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VIA FACSIMILE: (703) 440-1551

Dr. John Lyon
Eastern States Office Director
United States Department of the Interior
Bureau of Land Management
Eastern States
7450 Boston Boulevard
Springfield, Virginia 22153

RE: Protest of the Bureau of Land Management's Notice of Competitive Oil and Gas Lease Sale Concerning Parcels in Alabama National Forests

Dear Dr. Lyon:

The Southern Environmental Law Center hereby submits this protest letter on behalf of Wild South and the Natural Resources Defense Council ("NRDC") in accordance with 43 C.F.R. § 3120.1-3.[1] Wild South and NRDC protest the Bureau of Land Management's ("BLM") planned offering of 36 parcels containing 43,038.30 acres of Federal lands in Alabama at the June 14, 2012 oil and gas lease sale.[2] The parcels are publicly owned lands of the Alabama

[1] All materials cited herein, the majority of which are readily available online, are incorporated in full herein by reference. The protesting parties have included two publications that may not be readily available online as Attachments A and B to this protest letter.

[2] The contested leases are: ES-001-06/12 ALES 057412 ACQ, ES-002-06/12 ALES 057413 PD, ES-003-06/12 ALES 057414 PD, ES-004-06/12 ALES 057415 ACQ, ES-005-06/12 ALES 057416 ACQ, ES-006-06/12 ALES 057417 ACQ, ES-007-06/12 ALES 057418 ACQ, ES-008-06/12 ALES 057419 ACQ, ES-009-06/12 ALES 057420 ACQ, ES-010-06/12 ALES 057421 ACQ, ES-011-06/12 ALES 057422 ACQ, ES-012-06/12 ALES 057423 ACQ, ES-013-06/12 ALES 057424 ACQ, ES-014-06/12 ALES 057425 ACQ, ES-015-06/12 ALES 057426 ACQ, ES-016-06/12 ALES 057427 ACQ, ES-017-06/12 ALES 057428 ACQ, ES-018-06/12 ALES 057429 ACQ, ES-019-06/12 ALES 057430 ACQ, ES-020-06/12 ALES 057431 ACQ, ES-021-06/12 ALES 057432 ACQ, ES-022-06/12 ALES 057433 ACQ, ES-023-06/12 ALES 057434 ACQ, ES-024-06/12 ALES 057435 ACQ, ES-025-06/12 ALES 057436 ACQ, ES-026-06/12 ALES 057437 ACQ, ES-027-06/12 ALES 057438 ACQ, ES-028-06/12 ALES 057439 ACQ, ES-029-06/12 ALES 057440 ACQ, ES-030-06/12 ALES 057441 ACQ, ES-031-06/12 ALES 057442 ACQ, ES-032-

National Forests, and will hereinafter be referred to as "the parcels" or "the leases." Almost all these parcels (about 42, 965 acres) are located on the Talladega National Forest, including roughly 28,000 acres on the Talladega and Shoal Creek Divisions and a little over 15,000 acres on the Oakmulgee Division. One 73.31-acre parcel is on the Conecuh National Forest.

Should BLM proceed with the planned sale of leases to over 43,000 acres of public lands, it will commit significant substantive and procedural violations of federal law. For the reasons stated below, the parcels should be withdrawn from this lease sale by BLM.

PROTESTING PARTIES AND THEIR INTERESTS

Wild South is a nonprofit conservation organization founded in Alabama and currently based in North Carolina, with offices in Moulton, Alabama, and Asheville, North Carolina. Wild South's staff and members regularly and repeatedly recreate in, seek solitude and otherwise enjoy the National Forests in Alabama, including parcels involved in this proposed lease sale. Wild South's staff and members regularly hike and enjoy the trails in these national forests. These recreational resources, their solitude, their wildlife (including listed endangered and threatened species) and their beauty are all things of great value to the staff and members of Wild South, who enjoy these areas regularly and have for many years (for some of them, all their lives).

Wild South also has a vested and long-standing interest in the protection and enjoyment of rare wildlife species in the National Forests in Alabama. Based upon information and belief, many endangered and/or threatened terrestrial and aquatic species potentially reside, or are just downstream or upstream from, the proposed lease sale areas. These habitats are protected under the Endangered Species Act. Terrestrial species, such as the Red-Cockaded Woodpecker, and aquatic species, such as mussels, are likely to be adversely impacted by hydraulic fracturing. As stated by the Final Environmental Impact Statement for the Revised Land and Resource Plan for the National Forests in Alabama (Jan. 2004) (hereinafter the "2004 FEIS") for these forests:

> "The National Forests in Alabama serve as important habitat reserves for listed aquatic species and biodiversity in general. Geographically, the National Forests encompass less than 3% of the State's land mass but support over 60% of the listed freshwater species.
>
> "There are 25 aquatic federally listed endangered or threatened species associated with the National Forests in Alabama, representing half of all listed species. Listed aquatic species include 14 endangered and 11 threatened species.

06/12 ALES 057443 ACQ, ES-033-06/12 ALES 057444 ACQ, ES-034-06/12 ALES 057445 ACQ, ES-035-06/12 ALES 057446 ACQ, and ES-036-06/12 ALES 057447 ACQ.

> Mollusks compose nearly 75% of the aquatic listed species with 12 mussels and 6 snails. Additionally, there are six listed fishes and one turtle. According to the species viability assessment, over 50% of the listed aquatic species (14) are rated as being at a high level of risk for loss of population viability. Among those with the highest viability risks include the dark pigtoe, Cumberlandian combshell, orangenacre mucket, pygmy sculpin, and flattened musk turtle."

2004 FEIS at 3-207.

Wild South's staff and members have also invested decades of work with the Forest Service in developing forest-scale restoration plans for each of these forests. Increased exploration and development of oil and gas in these areas, especially when done without the required ESA consultation and NEPA analysis, will damage, if not destroy, the long-term investments being made in restoration of the native forest ecosystems in these forests.

Natural Resources Defense Council ("NRDC") is a non-profit environmental membership organization with more than 565,000 members throughout the United States. Over 6,000 NRDC members and activists reside in Alabama. NRDC members use and enjoy national forest lands in Alabama, including the specific lands at issue in this protest. NRDC members use these public lands for a variety of purposes, including: recreation, solitude, scientific study, and conservation of natural resources. NRDC has had a longstanding and active interest in the protection of the nation's public lands. For many years, NRDC has worked with both the Bureau of Land Management and the Forest Service to enhance public participation in government decision making and to protect important lands, wildlife, and resources.

The Southern Environmental Law Center is a regional non-profit organization working to conserve the environment and health of the Southeast, including natural resources on public lands in Alabama. Headquartered in Charlottesville, Virginia, SELC has nine offices throughout our six-state region of Virginia, Tennessee, North Carolina, South Carolina, Georgia and Alabama, including an office in Birmingham, Alabama.

STATEMENT OF REASONS

In January of 2004, the U.S. Forest Service issued its Revised Land and Resource Management Plan for the National Forests in Alabama (hereinafter "Forest Plan" or "Plan,") which sets management standards and activities in the National Forests of the state for the next 10-15 years. One outcome of the Plan was that the Forest Service identified lands that would be administratively available for mineral development, including oil and gas activities, and consented to the lease of those lands by BLM. *See* Forest Plan at 1-2.

Were BLM to offer these leases for sale, the agency would violate the Federal Onshore Oil and Gas Leasing Reform Act, 30 U.S.C. § 181 *et seq.*; the National Environmental Policy Act, 42 U.S.C. §§ 4321 *et seq.* ("NEPA"); the Endangered Species Act, 16 U.S.C. §§ 1531 *et seq.* ("ESA"); and the National Forest Management Act, 16 U.S.C. §§ 1600 *et seq.* ("NFMA") because BLM and the Forest Service have, *inter alia*: (1) Failed to provide adequate information in violation of the Federal Onshore Oil and Gas Leasing Reform Act; (2) Failed to supplement its environmental analyses in violation of NEPA; (3) Failed to consider a reasonable range of alternatives in violation of NEPA; (4) Made an irretrievable commitment of resources in violation of NEPA; (5) Failed to properly consult and/or to reinitiate consultation in violation of the ESA; and (6) Violated NFMA by failing to conform the lease sale to the Forest Plan. In addition, the agencies should delay the sale of the parcels until new rules, regulations and studies governing hydrofracking have been issued.

Accordingly, BLM should withdraw the parcels from the lease sale until the agencies have fully complied with federal law.

I. BLM and the Forest Service Have Failed to Provide Adequate Information to the Public Regarding This Lease Sale in Violation of the Federal Onshore Oil and Gas Leasing Reform Act.

BLM and the Forest Service have not provided sufficient information to the public regarding the parcels involved in this lease sale. The Competitive Lease Sale Notice fails to provide the public with an understanding of where the Alabama parcels are actually located. For example, there were no maps provided to the public of the Alabama parcels, and the description of lands offered in the lease sale notice is not sufficiently clear to inform the general public about the actual location of the parcels, given the difficulties understanding and interpreting the descriptions given by township, range and section. While the Forest Service did provide maps of the parcels in the Talladega and Shoal Creek Divisions to the protesting parties, the agency did not provide maps of the Oakmulgee Division. In addition, based upon information and belief, *none* of this information has been made readily available to the public as a whole. As a result, it is extremely difficult for concerned members of the public to understand the impacts of oil and gas leasing and development here and how it would affect them, and to enable them exercise their right to file a well-informed, meaningful protest founded on information about potential impacts, such as the proximity of the parcels to natural gas shale plays, to endangered and threatened species and their critical habitat, to sources of drinking water and other important aquatic resources, to important wildlife habitat, or to trails and recreation areas. In addition, it is difficult to determine whether certain parcels are located in management prescription areas that would necessitate additional stipulations and lease terms in order to conform to the Forest Plan's management direction.

This failure to map and adequately describe the location of the parcels constitutes a potential violation of the Federal Onshore Oil and Gas Leasing Reform Act, which requires that at least 45 days before offering lands for lease, the Secretary shall provide notice of the proposed action. *See* 30 U.S.C. § 226(f). "Such notice shall include the terms or modified lease terms and maps or a narrative description of the affected lands. Where the inclusion of maps in such notice is not practicable, maps of the affected lands shall be made available to the public for review. Such maps shall show the location of all lands to be leased, and of all leases already issued in the general area." *Id.* BLM must provide maps of the parcels to the public, along with maps of already issued lease parcels, in order to comply with this Act.

II. BLM and the Forest Service Will Violate NEPA If These Parcels are Included in the Lease Sale.

a. BLM and the Forest Service Must Supplement the 2004 FEIS to Assess the Impacts of New Information.

To comply with NEPA, an Environmental Impact Statement (EIS) must provide a "full and fair discussion of significant environmental impacts and shall inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. The agency must take a "hard look" at the environmental consequences of its proposed action. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989); *Strycker's Bay Neighborhood Council v. Karlen*, 444 U.S. 223, 231 (1980).

BLM's decision to offer the parcels for sale and the Forest Service's consent to lease these parcels in the Forest Plan are major federal actions requiring the preparation of an EIS. NEPA makes clear that an EIS must be prepared for any "major Federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C); 40 C.F.R. § 1502.3. The Forest Plan made two decisions related to federal oil and gas leasing: (1) the decision to make available lands for future leasing under 36 C.F.R. § 228.102(d); and (2) the decision to consent to BLM's lease of those available lands, under 36 C.F.R. § 228.102(e). *See* 2004 FEIS at 3-61.

The Forest Plan, completed in 2004, was appealed in part due to its consent to leasing of available lands without a site-specific analysis being conducted as part of its EIS. This fact in and of itself renders the 2004 FEIS inadequate. Regardless of its original adequacy, however, as this protest letter will discuss, since 2004 the situation has changed significantly and significant new information has emerged that make the environmental analyses in the FEIS insufficient to support a decision to lease the parcels for oil and gas development.

Where significant new circumstances or information arise *after* the completion of an EIS, NEPA requires the preparation of a supplemental EIS. *See* 40 C.F.R. § 1502.9(c)(1). An agency must prepare a supplemental EIS ("SEIS") when "[t]here are significant new

circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." *Id.* § 1502.9(c)(1)(ii). "The standard for determining when an SEIS is required is essentially the same as the standard for determining when an EIS is required." *Sierra Club v. U.S. Army Corps of Eng'rs*, 295 F.3d 1209, 1215-16 (11th Cir. 2002) (quotation marks and citation omitted). A supplemental EIS must be prepared if there remains major federal action to occur, and if the new information is sufficient to show that the remaining action will affect the quality of the human environment in a significant manner or to a significant extent not already considered. *Sierra Club v. Bosworth*, 465 F. Supp. 2d 931, 937 (N.D. Cal. 2006) (citations and quotations omitted) (enjoining four timber projects while the Forest Service prepares a supplemental EIS to address new information). The agency must "take a 'hard look' at the new information to assess whether supplementation might be necessary." *Norton v. S. Utah Wilderness Alliance*, 542 U.S. 55, 72-73 (2004). Whether new circumstances are significant depends on a number of factors, including "[t]he degree to which the proposed action affects public health or safety," "[u]nique characteristics of the geographic area," such as proximity to historic or cultural resources, park lands, wild and scenic rivers, or ecologically critical areas, "[t]he degree to which the effects on the quality of the human environment are likely to be highly controversial," "[t]he degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks," "[t]he degree to which the action . . . may cause loss or destruction" of significant resources, "[t]he degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act," and "[w]hether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment." 40 C.F.R. § 1508.27(b). These factors are implicated here, as is discussed further below, warranting supplementation under NEPA.

As discussed below, the emergence of commercially economical shale gas drilling is exactly the sort of new circumstance that requires supplementation under NEPA. The Forest Service did not consider impacts from potentially hundreds of producing wells in Alabama's National Forests, and did not assess impacts from unconventional oil and gas development and high volume hydraulic fracturing. The agencies must correct these flaws by conducting a supplemental NEPA analysis.

i. <u>An Overview of Environmental Impacts from Oil and Gas Drilling Analyzed in the 2004 FEIS.</u>

BLM and the Forest Service rely on the NEPA analysis contained in the 2004 FEIS in approving oil and gas leases on the parcels. While the 2004 FEIS provided a brief discussion of the potential impacts of oil and gas development as they were understood in 2004, this analysis did not and likely could not have anticipated the significant changes in the oil and natural gas industry that have emerged in the ensuing years. Therefore, BLM's and the Forest Service's reliance on these documents is misplaced and cannot comply with NEPA.

In the ten years prior to 2004, there had been no wells drilled on either the Bankhead or the Talladega Forests, and only 11 wells (about one per year) on the Conecuh Forest. 2004 FEIS at 3-66. At the time that the Forest Plan was enacted, the only active leases for oil and gas activities were 46 leases in the Conecuh National Forest; there were no active oil and gas leases in the Bankhead, Talladega or Tuskegee National Forests. *See id.* at 3-57. Of those oil and gas leases in the Conecuh National Forest, only 3 leases were commercially viable, containing a total of 4 productive wells. *Id.* at 3-64. In the 2004 FEIS, based in part on historical low interest in drilling in these areas, the Forest Service projected similarly low mineral development in Alabama's National Forests over the next ten years. Talladega National Forest, where the majority of the parcels are located, was rated by the 2004 FEIS as "Low Potential," which is described as:

> "The geologic, geochemical, and geophysical characteristics do not indicate a favorable environment for the accumulation of oil and/or gas resources. Specific indications that one or more of the following may not be present: source rock, thermal maturation, or reservoir strata possessing permeability and/or porosity, and traps."

2004 FEIS at 3-66.

The Forest Service predicted that, over the next ten years, only one oil/gas well would be drilled in Bankhead Forest, one in the Talladega Forest, and 10 (one per year) in the Conecuh Forest. *Id.* It was based on this assumption that the Forest Service conducted its NEPA analysis, which was aimed at disclosing environmental impacts "associated with *this projected activity*." *Id.* (emphasis added).

The 2004 FEIS analyzed what was at the time the "standard approach" to drilling, which was to "drill vertical holes from a single drill pad down to the target formation" into known producing zones, which "lie relatively shallow." *Id.* at 3-67. These drilling operations typically involve the clearing of one to two acres for the well pad; a reserve pit about five feet deep that is lined with bentonite clay; and constructed roads that average 1/3 of a mile. *Id.* In total, a drilling operation would be expected to disturb three acres in total – 1 for the access road and 2 for the drill pad. *Id.* at 3-68. Wells are typically drilled in 7 to 30 days with a rotary drilling rig that uses mud and water, which is normally pumped from a well drilled on the site. *Id.* at 3-67. Once a well begins to produce, drilling pads are reduced to 10,000 square feet, and the oil or gas is either stored in tanks on site or connected via a pipeline and transported off site. *Id.* at 3-68.

The Forest Service predicted that only 20 percent of the total wells drilled on the Alabama National Forests would produce commercial amounts of oil or gas. Based on that prediction, of the 12 wells projected to be drilled from 2004-2014, only 2 to 3 wells were predicted to produce oil or gas. *Id.* This would lead to a total annual disturbance of about six acres throughout the entire Alabama National Forests. *Id.* And on the Talladega National

Forest, the FEIS estimated that, during the entire 10-15 year lifespan of this forest plan,[3] only three to six acres (one well every 10 years) of the Forest would be disturbed.

Based on these minimal predicted development activities, the FEIS briefly described potential environmental impacts on air quality, water quality, soil disturbance, vegetation, listed species, and recreational activities. *See* 2004 FEIS at 3-69 to 3-70. In assessing the cumulative effects of the 12 wells estimated to be drilled over the next ten years, the 2004 FEIS predicted the following impacts: 1) an average surface disturbance over the term of the Forest Plan of .5 acres per year; 2) "negligible" impacts to air quality, water quality, aquatic habitat, wildlife, threatened and endangered species, soils, and visuals; and 3) some positive economic impacts resulting from drilling activities for local economies. *Id.* at 3-74.

ii. The 2004 FEIS Fails to Analyze the Impacts of Unconventional Oil and Gas Extraction and High Volume Hydraulic Fracturing on National Forest Land.

This cursory analysis must now be supplemented in light of changed circumstances. One particularly significant change since the 2004 EIS is the development and widespread increase in the use of unconventional oil and gas extraction techniques, especially those using hydraulic fracturing, also known as *hydrofracking*. Hydraulic fracturing, which was not widely used in the United States until around 2005, involves the extraction of natural gas from shale formations deep below the surface, and is one of the fastest growing trends in American on-shore domestic oil and gas production.[4] Large scale production of shale gas has become widespread in the past several years due to these advances in horizontal drilling and hydraulic fracturing, which have significantly improved the industry's ability to produce natural gas in shale basins around the country, including the Barnett, Hayesville, Fayetteville, Woodford, Utica, and Marcellus shale formations.[5] In 2009, 63 billion cubic meters of gas were produced from deep shale formations. In 2012, this production doubled to 137.8 billion cubic meters, and the U.S. Energy Information

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[3] The National Forest Management Act provides that forest plans shall be revised at least every 15 years or anytime the Secretary finds conditions in a unit have significantly changed. 16 U.S.C. § 1604(f)(5).

[4] Ground Water Protection Council and ALL Consulting, *Modern Shale Gas Development in the United States: A Primer*. Prepared for U.S. Dep't of Energy, Office of Fossil Energy and National Energy Technology Laboratory (Apr. 2009), *available at* http://www.rrc.state.tx.us/doeshale/Shale_Gas_Primer_2009.pdf. *See also* Energy Information Administration, Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays (July 2011), *available at* http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf; Secretary of Energy Advisory Board Shale Gas Production Subcommittee, 90-Day Report (Aug. 18, 2011), *available at* http://www.shalegas.energy.gov/resources/081811_90_day_report_final.pdf (noting that "it was only around 2008 that the significance of shale gas began to be widely recognized").

[5] Robert B. Jackson *et al.*, Duke University, Research and Policy Recommendations for Hydraulic Fracturing and Shale-Gas Extraction, Center on Global Change (2011), *available at* http://www.nicholas.duke.edu/cgc/HydraulicFracturingWhitepaper2011.pdf.

Administration projects that by 2035, production will increase to 340 billion cubic meters per year.[6]

This process of natural gas drilling differs significantly from the conventional oil and gas drilling that was analyzed in the 2004 FEIS. Hydrofracking typically involves millions of gallons of fluid that are pumped into a well at high pressure to create fractures in the shale rock.[7] This pressure exceeds the rock strength, and the fluid enlarges fractures in the rock, allowing gas to flow from the fractures and up into the wellbore.[8] Wells may extend to depths greater than 8000 feet, and horizontal drilling may extend several thousands of feet away from the location of the drill pad on the surface.[9]

Due to the fact that production from this natural gas shale was not in common use in 2004, the potential for high volume hydrofracking was not considered in the Forest Plan or the 2004 EIS. As a result, the 2004 EIS fails to analyze the impacts of this type of drilling activity, including potentially significant impacts on surface- and ground-water quality, aquatic habitat, air quality, wildlife habitat, listed species, recreation, and scenic values.

The 2004 FEIS also must be supplemented to address the State of Alabama's regulation of hydrofracking or lack thereof. Alabama regulates hydrofracking through its general permitting process, but those rules apply only to hydrofracking in coal bed methane formations, not in shale formations.[10] The agencies should consider how potentially lax regulations on the state level may impact the demand for and oversight of drilling on the National Forests.

Not only was the 2004 FEIS unable to consider the effects of new shale gas drilling using horizontal drilling and high-volume hydrofracking, but the FEIS also assumed there would be low interest in oil and gas development on the Talladega National Forest. This already has been proven incorrect by BLM's lease, in 2007, of almost 75,700 acres on the Oakmulgee Division of the Talladega National Forest. Now if this proposed lease sale goes forward, a total of about 118,738 acres of the Talladega would be under lease – 30% of the Talladega National Forest. Based on the FEIS statement that historically wells in Alabama are drilled on 40-640 acre spacing (which may or may not still be accurate with the advent of horizontal drilling and hydrofracking), complete development of the leased parcels could amount to several hundred to

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[6] U.S. Energy Information Administration. Annual Energy Outlook 2011 with Projections to 2035 (Dec. 2010), *available at* http://www.eia.doe.gov/oiaf/aeo/electricity.html.

[7] Jackson *et al.*, *supra* at note 5, at 1.

[8] U.S. Envtl. Prot. Agency, Office of Research and Development, *Hydraulic Fracturing Research Study* (June 2010), *available at* http://www.epa.gov/safewater/uic/pdfs/hfresearchstudyfs.pdf.

[9] *Id.*

[10] *See* Hannah Wiseman, *Untested waters: the rise of hydraulic fracturing in oil and gas production and the need to revisit regulation*, 20 Fordham Envtl. L. Rev. 115, 143-44 (2009). In 2007, Alabama exempted coal bed fracking from regulation under its underground injection control program, but also provided regulatory requirements that must be met before a coal bed fracking operation can obtain a permit under the state's general permitting regime. *See* In Re: Order No. 2007-133, Docket No. 1-31-07-12, State Oil and Gas Board of Alabama (Sept. 7, 2007). Notably, these regulations only apply to coal bed fracking, not to shale operations – there are no similar requirements governing shale. *See* Ala. Admin. Code r. 400-3-8-.03.

almost three thousand wells, exponentially exceeding the estimate of one well per decade on the Talladega National Forest upon which the FEIS and plan were based. The FEIS must be supplemented so that the effects of the new, greatly increased level of potential oil and gas development can be analyzed and disclosed, and so that the Forest Service can reconsider the Forest Plan's decision in that light.

Many of the parcels on the Talladega National Forest were included in a prior planned oil and gas lease sale in 2009. When those parcels were protested by Wild South, BLM "deferred" them "for further review and consideration." *See* BLM, Eastern States, Information Notice re Competitive Lease Sale scheduled for Dec. 3, 2009 (Nov. 24, 2009). Yet, to the knowledge of the protesting parties, no such further review and consideration ever occurred, at least not in documents provided for public notice and comment. Such further review and consideration is still warranted and necessary.

1. IMPACTS OF FRACKING ON WATER RESOURCES

Hydrofracking entails the use of large quantities of water. Estimates vary depending on the size and depth of the well, but two to four million gallons of water per well is an often-used figure, and water use can be as high as five million gallons or more.[11] In addition, wells are often "fracked" multiple times in order to maximize the resources extracted. The vast amount of water needed to drill these wells must come from somewhere, likely either from the streams and rivers of the National Forests or from local groundwater resources. Water withdrawals in other parts of the country for hydrofracking have had significant effects on lakes, streams, rivers and reservoirs, impacting aquatic life and local residents.[12] The lowering of water levels can also impact water quality, depleting aquifers and causing chemical changes in the water, affecting solubility and mobility; stimulating bacterial growth; and lowering surface water resources, causing changes in flow depth, velocity, and temperature and reducing the dilution effect on contaminants.[13] The 2004 FEIS fails to analyze the local area-specific impacts of such water withdrawals on the National Forests or on the nearby communities that rely on these forests as drinking water sources, making it unclear how large volume water withdrawals may impact this region.

These huge volumes of water are mixed with large amounts of chemicals and sand and then forced under high pressure down a well in order to blow out underground seams and

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[11] *See* U.S. Envtl. Prot. Agency, Office of Research and Development, *Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*, pp. 19 (Feb. 7, 2011), *available at* http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/HFStudyPlanDraft_SAB_020711-08.pdf. *See also* 2011 Draft Environmental Impact Statement for the Revised Land and Resource Management Plan, George Washington National Forest (Apr. 2011) at 3-311, *available at* http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5297825.pdf.

[12] Donald Gilliland, The Patriot-News, *SRBC suspends water withdrawal permits for drilling due to low stream flows* (July 19, 2011), *available at* http://www.pennlive.com/midstate/index.ssf/2011/07/srbc_suspends_water_withdrawal.html.

[13] *Id.* at 21.

increase the volume of gas extracted. The volume of chemicals can differ, but for a well that uses 3 million gallons of fracturing fluids, there will potentially be up to 60,000 gallons of chemicals used.[14] These chemicals are typically stored in tanks on-site and blended with water and proppants prior to injection.[15] Unfortunately, due to a loophole in the federal Safe Drinking Water Act, the exact chemicals, amounts, and combinations are not required to be disclosed, despite reports that many of these chemicals are harmful and potentially cancer-causing. For example, the EPA has found that chronic toxicity has been associated with some identified "fracking" chemicals, such as ethylene glycol, glutaraldehyde, and n,n-dimethyl formamide.[16]

After the fracturing event, the pressure is decreased and the direction of fluid flow is reversed, allowing the fracturing fluid and naturally occurring substances to return to the surface.[17] These returning fluids, known as *flowback* or *process* wastewater, come back highly contaminated with heavy metals, carcinogens, and naturally occurring radioactive materials.[18] These have been known to include brine, mercury, lead, arsenic, radium, uranium, and volatile and semi-volatile organic compounds.[19]

This flowback water, which comprise as much as 60-80 percent of the fracturing fluid injected into the well, can be contaminated with tens of thousands of pounds of chemicals, salt, and sand, posing difficulties for disposal.[20] Initially, flowback fluids can amount to as much as 100,000 gallons per day for several days, which is generally stored on-site in storage tanks and waste impoundment pits prior to treatment or disposal.[21] The lease sale stipulations do not appear to regulate the storage of these fluids. One method of disposal is to discharge water into surface waters after treatment at a wastewater treatment facility. However, flowback water can pose challenges for treatment facilities that are generally unable to remove radioactive and other harmful materials found deep underground, as well as large amounts of sodium, chloride and bromide.[22] As an alternative, flowback water is sometimes disposed through land application,

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[14] *See* Drinking Water Study Draft Plan, *supra* at note 11, at 24.
[15] *Id.*
[16] *Id.* at 25.
[17] *Id.* at 35.
[18] For example, the West Virginia Department of Environmental Protection found arsenic, lead and hexavalent chromium in wastewaters. *See* Letter from West Virginia Department of Environmental Protection to William Goodwin, Superintendent, Clarksburg Sanitary Board (July 23, 2009). New York State's Department of Environmental Conservation has reported levels of radium 226 in flowback water from the Marcellus Shale in amounts over 250 times the limit for safe drinking water. *See* N.Y. Dep't of Envtl. Conservation, Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program at p. 13 (2009), *available at* ftp://ftp.dec.state.ny.us/dmn/download/OGdSGEISFull.pdf. The known carcinogen benzene has also been found in flowback waters from Pennsylvania and West Virginia at average concentrations nearly 100 times the maximum acceptable contaminant levels. *Id.* at 5-104.
[19] *See* Drinking Water Draft Plan, *supra* at note 11, at 30.
[20] *See Hydraulic Fracturing Research Study*, *supra* at note 8. *See also* George Washington DEIS, *supra* at note 11, at 3-336.
[21] *See* Drinking Water Study Draft Plan, *supra* at note 11, at 36.
[22] *See* Ian Urbina, N.Y. Times, *Regulation Lax As Gas Wells' Tainted Water Hits Rivers* (Feb. 26, 2011), at A1 ("Yet sewage treatment plant operators say they are far less capable of removing radioactive contaminants than most other toxic substances. Indeed, most of these facilities cannot remove enough of the radioactive material to meet

which involves spraying of the wastewater onto the forest floor. This method has been known to kill trees and foliage in the area, and deposit high levels of chloride, calcium and sodium in the soil.[23] Lastly, flowback water may be returned underground using a permitted underground injection well.[24]

It is unclear what the potential impacts would be to Alabama's National Forests from releases of fracturing fluids on water resources through accidental spills, land application, surface water discharges and groundwater contamination, or whether such releases could violate state and federal water quality standards. The 2004 FEIS does not assess the ability of local wastewater treatment facilities to treat flowback water or analyze land application's impacts on the parcels. Nor do the lease stipulations require disclosure of chemicals, limit land application, or speak to whether flowback water can be discharged into surface waters of the National Forests or injected into underground wells. Concerningly, several of the parcels are located adjacent to or in the watershed of streams that fall under the State of Alabama's special water use designations, which subjects them to heightened water quality standards. This includes a Public Water Supply designation in Terrapin Creek; Fish and Wildlife designations in Cane Creek, Cheaha Creek, Choccolocco Creek, Shoal Creek and Terrapin Creek; and Swimming designations in Cheaha Creek and Shoal Creek. *See* 2004 FEIS at 3-28 – 3-29. Further, the Cahaba River and Hatchet Creek are designated as Outstanding Alabama Waters. The 2004 FEIS must be supplemented to assess hydrofracking's impact on these resources.

Those fracturing fluids that remain (or are later injected) underground have the potential to impact groundwater resources. For example, there have been numerous reports from homeowners of contamination of drinking water wells in areas of extensive shale gas drilling.[25] These fluids also have the potential to migrate into aquifers, as appears to be the case in Pavilion, Wyoming, where EPA has made a preliminary determination that hydraulic fracturing fluids

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federal drinking-water standards before discharging the wastewater into rivers, sometimes just miles upstream from drinking-water intake plants.") It is unclear whether local wastewater treatment facilities in the vicinity of Alabama's National Forests have the capacity to treat flowback waters, since this potential impact was not analyzed in the 2004 FEIS.

[23] *See* Adams *et al.*, U.S.D.A., *Effects of Development of a Natural Gas Well and Associated Pipeline on the Natural and Scientific Resources of the Fernow Experimental Forest* (June 2010), *available at* http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs76.pdf. *See also* Nicholas Kusnetz, ProPublica, *Anatomy of a Gas Well: What Happened When a Well Was Drilled in a National Forest* (Feb. 4, 2011), *available at* http://www.propublica.org/article/anatomy-of-a-gas-well-what-happened-when-a-well-was-drilled-in-a-national-f.

[24] *See* Hydraulic Fracturing Study, *supra* at note 8. A new study performed by scientists at the U.S. Geological Survey concluded that the increased rate of earthquakes in the mid-continental U.S. is almost certainly manmade, and potentially is linked to oil and gas extraction, particularly to deep waste disposal injection wells. *See* W.L. Ellsworth, US Geological Survey, *et al.*, *Abstract: Are Seismicity Rate Changes in the Midcontinent Natural or Manmade?*, to be presented at Seismological Society of America 2012 Annual Meeting, *available at* http://www.seismosoc.org/meetings/2012/app/#12-137 (April 2012).

[25] *See* Jackson *et al.*, *supra* at note 5, at 2.

have contaminated groundwater.[26] Contamination of groundwater may also originate from spills or leaks of fracturing fluids at the surface.

Gas may also migrate up through fractures in the overlying rock layers into groundwater. This shale gas is typically comprised of over 90 percent methane.[27] This form of methane contamination of drinking water wells is another clear and well documented potential risk of hydrofracking, as demonstrated by a recent Duke University study. The study found that methane concentrations were on average 17 times higher in drinking water wells located near natural gas drilling and hydrofracking sites in Pennsylvania and New York than in drinking water wells not located within 1 km of a gas well.[28] The average concentration in gas areas was high enough to be a potential explosion hazard. This migration can occur through corroded well casings, failures in the integrity of cement surrounding the casing, or even potentially through direct movement of methane or flowback water upwards from underground following hydraulic fracturing.[29] State environmental agencies also have reported incidents of drinking water contamination resulting from methane leaks from fracked gas wells.[30] The 2004 FEIS must be supplemented to include an analysis of the impacts on nearby drinking water resources, including possible contamination of aquifers, private drinking wells, groundwater and surface waters, from such drilling practices.

The re-evaluation of oil and gas development's impacts on aquatic resources is particularly critical due to the important National Forest resources that stand to be harmed by these activities. Although the National Forests encompass less than 3% of Alabama's land, over 40% of the state's freshwater aquatic species are represented therein. *See* 2004 FEIS at 3-167. In addition, compared to other National Forests, Alabama's forests rank first in the nation for diversity of mollusks, fish, and turtles, and second in diversity of crayfish and amphibians. *Id.* Among the National Forests of Alabama, the areas where parcels are located also appear to be areas of extremely high species diversity. For example, the Oakmulgee Division of the

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[26] Natural Resources Defense Council, *Comments on Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program* (Dec. 31, 2009) (submitted to the New York State DEC); *see also* U.S. Envtl. Prot. Agency, Office of Research and Development, *Draft Investigation of Ground Water Contamination near Pavilion, Wyoming* (2011), *available at* www.epa.gov/region8/superfund/wy/EPA_ReportOnPavilion_Dec-8-2011.pdf.

[27] *See* Jackson *et al.*, *supra* at note 5, at 2.

[28] Stephen G. Osborn, *et al.*, *Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing*, 108 PNAS 8172 (2011), *available at* http://www.nicholas.duke.edu/cgc/pnas2011.pdf.

[29] Pennsylvania State College of Agricultural Sciences Cooperative Extension, *Water Facts 28: Gas Well Drilling and Your Private Water Supply* at 2 (Mar. 2010), *available at* http://www.eesi.psu.edu/news_events/EarthTalks/2009Spring/materials2009spr/gasdrilling.pdf.

[30] For example, the Pennsylvania DEP has brought a series of enforcement actions against Cabot Oil & Gas for drinking water well contamination. *See* Abrahm Lustgarten, ProPublica, *Cabot Oil & Gas's Marcellus Drilling to Slow AfterPA Environment Officials Order Wells Closed* (Apr. 16, 2010), *available at* http://www.propublica.org/article/cabotoil-and-gas-ordered-to-shut-down-problem-wells-and-pay-massive-fine-a. *See also* Ohio Dept. of Natural Resources, Report on the Investigation of the Natural Gas Invasion of Aquifers in Bainbridge Township of Geauga County, Ohio (2008), *available at* http://s3.amazonaws.com/propublica/assets/natural_gas/ohio_methane_report_080901.pdf.

Talladega National Forest ranks first for aquatic biodiversity, and the Talladega Division of the Talladega National Forest ranks second. *Id.* In addition, exceptional watersheds for aquatic diversity and high numbers of listed species include the Cahaba, Lower Conecuh, Middle Choccolocco, Upper Choccolocco, and Five Runs. *Id.* The 2004 FEIS also notes that 52 aquatic species may be at high risk due to habitat impairment within the watersheds partially on the Talladega National Forest, potentially warranting that forest's designation as the highest aquatic conservation priority in Alabama. 2004 FEIS at 3-176.

Based upon information and belief, leasing many of the proposed parcels is likely to harm these important aquatic resources. For example, in the Talladega Division of the Talladega National Forest, 2,500 to 3,000 acres of proposed parcels, located in Township 14S, Range 11E, flow into the Cane and Muscadine Creeks of the Tallapoosa River watershed, and the remaining parcels flow into the Coosa River watershed. These two watersheds, the Tallapoosa River and the Coosa River, are among fifteen watersheds that contain the highest number of endemic aquatic species of all Alabama's National Forests, and the presence of sensitive and threatened and endangered species gives these watersheds a high overall vulnerability rating. *See* Forest Plan at 4-17. On the Oakmulgee Division, most if not all of the approximately 15,000 acres to be leased are in the watershed of the renowned Cahaba River. Many of these parcels are in the watersheds of the Cahaba tributaries, the Oakmulgee and Little Oakmulgee Creeks. The Oakmulgee Creek supports at least one federally listed species, the ovate clubshell.[31]

In addition, some parcels located in Township 15S, Range 9E, Section 12 are adjacent to Whitesides Mill Lake, also known as the Sam Hamner Reservoir. Although as of 2010 no water was being taken from the Reservoir, it is managed for water supply by the City of Anniston and is included in the City's Source Water Protection Plan and Water Quality Report.[32] Oil and gas production on those parcels, which are directly located on the shoreline of the lake, could have potentially significant impacts on the quality and quantity of drinking water available for Anniston and other municipalities that rely on this water source, such as Fort McClellan, Anniston Army Depot, parts of Oxford, Blue Mountain, Jacksonville, the Calhoun County Water and Fire Protection Authority, Hobson City, and the City of Weaver. Anniston's water supply is a source of drinking water for over 66,000 people.

In particular, it appears that many of these parcels are in the Choccolocco Creek watershed, especially in the watershed of its tributary Cheaha Creek, as well as some in the

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[31] Stuart W. McGregor, Geological Survey of Alabama, Water Investigations Program, and Jeffrey T. Garner, Alabama Dept. of Conservation and Natural Resources, Div. of Wildlife and Freshwater Fisheries, *Results of Qualitative Sampling for Protected Mussel Species at Selected Stations in the Cahaba River System, Alabama*, Open-File Report 0524, at 10 (2005), *available at* www.gsa.state.al.us/gsa/eco/pdf/OFR_0524.pdf.

[32] *See* Anniston Water Works & Sewer Board website, describing the Reservoir as one of the area's "most outstanding surface water reservoirs," *available at* http://www.awwsb.org/Default.asp?ID=2&pg=About+Us; *see also* Anniston Water Works and Sewer Board, *Water Quality Report for Period Ending December 2010* at 4 (2010), *available at* http://www.awwsb.org/Sites/Anniston_Water_Works/Documents/Main/2010%20Water%20Quality%20Report.pdf.

watershed of its tributary Shoal Creek. Several important aquatic species are found in Choccolocco Creek, including the blue shiner (listed as threatened and a Conservation Target Species of SAFC/TNC,) the holiday darter (endemic and a Conservation Target Species,) the Coosa darter (endemic,) the coldwater darter (endemic, a Conservation Target Species, and considered to be critically imperiled by The Nature Conservancy,) the Coosa shiner (endemic,) the bronze darter (endemic,) the greensaddle crayfish (endemic,) the fine-lined pocketbook (listed as threatened, endemic, and a Conservation Target Species,) the Tennessee heelsplitter (candidate for listing,) the Alabama moccasinshell (listed as threatened,) the Southern pigtoe (a Conservation Target Species considered critically imperiled by TNC, which has now been listed) and the Coosa creekshell (endemic).[33] According to a 1999 report by the Southern Appalachian Forest Coalition and the Pacific Rivers Council, "of the small streams within the Coosa drainage, Choccolocco Creek is probably the most significant in terms of species diversity and presence of imperiled species."[34] That report identified the Choccolocco Creek watershed as one of 15 Priority Aquatic Diversity Areas in the entire Southern Appalachian region. There are 6 miles of bank length of the Choccolocco Creek within Talladega National Forest, and 120 square miles of National Forest land within its watershed. *Id.* at 14. Based on this, the report finds that "[s]ystems lands on the Talladega NF should receive particular attention." *Id.* at 16.

The report also identified the Shoal Creek watershed (a Choccolocco tributary) as one of 22 smaller Critical Refugia for aquatic diversity on national forest lands in the Southern Appalachians, as well as the best example of a small warmwater stream in the entire Mobile Bay/Coosa drainage.[35] Shoal Creek holds three of the four imperiled mussel species and four critically imperiled snail species known from the Alabama portion of the Coosa system, and there is potential for other candidate species to be present there as well. *Id.* at 21. Indeed, the 1999 report notes that "virtually all the upper Coosa tributary systems in Alabama ... deserve attention as conservation priorities." *Id.* at 11.

Over 5,000 acres of the parcels in Township 14S, Range 11E feed the south fork watershed of Terrapin Creek, which also is considered a critical aquatic refuge for some fish and mussel species.

The 2004 FEIS did not examine the full lifecycle of the high volume hydrofracking process, from the impact on water sources at the outset to the potential contamination from "fracking" fluids used to extract natural gas to the proper treatment and disposal of these fluids at the end of the process. In fact, the potential for high-volume hydrofracking is nowhere mentioned in the 2004 FEIS. Without supplementing the 2004 FEIS, the permitting of high volume hydrofracking by BLM violates NEPA.

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[33] William O. McLarney, The Southern Appalachian Forest Coalition and Pacific Rivers Council, *Protection of Aquatic Biodiversity in the Southern Appalachian National Forests and their Watersheds* at 16, 7-9, included with this protest letter for ease of reference as Attachment A.
[34] *Id.*
[35] *Id.* at 21.

2. SURFACE IMPACTS OF FRACKING

During site preparation for a shale well, an area must be cleared to provide space for one or more wellheads; pits for holding water, used drilling fluids, and other materials; and space for trucks and other large equipment. The average size of a single high-volume hydrofracking operation is significantly larger than that of a conventional drill pad. The 2004 FEIS estimated that one to two acres per well would be cleared for the drill pad. *See* 2004 FEIS at 3-67. In contrast, in the Marcellus Shale gas play, an average 3.1 acres is cleared for the drill pad, another 5.7 acres is cleared for associated infrastructure (roads, pipelines, water impoundments, etc.), and another 21.2 acres is disturbed due to indirect forest impacts.[36] This directly destroys and indirectly degrades forests and forest habitat, and this level of ground disturbance can increase sedimentation in streams, such as those discussed above, adversely affecting water quality.

Similarly, truck traffic associated with horizontal natural gas wells is significantly heavier than traffic associated with conventional drilling operations. For example, the National Park Service estimates that in Marcellus Shale production areas, between 300 and 1,300 truck trips would occur per well.[37] Other documents have estimated that between 2,920 and 4,445 truck trips are necessary for a three well multi-well pad.[38] Narrow dirt roads may need to be widened or paved to accommodate this high volume of traffic, increasing surface impacts and stormwater runoff. Additionally, the increase in the number of truck trips required for each well also increases the risk of chemical transportation accidents.[39]

Additionally, many horizontal hydrofracking operations use open storage pits to hold brine and flowback. These pits can have impacts on bird and bat species, which can mistake the pits for bodies of water.[40] These pits can also impact the environment from leaks and spills. For example, in Ohio, a fracturing flowback storage pit was cut with a track hoe in 2010, causing more than 1.5 million gallons of fluid to spill into the environment.[41]

The 2004 FEIS also failed to address the potential impacts of solids disposal. The total volume of drill cuttings from drilling a horizontal well may be one-third greater than for the conventional drilling well.[42] This may necessitate the use of a larger reserve pit, and increases the amount of heavy metals and naturally occurring radioactive metals on the site.

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[36] Neal Johnson *et al.*, The Nature Conservancy, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind* (Nov. 15, 2010) at 10, *available at* http://www.nature.org/media/pa/tnc_energy_analysis.pdf.

[37] *See* Drinking Water Draft Plan, *supra* at note 11, at 55.

[38] *See* George Washington DEIS, *supra* at note 11, at 3-338.

[39] *See* Drinking Water Draft Plan, *supra* at note 11, at 14.

[40] *See* U.S. Fish and Wildlife Service, Region 6, Envtl. Contaminants Program, *Reserve Pit Management: Risks to Migratory Birds*, at i (2009), *available at* http://westernenergyalliance.org/wp-content/uploads/2009/09/Reserve-Pits.pdf.

[41] Ohio Dep't of Natural Resources, Notice of Violation No. 1278508985 (June 21, 2010).

[42] *See* N.Y. D.E.C. Draft Supplemental GEIS, *supra* at note 18, at 6-63.

Prior to offering the parcels for lease, BLM and the Forest Service must supplement their NEPA analysis to consider the potential effects from all these surface impacts.

These surface impacts can cause severe harm to forest resources that have not been adequately considered. For example, several of the proposed parcels appear to be located in the Forest Plan's Longleaf Restoration management prescription area, such as those in Township 21S, Range 6E, and Township 14S, Range 11E. This prescription area calls for "natural appearing" landscape. *See* Forest Plan at 3-39. The leasing of these parcels could be detrimental to Longleaf restoration efforts due to, for example, the conversion of longleaf forest or potential longleaf restoration sites to gas development facilities, the fragmentation of longleaf or potential longleaf forests by such facilities, and harmful land application practices or spills of chemicals from trucks or storage areas. In addition, the oil and gas development permitted by this lease sale appears to be at odds with the efforts of the Forest Service and numerous federal, state and nongovernmental partners to promote range-wide restoration of Longleaf Pine through the America's Longleaf Restoration Initiative.[43] The Range-Wide Conservation Plan for the Longleaf Pine designates the Talladega area, anchored by the Talladega National Forest, as a Significant Landscape for longleaf restoration, which is "intended to focus conservation efforts to establish or maintain functional landscapes with adequate connectivity for large-area dependent species and complex matrices of natural communities." *Id.* at 21, 34. The Plan notes that both Significant Landscapes and smaller Significant Sites are "important to the conservation of the range of longleaf pine communities and species diversity." *Id.* at 21. The Talladega area is particularly important to longleaf restoration efforts since it is the only representative of the Southeastern Interior LLP Woodland Ecosystem Type, giving it unique value even among the other Significant Landscape areas. *Id.* at 30. Despite evidence that the Forest Service is heavily invested in the restoration of longleaf pine, for example, with its leadership in America's Longleaf Restoration Initiative, there is no evidence that the agencies have considered the effects or consistency of leasing and drilling in the Alabama National Forests on the longleaf pine.

3. IMPACTS OF FRACKING ON AIR QUALITY

As part of its 2004 NEPA analysis, the Forest Service also did not consider the air quality impacts of high volume hydrofracking, which are more severe than those related to conventional drilling. The EPA has reported that hydraulic fracturing of one well leads to emissions of 23 tons of volatile organic compounds (VOCs) – roughly 200 times more emissions than if the well was not hydraulically fractured.[44] VOCs are known to be highly toxic and also to contribute to

[43] *See* America's Longleaf, *Range-Wide Conservation Plan for Longleaf Pine* (2009), *available at* http://americaslongleaf.org/media/86/conservation_plan.pdf.

[44] U.S. Envtl. Prot. Agency, Proposed Rule, *Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews*, 76 Fed. Reg. 52,757 (Aug. 23, 2011).

ozone. In addition, fugitive methane emissions from shale have been shown to be at least 30 percent more than those from conventional gas operations.[45]

In addition to the NEPA requirements to consider impacts on air quality, the agency must consider whether these potential emissions threaten the affected areas' compliance with the Clean Air Act. This is especially important for any Class 1 areas, such as the Sipsey Wilderness in the Bankhead National Forest in Alabama; Class 1 areas can only receive a small amount of pollution under the Act. *See* 2004 Forest Plan at 2-17.

BLM and the Forest Service must consider the potential for increases in air pollution connected to high volume hydrofracking prior to the issuance of leases for the Alabama parcels.

4. IMPACTS OF FRACKING ON WILDLIFE

Oil and gas drilling operations can impact wildlife by killing and harming animals that cannot leave habitats affected by construction of access roads, clearing and leveling or drill pad sites, or construction or pipelines and facilities. *See* 2004 FEIS at 3-69 (noting that "[v]egetation occupying the areas to be disturbed for road and pad will be uprooted and destroyed" and the "noise, lights, and activity of men and machines could disturb wildlife in the surrounding environs.") Wildlife will certainly be displaced by these activities in greater numbers than had originally be predicted in the Forest Plan and its FEIS, due to the increased footprint of high volume drilling operations compared to conventional drilling and the greater interest in oil and gas development than projected. In addition, there are potential adverse impacts from the creation of forest edge from construction activities, with research demonstrating that measurable impacts often extend at least 330 feet into the forest area adjacent to the edge.[46] The 2004 FEIS must be supplemented to consider increased impacts to wildlife and their habitat from increased development should high volume hydrofracking occur on the parcels.

5. IMPACTS OF FRACKING ON RECREATION AND SCENERY

The Alabama National Forests in particular hold many varied opportunities for recreation, including the Bartrum and Pinhoti National Recreation Trails, the Talladega Scenic Drive, and the Cheaha and Dugger Mountain Wilderness Areas. *See* Forest Plan at 2-55. One of the Forest Plan's goals is to provide "a spectrum of high quality, nature-based recreation settings and opportunities that reflect the unique and exceptional resources of the Forest." *Id.* Another goal is to "[p]rotect and enhance the scenic and aesthetic values of the National Forest lands

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[45] Robert W. Howarth, *et al.*, Climactic Change, *Methane and the greenhouse has footprint of natural gas from shale formations: A letter*, at Abstract (2011), *available at* http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf; *see also* Robert W. Howarth, *et al.*, Climactic Change, *Venting and leaking of methane from shale gas development: Response to Cathles et al.* (Feb 2012), *available at* http://www.eeb.cornell.edu/howarth/Howarthetal2012_Final.pdf.

[46] *See* Johnson, *supra* at note 36.

through application of the Scenery Management System and assigned Scenic Integrity Objectives, which are supposed to govern all new projects in the forests. *Id.* at 2-60.

Unconventional oil and gas development using hydrofracking has the potential to result in significant impacts to these resources, impairing the Forest Service's ability to meet its recreational and scenic management prescription goals. By its very nature, oil and gas development is incompatible with the desired experience in semi-primitive recreation settings. The 2004 FEIS provided a minimal discussion of impacts from conventional drilling, noting that oil and gas drilling may cause "some adverse impact on recreational activities such as bird watching or hunting." *Id.* at 3-69. However, it notes that these impacts will be "short in duration and very localized in effect," and most visual impacts will be "subtle and easily screened from most viewsheds." *Id.* at 3-69, 3-70. These impacts are likely to be much more significant should high volume hydrofracking be permitted on the parcels, as discussed above. The 2004 FEIS should be supplemented to analyze the expected extent of potential impacts on trails and trail users from increased road and pipeline construction and the sights and sounds of round-the-clock, large-scale hydrofracking operations on and near recreational and scenic areas.

Concerningly, some parcels appear to be within or adjacent to areas that serve important recreation and scenic functions within the National Forests. For example, several parcels in Sections 25 and 35 of Township 18S, Range 7E are adjacent to the Cheaha Wilderness Area, which, according to *Alabama Mountain Treasures*, provides "spectacular wilderness views" and is "vital to the integrity of the Wilderness."[47] The Cheaha Wilderness Area is near Cheaha Mountain, which is one of the most popular recreation sites in Alabama. This Area's management prescription in the Forest Plan dictates that it is to be characterized by "unfragmented habitat" and should exhibit "little evidence of visitor use" and "minor evidence of primitive travelways." *See* Forest Plan at 4-20. It is unclear how the drilling of oil and gas wells adjacent to this wilderness area is compatible with the management prescriptions set for this important recreational area. Moreover, some of the parcels proposed for lease appear to extend slightly into the Wilderness area. We hope this appearance is not actually the case, but the BLM and Forest Service must ensure that no leases include Wilderness land.

Similarly, several sections (located in Township 14S, Range 11E as well as Township 18S, Range 7E) appear to be located in an area that has been designated Dispersed Recreation Prescription[48] under the Forest Plan. *See id.* at 3-32. Under this prescription, the area is supposed to sustain "a relatively high number of recreationists" and to "showcase high quality scenery maintained through low intensity, planned vegetation management activities." *Id.*

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[47] Lamar Marshall and Ken Wills, The Wilderness Society, *Alabama's Mountain Treasures: The Unprotected Wildlands of the Bankhead and Talladega National Forests* at 27 (2003). Portions of this source are included with this protest letter for ease of reference as Attachment B.

[48] Most of the Oakmulgee District is allocated to forest plan prescriptions for Dispersed Recreation, Longleaf Pine Restoration, and Red-Cockaded Woodpecker habitat, so the impacts to those prescriptions and their resources discussed here likely apply to many of the Oakmulgee parcels as well.

Wildlife viewing is "an important component" of recreation in this area. *Id.* The parcels in Township 14S, Range 11E also fall within the *Alabama Mountain Treasures*' proposed Shoal Valley Scenic Area, which is "heavily used for recreation."[49]

The parcels in Township 18S, Range 7E are of particular concern, as these are located within the Dispersed Recreation prescription adjacent to the Cheaha Wilderness Area. Proposed lease parcels here contain Chinnabee Lake and various campsites and trails, including the Chinnabee Silent Trail, which was built in the early 1970s by members of a Boy Scout troop who were students at the Alabama Institute for the Deaf and Blind.[50] These parcels also are located within the proposed Cheaha Creek Scenic Area identified in *Alabama Mountain Treasures*. The proposed Cheaha Creek Scenic Area "includes some of the best waterfalls in the Talladega Mountain range" and "contains fabulous scenic views and some of the best recreational opportunities within the national forest."[51] Proposed lease parcels contain or are very near Cheaha Falls. The lease parcels in this area would cover most of the National Forest land in the Cheaha Creek watershed.

In addition, many of these parcels in the Cheaha Creek area are within the viewshed of the Talladega Scenic Byway, which is within the Forest Plan's Scenic Byway Corridor management prescription 7.A. Among other standards, Scenic Byway Corridors have a High scenic integrity objective. The Forest Plan states that any oil and gas leases "will be issued with a Controlled Surface Use stipulation." Forest Plan at 3-25. Further, the Forest Plan notes that "[m]ineral material authorizations with conditions to protect the area may be permitted." *Id.* The Plan does not specify what these conditions would be, or how stipulations would be sufficient to ensure that the scenery-related goals of the Plan will be achieved. Moreover, the Controlled Surface Use stipulation printed in the lease sale advertisement does not cover all of the Scenic Byway prescription 7.A area, since that stipulation only covers sections 14 and 25, while 7.A is located in sections 35 and 36 as well. This CSU stipulation also does not specify what the constraints would be to ensure compliance with the Forest Plan standards for the Scenic Byway.

The proposed parcels located in Township 21S, Range 6E (and perhaps other parcels as well) fall within the Pinhoti Trail viewshed, which is known for its "very scenic waterfalls" and "superb views,"[52] contain the Bulls Gap trailhead to the Pinhoti Trail, and are also within the *Alabama Mountain Treasures*' proposed Rebecca Mountain Wilderness, known as "the last great mountain of the Talladega chain."[53] Similar to the Scenic Byway discussed above, the Pinhoti National Receration Trail is protected by Forest Plan standards which designate a "trail corridor

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[49] Marshall and Wills, *supra* at note 47, at 20.
[50] Russell Helms, *60 Hikes within 60 Miles of Birmingham* (2003) *available at* www.trails.com/trailguide.aspx?trailid=HGD149-008.
[51] Marshall and Wills, *supra* at note 47, at 30.
[52] *Id.* at 18.
[53] *Id.* at 32.

protection zone" of 100' on each side of the trail and set a High scenic integrity objective for the foreground of the trails (views from the trail to about ½ mile). Forest Plan at 2-57 and App. B-28. There appear to be no stipulations attached to the lease sale to ensure compliance with the trail corridor protection zone and the High scenic integrity objective.

The parcels in Township 15S, Range 9E, Section 13, 18 and 24, south of Whitesides Mill Lake/Hamner Reservoir, fall within the proposed Horseshoe Bend Scenic Area, which contains a particularly scenic portion of Shoal Creek surrounded by old growth hardwood and longleaf pine forest which supported, and may still support, a red-cockaded woodpecker colony.[54]

Finally, on the Oakmulgee District, the parcels in Township 21N, Range 8E, Section 23 border the Cahaba River, a state-designated Outstanding Alabama Water. This section of the Cahaba River is eligible for federal designation as a Scenic River under the Wild and Scenic Rivers Act and the plan placed it in management prescription 2.C, Eligible Wild and Scenic Rivers. Forest Plan at 3-12 and App. D-3. In eligible Scenic River corridors, the Plan permits leasing with a Controlled Surface Use (CSU) stipulation, so long as the High scenic integrity objective is met. *Id.* The stipulations attached to the proposed lease sale, however, do not track the Forest Plan, as they reference only eligible Wild River segments, thus creating confusion regarding their application to the eligible Cahaba Scenic River. Moreover, the FEIS did not consider the effects of gas drilling and hydrofracking on the Cahaba River, even if drilling is directional without surface occupancy. We believe that oil and gas leasing and development on what is apparently the only National Forest parcel on the entire Cahaba River is not appropriate. Further, most parcels on the Oakmulgee Division appear to be located within the Forest Plan's management prescriptions for Red-Cockaded Woodpecker sub-HMA (Habitat Management Area) (Prescription 8.D.1) and Restoration of Longleaf Pine Forests (Prescription 9.D). Several parcels along the creeks also appear to be located within prescription areas for Maintenance and Restoration of Upland and Bottomland Hardwoods (Prescription 9.G). It is unclear how the Plan's objectives for the woodpecker and for restoration of these forest types can be met if these areas are leased and drilled, as discussed further below.

Nowhere do the agencies assess the impacts of potential high volume hydrofracking operations on the use and enjoyment of these recreational and scenic areas.

iii. The 2004 FEIS Must Be Supplemented to Adequately Assess the Current Reasonable Potential for Drilling in Alabama's National Forests.

In the face of the new information that has arisen since the 2004 FEIS, further analysis is now required under NEPA to determine the reasonable potential for drilling on the parcels. The Interstate Oil and Gas Compact Commission estimates that hydraulic fracturing is now used on

[54] Marshall and Wills, *supra* at note 47, at 21.

90 percent of domestic oil and gas wells.[55] Add to that the recent advances in shale and other unconventional gas recovery using high-volume horizontal hydrofracking, which is estimated to be 2-3 times more productive than conventional vertical wells. *Id.* The result is the likelihood of greater increases in the demand for and productivity of leases in areas where industry has typically not shown significant interest or success.

The Forest Plan analyzed the areas of the Alabama National Forests with mineral potential using a "Reasonable Foreseeable Development Scenario," ("RFD") which has been developed by BLM geologists. *See* 2004 FEIS at 3-62. This study attempts to predict the potential for oil and gas development in the area over the next ten years based on anticipated development and interest during that time, and predicts the associated environmental effects of this anticipated development. *See id.* at 3-62 -3-65. The RFD is typically based on "subsurface geology, past development history, current activity, anticipated future demand with consideration of other significant factors, such as economics, technology, physical limitations on access, existing or anticipated infrastructure, and transportation." *Id.* at 3-65. As discussed above, it was based on this RFD that the Forest Service estimated that over the next ten years, one oil/gas well would be drilled in Bankhead Forest, one on the Talladega Forest, and 10 (one per year) on the Conecuh Forest. *Id.* at 3-66.

It is highly likely that these projections are now gross underestimates due to the new advances in the oil and gas industry. In fact, there is evidence that these developments in technology have already impacted oil and gas drilling in Alabama. Shale formations in Alabama can be found in the Black Warrior Basin and the Appalachian Thrust Belt, and include the Middle Cambrian Conasauga Formation, a variety of Devonian shale units, and the Mississippian Neal (Floyd) Shale.[56] In recent years, there has been an increased interest in natural gas exploration on Alabama's private lands. In 2005, Dominion Exploration and Production, Inc. discovered gas in the Conasauga Formation, a landmark event representing the first commercial gas production from shale in the state of Alabama.[57] Since then, energy companies have been pursuing drilling rights in Alabama in order to gain access to its shale plays, whose potential have been compared to the Barnett Shale in Texas.[58] Currently, the industry is in the beginning stages of developing these shale resources, with multiple gas plays active in Alabama's Black Warrior Basin and Appalachia Thrust Belt.[59] The Neal Shale in particular has been described by the Geological Survey of Alabama as "the subject of intensive shale-gas exploration in recent

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[55] Railroad Commission of Texas, Testimony Submitted to the House Committee on Energy and Commerce by Victor Carrillo, Chairman, Texas Railroad Commission, Representing the Interstate Oil and Gas Compact Commission (Feb. 10, 2005), *available at* http://www.archive.org/stream/energypolicyact00statgoog/energypolicyact00statgoog_djvu.txt.

[56] Jack C. Pashin, Geological Survey of Alabama, *Gas Shale Potential of Alabama* at 1(2008), *available at* http://www.rpsea.org/attachments/contentmanagers/429/Pashin%20AL.pdf.

[57] *Id.* at 3-4.

[58] Mining Top News, *Natural gas field drawing energy firms to Alabama* (February 10, 2007), *available at* http://www.miningtopnews.com/natural-gas-field-drawing-energy-firms-to-alabama.html.

[59] Pashin, *supra* at note 56, at 1.

years."[60] Natural gas drilling companies have been reported to pay up to $500 an acre for these rights in Alabama, in addition to a share of potential revenues from drilling. *Id.* This spiking demand illustrates the likelihood of increased interest in the development of shale plays in Alabama's National Forests through high volume hydrofracking, a phenomenon that was not evaluated in the 2004 EIS.

Many of the Alabama parcels are located in shale basins and plays, such as those in the Talladega National Forest, that have garnered development interest from the natural gas industry.[61] Over 75,000 acres of the Oakmulgee Division of the Talladega National Forest were leased for drilling in 2007, showing greatly increased interest in gas development on the Forest which was unanticipated during the 2004 Plan revision. Thus, we do not agree with the 2004 FEIS' conclusion that economic conditions and a lack of interest in the development of oil and gas wells in the National Forests will continue in light of these recent changes. The RFD and NEPA analysis based on its conclusions must be supplemented to consider increased development of shale resources in the National Forests.

iv. The 2004 FEIS Must be Supplemented to Adequately Consider Cumulative Impacts from Development on Privately Owned Mineral Rights and Private Land.

There are 90,414 acres of federal surface within the National Forests of Alabama that are subject to privately owned mineral interests, which comprises about 13.5 percent of the forest area. *See* 2004 FEIS at 3-56. Of this, 80,337 acres are subject to 100% private mineral ownership. *See id.* As is clearly stated in the 2004 FEIS, the exercise of these private mineral rights on National Forest lands "is a private decision, not a federal decision." 2004 FEIS at 3-71. Therefore, all Forest Plan alternatives are subject to these existing private rights.

Under NEPA, there must be an analysis of cumulative impacts on the environment in an Environmental Impact Statement. This cumulative impacts analysis must assess "past, present, and reasonably foreseeable future actions" and the incremental impact of the proposed activities when added to that baseline, whether those actions and activities are private or governmental. 40 C.F.R. § 1508.7. This requires "some quantified or detailed information." *Neighbors of Cuddy Mountain v. U.S. Forest Service*, 137 F.3d 1372, 1379 (9th Cir. 1998). Despite this, the 2004 FEIS failed to estimate the potential impacts of drilling on private mineral rights and nearby private lands in assessing the regional cumulative impacts of drilling operations. This should have included an assessment of environmental impacts that are expected to occur in light of other past, present, and reasonably foreseeable future activities in the region, both public and private.

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[60] *Id.* at 3.

[61] *See* U.S. Energy Information Administration, *Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays* 6, 33 (July 2011) *available at* ftp://ftp.eia.doe.gov/natgas/usshaleplays.pdf. Large parts of the Talladega National Forest overlie the Black Warrior Basin. The EIA estimates that combined Conasaugua/Floyd-Neal shale play contains 4.37 trillion cubic feet of technically recoverable natural gas.

Despite the large acreage available to private mineral development in the National Forests, not only did the FEIS fail to predict environmental impacts on forest resources from any future exercise of these private mineral rights in its cumulative impacts assessment, it also could not consider the *increased* potential for private mineral development due to the heightened commercial viability of drilling for shale gas after the plan was adopted. The agencies must supplement the 2004 FEIS to consider the impacts of potential private mineral development on the National Forests and on adjacent and nearby private lands in light of this new information.

v. BLM and the Forest Service Must Supplement the 2004 FEIS to Adequately Consider Impacts to Listed Species and Their Critical Habitat.

The agencies cannot rely on the 2004 FEIS in approving leasing of the Alabama parcels due to the fact that it fails to assess impacts from oil and gas drilling on listed species and critical habitat that were added after its publication, and it must be supplemented to analyze the impacts from unconventional oil and gas development and hydrofracking to listed species and critical habitat.

Since 2004, the U.S. Fish and Wildlife Service has listed one mussel species that is found in the Alabama National Forests, meaning that it was not considered in the 2004 FEIS. This species is the Georgia pigtoe, which was listed as endangered on Dec. 2, 2010, and had critical habitat designated concurrent with its listing. *See* 75 Fed. Reg. 67,512 (Nov. 2, 2010). The Georgia pigtoe's critical habitat includes Terrapin Creek and Hatchet Creek, which, upon information and belief, may be impacted by this lease sale.

In addition, designated critical habitat for many previously listed aquatic species is now found in the National Forests in Alabama, and is potentially impacted by the leasing of many of the parcels offered in this proposed lease sale. These impacts must be assessed prior to the issuance of these leases. In July of 2004, several months after the release of the 2004 FEIS, the Fish and Wildlife Service designated new critical habitat for 11 mussel species: the fine-lined pocketbook, orange-nacre mucket, Alabama moccasinshell, Coosa moccasinshell, ovate clubshell, southern clubshell, dark pigtoe, southern pigtoe, triangular kidneyshell, southern acornshell, and upland combshell. *See* 69 Fed. Reg. 40,084, 40,107 (July 1, 2004). Segments of this critical habitat are located in the Alabama National Forests, including 10 miles in the Tuskegee National Forest, 83 miles in the Bankhead National Forest, and 40 miles in the Talladega National Forest. *Id.* The ESA's regulations mandate that federal agencies reinitiate consultation when critical habitat is designated and those agencies' actions may affect it. *See* 50 C.F.R. § 402.16. These species and critical habitat could potentially be found on the Alabama parcels and/or impacted by drilling operations on those parcels, making it critical that the agencies re-evaluate and re-consult on drilling's potential impacts prior to issuing any leases.[62]

[62] *See* discussion on consultation under the Endangered Species Act, *infra* at page 29.

Due to this critical habitat designation, the agencies must reinitiate consultation with the Fish and Wildlife Service.

The 2004 FEIS also must be supplemented to analyze impacts of hydrofracking on the listed species and critical habitat found in the National Forests. Based upon information and belief, drilling on the proposed parcels may affect listed species in the National Forests. For example, parcels at Township 15S, Range 9E, Section 12 are located in a Red-Cockaded Woodpecker sub-HMA designation, according to the Forest Plan. This HMA, which is specifically managed to provide habitat for Red Cockaded Woodpeckers, was deemed by the 2004 FEIS to be "essential support" for the recovery of the species. The 2004 FEIS mandates that a minimum of 3,000 acres of foraging must be restored in the Shoal Creek HMA, allowing for 24 cluster sites, in order for the Forest Service to comply with the Red-Cockaded Woodpecker Revised Recovery Plan. *See* 2004 FEIS at 3-194. The agencies must consult with the U.S. Fish and Wildlife Service to determine whether increased drilling operations may affect the habitat of the Red-Cockaded Woodpecker, and the Forest Service's ability to meet recovery goals, prior to authorizing leasing of these parcels.

There are 25 aquatic federally listed endangered and threatened species associated with the National Forests of Alabama, with mollusks composing nearly 75% of these species. 2004 FEIS at 3-207. The vast majority of these species are potentially harmed by activities that could "increase sedimentation, siltation, or turbidity, contribute pollutants, adjust water chemistry or nutrient cycling, raise water temperatures, change flow, modify habitat, alter streamside vegetation, or block fish passage." 2004 FEIS at 3-219.[63]

Unconventional oil and gas development and hydrofracking can impact listed species by altering habitat through construction of access roads, clearing and leveling of drill pad sites, and construction of pipelines and facilities. This can cause increased sedimentation from construction site runoff; addition of pollutants to aquatic resources due to accidents or land application of chemicals and fracturing fluids; and changes in water chemistry and water temperature due to significant water withdrawals that lessen the dilution of toxics in waterways, among other potential impacts. Specifically, the 2004 FEIS notes that "aquatic animals could be impacted by airborne dust settling on the nearby streambeds and pond bottoms" and "[s]ediment washed down from the disturbed sites would also adversely impact aquatic life." *Id.* at 3-69. The increased potential impacts to listed species and critical habitat from unconventional oil and gas development and hydrofracking have not been analyzed by the agencies.

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[63] *See* discussion of endangered Cahaba shriner, *id.* at 3-218; threatened goldline darter, *id.* at 3-220; endangered upland combshell, *id.* at 3-224; endangered southern acornshell, *id.* at 3-225; threatened fine-lined pocketbook, *id.* at 3-227; threatened orange-nacre mucket, *id.* at 3-229; threatened Alabama moccasinshell, *id.* at 3-231; endangered Coosa moccasinshell, *id.* at 3-232; endangered Southern clubshell, *id.* at 3-234; endangered southern pigtoe, *id.* at 3-238; endangered ovate clubshell, *id.* at 3-240; endangered triangular kidneyshell, *id.* at 3-241; endangered Lacy elimia snail, *id.* at 3-243; and threatened painted rocksnail, *id.* at 3-246).

In addition, based upon information and belief, several of these aquatic species are found near parcels that are included in this lease sale. This includes the upland combshell, southern acornshell, fine-lined pocketbook, Coosa moccasinshell, southern clubshell, ovate clubshell, triangular kidneyshell, which have critical habitat on Terrapin Creek within the Shoal Creek District of the Talladega National Forest, *see id.* at 3-224 – 3,240; *see also* 69 Fed. Reg. 40,084, 40,106; the Lacy elimia snail, which is located on Cheaha Creek downstream of the Talladega district, *see* 2004 FEIS at 3-243; the painted rocksnail, which is located on Choccolocco Creek, *see id.* at 3-246; and several species that may be impacted by activities in the Oakmulgee Division of the Talladega National Forest, including the Cahaba shriner, goldline darter, southern acornshell, orange-nacre mucket, Alabama moccasinshell, southern clubshell, ovate clubshell, triangular kidneyshell. *See* 69 Fed. Reg. 40,105.

In addition, the fine-lined pocketbook, Coosa moccasinshell, triangular kidneyshell, and southern pigtoe have critical habitat on Hatchet Creek, the Shoal Creek tributary to the Upper Choccolocco, and Cheaha Creek within the Talladega District; in addition, the fine-lined pocketbook also has critical habitat in Cane Creek. 2004 FEIS at 3-227- 3-241; 69 Fed. Reg. 40,106-40,156. The agencies must analyze the impacts to these listed species and critical habitat under NEPA before allowing leasing of the parcels to go forward.

In summary, in the face of the new information that has arisen since the 2004 FEIS, further analysis is now required under NEPA. The 2004 FEIS' lack of assessment of these potentially significant environmental impacts on Alabama's National Forests due to high volume hydraulic fracturing and the dramatically increased interest in drilling here is a fatal flaw in this NEPA analysis, requiring the agencies to supplement the 2004 FEIS to conduct more analysis and public disclosure of its impacts prior to leasing these parcels. This process of supplementing the FEIS should include public notice and an opportunity for interested members of the public to comment on a draft supplement, in order to ensure meaningful participation and informed decisionmaking.

b. BLM and the Forest Service Have Failed to Consider a Reasonable Range of Alternatives for Development of Oil and Gas in the Forest Service FEIS.

The Forest Plan's FEIS violates NEPA by failing to consider a reasonable range of alternatives in the acreage and amount of federally-owned minerals it will make available for leasing in its impact statement. Under NEPA, an EIS must consider and discuss reasonable alternatives to the proposed action. 42 U.S.C. § 4332(2)(c)(iii); 40 C.F.R. § 1502.14. It should sharply define the issues and provide a "clear basis for choice among options by the decisionmaker and the public." *Id.* Agencies must "rigorously explore and objectively evaluate all reasonable alternatives." *Id.* at 1502.14(a). The EIS must "provide a full and fair discussion of significant environmental impacts and shall inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." *Id.* at 1502.1.

Accordingly, "[a]n agency must look at every reasonable alternative, with the range dictated by the nature and scope of the proposed action, and sufficient to permit a reasoned choice." *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1520 (9th Cir. 1992) (internal citations omitted); *see also Headwaters, Inc. v. Bureau of Land Management*, 914 F.2d 1174, 1180-81 (9th Cir. 1990) ("appropriate range of alternatives" must be considered). The "existence of a viable but unexamined alternative renders an environmental impact statement inadequate." *Idaho Conservation League*, 956 F.2d at 1519 (internal citations omitted).

The National Forest Management Act (NFMA) regulations also require consideration of alternatives, providing that the agency "shall formulate a broad range of reasonable alternatives according to NEPA procedures . . . Alternatives shall be distributed between the minimum resource potential and the maximum resource potential." 36 C.F.R. § 219.12(f)(1) (Sept. 30, 1982).

Despite this mandate, all of the alternatives considered by the Forest Service contained identical management prescription allocations for mineral resources. *See* 2004 FEIS at 2-13. In the 2004 FEIS, every single alternative considered by the Forest Service had exactly the same area of the Forests open to mineral exploration and development – 92.2 percent. *See* 2004 FEIS at 2-26. While the alternatives varied in the stipulations applied, the FEIS itself admitted that "total acreage available for lease would remain virtually the same" under all alternatives. 2004 FEIS at 3-74. This alternatives analysis fails to represent a full spectrum – or *any* spectrum – of reasonable alternatives for oil and gas leasing availability in the National Forests. This is a significant flaw in the 2004 FEIS that must be cured before any oil and gas leases can be sold by BLM. Particularly now that the impacts of allowing leasing and drilling on 92% of the forest have changed so much, it is essential that the agencies consider, with public participation, a full range of alternatives for oil and gas development on the forest.

c. BLM's Issuance of Leases would Constitute an Irretrievable Commitment of Resources in Violation of NEPA.

The protesting parties also object to BLM's vesting of development rights at the time of lease issuance, which severely limits the agency's ability to respond to site-specific concerns that might arise later in time. This may lead to a situation where BLM or the Forest Service is unable to impose stipulations that are necessary in order to comply with federal laws and regulations or to fulfill their goals, due to perceived infringement on the rights of lessees.

For example, the 2004 FEIS states that, for any limitations that the Forest Service might impose on surface activities by lessees, those limitations will be "considered consistent with the lease rights granted, provided they do not require relocation of proposed operations by more than 200 meters, require that the operations be sited off the leasehold, or prohibit new surface disturbing operations for a period in excess of 60 days in any lease year." 2004 FEIS at 3-63. This significantly restricts the agencies' ability to ensure the protection of national forest

resources. Importantly, since the agencies apparently do not intend to conduct a site-specific investigation until the lessee submits an Application for Permission to Drill (APD), there may be significant impacts that are not fully understood until after development rights have been sold.

The agencies' interpretation of lease issuance under these terms apparently does not reserve to BLM the right to prevent surface disturbing activities except for, potentially, the limited purpose of ensuring against jeopardy to listed species.[64] The issuance of leases in their current form cannot ensure that BLM and the Forest Service will have the authority to enforce the additional stipulations they may find necessary to ensure the conservation and recovery of listed species, or to meet the Forest Service's obligations under the NFMA (discussed further below), should a site specific analysis reveal, for example, that a particular parcel is unsuitable for surface occupancy. The Forest Service itself has stated that "once a lease is issued the opportunity to deny access is irreversible for the life of the lease or the life of the producing field."[65]

Thus, lease issuance constitutes an irretrievable commitment of resources under NEPA section 102. Under NEPA, courts have determined that BLM and the Forest Service are obligated to fully analyze impacts arising from oil and gas development *prior* to issuing leases. *See, e.g.*, *Southern Utah Wilderness Alliance*, 159 IBLA 220, 224-43 (2003); *Pennaco Energy, Inc. v. U.S. Dep't of the Interior*, 377 F.3d 1147 (10th Cir. 2004); *Conner v. Burford*, 848 F.2d 1441 (9th Cir. 1988); *Sierra Club v. Peterson*, 717 F.2d 1409 (D.C. Cir. 1983).

It is also well-established that in order to satisfy NEPA, the environmental analysis must be site-specific. *See New Mexico ex rel. Richardson v. Bureau of Land Management*, 565 F.3d 683, 717-20 (10th Cir. 2009) (holding that where "any environmental impacts [are] reasonably foreseeable at the leasing stage," NEPA requires an analysis of the site-specific impacts of leasing). However, no such site-specific analysis has been conducted by BLM or the Forest Service in this case.

Moreover, the parties to this protest have requested that BLM provide maps of the contested parcels to the public, so that interested members of the public can understand and evaluate the effects of leasing for oil and gas development on National Forest resources. BLM claimed not to have maps. The Forest Service eventually provided maps of the parcels located in the Talladega and Shoal Creek divisions of the Talladega National Forest, which the parties appreciated. However, the Forest Service did not provide maps of the parcels in the Oakmulgee Division. It is our understanding that maps for those parcels in the Oakmulgee Division have not been created by either BLM or the Forest Service. Without having ever mapped these parcels, it

[64] None of the contested parcels is covered entirely by an NSO stipulation. One section of parcel ALES 057443 is subject to an NSO stipulation, but surface disturbing development is not precluded on the other sections of the lease, and even the NSO stipulation is unclear for reasons discussed further below.

[65] *See* Final Environmental Impact Statement on Oil and Gas Leasing in Bridger-Teton National Forest (Feb. 2003) at 3-192.

is difficult to imagine how the agencies could possibly have undertaken an adequate site-specific analysis. Because no site-specific analyses have been performed, leasing the contested parcels would violate the BLM's obligations under the National Environmental Policy Act.

Leasing should not move forward until either the current lease terms are amended to allow for more broad authority to restrict or forbid drilling in order to comply with federal law, or until site-specific evaluations of the Alabama parcels have been conducted and necessary information obtained to ensure that lease stipulations are sufficient to ensure compliance with federal laws.

III. BLM and the Forest Service Will Violate The ESA If They Offer These Parcels For Sale.

BLM and the Forest Service must consult with the U.S. Fish and Wildlife Service (FWS) on the impacts to listed species and critical habitat from proposed drilling prior to issuing oil and gas leases. As of 2004, when the Forest Plan was released, the National Forests of Alabama contained habitat supporting 54 federally listed species under the Endangered Species Act, including the bald eagle, the Red-Cockaded Woodpecker, and many aquatic species. *See* 2004 Forest Plan at 2-28. Many of these species may be affected by the proposed oil and gas drilling activities. Indeed, this oil and gas leasing and development seem likely to adversely affect many of these species, particularly the Red-Cockaded Woodpecker and the aquatic species, and to adversely modify any designated critical habitat in or downstream from the lease parcels, as discussed above.

In addition, the FWS has listed additional species and critical habitat impacting the National Forests, as discussed above. Despite this, as far as the protesting parties have been able to determine, while the Forest Service appears to have engaged in informal consultation on the Forest Plan in 2003, resulting in a biological assessment, neither the Forest Service nor BLM have yet consulted with FWS on the site-specific impacts of this lease sale. Nor have the agencies reinitiated consultation to consider impacts on newly listed species, newly designated critical habitat, or the emergence of high volume shale hydrofracking. This violates the ESA.

The ESA requires federal agencies to consult with the U.S. Fish and Wildlife Service regarding the impacts of proposed federal actions on threatened and endangered species. 16 U.S.C. § 1536(a)(2). Agencies, in consultation with FWS, must insure that their actions are not likely to jeopardize the existence of listed species or to destroy or adversely modify any designated critical habitat. *Id.* Further, ESA's implementing regulations mandate that "[e]ach federal agency shall review its actions at the *earliest possible time*" to determine whether an action may affect protected species and, if so, to engage in the appropriate consultation. 50 C.F.R. § 402.14(a) (emphasis added); *see also Wilderness Soc'y v. Wisely*, 524 F. Supp. 2d 1285, 1301 (D. Colo. 2007) ("[T]he BLM's duty to confer with the FWS arises as of the time that it was possible for the two agencies to engage in meaningful conference regarding the decision to

be made"). If a proposed action "may affect listed species or critical habitat," then the agency must formally consult with FWS, unless, as a result of informal consultation, the agency determines that the action "may affect, but "is not likely to adversely affect listed species or critical habitat," and the FWS concurs. 50 C.F.R. §§ 402.13(a), 402.14(a)-(b).

In addition, as discussed above, the ESA's regulations mandate that federal agencies reinitiate consultation when a new species is listed or critical habitat is designated and those agencies' actions may affect it. *See* 50 C.F.R. § 402.16(d). Further, these regulations also mandate that federal agencies reinitiate consultation when "new information reveals effects that may affect listed species or critical habitat in a manner or to an extent not previously considered." *Id.* at 402.16(b).

Contrary to this requirement, neither the Forest Service nor BLM have consulted with FWS on this lease sale. To the extent that the agencies may attempt to rely on the informal consultation on the Forest Plan, that consultation is not adequate to cover this lease sale. First, the new species listing, new critical habitat designations, and new information regarding the extent and type of drilling here require the reinitiation of consultation prior to any lease sale. Second, the consultation on the Forest Plan did not consider the site-specific impacts of leasing and gas development here. Third, such leasing and gas development here obviously are likely to adversely affect listed species and critical habitat, necessitating *formal consultation* prior to the sale of any leases. To the parties' knowledge, formal consultation has never occurred. To the extent that the agencies may contemplate delaying any further consultation until *after* the parcels have already been auctioned off at the lease sale, this would be impermissible, because NEPA analysis and ESA consultation must occur *prior* to the irretrievable commitment to the sale of those leases. The Forest Service and BLM must consult with the Fish and Wildlife Service over impacts to listed species and critical habitat in the Alabama National Forests prior to issuing leases. Their failure to reinitiate consultation violates the ESA.

IV. BLM and the Forest Service Should Delay Leasing of Alabama Parcels until New Rules are Promulgated.

There are several new rules in the process of being enacted that will address hydrofracking. For example, the Bureau of Land Management is currently in the process of issuing federal hydraulic fracturing regulations, which will apply to oil and gas leasing activities on federal lands.[66] These are reported to include requirements that companies disclose chemicals in their fracturing fluids, and also mandate that companies win approval prior to using hydraulic fracturing technology on federal lands.[67] In addition, the U.S. Environmental Protection Agency (EPA) is expected to release rules governing air pollution from hydraulic fracturing in April of

[66] Bureau of Land Management News Release, *BLM Begins New Look At Oil Shale Plans* (Apr. 13, 3011), *available at* http://www.blm.gov/wo/st/en/info/newsroom/2011/april/NR_04_13_2011.html.
[67] Houston Business Journal, *Fracturing regulation would benefit industry, Interior Secretary says* (Apr. 9, 2012), *available at* http://www.bizjournals.com/houston/morning_call/2012/04/interior-secretary-voices-support-for.html.

2012, as required under a consent decree entered into with environmental groups, that is expected to curb smog-forming VOCs, emissions of benzene, and releases of methane.[68] Lastly, the EPA is currently conducting a study to assess the impacts of hydraulic fracturing on drinking water resources, according to its plan, which was released in November 2011.[69]

It is unclear how these regulations will apply to hydrofracking operations that are already permitted on federal lands. In light of this, the protesting parties believe that it is premature and inappropriate to lease the Alabama parcels, where hydraulic fracturing could potentially be conducted, prior to the promulgation and entry into force of these new regulations. Once these regulations are issued, all future leases should incorporate the new regulations into their lease terms. In addition, the protesting parties believe that the lease of these parcels should be suspended until the EPA issues the results of its study on drinking water impacts, in order to ensure that the full impacts of hydrofracking are understood and incorporated into any supplemental NEPA analysis and future decisionmaking.

V. BLM and the Forest Service Will Violate the NFMA If They Offer These Parcels For Sale.

The Forest Service and BLM will violate the National Forest Management Act (NFMA) if they offer these parcels for sale. Under the NFMA, the Forest Service's land management plans must achieve several goals, including: (1) insuring consideration of the economic and environmental aspects of renewable resource management, "including the related systems of silviculture and protection of forest resources, to provide for outdoor recreation (including wilderness), range, timber, watershed, wildlife, and fish"; (2) providing for diversity of plant and animal communities; and (3) insuring research on and evaluation of the effects of each management system to ensure that it will not produce substantial and permanent impairment of the productivity of the land, among other goals. 16 U.S.C. § 1604(g). In addition, NFMA requires that "[r]esource plans and permits, contracts and other instruments for the use and occupancy of National Forest System lands shall be consistent with the land management plans." 16 U.S.C. § 1604(i).

Essentially, this means that the Forest Service, in its Plan, must provide for certain resources such as outdoor recreation, watershed integrity, fish and wildlife, plant and animal diversity, and soil productivity, and all oil and gas development activities must be consistent with the Forest Plan. *See Northwoods Wilderness Recovery, Inc. v. U.S. Forest Service*, 323 F.3d 405. 407 (6th Cir. 2003) ("Implementation of the forest plan is achieved through individual site-

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[68] Ben Geman, The Hill, *EPA delays 'fracking' air pollution rules* (Apr. 2, 2012), *available at* http://thehill.com/blogs/e2-wire/e2-wire/219565-epa-delays-fracking-air-pollution-rules. *See* proposed rule at 76 Fed. Reg. 52,738 (Aug. 23, 2011).

[69] *See* U.S. Envtl. Prot. Agency, Office of Research and Development, *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources* (Nov. 2011), *available at* http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/hf_study_plan_110211_final_508.pdf.

specific projects, and all projects must be consistent with the forest plan."); *see also Cherokee Forest Voices v. U.S. Forest Service*, 2006 U.S. App. LEXIS 13214 at *11-12 (6th Cir. May 25, 2006); *Sierra Club v. Martin*, 168 F.3d 1, 4-5 (11th Cir. 1999); *Friends of Southeast's Future v. Morrison*, 153 F.3d 1059, 1068 (9th Cir. 1998); *National Audubon Soc'y v. Hoffman*, 132 F.3d 7, 19 (2nd Cir. 1997).

In summary, the Forest Service has a duty to ensure that the amount of drilling permitted by this lease sale will still allow it to provide for the resources mandated under NFMA. This it has not done. Rather, the leasing appears to violate the NFMA by placing oil and gas development above other management prescriptions and other natural resources and by failing to ensure that lease stipulations for oil and gas development activities are sufficient to enforce all applicable Forest Plan standards. As a prime example of the agencies' failure to comply with NFMA, in 2010, the Forest Service issued an amendment to its Forest Plan, titled FW 185, which limits surface occupancy during minerals leasing operations to slopes that are equal to or less than 40 percent.[70] This standard has been incorporated into the Forest Plan. However, despite NFMA's mandate that leasing operations be consistent with Forest Plan standards, the lease sale notice does not include this standard in its lease stipulations.

The lack of maps for all parcels in the lease sale also prevents the Forest Service from adequately exercising its authority to ensure that leasing on the forest is consistent with the Forest Plan. If the Forest Service has not created maps of parcels in the Oakmulgee Division of the Talladega National Forest, and if it has not actually reviewed and evaluated the specific parcels displayed on its other maps, it cannot determine exactly where each parcel is, and what effects leasing might have. It also cannot adequately evaluate whether forest resources or other uses of the forest may be affected. Nor can the Forest Service ensure that leasing is consistent with its management plan. Perhaps for this reason, many of the proposed leases conflict with existing Forest Service management prescriptions.

The lease of the contested parcels would make several areas available for drilling, despite the conflict between the effects of drilling and the desired condition of these areas as stated in the management prescriptions.[71] While some areas require that leasing conform to controlled surface use stipulations, neither the 2004 FEIS nor the lease sale analyze whether these stipulations will ensure that the prescribed condition of these lands will not be compromised by drilling activities. Moreover, the Forest Service has not even considered whether it can meet its NFMA obligations to provide for these resources if the increased extent and new type of gas drilling and hydrofracking that now seems likely is allowed to go forward.

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[70] *See* National Forests in Alabama Revised Land and Resource Management Plan Amendment #2 – Minerals Operation Standard (Dec. 27, 2010).

[71] The protesting parties note that it is exceedingly difficult to them to determine the impact of leasing the parcels on the Forest Plan's management prescriptions (and other impacts), due to the lack of site-specific information in BLM's Notice of Competitive Lease Sale document.

Should the agencies allow active lease development with such significant impacts, it will likely interfere upon the management prescriptions of Alabama's National Forests, most of which are prescribed for restoration and/or recreation. As a result, more information and analysis is needed on how areas with high conservation priorities will be affected by gas development in order to comply with NFMA.

It is possible that BLM would also violate its own internal direction were it to offer these parcels for sale. On February 13, 2009, the acting Director of BLM issued a Memorandum to all State Directors requiring certain steps to be followed to "allow for a full review of parcels prior to an oil and gas lease sale." These steps include preparation of an initial briefing paper to the Washington office of BLM 50-55 days prior to the lease sale. Information to be provided in this briefing paper includes discussion of roadless characteristics, whether any of the parcels are in citizen proposed wilderness and whether any of the parcels involved an endangered species or BLM-listed sensitive species. Clearly, the parcels meet these conditions. It is unclear whether BLM has complied with this mandate.

Lastly, it is unclear that the agencies have considered whether they are capable of overseeing this level of oil and gas production in the Alabama National Forests. The Department of Interior's ability to police drilling on public lands has been called into question recently by a report prepared at the request of U.S. Representatives Edward J. Markey and Rush D. Holt, titled *Drilling Dysfunction: How the Failure to Oversee Drilling on Public Lands Endangers Health and the Environment.*[72] The report documented many violations of oil and gas drilling rules on federal lease and showed that only a "very small percentage of violations result in fines." *Id.* at 3. In addition, it is unclear that state regulators have the funding or staff to adequately enforce state oil and gas regulations.[73] The agencies must consider the likelihood of violations by lessees in determining the ultimate environmental impact of drilling on the parcels, and ought to weigh whether the potential harm caused by these violations mandates a greater demonstration of the agencies' ability to police these industries prior to the leasing of additional lands.

REQUEST FOR RELIEF

The protesting parties request that BLM withdraw the protested parcels from the June 2012 Competitive Oil and Gas Lease Sale until such time as BLM and the Forest Service have complied with federal laws and regulations, including NEPA, the ESA, and the NFMA. In conducting its NEPA supplementation, the Forest Service should consider whether sensitive parcels may be inappropriate for oil and gas development due to the presence of aquatic resources, listed or sensitive species, important recreational features, or other characteristics.

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[72] *Available at* http://democrats.naturalresources.house.gov/sites/democrats.naturalresources.house.gov/files/2012-02-08_RPT_DrillingDysfunction.pdf.

[73] *See* Abrahm Lustgarten, ProPublica, *State Oil and Gas Regulators Are Spread Too Thin to Do Their Jobs* (Dec. 30, 2009), *available at* https://www.propublica.org/article/state-oil-and-gas-regulators-are-spread-too-thin-to-do-their-jobs-1230.

Furthermore, the leasing of parcels in the Alabama National Forests should be delayed until the enactment of new BLM rules governing hydrofracking; EPA air quality rules; and EPA's final study on the impacts of hydrofracking on drinking water resources. The protesting parties further request that BLM suspend the offering of the Alabama parcels while the agency considers this protest.

Thank you for your consideration of this protest letter. Wild South's address is: Ben Prater, Wild South, 16 Eagle Street, Suite 200, Asheville, NC 28801. Ben Prater can be reached by telephone at 828-258-2667. Natural Resources Defense Council's address is: Matthew McFeeley, Natural Resources Defense Council, 1152 15th Street N.W., Suite 300, Washington, D.C. 20005. Matthew McFeeley can be reached by telephone at 202-513-6250. Should you have any questions, please contact Keith Johnston or Sarah Francisco at the Southern Environmental Law Center.

Sincerely,

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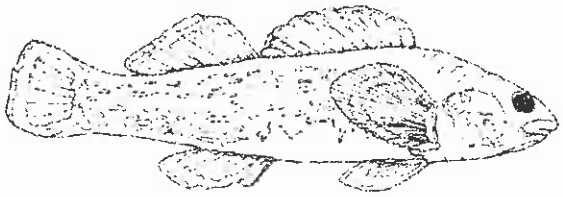
cc: Steve Lohr, Supervisor, National Forests in Alabama
Elizabeth Agpaoa, Regional Forester, Southern Region
Andrew Colaninno, Director of Resource Information, Southern Region.

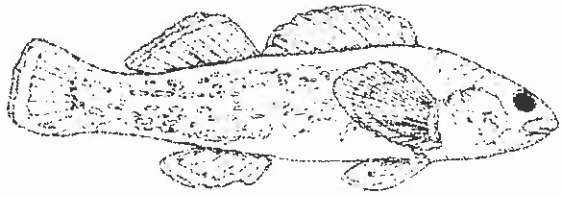
ATTACHMENT A

Protection of Aquatic Biodiversity in the Southern Appalachian National Forests and their Watersheds

Information for use in the Forest Plan Revision Process and Beyond

Compiled by
Dr. William O. McLarney
Franklin, NC





A Report of
The Southern Appalachian Forest Coalition
and
Pacific Rivers Council

Pacific Rivers Council

Pacific Rivers Council
P.O. Box 10798
Eugene, OR 97440
541-345-0119 www.pacrivers.org

SOUTHERN APPALACHIAN
FOREST
COALITION

Southern Appalachian Forest Coalition
46 Haywood St., Suite 323
Asheville, NC 28801
828-252-9223 www.safc.org

The Coalition consists of seventeen member groups:

Alabama Environmental Council

205-322-3126

Chattooga River Watershed Coalition

706-782-6097

Cherokee Forest Voices

423-247-7895

Coalition for Jobs & the Environment

540-628-8996

Citizens Task Force

540-774-6690

Forest Service Employees for Environmental Ethics

864-638-9843

Georgia ForestWatch

706-635-8733

Nantahala Forest Watch

828-526-9284

National Audubon Society-NC

910-251-0666

Sierra Club

828-692-0262

South Carolina Forest Watch

864-647-8804

Southern Appalachian Biodiversity Project

828-258-2667

Southern Environmental Law Center

804-977-4090

The Wilderness Society

404-872-9453

Virginia Forest Watch

540-479-2176

Wild Alabama

256-974-6166

WNC Alliance

828-258-8737

Protection of Aquatic Biodiversity in the Southern Appalachian National Forests and their Watersheds: A Rapid Assessment

Information for use in the Forest Plan Revision Process and Beyond

A Report Of The Southern Appalachian Forest Coalition

Compiled by
Dr. William O. McLarney
Franklin, NC

Edited by Susan Andrew and Hugh Irwin

In consultation with aquatic experts from around the southern Appalachians:

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John Alderman, NC Wildlife Resources Commission
Art Bogan, NC State Museum of Natural Science
Richard Bruce, Highlands Biological Station
Noel Burkhead, USGS Caribbean Science Center
Billy Campbell, South Carolina Forest Watch
Ron Cicerello, Kentucky State Nature Preserves Commission
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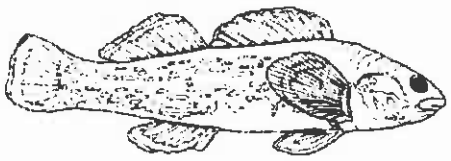
Russ England, Georgia DNR
Patricia Flebbe, Virginia Polytechnic Institute
John Fridell, U.S. Fish & Wildlife Service
Jeff Garner, Alabama DNR
Jim Godwin, Alabama Natural Heritage Program
Robert Jenkins, Roanoke College
Judith Johnson, NC Wildlife Resources Commission
Lee Ann McDougal, USDA Forest Service
Chris McGrath, NC Wildlife Resources Commission
Ed Menhinick, UNC –Charlotte
Scott Metee, Geological Survey of Alabama.
Richard Neves, Virginia Polytechnic Institute
Malcolm Pierson, Alabama Power & Light Co.
Charles Saylor, Tennessee Valley Authority
Wayne Starnes, NC State Museum of Natural Science
Bryn Tracy, NC DENR, Bioassessment Group
Buzz Williams, Chattooga River Watershed Coalition
Gary Williams, Tennessee Valley Authority

Executive Summary



The southeastern United States has recently been recognized as a global center of aquatic biodiversity. However, our understanding of this diversity—where it is found, and what must be done to conserve it—has yet to be fully grasped. This report focuses on the mountains of the region because it is here that our most natural landscapes, water quality, and public ownerships are found. The purpose of this report is to list and begin to prioritize stream reaches and their watersheds in order to develop strategies to protect aquatic biodiversity in and around our public lands, the Southern Appalachian National Forests. Barring a complete survey of the aquatic fauna of the region (something that has not been compiled at present), this report is intended as a "rapid assessment" of the most critical places requiring our attention for conservation efforts.

The author of this report consulted with a long list of recognized experts in the field of aquatic biology to compile the information presented within. This report prioritizes a set of 44 defined watershed units, or Aquatic Diversity Areas (ADAs), to identify a group of sites that, taken together, protect the greatest number of species, particularly imperiled forms, and simultaneously protect a diversity of intact, functional aquatic ecosystems. Of the 44 ADAs defined herein, 15 are selected as priority areas for conservation emphasis, including at least one from each of the three major drainage basins treated in this report. If it were possible to adequately protect these 15 ADAs, 96 of the 108 imperiled species listed in this report would be protected in at least one watershed, including all of the mussel species:

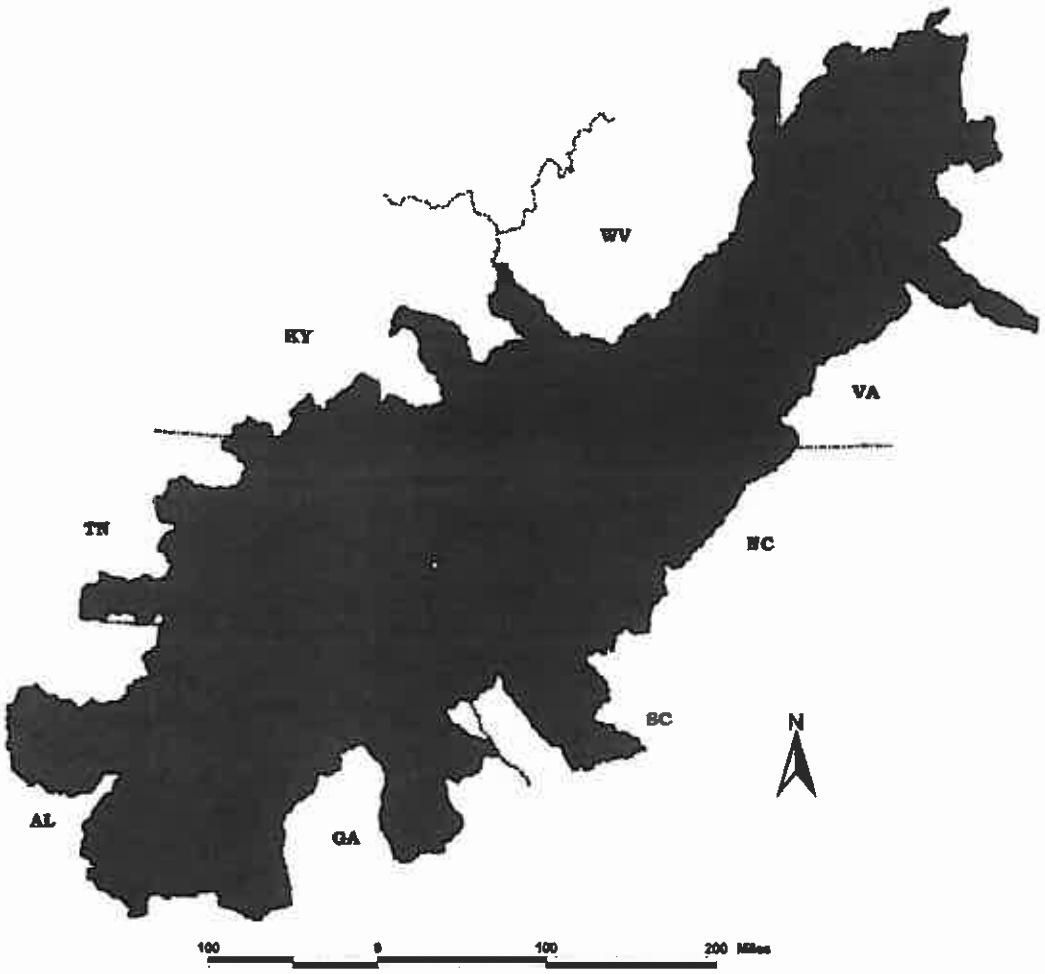
Choccolocco Creek, AL
Clinch River, TN and VA
Conasauga River, TN and GA
Coosawattee River, GA
Craig Creek / Johns Creek, VA
Etowah River, GA
(Lower) Hiwassee River, TN and NC
Holston River, North Fork, TN and VA
Holston River, South Fork, TN and VA
Nolichucky River, NC and TN
Powell River, TN and VA
Sipsey Fork / Black Warrior River, AL
Tallapoosa River, AL and GA
(Middle) and (Upper) Tennessee River, NC

The report also defines a set of 22 smaller Critical Refugia, which are described in more detail for their significance as sites of high fish diversity, endemic species richness, or their ecological identity as warm vs. coldwater streams. These places are then recommended for careful management to protect their special features, particularly through the process of national forest plan revision, now underway in the region. The Critical Refugia are found on these streams:

Betty Creek, GA and NC
Brasstown Creek, GA and NC
Chattooga River, GA, NC and SC
Chauga River, SC
Childers Creek, TN
Citico Creek, Tn
Cowee Creek, NC
Holston River, VA
Linville River, NC
Little Tennessee River, GA and NC
Pedlar River, VA
Poor Fork, Cumberland River, KY
Possum Creek, TN
Shoal Creek, AL
South Toe River, NC
Stony / Little Stony Creeks, VA
Suches Creek, GA
Tuckaseegee River, NC
Vengeance Creek, NC
Whitetop Laurel Creek, VA

Chances are, the battle for the conservation and restoration of our aquatic biodiversity will be won or lost on private lands. But our focus on the public lands is justified in part by the sheer cost of accomplishing conservation work. Our meager resources stand a realistic chance of making a real difference on the public forests. In addition, the data presented here make it clear that improving the management of the national forest lands will benefit habitats downstream, and some critical sites and species can be protected by focusing on improving national forest management. The timing of these recommendations is key, for the national forests in the region are now revising their management plans, and planners are in need of the kind of information offered in this rapid assessment.

Study Area for Protection of Aquatic Biodiversity



State lines

Watershed Divisions

Aquatic Study Area

SOUTHERN APPALACHIAN FOREST COALITION

Pacific Rivers Council

INTRODUCTION

THE SOUTHEASTERN UNITED STATES is recognized as a global center of aquatic biodiversity. The Southeast contains about 90 percent of the nearly 600 species of mussels and crayfishes, approximately 75 percent of the aquatic snails, and about half the freshwater fishes known from the continental United States (Shute et al, 1997). However, this remarkable natural heritage is at risk. Human beings are naturally biased in favor of affairs in the terrestrial world, but in fact, aquatic biodiversity is being lost at an even more rapid rate than terrestrial biodiversity. For fishes alone, it has been estimated that 28 percent of the known freshwater species in North America are extinct or in serious trouble. Stemming the tide of species loss in the region, as in other places, is a battle for ecological integrity at the landscape scale; for, as Warren and others note (1997), the process of extinction is not cataclysmic, but rather is incremental, often a result of cumulative, local and then regional extirpations that reflect a population's sensitivity to decreasing habitat and increasing isolation.

For the concerned citizen, what is at stake is not just a list of mysterious, arcane and unpronounceable critters that occupy unseen habitats below. Ultimately, the demise of our native species is a harbinger of our own future course. To cite just one example, our mountain streams provide drinking water to hundreds of communities downstream. If our native mussel species cannot survive the task of filtering the waters they have inhabited for millions of years, what expectations can we hold for our own sustainability?

This report focuses on the mountains of the region because it is here that our most natural landscapes, water quality, and public ownerships are found. The purpose of this report is to list and begin to prioritize stream reaches and their watersheds in order to develop strategies to protect aquatic biodiversity in and around the Southern Appalachian National Forests (primarily in the Southern Blue Ridge and Ridge and Valley Biogeographic Provinces, but including portions of the Appalachian Plateau and Piedmont Provinces as well). The task is timely, because the national forests of the region are presently revising the comprehensive land management plans that determine their future for the next 10-15 years. This is a once-in-a-decade opportunity to obtain substantial protection for the critical watersheds on public lands. Thus, identification and prioritization of streams for which the national forests play an ownership and management role is critical now. This identification is also important for project-level planning the forests perform in preparation for removing timber, building or obliterating roads, and carrying out other activities that can impact aquatic communities.

However, many of the stream reaches in this report extend well outside national forest ownership. This report should prove useful in prioritizing acquisition within Forest Service purchase units. The report also offers information and suggestions which should be useful for establishing conservation easements and riparian buffers on non-Forest Service land by other federal and state agencies and the conservation community after the forest planning process is completed.

This report is intended to be a rapid assessment, a tool to aid the protection of aquatic diversity in the region. It is hoped that the study this report represents will be developed and refined through future iterations. It is also hoped that other efforts to formulate protection strategies for aquatic systems will be encouraged by this report. This assessment covers the following national forests (NFs) and their watersheds:

Alabama: Talladega NF (Shoal Creek and Talladega Ranger Districts only) and Bankhead NF
Georgia: Chattahoochee NF
South Carolina: Sumter NF (Andrew Pickens Ranger District only)
North Carolina: Nantahala and Pisgah NFs
Virginia: Jefferson NF (Portions of the James River watershed in the George Washington NF are included in the areas proposed for protection, but were not reviewed in detail.)
Kentucky: Jefferson NF (not including the Redbird Purchase Unit of the Daniel Boone NF, administered by the Jefferson)
Tennessee: Cherokee NF

The majority of the area in these forests drains to the Gulf of Mexico via the Mississippi, Ohio and Tennessee Rivers. However, portions (including the entirety of the areas covered for the states of Alabama, South Carolina and Kentucky) drain into the Atlantic Ocean, the Ohio River or the Gulf of Mexico east of the Mississippi River. **Table 1** summarizes the drainage basins and watersheds covered by this report.

Aquatic Diversity Areas (ADAs)

For purposes of this report, key watersheds are classified as Aquatic Diversity Areas (ADAs), judged from a synthesis of information regarding the diversity and imperilment of native aquatic organisms. ADAs are defined as watersheds or portions of watersheds containing significant national forest ownership or lands within national forest purchase boundaries. ADAs are primarily large watersheds or portions of watersheds 200 square miles and larger. The ADAs are prioritized in this report based on the degree to which they provide habitat for clusters of imperiled aquatic species, or the degree that they represent the best examples of aquatic diversity in major drainage basins. Streams listed in parentheses in table 1 are tributaries within each ADA. The selection of tributaries listed in Table 1 is somewhat arbitrary; it represents an attempt to include the largest and best-known streams, plus those of particular conservation importance, e.g., because they contain occurrences of rare organisms, or are more or less intact (free of impoundments and other alterations).

Some of the Aquatic Diversity Areas (ADAs) outlined in this report conform to the boundaries of hydrologic units, as defined by TVA and other agencies, but they have no intrinsic relation with these or any other published system of subdividing drainage areas. ADAs are drawn specifically so as to facilitate discussion in the present context. Each ADA is defined by a "main stem" with a characteristic biotic community. The lower limit of each ADA is defined by a point on the main stem below which the biotic community changes and/or the effect of actions on the National Forest portion of the watershed becomes insignificant or highly diluted. In each case this point was defined by one or more of the following factors:

- Point below which "imperiled" species (defined below) are not known to occur with any regularity
- Confluence with a larger stream with different biotic characteristics
- Confluence of a tributary stream large and/or distinctive enough to profoundly alter the biotic community of the main stem.
- Interruption by a reservoir lake (in some cases small reservoirs may be included in the ADA)
- Entry of a known major pollution source

As further refinements, some ADAs are defined so as to "break out" significantly different tributaries. For example, the South Toe River is treated as a separate entity (ADA 39) within the Nolichucky River watershed. Still other watersheds are divided in the middle of the main stem. The clearest example is the Pigeon River (ADAs 35 and 36), which is markedly different above and below a major pollution source (Champion Paper) in Canton, NC.

Some important streams which clearly fit into the geographic area treated are not considered because no portion of their watersheds occurs within the National Forest system lands or purchase boundaries. The largest examples, all from Tennessee, are the Little River (in this case the Little River which drains into the Tennessee River at Maryville, Tennessee – there are at least 5 Little Rivers in the report area), the Emory River and the Sequatchie River. Many smaller streams are omitted for the same reason. Since this report demonstrates that the conservation of the southeastern aquatic fauna will not be achieved by focusing exclusively or even primarily on the National Forests, it is clear that these and other streams must be considered in efforts to follow.

Selection of biodiversity "targets" sometimes focuses on single imperiled species. In some instances, this can be effective. (An example from just outside the area of this report is provided by the pygmy sculpin (*Cottus pygmaeus*), which inhabits a single coldwater spring, within a small watershed, in the Coosa Basin of Alabama.) More often, a single species focus is either shown to be ineffectual or involves protecting large areas of habitat used by many other species. Or conservation advocates may apply the "more bang for the buck" approach by selecting sites notable for sheer diversity, expressed as high number of species. This approach makes an implicit and incorrect value judgement of Nature by favoring places with high numbers of common and exotic species, or otherwise selecting against systems which may be intact and perfectly functional, but naturally relatively less diverse.

In prioritizing sites for this report, I have tried not to make value judgements based on species diversity, even though some of the biotic communities of Southern Appalachian watersheds in their natural condition are extremely diverse. (This is equally true for the major drainage basins. Consider that while 147 species of fish have been recorded for the Tennessee River basin above the mouth of the Sequatchie River, all of which is covered in this report, the neighboring Apalachicola Basin, only a fraction of which falls into the report area, and which includes a coastal plain component lacking from the Tennessee, is home to just 99 native species.) The task of prioritizing ADAs is facilitated by using two preliminary methods which, taken together, tend to combine protection of the greatest number of species, particularly imperiled forms, with protection of a diversity of intact, functional aquatic ecosystems.

Priority ADAs

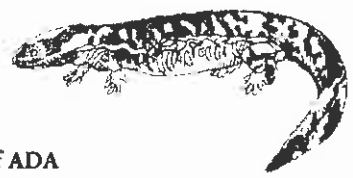
The first approach taken in prioritizing sites focuses on 28 ADAs with watershed areas of 200 square miles or more. From these, 15 are suggested as "Priority ADAs". The primary criterion for selection of the priority ADAs is a high number of imperiled species. (See following section for working definition of "imperiled species".) This list is adjusted for natural levels of diversity by including the best examples from each of the 4 major drainage basins represented (Tennessee, Atlantic, eastern Gulf and Ohio). A second criteria for selection of priority ADAs is the presence of a significant amount of area within national forest purchase boundaries. Actual Forest Service ownership was also taken into account.

Critical Refugia

A second selection of sites, termed Critical Refugia, was made by focusing primarily on integrity of ecosystems. Diversity or presence of imperiled species was also a criteria for selection of these watersheds. These Critical Refugia are also located on watersheds satisfying one of the following criteria: (1) a relatively high percentage of land in Forest Service ownership, particularly along stream reaches, or (2) a high percentage of land within Forest Service purchase boundaries. In this selection, all watersheds draining more than 4 square miles were potential candidates, and some of the sites are selected from the 15 original ADAs with watershed areas of less than 200 sq. mi. Most of the Critical Refugia represent small watersheds, but a few of the large ADAs qualify under these criteria. When available, Index of Biotic Integrity (IBI) scores were used as the primary determining factor for inclusion in this selection. Only sites receiving IBI scores of 54 or higher (Bioclass Good-Excellent) were considered. A limitation on this approach is that outside of the Tennessee Basin watersheds (where TVA maintains a regular biomonitoring program), IBI data are available only for North Carolina streams. For Alabama, South Carolina, Kentucky and the non-Tennessee Basin watersheds of Georgia and Virginia, more subjective criteria were used. Streams from these areas were selected based on lack of evidence that extirpations had occurred in modern times, evidence of little disturbance in the watershed, clues provided by other water quality indicators (macroinvertebrate monitoring, persistence of imperiled or known intolerant species, Outstanding Resource Water and similar designations) and recommendations by individuals familiar with the various watersheds.

For each of the sites selected in both categories, information is provided on the relation of the biotic community to the National Forests. Briefer descriptions of non-priority ADAs are also provided. A final section outlines very brief and general conclusions, with a few suggestions for conservation objectives and strategies. In this section a few special cases are discussed.

TABLE 1: Drainage Basins (UPPER CASE), Watershed Units (lower case), and tributary streams (in parentheses) of the Southern Appalachian National Forests. For each drainage basin, components are arranged roughly in ascending order.



	Lower Limit of ADA
ATLANTIC OCEAN	
01 JAMES RIVER	
James R.	Goochland County
46 (Craig Cr.) (with Johns Creek)	
(Maury R.)	
(Jackson R.)	
(Cowpasture R.)	
(Pedlar R.)	
SANTEE/COOPER RIVERS	
02 Catawba R.	L. James
(Johns R.)	
(Linville R.)	
(Warrior Fork)	
SAVANNAH RIVER	
03 Tugaloo River	L. Tugaloo
(Chattooga R. – east)	
(Tallulah R.)	
04 Seneca River - Lakes Hartwell & Jocassee	L. Hartwell or L. Jocassee
(Chauga R.)	(per individual tributary)
(Ramsey Cr.)	
(Toccoa Cr.)	
(Horsepasture R.)	
(Keowee R.)	
(Whitewater R.)	
05 Broad River	Chattahoochee National Forest boundary
EASTERN GULF OF MEXICO	
APALACHICOLA RIVER	
06 Chattahoochee River	L. Lanier
(Chestatee R.)	
(Soquee R.)	
(Chickamauga Cr. – south)	
MOBILE BAY	
COOSA/ALABAMA RIVER	
07 Chattooga River (west)	Weiss L.
08 Oostanaula River	mouth at Coosa R.
09 Conasauga River	mouth at Oostanaula R.
10 Coosawattee River	mouth at Oostanaula R.
(Cartecay R.)	
(Ellijay R.)	
11 Etowah River	Allatoona L.
12 Tallapoosa R.	Martin L.
(Turner R.)	
13 Choccolocco Cr.	mouth at Coosa R.
(Shoal Cr.)	
(Cheaha Cr.)	
(Clearwater Spring Run)	
14 Small Coosa R. tributaries	mouths at Coosa R.
(S. Terrapin Cr.)	
(Little R.)	
44 Sipsey Fork, Black Warrior River	
TENNESSEE RIVER	
15 Chickamauga Creek – north	Chickamauga L.
16 lower Hiwassee River	mouth of Ocoee R.
(Childers Cr.)	
17 Ocoee River	mouth at Hiwassee R.
18 Toccoa River	Tennessee state line
(Suches Cr.)	
19 Nottely River	Hiwassee L.
Valley River	Hiwassee L.
(Vengeance Cr.)	
20 Upper Hiwassee River	Appalachia dam
(Brasstown Cr.)	

22 Powell River	Norris L.
23 Clinch River	Norris L.
(Copper Cr.)	
(Little R.)	
(lower Little Tennessee River reservoirs[1])	
24 Tellico River	Tellico L.
25 Citico Creek	Tellico L.
26 Other lower Little Tennessee River reservoir tributaries	Calderwood, Cheoah &n Fontana Lakes (per individual tributary)
(Slickrock Cr.)	
(Abrams Cr.)	
(Cheoah R.)	
(Nantahala R.)	
(Alarka Cr.)	
27 Middle Little Tennessee River	Fontana L.
(Cowee Cr.)	
28 Tuckaseigee River	Fontana L.
29 Upper Little Tennessee River	L. Emory
(Cullasaja R.)	
(Cartoogechaye Cr.)	
(Betry Cr.)	
30 Holston River	Cherokee L.
31 North Fork Holston River	Kingsport, Tennessee
(Big Moccasin Cr.)	
(Little Cr.)	
32 South Fork Holston River	S. Holston L. &
(Middle Fork Holston R.)	NF boundary
(Possum Cr.)	downstream
(Thomas Cr.)	
33 Watauga River	Watauga L.
34 lower French Broad River	Douglas L.
(Ivy R.)	
(Swannanoa R.)	
(Spring Cr.)	
35 lower Pigeon River	mouth at French Broad R.
(Cataloochee Cr.)	
36 upper Pigeon River	Canton, North Carolina
37 upper French Broad River	Asheville, North Carolina
(Mills R.)	
(Little R.)	
(Davidson R.)	
38 Nolichucky River	Douglas L.
(Cane R.)	
(N. Toe R.)	
(Chucky Cr.)	
39 South Toe River	mouth at N. Toe R.
OHIO RIVER	
CUMBERLAND RIVER	
40 Poor Fork Cumberland River	Jefferson NF boundary??
Bad Branch	
KENTUCKY RIVER	
41 North Fork Kentucky River	Jefferson NF boundary
BIG SANDY RIVER	
42 Russell Fork	Jefferson NF boundary
(Pound R.)	
(Elkhorn Cr.)	
(Levisa Fork)	
NEW RIVER	
43 New River	West Virginia state line
(Bluestone R.)	
(Little R. – New)	
(N. Fork New R.)	
(S. Fork New R.)	

[1] Since the entire lower Little Tennessee River, from Fontana Reservoir to the junction with the Tennessee River has been converted to a continuous string of reservoir lakes, this portion of the mainstem is not considered as an ADA. However, tributaries to this reach merit consideration. Because of its particular importance to biodiversity conservation, Citico Creek is assigned its own ADA number (25). The other tributaries are taken together as ADA 26.

Imperiled Species And Their Distribution

This section is not intended to take issue with any experts who have attempted to catalog the degree of endangerment of various taxa, to propose any sort of alternative system, or to add still more categories and jargon to an already confusing panorama. My working definition of "imperiled" was adopted for the sole purpose of providing a framework for discussion of how to prioritize aquatic conservation targets in the Southern Appalachian National Forest areas; it is my fervent hope that it will not survive this paper. The practical goal is to include a number of taxa adequate to clearly differentiate among the watershed units (or ADAs) without creating massive, unwieldy and ultimately confusing lists. For this purpose, three groups of organisms were selected:

Fish are the best studied group of aquatic organisms in the region and exhibit a wide range of tolerances, habitat preferences and distribution patterns.

Crayfish could be included if there were no references other than the monumental work of Hobbs (1989). While crayfish are on the whole less sensitive to environmental perturbations than fish, there is a more pronounced tendency to endemism.

Unionid and margaritiferid mussels are an unusually diverse group in the southeastern U.S. and exhibit an unusually high degree of imperilment here as elsewhere. In addition, the mussel fauna of southern waters is relatively well studied.

Other groups of organisms were considered for inclusion in this assessment, but rejected. The following comments will serve to illustrate the rationales employed:

Insects: Although only a handful of aquatic insects are officially listed as such, a number are recognized as imperiled. However, data on their populations are not available for much of the region. (A notable exception is work done to identify high quality waters by the North Carolina Department of Water Quality, which uses benthic macroinvertebrate data to classify sites having "Excellent" or "Good" water quality, using benthos data. We have used these data where available to nominate Critical Refugia.)

Salamanders: The fame of the southeast as the "salamander capitol of the world" notwithstanding, most of the imperiled salamanders of the region are terrestrial; however, a few notable exceptions exist and are noted in the narrative below (under their respective Critical Refuge).

Gastropods (snails) are probably the next "hot" group for biodiversity studies. The southeast has lost four known genera of aquatic snails—this is significant because, although many *species* have been lost to various groups, no other group of aquatic organisms has lost a series of *genera.* It is sobering to consider what may have been lost before it could even be described by science. At present, the data are still too spotty to justify inclusion in this effort; however, future iterations of this paper may include them. In some cases (notably Choccolocco Creek in the Coosa watershed), presence of imperiled snails was used as one reason for nominating a priority ADA.

"Imperiled" species of fish, crayfish and molluscs (see Table 2) were selected for inclusion in this analysis based on the following criteria:

- Official recognition by the U.S. Fish and Wildlife Service or (in the case of fish) the American Fisheries

Society: Fish were included only if listed as "Endangered". For mussels, "Threatened" and "Candidate" species were also included. This decision reflects the need to limit what could have been an unwieldy number of fishes, but also reflects the general belief that "Many mussel species are more depleted than federal lists indicate." (Neves, et al., 1997). (A rapid review of the USFWS and AFS lists for Threatened, Special Concern and Candidate species indicates that their exclusion was justified.) State listings were not considered for any group, because the emphasis was regional, and because frequent state listing of "peripheral" species would have created a significant amount of "noise."

- Global ranking by The Nature Conservancy (TNC). All forms ranked as G1 (globally imperiled) were included.

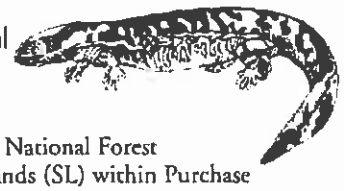
- Results of the November, 1997 SAFC/TNC experts' meeting at Valle Crucis, NC. All forms which made the experts' "A" list for conservation targets for the Southern Blue Ridge ecoregion were included.

- Endemism: All forms endemic to a particular ADA or other small component were included. "Small component" was not defined, but depended on the author's judgement. Exceptions were made for some of the endemic fauna of the New River watershed (ADA 43). Of 6 New River endemic fishes, 4 are largely restricted to the upper portion of the watershed in North Carolina and southernmost Virginia, where there is no National Forest land. They thus fall outside the report area. The same applies to the crayfish Cambarus chasmodactylus, a New River endemic widely distributed throughout the watershed.

- Undescribed forms were given the benefit of the doubt as probable new, rare taxa with limited distributions.

The final list of imperiled aquatic fauna comes to 51 fishes, 14 crayfish and 43 mussels, for a total of 108 forms. They are listed in Table 2, together with the criteria for their inclusion and the ADAs in which they are found. Table 3 shows the number of forms within each group which occur in the 43 ADAs defined.

TABLE 2: Imperiled fish, crayfish and mussels of the Southern Appalachian National Forests and their watersheds.



Taxon	Criteria for inclusion	ADAs	Found on National Forest System Lands (SL) within Purchase Boundaries (PB) or off the Forests (X)
Fish:			
Acipenser fulvescens	LE, A	30,34	X
Clinostomus funduloides sp.	En, Und	24, 25,26,27,28,29	X,PB,SL
Cyprinella caeruleas	A, LT	08,09,10,13,14	X, PB, SL
Cyprinella monacha	A, LT	27,30,31,32	PB, X
Erimystax cahni	En	22,23	X
Etheostoma acuticeps	X	22,23,32,38	X,PB
*Etheostoma bellator****	En	44A	SL
Etheostoma brevirostrum	A, En	09,13	X,PB,SL
Etheostoma chuckwachattae	G2	12	X
Etheostoma coosae	En	07,08,09,10,11,13,14	X,PB,SL
Etheostoma ditrema	A,G1,En	07,09,13,14	X,PB,SL
Etheostoma etowahae	G1,En	11	X
Etheostoma longimanum	En	01	X,PB,SL

Ethostoma osburni	En	43	X,PB
Etheostoma percnurum	LE,A,G1	23,25	X,SL
Etheostoma sagitta	En	40	X,PB,SL
Etheostoma scotti	En	11	X
Etheostoma stigmaeum meadei	En	22,23	X,PB,SL
Etheostoma trisella	G1,En	09,14	X,PB,SL
*Etheostoma sp.2***	Und	44A	SL
*Etheostoma sp. 3****	En, Und	44A	SL
Undescribed darter A	En, Und	11	X
Undescribed darter B	En, Und	11	X
Sicklefin redhorse	A,G1,Und	16,20,21,27	X,PB
Notropis albizonatus	LE,En	Paint Rock R, AL	X
Notropis bellus alegnotis	En	44B	SL
Cyprinella gibbsi	En	12	X,PB,SL
Notropis semperasper	En	01	X,PB,SL
Notropis xaenocephalus	En	07,08,09,10,11,12,13,14	X,PB,SL
Noturus baileyi	LE,A,G1	25	SL
Noturus flavipinnis	A,G1	22,23,25	X,PB,SL
Noturus munitus	En	09,11	X,PB,SL
Noturus stanauli	LE, En	23	X
Percina antesella	LE	09	PB,SL
Percina aurolineata	LE	10	?
Percina burtoni	A	16?,23,30,31,32,38,39	X,PB,SL
Percina gymnocephala	En	43	X,PB
Percina jenkinsi	A,G1,En, LE	09	PB,SL
Percina macrocephala	A	22,23,31,32,33	X,PB,SL
Percina palmaris	En	09,11,12,13,14	X,PB,SL
Percina squamata	A	16?,20,21?,23,27,28,29 30,32,33,34,35,37,38,39	X,PB,SL
Percina tanasi	En, LT	16,30	X,PB,SL
*Percina sp.****	Und	44A	SL
Bridled or muscadine darter	A,En,Und	09	PB,SL
Phoxinus cumberlandensis	En	40	PB, SL
Phoxinus tennesseensis	A	16,17,21,23.30, 31,32,33,35,38	X,PB,SL
Cottus baileyi/smokey sculpin	En,Und	22,23,31,32	X,PB,SL
Bluestone sculpin	En,Und	43	X,PB
Holston sculpin	En,Und	32	X.PB,SL
Clinch sculpin	En, Und	23	X
Tallapoosa sculpin	En, Und	12	X,PB?,SL?

Crayfish

Cambarus cymatilus	En	09	X
Cambarus englishi	En	12	X,PB
Cambarus halli	En	12	X,PB
Cambarus coosawattae	En	10	X
Cambarus fasciatus	En	11	X,PB,SL
Cambarus manningi	En	07,08,09,10,11,12,13,14?	X,PB,SL
*Cambarus obstipus*****	En	45, 44A?, 44B?**	X, PB?, SL?
Cambarus speciosus	En	10	X
Cambarus conasaugensis	En	09,10,11,16	X,PB,SL
Cambarus chaugaensis	En	03,04	X,PB,SL
Cambarus georgiae	A,G1,En,C	27,28	PB
Cambarus hiwasseensis	En	21	X,PB,SL
Cambarus parrishi	A,G1,En	21	X,PB
Cambarus reburrus	En?	04,34,37	X,PB

Mussels:

Alasmidonta raveneliana	A,G1,LE	27,28,38,39	X,PB,SL
Cumberlandia monodonta	C	22,23,38	X
Cyprogenia stegaria	LE,En?	22,23	X
Dromus dromas	LE	16,22,23	X,PB,SL
Epioblasma brevidens	LE	22,23	X,PB,SL

Epioblasma capsaeformis	LE	16,22,23,31,38	X
Epioblasma florentina walkeri	A,G1,LE	16,23,32	X,PB,SL
*Epioblasma metastriata**	LE,En	09,11	X
*Epioblasma othcaloogensis**	LE,En	09,11	X,PB,SL
E. torulosa gubernaculum	LE,En	23	X
Fusconaia barnesiana	A	16,22,23,27,28,31,32,33	X,PB
Fusconaia cor	LE	22,23,31	X,PB,SL
Fusconaia cuneolus	LE	22,23,31	X
Hemistena lata	LE	22,23	X
Lampsilis abrupta	LE	23	X
Lampsilis altilis	A,LT,En	09,11,12,13	X,PB,SL
Lampsilis perovalus	LT	44A, 44B, 45	X,PB,SL
Lasmigona subviridis	A	33,43	X,PB,SL
Lasmigona holstonia	C	11,13,14,16,23,31,32	X,PB,SL
Lemiox rimosus	LE	22,23,31	X
Lexingtonia dolabelloides	A,C	16,22,23,31,32	X,PB,SL
Medionidus acutissumus	LT	9,11,13,44A,44B,45	X,PB,SL
Medionidus parvulus	A,G1,LE	09,11	X,PB,SL
Pegias fabula	A,G1,LE	23,27,31,32	X,PB
Pleurobema collina	LE,En	01	X,PB,SL
Pleurobema decisum	LE,En	09,11,14	X
Pleurobema furvum	LE, En	44A, 44B,	SL
Pleurobema georgianum	A,G1	09,11,13	X,PB,SL
Pleurobema oviforme	A,C	16,22,23,31,32	X
Pleurobema perovatum	LE,En	11	X
Pleurobema plenum	LE	23	X
*Pleurobema rubellum**	C	11	X
Pleurobema rubrum	C	23	X
Ptychobranchus greeni	LE,En	07,09,11,44A,44B	X
Quadrula cylindrica strigillata	LE	22,23	X
Quadrula intermedia	LE	22,23	X
Quadrula sparsa	LE	22,23	X
Strophitus subvexus	G2	44A, 44B	X,PB,SL
Toxolasma lividus	C	23,24,31	X,PB
Villosa nebulosa	En	09	X,PB,SL
Villosa perpurpurea	LE,En	23	X
Villosa trabalis	A,G1,LE	16,23	X
Villosa vanuxemensis umbrans	En	13	PB,SL

- A - SAFC/TNC Conservation Target Species (see References Cited)
- C – Candidate for listing
- En – Endemic
- G1 – Critically imperiled (TNC)
- G2 – Imperiled (TNC)
- LE – Listed endangered
- LT – Listed threatened
- X – Not formally listed but probably will be, was considered to be extinct until its rediscovery in 1975
- Und – Undescribed form

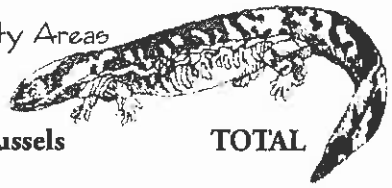
* This species may be extinct; no recent collections known.

** 44A indicates Sipsey Fork watershed above area impounded by Lewis Smith Lake
44B indicates Brushy Creek watershed

*** Complete information was not available for several darter species occurring in Alabama. What is certain is that there is one described endemic (*Etheostoma bellator*), 2 undescribed *Etheostoma* spp. (one of which appears to be endemic to the Bankhead NF), and one undescribed *Percina* sp., which appears to have an endemic subspecies.

**** Distribution information on *Cambarus obstipus* is fragmentary. It is endemic to the Black Warrior system and definitely occurs downstream of Lewis Smith Lake. Occurrence upstream (in ADA 44) is likely, but not confirmed for this report.

TABLE 3: Known occurrences of 108 imperiled species in 44 Aquatic Diversity Areas (ADAs)* draining the Southern Appalachian National Forests



ADA	Fish	Crayfish	Mussels	TOTAL
ATLANTIC DRAINAGES				
01 Craig / Johns Creeks	2	0	1	3
02 Catawba River*	0	0	0	0
03 Tugaloo River*	0	1	0	1
04 Seneca River	0	2	0	2
05 Broad River	0	0	0	0
EASTERN GULF OF MEXICO DRAINAGES				
06 Chattahoochee River*	0	0	0	0
07 Chattooga River – west	3	1	1	5
08 Oostanaula River*	3	1	0	4
09 Conasauga River*	11	3	10	24
10 Coosawattee River*	4	4	0	8
11 Etowah River*	8	3	11	22
12 Tallapoosa River*	4	3	1	8
13 Choccolocco Creek	5	1	5	11
14 small Coosa River tributaries	6	1	2	9
44 Sipsey Fork / Brushy Creek	5	1	4	10
TENNESSEE RIVER DRAINAGES				
15 Chickamauga Creek (north)	0	0	0	0
16 lower Hiwassee River*	4	1	8	13
17 Ocoee River*	1	0	0	1
18 Toccoa River	0	0	0	0
19 Nottely River*	0	0	0	0
20 Valley River	2	0	0	2
21 upper Hiwassee River*	3	2	0	5
22 Powell River*	7	0	15	22
23 Clinch River*	13	0	25	38
24 Tellico River*	1	0	1	1
25 Citico Creek	4	0	0	4
26 tributaries to Little Tennessee River reservoirs	1	0	0	1
27 Tuckasegee River*	2	1	2	5
28 middle Little Tennessee River	4	1	3	8
29 upper Little Tennessee River*	2	1	0	3
30 Holston River*	7	0	0	7
31 N. Fork Holston River*	6	0	10	16
32 S. Fork Holston River*	8	0	6	14
33 Watauga River*	3	0	2	5
34 lower French Broad River*	2	1	0	3
35 lower Pigeon River*	2	0	0	2
36 upper Pigeon River	0	0	0	0
37 upper French Broad River*	1	1	0	2
38 Nolichucky River*	4	0	3	7
39 South Toe River	2	0	1	3
OHIO RIVER DRAINAGES				
40 Poor Fork Cumberland River	2	0	0	2
41 N. Fork Kentucky River	0	0	0	0
42 Russell Fork	0	0	0	0
43 New River*	3	0	1	4

*Indicates 28 large ADAs (defined as having a drainage area of 200 sq. mi. or more).

Of the 44 ADAs, 15 have been selected as priority areas for conservation of aquatic biodiversity, including at least one example from each of the 4 major drainage basins represented, as shown below:

Atlantic drainages (1 ADA): Most of the watersheds draining the eastern slope of the Southern Appalachians have very small mountain components, compared with their west slope counterparts. A conspicuous exception is the James River (whose tributaries, Craig Creek and Johns Creek form ADA 01), which in addition to being the only Atlantic slope river represented in the Ridge and Valley Biogeographic Province, also has a significant extension in the Blue Ridge. It is thus not surprising that although the James watershed fauna is not the most diverse among the Atlantic drainages from Virginia south, it harbors more upland species. Craig Creek and Johns Creek contain at least 3 imperiled species not protectable elsewhere.

Eastern Gulf of Mexico drainages (6 ADAs)[2] : Of the two Gulf drainages east of the Mississippi which have headwaters in the Southern Appalachians, the Apalichicola River watershed is characterized by relatively low natural diversity, while the diversity of the Mobile Bay drainages, including the Coosa River, is unusually high (e.g., 99 vs. 144 native fish species). The Coosa River fauna was seriously depleted when the entire main stem in Alabama was converted to a chain of reservoir lakes. Neves et al. (1997) argue that "the Coosa River and its major tributaries . . . may hold the dubious distinction of having more recent extirpations and extinctions of aquatic organisms than any other equally-sized river in the United States." Considered in this light, virtually all the upper Coosa tributary systems in Alabama, Georgia and Tennessee deserve attention as conservation priorities. In Table 3, the Conasauga River (ADA 09) and Etowah River (ADA 11) stand out as having unusually high numbers of imperiled taxa. Addition to the list of the Coosawattee River (ADA 10), the Tallapoosa River (ADA 12), and Choccolocco Creek (ADA 13) adds four crayfish, one mussel and one fish to the list of imperiled fauna of the upper Coosa basin.

Most of the Mobile Bay drainage portion of the Bankhead NF is contained within the watershed of the Sipsey Fork of the Black Warrior (not to be confused with the Sipsey River, which arises about 5 miles west of the southwest corner of the Bankhead NF and eventually also finds its way to Mobile Bay via the Black Warrior – Tombigbee drainage). A significant portion of the biodiversity of the Sipsey Fork was undoubtedly lost with the construction of Lewis Smith Lake, which impounds nearly half of the mainstem within the purchase boundaries (plus a large area downstream). The head of impoundment of Lewis Smith Lake corresponds roughly with the greatest concentration of system lands in the Bankhead NF, and both the ca. 40 sq. mi. Sipsey Wilderness and the Sipsey Fork/West Fork Wild and Scenic River Corridor are located entirely above this point.

One major tributary to the impounded portion of the Sipsey Fork, Brushy Creek, also contains a high percentage of system lands in its watershed. For purposes of this discussion, the contiguous watersheds of Brushy Creek and the Sipsey Fork above the impounded area are treated as ADA 44, while the rest of the area draining into the Sipsey Fork upstream of the southern National Forest boundary is designated ADA 45. There are also two minor watershed areas within the purchase boundary which drain, respectively, into the East Fork at Lewis Smith Lake and the Sipsey Fork downstream of the dam. Neither appears to be significant in the context of this effort, and they are not discussed here.

Tennessee River drainages (7 ADAs): The extraordinary diversity of the Clinch and Powell River watersheds (ADAs 22 and 23, respectively) is immediately apparent from inspection of Table 2. While no species currently known from the Powell are missing from the Clinch, it is customary to speak of the two rivers as one system (the Clinch-Powell). In view of this fact, and also because of the extreme rarity of some of the mussel species in the Clinch-Powell, both ADAs are listed as priorities. A similar logic applies to the inclusion of the somewhat less diverse North Fork Holston and South Fork Holston Rivers (ADAs 31 and 32, respectively). If it were necessary to strictly prioritize, these two could be eliminated in favor of the Clinch-Powell, but for now they are included on the basis of high numbers of imperiled species.

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[2]The Bankhead National Forest in Alabama straddles the divide between 2 of the 10 river basins covered in this report (Mobile Bay and Tennessee River). Approximately 95% of the area within the purchase boundary (all but the northern extreme) drains toward the Gulf of Mexico (Mobile Bay) via the Black Warrior River. The portion of the Bankhead NF within the Tennessee River basin is drained by small headwater streams and does not appear to contain any fauna of special conservation interest within the three groups considered in this report (fish, crayfish and mussels). Therefore, it will not be discussed further here.

At first glance, this would seem to cover the Tennessee River drainages. However, all 4 of the rivers mentioned flow from Virginia into Tennessee and have their drainages largely in the Ridge and Valley Province. There is a distinctive, if somewhat less diverse, Blue Ridge fauna in the upper Tennessee River drainage. (Note the absence of crayfishes from the imperiled species counts for the Ridge and Valley watersheds.) To include it, it is necessary to take into consideration those rivers which flow into the east bank of the Tennessee River and/or drain southeastern Tennessee, western North Carolina and north Georgia. In this area, the highest numbers of imperiled species are found in the lower Hiwassee River, middle Little Tennessee River and Nolichucky River watersheds (ADAs 16, 27 and 38, respectively), and these are designated as priorities.

Ohio River drainages (1 ADA): The Cumberland and Kentucky River drainages have important faunas worthy of protection, but here I have only considered those areas of these Ohio River watersheds (plus the Russell Fork) which are within or in proximity to the Jefferson National Forest. (An adequate review of the fauna of the state of Kentucky might lead to revision of this section, but the information was not available in time for this assessment.)

If it were possible to adequately protect these 15 ADAs, 96 of the 108 species in Table 2 would be protected in at least one watershed, including all of the mussels. (Note that 38 imperiled species are listed for a single ADA, the Clinch River.) The exceptions are:

Acipenser fulvescens (lake sturgeon), known from the Holston River (ADA 30) and lower French Broad River (ADA 34) is a special case. Once fairly widespread in the Southern Appalachian Rivers, it has been depleted by a variety of factors, not the least being the construction of dams. If the metapopulation of this species is to be preserved, the task will be accomplished on the mainstems of the larger rivers. Protection of watersheds in the mountains and the National Forests will be a minor factor.

Etheostoma sagitta sagitta (arrow darter), suggests the need for a fuller review of the 3 watersheds downstream from the Jefferson National Forest in the state of Kentucky. It is here listed only from the Poor Fork of the Cumberland River in Kentucky (ADA 40), but is also known (as a subspecies, *E. sagitta spilotum*) from the Kentucky River watershed downstream of our area. (Poor Fork is suggested for protection here under Critical Refugia.)

Noturus baileyi (smoky madtom), is not known from any mainstem rivers, and is presently known from only one site, Citico Creek (ADA 25). Citico Creek is proposed for protection under Critical Refugia.

Cambarus chaugaensis (Oconee stream crayfish), inhabits the upper Savannah River basin, including portions of the Chattooga, Chauga, Keowee and Whitewater watersheds (ADAs 03 and 04). It is the only form here listed as imperiled which is known to inhabit the Chattooga and Chauga, both of which are here proposed as Critical Refugia.

Cambarus hiwasseensis (Hiwassee crayfish) and *Cambarus parrishi* (Hiwassee headwaters crayfish) are both endemic to the upper Hiwassee River watershed (ADA 21). If the entire Hiwassee River watershed were considered as one unit, they would be "protected." Neither species is primarily a main stem inhabitant, and alternatives for their protection are discussed under Critical Refugia.

Cambarus reburrus (French Broad crayfish) has an odd disjunct distribution. It is known from the type locality in a small tributary to the Horsepasture River (ADA 04), where it is suspected of having been introduced. All other populations are from tributaries to the French Broad River (ADAs 34 and 37). The type locality is entirely off National Forest land, though within the purchase boundaries of the Pisgah NF. Virtually the entirety of the rest of the range of this species falls outside the purchase boundary. The northern limit of its range is reported as "the vicinity of Hot Springs, Madison County" (NC), which raises the probability that it occurs barely within the Pisgah NF purchase boundary, and the possibility of finding it on system lands. If *C. reburrus* were to be found in Spring Creek, tributary to the French Broad at Hot Springs, it might be prudent to propose Spring Creek as a Critical Refuge.

Etheostoma osburni (candy darter), the *Cottus* sp. bluestone sculpin, and *Percina gymnocephala* (Appalachia darter), which occur in the New River (ADA 43). The mussel *Lasmigona Subvividis*, or green floater, occurs in the New River, as well as the Watauga River.

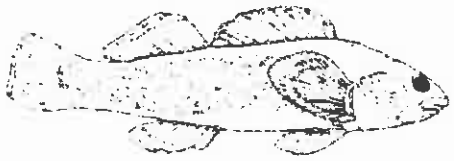
Phoxinus cumberlandensis (blackside dace) occurs in Poor Fork of the Cumberland River (ADA 40).

As for fishes listed at a lower level than Endangered, all are found in at least one of the priority ADAs, with two marginal exceptions:

Cyprinella calitaenia, the bluestripe shiner, listed as a Candidate 2 species by the USFWS and as Threatened by the AFS, is an Apalachicola-Flint watershed endemic which has been recorded from the Chattahoochee River, Georgia, upstream of Lake Lanier (ADA 06). However, the great majority of the range of this species is downstream of Lake Lanier and in the Flint River watershed, which does not extend into the report area.

There is one record of the robust redhorse (*Moxostoma robustum*) which appears to be from the Linville River, North Carolina, in the Catawba River watershed (ADA 02), and this species may have been able to survive impoundment of Lake James. However, it is essentially a Piedmont and coastal plain species, found below Lake James in the Catawba system. Listing is as for the bluestripe shiner.

In the same context, mention should perhaps be made of *Cambarus howardi* (Chattahoochee crayfish), which may ultimately be considered a Chattahoochee watershed (ADA 06) endemic. However, as in the case of the two fishes mentioned above, it is found far down the Chattahoochee system, below Lake Lanier and the city of Atlanta. In addition, its taxonomy is unclear. Possible conspecific forms are reported from various watersheds on both slopes of the Appalachians from Virginia to Alabama.



RELATION OF ADAs TO THE NATIONAL FOREST SYSTEM

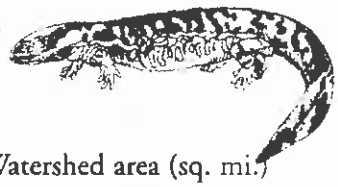
Before revision of the Forest Plans or other actions involving the National Forests and the Forest Service can be properly considered as part of the larger goal of conserving Southern Appalachian aquatic biodiversity, there is one other aspect which must be considered before each of the ADAs can be given its proper priority: What is the relation of each ADA and its imperiled species to the National Forests?

While the information in the last column of Table 4 is subject to considerable inaccuracy, since much of it is interpolated from maps at a scale larger than appropriate for this work, it makes the point that aquatic biodiversity in the Southern Appalachian region is not going to be protected by focusing mainly on the National Forests. Only one of the 95 imperiled species (*Noturus baileyi*) is found exclusively within the National Forest system (Citico Creek, ADA 25, Cherokee NF) – and it is being reintroduced to Abrams Creek in the Great Smoky Mountains National Park. *Cambarus georgiae*, endemic to the Little Tennessee River above Fontana Reservoir, occurs exclusively within the purchase boundaries (Nantahala NF, ADAs 27 and 29). The same may be true of 3 of the endemic darters of the Conasauga River (ADA 09, Cherokee and Chattahoochee NFs) and the mussel *Villosa vanuxemensis* of Choccolocco Creek (ADA 13, Talladega NF). However, for none of the latter 4 species is the downstream range limit known with precision and they may well occur outside the purchase boundaries.

Thirty-four of the imperiled species, including 21 of 40 mussels, apparently do not occur anywhere within the national forest purchase boundaries. However, since national forest lands are generally upstream of this habitat, all 108 imperiled species, in common with all aquatic species inhabiting the 44 ADAs, are influenced, for better or for worse, by land management decisions and actions on the national forests. Nevertheless, in the present context there may be an argument for assigning higher priorities to those species which maintain significant populations within the national forest system or purchase boundaries.

There is also an argument for assigning a higher priority to ADAs where the National Forest has the greatest potential influence, as measured by watershed areas or stream miles within the system and purchase boundaries. Tables 4 and 5 are intended to enrich this discussion. For each of the 13 large priority ADAs , Table 4 quantifies the proportion of National Forest land in terms of watershed area and stream miles. Table 5 shows selected portions of this data in percentage form.

TABLE 4: Watershed areas and stream miles in and out of the National Forests for 13 large Priority ADAs selected (selected tributaries and subdivisions included as appropriate). Bank length is double stream length, e.g. the sum of the two banks.



ADA	States and National Forests	Bank length (miles) Within ADA	Within NF System	Within Purchase Boundary	Watershed area (sq. mi.) Within ADA	Within NF System	Within Purchase Boundary
09 Conasauga R.	TN/Che, GA/Cha	138	34	50	470	90	140
upper GA portion		24	18	24	80	75	80
TN portion		38	8	26	45	15	30
Lower GA portion		76	2	8	345	0	210
10 Coosawattee R.	GA/Cha	36	0	0	537	70	274
Cartecay R.		38	0	30	80	15	50
11 R.	GA/Cha	70	0	0	1,600	240	310
12 Tallapoosa R.	AL/T, GA/Cha	270	0	0	1,700	40	155
to R.L. Harris L.		110	0	0	600	40	120
13 Choccolocco Cr.	AL/T	100	6	8	507	120	150
16 lower Hiwassee R.	TN/Che, NC/N	72	38	45	360	90	220
plus upper Hiwassee River (ADA 21)		226	97	200	1,200	520	760
22 Powell R.	VA/J, TN	400	4	10	950	30	140
23 Clinch R.	VA/J, TN	400	0	5	1,960	100	210
Copper Cr.	VA	160	0	0	0	0	0
Little R.	VA	180	0	0	0	0	0
28/29middle Little Tennessee R.	NC/N	50	0	50	693	120	693
plus upper Little Tennessee R.	NC/N, GA/Cha	112	0	112	690	120	690
31 N. Fork Holston R.	VA/J, TN	250	0	3	730	60	280
Big Moccasin Cr.	VA	80	0	0	100	0	0
32. S. Fork Holston R.	VA/J, TN	74	9	18	530	190	290
Middle Fork Holston R.	VA/J	112	0	0	244	20	30
38 Nolichucky R.	TN/Che, NC/P	186	20	49	1,750	270	710
44 44A and 44B combined	AL/B	96	82 (85%)	96 (100%)	289	216 (75%)	284 (98%)
44A Sipsey Fork above Lewis Smith Lake		34	24 (71%)	34 (100%)	154	124 (81%)	153 (99%)
44B Brushy Creek		62	58 (94%)	62 (100%)	135	92 (68%)	131(97%)
46 Craig Cr / Johns Cr.	VA/J	80	20	76	350	180	330

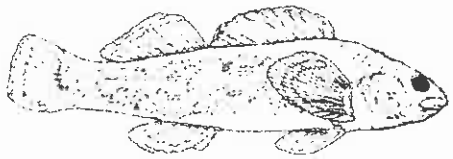
*Not calculated: entirety of mainstem is impounded by Lewis Smith Lake

B = Bankhead NF
Cha = Chattahoochee NF
Che = Cherokee NF
J = Jefferson NF
N = Nantahala NF
P = Pisgah NF

TABLE 5: Percentages of mainstem river length and watershed area in the National Forests for 15 priority ADAs in the Southern Appalachians

Watershed Unit	% of Mainstem System Lands	Bank Mi. within: Purchase Boundaries	% of Watershed System Lands	Area within: Purchase Boundaries
16 + 21 Hiwassee R	43	88	43	63
28 + 29 Little Tennessee R.	0	100	20	100
09 Conasauga R.	25	36	19	30
32 S. Fork Holston R.	12	24	41	50
38 Nolichucky R.	11	26	15	41
46 Craig / Johns Cr.	2	95	51	95
10 Coosawattee R.	0	0	13	45
43 New R.	0	6	10	20
31 N. Fork Holston R.	0	1	8	38
11 Etowah R.	0	0	15	19
22 Powell R.	1	2	3	15
23 Clinch R.	0	1	5	11
12 Tallapoosa R.	0	0	2	9

Brief descriptions of the priority ADAs



09 Conasauga River: The Conasauga is the most nearly pristine of the major streams of the Coosa Basin, and it leaves much to be desired. As Table 5 suggests, it presents one of the best opportunities to effect improvement of habitat in an ADA by working with the Forest Service. However, National Forest lands are heavily concentrated in the upper portion of the watershed. In the upper Georgia sector, 100% of the river bank and 94% of the watershed is in system lands. Proceeding downstream into the Tennessee sector, these figures drop to 21 and 60%, respectively, virtually all of it concentrated in the upper reaches just north of the Georgia line. Once the river loops back into Georgia, there are no system lands in the watershed. There is however, a sizable purchase unit, containing 8 miles of the right bank of the Conasauga. Since SAFC has already participated in reaching an agreement with the Forest Service re management in the Conasauga watershed, there might be a temptation to lower the priority of this ADA. This would be a mistake, particularly with respect to the lower reaches of the river. A recent visitor to the area (Steve Ahlstedt, of the USGS) reports alarming decreases in numbers of mussels, and heavy sediment bedloads. The latter problem is worse downstream of the National Forest lands, but significant within the Forests. Of the imperiled species listed 6, (4 fish, 1 crayfish and 1 mussel) are not presently known to survive elsewhere in the Southern Appalachians.

10 Coosawattee River: The Coosawattee River watershed is home to no imperiled mussels, and its 3 imperiled fish species are all protectable elsewhere. However, it has the greatest number of imperiled crayfish species (4) of any of the ADAs. Two of these are endemic to the Coosawattee watershed. One, *Cambarus cossawattae*, appears to be restricted to the area upstream of Carters Lake, and the other may be. No portion of the Cossawattee River is within the Chattahoochee National Forest purchase boundaries. However, nearly half of the ADA is within the purchase boundaries, with 13% in System lands. The other 2 imperiled crayfish and the fish likely occur downstream of Carters Lake, and a case could be made for extending the ADA downstream to its confluence with the Oostanaula River, particularly given its position upstream from the Etowah River (see below.)

11 Etowah River: According to either the definition of "imperiled" used in this document or the more conventional one of all federally listed species, the Etowah River ranks slightly ahead of the Conasauga as a biodiversity conservation "hot spot" within the Coosa Basin. It has the apparent disadvantage of having no portion of the mainstem and less than 20% of its watershed within the Chattahoochee NF purchase boundaries (all of it in the extreme headwaters). However, it ranks as a conservation imperative. Of the species apppearing in Table 2, 4 fish, 1 crayfish and 5 mussels are not known to persist anywhere else at this time. And, as the presence of 2 undescribed *Percina* darters suggests, much remains to be learned about the fauna of the Etowah.

12 Tallapoosa River: The Tallapoosa River originates in Haralson County, Georgia, crosses into Alabama, and runs parallel to the Coosa River until it reaches what is now Martin Lake, then turns west and joins the Coosa just upstream of Montgomery. The

Talladega and Shoal Creek Ranger Districts of the Talladega NF occupy the divide between the two rivers. As a consequence, such Critical Refuge areas as are protectable within the Talladega NF are limited to small tributary streams. Most, if not all of the 7 imperiled species listed for ADA 12 can be found in such environments. Even so, the Tallapoosa has the lowest percentage of land within the National Forest system or purchase boundaries of any of the 13 ADAs identified. Four of the species listed (the Tallapoosa shiner, *Notropis gibbsi*; the Tallapoosa sculpin, *Cottus carolinae*; and the crayfishes *Cambarus englishi* and *Cambarus halli*) are endemic to the Tallapoosa watershed.

13 Choccolocco Creek: Nine imperiled species are found in this relatively small watershed of the Coosa dreainage. It should be noted that while gastropods have not been a focus of this report, an endangered snail is found in the watershed and the Coosa drainage is considered a world center of snail diversity. Particular attention should perhaps be paid to some of the streams within the Coosa drainage in terms of protecting species characteristic of small streams. Of the small streams within the Coosa drainage, Choccolocco Creek is probably the most significant in terms of species diversity and presence of imperiled species. System lands on the Talladega NF should receive particular attention. One Choccolocco Creek tributary (Shoal Creek) is proposed as a Critical Refuge.

16 lower Hiwassee River: Most of the imperiled fauna (with the notable exception of 2 endemic small stream crayfish, discussed above and under Critical Refugia) are to be found downstream of the series of reservoir lakes which begins with Appalachia Dam, just upstream of the Tennessee – North Carolina line. "At Appalachia Dam most of the water in the stream is diverted downstream to the Appalachia Powerhouse at river mile 53, altering the river downstream from Appalachia Dam from a medium-sized river to a first order stream, thereby altering the river below the Powerhouse to a trout stream for 27.3 miles" (Parmalee and Hughes, 1994, cited in Ahlstedt and Rashleigh, unpublished ms). The ecological damage thus done is apparent, but surprisingly, the molluscan fauna of the Hiwassee (including 8 species of mussels here cited as imperiled) finds its fullest expression in the cut-off reach between the dam and the powerhouse and this was also the site for an IBI sample which received a high score. Parmalee and Hughes (1994) recommend that this reach be considered for federal protection and for possible mussel transplants. (It has already been used as a transplant site for the snail darter, *Percina tanasi*, displaced from its original endemic range by construction of the Tellico Dam on the Little Tennessee River.) The total known mussel fauna of the Hiwassee comprises 35 species, rivaling the better known mussel "hot spots" of the upper Tennessee Valley. The lower Hiwassee is unique in the area in having over half its riparian lands within the National Forest system.

22 and 23 Powell and Clinch Rivers: Originally, the Powell was tributary to the Clinch. Now both flow into Norris Lake, and it is customary to refer to the "Clinch-Powell System". The parallel rivers share a number of other traits. Both are characteristically straight Ridge and Valley rivers which arise in Virginia and flow into Tennessee. National Forest lands play a minor role on both rivers, and there is no National Forest land in either watershed in Tennessee. Both rivers have suffered major pollution episodes in the past, but maintain impressive fish and mussel faunas, with high numbers of imperiled species. The fauna of the Clinch is more diverse, and there are no species unique to the Powell. However, some fish species, notably the slender chub (*Erimystax cahni*), may be better represented in the Powell. It should also be mentioned that the Powell has consistently received high IBI scores over more than 100 miles of its length, in both states. Two tributaries of the Clinch with no relation to the National Forest, the Little River and Copper Creek, constitute Critical Refugia. Discussion of the ranges of the various species in the Clinch/Powell could take up many pages. However, for practical purposes conservation effort needs to be focused on the entirety of the ADAs for both Rivers – from the headwaters to Cherokee Lake.

28 Middle Little Tennessee River: The middle (ADA 28) and upper (ADA 29) Little Tennessee represent a unique situation. Only about 500 ft. of one bank of the mainstem, and no other large, low elevation stream reaches are on National Forest system lands, but 100% of the watershed is within the purchase boundaries of the Nantahala and (for ADA 29) Chattahoochee National Forests. Of particular note in this regard is the Needmore Tract, comprising about 12 miles of undeveloped riparian lands on both banks beginning immediately upstream of Fontana Lake. While the total number of species or imperiled species in the Little Tennessee is not impressive when compared to some of the Mobile Bay or upper Tennessee River tributaries, it is the only major river in the Blue Ridge for which no modern extirpations are documented. A TVA fixed station at Needmore continually receives an Excellent IBI score. In contrast to the middle Little Tennessee, the upper river in ADA 29 is severely degraded, especially by nonpoint sources. The division between the two sectors is marked by Lake Emory, a small run-of-the-river impoundment located at Franklin, North Carolina. While a case can be made for any stream reach that conservation of the biota hinges on protecting the upstream watershed, this is particularly true in the case of the Little Tennessee, since Lake Emory, which was once an effective sediment trap, is effectively filled. An added argument for considering ADAs 27 and 29 together is that the Little Tennessee's only endemic (the Little Tennessee River crayfish, *Cambarus georgiae*), present only in 1 or 2 tributary streams on ADA 27, is widespread and abundant above Lake Emory.

31 and 32 North Fork Holston River and South Fork Holston River: These two streams present a situation similar to that of the Clinch-Powell. At Kingsport, Tennessee they join to form the Holston River (ADA 30). However, movement of animals between the two rivers is limited by the presence of S. Holston dam on the South Fork Holston upstream of the confluence. Both rivers flow out of Virginia into Tennessee and both have histories of industrial pollution dating back into the 19th century, from which they have recovered to a significant degree. There are slight differences between the faunas of the two rivers, but both are less diverse than the Clinch or the Powell, and neither contains any imperiled species which cannot be protected in the Clinch-Powell. The North Fork Holston routinely receives Good IBI scores, but one site (at river mile 97.8, just above Saltville, Virginia) scored high enough to merit mention here. Unlike the case of the Clinch and the Powell, there are significant portions of the Jefferson NF in the Virginia portion of both watersheds, including a limited amount of riparian lands on the South Holston. (The ADA boundary is extended along the east

bank of S. Holston L. to include all the national forest lands in the watershed.) However, the major justification for considering them as conservation priorities is that, among the 43 ADAs they rank 5th and 6th in total number of imperiled species, after the Clinch, Powell, Etowah and Conasauga.

38 Nolichucky River: The Nolichucky can be said to be in a process of recovery from a period of severe sedimentation related principally to mica mining. While there are presently no imperiled species known from the Nolichucky which cannot be protected elsewhere in the region, its lower reaches may represent the best chance to recover some of the original French Broad River fauna, and it can be said to be the healthiest major stream in the upper Tennessee River watershed. Its recovery is also presumably assisted by downstream movement of organisms from the small (90 square mile), but unusually healthy South Toe System (ADA 39). The Nolichucky River is particularly important as a site for the sharphead darter (*Etheostoma acuticeps*), considered extinct prior to its rediscovery in the river in 1975.

44 and 45 Sipsey Fork/Brushy Creek: ADA 44, defined here as Sipsey Fork above Lewis Smith Lake (44A), together with Brushy Creek (44B), contains a total of 5 fish forms, 4 mussels, and possibly 1 crayfish here considered to be imperiled, for a total of 10 imperiled forms. It also contains the rare and endemic amphibian *Necturus alabamensis*, and musk turtle *Sternotherus depressus*. (Brushy Creek must be included to protect the endemic subspecies of the pretty shiner, Notropis bellus alegnotis.) The importance of the upper Sipsey Fork/Brushy Creek watershed is even more clear if one considers that of the 10 imperiled species, only one (*Ptychobranchus greeni*, also known from the Etowah River system) is protectable in the other 43 ADAs. It appears likely that this fish will soon be determined to be a distinct species. Interestingly, and atypically for the region, 6 of the 10 imperiled forms in ADA 44 are known exclusively from system lands. In addition, there is doubt that *Lampsilis perovalus* persisting outside ADA 44 constiture viable populations.

46 Craig Creek / Johns Creek: Craig Creek is a Ridge and Valley tributary of the James River (ADA 1). Johns Creek runs parallel to and is a tributary of the Craig. Almost the entire watershed is contained within the Jefferson NF purchase boundaries (approximately 50% in System Lands). However, very little of the main stem is in national forest ownership. Craig Creek / Johns Creek supports all 3 of the imperiled species in the James River watershed. One of these species (*Notropis semperasper*, roughhead shiner) is notable as being a pure Ridge and Valley endemic, virtually unknown from either the upstream Blue Ridge or downstream Piedmont areas of the watershed. While 3 imperiled species is a relatively low number as compared to some of the Gulf of Mexico and Tennessee drainage streams, all 3 are endemics to the James River watershed. Because most of the watershed is within Forest Service purchase boundaries but little of the riparian area of the main stem is in Forest Service ownership, priority should be given to key Forest Service acquisitions along the main stem, riparian easements by federal and state programs, and outreach to landowners to improve riparian management.

If the information presented in Table 2 is compared with that in Table 5, the very strong relation of the upper Sipsey Fork/Brushy Creek ADA to the Bankhead NF stands out. Of the 13 other priority ADAs analyzed in the main document, none has the majority of its mainstem bank length or watershed area within National Forest system lands, and 7 have no mainstem riparian area whatsoever in Forest Service ownership. For only one of the other priority ADAs (the Little Tennessee River) is the entire mainstem bank length within National Forest purchase boundaries (and in that case virtually 0% is within system lands). All but one of the other ADAs have less than 50% of their mainstem bank length within purchase boundaries.

Not only is the upper Sipsey Fork/Brushy Creek watershed biologically unique within the context of the Southern Appalachian National Forests, it also provides one of the best opportunities for effecting conservation of aquatic biodiversity through working with the Forest Service.

Other ADAs:

01 James River: Most of the mainstem James River is in the Ridge and Valley Province, but many tributaries drop from the Blue Ridge. The James River has three imperiled species. One of thise species (*Notropis semperasper*, roughhead shiner) is notable as being a pure Ridge and Valley endemic, virtually unknown from either the upstream Blue Ridge or downstream Piedmont areas of the watershed. While 3 imperiled species is a relatively low number as compared to some of the Gulf of Mexico and Tennessee drainage streams, all 3 are endemics to the watershed, which also harbors an unusually high percentage of species of high concern at the state level. A major portion of the James watershed, including the 3 largest mountain tributaries (the Maury, Cowpasture and Jackson Rivers) is in the George Washington NF, and a complete discussion of conservation priorities for the watershed cannot be entertained without taking that area into consideration. The Craig / Johns Creek which has a significant amount of national forest ownership, is listed as a priority watershed, ADA 46. The Pedlar River watershed is a biologically important James River tributary that is a included as a Critical Refuge.

02 Catawba River: Recent investigations of several Catawba tributaries (Johns River, Linville River and Warrior Fork) have turned up unexpected populations of state listed mussels, and the area merits further investigation for both mussels and fish. The Linville River is proposed as a Critical Refuge.

03 and 04, Tugaloo River and Seneca River: These watersheds represent the only opportunity to protect the crayfish *Cambarus chaugaensis*. One tributary to each ADA is discussed under Critical Refugia.

05 Broad River: No distinctive or imperiled elements are known from this Broad River watershed (not to be confused with the much larger Broad River of the North and South Carolina piedmont.) This ADA is represented within the Chattahoochee National Forest purchase boundaries only by small tributary streams.

06 Chattahoochee River: Despite its recreational and esthetic significance, few distinctive or imperiled elements are known from the Chattahoochee, which serves as a headwater example of the rather unexceptional Apalichicola Basin biotic community. One Threatened fish, the bluestripe shiner (Cyprinella calitaenias) can probably better be protected in the lower watershed, outside the area covered by this report. The same is true for the one arguable Chatthoochee watershed endemic, the Chattahoochee crayfish (*Cambarus howardi*), discussed above.

07 and 08 Chattooga River (west) and Oostanaula River: This Chattooga River should not be confused with the famed Chattooga River (east), which forms part of ADA 03.

13 and 14 Choccolocco Creek and small Coosa River tributaries: As for ADAs 07 and 08, but particular attention should perhaps be paid to some of these streams in terms of protecting species characteristic of small streams. System lands on the Talladega NF should receive particular
attention. One Choccolocco Creek tributary (Shoal Creek) is proposed as a Critical Refuge).

15 Chickamauga Creek (north): Not to be confused with Chickamauga Creek (south), tributary to the Chattahoochee River. *Percina tanasi* may be found in this ADA (?).

17 Ocoee River: While a popular recreational river, the Ocoee is still recovering from severe copper pollution, and may fairly be called a biological desert. The one imperiled form listed for ADA 17 is the Tennessee dace (*Phoxinus tennesseensis*) found in tributary streams.

18 and 19 Toccoa and Nottely Rivers: Toccoa River is the name applied to the Ocoee River upstream of the Georgia – Tennessee state line (and the historic pollutin source). No distinctive or imperiled elements are known for either of these rivers, but a Critical Refuge area is designated for the upper Toccoa watershed, based on IBI scores from the Toccoa and a tributary (Suches Creek).

20 Valley River: This river has recently been found to sustain unusually good populations of redhorse suckers (*Moxostoma* spp.), including the undescribed sicklefin redhorse. Robert Jenkins (personal communication) notes unusual concentrations of large bodied fishes for a relatively small stream, and the river may bear further study for unusual elements. One Valley River tributary (Vengeance Creek) is proposed as a Critical Refuge area, based on IBI.

21 upper Hiwassee River: The Hiwassee River above Apalachia Dam presents no special elements except for 2 tributary stream crayfishes (See discussion under Critical Refugia). Most of the National Forest lands in ADA 21 are concentrated around Appalachia and Hiwassee Lakes, so that their value to biodiversity concentration is less than might be expected. Due to the several reservoir lakes, sedimentation from ADA 21 to ADA 16 (a priority ADA) is less than would normally be the case.

24 Tellico River: Much of the lower Tellico River was drowned when Tellico Lake was filled, and it presently has no unique or imperiled fauna apart from the smoky dace, a presumed subspecies of the rosyside dace (*Clinostomus funduloides*), shared with many other Little Tennessee River tributaries.

25 Citico Creek: Despite sharing the fate of the Tellico River in having its lower reaches impounded, Citico Creek is one of the most important small stream biodiversity sites in the southern Appalachians. See Critical Refugia.

26 lower Little Tennessee River reservoir tributaries: The lowermost 61 miles of the Little Tennessee River has been effectively removed from consideration in this context by conversion to a series of reservoir lakes (Fontana, Cheoah, Calderwood, Chilhowie and Tellico). However, several significant tributaries remain. Apart from Citico Creek (ADA 25) none of them is of outstanding conservation interest in this context. However, mention should be made of the Nantahala River. It is unusual among rivers of its size in this region (watershed area approximately 150 sq. mi.) in maintaining water cold enough for trout along its entire length. It maintains high water quality, and the Nantahala Gorge is known as an important biodiversity site for snails. Data on benthic macroinvertebrates from six sites show that this river has high benthos diversity (NCDWQ).

28 Tuckaseegee River: In recent years, water quality in the Tuckaseegee has improved, high IBI scores have been recorded from a monitoring site at RM 14.7 near Bryson City, North Carolina, and populations of 2 mussel species, *Alismodonta raveneliana* and *Fusconia barnesiana*, have been discovered. However, it is presumed that populations of other imperiled species remain extirpated in the Tuckaseegee.

29 upper Little Tennessee River: Discussed under ADA 27, middle Little Tennessee River, above.

30 Holston River: This watershed is effectively separated from the upper reaches of its two main tributaries by urban pollution (North Fork) and South Holston Dam (South Fork) It is included here as an area where several fishes (and no mussels) from ADAs 31 and 32 extend their range.

33 Watauga River: The Watauga River is a Holston tributary with some of the species found in the upper Tennessee River tributaries draining out of Virginia (ADAs 22,23,31 and 32).

35 and 37: lower and Upper French Broad River The French Broad is the largest of the upper Tennessee River tributaries and undoubtedly once supported a rich fish and mussel fauna. However, it has been the site of numerous extirpations over the years. It is divided into lower and upper sectors on the basis of the presence of a major urban center (Asheville, North Carolina), but neither sector currently contains unique or imperiled elements not protectable elsewhere, with the probable exception of the French Broad crayfish (*Cambarus reburrus*). Over time, if water quality improves, some important species may expand back into the French Broad from the Nolichucky River (ADA 38)

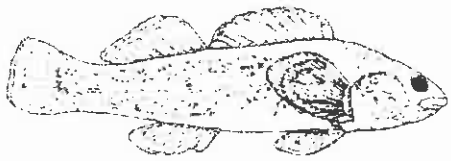
39 South Toe River: This tributary to the Nolichucky system (ADA 38) is an important biodiversity "hot spor" in its own right. See Critical Refugia.

40, 41 and 42: Poor Fork Cumberland River, N. Fork Kentucky River and Russell Fork If portions of these watersheds downstream of the Jefferson NF boundary in Kentucky were taken into consideration, these streams would be added to the list of 28 large ADAs. However, for our present purposes they are considered as headwater environments, one of which (Poor Fork Cumberland River) is discussed under Critical Refugia.

43 New River: The New River arises in northwestern North Carolina, but there is no influence ofthe National Forests until it crosses into Virginia, and most of the drainage into the watershed off the Jefferson National Forest reaches the mainstem downstream (north) of Claytor Lake. The New River contains numerous endemic species, however, most are not considered here, since they are confined to or concentrated in the area of the watershed above any National Forest influence. The 4 species listed in Table 2 are all found predominantly downstream of Claytor Lake (and on into the West Virginia waters of the New River watershed, which are not considered here). The New River ADA is not without serious problems, mainly due to non-point source pollution and exotic species. On the bsis of endemism alone, the New, including the upper reaches, deserves the attention of conservationists.

45 Lower Sipsey Fork: This ADA is defined as Sipsey Fork between the head of Lewis Smith lake and continuing downstream in the NF purchase boundary, and it contains 1 crayfish and 2 mussels, totaling 3 imperiled forms. On this basis, its neighbor ADA 44 qualifies as a "priority" ADA, while ADA 45 does not. (See page 24 for more on ADA 44, Sipsey Fork/Brushy Creek.)

Critical Refugia



A total of 22 sites, scattered throughout the area, were selected under the Critical Refuge criteria. They are here broken into 8 categories for discussion. All sites discussed in this report have a minimum watershed drainage area of 4 square miles.

A. High IBI scores on large ADAs: IBI scores of 54 or better were achieved on mainstem sites in the lower reaches of 5 of the 28 large ADAs. Four of these ADAs (16 - lower Hiwassee River, 22 - Powell River, 27 - middle Little Tennessee River and 31 - North Fork Holston River, are discussed as priority protection sites above. High IBI scores are also routinely recorded for a site on the Tuckasegee River (ADA 28) at river mile 15, not far above Bryson City, North Carolina. Before construction of Fontana Lake the Tuckasegee was a tributary of the Little Tennessee and probably shared all of the native fauna. However, numerous species were extirpared as a consequence of dam construction and industrial pollution. With the latter problem largely corrected, some species, notably some of the mussels, are coming back in the 20 miles of the river between Cullowhee and Fontana Lake, and 5 imperiled species are currently known from the river. However, important elements are still missing and there is nothing protectable in the Tuckasegee that is not protectable, and more abundant, in the Little Tennessee. The Nantahala NF is a less significant factor than in the case of the Little Tennessee, with perhaps 20% of the watershed in system lands, all of it at higher elevations. However, as in the case of the Little Tennessee, 100% of both banks of the mainstem (and other important streams) is within the purchase boundary. The lower

Tuckasegee has been considered as a possible reintroduction site for the spotfin chub (*Cyprinella monacha*) and its rating as a conservation priority may continue to rise.

B. Small ADAs: Three smaller watersheds separated as distinct ADAs merit special protection – Citico Creek (ADA 25), the South Toe River (ADA 39) and Poor Fork Cumberland River (ADA 40).

Citico Creek likely supported a significant mussel population before its lower reaches were drowned by the construction of Tellico Lake. Even so it still harbors 4 imperiled fish species. Citico Creek is the only currently known natural occurrence of the smoky madtom (*Noturus baileyi*). About 95% of the watershed, and all of the riparian area, forms part of the Cherokee NF system lands, and the upper half of the watershed forms the Citico Creek Wilderness. However, some of the most significant stream areas for fish diversity lack wilderness protection.

The South Toe River is known to support 3 imperiled species and, as conditions improve downstream in the North Toe and Nolichucky Rivers, it is to be presumed that these species will spread. Approximately 75% of the watershed is within the purchase boundary of the Pisgah NF, and the upper 70% of that, including most of the riparian area, is within system lands. Throughout this reach and for several miles below, the South Toe is designated Outstanding Resource Waters by the state of North Carolina. However, the protected area corresponds closely to cold water habitat, and it is precisely the downstream, warm water sector, unprotected by either federal ownership or state regulation, where the imperiled species reside. This is undoubtedly in part a consequence of upstream protection, but suggests a need for further safeguards, at least for the 50% of the riparian area corresponding to the habitat for imperiled species.

Poor Fork Cumberland River arises and flows for about 8 miles within the Kentucky portion of the Jefferson NF. Most of the watershed is also within the purchase boundary, but there are no system lands within the watershed. This stream and its tributary Bad Branch provide the only opportunity within the report area to protect the arrow darter (*Etheostoma sagitta*) endemic to the Cumberland and Kentucky River systems (The subspecies *E. sagitta sagitta* is restricted to the Cumberland system.) and the blackside dace (*Phoxinus cumberlandensis*), a Cumberland watershed endemic. The Cumberland and the Kentucky, along with the Russell Fork, probably merit inclusion as larger ADAs with all or most of their area in the state of Kentucky.

C. Endemic species sites: The Poor Fork Cumberland River (above) qualifies for inclusion under this category as well.

Mention should also be made here of 3 endemic crayfishes. The Hiwassee crayfish (*Cambarus hiwasseensis*) and Hiwassee headwater crayfish (*Cambarus parrishi*) are widespread (but apparently never sympatric) in the upper Hiwassee River watershed (ADA 21), while the French Broad crayfish (*Cambarus reburrus*) is known from a single stream (outlet to Sapphire Lake, Horsepasture River watershed) in ADA 04, and "tributaries of the French Broad River in Buncombe, Henderson, Jackson, Madison and Transylvania Counties, North Carolina" (Hobbs, 1989.) It would be premature to designate sites for these species, and it is to be hoped that their range will be captured within some conservation initiative with a larger focus.

D. Best examples of small warmwater streams in Atlantic drainages: It was hoped that North Carolina IBI data would provide streams in this category from the Catawba watershed. However, all of the available Catawba watershed IBI data was from the Piedmont sector downstream of Lake James. Consequently a selection of 4 widely separated and distinctive Atlantic drainage streams was made, using the limited available information. A common factor uniting these streams is relative ease of protecting them.

Linville River is one of 3 streams in the Catawba watershed (the others are Johns River and Warrior Fork) where several state endangered mussel species have recently been discovered (McGrath, personal communication). While no imperiled species, as defined here, are known from the Linville (or the upper Catawba system), the area has not been adequately explored for most groups of organisms. Of the 3 streams mentioned, the Linville presents

the most nearly pristine conditions and is the most protectable. All of its length as a warm water stream (from Linville Falls downsteam) is within the Pisgah NF purchase boundary and 87% of the riparian area is on system lands, most of it within the Linville Gorge Wilderness. The upper half of the watershed is mostly within the purchase boundary, but there are no system lands.

The Chattooga River (east) is so designated to prevent confusion with the lesser known Chattooga River (west) (ADA 07), which forms part of the Coosa system. The Chattooga (east) forms part of ADA 03. The Chattooga (east) and the Chauga River (see below) provide the best opportunities to protect one imperiled species not found in any of the Priority ADAs, the Oconee stream crayfish *Cambarus chaugaensis*. The North Carolina portion of the Chattooga (east) qualifies as a cold water stream; because the transition occurs gradually over the reach which forms the Georgia/South Carolina border, the river is here treated as a warm water system. All of the Chattooga (east) outside its extreme upper reaches is on system lands (Nantahala, Chattahoochee and Sumter NF's), most of it as part of a Wild and Scenic Corridor. The entire watershed lies within the purchase boundaries of the 3 forests, with a high percentage of system land. Above Stekoa Creek, which drains the city of Clayton, Georgia and is a significant pollution source, the ecosystem is esssentially unaltered, except for replacement of the native brook trout (*Salvelinus fontinalis*) by exotic salmonids. Brook trout persist in many tributary systems. Major efforts are already underway, both within and outside the Forest Service, to address the need to maintain the Chattooga watershed in as nearly unaltered a state as possible.

The Chauga River flows parallel to the Chattooga, entirely in the state of South Carolina, and drains into Lake Hartwell (part of ADA 04). Although close in miles to the Chattooga, it is very different -s essentially a warmwater foothill stream of a type which may not otherwise be protectable within the area of this report. In addition to harboring Cambarus chaugaensis, it is suggested that it may be a diversity center for caddisflies (Trichoptera), with possible endemics. (Campbell, personal communication). The three quarters of the riparian lands above the suggested lower limit (mouth of Ramsey Creek at Chau-Ram County Park, below which various forms of pollution become a problem) and 75% of the watershed are on system lands. One hundred percent of the riparian lands and 90% of the watershed are within the Sumter NF purchase boundary. Turkey Creek, featuring broken topography and a mix of plants typical of the mountains (e.g. mountain laurel) and coastal plain (bald cypress) is considered the outstanding diversity site for mussels in the state of South Carolina or the Savannah River watershed. It should be considered as a Critical Refuge.

E. Best example of a warmwater small stream in the Mobile Bay/Coosa drainage. Many members of the distinctive Coosa fauna inhabit small streams; however these streams are characteristically quite degraded. Perhaps the best example is Shoal Creek, tributary to Choccolocco Creek (ADA 13). Three of four imperiled mussel species known from the Alabama portion of the Coosa system have been found in Shoal Creek, and "there is potential for additional species of proposed threatened or endangered mussels" (Pierson, 1992). In addition, there are four species of critically imperiled snail species, at least one of which is known to occur on national forest ownership (Elimia bellula, E. crenatella, Leptoxis taeniata, and Tulotoma magnifica). All but the lowermost 2 miles of Shoal Creek and its watershed lie within system lands of the Talladega NF. Given the fragmented nature of the northern Talladega NF and the concentration of system lands on the ridges, Shoal Creek is undoubtedly the outstanding opportunity to accomplish something for aquatic biodiversity conservation in the portion of Alabama covered by this report.

F. Best examples of warmwater small streams in the Tennessee drainages.

Brasstown Creek, tributary to the upper Hiwassee River (ADA 21) in North Carolina, received a high IBI score from TVA at a site I am unable to locate. The site is listed as "river mile 0", which would be at the mouth in North Carolina, but a location is given in Towns County, Georgia, which would have to be at least river mile 6. Nor does the information available list fish species or designate a temperature type. Brasstown Creek is known to be a warm water stream in North Carolina (and the only known small stream habitat for the undescribed sicklefin redhorse), and it is so designated here. The entire Georgia portion of the watershed is within the purchase

boundary of the Chattahoochee NF.

South Fork Holston Tributaries: A tributary to the South Fork Holston River downstream of South Holston Dam, Possum Creek received high IBI scores in 1997. Possum Creek showed tremendous improvement, for unknown reasons, between 1993 (IBI 40 – Fair) and 1997 (58 –Excellent). All but the lower reaches of Possum Creek are within the purchase boundary, and much of the watershed is in Forest Service ownership. Another tributary of the S. Fork Holston, Whitetop Laurel, has a high diversity of species, including rare fish, aquatic insects, hellbenders, the spiny river snail, and bog turtles.

Cowee Creek, tributary to the middle Tennessee River (ADA 27), received a surprising IBI score of 58 in 1997. No imperiled species are known from Cowee Creek with certainty, but it is the only stream in the Little Tennessee watershed known to contain all 4 species of darters associated with smaller streams. There is also a somewhat doubtful report of the Little Tennessee River crayfish (Cambarus georgiae, largely confined to the upper Little Tennessee River watershed – ADA 29) from Cowee Creek. The entire Cowee Creek watershed is within the Nantahala NF purchase boundary; approximately half, all of it at higher elevations, is included in system lands.

Betty Creek routinely scores an IBI of about 52 at several sites, but 2 higher scores merit its inclusion, as does the fact that it provides habitat for 2 imperiled species (the smoky dace, *Clinostomus funduloides* ssp., and the Little Tennessee River crayfish (*Cambarus georgiae*), plus several Georgia state listed fish species. Betty Creek is the largest tributary to the upper Little Tennessee River (ADA 29) in Georgia. The entire watershed is within the purchase boundaries of the Chattahoochee and Nantahala NF's. None of the riparian area in the warm water reaches is on system lands, which make up perhaps half of the total watershed. However, the extreme headwaters, are protected within the Southern Nantahala Wilderness. This reach is an important brook trout (*Salvelinus fontinalis*) water, harboring what is considered to be one of the strongest populations of the putative southern strain of this species. (See Suggestions.) Most of the riparian area belongs to 3 large landowners, suggesting an excellent purchase opportunity. In my opinion, this stream is critical to maintenance of water quality in the upper Little Tennessee River.

G. Best example of small warmwater streams in the Ohio drainage: This is Poor Fork Cumberland River, discussed under B and C above, respectively.

H. Trout streams: Coldwater streams draining more than 4 square miles have been well surveyed for trout, but not generally well evaluated for diversity or biotic integrity. Following are 6 such streams; TVA has assigned high IBI scores to four of these (see Table 7). These streams, concentrated in the greater Hiwassee watershed, should be considered as examples. More thorough survey work and proper attention to macroinvertebrates would surely multiply this list.

Childers Creek is tributary to the lower Hiwassee River (ADA 16) in Tennessee. Most of its watershed is within the purchase boundary of the Cherokee NF. There is not much system land, but it does include 2 miles of stream bank.

Toccoa River is the name applied to the Ocoee River upstream of the North Carolina/Georgia line. Since this is also the point at which pollution from past copper mining and processing ceases to be a concern, it is designated as a separate ADA (ADA 18). The site at which a high IBI score is indicated is identified as a cold water stream, and located at river mile 92 (presumably this is Ocoee River mile 92), at which point it drains 4.6 square miles. This would locate it near the mouth of Suches Creek, which also received a high IBI score, and I have combined the two watersheds in a single Critical Refuge area. All of this area is within the Chattahoochee NF purchase boundary, but only small headwater portions are on System Lands.

Vengeance Creek is located in the Valley River watershed (ADA 20), which is not noted for high quality trout streams. The entire watershed is within the Nantahala NF purchase boundary, with the entire upper half on system lands.

The Pedlar River in the James River watershed has high quality waters with consistently high IBI scores. The river contains habitat for the James spiny mussel. The Pedlar River has a large percentage of its area within the national forest purchase boundaries and most of this is in national forest ownership.

The Stony and Little Stony Creeks in the New River watershed both contain high insect diversity. The streams are the last strong-hold of the candy darter. Much of the streams are within national forest purchase boundaries and in national forest ownership.

Finally, Table 6 is a list of additional small stream sites which have no relation to the National Forest system, but which would bear consideration in future efforts. Each site is identified by state(s), nearest ADA and criteria for inclusion.

TABLE 6: *Known Critical Refuge sites with no portion of the watershed within National Forest purchase boundaries.*

Stream	State	Nearest ADA	Criteria for inclusion
Coldwater Spring Run	AL	13	endemic species (unique to site)
Little River	AL,GA	14	imperiled species
Copper Creek	VA	23	imperiled species
Little River	VA	23	imperiled species
Abrams Creek	TN	26	imperiled species, reintroduction site, in National Park
Big Moccasin Creek	VA	31	imperiled species
Little Creek	VA	31	high IBI
Cataloochee Cr.	NC	35	known high quality waters, in National Park
Little River	NC	37	high IBI
Chucky Creek	TN	38	endemic species (unique to site)
Levisa Fork	VA,KY	41	imperiled species

Conclusions And Recommendations

A number of recommendations are suggested from a review of the information presented here. The goal of this exercise was to identify the best examples of intact aquatic systems on public lands—or the functional portions of such biologically/functionally intact watersheds (where it would be possible to create or protect conditions for restoration of their diversity). We have prioritized these places not so much on the basis of species count as on their aquatic uniqueness, and how well they capture, as a group, the diversity of aquatic species that make the region biologically special. Such an effort should also aid good restoration: namely, restoration that recovers the natural functions and processes that support these creatures in places where the likelihood of success is the greatest. It is important to protect the best areas and begin restoration, not in the worst areas, but in the "next best" areas -- the ones most likely to recover, those where all or nearly all the biological and physical elements may still be found.

Clearly, conservation attention is critical for the lands and waters outside the national forest system. Many imperiled aquatic fauna are found on private lands downstream from the public forests. If conservation actions were focused only on public lands, we would lose an incalculable portion of our biological richness. However, the data presented also make it clear that improving the management of the national forest lands will benefit habitats downstream, and some critical sites and species can be protected by focusing on improving national forest management. At the same time, we do not intend to neglect the public lands outside of the critical watersheds. On those lands, it is important to work for improvements in riparian protection, using an ecologically meaningful definition of riparian areas, and improvements in the protection of roadless areas the restoration of poorly constructed roads, for instance.

Chances are, the battle for the conservation and restoration of aquatic biodiversity will be won or lost on private lands. But our focus on the public lands is further justified by the relative costs and benefits of the work we propose. Our meager resources stand a realistic chance of making a real difference on the public forests. By contrast, private lands, with their highly differentiated ownership, require enormous resources to make similar changes. We do have the resources to make potentially large changes on the 10% of the battle that is public, even though it is the smaller part of the problem. It is a biologically important part of the battle to protect our aquatic diversity that can actually be won.

In 1998, the Environmental Protection Agency released its Clean Water Action Plan, which provides a blueprint for restoring and protecting the nation's water resources. A key element of the Action Plan is a cooperative approach to watershed protection in which state, federal, and local governments work with the public to identify the watersheds with the most urgent needs, and focus on effective strategies for those watersheds. This report represents the kind of effort that is called for in the Action Plan, and the sites it nominates on federal land, along with their downstream reaches, are good candidates for the recommendations it makes for stream buffer management, the purchase of easements from willing sellers, and other kinds of stewardship. The sites nominated here will support acquisition priorities for land trusts in the region, especially in places that are linked to key national forest land by virtue of a stream that flows through them from public lands upstream. Our assessment can also support acquisition goals for the Forest Service in their efforts to consolidate their ownership (see below).

On public lands, the sites nominated as Aquatic Diversity Areas in this report deserve careful management through the forest plan revision to protect, restore and maintain the ecological elements and processes essential to the survival of native aquatic species. Management activities should emphasize rapid reduction of threats to ecosystem integrity caused by past road-building, off-highway vehicle crossings, timber harvest, and other such activities, followed by restoration. All activities in these places would occur within a context of planning at the scale of that ADA to ensure the protection or restoration of riparian and watershed-related ecosystem processes.

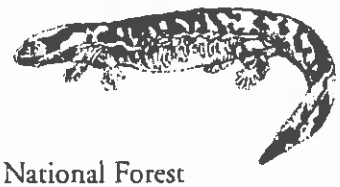
Sites nominated as Critical Refugia could serve as benchmark or reference waters that would capture the full range of diversity characteristic of our regional aquatic ecosystems. Appropriate management would feature no new road construction, and all roads and crossings should be evaluated for decommissioning or upgrading, depending upon the risk they present to the aquatic ecosystems. High-risk roads unsuitable for upgrade should be decommissioned. Maintenance of retained roads and crossings would be robust and continuous. Recreation is often an important feature of public streams and rivers, but when feasible, recreational pressures should be diverted up-slope or downstream of Critical Refugia. Toxic, bioaccumulative, or persistent pesticides and herbicides should not be used in Critical Refugia. These areas would not be suitable for hard rock or common mineral extraction.

A. Forest Service land purchase: In many instances, ranging from the spectacular case of the middle and upper Little Tennessee River watersheds (ADAs 27 and 29) to discrete sites like Craig Creek (ADA 01) in the James River watershed, important riparian zones, even of large rivers, lie within the National Forest purchase boundaries, but not on system lands. As our area has evolved, it would be naïve to assume that the Forest Service will ever acquire most of these lands, which are often the most developed portions of our watersheds—to do so would more often than not be impractical, uneconomical or unjust. Furthermore, Forest Service criteria for land acquisition work against the outright purchase of streamside buffer zones; the agency tends to take advantage of opportunities that present themselves for consolidation of their ownership. Even so, it would be in keeping with the currently expressed purpose of the Forest Service to seek opportunities to acquire riparian buffer strips; at the very least, this may offer private landowners a palatable alternative to regulation of riparian zone management.

B. Restoration: Stream bank restoration is an urgent need in many watersheds. A spectacular example is provided by the banks of the Little Tennessee River upstream of Franklin, North Carolina (ADA 29), where deforested and eroding banks are the primary stress on the aquatic community not only locally, but downstream through the entire length of the mainstem in a priority conservation area, ADA 27. The Little Tennessee Watershed Association is implementing a program of fencing out livestock and restoring riparian vegetation in the North Carolina portion of this reach, but there is a need to extend upstream into the Georgia waters of the Little Tennessee and into other watersheds. In the cited example, the stream banks in question are within the Nantahala NF purchase boundary and could be purchased, but it may be that ownership is not a perquisite for Forest Service participation; programs may exist where Forest Service money and expertise could be applied to stream bank restoration outside the National Forest system. With or without the Forest Service, stream bank restoration is probably the single greatest biodiversity conservation need in many of our watersheds.

C. Brook trout: The brook trout (Salvelinus fontinalis) is found in all of our National Forests except the Talladega and Bankhead of Alabama. In recent years, the hypothesis that there are one or more distinct Southern Appalachian strains, or subspecies ("speckled trout") (Lennon, 1967, McCracken, et al., 1993) has gained acceptance. If so, given the historic shrinkage of brook trout range, it would merit designation as imperiled. (Brook trout are already state listed in South Carolina.) While the brook trout is a "negative indicator" of fish diversity (it is found in small streams where few other fish species co-occur), it is *prima facie* evidence of high water quality.

TABLE 7: Priority sites for conservation of aquatic biodiversity in the Southern Appalachians as determined by the "Critical Refuge" criteria.



ADA	Name of stream	Criteria for selection	Imperiled Species	Relation to National Forest
01	Craig/Johns Creeks, VA/J	imperiled species reputation	3	entire watershed within PB of Jefferson 2 mi. of stream bank in SL
	Pedlar River,VA/GW	imperiled species, insect diversity	1	mostly within PB, much in SL
02	Linville River NC/P	state listed mussels need for further study	0	most of lower low gradient section in Pisgah NF (Linville Gorge Wilderness)
03	Chattooga River (east) SC/S, GA/Cha, NC/N	special status known for high quality	1	93% of riparian lands in SL (Wild and Scenic)
04	Chauga River SC/S	no known extirpations unusual foothills stream known for endangered Trichoptera	1	75% of watershed and riparian areas in Sumter NF SL
14	Shoal Cr. AL/T	imperiled mussels best example of Coosa Basin trib	3	all but lower end of watershed and riparian zones in Talladega NF SL
16	Hiwassee R. NC/N, TN/Che, GA/Cha	fish IBI	(13)	high IBI sector not on NF; See below and ADA 16
	Childers Cr. TN/Che	fish IBI	?	most of watershed is within PB,not SL About 1 mi. of bank in SL
18	Toccoa R. GA/Cha, NC/N?	fish IBI	?	small tributary area in PB rest of NF area (SL & PB) in watershed is upstream of Blue Ridge L.
19.	Suches Cr. GA/Cha	fish IBI	?	could not locate, but high probability of significant SL area.
20	Vengeance Cr. NC/N	fish IBI	?	all within PB, upper half of watershed and stream within SL
21	Brasstown Cr. GA/Cha, NC/N?	fish IBI	1 or more	watershed is within PB in GA, no SL runs along PB in NC
22	Powell R. VAJ	fish IBI	(21)	See ADA 22
25	Citico Cr. TN/Che	fish IBI imperiled species reputation reintroduction site	4	Over 90% of watershed and all of riparian zone in SL Half in Citico Cr. Wilderness
27	Little Tennessee R. NC/N, GA/Cha	IBI imperiled species No extirpations	8	100% of watershed & riparian area in PB, No riparian areas in SL

	Cowee Cr. NCN	IBI darter diversity	0	Most of upper watershed in SL, all in PB No riparian lands in SL
	Betty Cr. NCN, GA/Cha	IBI	0	Almost all of watershed in NC in SL; most in Southern Nantahala Wilderness
28	Tuckasegee R. NC/N	IBI	5	
31	N. Fork Holston R. VA/J	IBI imperiled species	16	See ADA 31
	Possum Cr. TN/Che	fish IBI	0	
32	Whitetop Laurel	species diversity	?	Approx. 60% of watershed in PB and also SL
37	Little R. (French Broad) NC/P	fish IBI	?	
39	S. Toe R. NC/P	fish IBI imperiled species ORW	3	Upper half of watershed in PB and much of riparian area in SL
40	Poor Fork Cumberland R. KE/J	imperiled species	1	
43	Stony/Little Stony	endemic species		Most of watershed, in PB, majority within SL

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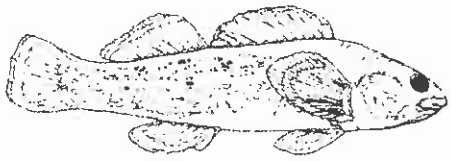

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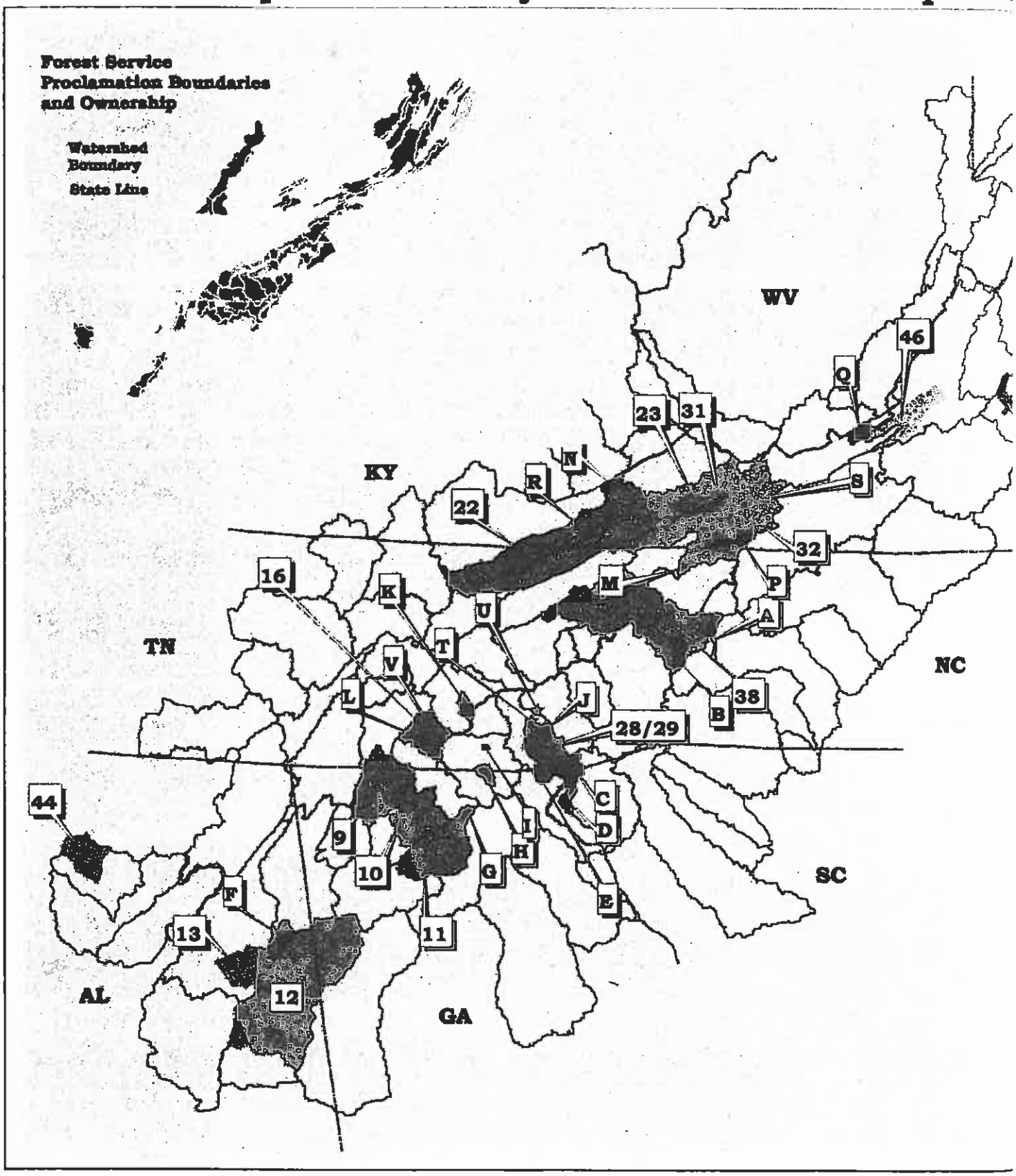
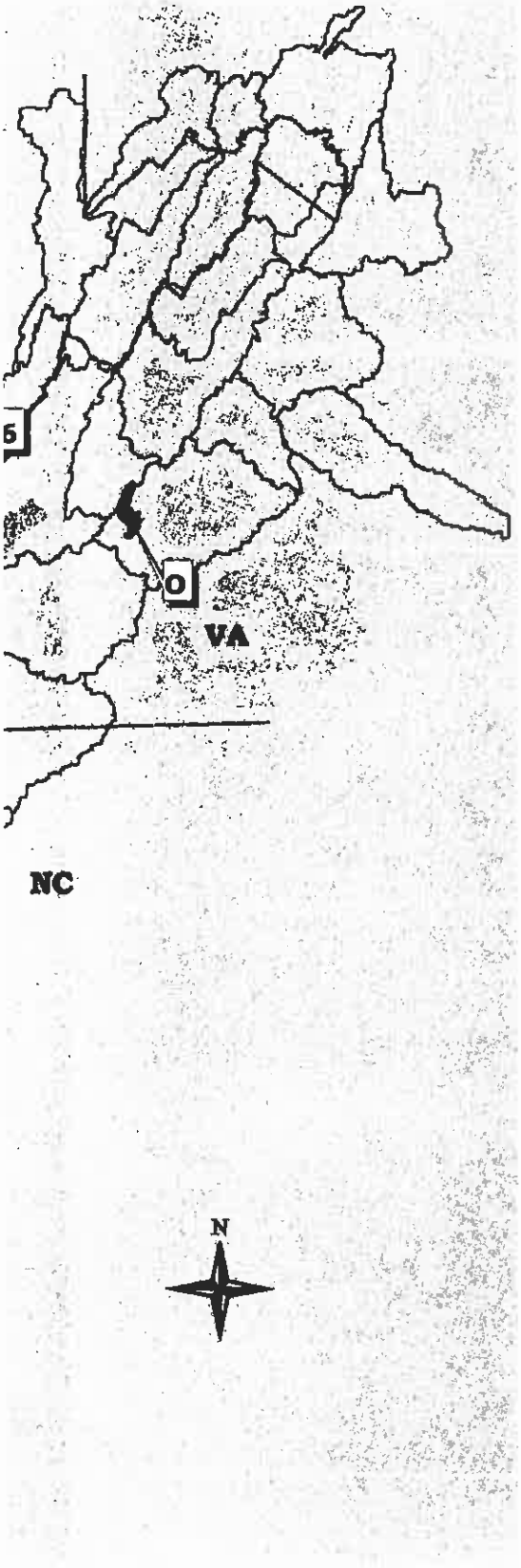
Aquatic Diversity Areas and Critical Aquati



quatic Refuges in the Southern Appalachians



SOUTHERN APPALACHIAN FOREST COALITION

Pacific Rivers Council

- National Forest Ownership
- National Forest Purchase Boundary
- National Park Lands
- Watershed Boundary
- State Line
- Aquatic Diversity Areas

9 Conasauga River
10 Coosawattee River
11 Etowah River
12 Tallapoosa River
13 Choccolocco Creek
16 lower Hiwassee River
22 Powell River
23 Clinch River
28/29 middle/upper Little Tennessee River
31 North Fork Holston River
32 South Fork Holston River
38 Nolichucky River
44 Sipsey Fork Black Warrior River
46 Craig/Johns Creek

- Critical Aquatic Refugia
- ★ Critical Refuge IBI Sites

A Linville River
B South Toe River
C Chattooga River
D Chauga River
E Betty Creek
F Shoal Creek
G Toccoa River/Suches Creek
H Brasstown Creek
I Vengeance Creek
J Cowee Creek
K Citico Creek
L Childers Creek
M Possum Creek
N Poor Fork Cumberland River
O Pedlar River
P Whitetop Laurel Creek
Q Stony/Little Stony Creeks

R Powell River
S Holston River
T Little Tennessee River
U Tuckasegee River
V Hiwassee River

200 Miles

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Town Creek Foundation

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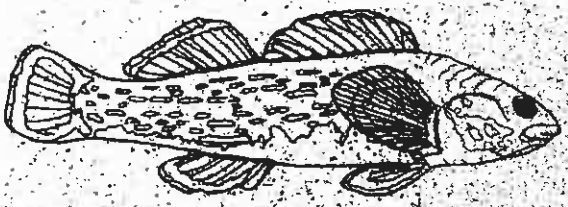

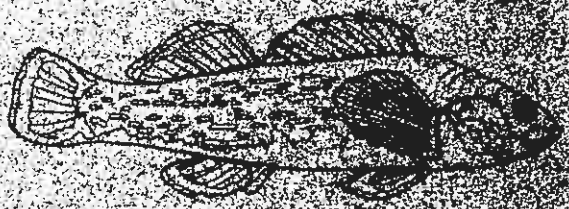

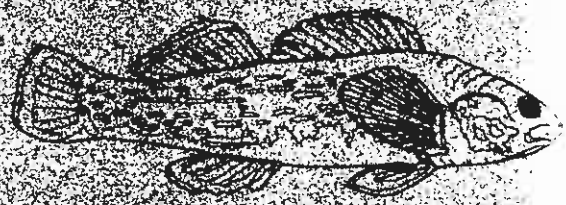

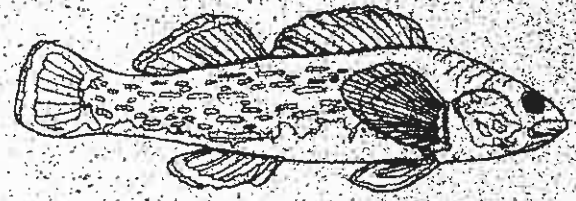

ATTACHMENT B

Alabama's Mountain Treasures

THE WILDERNESS SOCIETY

The Unprotected Wildlands of the Bankhead and Talladega National Forests

by
Lamar Marshall and Ken Wills
for
The Wilderness Society®

Cover photo: Lamar Marshall
Little Hiker: Sabrina Balch, daughter of Keith and Zilphah Balch

First printing: March 2003

1615 M. Street, Washington D.C. 20036

The Wilderness Society
Southeast Regional Office
112 Krog Street, Suite 26
Atlanta, GA 30307
404-872-9453

Founded in 1935, The Wilderness Society works to protect America's wilderness and to develop a nationwide network of wildlands through public education, scientific analysis and advocacy. Our goal is to ensure that future generations will enjoy the clean air and water, wildlife, beauty and opportunities for recreation and renewal that pristine forests, rivers, deserts and mountains provide.

Our membership of more than 200,000 people is a potent force that gets the attention of Congress, the White House, and federal agencies who manage our public lands.

You can join the growing number of Americans who believe that preserving wilderness is essential by calling 1-800-THE-WILD (1-800-843-9453) to speak with a representative of our membership services. Or, you can join online at our website – www.wilderness.org.

This report would not have been possible without the generous support of the Curtis and Edith Munson Foundation, and Carolyn and William Ratliff. We also extend a special thanks to The Wilderness Society's members in Alabama who helped support this publication.

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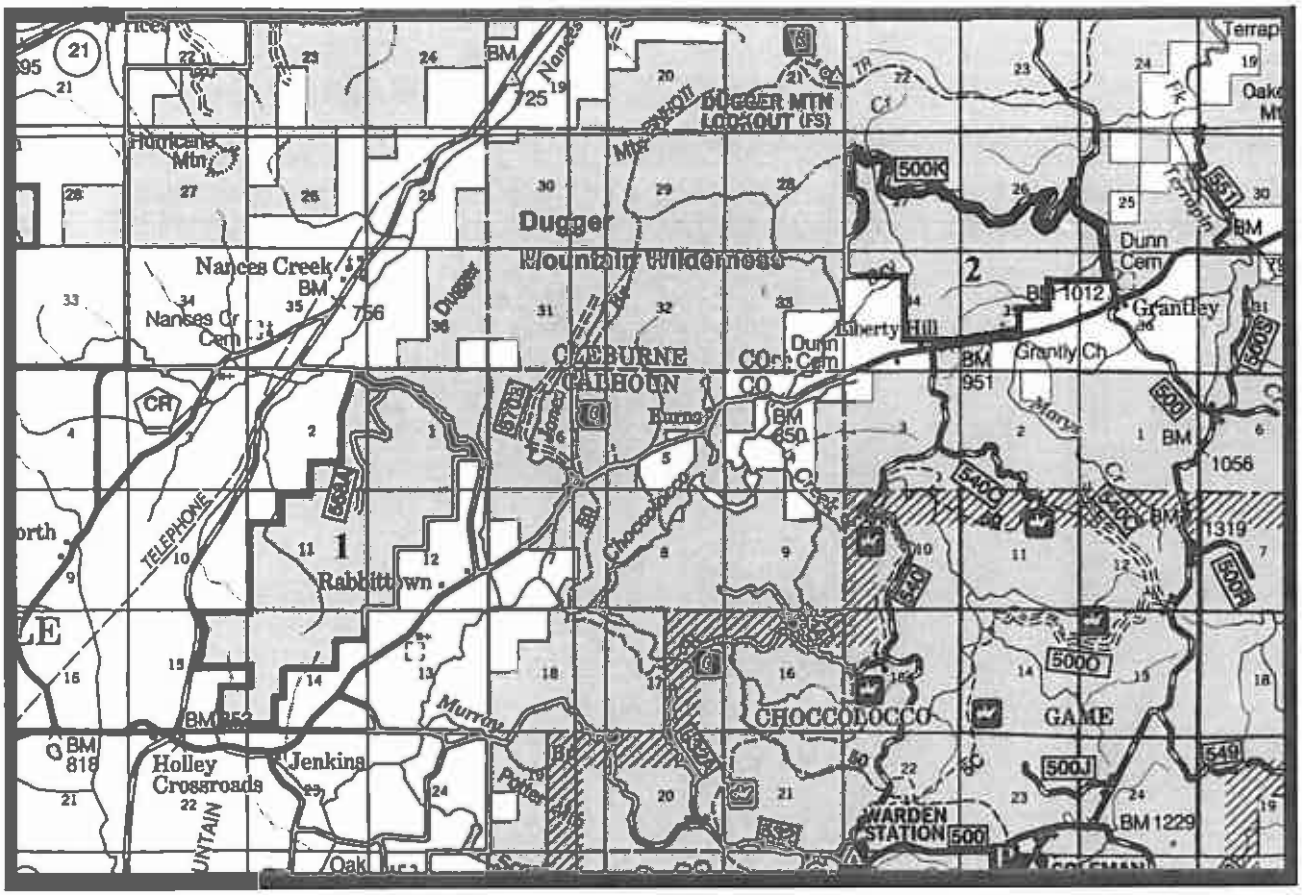


Dugger Mountain (Proposed Scenic Area)

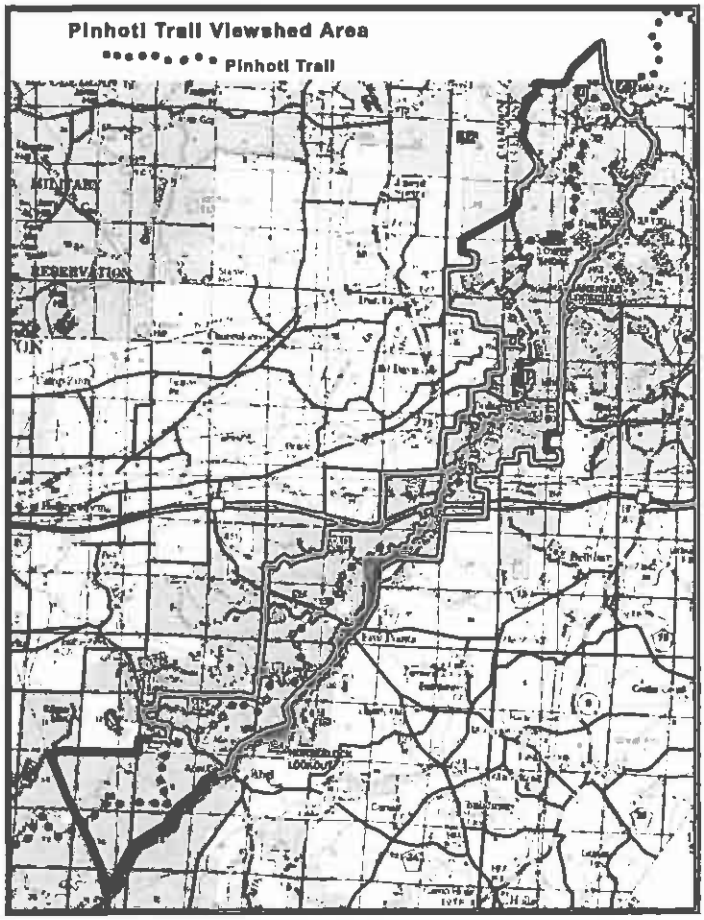
These two areas include portions of the Dugger Mountain ridge that lie outside the Dugger Mountain Wilderness. Scenic upland oak-hickory forest occurs on the upper slopes and pine-hardwood forests occur along the lower slopes, with mesic hardwood forest in the hollows. The area contains a special abundance of woodland wildflowers.

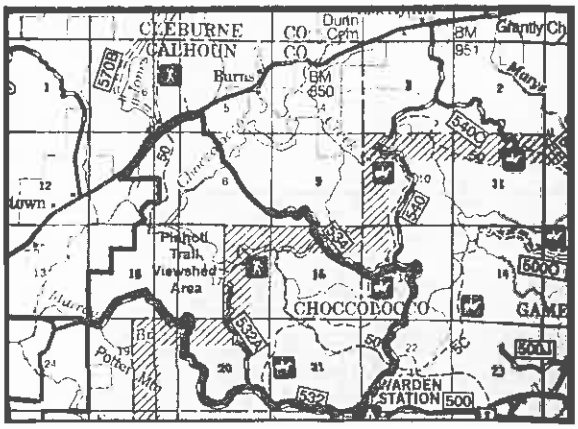
The area contains scenic ridge lines and sensitive viewsheds adjacent to the Dugger Mountain Wilderness. A portion of the area, together with the Dugger Wilderness and the Oakey Mountain Roadless Area, form the watershed for the South Fork of Terrapin Creek, which has been recognized as a critical aquatic refugia.

"The fire-dependent, montane longleaf pine ecosystems in the northeast part of the Talladega National Forest in Northeast Alabama, where the ridges steeply rise 700-800 feet above Terrapin Creek, are my temple. To me, this is the center of the world...
When I was a boy, my passion was wading creeks and catching "spring lizards" (salamanders) and crawdads and snakes. I also loved to climb trees. I reckon that my main passion then, and now, was just wandering in wild areas...
My love of wildlands is closely tied to my love of hunting. Hunting to me is a ritual. Through hunting, I obtain - in addition to what Leopold called my 'meat from God' - spiritual sustenance...this is especially true in wild areas relatively untouched by humans."

Johnny Stowe

Approximate Size: 4,000 acres
Location: Three miles south of Piedmont, Alabama
Topos: Jacksonville East, Piedmont, Piedmont SE





Pinhoti Trail Viewshed Area - Section north of proposed Shoal Creek Scenic Area

Pinhoti Trail Viewshed Area - Section south of proposed Shoal Creek Scenic Area

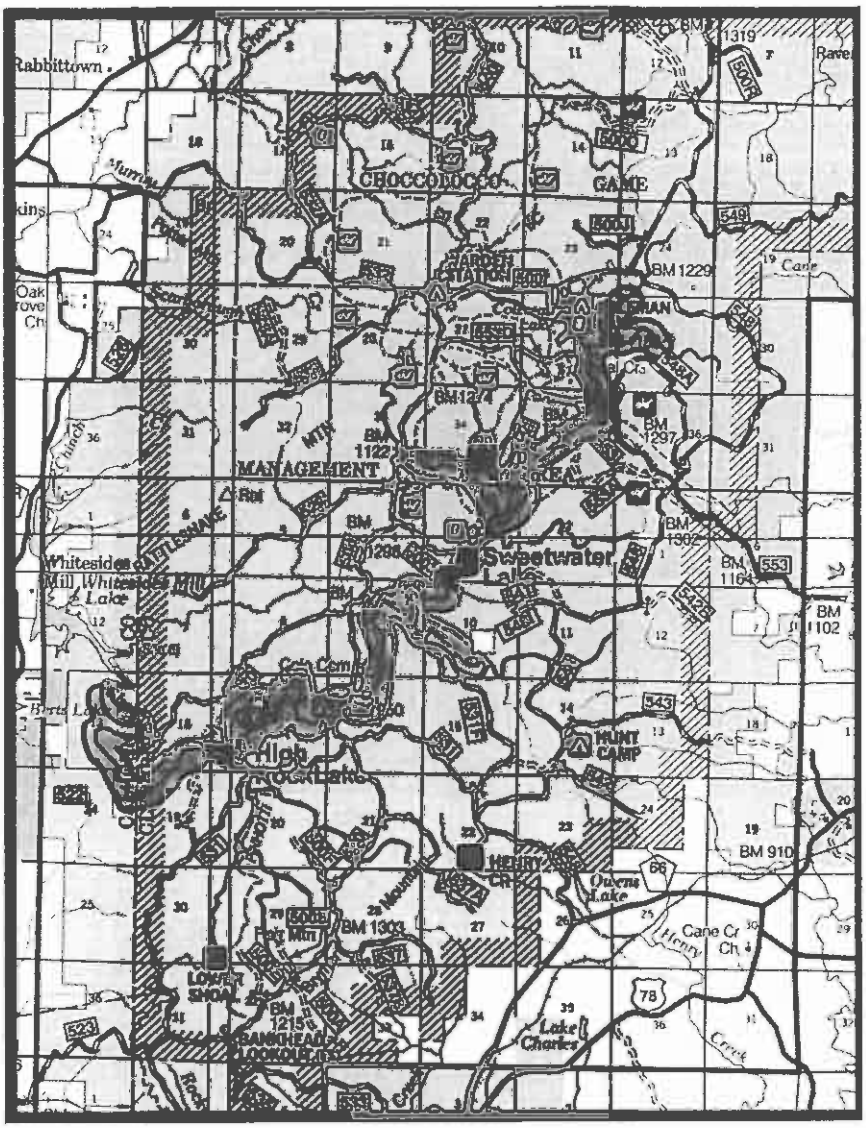
Pinhoti Trail (Proposed Viewshed Area)

The streams that cut through this rugged terrain drop in a series of small waterfalls and shoals into the much lower Choccolocco Creek Valley. This creek system is considered one of the best remaining habitat areas for many endangered aquatic species. Also, rapid changes in elevation have created some fairly large and very scenic waterfalls in the area. Shoal Creek runs along a portion of the corridor, and this large pool and ripple stream contains rare and threatened aquatic species.

The area contains many forest types, including relatively lush white oak-beech forests, and patches of old growth can be found in the area. Superb views of the mixed land use in the Choccolocco Valley and Choccolocco Mountain beyond can be seen along the southwestern escarpment of the area. The corridor contains the Coleman Lake and Pine Glen Campgrounds, along with the Morgan, High Rock, Sweet Water, Coleman and Choccolocco Creek watershed lakes. The southern portion of the corridor borders the Talladega Scenic Drive.

The area contains waterfalls, scenic views and significant recreational opportunities and facilities adjacent to the Pinhoti Trail, including several developed recreation areas. The current natural quality of this corridor needs to be protected so that the overall corridor of the Pinhoti Trail between the Dugger Mountain Wilderness and the proposed Blue Mountain Wilderness can offer hikers a scenic experience. This will also help fulfill the greater vision of the Talladega National Forest portion of the Pinhoti Trail — a path that passes through a connected series of protected areas.

Approximate Size: 14,000 acres
Location: Eight miles east of Jacksonville
Topos: Jacksonville, Piedmont SE



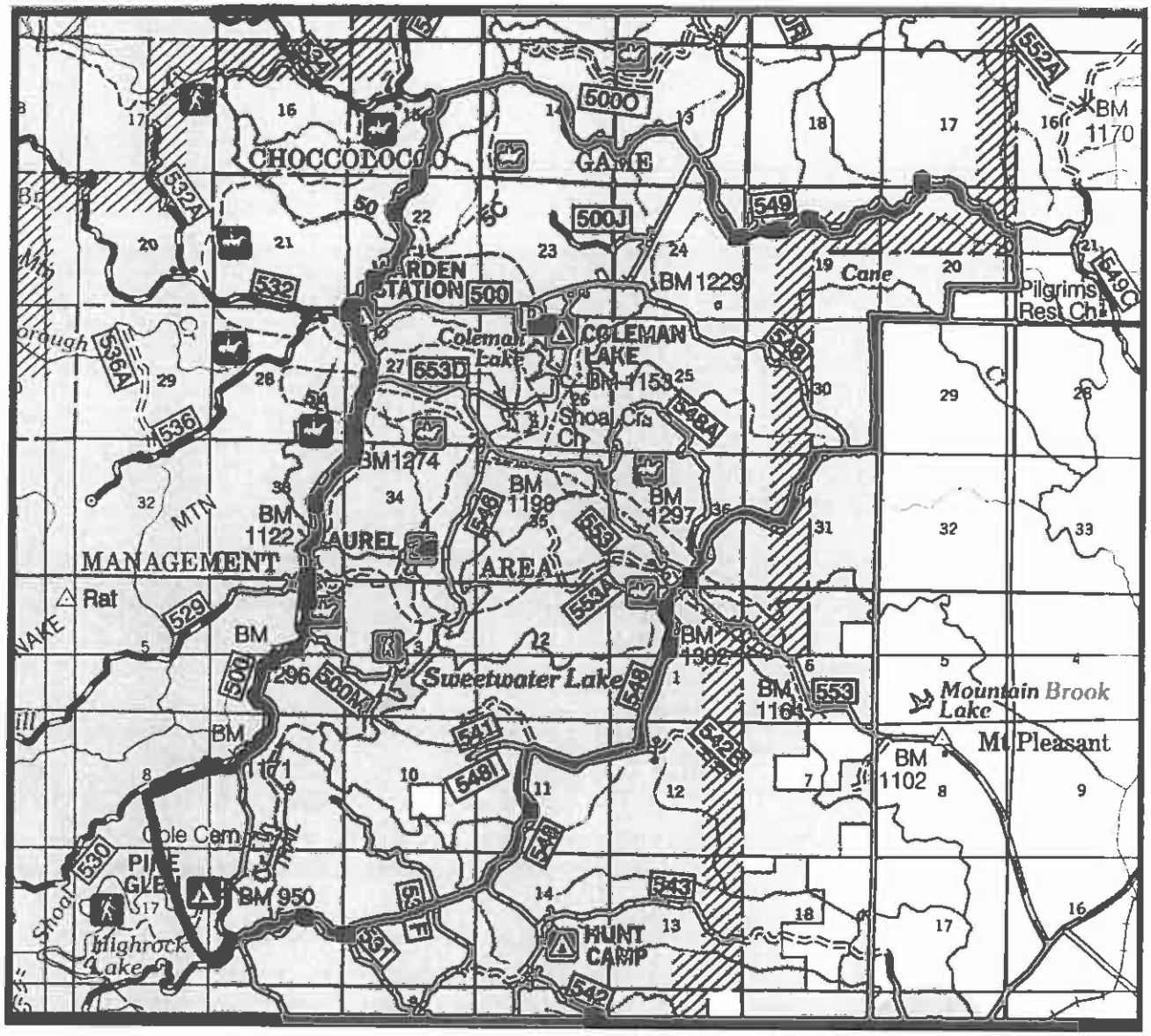
Shoal Creek (Proposed Scenic River)

Shoal Creek is a long and largely free-flowing pool and ripple stream which contains rare and threatened aquatic species listed by the U.S. Fish and Wildlife Service. Included are several species of mussels and the blue shiner. The colorful holiday darter is also found in Shoal Creek. The stream is considered a critical aquatic refugia. It is also a favorite fishing stream where anglers stalk red-eye bass.

Shoal Creek is formed by numerous pristine springs that flow out of the Talladega ridges as headwaters of the Coosa Basin. This area is a corridor of the Pinhoti and is enjoyed by hikers and backpackers. It is a favorite Alabama stream for swimming and seasonal canoeing. It ranks as one of Alabama's cleanest waters. This stream deserves the highest level of protection under the Wild and Scenic Rivers Act.

As shown in the above map, there are three proposed sections of the proposed Scenic River. They are divided by High Rock Lake and Sweetwater Lake.

Approximate Length: 12 miles
Location: Between Jacksonville and Heflin, Alabama
Topos: Choccolocco, Heflin, Piedmont SE

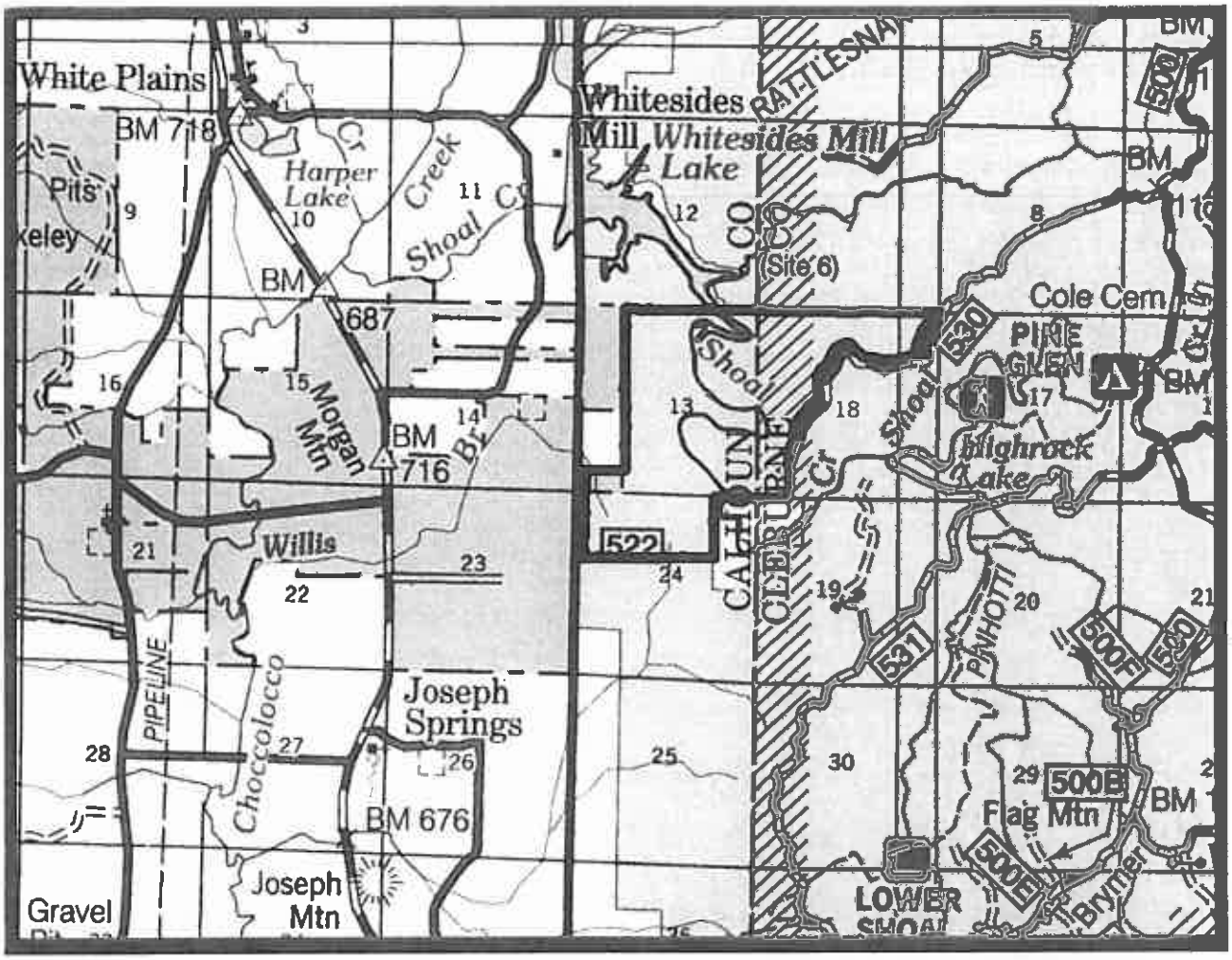


Shoal Valley (Proposed Scenic Area)

This proposed Scenic Area includes a large portion of the rugged valley formed by the upper portion of Shoal Creek. The area is heavily used for recreation. The area contains some horse trails, as well as the Pinhoti Trail and the Coleman Lake and Pine Glen Campgrounds, along with Sweet Water and Coleman Lakes, where wildlife including beaver, heron and osprey can be observed. Rare species of plants such as purple gentian and Grass of Parnassus are found here. The scenic value of this heavily used area should be better conserved. A higher level of protection for this area would help to better preserve the water quality as well as the scenic values of Shoal Creek, which is both a critical refuge for threatened aquatic species and a proposed Wild, Scenic or Recreational River.

Coleman Lake

Approximate Size: 9,600 acres
Location: Seven miles north of Heflin, Alabama
Topos: Choccolocco, Heflin, Jacksonville East, Piedmont SE



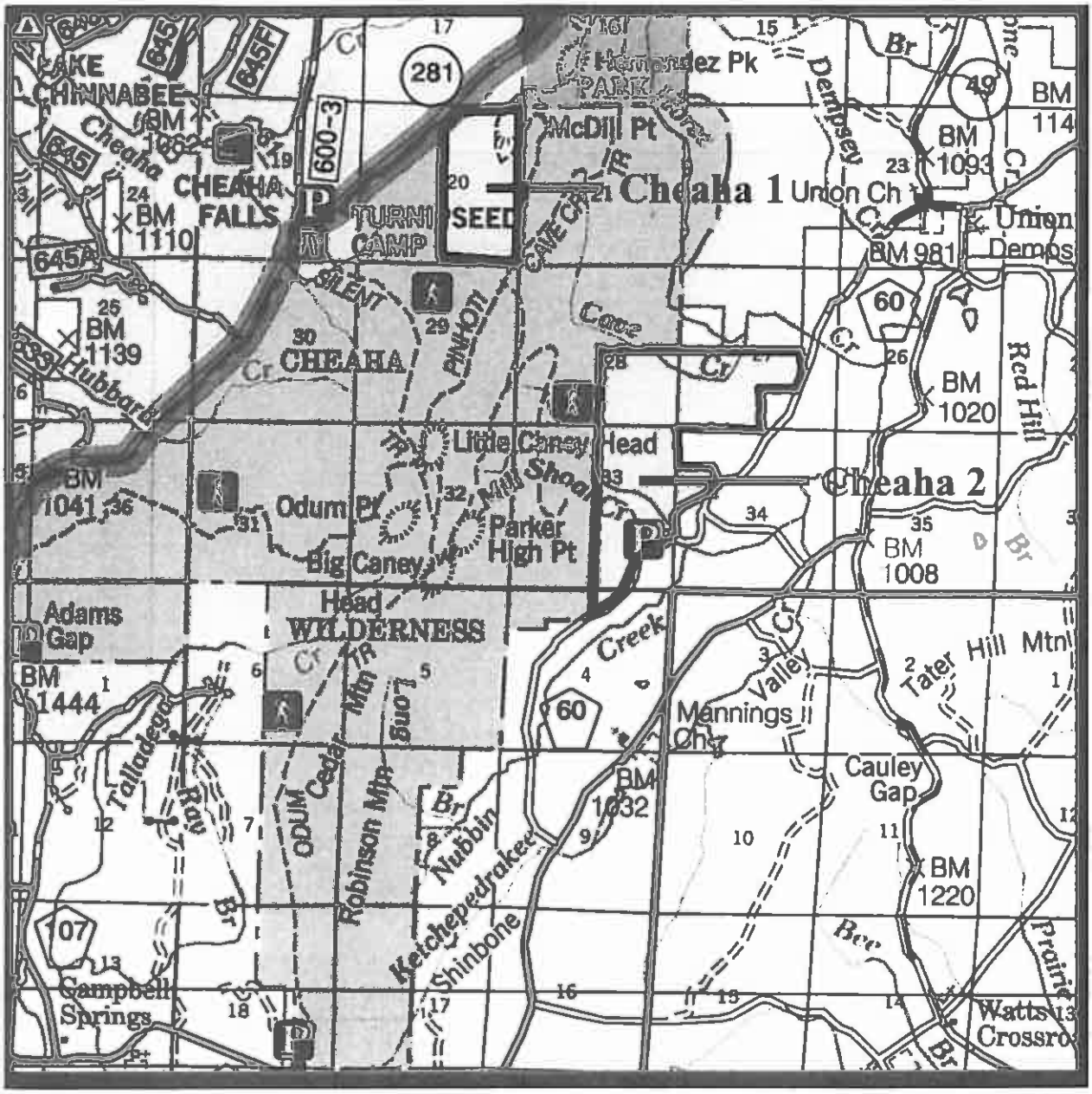
Horseshoe Bend (Proposed Scenic Area)

This area contains a closed road, which now serves as an unofficial hiking trail through several wild and scenic environments. The trail goes north from the Chosea Springs Road through pine and mixed forests. Surrounding ravines are blanketed with hardwood forest communities. There are spectacular views of Cheaha, Dugger, and Choccolocco Mountains and of the Choccolocco Valley. The trail leads to a hill within a horseshoe-like bend of Shoal Creek.

There is a series of scenic shoals in this deep valley that is surrounded by old growth hardwood slopes. The ridgetops contain old growth longleaf pine and a red-cockaded woodpecker colony. This is an example of a small area that is replete with outstanding scenic and natural values. It is an Alabama treasure that deserves the highest level of protection.

The Abika faction of Creeks lived nearby

Approximate Size: 1,000 acres
Location: Four miles NW of Heflin
Topos: Choccolocco, Heflin

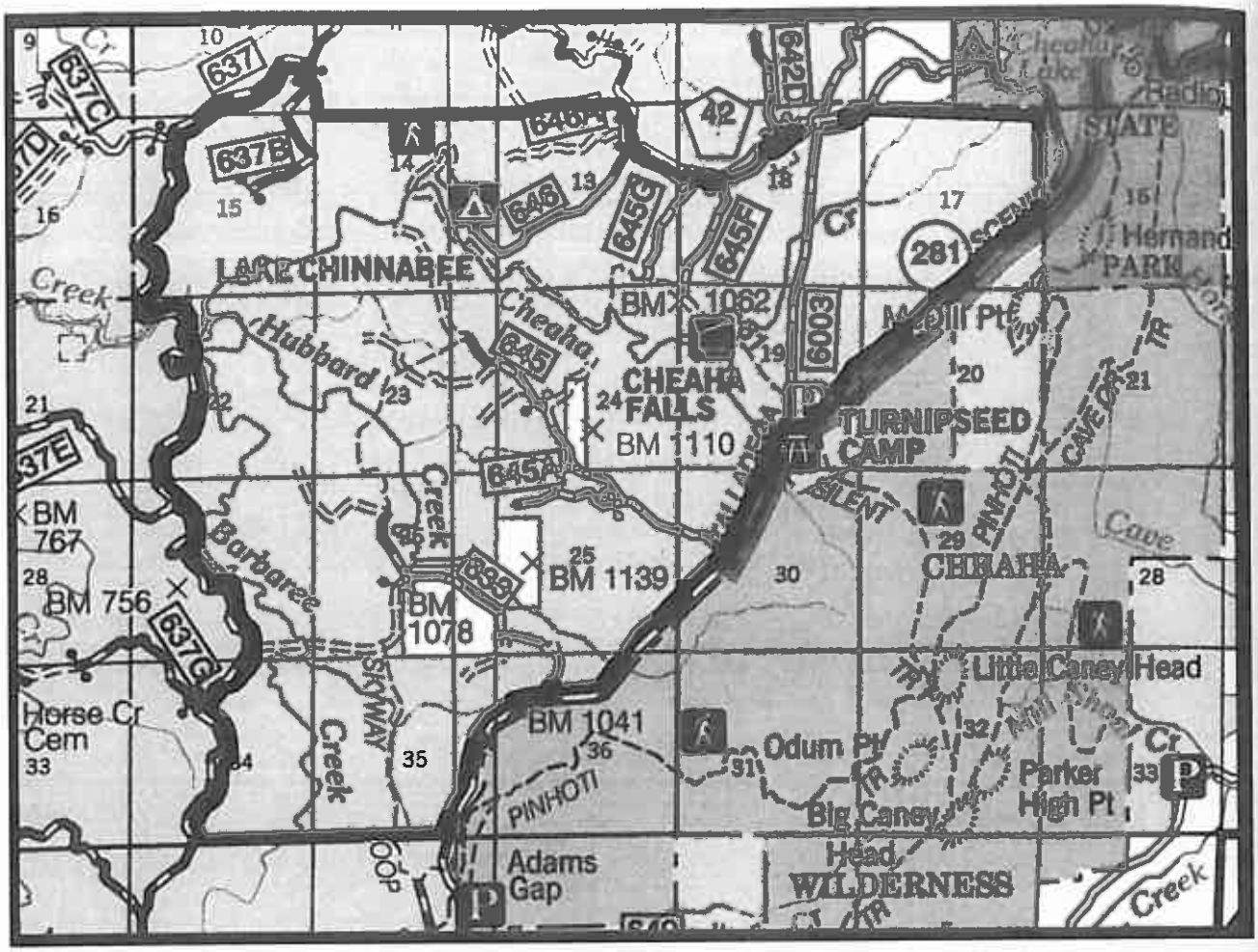


Cheaha Wilderness (Proposed Additions)

The eastern area contains low hill and stream valley forests such as the white oak-beech forest type, which is uncommon in the present Cheaha Wilderness. It provides spectacular wilderness views. The Pinhoti/Odum Trail system is nationally acclaimed and well-used by Boy and Girl Scouts from Alabama and the surrounding states. The areas are adjacent to the Wilderness, and the areas were recognized as roadless by the SAA. To the Creek Indians, *pinhoti* means "turkey's home."

Considering the small size (7,245 acres) of the existing Cheaha Wilderness, this area is vital to the integrity of the Wilderness.

Approximate Size: Area "1" - 230 acres, Area "2" - 715 acres, Total - 945 acres
Location: About eight miles SE of Oxford and adjoining Cheaha Wilderness on the east side
Topos: Cheaha Mountain



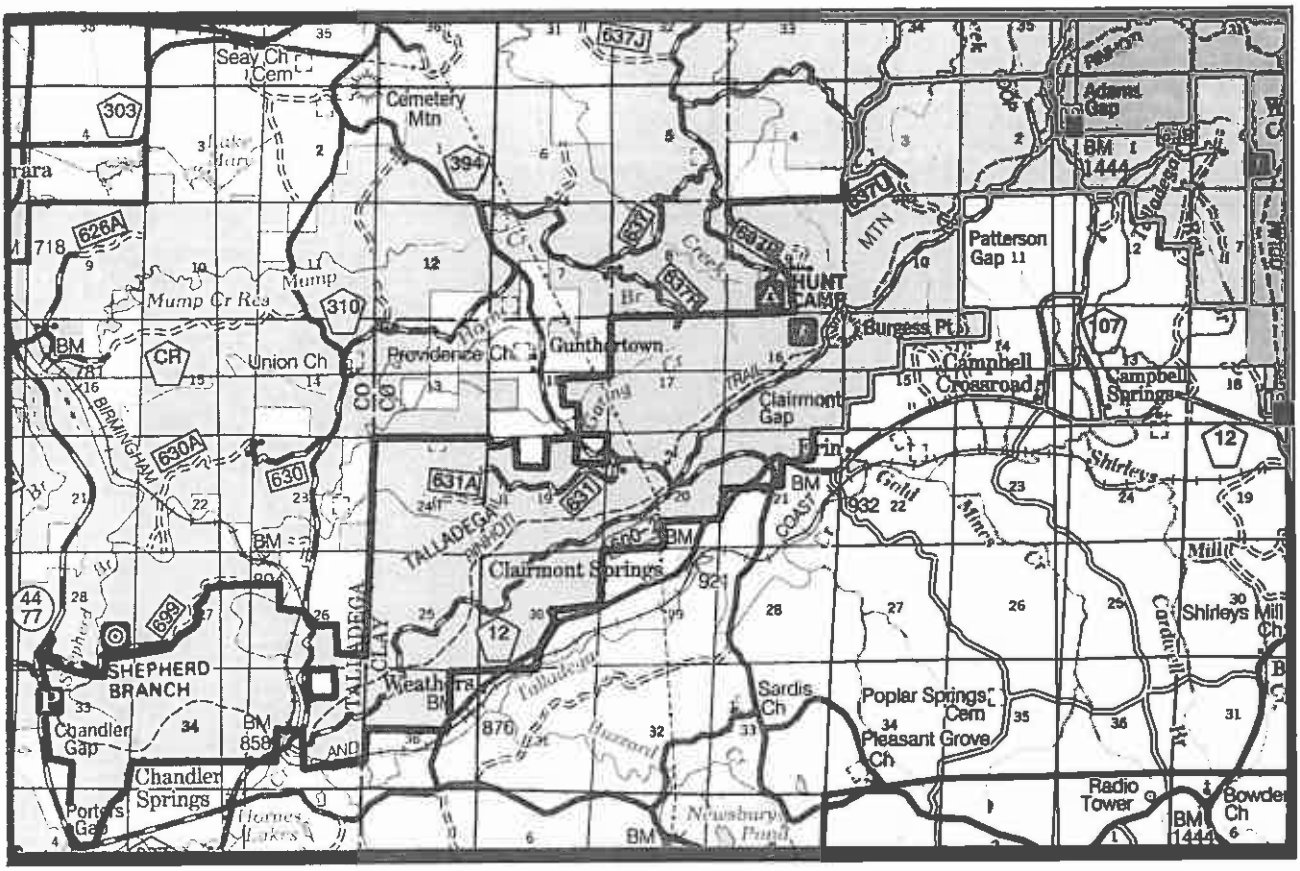
Cheaha Creek (Proposed Scenic Area)

The area includes some of the best waterfalls in the Talladega mountain range. There are several branch trails of the Pinhoti system in the area, along with the Talladega Scenic Drive and the Chinnabee Lake developed camping area. The area contains fabulous scenic views and some of the best recreational opportunities within the national forest. Along with Cheaha State Park, the Cheaha Wilderness and nearby proposed Wilderness, this area forms a great concentration of wild and scenic recreational opportunities. The Cheaha Creek Area and the nearby proposed Wilderness Areas need to be protected in order to ensure that this great recreational concentration remains intact.

View of Mt. Cheaha from Cheaha Creek Scenic Area

Approximate Size: 10,300 acres
Location: Ten miles east of Talladega
Topos: Cheaha Mountain, Ironaton

Of note in this area is the beautiful Chinabee Silent Trail, built by hearing-impaired students from the Alabama School for the Deaf, under the leadership of Scoutmaster Moran Colburn.



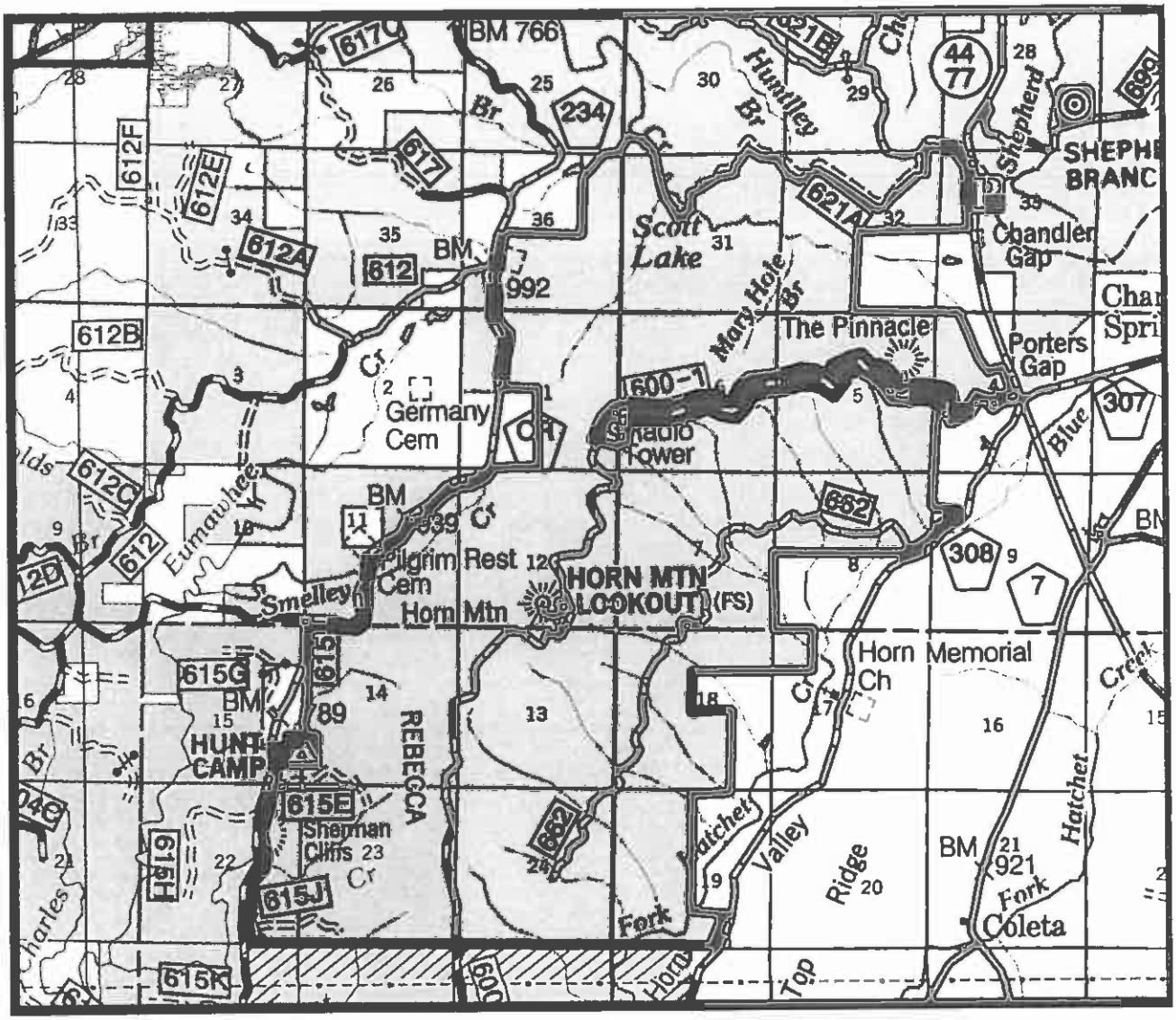
Talladega Mountain (Proposed Scenic Area)

Located in the southernmost portion of the Talladega National Forest, Talladega Mountain is a long, high ridge with spectacular scenic views over a large lowland area of forests and streams. This area still harbors clean streams, lowland forests with large pine trees, and hardwood forests along the ridge. The great views of the farm valleys and forested hills of the Piedmont (east side), and Ridge and Valley Provinces (west side), combined with rock cliffs and outcrops in the proposed Wilderness nearby make this area very visually attractive.

The higher ridge tops are predominately xeric oak-hickory forests. Mixed mesic hardwood-pine forests occur on the middle and lower slopes. The area may contain the rare New England Cottontail Rabbit.

The lower portion of the Talladega Mountain range resembles the Cheaha Wilderness in both topography and ecology. The Talladega Mountain area was considered wild enough to be officially evaluated for wilderness characteristics in a U.S. Forest Service 1979 Final Environmental Impact Statement (FEIS).

Approximate Size: 5,400 acres
Location: Six miles SE of Talladega
Topos: Clairmont Springs, Porter Gap



Rebecca Mountain (Proposed Wilderness)

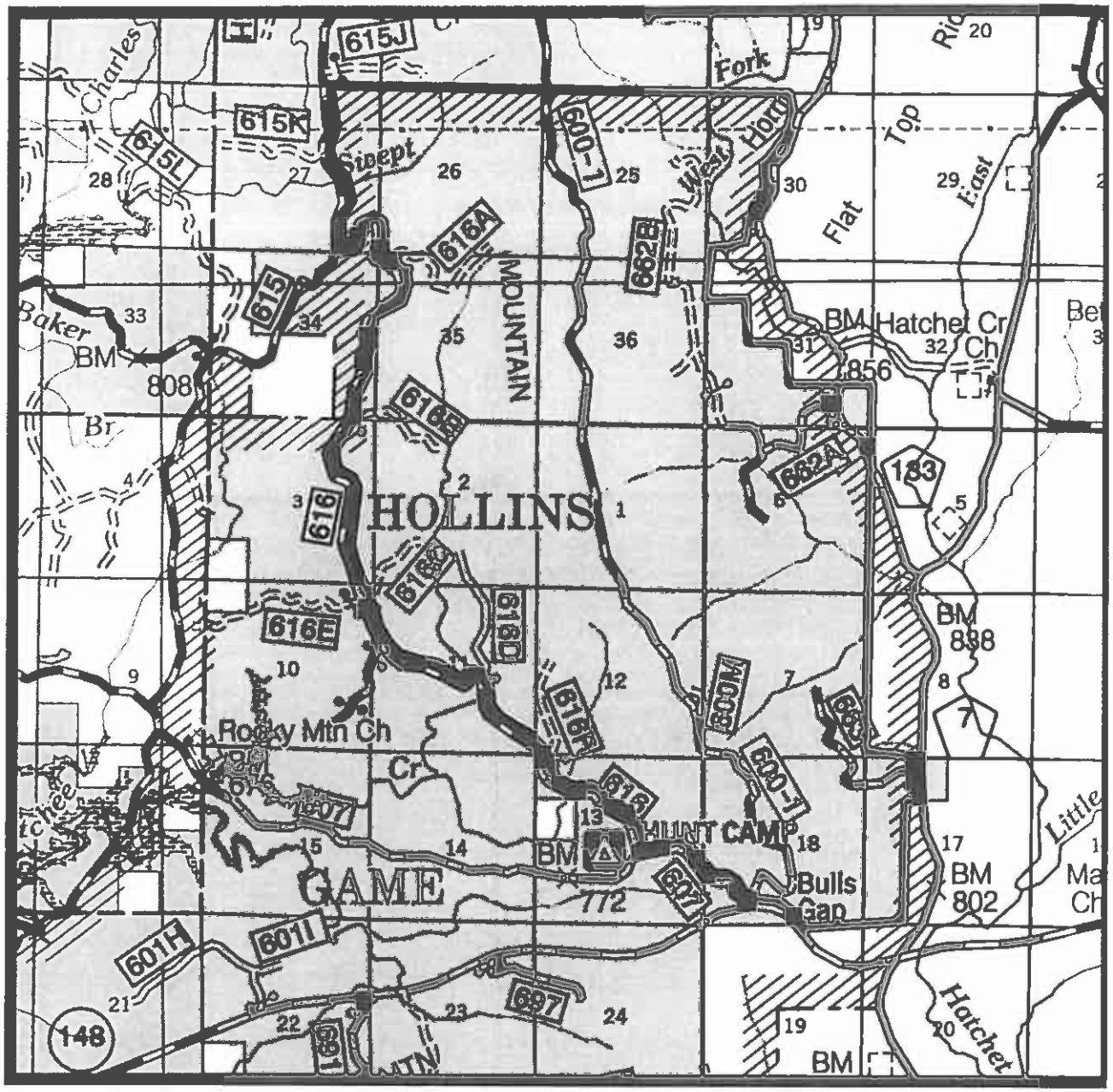
Since its scenic views equal Cheaha's in every way, the protection of Rebecca Mountain could serve to mitigate the increasing demands and impacts on the small Cheaha Wilderness nearby. On busy weekends, literally hundreds of people hike and camp the Cheaha area and the solitude central to the wilderness experience can get lost in the crowd. An outstanding feature on the west rim of the mountain is Sherman's Cliffs.

The extension of the Pinhoti Trail south along Rebecca Mountain would complete a section of the Eastern Continental Trail. (See page 14.)

This trail will be 4,500 miles long from Cape Gasp, Quebec to the Florida Keys. The Eastern Continental Trail includes the International Appalachian Trail in Canada, the Appalachian Trail, the Benton MacKaye Trail, the Pinhoti Trail, and the Florida Trail. Currently, about 150 miles of trail remain to be built, from Porter's Gap at the southern end of the Pinhoti Trail to the Conecuh Forest south of Andalusia.

Rebecca Mountain is the last great mountain of the Talladega chain.

Approximate Size: 9,000 acres
Location: Ten miles east of Sylacauga
Topos: Bulls Gap, Porter Gap



Rebecca Mountain (Proposed Scenic Area)

The proposed Rebecca Mountain Wilderness designation would provide the highest level of protection for the northern half of the ten mile long ridge that constitutes Rebecca Mountain. Unfortunately, a power line that crosses the mountain restricts the Wilderness proposal from protecting the southern region of the mountain. Hence, a Scenic Area designation is proposed.

The proposed Pinhoti Trail extension and the Eastern Continental Trail will cross the Rebecca Mountain Wilderness and the Rebecca Mountain Scenic Area. This rugged and narrow ridge has many rock outcrops and scrubby oaks. See previous description of the Rebecca Mountain Wilderness.

Approximate Size: 6,000 acres
Location: Ten miles east of Sylacauga
Topos: Bulls Gap, Porter Gap