

Biological Evaluation
Managing Recreational Uses on the Upper Segment of the Chattooga
Wild and Scenic River Corridor
Sumter National Forest
Chattahoochee National Forest
Nantahala National Forest

I. INTRODUCTION

Three national forests, the Sumter (SNF) in South Carolina, the Chattahoochee (CONF) in Georgia, and the Nantahala (NNF) in North Carolina, are proposing a change in recreation management for the 21-mile section of the Chattooga Wild and Scenic River (WSR) upstream of the bridge traversing South Carolina (SC) 28. This upstream area is known as the upper segment of the Chattooga WSR. Approximately 70% of the upper segment of the Chattooga WSR is bordered by South Carolina on the east bank and Georgia on the west bank. The northernmost portion (30%) of the upper segment of the Chattooga WSR is within North Carolina. This Biological Evaluation (BE) was prepared to address potential project-related impacts to species listed as sensitive by United States Forest Service Region 8. It was prepared in accordance with USFS manual 2671.44 and 2672.42.

II. PROPOSED ACTION

The proposal will:

1. Establish frontcountry and backcountry capacities as follows:

Frontcountry Areas	Groups at One Time ¹		People at One Time ²	
Grimshawes/Sliding Rock Bridge	25		65	
Bullpen Road Bridge Area	15		40	
Burrells Ford Bridge Area	80		205	
Highway 28 Bridge Area	35		85	
Backcountry Reach	Average Groups per Weekday	Average People per Weekday ²	Average Groups per Weekend Day	Average People per Weekend Day ²
Chattooga Cliffs	5	10	10	15
Ellicott Rock	10	35	20	110
Rock Gorge	15	40	30	95
Nicholson Fields	15	40	30	95

¹ The number of groups at one time equals the number of designated parking spaces in each frontcountry area.

² Average number of people per group varies by reach.

2. Allow non-commercial boating by issuance of a boating permit consistent with 36 C.F.R. § 261.77 on approximately 17 miles of the 21-mile main stem of the upper

segment of the Chattooga WSR December 1 to April 30 from the Green Creek confluence downstream to a designated take out within one-quarter mile downstream of the Lick Log Creek confluence.

3. Allow boating from the time that flows reach 350 cfs or greater at the USGS Burrells Ford gauge during daylight hours. Daylight hours will be 30 minutes before official sunrise to 30 minutes after official sunset. Once boating is allowed, it may continue until 30 minutes after official sunset on that same day.
4. Specify that boating opportunities (see 2 and 3 above) will be a condition of the self-registration boating permit.
5. Require boaters to use tandem/single capacity hard boats or tandem/single capacity inflatable boats.
6. Require boaters to start or complete their trip only at specific boater put-ins and takeouts, which will be designated after site-specific NEPA analysis and will be a condition of the self-registration boating permit. In the interim, require boaters to start or complete their trip only at existing trails at the following locations:
 - a) Within one-quarter mile downstream of the Green Creek confluence;
 - b) Within 500 feet of the Norton Mill Creek confluence;
 - c) Within one-quarter mile of Bullpen Bridge;
 - d) Within one-quarter mile of Burrells Ford Bridge; and
 - e) Within one-quarter mile downstream of the Lick Log Creek confluence.
8. Specify that safety equipment for boaters will be determined at the district level as a condition of the self-registration boating permit.
9. Require backcountry group size limits as follows: maximum 12 people per group on trails, six people per group at designated campsites, except at designated large group campsites; six people per boating group; and four people per angling group. Require a minimum of two craft per boating group.
10. Establish a desired condition where the trail system (including portage trails) minimizes encounters and conflict while being environmentally sustainable and where redundant trails, trails where resource damage cannot be mitigated and trails that exacerbate encounters or conflict will be closed or rerouted. Trails will be designated based on future site-specific NEPA analysis.
11. Allow camping only in designated campsites. Allow campfires only in designated fire rings. Campsites and fire rings will be designated based on future site-specific NEPA analysis. Allow visitors to use existing campsites until site-specific NEPA analysis is complete.
12. Establish a desired condition where campsites accommodate no more than three tents per site, except at designated large, group campsites, are environmentally sustainable and limit encounters and conflict; where redundant campsites, campsites where resource damage cannot be mitigated and campsites that exacerbate encounters or conflict are closed or relocated.
13. Require agency approval for large woody debris (LWD) removal.
14. Adopt a monitoring plan to help determine whether my decision is producing the desired outcomes and avoiding unintended consequences. For *Gymnoderma lineare* an annual assessment of the subpopulation along the main stem of the Chattooga River would be completed using a rapid assessment field form.

15. Incorporate the use of adaptive management to address any problems revealed through monitoring. If any unacceptable impacts were noted to the *Gymnoderma lineare* subpopulation corrective measures would be implemented including consultation with the Asheville office of the US Fish and Wildlife Service.

III. EXISTING CONDITION

The topographic character of the Chattooga River watershed is abrupt with a deeply dissected landform that forms a portion of the Blue Ridge Escarpment as it divides the Blue Ridge from the Foothills and Piedmont. Steep gorge walls, narrow chutes, waterfalls and small shaded rock outcrops are prominent features across this dissected portion of the watershed. The steep vertical relief along the river changes rather abruptly downstream of Ellicott Rock turning into a relative gentle gradient with only small falls, broader chutes or scattered rapids such as at Big Bend Falls and at Rock Gorge.

The geological dominants have greatly influenced the vegetation types. Both graywacke-schist and greywacke-schist-amphibolite comprise more than three-quarters of the watershed area (Hatcher 1971, USDA 1995). Mica gneisses, feldspathic gneisses, quartzite, and aluminum schist dominate the basin. The mafic derived rocks, amphibolites, are generally scarce and as such the soils tend to be less productive and plants within the heath family are particularly abundant across the watershed.

Various community classification reviews have been conducted within portions of the Chattooga River watershed during the past 30 to 35 years. Dumond completed a floristic and plant community study within the upper reaches of the watershed in 1970. A landscape ecosystem classification model was developed by Gattis (1992) and Carter (1994) for portions of the Highlands Ranger District and by Moffat (1993) for the Chattooga Ranger District. Patterson classified more complex vegetation patterns for the Ellicott Rock Wilderness in 1994. A land type phase model with incorporation of the diverse vegetation types each separated by soil characteristics was completed by the Chattooga Ecological Classification Team (USFS 1995). Permanent community classification plots within the escarpment area south of Highlands were established in 1997 by the North Carolina Vegetation Survey (Peet, et al. 1997).

Unique and high quality communities as well as rare species were characterized by Dellinger in 1992 throughout the Highlands Ranger District, by Gaddy in 1992 both within the Highlands area and within the Andrews Pickens Ranger District of the Sumter National Forest, by Zartman and Pittillo within spray cliffs in 1995 and by various bryologists in conducting a survey to determine the current status of those bryophytes formerly ranked as federal candidates (Anderson et. al. 1997). Previous bryology surveys had been completed by Anderson within a small portion of the watershed while characterizing moss diversity across the Blue Ridge Escarpment (Anderson and Zander 1973). All of these studies have expanded the knowledge of rare habitats and communities within the Chattooga River watershed.

There are about 178,700 acres in the Chattooga River Watershed. Table 1 indicates the ecological diversity across the watershed. Approximately two-thirds of the watershed,

126,300 acres, is national forest lands. The only ecological classification that has been modeled and mapped in a Geographic Information System throughout the watershed includes the work completed by the USFS in 1995. Tables 1 and 2 lists the acreage managed by the three national forest units for the different ecological types present within the watershed and the lower and upper wild and scenic corridor. South Carolina 28 separates the lower and upper corridor. This database shows that about 47% of the watershed is dominated by hardwood types, primarily oaks, 25% is dominated by mixed yellow pine-oak types, 14% is dominated by hemlocks and hardwoods, and 10% by white pine and hardwoods. The remaining types, such as alluvial forest and rock outcrops are much less common within the watershed. As a result, they are difficult to map or model and may significantly deviate from the tally.

The upper (upstream of SC 28) and lower wild and scenic corridor segments differ in the abundance of these dominant types (Table 2). Within the upper corridor, white pine dominant communities, hemlock-hardwood communities, pitch and table mountain pine communities, and dry oak-hickory communities are much more prevalent. In contrast, shortleaf pine communities dominate the lower segment of the wild and scenic corridor and acidic cove forest and mesic oak-hickory forest types are more abundant in comparison to the upper corridor segment.

Table 1. Comparison of Ecological Type Abundance within the Chattooga River Watershed, within the Upper Segment (north of SC 28), and within the Lower Segment (south of SC 28) Wild and Scenic Corridor.

Natural Communities	Acres	% in Watershed	Upper Wild & Scenic Corridor (Ac)	% Upper Corridor	Lower Wild & Scenic Corridor (Ac)	% Lower Corridor
High Elevation Red Oak Forest	1882	1%	23	0.3%	0	0%
Montane Oak-Hickory Forest	10667	6%	156	2%	0	0%
Montane White Oak Forest	1529	1%	13	0.2%	0	0%
White Pine/Heath Forest	17293	10%	1331	19%	436	2%
Mesic Oak-Hickory Forest	34391	19%	636	9%	4916	25%
Table Mountain Pine-Oak/Heath Forest	246	0.1%	0	0%	0	0%
Pitch Pine-Oak/Heath Forest	16837	9%	955	14%	2257	12%
Acidic Cove Forest	6373	4%	423	6%	2323	12%
Eastern Hemlock/ Rhododendron maximum Forest	18252	10%	842	12%	92	0.5%
Alluvial Forest River Bar/Island	1788	1%	156	2.2%	628	3%
Chestnut Oak/Northern Red Oak/ Rhododendron	5243	3%	528	7%	367	2%
Chestnut Oak/Scarlet Oak/Heath Forest	12005	7%	604	9%	187	1%
Dry Oak-Hickory Forest	18574	10%	1048	15%	976	5%
Shortleaf Pine-Southern Red Oak-Blackjack Oak Forest	11533	6%	9	0.1%	1099	6%
Shortleaf Pine-Southern Red Oak Forest	18601	10%	141	2%	5721	29%
Heath Bald	447	0.3%	0	0%	0	0%
Swamp Forest/Bog	1164	1%	0	0%	0	0%
Rock Outcrops	234	0.1%	0	0%	0	0%
Urban	216	0.1%	0	0%	0	0%
Water	1104	1%	182	3%	496	3%
Unmodeled	325	0.2%	0	0	0	0
Totals	178704		7047		19498	

Table 2. Comparison of Ecological Type Abundance in USFS Management within the Chattooga River Watershed, within the Upper (north of Highway 28) and Lower Segments (south of Highway 28) Wild and Scenic Corridor.

Ecological Types	USFS Acres	% on USFS	Upper Wild & Scenic Corridor (USFS Ac)	% Upper Corridor	Lower Wild & Scenic Corridor (USFS Ac)	% Lower Corridor
High Elevation Red Oak Forest	1183	1%	23	0.4%	0	0%
Montane Oak-Hickory Forest	7156	6%	155	2%	0	0%
Montane White Oak Forest	828	1%	13	0.2%	0	0%
White Pine/Heath Forest	14127	11%	1248	19%	361	4%
Mesic Oak-Hickory Forest	20554	16%	636	10%	1671	18%
Table Mountain Pine-Oak/Heath Forest	168	0.1%	0	0%	0	0%
Pitch Pine-Oak/Heath Forest	13561	11%	921	14%	710	8%
Acidic Cove Forest	4951	4%	423	6%	1735	18%
Eastern Hemlock/ Rhododendron maximum Forest	14005	11%	679	10%	24	0.3%
Alluvial Forest/Island/River Bar	1217	0.2%	156	2.4%	573	6%
Chestnut Oak/Northern Red Oak/ Rhododendron	4548	4%	486	7%	275	3%
Chestnut Oak/Scarlet Oak/Heath Forest	8275	7%	490	7%	157	2%
Dry Oak-Hickory Forest	14862	12%	1032	16%	498	5%
Shortleaf Pine-Southern Red Oak-Blackjack Oak Forest	6316	6%	9	0.1%	401	4%
Shortleaf Pine-Southern Red Oak Forest	13531	11%	141	2%	2773	29%
Heath Bald	347	0.3%	0	0%	0	0%
Swamp Forest/Bog	84	0.1%	0	0%	0	0%
Rock Outcrops	178	0.1%	0	0%	0	0%
Water	400	0.3%	117	2%	264	3%
Totals	126291		6531		9444	

IV. SPECIES CONSIDERED AND EVALUATED

All Region 8 sensitive species that occur or could occur on the Nantahala National Forest (NNF), Chattahoochee-Oconee National Forest (CONF), or the Sumter National Forest (SNF) Rare Plant Species were initially considered in this analysis. The list of species was compiled by reviewing: (1) North Carolina Natural Heritage Program Element Occurrence (EO) records, (2) Georgia Nongame Conservation Section EO records, (3) South Carolina Department of Natural Resources EO records, and (4) U.S. Forest Service rare species inventory records (Biotics database 2011). The initial wildlife list (Appendix B) did not include some Piedmont species and Ridge and Valley species which are included on the CONF list and SNF list but do not occur in the Southern Blue Ridge Subsection. The initial aquatic list included only those species known or suspected to occur within the Chattooga River Watershed.

The initial list included 138 plants, 32 terrestrial wildlife species, and five aquatic wildlife species (Appendices A, B, and C). Of these 175 species, forty-nine plant species, six terrestrial wildlife species, and four aquatic wildlife species are known to occur on at least one of the three national forests within the Chattooga River Watershed (highlighted in bold in Appendices A, B, and C).

A geographic information system was used to examine the distribution of EOs on the three forests and general vicinity. These records and distribution maps were reviewed to determine areas of known populations of rare species within the proposed project area. Based on these information sources the potential affected rare species list for the upper

Chattooga River project was filtered to derive those species with the greatest likelihood of occurrence. Species, such as lost Nantahala Cave spider, granitic dome goldenrod, or Georgia aster were eliminated based on range information such as only occurring at higher elevations in the NC or GA mountains, or in the foothills or Piedmont at lower elevations in SC or GA. In addition, some species were eliminated if the project area is outside their current known range and searches in the project area did not locate any populations in potential habitat. For example, lobed-barren strawberry is known from the lower portions of the Chattooga River up to approximately 1,400 feet elevation. The lowest elevation in the project area is 1,600 feet by the Highway 28 Bridge. *Waldsteinia lobata* was excluded from further consideration given the slightly higher elevations, a separation of eight or more aerial miles from the nearest populations, and negative searches within portions of what appear to be suitable habitat.

Other species were excluded from further analysis because proper habitat did not occur within the proposed activity area. These habitats included Southern Appalachian Bogs, Swamp Forest Bogs, Rich Cove Forest, Pine-Oak/Heath Forest, and various Oak-Hickory Forests. Bog turtles were excluded for this reason since its preferred habitats, Southern Appalachian Bogs or wet pastures such as sites with mucky high organic content soils, did not occur within or near the proposed activity areas.

Some species were eliminated from further analysis if they were known to occur within the project area but unlikely to be impacted by any project activities. For instance, *Schlotheimia lancifolia*, *Cheilolejeunea evansii*, and *Drepanolejeunea appalachiana* are known to occur on the bark of hardwood trees and have been documented near the Chattooga River in NC and/or SC depending on the individual species (Davison et. al 1996). However all three bryophytes typically occur on the bark of older deciduous trees and are unlikely to be impacted by any of the boating alternatives nor by any proposed trail reroutes since larger trees would probably not be cut for a new trail. Species such as *Hymeophyllum tayloriae*, *Pellia appalachiana*, *Platyhypnidium pringlei*, and *Aneura maxima* are only known to occur in grottoes or near Spray Cliff communities (waterfalls). These four species were not located during the 2007 survey or prior surveys within easily accessible microsites that would tend to invite exploration by recreationists. Other rare plant species such as *Packera millefolium* and *Carex biltmoreana* are known to occur in nearby rock outcrops but they are either undetectable from the river or at a height on almost vertical rock that is essentially inaccessible to anyone except rock climbers. Birds, mammals, butterflies, and moths were dropped from the affected list because they are very mobile and easily able to adjust to human-related disturbances by fleeing. All of these eliminated wildlife species are readily able to flee from disturbances. The mere presence of humans within these birds and mammals habitats is not thought to be particularly disturbing to these species. All of the eliminated birds and mammals roost and nest either in trees, abandoned buildings or in rock crevices, and therefore would not be affected by the proposed action. The butterflies and moths were dropped from the list because they are readily able to flee from disturbances and their host plants and habitats are rather common and would not be affected by the proposed action. The reptiles and spiders were dropped from the list because they occur in rock outcrops, rocky talus slopes and other areas within the corridor which would likely be unaffected by recreationists.

A few of the more readily discernible species were eliminated since they were not located during the 2007 review. For instance, *Riccardia jugata*, a thalloid liverwort, has not been located within any of the southern escarpment gorges since 1961 despite this survey as well as other surveys. There is a 20 year old record of Fox Mountain sedge adjacent to the Chattooga River near the intersection of Chattooga trail and East Fork Trail. The sedge was not relocated during the 2007 field survey and the surrounding habitat, Acidic Cove Forest, did not seem suitable. Dr. L.L. Gaddy who previously documented the sedge indicates the location is inaccurately mapped. He indicated it occurs within a Rich Cove Forest 0.5 mile east of the Chattooga River.

The final filtered list of species that occurs within the Chattooga River corridor and might be affected by the proposed project includes thirteen plant species, one terrestrial wildlife species and five aquatic wildlife species (Table 3). A field survey to provide info for the final analyzed plant species was completed by a team of USFS botanists/ecologists (Robin Mackie from the Sumter NF, David Danley from the Pisgah NF, Dr. Wilson Rankin from the Nantahala NF, and Gary Kauffman from the National Forests in NC) and a botanical consultant, Dr. L. L. Gaddy, from mid August to early October of 2007. Much of the botanical field work concentrated on bryophytes in the river channel or the stream banks.

Table 3. Habitat microsites within the Chattooga River corridor for those rare species known or assumed to occur within the Chattahoochee, Nantahala and Sumter National Forests and could be potentially affected by the proposed recreation project.

Scientific Name	Forest Status	Chattooga River Microsite	Present	Type
<i>Acrobolbus ciliatus</i>	A liverwort	Spruce-Fir Forest, Spray Cliff, Acidic Cove	NNF	Liverwort
<i>Cephalozia macrostachya</i> ssp. <i>australis</i>	A liverwort	Rock Outcrop in Acidic Cove Forest in Gorge	NNF	Liverwort
<i>Peltigera hydrothyria</i> (= <i>Hydrothyria venosa</i>)	A liverwort	Stream	NNF	Lichen
<i>Lejeunea blomquistii</i>	A liverwort	Spray Cliff, moist gorges along southern escarpment	NNF, CONF	Liverwort
<i>Lophocolea appalachiana</i>	A liverwort	Spray Cliff, moist forests in gorges	NNF, CONF	Liverwort
<i>Lysimachia fraseri</i>	Fraser's Loosestrife	Mesic Oak-Hickory Forest, Montane Oak Forest, Rich Cove Forest, Alluvial Forest scour zone, Acidic Cove Forest, Roadside	NNF, CONF, SNF	Vascular Plant
<i>Marsupella emarginata</i> var. <i>latiloba</i>	A liverwort	Spray Cliff, Acidic Cove in steep gorge	NNF	Liverwort
<i>Plagiochila austinii</i>	A liverwort	Moist Montane Acidic Cliff, Spray Cliff, Moist outcrop in gorge	NNF	Liverwort
<i>Plagiochila caduciloba</i>	A liverwort	Spray Cliff, Streamside, Rock Outcrop in Acidic Cove Forest in Gorge	NNF, CONF, SNF	Liverwort
<i>Plagiochila sharpii</i>	A liverwort	High Elevation Rocky Summit, Rock Outcrop in Acidic Cove Forest in Gorge	NNF, CONF, SNF	Liverwort
<i>Plagiochila sullivantii</i> var. <i>sullivantii</i>	A liverwort	Spruce-Fir Forest, Spray Cliff, moist shaded rock outcrops in gorges	NNF, CONF	Liverwort
<i>Plagiommium carolinianum</i>	Carolina Star Moss	Rock Outcrop in Acidic Cove Forest in Gorge, Stream bank	NNF, CONF, SNF	Moss
<i>Radula sullivantii</i>	A liverwort	Spray Cliff, Rock Outcrop in Acidic Cove Forest in Gorge	NNF, CONF, SNF	Liverwort
<i>Plethodon teyahalee</i>	Southern Appalachian Salamander	Alluvial forests, moist forests	NNF, CONF, SNF	Amphibian
<i>Alasmidonta varicosa</i>	Brook Floater	High gradient streams and moderate gradient rivers among rocks and gravel substrates in sandy shoals, riffles and moderate rapids.	CONF, SNF	Mollusks
<i>Beloneuria georgiana</i>	Georgia Beloneurian Stonefly	High elevation Spray Cliffs and spring brooks.	CONF	Stonefly
<i>Cambarus chaugaensis</i>	Chauga Crayfish	Fast-moving, rocky tributaries of the upper Savannah River.	NNF, CONF, SNF	Crustacean
<i>Macromia margarita</i>	Mountain River Cruiser	Mountain, sometime Piedmont, streams and rivers with high water quality, forested watersheds and silt deposits among rocks.	NNF, CONF	Dragonfly
<i>Ophiogomphus edmundo</i>	Edmund's Snaketail	Clear moderately flowing mountain streams and rivers with sand or gravel riffles.	NNF, CONF	Dragonfly

The majority of the bryophyte specimens were sent to a liverwort specialist, Dr. Paul Davison, at the University of North Alabama, or a moss expert, Dr. Allen Risk, at Moorehead State University. No recent terrestrial wildlife surveys were completed within the proposed project area. Previous and current aquatic surveys conducted in the Wild and Scenic Corridor were utilized to identify the five potentially affected aquatic species.

English and Pike (2009) and English (1990) conducted aquatic insect surveys in the Chattooga River watershed. Mussel surveys were conducted in the main channel of the river by Alderman in 2004 and 2008. The most recent crayfish survey occurred in 2002 (Eversole et. al. 2002).

V. SURVEY RESULTS

Twenty-two sensitive plant species have been documented within the upper 21-mile reach of the Chattooga River Wild and Scenic Corridor. Over 60 site locations of new sensitive plant species were documented during the fall 2007 survey. Seventeen of these species were documented on portions of the main stem of the Chattooga River. Primary suitable habitat for the majority of the rare species included boulders in the middle and/or edge of the river and alluvial sandbars. Suitable habitat for the majority of the river-associated rare species decreased from the northern portion to the southern portion of the 21 mile reaches (see Table 4). This is primarily due to the river widening as it traverses downstream, the presence of fewer boulders and protected grottoes, lower humidity and higher temperatures.

Table 4. Rare plant species documented within different reaches of the main stem of the Chattooga River.

River Segment	Federally Listed Plants	Regional Sensitive Plants	Locally Rare Plants
Bull Pen Bridge North to Access	0	12	9
Bull Pen Bridge South –Ellicott Rock	1	10	4
Ellicott Rock – East Fork	0	6	1
East Fork – Burrells Ford	0	3	0
Burrells Ford -Licklog	0	3	1
Licklog – Highway 28	0	0	1
Highway 28-Tugaloo Lake	0	1	2

VI. EFFECTS ANALYSIS

Terrestrial Wildlife Species Biology and Distribution

1) Southern Appalachian Salamander (*Plethodon teyahalee*)

The Southern Appalachian Salamander's range is limited to the Blue Ridge physiographic province of southwestern NC (west of French Broad River) and immediately adjacent TN, GA and SC. Within this range, this species' habitat includes moist forests at all elevations. NatureServe documents this species' habitat to include birch-beech-hemlock forests with witch hazel and rhododendron understory. Special habitat factors for this species include burrowing in soil and fallen logs and debris. This species is listed as a Regional Forester's Sensitive Species on the CONF, NNF and SNF. It is Globally Ranked (G-Rank) as G3 (vulnerable) and State Ranked (S-Rank) as S2 (imperiled), S3? (vulnerable) and SNR (not ranked) in GA, NC and SC, respectively.

There are no documented occurrences of this species within the upper corridor. There are eight documented occurrences within the upper watershed on the NNF and two documented occurrences in the upper watershed on the CONF. There are approximately

1,000 documented occurrences of this species outside of the Chattooga watershed in other areas of the NNF, where this species is thought to be most secure (Doreen Miller, retired USFS biologist, personal communication). When analyzing the data in Table 1 to only include suitable habitat within the upper corridor, it can be conservatively estimated that this section of upper corridor provides approximately 2,057 acres (29% of whole) of suitable habitat for this species. These habitats include: mesic oak – hickory forest, eastern hemlock / rhododendron maximum forest, acidic cove and alluvial forest.

Aquatic Wildlife Species Biology and Distribution

There are documented occurrences in the Chattooga River watershed for four of the five Region 8 Sensitive aquatic animal species that may be affected by the proposed project. Habitat descriptions for Region 8 Sensitive aquatic species are summarized in Table 3. It is possible that *Cambarus chaugaensis*, *Beloneuria georgiana*, *Ophiogomphus edmund* and *Macromia margarita* occur throughout the Chattooga River watershed. However, *Alasmidonta varicosa* is only known from the vicinity of SC 28 Bridge and downstream in the main channel of the Chattooga River.

1) Mollusks

Alasmidonta varicosa is located in the main channel of the Chattooga River from the vicinity of the SC 28 Bridge and downstream in South Carolina and Georgia. The mussel's range extends along the east coast from Georgia into Canada. From Georgia through at least Maryland, this is the best extant population within this range (Alderman 2008). Alderman (2004) reports that *Alasmidonta varicosa* is reproductively viable in the Chattooga River.

2) Crustaceans

There are state natural heritage program element occurrence (EO) records for *Cambarus chaugaensis* in the Chattooga River in North Carolina. The species range includes the Chattooga River watershed in North and South Carolina and Georgia; and the Chauga River watershed in South Carolina, where it is most abundant.

3) Insects

English (1990) sampled *Beloneuria georgiana* in the Chattooga River and two tributaries. *Ophiogomphus edmund* was recently reported from the main channel of the river in the vicinity of the Highway 76 Bridge (Abbott 2010). This species has also been reported from Georgia, North Carolina and Tennessee. *Macromia margarita* is not documented from the watershed, but occurs in adjacent watersheds in South and North Carolina. For this reason, and the likelihood of discovering more occurrences, this species is included for analysis. *Macromia margarita* is documented from Alabama, Georgia, North Carolina, South Carolina, Tennessee and Virginia (Natureserve 2011). In South Carolina, this species is documented from the Seneca River watershed in Pickens County. There is the possibility that these three aquatic insects occur in a wider range than is documented due to the lack of wide range sampling and the difficulty of identifying individuals at different life stages. English and Pike (2009) found the genus *Ophiogomphus* at seven sites in the Chattooga River watershed, but were unable to identify them to the species level.

Plants Species Biology and Distribution

Following is a brief discussion on the species known range and distribution within the Chattooga River watershed. Table 5 follows with more specific habitat conditions for these 13 sensitive species.

1) *Acrobolbus ciliatus* is primarily restricted in the southern Appalachians within the Carolinas, Tennessee, and Georgia; however, the species also occurs within Alaska, Arkansas, Japan, Taiwan, and India (Hicks 1992, Natureserve 2011). The species occurs either on humid or moist rocks in steep gorges or shaded outcrops in Spruce-Fir Forests (Hicks 1992). Typically it occurs as very tiny populations (Hicks 1992). Within the Nantahala NF there are five occurrences. There are no known occurrences across the SNF or the CONF. The species was located within the lower reaches of the NNF and on the SNF during the 2007 field survey.

2) *Cephalozia macrostachya* ssp. *australis* has an odd distribution of Mississippi and North Carolina (Natureserve 2011). While the limited distribution of the species puts it at risk, there is some question on its taxonomic validity (Dr. Paul Davison, University of North Alabama Bryology Professor). Within North Carolina it is only known to occur historically within Linville Gorge and Chattooga Gorge. It has only been collected by Rudolph Schuster who originally described the species (Schuster 1980). The species was previously collected on soil in crevices of streamside rocks (Hicks 1992).

3) *Peltigera hydrothyria* is an aquatic lichen that is generally found attached to rocks partially submerged on the edge of swift flowing, steep gradient streams. Within the last 18 years, occurrences have been located in streams across 12 western North Carolina counties and within the past several years it has been found more frequently within Virginia (F. Huber, George Washington and Jefferson National Forests botanist, personal communication). There are over 65 occurrences of this species documented on the NNF. The species is also known to occur within Pennsylvania, southeastern Canada, and the Pacific Northwest (Brodo et. al 2001, Natureserve 2011). New site locations were located for this aquatic lichen during the project review surveys in Scotsman Creek and the main stem of the Chattooga north and south of Bull Pen Road. No occurrences were noted for this species within the SNF or CONF.

4) *Lejeunea bloomquistii* ranges from Kentucky, Tennessee, the Carolinas and Georgia (Natureserve 2011). The species typically occurs on horizontal rock, typically dry and in partial sun (Dr. Paul Davison, University of North Alabama Bryology Professor). Threats to the species include development and disturbance such as trampling (Hicks and Amoroso 1996a).

Lejeunea bloomquistii has a global rank of G1G2. Of the three states, the species is more abundant in NC with a state rank of S2, while in Georgia and South Carolina the state ranks are S1? or S1, respectively. Thirteen populations have been documented within NC, four in SC, and a single one in GA. *Lejeunea bloomquistii* is known from the Whitewater and Cullasaja River Gorges in the NNF. There are no populations in the SNF.

The single population relocated in the Chattooga is the only one known for the CONF. Until this year the species had not been relocated within GA for 50 years.

5) *Lophocolea appalachiana* is known from Kentucky, Tennessee, Georgia and the Carolinas (Natureserve 2011). There is some question on the taxonomic distinctiveness of this species from *L. cuspidata* (Hicks 1996). As a result the global rank of the species is G1G2Q. Seven populations of this species are documented on the NNF. Two are known within the Chattooga River, one in CONF and one in NNF. The collection from the Chattooga River gorge in GA in 2007 represents the first collection for this species from the state. This species typically occurs on shaded wet rock or seep (P. Davison, personal communication).

6) Fraser's loosestrife (*Lysimachia fraseri*) is primarily a southern Appalachian endemic restricted to the mountains of North Carolina, South Carolina, Tennessee, and Georgia (Weakley 2007, Bates 1998). A few disjunct populations have been documented in Kentucky, Alabama and Illinois also. *Lysimachia fraseri* is found in a variety of habitats including Acidic Cove Forest, Mesic Oak-Hickory Forest, Montane Oak-Hickory Forest, Dry Oak-Hickory forest, wet rock outcrops, and river rocky shoals and islands. Typically the limiting environmental factor for this species is light intensity. It has been noted to produce more flowers under higher light intensities, such as along roadside edges. Periodic burns and flooding are believed to be the natural disturbance regimes that maintain the species within certain habitats while thin soils within rock outcrops helps to maintain a canopy free area. Low disturbance rates favor succession and competition from overtopping plants, which could result in localized elimination of a population, while high rates of disturbance could exceed the level of population maintenance and also result in localized elimination. Impacts to the species have been noted from road widening projects, herbicide use, and road grading (G. Kauffman, personal observation). Fraser's loosestrife, a Region 8 sensitive plant, has a global rank of G2. The three states maintain a state rank of S2, S1S2, and S1 for NC, GA, and SC, respectively.

The Chattooga River watershed represents the center of the species range (Bates 1998). Numerous site locations occur both within the Wild and Scenic Corridor and within the remainder of the watershed, however not all of them have been recently monitored. There are 52 site locations for the three forests within the watershed, 21 occur within the Wild and Scenic Corridor. Two new sites within the watershed were located for Fraser's loosestrife during the 2007 field survey. A small population of this species was first recorded in 1998 along an alluvial island on the Georgia side of the river approximately one mile downstream of Ellicott Rock. The small population was relocated in 2007 dispersed amongst varying densities of *Alnus serrulata*. Eight to 12 separate island sites occur within the section of the river with current active whitewater rafting use.

7) *Marsupella emarginata* var. *latiloba* is a fine distinction by Schuster that other bryologists have trouble in distinguishing (P. Davison, personal communication). As a result it has only been located within North Carolina and Vermont (Natureserve 2011). The typically occurs on damp shaded rock outcrops (Schuster 1980). Within the NNF there are two historical locations including one in the uppermost reaches of the Chattooga River.

8) *Plagiochila austinii* ranges from Georgia, North Carolina and Tennessee north to Vermont and Nova Scotia (Natureserve 2011). The species typically occurs within damp shaded rock outcrops, although occasionally has also been associated with Spray Cliffs (NC Biotics 2007, Schuster 1980). As with *Plagiochila sullivantii* var. *sullivantii*, this species is not thought to be as threatened as some of the other *Plagiochila* species since it is not as restricted to gorges and can occur in other habitats (Hicks and Amoroso 1996c).

Plagiochila austinii has a global rank of G3. The state rank for North Carolina is S1S2. Ten populations have been documented within NC, five of these occurring in the NNF. The occurrence near Chattooga Bluffs is near the southernmost site for this species across its range.

9) *Plagiochila caduciloba* is a narrow southern Appalachian endemic of Kentucky, Tennessee, North Carolina, Georgia and South Carolina (Natureserve 2011). The species typically occurs on shaded, damp rocks either on the vertical rock walls or on the underside of ledges (Natureserve 2011). Occasionally it has been associated with Spray Cliffs, but always removed from the spray zone (Natureserve 2011). Threats to the species include development and disturbance such as trampling (Hicks and Amoroso 1996a).

Plagiochila caduciloba has a global rank of G2. The species is most abundant within the southern Blue Ridge Escarpment at the southern terminus of its range such as in the Chattooga River Gorge where it was located within all three states. Of the three states, the species is more abundant in NC with a state rank of S2, while in Georgia and South Carolina the state ranks are S1? or S1, respectively. Thirteen populations have been documented within NC, four in SC, and two in GA. Populations are known across ten sites in the NNF, one within the SNF, and one in the CONF. In the 2007 survey, this species was located across all three forests from Licklog Creek to the Chattooga Cliffs area.

10) *Plagiochila sharpii* occurs within a limited area in the southern Appalachian mountains of Tennessee, North Carolina, Georgia and South Carolina (Natureserve 2011). The species typically occurs on wet boulders and outcrops in river gorges (Natureserve 2011). Threats to the species include developments and recreational disturbance such as trampling (Hicks and Amoroso 1996b).

Plagiochila sharpii has a global rank of G2G4. The species is locally abundant within Chattooga River and Whitewater River Gorges and the Great Smoky Mountains National Park. Lush mats have been located on rocks when located within undisturbed portions of these areas (Hicks and Amoroso 1996b). It was located within the Chattooga River in all three states along and above the river in the 2007 survey and in 1996 (Hicks and Amoroso). Of the three states, the species is more abundant in NC with a state rank of S2, while in GA and SC the state ranks are S1? and S1, respectively. The species is not formally tracked in SC. *Plagiochila sharpii* is known across eight sites in six gorges in NNF, one in SNF restricted to the Chattooga River, and two in CONF in Big Creek and Chattooga River watersheds. The 2007 survey located this species most frequently within

the Ellicott Reach and Chattooga Cliffs section of the corridor although a few sites were located downstream of Ellicott Rock, including one in the Falls or cascading area at the confluence of Licklog Creek with the Chattooga River.

11) *Plagiochila sullivanii* var. *sullivanii* occurs within the Appalachians from West Virginia south to the Carolinas (Natureserve 2011). The species occurs on deeply shaded overhung rock walls and ledges within gorges. It can be associated with Spray Cliffs but also can occur at high elevations on shaded rock outcrops (Hicks and Amoroso 1996c). The species is historically known from more than 30 sites. However, only six to ten sites have been recently located and no comprehensive effort has been undertaken to reexamine all the sites. However, this species is not thought to be as threatened as some of the other *Plagiochila* species since it is not as restricted to gorges and is often not directly adjacent to streams (Hicks and Amoroso 1996c).

Plagiochila sullivanii var. *sullivanii* has a global rank of G2T2. Some collections indicate large populations, but often the plants form thin patches (Hicks and Amoroso 1996). The Chattooga and Whitewater River basins represents the southern edge of the range for the species in GA and SC. The species is more abundant in NC with a state rank of S2, while in GA and SC the state ranks are SH and S?, respectively. *Plagiochila sullivanii* var. *sullivanii* is known across four sites in two gorges and high elevation rock outcrops in NNF. The species is historically known within GA and the CONF near Ellicott Rock. The species is not known to occur in SNF, known in SC only from the lower falls of Whitewater River. The 2007 survey located this species in two separate locations in NC along Ellicott Rock Reach near Scotsman Creek and also just upstream of the state border.

12) Carolina star moss (*Plagiomnium carolinianum*) is a narrow endemic ranging from Tennessee, North Carolina, and Georgia to South Carolina occurring in its greatest abundance in the Escarpment Gorges at the southern edge of its range (Natureserve 2011). The species typically occurs on wet, dripping rocks with a thin soil layer or wet humus in seepage areas (Anderson and Amoroso 1996). All the populations were noted to be thriving during the mid 1990's assessment with the principle threat to the species from dam construction. This principle threat is no longer likely since most of the Duke Power lands have been sold to government land management agencies. Current threats include developments and recreational disturbance such as trampling (Anderson and Amoroso 1996).

Plagiomnium carolinianum has a global rank of G3. Of the three southern states, the species varies in state rank from S2 in NC to S2? in GA and S1 in SC. It was located within the Chattooga River above Bull Pen Bridge in the 2007 survey. The species has also been located in the lowermost portion of the watershed near the Chattooga River in the SNF across two separate tributaries and within four sites in three drainages in CONF (Anderson and Amoroso 1996, Zartman and Pittillo 1995). The sites in Chattooga River watershed are the only locations for this moss within either CONF or SNF. There are three additional sites for *Plagiomnium carolinianum* in NNF.

13) *Radula sullivanii* is a southern Appalachian endemic occurring from northern South Carolina, northeastern Georgia, western North Carolina, and eastern Tennessee (Natureserve 2011). This G3 ranked species is locally abundant within the escarpment gorges on shaded rock outcrops near streams and rivers (Schuster 1980). *Radula sullivanii* varies in state rank from S2 in NC to SNR for both South Carolina and Georgia. Of all the rare bryophytes noted in the upper Chattooga River in 2007, *Radula sullivanii* was the most frequently collected liverwort occurring throughout the length of the upper corridor. The species has been located within 15 sites across the NNF, within five sites in the CONF, and across six sites in the SNF. All the SNF sites are within the upper Chattooga River wild and scenic corridor.

Table 5. Habitat Abiotic Factors for Region 8 Sensitive Plants with Potential Effects from the project proposal.

Scientific Name	Microsite	Cover	Moisture
<i>Acrobolbus ciliatus</i>	Vertical rock, Underhang	Shade	Wet
<i>Cephalozia macrostachya</i> ssp. <i>australis</i>	Vertical rock, Boulders	Shade	Wet
<i>Peltigera hydrothyria</i>	Rock Streambed	Partial to Full Shade	Inundated
<i>Lejeunea blomquistii</i>	Horizontal rock	Sunny, Partial Shade	Drier
<i>Lophocolea appalachiana</i>	Horizontal rock	Sunny, Partial Shade	Mesic to Wet
<i>Lysimachia fraseri</i>	Island	Sunny, Partial Shade	Mesic
<i>Marsupella emarginata</i> var. <i>latiloba</i>	Vertical rock, Boulders	Shade	Wet
<i>Plagiochila austinii</i>	Vertical rock, Underhang	Shade	Wet
<i>Plagiochila caduciloba</i>	Vertical rock, Underhang	Shade	Wet
<i>Plagiochila sharpii</i>	Vertical rock, Underhang	Shade	Moist
<i>Plagiochila sullivanii</i> var. <i>sullivanii</i>	Vertical rock, Underhang	Shade	Wet
<i>Plagiommium carolinianum</i>	Vertical rock, Boulders	Shade	Wet
<i>Radula sullivanii</i>	Vertical rock, Underhang	Shade	Wet

B) Direct and Indirect Effects

Terrestrial Wildlife

Potential direct and indirect effects to Southern Appalachian Salamander (*Plethodon teyahalee*) from this alternative include increased user densities and associated disturbance within the upper corridor, trampling of vegetation and sensitive habitat through creation of portage trails and new access trails, and increased vegetation disturbance through creation of new “play” (swimming, resting, lunch) sites. Based on the uncertainty (in amount, time and location) associated with some of the effects resulting from the proposed actions, such as portage trails, it is unreasonable to assume this alternative would have “no effect” on this species. It is therefore assumed that some individuals of this species may be directly or indirectly affected by the proposed action. However, given the widely dispersed number of populations known across the southern Appalachians, primarily in the NNF, there should be no viability concerns to this salamander with implementation of the project proposal.

Aquatic Wildlife

Recreational use of the river may result in the physical trampling and equipment scraping of aquatic species, particularly those with slow mobility and those in early life stages. Direct impacts may occur through mortality or injury to individuals from trampling and scraping by recreational users. Given the remote chance of these impacts targeting one particular species over time, the species occurrence ranges and the abundance of habitat across the species ranges; recreational use is not likely to cause a trend toward federal listing or a loss of viability. Indirect impacts from sediment to Region 8 Sensitive aquatic species are expected to be less than existing conditions with the implementation of watershed improvement projects. There should be no indirect impacts from the removal of large woody debris (LWD) to Region 8 Sensitive aquatic species. LWD recruitment and retention would be maintained throughout the watershed. There would be no LWD removal without agency approval (as in current management) and no removal to accommodate recreation. There is the potential for spreading or introducing new NNIS by recreation visitors to the Chattooga River and its tributaries. Aquatic NNIS, such as didymo (*Didymosphenia germinana*) or zebra mussel (*Dreissena polymorpha*) have been identified in numerous streams in the Southeastern United States. Humans can be vectors of these aquatic NNIS and the NNIS could be spread by recreational equipment. Indirect impacts could result from habitat loss or competition for resources from NNIS.

Plants

Direct effects include trampling and/or manipulation of the shrub and herb layers while creating campsites and user trails. Anglers and swimmers can directly affect rare bryophytes and lichens by trampling and scraping occupied rocks. Trampling and removal of vegetation with creation of campsites and user trails has an indirect affect on competition among associated understory species. Species such as the native rush, *Juncus tenuis*, or nonnative invasive species that favor compacted soils may increase and displace rare species on islands such as *Lysimachia fraseri*. By allowing some boating within the corridor there may be a greater frequency of these direct effects in accessible areas since there would be an additional number of people utilizing the river and potentially extend to the most inaccessible portions of the river. As a result there could be direct effects of trampling or scouring individuals of additional rare species. These include *Acrobolbus ciliatus*, *Cephalozia macrostachya* ssp. *australis*, *Peltigera hydrothyria*, *Lejeunea blomquistii*, *Lophocolea appalachiana*, *Plagiochila austinii*, *Plagiochila caduciloba*, *Plagiochila sharpii*, *Plagiochila sullivantii* var. *sullivantii*, *Plagiomnium carolinianum*, and *Radula sullivantii*.

The most noteworthy effect from the proposed action would be a potential need for portaging throughout the uppermost portion of the corridor, where eastern hemlocks are denser, and currently dead (see Table 6). With the greater potential for stringers stretching the length of the narrower uppermost portion of the corridor, increased portaging could directly affect rare bryophytes and lichens by trampling and crushing small individuals adhering to rocks and boulders primarily on the river's edge, or trampling terrestrial herbaceous species, such as *Lysimachia fraseri* if forested trails are created. If portaging is possible in the middle of the river, potential direct effects would be greatly reduced. These impacts to rare bryophytes and lichens are difficult to

adequately assess in terms of timing and intensity since it is uncertain how quickly the dead trees will fall, where they will fall, and how large individual bryophyte populations are present within potential portage areas

Table 6. Eastern hemlock communities within different reaches of the main stem of the Chattooga River.

River Segment	Hemlock-Hardwood % Adjacent to River	Acidic Cove % Adjacent to River
Bull Pen Bridge North to Access	86%	0%
Bull Pen Bridge South –Ellicott Rock	65%	0%
Bull Pen Bridge South –East Fork	59%	0.1%
Bull Pen Bridge South– Burrells Ford	54%	0.3%
Burrells Ford -Licklog	1%	64%
Licklog- Highway 28	0.2%	33%
Burrells Ford – Highway 28	0.6%	53%

While all of these species could be negatively impacted it should be noted different species have different risk of impacts from recreational use even though the direct and indirect effects do not differ. The likelihood of direct affects varies due to microhabitat preferences, the susceptibility of individual plants to withstand scraping or trampling, and population sizes (see table 4). Some of the liverwort species occur on more vertical rock surfaces and in shadier locations along the banks edge or underneath small overhanging boulders. As a result direct impacts to these species would be reduced. These include many of the liverworts such as the four *Plagiochila* species and others such as *Acrobolbus ciliatus* and *Radula sullivantii*. The species most at risk from increased recreational use includes bryophytes such as *Lejeunea bloomquistii* which tend to occur on horizontal rocks, occur in sunnier locations, and tend to have small population sizes.

It is impossible to completely quantify the amount of impacts to populations of many of the bryophyte species since most were only identified after collecting specimens (approximately 1000) and identifying them with a dissecting or compound microscope. Various identifications consisted of only small stems embedded in more common bryophytes. As such it is anticipated population sizes of these are quite tiny and could be more vulnerable to impacts with increased usage.

Viability concerns are incomplete and difficult to assess since complete population sizes could not be determined during the field survey. All of those with few populations (less than five known across the individual forest, those that are limited within the Chattooga River watershed, and typically have small individual population sizes would have potential viability concerns. This would include the following sensitive species; *Lophocolea appalachiana* and *Lejeunea bloomquistii* for CONF, and *Cephalozia macrostachya* ssp. *australis*, *Plagiomnium carolinianum*, and *Plagiochila sullivantii* var. *sullivantii* for NNF.

Given the potential to significantly impact these five region 8 sensitive bryophyte species the project proposal also includes a monitoring component. All five of these species would be annually monitored to detect their continued presence in the reach of the

corridor where they were located. Management actions would be taken if monitoring indicates adverse impacts from recreational activities for any of these five sensitive plant species.

C) Cumulative Effects

Cumulative effects are those resulting from incremental impacts of the proposed action when added to other past, present and reasonably foreseeable future actions. Cumulative effects can result from individually minor, but collectively significant actions that take place over a period of time.

Recent past activities in the watershed include prescribed burning, road reconstruction and timber management. Present ongoing activities include brook trout restoration and habitat enhancement, wildlife opening maintenance, road maintenance and recreational activities. Possible future activities include prescribed burning, timber management, invasive plant management, and road reconstruction in addition to the present ongoing activities. LRMP directions and standards are designed to minimize adverse impacts from any of these activities. Brook trout restoration and habitat enhancement have a positive impact on aquatic populations.

In the past 10-20 years there has been an increase in recreational use on the trails and on the river within the Wild and Scenic Corridor. The increased use has affected individual rare plant species. The recreational activities are anticipated to continue in the future in the most accessible portions of the river corridor. Within private property in the corridor and the watershed recent home development, road construction, and reconstruction has primarily contributed to the loss of suitable habitat for the forest associated species and to a lesser extent to the gorge river-associated species since most of this habitat is within public ownership which has resulted in less frequent and smaller disturbances. These cumulative effects on private property are expected to continue for the foreseeable future given the high land value across the watershed.

Given the remote chance of trampling and scraping impacts targeting one particular species over time and the abundance of habitat within the watershed; it is unlikely that cumulative impacts to aquatic wildlife would occur from recreational use. There are records for three of the five Region 8 Sensitive aquatic species in the lower section of the Chattooga River downstream of Highway 28, where recreational uses include fishing and boating. In addition, this section of the river contains the best extant population of *Alasmidonta varicosa* within this range. There would be an overall net reduction in sediment when watershed improvement projects are implemented in the Chattooga River watershed. These include treatment and maintenance of trails, campsites, erosion sources, and roads. Sediment input is expected to be less than existing conditions with the implementation of watershed improvement projects. Cumulative impacts to aquatic sensitive species are unlikely to occur with the implementation of watershed improvement projects. LWD recruitment and retention would be maintained and monitored; therefore cumulative impacts are unlikely to occur from loss of LWD in the watershed.

There are no future projects on the three forests that would affect the bryophyte species. There may be impacts with upcoming projects across the NNF, CONF, and the SNF for the two more widespread species, *Peltigera hydrothyria* and *Plethodon teyahalee*. Both of these species have more than 70 populations known across the three forests.

Lysimachia fraseri, locally more common within the escarpment gorges surrounding Chattooga River Watershed is also anticipated to have more impacts from upcoming projects since it often occurs on roadside edges or trails and can be impacted by road construction, and road and trail reconstruction. Even with possible greater impacts to these species these cumulative impacts added with the present project and with previous projects is not anticipated to result in any viability concern for the species across any of the three forests. The cumulative effects from the past and present project on the other 11 bryophyte species within the corridor are not anticipated to result in the loss of any existing species but may contribute to a reduction in population size of any individual species.

VII. DETERMINATION OF EFFECT

Thirteen Regional Forester's sensitive plant species, *Acrobolbus ciliatus*, *Cephalozia macrostachya* ssp. *australis*, *Peltigera hydrothyria*, *Lejeunea blomquistii*, *Lophocolea appalachiana*, *Lysimachia fraseri*, *Marsupella emarginata* var. *latiloba*, *Plagiochila austinii*, *Plagiochila caduciloba*, *Plagiochila sharpii*, *Plagiochila sullivanii* var. *sullivanii*, *Plagiomnium carolinianum*, and *Radula sullivanii* have been recently or previously located within the existing or proposed activity area across portions of the three forests. An annual monitoring plan to assess the continued presence of the two rarest species on the CONF, *Lejeunea blomquistii* and *Lophocolea appalachiana*, and the four rarest species on the NNF, *Cephalozia macrostachya* ssp. *australis*, *Lophocolea appalachiana*, *Plagiochila sullivanii* var. *sullivanii*, and *Plagiomnium carolinianum* would be implemented. Management actions would be taken if monitoring indicates adverse impacts from recreational activities for any of these five sensitive plant species.

By implementing the monitoring plan, the proposed project may impact individuals of any of the 13 sensitive plant species on the NNF, but is not likely to result in a loss of viability for any of these species across the NNF. With implementation of the monitoring plan, the proposed project may impact individuals of *Acrobolbus ciliatus*, *Lejeunea blomquistii*, *Lophocolea appalachiana*, *Lysimachia fraseri*, *Plagiochila caduciloba*, *Plagiochila sharpii*, *Plagiomnium carolinianum*, and *Radula sullivanii*, but is not likely to result in a loss of viability for any of the eight species across the CONF. The proposed project may impact individuals of the following five species, *Lysimachia fraseri*, *Plagiochila caduciloba*, *Plagiochila sharpii*, *Plagiomnium carolinianum*, and *Radula sullivanii*, on the SNF, but is not likely to result in a loss of viability for any of these species across the SNF.

For terrestrial wildlife species the project proposal may impact individuals of *Plethodon teyahalee* but is not likely to result in loss of viability for the species across the NNF, CONF, or the SNF.

Five aquatic wildlife species, *Cambarus chaugaensis*, *Alasmidonta varicosa*, *Beloneuria georgiana*, *Ophiogomphus edmundi* and *Macromia margarita*, could occur within the proposed project area. The project proposal could impact individuals of all five species

on the CONF, however is not likely to result in the loss of viability for any of these species on the CONF. For the SNF, the proposed project could impact individuals of *Cambarus chaugaensis* and *Alasmidonta varicosa*, but is not likely to result in loss of viability for either species on the SNF. The proposed project may impact individuals of *Cambarus chaugaensis*, *Ophiogomphus edmunds*, and *Macromia margarita* on the NNF, but is not likely to result in a loss of viability for any of these three species across the NNF.

No other sensitive species would be impacted by any of the project activities.

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/s/ Gary L. Kauffman Date: January 18, 2012

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