040203	P	9	AR	FISH
Noturus munitus	S	03150101	P	4	TN	FISH
Noturus munitus	S	03150104	P	3	GA	FISH
Noturus munitus	S	03150202	P	1	AL	FISH
Noturus stigmosus	S	05100101	P	2	KY	FISH
Noturus stigmosus	S	05100202	P	2	KY	FISH
Noturus taylori	S	08040101	P	9	AR/OK	FISH
Noturus taylori	S	08040102	P	9	AR/OK	FISH
Noturus taylori	S	08040103	P	9	AR/OK	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Percina antesella	E	03150101	P	3	GA	FISH
Percina antesella	E	03150101	P	4	TN	FISH
Percina antesella	E	03150104	P	3	GA	FISH
Percina aurolineata	T	03150102	P	3	GA	FISH
Percina burtoni	S	05130101	P	2	KY	FISH
Percina burtoni	S	06010101	P	8	VA	FISH
Percina burtoni	S	06010102	P	4	TN	FISH
Percina burtoni	S	06010102	X	8	VA	FISH
Percina burtoni	S	06010105	P	11	NC	FISH
Percina burtoni	S	06010108	P	11	NC	FISH
Percina burtoni	S	06010204	P	4	TN	FISH
Percina burtoni	S	06010205	P	8	VA	FISH
Percina burtoni	S	06010206	X	8	VA	FISH
Percina burtoni	S	06020002	P	4	TN	FISH
Percina gymnocephala	S	05050003	P	8	WV	FISH
Percina jenkinsi	E	03150101	P	3	GA	FISH
Percina jenkinsi	E	03150101	P	4	TN	FISH
Percina lenticula	S	03150101	P	3	GA	FISH
Percina lenticula	S	03150104	P	3	GA	FISH
Percina lenticula	S	03150110	P	1	AL	FISH
Percina lenticula	S	03150202	P	1	AL	FISH
Percina lenticula	S	03170003	P	7	MS	FISH
Percina lenticula	S	03170005	P	7	MS	FISH
Percina lenticula	S	03170006	P	7	MS	FISH
Percina lenticula	S	03170007	P	7	MS	FISH
Percina lenticula	S	03170009	P	7	MS	FISH
Percina macrocephala	S	05130101	P	2	KY	FISH
Percina macrocephala	S	06010101	P	8	VA	FISH
Percina macrocephala	S	06010102	P	4	TN	FISH
Percina macrocephala	S	06010102	P	8	VA	FISH
Percina macrocephala	S	06010103	P	4	TN	FISH
Percina macrocephala	S	06010105	X	11	NC	FISH
Percina macrocephala	S	06010205	P	8	VA	FISH
Percina nasuta	S	11010001	P	10	AR	FISH
Percina nasuta	S	11010014	P	10	AR	FISH
Percina nasuta	S	11110104	P	10	AR	FISH
Percina nasuta	S	11110201	P	10	AR	FISH
Percina nasuta	S	11110202	P	10	AR	FISH
Percina palmaris	S	03150101	P	3	GA	FISH
Percina palmaris	S	03150101	P	4	TN	FISH
Percina palmaris	S	03150102	P	3	GA	FISH

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Percina palmaris	S	03150103	P	3	GA	FISH
Percina palmaris	S	03150104	P	3	GA	FISH
Percina palmaris	S	03150105	P	1	AL	FISH
Percina palmaris	S	03150105	P	3	GA	FISH
Percina palmaris	S	03150106	P	1	AL	FISH
Percina palmaris	S	03150108	P	1	AL	FISH
Percina palmaris	S	03150109	P	1	AL	FISH
Percina pantherina	T	11140107	P	9	AR/OK	FISH
Percina pantherina	T	11140108	P	9	AR/OK	FISH
Percina pantherina	T	11140109	P	9	AR/OK	FISH
Percina rex	E	03010101	P	9	VA	FISH
Percina squamata	S	05130101	P	2	KY	FISH
Percina squamata	S	06010103	P	4	TN	FISH
Percina squamata	S	06010105	P	4	TN	FISH
Percina squamata	S	06010105	P	11	NC	FISH
Percina squamata	S	06010108	P	4	TN	FISH
Percina squamata	S	06010108	P	11	NC	FISH
Percina squamata	S	06010202	P	11	NC	FISH
Percina squamata	S	06010203	P	11	NC	FISH
Percina squamata	S	06020001	P	3	GA	FISH
Percina squamata	S	06020002	P	4	TN	FISH
Percina squamata	S	06020002	P	11	NC	FISH
Percina tanasi	T	06020002	P	4	TN	FISH
Percina tanasi	T	06020003	P	4	TN	FISH
Percina uranidea	S	11010004	P	10	AR	FISH
Phenacobius crassilabrum	S	06010102	P	8	VA	FISH
Phenacobius crassilabrum	S	06020001	P	3	GA	FISH
Phenacobius teretulus	S	05050001	P	8	VA	FISH
Phenacobius teretulus	S	05050002	P	8	VA	FISH
Phenacobius teretulus	S	05050003	P	8	WV	FISH
Phoxinus cumberlandensis	T	05130101	P	2	KY	FISH
Phoxinus cumberlandensis	T	05130101	P	8	KY	FISH
Phoxinus cumberlandensis	T	05130102	P	2	KY	FISH
Phoxinus cumberlandensis	T	05130104	P	2	KY	FISH
Phoxinus tennesseensis	S	06010101	P	8	VA	FISH
Phoxinus tennesseensis	S	06010102	P	4	TN	FISH
Phoxinus tennesseensis	S	06010102	P	8	VA	FISH
Phoxinus tennesseensis	S	06010103	P	4	TN	FISH
Phoxinus tennesseensis	S	06020002	P	4	TN	FISH
Phoxinus tennesseensis	S	06020003	P	4	TN	FISH
Pteronotropis hubbsi	S	08080102	P	6	LA	FISH

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Pteronotropis hubbsi	S	11140107	P	9	AR/OK	FISH
Pteronotropis hubbsi	S	11140108	P	9	AR/OK	FISH
Pteronotropis hubbsi	S	11140109	P	9	AR/OK	FISH
Scaphirhynchus albus	E	08030207	P	7	MS	FISH
Scaphirynchus suttkusi	P	03150202	P	1	AL	FISH
Semotilus lumbee	S	03040104	P	11	NC	FISH
Typhlichthys subterraneus	S	05130101	P	2	KY	FISH
Typhlichthys subterraneus	S	11010004	P	10	AR	FISH
Macrocotyle hoffmasteri	S	05050003	P	8	WV	FLATWORM
Caecidotea holsingeri	S	05050003	P	8	WV	ISOPOD
Neofiber alleni	S	03070204	P	5	FL	MAMMAL
Neofiber alleni	S	03080101	P	5	FL	MAMMAL
Neofiber alleni	S	03080102	P	5	FL	MAMMAL
Neofiber alleni	S	03110201	P	5	FL	MAMMAL
Neofiber alleni	S	03110206	P	5	FL	MAMMAL
Neofiber alleni	S	03120001	P	5	FL	MAMMAL
Neofiber alleni	S	03120003	P	5	FL	MAMMAL
Neofiber alleni	S	03130011	P	5	FL	MAMMAL
Neofiber alleni	S	03130013	P	5	FL	MAMMAL
Sorex palustris punctulatus	S	02070001	P	8	VA	MAMMAL
Sorex palustris punctulatus	S	02080201	P	8	VA	MAMMAL
Sorex palustris punctulatus	S	06010202	P	11	NC	MAMMAL
Sorex palustris punctulatus	S	06020002	P	11	NC	MAMMAL
Trichechus manatus	E	03080101	P	5	FL	MAMMAL
Trichechus manatus	T	03120003	P	5	FL	MAMMAL
Trichechus manatus	T	03130011	P	5	FL	MAMMAL
Dannella provonshai	S	11110201	P	10	AR	MAYFLY
Homoeoneuria cahabensis	S	03150202	P	1	AL	MAYFLY
Homoeoneuria cahabensis	S	08060205	P	7	MS	MAYFLY
Leptophlebia johnsoni	S	05050001	P	8	VA	MAYFLY
Leptophlebia johnsoni	S	06010102	P	8	VA	MAYFLY
Alasmidonta atropurpurea	E	05130101	P	2	KY	MUSSEL
Alasmidonta raveneliana	E	06010105	X	11	NC	MUSSEL
Alasmidonta raveneliana	E	06010106	X	11	NC	MUSSEL
Alasmidonta raveneliana	E	06010108	P	4	TN	MUSSEL
Alasmidonta raveneliana	E	06010108	P	11	NC	MUSSEL
Alasmidonta raveneliana	E	06010202	P	11	NC	MUSSEL
Alasmidonta raveneliana	E	06010203	P	11	NC	MUSSEL
Alasmidonta varicosa	S	02070001	X	8	VA	MUSSEL
Alasmidonta varicosa	S	02070003	P	8	WV	MUSSEL
Alasmidonta varicosa	S	02070006	P	8	VA	MUSSEL

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Alasmidonta varicosa	S	02080201	X	8	VA	MUSSEL
Alasmidonta varicosa	S	03040104	P	11	NC	MUSSEL
Alasmidonta varicosa	S	03050101	P	11	NC	MUSSEL
Alasmidonta varicosa	S	03060102	P	3	GA	MUSSEL
Alasmidonta varicosa	S	03060102	P	12	SC	MUSSEL
Alasmidonta varicosa	S	03060103	P	12	SC	MUSSEL
Alasmidonta varicosa	S	03060107	P	12	SC	MUSSEL
Alasmidonta wrightiana	S	03120003	P	5	FL	MUSSEL
Alasmidonta wrightiana	S	03130011	P	5	FL	MUSSEL
Amblema neislerii	E	03130011	P	5	FL	MUSSEL
Amblema plicata perplicata	S	12020005	P	13	TX	MUSSEL
Anodontoides denigratus	S	05130101	P	2	KY	MUSSEL
Anodontoides radiatus	S	03150106	P	1	AL	MUSSEL
Anodontoides radiatus	S	03170007	P	7	MS	MUSSEL
Anodontoides radiatus	S	03170009	P	7	MS	MUSSEL
Anodontoides radiatus	S	08030201	P	7	MS	MUSSEL
Arcidens confragosus	S	08030201	P	7	MS	MUSSEL
Arcidens confragosus	S	08030207	P	7	MS	MUSSEL
Arcidens confragosus	S	12010004	P	13	TX	MUSSEL
Arcidens confragosus	S	12020002	P	13	TX	MUSSEL
Arcidens confragosus	S	12020005	X	13	TX	MUSSEL
Arcidens confragosus	S	12030106	X	13	TX	MUSSEL
Arcidens confragosus	S	12030202	X	13	TX	MUSSEL
Arkansia wheeleri	E	11140105	P	9	AR/OK	MUSSEL
Arkansia wheeleri	E	11140107	P	9	AR/OK	MUSSEL
Arkansia wheeleri	E	11140109	P	9	AR/OK	MUSSEL
Cumberlandia monodonta	S	05130101	P	2	KY	MUSSEL
Cumberlandia monodonta	S	06010205	P	8	VA	MUSSEL
Cyprogenia aberti	S	08040102	P	9	AR/OK	MUSSEL
Cyprogenia aberti	S	08040203	P	9	AR/OK	MUSSEL
Cyprogenia stegaria	E	05100101	X	2	KY	MUSSEL
Cyprogenia stegaria	E	05100204	X	2	KY	MUSSEL
Cyprogenia stegaria	E	05130103	X	2	KY	MUSSEL
Cyprogenia stegaria	E	06010205	P	8	VA	MUSSEL
Dromus dromas	E	05130101	P	2	KY	MUSSEL
Dromus dromas	E	06010101	P	8	VA	MUSSEL
Dromus dromas	E	06010205	P	8	VA	MUSSEL
Dromus dromas	E	06010206	P	8	VA	MUSSEL
Elliptio ahenea	S	03080102	P	5	FL	MUSSEL
Elliptio arctata	S	03150101	P	3	GA	MUSSEL
Elliptio arctata	S	03150110	P	1	AL	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Elliptio arctata	S	03160110	P	1	AL	MUSSEL
Elliptio arctata	S	03170004	P	7	MS	MUSSEL
Elliptio arctata	S	03170005	P	7	MS	MUSSEL
Elliptio arctata	S	03170007	P	7	MS	MUSSEL
Elliptio arctata	S	03170009	P	7	MS	MUSSEL
Elliptio arctata	S	03180001	P	7	MS	MUSSEL
Elliptio arctata	S	03180002	P	7	MS	MUSSEL
Elliptio lanceolata	S	02080203	P	8	VA	MUSSEL
Elliptio lanceolata	S	03010101	X	8	VA	MUSSEL
Elliptoideus sloantianus	T	03130011	P	5	FL	MUSSEL
Epioblasma brevidens	E	05130101	P	2	KY	MUSSEL
Epioblasma brevidens	E	05130102	P	2	KY	MUSSEL
Epioblasma capsaeformis	E	05130101	P	2	KY	MUSSEL
Epioblasma capsaeformis	E	05130102	P	2	KY	MUSSEL
Epioblasma capsaeformis	E	06010101	P	8	VA	MUSSEL
Epioblasma capsaeformis	E	06010105	X	11	NC	MUSSEL
Epioblasma capsaeformis	E	06010205	P	8	VA	MUSSEL
Epioblasma capsaeformis	E	06010206	X	8	VA	MUSSEL
Epioblasma f. florentina	E	05130101	P	2	KY	MUSSEL
Epioblasma f. florentina	E	06010204	X	4	TN	MUSSEL
Epioblasma f. florentina	E	06020002	X	4	TN	MUSSEL
Epioblasma f. walkeri	E	05130101	X	2	KY	MUSSEL
Epioblasma f. walkeri	E	06010102	P	8	VA	MUSSEL
Epioblasma f. walkeri	E	06010205	P	8	VA	MUSSEL
Epioblasma f. walkeri	E	06020002	P	4	TN	MUSSEL
Epioblasma metastriata	E	03150101	P	3	GA	MUSSEL
Epioblasma metastriata	E	03150101	P	4	TN	MUSSEL
Epioblasma metastriata	E	03150106	X	1	AL	MUSSEL
Epioblasma metastriata	E	03150202	X	1	AL	MUSSEL
Epioblasma metastriata	E	03160110	X	1	AL	MUSSEL
Epioblasma o. obliquata	E	05130101	P	2	KY	MUSSEL
Epioblasma othcaloogensis	E	03150101	P	3	GA	MUSSEL
Epioblasma othcaloogensis	E	03150102	P	3	GA	MUSSEL
Epioblasma othcaloogensis	E	03150106	X	1	AL	MUSSEL
Epioblasma othcaloogensis	E	03150202	X	1	AL	MUSSEL
Epioblasma t. gubernaculum	E	06010101	P	8	VA	MUSSEL
Epioblasma t. gubernaculum	E	06010205	P	8	VA	MUSSEL
Epioblasma t. rangiana	E	05100101	P	2	KY	MUSSEL
Epioblasma t. rangiana	E	05100201	X	2	KY	MUSSEL
Epioblasma t. torulosa	E	05100101	P	2	KY	MUSSEL
Epioblasma triquetra	S	05100101	P	2	KY	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Epioblasma triquetra	S	05100204	P	2	KY	MUSSEL
Epioblasma triquetra	S	05130101	P	2	KY	MUSSEL
Epioblasma triquetra	S	05130102	P	2	KY	MUSSEL
Epioblasma triquetra	S	06010101	P	8	VA	MUSSEL
Epioblasma triquetra	S	06010205	P	8	VA	MUSSEL
Epioblasma triquetra	S	06010206	P	8	VA	MUSSEL
Fusconaia askewi	S	12010004	P	13	TX	MUSSEL
Fusconaia askewi	S	12020002	P	13	TX	MUSSEL
Fusconaia askewi	S	12030202	P	13	TX	MUSSEL
Fusconaia barnesiana	S	06010101	P	8	VA	MUSSEL
Fusconaia barnesiana	S	06010102	P	8	VA	MUSSEL
Fusconaia barnesiana	S	06010202	P	11	NC	MUSSEL
Fusconaia barnesiana	S	06010205	P	8	VA	MUSSEL
Fusconaia barnesiana	S	06010206	P	8	VA	MUSSEL
Fusconaia cor	E	06010101	P	8	VA	MUSSEL
Fusconaia cor	E	06010205	P	8	VA	MUSSEL
Fusconaia cor	E	06010206	P	8	VA	MUSSEL
Fusconaia cuneolus	E	06010205	P	8	VA	MUSSEL
Fusconaia cuneolus	E	06010206	P	8	VA	MUSSEL
Fusconaia lananensis	S	12020005	P	13	TX	MUSSEL
Fusconaia lananensis	S	12040101	P	13	TX	MUSSEL
Fusconaia lananensis	S	12040103	P	13	TX	MUSSEL
Fusconaia masoni	S	02080201	P	8	VA	MUSSEL
Fusconaia masoni	S	03010101	X	8	VA	MUSSEL
Fusconaia masoni	S	03020106	P	11	NC	MUSSEL
Fusconaia masoni	S	03040104	P	11	NC	MUSSEL
Fusconaia subrotunda	S	05130101	P	2	KY	MUSSEL
Fusconaia subrotunda	S	05130102	P	2	KY	MUSSEL
Fusconaia succissa	S	03140103	P	1	AL	MUSSEL
Hemistena lata	E	05130101	P	2	KY	MUSSEL
Hemistena lata	E	06010205	P	8	VA	MUSSEL
Hemistena lata	E	06010206	P	8	VA	MUSSEL
Lampsilis abrupta	E	05130101	X	2	KY	MUSSEL
Lampsilis abrupta	E	11140109	P	9	AR/OK	MUSSEL
Lampsilis altilis	T	03150101	P	3	GA	MUSSEL
Lampsilis altilis	T	03150101	P	4	TN	MUSSEL
Lampsilis altilis	T	03150106	P	1	AL	MUSSEL
Lampsilis altilis	T	03150107	P	1	AL	MUSSEL
Lampsilis altilis	T	03150108	P	1	AL	MUSSEL
Lampsilis altilis	T	03150110	P	1	AL	MUSSEL
Lampsilis altilis	T	03150202	X	1	AL	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Lampsilis altilis	T	03160110	P	1	AL	MUSSEL
Lampsilis hydiana	S	11110201	P	10	AR	MUSSEL
Lampsilis hydiana	S	11110206	P	9	AR/OK	MUSSEL
Lampsilis hydiana	S	11140105	P	9	AR/OK	MUSSEL
Lampsilis hydiana	S	11140107	P	9	AR/OK	MUSSEL
Lampsilis hydiana	S	11140108	P	9	AR/OK	MUSSEL
Lampsilis hydiana	S	12020002	P	13	TX	MUSSEL
Lampsilis hydiana	S	12020005	P	13	TX	MUSSEL
Lampsilis hydiana	S	12030202	P	13	TX	MUSSEL
Lampsilis perovalis	T	03150202	X	1	AL	MUSSEL
Lampsilis perovalis	T	03160110	P	1	AL	MUSSEL
Lampsilis powelli	T	08040101	P	9	AR/OK	MUSSEL
Lampsilis powelli	T	08040203	P	9	AR/OK	MUSSEL
Lampsilis satura	S	12030202	P	13	TX	MUSSEL
Lampsilis subangulata	E	03120003	P	5	FL	MUSSEL
Lampsilis subangulata	E	03130011	P	5	FL	MUSSEL
Lasmigona decorata	E	03060103	P	12	SC	MUSSEL
Lasmigona decorata	E	03060107	P	12	SC	MUSSEL
Lasmigona holstonia	S	03150101	P	3	GA	MUSSEL
Lasmigona holstonia	S	03150101	P	4	TN	MUSSEL
Lasmigona holstonia	S	03150103	P	3	GA	MUSSEL
Lasmigona holstonia	S	03150105	P	1	AL	MUSSEL
Lasmigona holstonia	S	03150106	P	1	AL	MUSSEL
Lasmigona holstonia	S	06010101	P	8	VA	MUSSEL
Lasmigona holstonia	S	06010102	P	8	VA	MUSSEL
Lasmigona holstonia	S	06010105	P	11	NC	MUSSEL
Lasmigona holstonia	S	06010205	P	8	VA	MUSSEL
Lasmigona subviridis	S	02070003	P	8	WV	MUSSEL
Lasmigona subviridis	S	02070006	P	8	VA	MUSSEL
Lasmigona subviridis	S	02080203	P	8	VA	MUSSEL
Lasmigona subviridis	S	03040104	P	11	NC	MUSSEL
Lasmigona subviridis	S	05050003	P	8	WV	MUSSEL
Lemiox rimosus	E	06010205	P	8	VA	MUSSEL
Lemiox rimosus	E	06010206	P	8	VA	MUSSEL
Leptodea leptodon	P	08020203	X	10	AR	MUSSEL
Leptodea leptodon	P	11110201	X	10	AR	MUSSEL
Leptodea leptodon	P	11110206	P	9	AR/OK	MUSSEL
Leptodea leptodon	P	11140108	P	9	AR/OK	MUSSEL
Leptodea leptodon	P	11140109	P	9	AR/OK	MUSSEL
Lexingtonia dolabelloides	S	06010101	P	8	VA	MUSSEL
Lexingtonia dolabelloides	S	06010102	P	8	VA	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Lexingtonia dolabelloides	S	06010205	P	8	VA	MUSSEL
Lexingtonia dolabelloides	S	06010206	P	8	VA	MUSSEL
Lexingtonia dolabelloides	S	06020002	P	4	TN	MUSSEL
Margaritifera hembeli	T	08080102	P	6	LA	MUSSEL
Margaritifera hembeli	T	11140207	P	6	LA	MUSSEL
Medionidus acutissimus	T	03150101	P	3	GA	MUSSEL
Medionidus acutissimus	T	03150101	P	4	TN	MUSSEL
Medionidus acutissimus	T	03150106	X	1	AL	MUSSEL
Medionidus acutissimus	T	03150202	X	1	AL	MUSSEL
Medionidus acutissimus	T	03160110	P	1	AL	MUSSEL
Medionidus parvulus	E	03150101	P	3	GA	MUSSEL
Medionidus parvulus	E	03150101	P	4	TN	MUSSEL
Medionidus parvulus	E	03150106	X	1	AL	MUSSEL
Medionidus parvulus	E	03150202	X	1	AL	MUSSEL
Medionidus parvulus	E	03160110	P	1	AL	MUSSEL
Medionidus penicillatus	E	03120003	P	5	FL	MUSSEL
Medionidus simpsonianus	E	03120003	P	5	FL	MUSSEL
Megalonaias boykiana	S	03120003	P	5	FL	MUSSEL
Obovaria jacksoniana	S	03150202	P	1	AL	MUSSEL
Obovaria jacksoniana	S	08040206	P	6	LA	MUSSEL
Obovaria jacksoniana	S	08080204	P	6	LA	MUSSEL
Obovaria jacksoniana	S	11110206	P	9	AR/OK	MUSSEL
Obovaria jacksoniana	S	11140105	P	9	AR/OK	MUSSEL
Obovaria jacksoniana	S	11140107	P	9	AR/OK	MUSSEL
Obovaria jacksoniana	S	11140108	P	9	AR/OK	MUSSEL
Obovaria jacksoniana	S	11140207	P	6	LA	MUSSEL
Obovaria retusa	E	05130101	P	2	KY	MUSSEL
Obovaria subrotunda	S	05100202	P	2	KY	MUSSEL
Obovaria subrotunda	S	05100204	P	2	KY	MUSSEL
Pegias fabula	E	05130101	P	2	KY	MUSSEL
Pegias fabula	E	05130102	P	2	KY	MUSSEL
Pegias fabula	E	06010101	P	8	VA	MUSSEL
Pegias fabula	E	06010205	P	8	VA	MUSSEL
Pegius fabula	E	06010105	X	11	NC	MUSSEL
Pegius fabula	E	06010106	X	11	NC	MUSSEL
Pegius fabula	E	06010202	P	11	NC	MUSSEL
Plethobasus cicatricosus	E	05130101	X	2	KY	MUSSEL
Plethobasus cooperianus	E	05130101	X	2	KY	MUSSEL
Plethobasus cyphyus	S	05100101	P	2	KY	MUSSEL
Plethobasus cyphyus	S	06010205	P	8	VA	MUSSEL
Plethobasus cyphyus	S	06010206	P	8	VA	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Pleurobema beadleanum	S	03170004	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03170005	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03170007	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03170009	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03180001	P	7	MS	MUSSEL
Pleurobema beadleanum	S	03180002	P	7	MS	MUSSEL
Pleurobema clava	E	05100101	X	2	KY	MUSSEL
Pleurobema clava	E	05100201	X	2	KY	MUSSEL
Pleurobema clava	E	05130101	X	2	KY	MUSSEL
Pleurobema collina	E	02080201	P	8	VA	MUSSEL
Pleurobema collina	E	02080202	X	8	VA	MUSSEL
Pleurobema collina	E	02080203	P	8	VA	MUSSEL
Pleurobema cordatum	S	06010205	P	8	VA	MUSSEL
Pleurobema cordatum	S	11140107	P	9	AR/OK	MUSSEL
Pleurobema decisum	E	03150101	P	3	GA	MUSSEL
Pleurobema decisum	E	03150102	P	3	GA	MUSSEL
Pleurobema decisum	E	03150103	P	3	GA	MUSSEL
Pleurobema decisum	E	03150104	X	3	GA	MUSSEL
Pleurobema decisum	E	03150106	X	1	AL	MUSSEL
Pleurobema decisum	E	03150110	P	1	AL	MUSSEL
Pleurobema decisum	E	03150202	X	1	AL	MUSSEL
Pleurobema decisum	E	03160108	P	7	MS	MUSSEL
Pleurobema decisum	E	03160110	X	1	AL	MUSSEL
Pleurobema furvum	E	03160110	P	1	AL	MUSSEL
Pleurobema georgianum	E	03150101	P	3	GA	MUSSEL
Pleurobema georgianum	E	03150101	P	4	TN	MUSSEL
Pleurobema georgianum	E	03150106	P	1	AL	MUSSEL
Pleurobema oviforme	S	05130101	P	2	KY	MUSSEL
Pleurobema oviforme	S	05130102	P	2	KY	MUSSEL
Pleurobema oviforme	S	06010101	P	8	VA	MUSSEL
Pleurobema oviforme	S	06010102	P	8	VA	MUSSEL
Pleurobema oviforme	S	06010205	P	8	VA	MUSSEL
Pleurobema oviforme	S	06010206	P	8	VA	MUSSEL
Pleurobema oviforme	S	06020002	P	4	TN	MUSSEL
Pleurobema perovatum	E	03150101	P	3	GA	MUSSEL
Pleurobema perovatum	E	03150104	X	3	GA	MUSSEL
Pleurobema perovatum	E	03150106	X	1	AL	MUSSEL
Pleurobema perovatum	E	03150110	P	1	AL	MUSSEL
Pleurobema perovatum	E	03150202	X	1	AL	MUSSEL
Pleurobema perovatum	E	03160110	X	1	AL	MUSSEL
Pleurobema plenum	E	05100101	P	2	KY	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Pleurobema plenum	E	05130101	P	2	KY	MUSSEL
Pleurobema plenum	E	06010205	X	8	VA	MUSSEL
Pleurobema pyramidatum	S	08030207	P	7	MS	MUSSEL
Pleurobema pyriforme	S	03080101	P	5	FL	MUSSEL
Pleurobema pyriforme	E	03120003	P	5	FL	MUSSEL
Pleurobema pyriforme	E	03130013	P	5	FL	MUSSEL
Pleurobema riddelli	S	12010004	P	13	TX	MUSSEL
Pleurobema riddelli	S	12020005	P	13	TX	MUSSEL
Pleurobema riddelli	S	12030202	P	13	TX	MUSSEL
Potamilus amphichaenus	S	12010004	P	13	TX	MUSSEL
Potamilus amphichaenus	S	12020002	P	13	TX	MUSSEL
Potamilus amphichaenus	S	12030202	P	13	TX	MUSSEL
Ptychobranchus greeni	E	03150101	P	3	GA	MUSSEL
Ptychobranchus greeni	E	03150101	P	4	TN	MUSSEL
Ptychobranchus greeni	E	03150103	P	3	GA	MUSSEL
Ptychobranchus greeni	E	03150106	X	1	AL	MUSSEL
Ptychobranchus greeni	E	03150202	X	1	AL	MUSSEL
Ptychobranchus greeni	E	03160110	P	1	AL	MUSSEL
Ptychobranchus jonesi	S	03140103	P	1	AL	MUSSEL
Pyganodon gibbosa	S	03070103	P	3	GA	MUSSEL
Quadrula c. strigillata	E	06010101	X	8	VA	MUSSEL
Quadrula c. strigillata	E	06010102	X	8	VA	MUSSEL
Quadrula c. strigillata	E	06010205	P	8	VA	MUSSEL
Quadrula c. strigillata	E	06010206	P	8	VA	MUSSEL
Quadrula houstonensis	S	12040103	P	13	TX	MUSSEL
Quadrula metanevra	S	03150202	P	1	AL	MUSSEL
Quadrula metanevra	S	11140105	P	9	AR/OK	MUSSEL
Quadrula pustulosa mortoni	S	12020005	P	13	TX	MUSSEL
Quadrula rumphiana	S	03150103	P	3	GA	MUSSEL
Quadrula rumphiana	S	03150202	P	1	AL	MUSSEL
Quadrula sparsa	E	05130101	P	2	KY	MUSSEL
Quadrula sparsa	E	06010205	P	8	VA	MUSSEL
Quadrula sparsa	E	06010206	P	8	VA	MUSSEL
Simpsonaias ambigua	S	05100101	P	2	KY	MUSSEL
Simpsonaias ambigua	S	05100202	P	2	KY	MUSSEL
Simpsonaias ambigua	S	05100204	P	2	KY	MUSSEL
Strophitus connasaugaensis	S	03150101	P	3	GA	MUSSEL
Strophitus connasaugaensis	S	03150101	P	4	TN	MUSSEL
Strophitus connasaugaensis	S	03150103	P	3	GA	MUSSEL
Strophitus connasaugaensis	S	03150105	P	1	AL	MUSSEL
Strophitus connasaugaensis	S	03150106	P	1	AL	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Strophitus subvexus	S	03150110	P	1	AL	MUSSEL
Strophitus subvexus	S	03150202	P	1	AL	MUSSEL
Strophitus subvexus	S	03160104	P	7	MS	MUSSEL
Strophitus subvexus	S	03160108	P	7	MS	MUSSEL
Strophitus subvexus	S	03160110	P	1	AL	MUSSEL
Strophitus subvexus	S	03170004	P	7	MS	MUSSEL
Strophitus subvexus	S	03180001	P	7	MS	MUSSEL
Strophitus subvexus	S	03180002	P	7	MS	MUSSEL
Strophitus subvexus	S	08040206	P	6	LA	MUSSEL
Toxolasma lividus	S	05130101	P	2	KY	MUSSEL
Toxolasma lividus	S	05130102	P	2	KY	MUSSEL
Toxolasma lividus	S	06010101	P	8	VA	MUSSEL
Toxolasma lividus	S	06010105	X	11	NC	MUSSEL
Toxolasma lividus	S	06010205	P	8	VA	MUSSEL
Toxolasma pullus	S	03020106	P	11	NC	MUSSEL
Toxolasma pullus	S	03040104	P	11	NC	MUSSEL
Utterbackia peggyae	S	03120003	P	5	FL	MUSSEL
Villosa arkansasensis	S	11140105	P	9	AR/OK	MUSSEL
Villosa arkansasensis	S	11140107	P	9	AR/OK	MUSSEL
Villosa arkansasensis	S	11140108	P	9	AR/OK	MUSSEL
Villosa australis	S	03140103	P	1	AL	MUSSEL
Villosa choctawensis	S	03140103	P	1	AL	MUSSEL
Villosa nebulosa	S	03150101	P	3	GA	MUSSEL
Villosa nebulosa	S	03150101	P	4	TN	MUSSEL
Villosa nebulosa	S	03150103	P	3	GA	MUSSEL
Villosa nebulosa	S	03150105	P	1	AL	MUSSEL
Villosa nebulosa	S	03150106	P	1	AL	MUSSEL
Villosa nebulosa	S	03150107	P	1	AL	MUSSEL
Villosa nebulosa	S	03150110	P	1	AL	MUSSEL
Villosa nebulosa	S	03160110	P	1	AL	MUSSEL
Villosa perpurpurea	E	06010205	P	8	VA	MUSSEL
Villosa trabalis	E	05130101	P	2	KY	MUSSEL
Villosa trabalis	E	05130102	P	2	KY	MUSSEL
Villosa trabalis	E	06020002	P	4	TN	MUSSEL
Villosa v. umbrans	S	03150101	P	3	GA	MUSSEL
Villosa v. umbrans	S	03150101	P	4	TN	MUSSEL
Villosa v. umbrans	S	03150103	P	3	GA	MUSSEL
Villosa v. umbrans	S	03150105	P	3	AL	MUSSEL
Villosa v. umbrans	S	03150106	P	1	AL	MUSSEL
Villosa v. umbrans	S	03150108	P	1	AL	MUSSEL
Villosa vaughaniana	S	03040104	P	11	NC	MUSSEL

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Villosa villosa	S	03120003	P	5	FL	MUSSEL
Alligator mississippiensis	T	03020106	P	11	NC	REPTILE
Alligator mississippiensis	T	03020204	P	11	NC	REPTILE
Alligator mississippiensis	T	03070204	P	5	FL	REPTILE
Alligator mississippiensis	T	03080101	P	5	FL	REPTILE
Alligator mississippiensis	T	03080102	P	5	FL	REPTILE
Alligator mississippiensis	T	03110201	P	5	FL	REPTILE
Alligator mississippiensis	T	03110206	P	5	FL	REPTILE
Alligator mississippiensis	T	03120001	P	5	FL	REPTILE
Alligator mississippiensis	T	03120003	P	5	FL	REPTILE
Alligator mississippiensis	T	03130011	P	5	FL	REPTILE
Alligator mississippiensis	T	03130013	P	5	FL	REPTILE
Alligator mississippiensis	T	03140103	P	1	AL	REPTILE
Alligator mississippiensis	T	03140104	P	1	AL	REPTILE
Alligator mississippiensis	T	03140301	P	1	AL	REPTILE
Alligator mississippiensis	T	03140304	P	1	AL	REPTILE
Alligator mississippiensis	T	03150110	P	1	AL	REPTILE
Alligator mississippiensis	T	03160104	P	7	MS	REPTILE
Alligator mississippiensis	T	03160108	P	7	MS	REPTILE
Alligator mississippiensis	T	03170003	P	7	MS	REPTILE
Alligator mississippiensis	T	03170004	P	7	MS	REPTILE
Alligator mississippiensis	T	03170005	P	7	MS	REPTILE
Alligator mississippiensis	T	03170006	P	7	MS	REPTILE
Alligator mississippiensis	T	03170007	P	7	MS	REPTILE
Alligator mississippiensis	T	03170009	P	7	MS	REPTILE
Alligator mississippiensis	T	03180001	P	7	MS	REPTILE
Alligator mississippiensis	T	03180002	P	7	MS	REPTILE
Alligator mississippiensis	T	08010207	P	7	MS	REPTILE
Alligator mississippiensis	T	08010208	P	7	MS	REPTILE
Alligator mississippiensis	T	08010210	P	7	MS	REPTILE
Alligator mississippiensis	T	08020100	P	10	AR	REPTILE
Alligator mississippiensis	T	08020203	P	10	AR	REPTILE
Alligator mississippiensis	T	08020304	P	10	AR	REPTILE
Alligator mississippiensis	T	08030201	P	7	MS	REPTILE
Alligator mississippiensis	T	08030202	P	7	MS	REPTILE
Alligator mississippiensis	T	08030203	P	7	MS	REPTILE
Alligator mississippiensis	T	08030204	P	7	MS	REPTILE
Alligator mississippiensis	T	08030205	P	7	MS	REPTILE
Alligator mississippiensis	T	08030207	P	7	MS	REPTILE
Alligator mississippiensis	T	08060203	P	7	MS	REPTILE
Alligator mississippiensis	T	08060205	P	7	MS	REPTILE

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Alligator mississippiensis	T	08060206	P	7	MS	REPTILE
Alligator mississippiensis	T	08070202	P	7	MS	REPTILE
Alligator mississippiensis	T	11140106	P	9	AR/OK	REPTILE
Alligator mississippiensis	T	12010004	P	13	TX	REPTILE
Alligator mississippiensis	T	12020002	P	13	TX	REPTILE
Alligator mississippiensis	T	12020005	P	13	TX	REPTILE
Alligator mississippiensis	T	12030202	P	13	TX	REPTILE
Alligator mississippiensis	T	12040101	P	13	TX	REPTILE
Alligator mississippiensis	T	12040103	P	13	TX	REPTILE
Clemmys muhlenbergii	S	06010102	P	4	TN	REPTILE
Clemmys muhlenbergii	S	06010105	P	11	NC	REPTILE
Clemmys muhlenbergii	S	06010202	P	11	NC	REPTILE
Clemmys muhlenbergii	S	06020002	P	3	GA	REPTILE
Graptemys barbouri	S	03130011	P	5	FL	REPTILE
Graptemys ernsti	S	03140103	P	1	AL	REPTILE
Graptemys ernsti	S	03140304	P	1	AL	REPTILE
Graptemys flavimaculata	T	03170003	P	7	MS	REPTILE
Graptemys flavimaculata	T	03170005	P	7	MS	REPTILE
Graptemys flavimaculata	T	03170006	P	7	MS	REPTILE
Pseudemys c. suwanniensis	S	03080101	P	5	FL	REPTILE
Pseudemys c. suwanniensis	S	03120003	P	5	FL	REPTILE
Sternotherus depressus	T	03160109	P	1	AL	REPTILE
Sternotherus depressus	T	03160110	P	1	AL	REPTILE
Aphaostracon pyncus	S	03080101	P	5	FL	SNAIL
Elimia crenatella	T	03150106	P	1	AL	SNAIL
Fontigens tartarea	S	05050003	P	8	WV	SNAIL
Fontigens turritella	S	05050003	P	8	WV	SNAIL
Io fluvialis	S	06010101	P	8	VA	SNAIL
Io fluvialis	S	06010102	P	4	TN	SNAIL
Io fluvialis	S	06010108	P	4	TN	SNAIL
Io fluvialis	S	06010205	P	8	VA	SNAIL
Leptoxis crassa	S	06010204	P	4	TN	SNAIL
Leptoxis praerosa	S	05130101	P	2	KY	SNAIL
Leptoxis taeniata	T	03150106	P	1	AL	SNAIL
Leptoxis taeniata	T	03150202	X	1	AL	SNAIL
Lioplax cyclostomaformis	E	03150105	X	3	GA	SNAIL
Lioplax cyclostomaformis	E	03150106	X	1	AL	SNAIL
Tulotoma magnifica	E	03150106	P	1	AL	SNAIL
Tulotoma magnifica	E	03150107	P	1	AL	SNAIL
Allocapnia jeanae	S	11010001	P	10	AR	STONEFLY
Allocapnia ozarkana	S	11010001	P	10	AR	STONEFLY

Species Name	Status	Subbasin	Presence	Forest	State	Species Type
Leuctra szczytkai	S	08080102	P	6	LA	STONEFLY
Leuctra szczytkai	S	11140207	P	6	LA	STONEFLY
Megaleuctra williamsae	S	05050001	P	8	VA	STONEFLY
Megaleuctra williamsae	S	06010102	P	8	VA	STONEFLY
Taeniopteryx nelsoni	S	05050001	P	8	VA	STONEFLY
Taeniopteryx nelsoni	S	06010102	P	8	VA	STONEFLY