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Environmental Assessment

Gypsy Moth Eradication Project

Watauga Ranger District
Cherokee National Forest
Johnson County, Tennessee

For Information Contact: Don Palmer, District Ranger
Cherokee National Forest
4400 Unicoi Drive
Unicoi, TN 37692
(423) 735 1500

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SUMMARY

The USDA Forest Service, Cherokee National Forest (CNF) in cooperation with the Tennessee Department of Agriculture (TDA) proposes to treat approximately 360 acres in Johnson County, Tennessee for gypsy moth control. The project area includes approximately 100 acres of private land and 260 acres of National Forest System lands. All 360 acres would receive treatment. The no action and mating disruption action proposed in this Environmental Assessment have been analyzed in detail in the Gypsy Moth Final Environmental Impact Statement. The following describes the location of the proposed treatment block:

> **Rutter Ridge Treatment Area**: The approximately 360-acre Rutter Ridge Treatment Area is located approximately one mile northeast of the town of Crandull, Johnson County, Tennessee. The treatment block is primarily a xeric forest of red, scarlet and chestnut oaks, with mixed mesophytic-hardwood forest of yellow-poplar and white pine. Rhododendron thickets dominate the shrub layer in the mesic forest communities.

There is a need to eradicate the gypsy moth population in the Rutter Ridge Treatment Area in 2010 because 1) treating populations when they are at a low density is considered optimal with regards to time and expense of treatment effort, and 2) without timely intervention, the population would continue to grow and contribute to a faster rate of spread into non-infested areas.

The proposed action would protect forest resources from further defoliation. Biological resources, in general, would have no effect. The Tennessee dace may be impacted but not likely to cause a trend toward federal listing or loss of viability. Scenery and Recreation resources would be maintained with application of the mating disruptant. Cultural Resources would not be affected.

The proposal to treat private lands requires Regional Forester Liz Agpaoa, Southern Region, USDA Forest Service, to be the responsible official. The decisions to be made are whether or not to 1) treat the infested area on National Forest System lands, as proposed, and 2) to fund the treatment on private land.

INTRODUCTION

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for addressing that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by Resource Area, Affected Environment, Scope of Analysis, Direct and Indirect Effects, and Cumulative Effects. Within each section, the effects of the No-Action Alternative are discussed first to provide a baseline for evaluation and comparison with the other alternatives that follow.
- *Literature Cited:* This section provides a list of those documents specifically cited in the preparation of this assessment.
- *Preparers:* This section provides a list of individuals who assisted in the development of the environmental assessment.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Watauga Ranger Office in Unicoi, Tennessee.

Background

Accidentally released in eastern Massachusetts around 1869, the Gypsy Moth (*Lymantria dispar*) is one of the most destructive pests of trees and shrubs in the United States. The species has a host range of over 300 species of trees and shrubs; however, they have a preference for oaks and aspen. Gypsy moth outbreaks cause widespread defoliation (Figure 1), tree mortality, environmental and public health risks, and a public outcry to control the outbreaks.

Figure1: Aerial photo of gypsy moth defoliation, Snow Shoe, Pennsylvania, July 2007. The light green patches on the hilltops are trees that have begun refoliating (http://en.wikipedia.org/wiki/Gypsy_moth).

Gypsy moths infest new areas through natural means, and by egg masses and pupae attached to and being transported on human-associated articles, such as nursery stock, vehicles, camping equipment, firewood, and outdoor house-hold articles. When compared to most invasive pests the spread of the gypsy moth has been slow. This is illustrated by the fact that only 30% of the susceptible habitat in the U.S. is infested 139 years after the initial establishment occurred; however, the rate of spread has accelerated in the last four decades. For example, in the past 20 years, gypsy moths have infested over 4.5 million acres of forest in Virginia alone. The USDA Forest Service has a responsibility to protect forests from gypsy moth damage and protect neighbors by minimizing spread.

The Tennessee Department of Agriculture (TDA) in cooperation with USDA Animal and Plant Health Inspection Service (APHIS) conducts gypsy moth detection surveys. Areas with multiple male moth catches are identified the following year. Entomologists and other specialists review the trap data and propose a treatment tactic appropriate for the site and gypsy moth population density. The Forest Service has the lead for implementing eradication projects on Federal lands, along with state partners.

The national strategy for managing gypsy moth includes suppression in generally infested areas, “Slow The Spread” in transition areas, and eradication in areas that are not yet heavily infested (Sharov et al 2002a). The block proposed for treatment is within a “not yet infested” area. Populations typically found in these areas are recently discovered and still at a low density. The optimum time to treat these infestations is before they increase and spread.

Treatment On National Forest Consistent With Revised Forest Plan

The project is consistent with the Revised Land and Resource Management Plan for Cherokee National Forest (2004 RLRMP). The 2004 RLRMP identifies forest-wide standards and specific Management Prescription standards to be implemented. The Rutter Ridge Treatment Area (RRTA) contains two prescription areas: 2.B.3 – Eligible Recreational River, and 8.C – Black Bear Habitat Management. Table 1 identifies standards which give direction regarding the implementation of this proposed action.

Table 1: 2004 RLRMP Standards for Control of Non-Native Invasive Species

Forest-wide Standard	Description
FW-64	Forest insect and disease outbreaks are controlled, if necessary to prevent unacceptable damage to resources on adjacent land, or to prevent unnatural loss to the forest resource, or to protect threatened, endangered or sensitive species.
FW-70	Manage gypsy moth infestations using suppression, eradication, and slow the spread strategies.
FW-77	A certified pesticide applicator supervises each forest service application crew and trains crew members in personal safety, proper handling and application of herbicides, and proper disposal of empty containers.
FW-78	People living within one-fourth mile of an area to be treated aerially are notified during project planning and shortly before treatment.
Prescription Standard	**Description**
RX2B3-4	Manage forest insects, diseases and non-native invasive plants using IPM [Integrated Pest Management] practices. Eradication of non-native invasive pests may be considered. Use biological control, where available and effective, as the preferred method for management.
RX8C-4	Manage forest insects, diseases and non-native invasive plants using IPM practices.

Relationship To Other Decisions

This EA is tiered to the Record of Decision for the 1995 Final Environmental Impact Statement (FEIS) on "Gypsy Moth Management in the United States: a cooperative approach" (USDA 1995). The 1995 FEIS describes alternatives for managing gypsy moth populations nationwide and includes an analysis of environmental effects and human health risks associated with each alternative and treatments that may be used. The Proposed Action calls for implementing an eradication strategy to prevent the spread of the species in the infested areas and to curtail the establishment in uninfested areas. The FEIS requires that a site-specific environmental analysis be conducted on a project-by-project basis.

Purpose and Need for Action

There is a need to eradicate the gypsy moth population in the Rutter Ridge Treatment Area in 2010 because 1) treating populations when they are at a low density is considered optimal with regards to time and expense of treatment effort, and 2) without timely intervention, the population would continue to grow and contribute to a faster rate of spread into non-infested areas.

Proposed Action

The USDA Forest Service in cooperation with the Tennessee Department of Agriculture is proposing to treat approximately 360 acres in Johnson County, Tennessee for gypsy moth control utilizing a mating disruptant. The Project area includes approximately 100 acres of private land and 260 acres of National Forest System lands. All 360 acres would receive treatment. The following describes the location of the proposed treatment block (also see Appendix A):

> **Rutter Ridge Treatment Area**: The approximately 360-acre Rutter Ridge Treatment Area is located approximately one mile northeast of the town of Crandull, Johnson County, Tennessee (see Appendix A, Vicinity Map). A total of 26 gypsy moths were captured over two years of trapping efforts (2008 and 2009) in the proposed treatment block (J. Ghent, Southern Research Station, Asheville, NC, pers. comm. 2010). The treatment block is primarily a xeric forest of red, scarlet and chestnut oaks, with mixed mesophytic-hardwood forest of yellow-poplar and white pine. Rhododendron thickets dominate the shrub layer in the mesic forest communities.
>
> The Appalachian Trail is, at its closest point, approximately 0.8 miles north of the treatment block. An approximately one mile section of Beaverdam Creek and all or portions of three permanent tributaries (Birch Branch, Old Road Branch, and Rutter Branch) and an intermittent tributary to the Creek are also present. Open roads include TN Highway 133, and approximately 0.25 miles of Forest Development Road (FDR) 6048 that crosses private land.

Mating disruption is species specific to gypsy moth. A synthetic pheromone is formulated into controlled active ingredient release dispensers that are scattered over the forest canopy using aircraft. The dispensers slowly release pheromone into the environment over a two to three month period when gypsy moths would be mating. Because the air becomes saturated with pheromone, the male cannot distinguish between the real female moth and the synthetic pheromone released by the dispensers, and become disoriented when seeking the source. The mating disruption process is effective at controlling low-density populations of the gypsy moths.

Decision Framework

The proposal to treat private lands requires Regional Forester Liz Agpaoa, Southern Region, USDA Forest Service, to be the responsible official. The decisions to be made are whether or not to 1) treat the infested area on National Forest System lands, as proposed, and 2) to fund the treatment on private land.

Public Involvement

The Forest Service requested comments to help determine issues regarding the Proposed Action. The Forest Service placed a legal notice in the *Knoxville News Sentinel* on March 2nd, 2010. Comments received are in the project file at the Nolichucky/Unaka District office. The proposal has been published in the Schedule of Proposed Actions since December, 2009.

Four comments were received. The comments all acknowledged the need for treating Gypsy Moth.

Issues

There are no significant issues to the proposed action.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the Gypsy Moth Eradication Project. It includes a description of each action alternative considered. This section also presents the alternatives in comparative form. This section provides a clear basis for choice among options by the Deciding Official and the public. Maps for each action alternative are in Appendix A.

Alternatives

Alternative 1

No Action

The proposed Gypsy Moth eradication treatment at Rutter Ridge would not occur.

Alternative 2

Proposed Action

In this alternative, the Forest Service in cooperation with the Tennessee Department of Agriculture (TDA) would treat low-density gypsy moth populations on intermixed Federal and private lands on the block described as the proposed treatment area. A private aerial contractor, using low flying aircraft under the direction of USDA Forest Service would treat approximately 360 acres with mating disruptants. These acres include 100 acres of private land and 260 acres of National Forest System lands. The mating disruption treatment is usually performed in mid-June. The timing of the treatment is after full "leaf-out" and before the emergence of the gypsy moth breeding adults. The dosage would be 15 grams of Disrupt II® or 23 grams of SPLAT-GM (Specialized Pheromone and Lure Application Technology – Gypsy Moth) per acre, depending on aerial contractor used.

Detailed Description of Treatment

The following information on mating disruption (MD) was provided by the USDA Forest Service, Forest Health Protection office, in Asheville, NC, last modified in 2008.

Pheromones are chemicals produced by insects to communicate with one another. In the case of the gypsy moth, the female releases a sex pheromone – disparlure (chemical name:cis-7, 8-epoxy-2-methyloctadecane) - when she is ready to mate. The male moths follow the pheromone scent to its source – the female. A synthetic form of disparlure, produced in the laboratory, is used in the co-operative USDA Forest Service projects to control low-density gypsy moth populations. The synthetic pheromone is formulated into controlled active ingredient release dispensers that are scattered over the forest canopy

using aircraft. The dispensers slowly release pheromone into the environment over a two to three month period when gypsy moths would be mating. Because the air becomes saturated with pheromone, the males cannot distinguish between the real female moth and the synthetic pheromones released by the dispensers, and become disorriented when seeking the source. In turn, the number of gypsy moth caterpillars produced is reduced, thereby reducing the damage caused by caterpillars feeding. This process, called mating disruption, is effective at controlling low-density populations of the gypsy moth. The application would likely occur in early June 2010 prior to the emergence of gypsy moth breeding adults. The following provides more information on the potential dispensers:

- Disrupt II® (Hercon Environmental, Emigsville, PA) is a plastic laminate flake formulation that contains disparlure as the active ingredient. It is 17.9% active ingredient (pheromone) by weight, and is registered with the Environmental Protection Agency to control low density populations of gypsy moth (EPA Reg. No. 8730-55). Prior to application the flakes are mixed with an adhesive (Gelva Mulipolymer Resin Emulsion 2333) to ensure they stick at all levels in the forest canopy or on foliage where gypsy moths are found.
- SPLAT-GM (ISCA Technologies, Riverside, CA) is a polymer matrix formulation that contains disparlure as the active ingredient. It is 13% active ingredient (pheromone) by weight and is registered with the Environmental Protection Agency for use on low-density gypsy moth populations (EPA Reg. No. 80286-4)

The product would be applied at a dose of 15 grams of Disrupt II or 23 grams of SPAT-GM per acre. The active ingredient dose is equivalent to about ½ cup of Disrupt II flakes or one cup of SPLAT-GM droplets per application per acre.

Design Criteria

The following measures would apply to Alternative 2 (Proposed Action) to enhance the effectiveness of the treatment, and to reduce the risk of off-site impacts. Detailed descriptions, insecticide labels and Material Safety Data Sheets (MSDS) can be obtained at the Forest Supervisor's office in Cleveland, Tennessee, and at the Nolichucky/Unaka Ranger District office.

1. To minimize drift and insure a uniform distribution on vegetation, the application of the mating disruptants would be discontinued when winds would negatively impact deposition, the foliage is dripping wet or there is an imminent threat of rain. Since the mating disruptant products are not affected by temperature and relative humidity, these conditions would not directly effect the application of these products; however, these conditions are monitored to predict storm patterns and ensure the safety of the pilots. Ground personnel within the project area would monitor application conditions. Application heights would range between 100 and 200 feet above the treetops, depending on aircraft type and terrain.
2. The application pilot and observer aircraft pilot would conduct a pre-treatment flight of all proposed treatment blocks to become familiar with boundaries.

Topographical maps would be provided to the application and observer pilots to assist in identifying the target area boundaries and any hazards associated with the aerial treatment of the areas. The application pilot would have radio communication with the airbase, observer aircraft, and personnel in the areas at all times. Ground crews assigned to the areas would monitor the application and provide weather updates. Observer pilot would provide flight following to the airbase for safety.

3. The application aircraft is equipped with a Differential Global Positioning System (DGPS) that assists the pilot in locating the treatment areas, identifying area boundaries, and insuring even coverage throughout the areas.

4. Disruptants would be applied according to label directions. All label warnings and restrictions would be strictly adhered to by the applicator. Disruptants would not be applied over open bodies of water.

5. The public would be notified of the proposed treatment dates and times through local newspapers and local radio stations.

6. Security measures would be implemented around all planes, chemicals, spray tanks, and other items associated with the aerial spraying.

Monitoring

Effectiveness of the mating disruption treatment would be monitored for two years post-treatment using pheromone-baited traps*. Traps deployed in the proposed year of treatment (2010) would not be expected to effectively trap male moths because the air would still be saturated with synthetic pheromone from the treatment. Traps deployed the year after the treatment (2011) would be used to evaluate treatment efficacy and to determine whether follow-up treatments would be required in 2012. The project would be considered successful if no male moths are caught in the second year post-treatment.

** Delta or milk carton traps, which vary in color from green, orange, or brown are distributed within areas known to have Gypsy moth and at the leading edge of an infestation to track its spread. The traps are baited with a lure, which is a natural pheromone that attracts the male Gypsy moth. The traps are hung 4-5 feet off the ground in a tree where air current can circulate the attractant freely.*

Alternatives Considered but Eliminated from Detailed Study

Alternative 3 - (Aerial Application of Gypchek®)

Gypchek® is the trade name for the Forest Service formulation of the nucleopolyhedrosis virus, a natural occurring gypsy moth-specific pathogen. Gypchek® is produced in limited quantities each year and only made available when there is a demonstrated need.

The probability of successfully suppressing low-density populations like those found in the project area is not well documented. Gypchek® is most efficacious in high-density populations of gypsy moth where adequate numbers of caterpillars are present to transmit the virus among the population (Reardon and Podgwaite 1996). Due to the lack of efficacy data to support the use of Gypchek® in low-density populations, this alternative was eliminated from detailed study.

Alternative 4 - (Release of Predators and Parasites)

Predators and parasites would be released to manage gypsy moth populations throughout the project area. Previous studies are not conclusive as to the efficacy of this control technique on low-density populations (USDA FEIS 1995, pp 2-7); thus, this alternative was not brought forward for additional analysis. It is important to recognize however that within any ecosystem, specific and non-specific predators and parasites of gypsy moth may contribute to the long-term biological control of the gypsy moth.

Alternative 5 - (Aerial Application of *Btk* on the treatment block)

Two aerial applications of the biological insecticide, *Bacillus thuringiensis var. kurstaki* (Btk), a lepidoptera (butterfly family) specific insecticide, would be applied on the proposed treatment block. Btk is very effective when used for eradication of low-density populations of the gypsy moth. However, the Forest Service is committed to using the most environmentally sensitive tactic that would meet project objectives. Entomologists believe that the project objective could be met using a gypsy moth-specific tactic (mating disruption) on the treatment block. However since Btk would affect a wider range of moth and butterfly species, the use of Btk was not brought forward for additional analysis. (See Reardon et al. 1994).

Alternative 6 - (Mass Trapping)

Mass trapping would be done to manage the gypsy moth population. Theoretically mass trapping works by capturing all the males in pheromone traps before they have a chance to mate. However, data to support the efficacy of this tactic is very limited and prior use in similar forest type was not successful. Because the efficacy has not been demonstrated the use of mass trapping was not brought forward for additional analysis.

Comparison of Alternatives

This section provides a comparison of the activities and a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Resource Area	**Alternative A**	**Alternative B**
Soil	No effect	No effect
Forest Resource	Effect (defoliation/ tree mortality	No effect
Biological Resources		
Threatened and Endangered	No occurrences	No occurrences
Sensitive Species		
Diana fritillary	May impact individuals but not likely to cause a trend toward federal listing or loss of viability	Beneficial effect because defoliation and tree mortality would be prevented
Carolina saxifrage	May impact individuals but not likely to cause a trend toward federal listing or loss of viability	Beneficial effect because defoliation and tree mortality would be prevented
Rock skullcap	May impact individuals but not likely to cause a trend toward federal listing or loss of viability	Beneficial effect because defoliation and tree mortality would be prevented
Tennessee dace	May impact individuals but not likely to cause a trend toward federal listing or loss of viability	May impact individuals but not likely to cause a trend toward federal listing or loss of viability

Resource Area	Alternative A	Alternative B
MIS		
Acadian flycatcher	Not threaten viability	No effect
Hooded warbler	Not threaten viability	No effect
Ovenbird	Not threaten viability	No effect
Pileated woodpecker	Not threaten viability	No effect
Scarlet tanager	Not threaten viability	No effect
Demand Species		
Black bear	Not threaten viability	No effect
Ruffed grouse	Not threaten viability	No effect
White-tailed deer	Not threaten viability	No effect
Wild turkey	Not threaten viability	No effect
Terrestrial Viability Species		
Common Raven	No effect	No effect
Diana fritillary	No effect	No effect
Rough hawkweed	No effect	No effect
Carolina saxifrage	No effect	No effect
Rock skullcap	No effect	No effect
Water Quality/Aquatic Resources/ Aquatic Viability Species		
Tennessee Dace	May impact individuals but not likely to cause a trend toward federal listing or loss of viability	May impact individuals but not likely to cause a trend toward federal listing or loss of viability
Hellbender	No effect	No effect
Wild trout (brown/brook/rainbow)	No effect	No effect
Scenery and Recreation		
SIO	Not Meet	Meet
Recreation experience	Effect (defoliation/ tree mortality)	No effect
Cultural Resource	No effect	No effect

Resource Area	**Alternative A**	**Alternative B**
Economics	Effect (defoliation/ tree mortality)	Beneficial effect (revenues to community)
Climate Change	Effect (defoliation/ tree mortality)t	Beneficial effect (revenues to community)
Health and Safety	Effect (defoliation/ tree mortality/ secondary pathogens)-	No Impact

ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives.

Soil Resource

Scope of Analysis

The scope of this analysis includes 260 acres of National Forest Lands within the Beaver Dam watershed. The time-period considers the past ten years and future actions that could occur within five years.

Affected Environment

Diverse parent material along with other factors such as aspect, topography, and climate has resulted in many different soil types forming across the landscape. Upland soils that are well drained and have moderate permeability most frequently occur within the analysis area. However, the depth to bed rock may vary greatly depending on landscape position and past events such as landslides. Seeps and springs commonly occur in many soil types that are found on benches, foot slopes, toe slopes, colluvial fans, and coves. Soils that exhibit anaerobic conditions are associated with the few isolated wetlands found within the analysis area.

Gypsy Moth eradication would occur on 360 acres (100 acres of private and 260 acres of National Forest lands) within the Beaverdam watershed. Treatment methods for Gypsy Moth eradication require aerial application of pheromones; therefore, no soil disturbance is expected with these activities.

Direct, Indirect, and Cumulative Effects to Soils

Alternative 1 (No Action)

The No Action Alternative would result in a continuation of existing conditions within the analysis area. No effects to the soil resources would result from the No Action Alternative

Alternative 2 (Proposed Action)

A treatment method for Gypsy Moth eradication requires aerial application of pheromones; therefore, no soil disturbance or vegetation removal would occur with these activities. These pheromones are not known to affect any soil processes. Overall, Gypsy Moth Eradication treatment methods would have little to no effect on the soil resource.

Cumulative Effects (Alternative 1 or 2)

The implementation of alternative 1 or 2 would have no cumulative effects on the soil resource because there is no soil disturbance or vegetation removal .

Forest Resource

Scope of Analysis

The scope of the analysis for biological resources is the proposed treatment block. The time frame used in the analysis is from when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to disclose the potential increase and spread of the gypsy moth population and for associated impacts to occur.

Affected Environment

The Forest Service portion of the proposed treatment area is forested land, with private property including residential areas and open lands as well. The moderate to steep side slopes have a southeast aspect, with the perennial and intermittent streams draining into Beaverdam Creek. Overstory vegetation on FS lands consists primarily of forests of northern red, white, scarlet and chestnut oaks and white pine, with mixed mesophytic-hardwood forest of yellow poplar and eastern hemlock. The understory/shrub layer is primarily composed of mountain laurel, huckleberry, hardwood and pine seedlings, with rhododendron found along the drainages. The adjacent private lands are similar but tend to be composed of yellow poplar, sycamore, and other lowland species.

Table 2 displays additional, site-specific information for the proposed Rutter Ridge Treatment Area. A total of 26 gypsy moths were captured over two years of trapping efforts (2008 and 2009) in the proposed treatment block (J. Ghent, Southern Research Station, Asheville, NC, pers. comm. 2010).

Table 2: Rutter Ridge Treatment Area Site Specific Information

Area	Private Land (acres)	National Forest (acres)	National Forest Management Prescriptions	Elevation Range (feet)	Main Road(s)	Major Streams
Rutter Ridge	100	260	2B3–4, 8C-4	2400 - 3300	TN 133	Beaverdam Creek

Forest Service land in the proposed Gypsy Moth Project area is predominantly composed of deciduous and mixed forest (Table 3). The most prevalent forest type is Yellow Poplar-White Oak-Northern Red Oak occupying 32.8% of the area, followed by White Oak-Northern Red Oak-Hickory (26.3%), Upland Hardwoods-White Pine (23.7%), Cove Hardwood-White Pine-Hemlock (11.5%) and small amounts of White Pine (3.8%) and Chestnut Oak-Scarlet Oak-Yellow Pine (1.9%).

Table 3: Forest Types and Age Class Distribution on National Forest System lands (base year - 2010)

Forest Type	Age class				Total	%
	0 - 10	11 - 50	51 - 99	100 +		
White Pine		10			10	3.8%
Cove Hardwood-White Pine-Hemlock			30		30	11.5%
Upland Hardwoods-White Pine		18	44		62	23.7%
Chestnut Oak-Scarlet Oak-Yellow Pine			5		5	1.9%
White Oak-Northern Red Oak-Hickory		8	56	5	69	26.3%
Yellow Poplar-White Oak-No. Red Oak			86		86	32.8%
Total Acres	0	36	221	5	262	
Percent	0.0%	13.7%	84.4%	1.9%		

The vast majority (84.4%) of Forest Service land is occupied by stands between 51-99 years old (see Table 3), with the oldest stands in this age class likely dating back to extensive logging beginning around the late 1900's and early1910's, prior to Federal ownership. The 11-50 year age class (13.7%), likely dates from timber sales in the 1960's through the 80's. None of the Forest Service land is in the 0-10 year age class, while less than 2% is 100 years old or older. Based on CNF GIS data, the youngest stand in the project area is 25 years old, the oldest stand 110 years old.

Approximately 50% of the project area is in forest types dominated by oak species, a primary host for gypsy moth larvae in all stages of development. The remaining 50% is in forest types with a component of oak and tree species, e.g. white and yellow pine, and yellow poplar that are preferred by older (4^{th} thru 6^{th} instar) but not younger (1^{st} thru 3^{rd} instars) gypsy moth larvae. Note: an "instar" is a stage of development between molts, with larvae increasing in size after each molt.

Direct, Indirect, and Cumulative Effects to Forest Resource

Alternative 1 (No Action)

Because the proposed Rutter Ridge Treatment Area (RRTA) is composed primarily of tree species (oaks) preferred by gypsy moth larvae (caterpillars), the gypsy moth population would be expected to increase and expand throughout the treatment area under Alternative 1. Once established, the population would build from the low to a high (outbreak) density level, resulting in varying levels of defoliation over time. At the current low density population level, the gypsy moth larvae would be expected to cause 30% or less defoliation (USDA, 1995). Most of the healthy trees would replace this foliage with minor effects to health, vigor and growth; and changes to RRTA forest resources would not be expected.

During periods of moderate (30% - 60%) defoliation, the general health of the forest would decline, especially where it occurred for two or more consecutive years (ibid). Since the majority of the trees' energy reserves would be spent on re-growing leaves, the presence of additional stressors (e.g. drought, shoestring fungus, etc) would increase tree mortality rates, particularly among smaller, suppressed trees. The result would be a more open one-storied forest, with a parallel increase of shrubs, herbaceous plants, and grasses in the understory.

With two consecutive years of heavy defoliation (> 60%), a high mortality of dominant oaks, as well as less-preferred species such as, ash species, sycamore and yellow poplar (tulip tree), would be expected (ibid). The forest's composition would subsequently shift to species that are not or minimally impacted by gypsy moth larvae. Three years of heavy defoliation would cause most if not all of the forest' overstory trees to die, especially where dominated by preferred hosts. With few to no overstory trees, the forest would convert to mostly shrub species more resistant to gypsy moth larvae. High tree mortality would also increase the danger of large, intense wildfires due to a heavy fuel build-up. Under this alternative, it could take decades for the proposed RRTA to return to a forested condition.

Under Alternative 1, the gypsy moth population would continue to grow and spread unimpeded. In time, the population would likely reach a threshold (high population, low forage availability) that would cause the population to crash. But as the forest recovered, the population would increase, and the cycle would repeat itself. The cycle of repeated outbreaks and moderate-to-heavy defoliation would have a cumulative effect on the RRTA and surrounding area forest resources since tree species composition in these areas would gradually shift from oaks to less preferable host species, such as yellow poplar, ashes, cedar, black locust, mountain laurel, and sycamore (USDA Forest Service 1995). The resultant forest would be more resistant to gypsy moths over the long term.

Alternative 2 (Proposed Action)

Implementing this alternative would reduce or completely eliminate the potential for the attendant gypsy moth populations to spread within the treatment and adjacent uninfected areas, and for the species' egg masses, caterpillars and adults to be transported to distant uninfected areas via human assistance.

Alternative 2 would have no cumulative effects since there would be no periodic Gypsy moth caused defoliation or mortality to combine with other effects on the vegetation.

Biological Resource

Scope of Analysis

The scope of the analysis for biological resources is the proposed treatment block. The time frame used in the analysis is from when the infestation was detected in 2008 up to

10 years in the future. This time frame was chosen to disclose the potential increase and spread of the gypsy moth population and for associated impacts to occur.

Affected Environment

Analysis of effects to biological resources loosely follows the habitat framework used in the RLRMP to ensure comprehensive consideration of project effects. Threatened, Endangered, and Sensitive Species are addressed in detail in the *Gypsy Moth Eradication Project Biological Evaluation* (Carter 2010)(Appendix B). An analysis of each alternative's effect(s) on federally threatened, endangered and sensitive species, CNF management indicator species, demand species, terrestrial viability species, and water quality and fisheries, is provided below.

Threatened, Endangered and Sensitive Species

Threatened and Endangered Species

There are no documented occurrences of species currently listed as federally threatened, endangered or proposed to be listed in the proposed treatment area. Therefore, the proposed Gypsy Moth Eradication Project would have No Effects to federally threatened, endangered and proposed to be listed species.

Sensitive Species

Based on habitats present and documented occurrences, four Sensitive Species are known to occur in the proposed treatment area (Table 4).

Table 4: Sensitive Species in Project Area

Scientific Name	Common Name
Speyeria Diana	Diana fritillary
Saxifraga caroliniana	Carolina saxifrage
Scultellaria saxatilis	Rock skullcap
Phoxinus tennessensis	Tennessee dace

Diana fritillary apparently underwent a major range wide decline in the past resulting in a substantial loss of its historic range. However, some believe it is increasing in areas where second growth forests are becoming mature, and where gypsy moth spraying is not widespread (NatureServe 2009). Adults breed in deciduous or mixed forests with abundant violets in late summer. The larvae hatch in the fall, over-winter, and begin feeding on violets in early spring. Adults feed on nectar from flowers in open areas and also are found on scat and moist soil (NatureServe 2009).

Carolina saxifrage occurs in cool, shaded, rocky woods and rock ledges, rooted in the thin layer of organic matter and moss that forms on the surface of the rocks. Almost

always in steep terrain and often in areas misted by spray from nearby waterfalls or in areas where water trickles down the rocky slopes (NatureServe 2009).

Rock skullcap occurs in the Blue Ridge Mountains. This skullcap grows in rocky areas in dry to mesic forests and open areas (Pistrang 2001).

Tennessee dace inhabit cool and cold, clear first-order spring-fed streams of relatively moderate gradient, shaded by riparian vegetation. The population trend of this fish is declining within its range (NatureServe 2009).

Direct, Indirect, and Cumulative Effects to Sensitive Species

Alternative 1 (No Action)

Terrestrial Wildlife: Alternative 1 would have no direct impacts on Diana fritillary, Carolina saxifrage, and rock skullcap because no actions would occur. Left untreated, the gypsy moth population would be expected to increase, leading to widespread canopy defoliation and tree mortality over the long term. The loss of the forest canopy would have negative indirect impacts on Diana fritillary, Carolina saxifrage, and rock skullcap: the increase in light intensity and decrease in soil moisture may change habitat conditions in the area to where they would no longer be suitable for the species.

When combined with other past, present and future management activities, Alternative 1 would have a negative cumulative effect on Diana fritillary since the increased tree mortality could cause future prescribed burning in the area to be more intense, thus altering mating habitat and causing mortality on over-wintering caterpillars. In addition, the more intense fires would likely result in more burned area, thereby affecting more potential Diana fritillary habitat and caterpillars. The alternative would have no cumulative effects on Carolina saxifrage and rock skullcap.

Fisheries: In the No Action alternative, stream temperatures may increase in severely defoliated riparian zones. Although the streams in the project area are not marginal cold water habitats, temperature increases during extended periods of drought may adversely affect Tennessee dace in Rutter Branch and Old Road Branch. However, dense stands of rhododendron lining the streams should provide adequate shade and prevent temperature increases. Beaverdam Creek flows through much open habitat before it reaches the project area, and temperatures remain low enough year-round to maintain coldwater species. Defoliation in the project area is not likely to measurably increase water temperature in Beaverdam Creek. Tennessee dace would find refuge in Beaverdam Creek and other tributaries nearby.

Defoliation due to gypsy moth reduces acid neutralizing capacity, increases nitrate mobility, and lowers pH. When coupled with atmospheric deposition of nitrogen and sulphur these effects may be substantial in some acid-sensitive streams (USDA 1995). A considerable reduction in pH could reduce population health of Tennessee dace.

No other activities in the project area have affected or will affect fisheries in the project area. Therefore there would be no cumulative effects from Alternative 1.

Determination of Effect – Alternative 1 may impact individual Diana fritillary, Carolina saxifrage, rock skullcap and Tennessee dace, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 2 (Proposed Action)

Terrestrial Wildlife: The pheromone proposed for mating disruption is specific to the genus to which the gypsy moth belongs, *Lymantri*a. As the Diana fritillary is in the genus, *Speyeria*, the proposed action would have no direct effects on the species. Since insect pheromones have no effects on plants, Carolina saxifrage and rock skullcap would not be directly affected by the proposed action as well. Alternative 2 would have a beneficial indirect effect on Diana fritillary, Carolina saxifrage, and rock skullcap however because by removing the area's gypsy moth population, habitat alteration and/or loss through defoliation and tree mortality would be prevented.

When combined with past, present and future management actions, specifically prescribed burning, Alternative 2 would have beneficial cumulative effects on Diana fritillary because it's breeding and foraging habitat would be maintained. The alternative would have no cumulative effects on Carolina saxifrage and rock skullcap since past and future actions would have no impacts on the species.

Determination of Effect – Alternative 2 would have beneficial impacts on Diana fritillary, Carolina saxifrage, and rock skullcap.

Fisheries: Based on project design, application of the dispensers would not occur over open water, i.e. Beaverdam Creek, but application would occur over Old Road and Rutter Branches. However, these streams are lined by dense stands of rhododendron and overstory trees that completely cover the stream channel over much of its length. Some dispensers may come in direct contact with the stream, but most of the dispensers would be intercepted by and adhere to trees, rhododendron and other vegetation, where they would remain until leaf fall. By this point the product would have released at least 60% of its active ingredient. The risk of the remaining disparlure leaching into surface or groundwater via trans-location after leaf fall is minimal because disparlure is insoluble in water (USDA Forest Service 2008).

Disparlure is not highly toxic to fish, but has been shown to have a 20% mortality rate to rainbow trout at a rate of 100 mg/liter (Durkin 2004). Only a small fraction of this amount would be used in this project. Because disparlure is not soluble in water and only a very small portion of the disruptant would actually reach the water, direct impacts to Tennessee dace would be minimal to non-existent.

Eradication of the treatment area's gypsy moth population would have beneficial indirect effects since the possibility of detrimental effects on Tennessee dace from temperature increases and reduction of pH levels in the streams would be eliminated. Alternative 2 would have no cumulative effects on fisheries since no other activities have affected or will affect aquatic resources in the project area.

Determination of Effect – Alternative 2 may impact individuals Tennessee dace, but is not likely to cause a trend toward federal listing or loss of viability.

Management Indicator Species (MIS)

Based on habitats present, five MIS species are highly expected but not known to occur in the project area (Table 5). Other than the pileated woodpecker (a permanent resident), these species typically migrate over long distances, spending only the breeding season on the CNF. Factors outside of CNF's management influence their population trend estimates (e.g. observer bias, weather, timing of point counts, number of points in habitat), resulting in confidence intervals that are often inconclusive. The estimated population trend on CNF for Acadian flycatcher and hooded warbler show a slight decline, a slight increase for ovenbird and pilieated woodpeecker, and is inconclusive for scarlet tanager. The results for each species however, are too varied to draw accurate conclusions from the data.

Table 5: MIS in the Project Area

Common Name	Scientific Name	Habitat Represented	CNF Population Trend
Acadian Flycatcher	*Empidonax virescens*	Mature Riparian Forest	NCT * (-0.3%)
Hooded Warbler	*Wilsonia citrina*	Mature Mesic Deciduous Forest	Decline (-1.8%)
Ovenbird	*Seiurus aurocapillus*	Mature Forest Interior	Increase (1.4%)
Pileated Woodpecker	*Dryocopus pileatus*	Snags, Dens, Down Wood	Increase (2.1%)
Scarlet Tanager	*Piranga olivacea*	Mature Oak and Oak-Pine Forest	NCT* (0.5%)

* NCT – No conclusive trend based on data; 90% confidence interval does not indicate reliable results

Acadian flycatcher (*Empidonax virescens***)** breeds in most of the eastern half of the U.S. and winters in South America (NatureServe 2007). It requires deciduous forests near streams for breeding. It prefers forests with a high, dense canopy and few shrubs at elevations lower than 3500 feet in elevation (Nicholson 1997). This species was selected as a MIS to represent mid- and late-successional riparian forest habitat.

Hooded warbler (*Wilsonia citrina*) breeds in most of the eastern half of the U.S. and winters in Mexico, Central America, and the Carribean Islands (NatureServe 2007). It is found in moist deciduous forests with fairly dense understories (Hamel 1992). Hooded warbler was selected as a MIS for mid-late successional MDF with canopy gaps and structurally diverse understories (USDA Forest Service 2004).

Ovenbird (*Seiurus aurocapillus***)** breeds in most of northern and eastern U.S. and winters in Mexico, Central America, and the Carribean Islands (NatureServe 2007). It typically nests in older closed-canopied deciduous and mixed deciduous-coniferous forest with

deep litter layer and limited understory. Large, contiguous forested tracts are needed to support successful breeding and long-term population viability (USDA Forest Service 2004). This species was selected as a MIS because of its association with mature deciduous forest interiors.

Pileated woodpecker (*Dryocopus pileatus*) is a permanent resident across most of the eastern U.S., portions of the northwest and across Canada (NatureServe 2007). It requires large cavity trees for nesting and forages on dead trees and downed logs across a variety of community types. The occurrence of this species may be correlated with forested habitats with abundant large dead trees and fallen logs (USDA Forest Service 2004). Pileated woodpecker was selected as an MIS because it requires large snags for nesting and feeding. It was also selected to help indicate the effects of management activities on the availability of forests with desired abundance of snags.

Scarlet tanager (*Piranga olivacea*) breeds in most of the eastern half of the U.S. and winters in South America (NatureServe 2007). Primary habitat includes mature deciduous forests, especially in uplands; they also breed in bottomlands (Hamel 1992). The scarlet tanager was selected as a MIS to represent oak and oak/pine forests.

Direct, Indirect, and Cumulative Effects to MIS

Alternative 1 (No Action)

Alternative 1 would have No direct effects to MIS listed in Table 4 because the action would not occur. Left untreated, the increase in the gypsy moth population would be expected result in widespread canopy defoliation and tree mortality. The loss of canopy cover would cause MIS that prefer mature, closed-canopy forest (Acadian flycatcher, hooded warbler, ovenbird, and scarlet tanager) to find suitable nesting habitat elsewhere. Since pileated woodpeckers nest in large dead trees, defoliation and tree mortality could increase the availability of nesting habitat, i.e. standing snags.

Defoliation would also reduce the abundance and diversity of insects that feed on tree leaves, reducing food availability for Acadian flycatcher and scarlet tanagers. The more open conditions created by defoliation would increase vegetation growth in the mid and understory, resulting in higher insect production at those levels. Since hooded warbler and ovenbird feed in the shrub layer or understory, they would still be able to feed in the defoliated areas. The increase in tree mortality would also increase the number snags and downed wood in the area. Wood-boring insects would invade the boles, increasing food availability for pileated woodpeckers.

Although this alternative would have negative impacts on MIS individuals in the project area, habitat for these species is widespread in the surrounding watershed and across the Cherokee National Forest. Therefore, Alternative 1 would not threaten the viability of Acadian flycatcher, hooded warbler, ovenbird, pileated woodpecker, and scarlet tanager on the CNF.

Past and future prescribed burning would have negligible direct and indirect impacts to Acadian flycatcher, hooded warbler, ovenbird, and scarlet tanager and their habitats.

Therefore, when combined with this alternative, the burns would be no cumulative effects. Prescribed burning may have slightly beneficial effects on pileated woodpecker by creating additional nesting and foraging habitat (standing snags). This alternative, when combined with prescribed burning may have slightly beneficial effects on pileated woodpecker.

Alternative 2 (Proposed Action)

MIS may inadvertently ingest disruptant flakes that stick to seeds or berries; however, toxicological tests have shown a very low toxicity of disparlure to birds (Durkin 2004). Pheromones, such as disparlure and its synthetic equivalent, Disrupt II, have no effect on plants so MIS habitat would not be altered. Alternative 2 would have a beneficial indirect effect on the MIS because habitat impacts and/or loss, as described for Alternative 1, would be prevented by removing the gypsy moth population.

Past and future prescribed burning in the proposed treatment area would have negligible direct or indirect impacts to Acadian flycatcher, hooded warbler, ovenbird, and scarlet tanager and/or their habitats. When combined with this alternative, there would be no cumulative effects to these species. Past and future prescribed burning may have slightly beneficial effects however on the pileated wood-pecker by creating additional nesting and foraging habitat (i.e. standing snags). When combined with the prescribed burning, Alternative 2 would have beneficial cumulative effects on pileated woodpecker.

Demand Species

Four demand species - black bear, ruffed grouse, white-tailed deer, and wild turkey - utilize a variety of habitats in the project area. Population trends for each species on the CNF are shown in Table 6. A detailed discussion of the species and their habitats can be found in the *Terrestrial Resources of the Beaverdam Creek Watershed* report (Carter 2009).

Table 6: Demand Species in the Project Area

Demand Species	Population Trend - CNF
Black bear	Increase
Ruffed grouse	Decline
White-tailed deer	Increase
Wild turkey	Increase

Black bear (*Ursus americanus***)** uses a wide variety of habitats in the Southern Appalachians. Important habitat elements include remoteness and diversity, hard mast, den sites, and large home ranges (USDA Forest Service 2004, Whitaker and Hamilton 1998). Black bear was selected as a MIS to help indicate management effects on meeting hunting demand for this species.

Ruffed grouse (*Bonasa umbellus*) utilize a variety of forest habitats and successional stages. Grouse generally nest in pole timber (or larger) hardwood stands. Dense and diverse herbaceous vegetation, offering low overhead cover and easy movement, provides high quality brood habitat. Adults use cover in young forests (6-15 year-old) or shrubby habitats, but also use older stands with dense cover. Close proximity of nesting habitat to secure adult cover and brood habitat is critical. Grassy areas are important brood habitat and bugging areas for young. Linear openings, especially those associated with young regenerating forests provide optimal brood habitat (USDA Forest Service 2004).

White-tailed deer (*Odocoileus virginianus*) use a variety of forest types and successional stages to meet their year-round needs. In the Southern Appalachians, regeneration areas and older forests provide complimentary benefits to deer. Older forests are most important in fall and winter providing acorns, the dominant food item. In spring and summer, regeneration areas provide an abundance of food (woody browse, herbs, fungi, soft mast), which is limited in older forests. Wildlife openings, especially those containing a clover-grass mixture, are used most extensively in early spring. They are also an important source of nutritious forage in winter, especially when acorns are in short supply (USDA Forest Service 2004).

Wild turkey (*Meleagris gallopavo***)** is present throughout the Southern Appalachians and occupies a wide range of habitats. This includes mature mast-producing stands during fall and winter, shrub-dominated stands for nesting, and herb-dominated communities, including clearings for brood rearing. High population densities are associated with greater amounts of oak forest and cropland, and lesser amounts of developed and coniferous forestland. Forest openings also are a key habitat component for wild turkeys throughout the year. Permanent openings provide nutritious green forage in the winter and early spring and seeds during late summer and fall. Because of the abundance of insects and herbaceous plants, they are especially important as brood rearing habitat for young turkeys (USDA Forest Service 2004).

Direct, Indirect, and Cumulative Effects to Demand Species

Alternative 1 (No Action)

Damage to or mortality of large trees caused by defoliation may provide additional denning habitat for black bear over the long term. The increase in forest openings would create nesting habitat for ruffed grouse and wild turkey. Both would provide cover for white-tailed deer (does and fawns) and ruffed grouse (adults and young).

A more open upper canopy level from defoliation would also stimulate the growth of understory vegetation such as soft mast (fruit), woody browse, and herbaceous plants. This would also result in a concomitant increase in insect production. Both would provide additional habitat and food sources for black bear, ruffed grouse, white-tailed deer, and wild turkey. However, Alternative 1would also result in decreased acorn production, an important component in the fall and winter diet of black bear, white-tailed deer, and wild turkey.

This alternative would have both negative and positive impacts on black bear, white-tailed deer and wild turkey populations in the project area. Effects to ruffed grouse would be beneficial, through creating additional suitable habitat and in turn increasing population size. Since habitat for these demand species is widespread in the surrounding watershed and across the CNF, Alternative 1 would not threaten the viability of black bear, ruffed grouse, white-tailed deer, and wild turkey on the CNF.

Past and future prescribed burning would create a diversity of habitat and improve conditions for each of these demand species. Therefore, when combined with this alternative, there would be beneficial effects on black bear, ruffed grouse, white-tailed deer, and wild turkey.

Alternative 2 (Proposed Action)

Demand species may inadvertently ingest disruptant flakes that stick to plants, seeds or berries. However, the acute toxicity of disparlure in mammals and birds is very low (Durkin 2004); therefore, indirect effects on demand species would be minimal to non-existent. Habitat for bear, grouse, turkey, and deer would not be altered and populations would remain the same as they are currently. Existing habitat would be protected from defoliation and tree mortality caused by the gypsy moth. As no measurable effects to demand species would occur, cumulative effects from Alternative 2 and any past and future prescribed burns in the area would be minimal to non-existent.

Terrestrial Viability Species

Five terrestrial species from the CNF Species Viability List (USDA Forest Service 2004) have been found in or adjacent to the project area **(**Table 7). The effects analysis for Diana fritillary, Carolina saxifrage, and rock skullcap can be found in the Sensitive Species section of this EA. Common raven and rough hawkweed are analyzed below.

Table 7: Terrestrial Viability Species in the Project Area

Scientific Name	Common Name	Status*	Canopy Gaps	Dry Forests	Mesic Forests	Riparian/ Wetland
Corvus corax	Common raven	VC	X	X	X	
Speyeria diana	Diana fritillary	S	X	X	X	
Hieracium scabrum	Rough hawkweed	VC	X	X		
Saxifraga caroliniana	Carolina saxifrage	S			X	X
Scutellaria saxatilis	Rock skullcap	S	X	X	X	

*Status: VC - Viability Concern, S - Forest Sensitive; X – occurs in this habitat type

Direct, Indirect, and Cumulative Effects to Terrestrial Viability Species

Alternative 1 (No Action)

Alternative 1 would have no direct effects on any Viability Species (Table 7) because no actions would occur. Left untreated, the gypsy moth population would be expected to increase, leading to widespread canopy defoliation and tree mortality. However, common raven and rough hawkweed would not be impacted by defoliation because they occupy a variety of habitats, including open and brushy areas.

When combined with past, present and future management activities (e.g. prescribed burning), Alternative 1 would have no cumulative effects on rough hawkweed because the species is found outside of a prescribed burn area, the only other project planned for the area. Alternative 1 would not have cumulative effects on common raven as well, because burning would have no measurable effects on the species or its habitats.

Alternative 2 (Proposed Action)

The mating disruptant proposed in the treatment area is a pheromone specific to the gypsy moth. Since insect pheromones have no effects on plants or other animals, common raven and rough hawkweed would not be directly or indirectly affected by the proposed action. Habitats for common raven and rough hawkweed would not be altered and therefore, their populations would remain the same as they are currently. Alternative 2 would have no cumulative effects on common raven or rough hawkweed.

Water Quality, Aquatic Resources, and Aquatic Viability Species

Aquatic habitat in the project area includes an unnamed intermittent stream and three perennial coldwater streams, Old Road Branch, Rutter Branch and Beaverdam Creek. Demand Species (wild trout: brown, rainbow and brook) are likely to occur in Old Road Branch and Rutter Branch. Weather events such as floods and droughts have major impacts on wild trout populations in the southern Appalachians (Strange and Habera 1995). Populations fluctuate from year to year, but their overall trends are stable (USDA Forest Service 2004).

Two aquatic viability species occur within the project area: Tennessee dace, *Phoxinus tennessensis* (Sensitive) has been found in Beaverdam Creek and may also occur in Old Road and Rutter Branches; and Hellbender, *Cryptobranchus alleganiensis* (Viability Concern) also known to occur in Beaverdam Creek. Hellbenders are found in clear, cold streams with large rocks. Little is known about the population trends throughout its range (NatureServe 2009), although surveys in Beaverdam Creek suggest a healthy population exists there. A detailed discussion of aquatic resources can be found in the *Aquatic Resources of the Beaverdam Creek Watershed* report (Carter 2008).

The analysis of effects to Tennessee dace can be found in the Sensitive Species section of this EA. Wild trout and hellbender are analyzed below.

Direct, Indirect, and Cumulative Effects to Water Quality, Aquatic Resources, and Aquatic Viability Species

Alternative 1 (No Action)

In Alternative 1, stream temperatures may increase in severely defoliated riparian zones. Although the streams in the project area are not marginal cold water habitats, temperature increases during extended periods of drought resulting from defoliation and loss of canopy may negatively affect wild trout in Rutter Branch and Old Road Branch, making habitat unsuitable while temperature is increased. However, this is not likely because dense stands of rhododendron lining the streams would provide adequate shade to prevent or minimize any temperature increases. Though Beaverdam Creek flows through mostly open land before reaching the project area, its temperatures remain low enough year-round to maintain wild trout and other coldwater species. Defoliation adjacent to the creek would not measurably increase water temperature in Beaverdam Creek, and therefore, would have no impact on wild trout and hellbender.

Defoliation would also reduce acid neutralizing capacity, increase nitrate mobility, and lower pH in the streams. When coupled with atmospheric deposition of nitrogen and sulphur, the effects to aquatic organisms may be substantial in some acid-sensitive streams (USDA 1995). While trout and hell-benders can tolerate pH levels as low as 4-5, a substantial reduction in pH (e.g. less than 6.5) due to defoliation would interfere with the optimum growth of wild trout (Raleigh 1982, Raleigh et al 1984). The reduction in pH could also reduce the health of the hellbender population. Though potentially reduced, populations of wild trout and hellbender would remain in the area

There would be no cumulative effects from Alternative 1 since no other activities in the project area have affected or will affect aquatic resources in the project area.

Alternative 2 (Proposed Action)

Based on project design, application of the pheromone dispensers would not occur over open water, i.e. Beaverdam Creek, but would likely occur over the Old Road and Rutter Branches. While some dispensers may come in direct contact with the two streams, most would be intercepted by and adhere to the dense stands of rhododendron and overstory trees that completely cover the stream channels over most of their length. The dispensers would enter the streams during leaf fall; however, by this point the product would have released at least 60% of its active ingredient. The risk of the remaining disparlure leaching into surface and/or groundwater via translocation after leaf fall is minimal because disparlure is insoluble in water. In laboratory experiments using Disrupt II, less than 0.04% of the disparlure leached into the water, even after being submerged and vigorously agitated in it for 48 hours (USDA Forest Service 2008).

Disparlure is not highly toxic to fish, but has been shown to cause up to 20% mortality rate to rainbow trout at a rate of 100 mg/liter (Durkin 2004); however, only a small fraction of the tested amount would be used in the proposed project. Because disparlure is not soluble in water and only a very small (less than ten percent) would actually reach

the water, impacts to wild trout would be minimal or non-existent. Hellbenders would not be directly impacted either because the application of Disrupt II would not occur directly over open water, i.e. Beaverdam Creek.

The eradication of the gypsy moth population in the proposed treatment area would eliminate the possibility of detrimental temperature increases and a reduction in pH levels in the streams. Alternative 2 would therefore have beneficial indirect effects by protecting the streams' aquatic habitats and the wild trout and hellbender populations in the project area.

There would be no cumulative effects from Alternative 2 since no other activities in the project area have affected or will affect aquatic resources in the project area.

Scenery and Recreation Resources

Scope of Analysis

The scope of the analysis is the proposed treatment block and the area scene from the Appalachian Trail. The time frame used in the analysis is from when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to disclose the potential increase and spread of the gypsy moth population and for associated impacts to occur.

Affected Environment

The Rutter Ridge Treatment Area (RRTA) is located in a section of the Cherokee National Forest where visitors engage in a wide variety of recreation activities including, but not limited to, hiking, back-packing, hunting, fishing, sightseeing (waterfalls, wildlife and scenery) and driving for pleasure. Visitors commonly travel TN State Highways 133 and 91 between Elizabethton, TN and Damascus, VA to view the mountain and water-based scenery. The foreground scenery viewed within a 0.5 miles of the roadways are mostly privately owned until it transitions to national forest lands along TN 133, which is approximately halfway between Shady Valley and Backbone Rock, the "Shortest Tunnel in the World." This transition begins near the proposed Rutter Ridge Treatment Area.

Approximately 110 acres of national forest lands within the RRTA foreground as viewed from TN 133 and Beaverdam Creek, an eligible Recreational Wild & Scenic River is managed to provide a High level of scenic integrity. [Scenic Integrity is defined in the RLRMP as "*…a measure of the degree to which a landscape is visually perceived to be 'complete.' The highest scenic integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal*" (USDA 2004).] The remaining 150 acres of the RRTA are located in the middleground at a distance greater than ½-mile from TN 133. These acres are managed to provide a Moderate level of scenic integrity.

The Appalachian National Scenic Trail (A.T.) traverses Holston Mountain approximately one mile upslope from the RRTA near the Abingdon Gap trail shelter. No portion of the RRTA is located within the foreground of the A.T.

Direct, Indirect, and Cumulative Effects to Scenery and Recreation Resource

Alternative 1 (No Action)

Alternative 1 would have no direct or indirect impacts on recreational use of the proposed treatment area in the short term since the gypsy moth population is currently at a low density, and the proposed treatment would be deferred. However, as time passes, the extent of defoliation and tree mortality caused by gypsy moth caterpillars would create noticeable impacts to recreational use and scenic integrity. The defoliated canopy of oaks and other susceptible trees would become noticeable to the public during leaf-on seasons. The composition of the forest's vegetation structure (e.g. numerous dead standing and down trees) would eventually reduce the area's scenic integrity below the desired HIGH and MODERATE levels. The assigned Scenic Integrity Objectives (SIOs) would not be maintained over the next 10 years without controlling the gypsy moth.

Over time, the dead and dying trees within the highway right-of-ways would be removed to reduce hazards to travelers. Dead trees outside the ROW would likely remain on the landscape and present new hazards to visitors engaging in activities like fishing and hiking. The large numbers of caterpillars may also reduce the enjoyment of the outdoors for some people due to gypsy moth larval droppings.

The recreational and scenic Outstanding Remarkable Values noted for Beaverdam Creek would be impacted more noticeably than the fisheries/aquatics, wildlife, geologic, and botanical/ecological related values. If populations of the gypsy moth are allowed to spread unchecked, impacts may spread to the A.T. corridor in the foreseeable future. Effects would impact the use, maintenance and recreational experience of the A.T.

Alternative 2 (Proposed Action)

The impacts of the proposed treatments in the RRTA would not be noticed by most national forest visitors since the majority of them would only view the affected area from their vehicles. Visitors choosing to recreate outside of their vehicle (e.g. hiking) in the proposed treatment block on the day of treatment might see and hear the contractor's low-flying aircraft overhead. The impact would be short term however, lasting for about 10 minutes, the expected amount of time it would take to treat the approximately 360-acre block (J. Ghent, Southern Research Station, Asheville, NC, pers. comm. 2010).

Visitors would also likely hear the controlled release dispensers hitting the canopy as they fell through the forest; the dispensers would sound similar to rain hitting the leaves. Due to their small size, about 1/32 inch by 3/32 inch (USDA Forest Service 2006), and green or gray color, it is unlikely a person would however, notice the dispensers on the surrounding foliage, ground, etc since they are extremely difficult to see (even to a trained eye looking for them). Some dispensers may land on a person's skin, clothing,

etc; however, "[e]ven when the maximum potential for inadvertent residues from the non-food uses of this pesticide are compared with the most conservative estimate of hazard, there is reasonable certainty that no harm will result…from exposure to this pesticide when used according to label instructions" (U.S. EPA 2008).

The chances of maintaining the existing and desired levels of scenic integrity in the affected area would be increased under Alternative 2. The actions taken would help to control the gypsy moth population and thereby minimize the defoliation of the trees that contribute to the aesthetic appeal of the landscape. All Scenic Integrity Objectives would be met.

It is unlikely the same person (hiker) would experience any cumulative impacts from the proposed treatment since noise from the aircraft would occur over a relatively short time frame (10 minutes), and any exposure to the dispensers would be limited to the immediate area, i.e. the area where the person was standing at the time of release. Since the treatment would not be conducted during any hunting season, there would be no associated impacts to hunters.

Cultural Resource

Scope of Analysis

The scope of the analysis is the proposed treatment block. The time frame used in the analysis is from when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to disclose the potential increase and spread of the gypsy moth population and for associated impacts to occur.

Affected Environment

The project area was subjected to a records search to identify and evaluate all significant cultural resources within the proposed treatment area.

Direct, Indirect, and Cumulative Effects to Culutural Resources

Alternative 1 (No Action)

This alternative would have no direct, indirect or cumulative effects on cultural resources since the proposed action would not be implemented.

Alternative 2 (Proposed Action)

Pursuant to and in compliance with the terms and conditions codified in the National Historic Preservation Act (NHPA), as amended, (36 CFR 800), Alternative 2 would result in no significant ground disturbance, nor would it result in any direct, indirect, or cumulative effects to significant cultural resources. Because the proposed action offers no potential for effects to historic properties, it was determined to not be an "undertaking" (36 CFR 800.3 (a)). The proposed Gypsy Moth Eradication Project would therefore be excluded from the Section 106 reporting process as stipulated in the Programmatic Agreement and the NHPA (36 CFR 800.3 a, 1).

Economics

Scope of Analysis

The scope of the analysis is the proposed treatment block and the surrounding community. The time frame used in the analysis is from when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to disclose the potential increase and spread of the gypsy moth population and for associated impacts to occur.

Affected Environment

Several local industries and sawmills utilize timber from the Watauga Ranger District. Forest workers and contractors contribute to local economies. Many local residents heat their homes with firewood, while others supplement their income by gathering other forest products such as ginseng, galax and rhododendron. Hunters and recreationists bring revenues into the area.

Direct, Indirect, and Cumulative Effects to Economics

Alternative 1 (No Action)

Alternative 1 would not provide any additional economic benefits to help provide employment and generate revenues in this portion of eastern Tennessee, beyond what is occurring now. There are no revenues or associated costs with Alternative 1 to the forest. The impacts would be on the local community. With the continuing defoliation, the trees would eventually die, therefore, impacting the local loggers from an economic perspective, yet creating additional firewood opportunities for the community. Also with continue defoliation, the recreational and visual impact would continue to increase, therefore, deterring visitor use, experience, and monetary contributions to the local community. Collectively over time, the impacts from the social perspective (recreational, visual, and local industries) would contribute to the loss of revenue to the area.

Alternative 2 (Proposed Action)

Alternative 2 may provide additional economic benefit to local employment and revenue in this area of upper east Tennessee. There are no direct revenues associated with Alternative 2 for the Forest. The impacts would be to the local community. With eradication of the gypsy moth, the forest community could be saved which would benefit the loggers in the long-term by providing a source of revenue when the area is proposed for manipulation. In addition, benefits to the recreation and scenery would continue which could bring revenues into the local community. Collectively over time, the impacts from the social perspective (recreational, visual, and local industries) would be minimal.

Climate Change

Scope of Analysis

The scope of the analysis is the proposed treatment block. The time frame used in the analysis is from when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to disclose the potential increase and spread of the gypsy moth population and for associated impacts to occur.

Affected Environment

When analyzed at very large scales (regional or national) climate change has been proposed as a potential cause of range expansion or increased intensity of outbreaks of some forest pests. Likewise improving forest health through control of forest pests at the regional or national scale may have an effect on climate change.

Scope of Analysis

The scope of analysis is the boundary of the proposed treatment area. The time frame used in the analysis is from the when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to allow for the increase and spread of the gypsy moth population and associated impacts to occur.

Direct, Indirect, and Cumulative Effects to Economics

Alternative 1 (No Action)

The no action alternative would contribute to increasing greenhouse gasses through elimination of vegetation cover and eventually sustainable forest resources. Because no treatments would occur, defoliation by gypsy moths would contribute to declining tree health and vigor, which would eventually remove the tree species from the forest vegetation cover. Collectively over time, additional impacts (e.g. health and safety, recreation/scenery, and other forest resources) would alter the area, thereby, contributing more changes to the local climate. Over many decades, the canopy composition would return. However, the scope of the project is focused and effects are essentially imperceptible at the scale of global carbon balance and climate change.

Alternative 2 (Proposed Action)

The proposed actions would contribute minor amounts of greenhouse gasses through the use of energy to produce and transport the pheromone flakes and through the use of fuel to power the spray aircraft. The proposed actions would also help reduce greenhouse gasses by helping retain carbon capture and storage on 360 total acres being proposed. Treatments would prevent defoliation by gypsy moths and contribute to maintaining tree health, which would allow for greater absorption of carbon dioxide and other pollutants. The scope of the proposal is limited and effects are essentially imperceptible at the scale of global carbon balance and climate change.

Health and Safety

Scope of Analysis

The scope of the analysis for biological resources is the proposed treatment block. The time frame used in the analysis is from when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to disclose the potential increase and spread of the gypsy moth population and for associated impacts to occur.

Affected Environment

This section specifically discusses the effect of mating disruptant on the health and safety of forest users and workers. The Rutter Ridge Treatment Area (RRTA) is located in a section of the Cherokee National Forest where visitors engage in a wide variety of recreation activities including, but not limited to, hiking, back-packing, hunting, fishing, sightseeing (waterfalls, wildlife and scenery) and driving for pleasure. Visitors commonly travel TN State Highways 133 and 91 between Elizabethton, TN and Damascus, VA to view the mountain and water-based scenery.

Scope of Analysis

The scope of analysis is the boundary of the proposed treatment area. The time frame used in the analysis is from the when the infestation was detected in 2008 up to 10 years in the future. This time frame was chosen to allow for the increase and spread of the gypsy moth population and associated impacts to occur.

Direct, Indirect, and Cumulative Effects to Health and Safety

Alternative 1 (No Action)

In areas with a dense population, it is common to have numerous caterpillars on a person's clothing caused by gypsy moth caterpillars falling on their clothing and crawling on them. A person in the area may experience skin irritation caused by an allergic reaction to gypsy moth hairs, primarily as a rash. Irritation to the eyes and to the respiratory tract is also possible. These possible health effects do not suggest that exposure to the gypsy moth poses a public health concern; effects generally would be short-lived and mild (USDA 1995). Given the infested area's current low-density population, the potential for caterpillars to fall on a person hiking/present in the area and therefore experience an allergic or other reaction would be minimal. As the gypsy moth population increased, the potential for an allergic reaction would increase however under this alternative over the long term. In addition, the numerous dead trees resulting from repeated defoliation and secondary pathogens pose a threat from falling limbs or toppling trees, particularly along trails or near shelters.

Alternative 1 could have a cumulative effect when combined with the Arnold Branch prescribed burn, to be implemented in the near future (within 5 years). The burn would be on Forest Service lands in the eastern half of the proposed treatment area. Threats associated with dead trees, e.g. falling limbs or tree from repeated heavy defoliation by

gypsy moth larvae may be cumulative with the same threats resulting from the burn, depending on its intensity. For example, a low intensity burn would have minimal cumulative impacts since little to no tree mortality would be expected, with the potential for cumulative impacts increasing as the burn intensity increased.

A secondary impact from the burn could be the smoke augmenting any irritation of the eyes and the respiratory tract due to contact with or inhalation of gypsy moth caterpillar hairs. However, since the potential for both impacts to occur at the same time would be highly unlikely, the cumulative impact is considered to be discountable.

Alternative 2 (Proposed Action)

Mating disruption has no known or expected impacts to any species, including humans, beyond gypsy moth. For example, the Environmental Protection Agency (EPA) concluded that "[disparlure] is practically non-toxic to mammals, including [humans]…The EPA has arrived at this conclusion based on the chemicals [disparlure] low acute toxicity, it is a naturally occurring lepidopteran pheromone produced by female gypsy moths (*Lymantria dispar*), is similar in chemical structure to compounds of low chronic toxicity, and has a very low potential for human exposure" (USDA EPA 2008).

Additionally, "[the results] of acute exposure studies for oral, dermal, ocular, and inhalation exposure to disparlure show no indication of adverse effects. The acute toxicity of disparlure in mammals is very low. The risk characterization for … disparlure is unequivocal. Based on the available information, there is no basis for asserting that any serious adverse effects [to humans] are plausible" (USDA 2006).

Finally, "…drinking water exposure is not expected to pose any quantifiable risks due to a lack of residues of toxicological concern" (USDA EPA 2008).

Given these factors, Alternative 2 would have no direct, indirect impacts to human health. (Also see USDA 1995, pp 8-1 to 8-6; Appendix F). Cumulative impacts would include the effects of prescribed burning, such as the smoke presence in the area. Those individuals who are sensitive, allergic, asthmatic, etc would need to take extra precaution during these times.

AGENCIES AND PERSONS CONSULTED

Agencies
Nature Conservancy of TN (Gabrielle Call)
TN Division of Environment & Conservation – Division of Recreation (Joyce Hoyle)
Tennessee Historical Commission (Herbert Harper)
Tennessee Division of Forestry (Jack McCarty)
Tennessee Division of Forestry
Environmental Protection Agency (Ben West)
USDI Fish & Wildife Service
Environmental Stewardship Management – LBL NRA
Tennessee Valley Authority

Tribal
Poarch Creek Indians (Eddie Tullis, Chairman)
United Keetoowah Band of Cherokee Indians in OK (Lisa Stopp, Acting THPO)
Cherokee Nation (Dr. Richard Allen, THPO)
Muscogee (Creek) Nation (Joyce Bear, THPO , Tim Thompson, Asst THPO)
Eastern Band of Cherokee Indians (Russ Townsend, THPO and Chief)
Alabama-Quassarte Tribal Town (Chief)
Kialgee Tribal Town (Town King)
Thlopthlocco Tribal Town (Town King)

Individuals			
Donald R. Scharf	Harry Switzer	Carla Ownby	Don Mallicont
Cindy Jenkins	James McConkey	Kirk Johnson	Mike McClelland
James H. Hill, Sr.	Charles Moorhouse, Jr.	Foster Levy	Powell & Sharon Foster
Daniel Herron	Lynn Cox	William Brown	Dean Whitworth
Karen Dielbut	Carlie Corn	Robin Cooper	Loretta Modica
Alice & Wayne Feehrer	Harold Webb	Catherine Murray	James Arthur Hensley
Bill Ristom	Charles Chapman	Jerry Nagel	Bobby Booker
Jane Lucchesi	Andrew Armstrong	Terry Ponder	Robert Lee
Julie Garren	William Manning	Bob Green	Wayne Fish

Individuals			
Alton & Kenneth Sluder	James Malia	Carla Boucher	Ken Ives
Mary Hosmer	Harold Lampkin	Bruce Saunders	Larry Longerbeam
Doug Bernardi	Barbara Allen	Davis Mounger	Jeff Richards
Axel Ringe	Russell Townsend	Howard McDonald	Jim Web
Rodger Duckworth	James Hines	Claude D. Falls	Stan Hitchcock
William Skelton	Brian & Kathy Stubblefield	Curt Ditzer	Chris York
Bob Jones	Chuck Ray	Ken Mealor	

Organizations
Lee University – Department of Natural Resources (Michael Freake)
Cherokee Forest Voices (Larry Dunn)
Cherokee Forest Voices/Southern Appalachian Forest Coalition (Julie Guthrie)
WildSouth (Ben Prater)
Blue Ribbon Coalition (Ric Foster)
Volunteer Logging, Inc.
Appalachian Mountain Riders (Ted Durney)
East Brainerd Lumber Company
Johnson City Star (Blain Honey)
League of Women Voters
Wilderness Society (George Gay)
Tennessee Eastman Hiking Club (Joe DeLoach)
East Brainerd Lumber Company
Roan Mtn State Park (Jennifer Wilson)
Global Sustainability
Carolina Mountain Club (Don Walton)
Cherokee Forest Voices (Cindy Kendrick)
East Tennessee Development District
Westvaco: Central Woodlands (Dan Kincaid)
Southern Appalachian Forest Coalition (Hugh Irwin)
Cherokee Forest Voices (Dana Eglinton)
Southern Environmental Law Center (Sarah Francisco)
Columbia Carolina Corporation (Jim Sitts)
Ruffed Grouse Society (Mark Banker)
Tennessee Forestry Association (Matt Bennett)
Tennessee Conservation League (Mike Butler)
Tennessee Forestry Association (Candace Dinwiddie)
Ruffed Grouse Society (Greg Isenberg)
Wildlaw (Steve Novak)

LIST OF PREPARERS AND REVIEWERS

PREPARERS

Interdisciplinary Team :
Jeff Chynoweth (North Zone NEPA Coordinator)
Marcia Carter (Fisheries Biologist): Terrestrial, Aquatics, TES, MIS.
Tom Rowe (Forester): FSVEG, Geographical Information System (GIS)\
Doug Byerly (Forest Landscape Architect): Recreation, Scenery

Consultants:
Stephanie Medlin (Forest NEPA Coordinator)
Jim Stelick (Vegetation Management Program Manager)
Mike Nicolo (former Forest Forester)

REVIEWERS

Stephanie Medlin (Cherokee National Forest, Forest Environmental Coordinator)
Susan Shaw (Cherokee National Forest, BPRLM Staff Officer)
Dave Purser (R8 NEPA Coordinator)
Wes Nettleton (R8 Forest Health Protection Director)
Don Duerr (R8 Forest Health Protection)
John Ghent (R8 Forest Health Protection)

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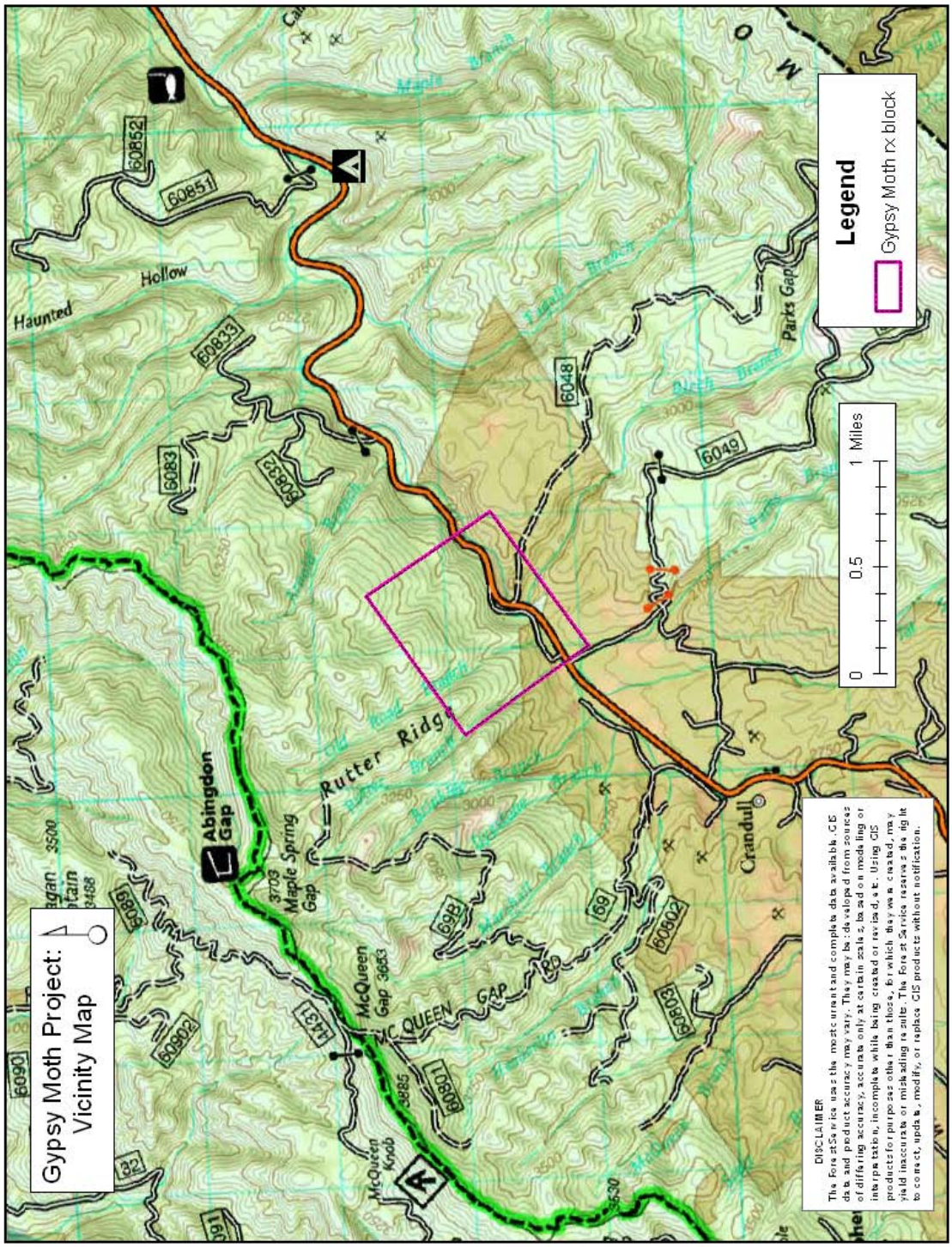
APPENDICES

Appendix A: Gypsy Moth Eradication Project Vicinity Map
Appendix B: Biological Evaluation
Appendix C: Response to Comments

Appendix A: Gypsy Moth Eradication Project Vicinity Map



Appendix B: Biological Evaluation

GYPSY MOTH ERADICATION PROJECT
USDA FOREST SERVICE, SOUTHERN REGION
CHEROKEE NATIONAL FOREST
WATAUGA DISTRICT

The purpose of this biological evaluation (BE) is to ensure that the Gypsy Moth Eradication Project at Rutter Ridge does not contribute to the loss of viability or trend toward Federal listing of any native plant or animal species as directed in the Cherokee National Forest (CNF) Revised Land and Resource Management Plan (RLRMP). The Endangered Species Act of 1973 requires that Federal agencies not jeopardize or adversely modify critical habitat of federally listed species. This BE will document any potential effects of the proposed activities on Threatened, Endangered, and Sensitive (TES) species or their habitat and make certain that land management decisions are made with the benefit of such knowledge.

PROPOSED ACTION AND ANALYSIS AREA

Alternative 1 (No Action)

In this alternative, no actions would be taken, at this time, to eradicate the gypsy moth population on the Cherokee National Forest, or on adjacent private lands in Johnson County, Tennessee.

Alternative 2 (Proposed Action)

In this alternative, the Forest Service would cooperate with States agencies to treat low-density gypsy moth populations on intermixed Federal and private lands to eradicate the gypsy moth. A private aerial contractor, using low flying aircraft under the direction of USDAFS would treat approximately 360 acres with mating disruptants. These acres include 100 acres of private land and 260 acres of National Forest System lands. The mating disruption treatment is usually performed in mid-June after full "leaf-out" and before emergence of the gypsy moth breeding adults. The dosage will be 15 grams of Disrupt II or 23 grams of SPLAT-GM (Specialized Pheromone and Lure Application Technology- Gypsy Moth) per acre.

Analysis Area

The analysis area for this biological evaluation consists of the proposed treatment block on Forest Service land (260 acres). The period of time used in this analysis is from the time the infestation was detected in 2008 up to 10 years in the future, allowing time for the establishment and spread of the gypsy moth population and for associated impacts to occur.

The Rutter Ridge treatment area is located in Johnson County along and approximately one mile north of Beaverdam Creek. Terrestrial habitats include upland and cove hardwood, hemlock and white pine forests. Aquatic habitats include small coldwater streams lined with dense stands of rhododendron and a large coldwater stream.

METHODS USED

Analysis of the project was conducted using the best available science, including references from science-based websites, books, papers, reports, state and federal databases, field surveys, and professional opinion based upon 5 years of work on the CNF. Using information from field surveys, project area habitat conditions, species

habitat requirements, and species distributions and limiting factors, the 2001 Sensitive Species List for Region 8 was reviewed to determine if any sensitive species were likely to occur in the project area. The threatened and endangered species list on the CNF (Barclay 2002) was also reviewed. The TES database maps were also examined to locate any records of TES species present in the project area or vicinity.

This BE addresses TES species that are considered to occur or have habitat on the CNF. Each species, listed in Attachment A, was evaluated and given a Project Review Code (PRC) using a list (Attachment B) for evaluation. The process used to decide when to inventory for TES species is consistent with FSM 2672.43. Some of the PRC's are used for a Determination of Effect. Based on the analysis Attachment A, the following species require detailed analysis and a determination of effect.

Species Evaluated and Effects Analysis

Based on the results of this process, four Regional Forester's Sensitive Species are known to occur in the proposed project areas (Table 1) and will be analyzed in this Biological Evaluation. No Threatened or Endangered Species occur in the project area.

Table 1. TES Species Evaluated

Scientific Name	Common Name	TES
Speyeria Diana	Diana fritillary	Sensitive
Saxifraga caroliniana	Carolina saxifrage	Sensitive
Scutellaria saxatilis	Rock skullcap	Sensitive
Phoxinus tennessensis	Tennesee dace	Sensitive

Terrestrial Analysis

Alternative 1(No Action)

No direct effects to species in Table 1 would result from alternative one because no actions would occur. If gypsy moth population is left untreated, it could lead to a larger infestation. This would lead to widespread canopy defoliation and tree mortality. At first, when gypsy moth populations are small, trees experience little visible defoliation. This is followed by 2 to 4 years where trees are visibly defoliated when gypsy moth populations are dense (McManus et al). Deciduous trees can usually withstand two or three years of defoliation above 50 percent, but after this period of time they often succumb to disease and parasites which cause tree kill (McManus et al).

Losing the forest canopy would have negative indirect effects on Diana fritillary, Carolina saxifrage, and rock skullcap. Increased light intensity and decreased moisture are likely to change habitat conditions to where they would no longer be suitable for these three species.

Combined with other past and future management activities, alternative one would have no cumulative effects on Carolina saxifrage and rock skullcap. Carolina saxifrage is not located within the prescribed burn block, the only other project planned for Rutter ridge. Prescribed burning would take place during winter/early spring when rock skullcap is dormant so burning would have no additional impacts. Tree kill could cause future prescribed burning in the area to be more intense, having a negative cumulative effect on Diana fritillary mating habitat and overwintering caterpillars. More intense fires would burn more area, affecting more potential habitat and destroy more caterpillars.

Determination of effect – Alternative one ***may impact individuals but is not likely to cause a trend toward federal listing or loss of viability*** of Diana fritillary, Carolina saxifrage, and rock skullcap.

Alternative 2 (Proposed Action)
The pheromone proposed in the treatment area for mating disruption is specific to the genus to which the gypsy moth belongs, *Lymantri*a. As the Diana fritillary is in the genus, *Speyeria*, the proposed action would have no direct effects on the species. Pheromones have no effects on plants so rock skullcap and Carolina saxifrage should not be directly affected by the proposed action. Alternative two would have a beneficial indirect effect on Carolina saxifrage, Diana fritillary, and rock skullcap because habitat loss would be prevented by removing the gypsy moth.

When combined with past and future prescribed burns, alternative two would have beneficial cumulative effects for Diana fritillary because breeding and foraging habitat would be maintained. Rock skullcap and Carolina saxifrage would have no cumulative effects because past and future projects would have no impacts on these species.

Determination of effect – Alternative two would have ***beneficial impacts*** Diana fritillary, Carolina saxifrage, and rock skullcap.

Aquatic Analysis

Alternative 1 (No Action)
In the No Action alternative, stream temperatures may increase in severely defoliated riparian zones. Although the streams in the project area are not marginal cold water habitats, temperature increases during extended periods of drought may adversely affect Tennessee dace in Rutter Branch and Old Road Branch. However, dense stands of rhododendron lining the streams should provide adequate shade and prevent these temperature increases. Beaverdam Creek flows through much open habitat before it reaches the project area, and temperatures remain low enough year-round to maintain coldwater species. Defoliation in the project area is not likely to measurably increase water temperature in Beaverdam Creek. Tennessee dace would find refuge in Beaverdam Creek and other tributaries nearby.

Defoliation due to gypsy moth reduces acid neutralizing capacity, increases nitrate mobility, and lowers pH. When coupled with atmospheric deposition of nitrogen and

sulphur these effects may be substantial in some acid-sensitive streams (USDA 1995). A considerable reduction in pH could reduce population health of Tennessee dace.

No other activities in the project area have affected or will affect aquatic resources in the project area. Therefore there would be no cumulative effects from Alternative 1.

Determination of effect – Alternative 1 ***may impact individuals but is not likely to cause a trend toward federal listing or loss of viability*** of Tennessee dace.

Alternative 2 (Proposed Action)

Based on project design, application would not occur over Beaverdam Creek (open water), but application would occur over Old Road and Rutter Branches. However, these streams are lined by dense stands of rhododendron and overstory trees that completely cover the stream channel over much of its length. During application, some dispensers may come in direct contact with the stream, but most of the dispensers would be intercepted by and adhere to rhododendron and other vegetation, where they would remain until leaf fall. At this point the product would have released at least 60% of its active ingredient. The risk of the remaining disparlure leaching into surface or groundwater via translocation after leaf fall is minimal because disparlure is insoluble in water. In laboratory experiments Disrupt II was submerged in water and vigorously agitated for 48 hours. Under these conditions less than 0.04% of the disparlure contained in the Disrupt II leached into water (USDA Forest Service 2008).

Disparlure is not highly toxic to fish, but has been shown to cause 20 percent mortality rate to rainbow trout at a rate of 100 mg/liter (Durkin 2004). Only a small fraction of this amount would be used in this project. Because disparlure is not soluble in water and only a very small would actually reach the water, direct impacts to Tennessee dace would be minimal or non-existent.

Eradication of gypsy moth in Alternative 2 would have beneficial indirect effects by eliminating the possibility of detrimental temperature increases and reduction of pH levels in the streams of the project area that could have detrimental effects on Tennessee dace. No other activities in the project area have affected or will affect aquatic resources in the project area. Therefore there would be no cumulative effects from Alternative 2.

Determination of effect – Alternative 2 ***may impact individuals but is not likely to cause a trend toward federal listing or loss of viability*** of Tennessee dace.

Prepared by:

/s/Brittany Bird
Wildlife Biologist Trainee

Reviewed by

/s/Marcia S. Carter
North Zone Fisheries Biologist
2/26/2010

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ATTACHMENT A
GYPSY MOTH ERADICATION PROJECT
CHEROKEE NATIONAL FOREST
Threatened, Endangered, and Sensitive Species 2001 List

	Scientific Name	Common Name	Range/Watersh/Co*	CNF Records	Habitat Information	TES	G-Rank
Amphibians							
1a	Desmognathus carolinensis	Carolina Mountain Dusky Salamander	NC & TN; Iron Mtn. Gap SW to Pigeon River Valley	Common in Unicoi, Greene, Cocke, Washington Counties	Seeps, springs, headwater streams, wet rock faces at lower elevations; more terrestrial at higher elevations; v. common in spruce/fir & northern hardwood forests; 900-6600 ft	S	G4
1a	Desmognathus santeetlah	Santeetlah dusky salamander	NC & TN; Unicoi, Great Smoky, &Great Balsam Mtns. Monroe to Cocke Co.	4 records; Monroe Co. & SW Cocke Co.	Mid-high elevation seeps, stream headwaters, rock faces; 640-1805 m, primarily > 3200 ft	S	G3Q
1a	Eurycea junaluska	Junaluska salamander	W NC & SW TN; Sevier Co. & Monroe Co., TN	8 Monroe Co. records Tellico, Bald & North Rivers, Citico & Slickrock Creeks; potentially Hiwassee River drainage; total 17 streams rangewide	Large streams with sand-gravel substrate, large rocks & adjacent riparian forests. Low elevation, 1100-2000 ft.	S	G3Q
1a	Plethodon aureolus	Tellico salamander	Unicoi Mtns & adjacent valleys of TN and NC, between Little TN & Hiwassee Rivers	1 Monroe Co. record; also in Polk Co.	Hardwood and pine-hardwood forest; terrestrial breeder in leaf litter humus/rotting logs	S	G2G3Q
1a	Plethodon teyahalee	Southern Appalachian salamander	TN, NC, SC, GA; W of French Broad in Cocke Co. to Unicoi Mtns in Polk & Monroe Co.	Polk, Monroe, Cocke Cos.	Deciduous, mesic forest; terrestrial breeders (underground); <5000 ft.	S	G2G3Q
1a	Plethodon welleri	Weller's salamander	SW VA to NE TN & NW NC; Johnson, Carter & Unicoi Co.	10 TDEC records; Johnson, Carter, Unicoi Cos. (3 new records submitted)	Spruce-fir, birch-hemlock and other mesic, rocky forests; boulderfields; grassy open areas; terrestrial breeder-moss mats & rotting logs; > 2200 ft.	S	G3
Arachnids							
1a	Microhexura montivaga	Spruce-fir moss spider	Mountains of NC, TN	3 TDEC records; Roan Mtn.; Carter Co.	Moss and liverwort mats on rocks/boulders in mature spruce-fir forest > 5400 ft.	E	G1
Birds							
1a	Falco peregrinus	Peregrine Falcon	US and CAN	2 TDEC records; hacking Big Bald 1987-89. Carter, Greene, Unicoi Cos.	Nests at ledges of vertical rocky cliffs. Feeds in fields, lakeshores, and river mouths.	S	G4
1a	Haliaeetus leucocephalus	Bald eagle	US and CAN	2 TDEC records; active nest at Parksville Lake 2006; hacking S. Holston Lake 1991-94; other recent nests Tellico Lake. Carter, Johnson, Unicoi, Sullivan, Monroe Washington, Polk Cos.	Nests in large "supercanopy" trees along lake & river shores. Prefers roosts in conifers & protected areas along open water in winter.	T	G4
1a	Lanius ludovicianus migrans	Migrant loggerhead shrike	ME to MN south, from GA to AR; OK, TX; CAN: PE to MB	O TDEC records; occurs thruout E. Tennessee; Greene Co. near Forest	Low elevation crop & grasslands and old fields with scattered trees, shrubs, posts	S	G5T3Q
Fish							
1a	Cottus baileyi	Black sculpin	SH	4 occ. Laurel Creek, 2 occ. Beaverdam Creek, Doe Creek ***These occurrences are not confirmed. TWRA***	Cool and cold water rivers and streams to headwater springs. Rare in Streams over 15m wide. Utilize riffles,runs, and pools with gravel, stone, and boulder substrates. Mod. To high gradient.	S	G4Q

	Scientific Name	Common Name	Range/Watersh/Co*	CNF Records	Habitat Information	TES	G-Rank
1a	Cyprinella caerulea	Blue shiner	C	2 occ. Conasauga & Jack's Rivers	Large streams, small to medium-sized rivers, moderate gradient, low elevation	T	G2
1a	Erimonax monachus	Spotfin chub	LT,FB,SH	0 occ. on CNF; Experimental pop. being introduced into Tellico R.	Large streams, moderate gradient, low elevation	T	G2
1a	Etheostoma acuticeps	Sharphead darter	N	1 occ. Nolichucky R.	Large creeks to medium rivers, moderate gradient, cool warm water	S	G2G3
1a	Etheostoma brevirostrum	Holiday Darter	C	2 occ. Conasauga & Jack's Rivers	Large streams to medium rivers, moderate gradient, low elevation	S	G2
1a	Etheostoma percnurum	Duskytail darter	LT	1 occ. Citico Creek; Experimental pop. being introduced into Tellico R.	Large creeks & small-med rivers 10-80 m wide; moderate gradient, warm	E	G1
1a	Etheostoma vulneratum	Wounded darter	LT, FB (extirpated)	1 occ. Citico Creek	Small to large rivers, low to moderate gradient, low to moderate elevations	S	G3
1a	Ichthyomyzon greeleyi	Mountain brook lamprey	H,O, LT, FB, N, W	3 occ. Hiwassee R. #4 & #5; Spring Cr.; poss in many other streams	Small streams to small upland rivers, moderate to high gradient	S	G3
1a	Noturus baileyi	Smoky madtom	LT	1 occ. Citico Creek; Experimental pop. being introduced into Tellico R.	Large streams, low gradient, low elevation.	E	G1
1a	Noturus flavipinnis	Yellowfin madtom	LT	1 occ. Citico Creek; Experimental pop. being introduced into Tellico R.	Large streams to large rivers, low gradient, low elevation	T	G1
1a	Percina antesella	Amber darter	C	Conasauga River < 5 miles from Forest Bdy.	Large streams and small rivers, low gradient, low elevation	E	G1
1a	Percina burtoni	Blotchside logperch	H, SH (extirpated)	2 occ. Spring Cr. & Hiwassee R.	Large streams to small rivers, moderate gradient, low elevation	S	G2
1a	Percina jenkinsi	Conasauga logperch	C	1 occ. Conasauga River; possibly in Jack's R.	Medium river, moderate gradient, low elevation	E	G1
1a	Percina macrocephala	Longhead darter	SH, W	Watauga & South Holston R. <5 miles from the Forest Bdy.	Large streams to medium rivers, moderate gradient, low to moderate elevations.	S	G3
1a	Percina palmaris	Bronze darter	C	2 occ. Conasauga & Jack's Rivers	Small to medium rivers, moderate gradient, low elevation.	S	G3
1a	Percina squamata	Olive darter	H, FB, N, W	1 occ. Hiwassee R. #4; poss in French Broad, Nolichucky & Watauga	Small to medium rivers, moderate to high gradient, moderate elevations	S	G2
1a	Percina tanasi	Snail darter	O, H, LT	1 occ. Hiwassee R.; Ocoee River < 5 miles from Forest Bdy. LT habitat destroyed by Tellico Res.	Large streams to medium rivers, low to moderate gradient, low elevation.	T	G2
1a	Phenacobius crassilabrum	Fatlips minnow	P, FB, N, W, SH	1 occ. Nolichucky R.; poss French Broad, Nolichucky, Watauga, & South Holston R.	Large streams to medium rivers, moderate to high gradient, moderate elevation	S	G3
7a	Phoxinus tennesseensis	Tennessee dace	O, H, LT, N, W, SH; Ridge & Valley of upper TN system in VA in TN	28 occ. O=8; H=15; LT=3; SH=1; poss Nolichucky & Watauga tribs.	1st order spring-fed streams (1-2 m wide) of R&V region & mountain fringes; low to moderate gradients, low to moderate elevation	S	G2G3
Insects and Millipedes							
1a	Cheumatopsyche helma	Helma's net-spinning caddisfly	PA, KY, TN, AL	1 occ. Big Lost Cr (Hiwassee)	Large streams, low gradient, low elevation	S	G1G3
	Dixioria fowleri	A millipede	VA, TN, Laurel Fork drainage in Virginia	1 occ., Holston Mtn near Backbone Rock	Leaf litter, deciduous forests	S	G2
1a	Gomphus consanguis	Cherokee clubtail	VA to AL	0 TDEC records; known from Polk and Sullivan Counties	Small, spring-fed streams, mod to high gradient	S	G2G3
1a	Gomphus viridifrons	Green-faced clubtail	Ontario to AL	1 TWRA record; Chestoa, Nolichucky R. 2001	Small-large rivers, moderate gradient	S	G3
1a	Macromia margarita	Mountain river cruiser	VA to GA	0 records	Small streams to large rivers, rocky with silt deposits	S	G2G3

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1a	Megaleuctra williamsae	William's giant stonefly	VA, TN, NC, SC	0 TDEC records; known from Mt. Rogers & GSMNP	Springs and seeps at high elevations (>4000 feet).	S	G2
1a	Ophiogomphus alleghaniensis	Allegheny Snaketail	WV, VA, TN, AL	0 TDEC records; known from Polk Co. & GSMNP	Spring-fed Piedmont streams	S	G3Q
1a	Ophiogomphus edmundo	Edmund's snaketail	TN, NC, GA	1 occ. Conasauga R.	Large streams, low gradient, low elevation	S	G1
1a	Ophiogomphus incurvatus	Appalachian snaketail	PA, TN, NC, GA	Conasauga River < 5 miles from CNF	Small streams, low gradient	S	G3
4a	Speyeria diana	Diana fritillary	WV to AL	3 TDEC records (Carter & Monroe Co); also in Greene, Cocke, Johnson, Sullivan, Unicoi Cos. (7 new records submitted)	Mature mesic forests, edges & grassy openings; caterpillar host is Viola sp.	S	G3
Mammals							
1a	Corynorhinus rafinesquii	Rafinesque's big-eared bat	OH to MO, south to FL and LA; OK, TX	1 record; Cocke Co.	Caves & mine portals; summer roosts in hollow trees, under loose bark, & abandoned buildings; forages primarily in mature forest	S	G3G4
1a	Glaucomys sabrinus coloratus	Carolina northern flying squirrel	Mountains of NC, TN, VA	4 TDEC records; Monroe and Carter Cos.	Mature spruce fir and adjacent northern hardwood/hemlock forests above 4000 feet; abundant snags & woody debris, fungi	E	G5T1
1a	Microtus chrotorrhinus carolinensis	Southern rock vole	Mountains of MD, NC, TN, VA, WV	0 TDEC records; likely Monroe, Carter, Unicoi Cos.	Cool, damp coniferous and mixed forest; moist/mossy talus and logs at higher elevations	S	G4T3
1a	Myotis grisescens	Gray bat	VA to KS south, from TN to OK; SC to FL, AL	4 TDEC records; Cocke, Greene, Sullivan Cos.	Uses caves year round; forages along riparian areas/shorelines with forest cover	E	G3
1a	Myotis leibii	Eastern small-footed bat	ME to OH south, from SC to AL; AR, MO, OK; CAN: ON, QC	8 TDEC records; Monroe, Cocke, Greene, Carter Cos.	Bridges, cliffs, mine portals, buildings; summer roosts buildings, hollow trees, loose bark	S	G3
1a	Myotis sodalis	Indiana bat	VT to MI south, to SC, AL; IA to AR, OK	1 TDEC record; Monroe Co; addtl. ANABAT records Monroe Co.	Hibernates limestone caves; maternity roosts primarily hollow trees or trees with loose bark; forages riparian areas and upland water holes	E	G2
1a	Sorex palustris punctulatus	Southern water shrew	Mountains of MD, NC, PA, TN, VA, WV	4 TDEC records Monroe Co.	Swift rocky streams in northern & cove hardwoods; often hemlock, mossy rocks, rhododendron; riparian dependent	S	G5T3
Mussels							
1a	Alasmidonta raveneliana	Appalachian elktoe	N	1 occ. Nolichucky R.	Small to medium rivers, moderate gradient, moderate elevation	E	G1
1a	Epioblasma florentina walkeri	Tan riffleshell	H	2 occ Hiwassee R. #4 & #5	Small to large rivers, low gradient, low elevation	E	G1T1
1a	Epioblasma metastriata	Upland combshell	C	O occ Critical Habitat	Large streams to medium rivers, low to moderate gradient, low elevation	E	GH
1a	Epioblasma othcaloogensis	Southern acornshell	C	O occ Critical Habitat	Large streams to medium rivers, low to moderate gradient, low elevation	E	GHQ
1a	Fusconaia barnesiana	Tennessee pigtoe	H, LT, N, FB, W, SH	2 occ Hiwassee R. #4 & #5; LT habitat is inundated by Tellico Res.	Small to medium rivers, moderate to high gradient, low elevation	S	G2G3
1a	Lampsilis altilis	Finelined pocketbook	C	1 occ. Conasauga R. last obs 1999	Large streams to medium rivers, low to moderate gradient, low elevation	T	G2
1a	Lasmigona holstonia	Tennessee Heelsplitter	H, FB	Hiwassee and French Broad tribs. < 5 miles from the Forest Bdy.	Small streams to small rivers, low to moderate gradient, low elevation	S	G3
1a	Lasmigona subviridis	Green floater	W	Watauga R. <5 miles from the Forest Bdy (only location in TN).	Large streams to small rivers, low gradient, low elevation	S	G3
1a	Lexingtonia dolabelloides	Slabside pearlymussel	H	2 occ Hiwassee R. #4 & #5	Small streams to large rivers, moderate to high gradient, low elevation	S{C}	G2

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1a	Medionidus acutissimus	Alabama moccasinshell	C	O occ Critical Habitat	Large streams, low gradient, low elevation	T	G1
1a	Medionidus parvulus	Coosa moccasinshell	C	O occ Critical Habitat	Large streams, low gradient, low elevation	E	G1
1a	Pleurobema decisum	Southern clubshell	C	O occ Critical Habitat	Large streams to medium rivers, low to moderate gradient, low elevation	E	G1G2
1a	Pleurobema georgianum	Southern pigtoe mussel	C	1 occ. Conasauga R.	Medium rivers, moderate gradient, low elevation	E	G1
1a	Pleurobema hanleyianum	Georgia pigtoe	C	Conasauga River < 5 miles from Forest Bdy.	Small streams to large rivers, moderate to high gradient, low elevation	S{C}	GHQ
1a	Pleurobema oviforme	Tennessee clubshell	H	2 occ Hiwassee R. #4 & #5	Large streams, low gradient, low elevation	S	G3
1a	Pleurobema perovatum	Ovate clubshell	C	O occ Critical Habitat	Large streams, low gradient, low elevation	E	G1
1a	Ptychobranchus greenii	Triangular kidneyshell	C	O occ Critical Habitat	Large streams, low gradient, low elevation	E	G1
1a	Strophitus connasaugaensis	Alabama creekmussel	C	1 occ. Conasauga R.	Large streams, low gradient, low elevation	S	G3
1a	Villosa nebulosa	Alabama rainbow	C	1 occ. Conasauga R.	Large streams, low gradient, low elevation	S	G3
1a	Villosa trabalis	Cumberland bean pearly mussel	H	2 occ Hiwassee R. #4 & #5	Large streams and small rivers, low gradient, low elevation	E	G1G2
1a	Villosa vanuxemensis umbrans	Coosa creekshell	C	1 occ. Conasauga R.	Small and large streams, low gradient, low elevation	S	G4T2
Reptiles							
1a	Clemmys muhlenbergii	Bog turtle	Local: SH; US: MA south to GA, TN	South Holston R. tribs with bogs; < 5 miles from Forest, Johnson Co.	Slow, shallow, mucky rivulets of sphagnum bogs, seeps, wet cow pastures, & shrub swamps	S	G3
Snails							
1a	Fumonelix archeri	Ocoee culvert	Polk County, TN	Polk County	Leaf litter under rock ledges in ravines	S	G1
1a	Pallifera hemphilli	Black mantleslug	MI, NC, TN, VA	0 TDEC records; Field Museum records Polk (2), Carter (4) Cos.	Spruce fir and mesic forests with moist litter, downed wood and rock cover; high elevation	S	G3
1a	Paravitrea placentula	Glossy supercoil	VA, TN, NC, KY Off-forest Cocke Co.; unk location Sullivan Co.	0 TDEC records; Field Museum & CNF records Polk(2), Monroe(2), Carter(2), Unicoi(1) Cos.	Leaf litter of deciduous forests and streamside forests with moist litter, downed wood & rock cover.	S	G3
1a	Ventridens coelaxis	Bidentate dome	NC, TN, KY, VA Off-CNF & unk locations Carter, Johnson, Sullivan Cos.	Field Museum & Forest records; Carter (5) and Johnson (3) Cos.	Mesic deciduous forest, mid-high elevation	S	G3
	Vertigo bollesiana	Delicate vertigo	ME south to TN, NC	2 records Monroe Co.; 1 Field Museum record Johnson County	Rich coves, acidic coves, other deciduous forests with downed wood	S	G3
1a	Vertigo clappi	Cupped vertigo	KY, TN, VA, WV	5 records Monroe Co.	Leaf litter and debris on steep wooded slopes with boulders and rotting timber	S	G1G2
Non-vascular Plants							
1a	Acrobolbus ciliatus	A liverwort	Mountains of NC, TN, SC, GA. AK, Japan, Taiwan, and India. Monroe Co.	1 Record	On rock in moist ravines, spray cliffs, cascading streams, and spruce/fir forests; Riparian dependent except when in the spruce/fir forest zone.	S	G3?
1a	Aneura maxima (=A. sharpii)	A liverwort	Mountains of VT, south to NC and TN	0 Records	Humus or gravelly soil at base of wet outcrops, along streams, and waterfalls. Mostly riparian dependent	S	G1G2
1a	Aspiromitus appalachianus	A hornwort	TN, NC, SC	Undocumented records have been reported.	On rock in streams. Riparian dependent.	S	G1
1a	Bartramidula wilsonii	Dwarf apple moss	Macon & Jackson Counties, NC and Monroe County, TN	O Records. Known from Monroe County however site is undocumented.	Wet, acidic rock in the mtns, especially road cuts. Also on spray cliffs and in humid gorges. Mostly riparian dependent.	S	G3?

	Scientific Name	Common Name	Range/Watersh/Co*	CNF Records	Habitat Information	TES	G-Rank
1a	Bazzania nudicaulis	A liverwort	Mountains of VA, TN, and NC	2 locations; Roan Mountain	On rock and bark of *Abies fraseri, Picea rubens, Betula lutea, Prunus pennsylvanica,* and *Sorbus americana* in spruce/fir forests.	S	G2G3
1a	Brachydontium trichodes	Peak moss	Europe, Mount Rainier, NH, NC, and TN	Unknown # on Roan Mountain	Moist, shady, acidic rock, especially sandstone; rocky seepage along mountain trails.	S	G2
1a	Buxbaumia minakatae	Hump-backed Elves	Nova Scotia, MA, NY, MI, VT, VA, NC and Japan	0 Records	Swampy areas; habitats occupied by *Nowellia, Lophocolea,* and *Tetraphis;* rotten logs or stumps; found on elm, ash and yellow birch logs.	S	G2G3
1a	Cephalozia macrostachya ssp australis	A liverwort	NC to MS	0 Records	On soil in rock crevices along streams. Riparian dependent.	S	G4T1
1a	Cephaloziella massalongi	A liverwort	Europe, VT, TN, and NC	0 Records	Rock crevices and soil above 5,500'. Often with copper or sulphur deposits.	S	G2G3
1a	Cheilolejeunea evansii	A liverwort	NC, SC, AL, and TN. Monroe Co.	1 Record	On tree bark in humid gorges. Variety of mesic to dry-mesic hardwoods including *Quercus* spp., *Liriodendron tulipifera, Nyssa sylvatica, Carya* spp., *Liqyuidambar styraciflua, Fraxinus* spp., and *Ilex opaca*. The moss *Fissidens subbasilaris* is nearly a constant associate.	S	G1
1a	Chiloscyphus appalachianus	A liverwort	KY, NC, SC, and TN. Monroe Co.	1 Record	On wet rock, usually near cascades or waterfalls. Riparian dependent.	S	G1G2
1a	Diplophyllum apiculatum var taxifoliodes	A liverwort	NC, TN The variety *taxifolioides* is known from several locations in NC and from Mt. Leconte in TN.	0 Records.	On moist soil or rocks at moderate to high elevations. *Diplophyllum* collected below 3,000 feet is likely to be *D. apiculatum* (Hicks 1992). The variety is thought to be a hybrid of *D. apiculatum* and *D. taxifolioides* (Shuster 1974).	S	G5T1Q
1a	Diplophyllum obtusatum	A liverwort	Newfoundland, MN, mountains of NC & TN	0 Records.	In crevices of rock outcrops in spruce/fir forests; >5,500 ft. Always associated with damp, shaded rocks. It is also known to occur within mixed mesophytic forest in NC (Shuster 1974).	S	G2?
1a	Ditrichum ambiguum	A moss	CA, MT, NC, NH, NY, OR, VT, WA; BC, QC, SK	0 Records.	On bare soil of moist banks of roads or streams in wooded, upland, or montane habitats. Also acidic coves.	S	G3?
1a	Drepanolejeunea appalachiana	A liverwort	Mountains of VA, TN, NC, SC, and GA; PR	4 Records.	On rock and the bark of trees and shrubs along streams, mixed mesophytic forest, and in humid gorges. Most often found on *Kalmia Rhododendron, Clethra,* and *Ilex.* Substrates for the CNF pops include rock, *Quercus alba,* and *Betula allegheniensis.*	S	G2?
1a	Entodon concinnus	Lime entodon	NC, TN; AB, BC, NS	0 Records.	On moist calcareous rock.	S	G4G5
1a	Fissidens appalachensis	Appalachian pocket moss	NC and TN. Monroe Co.	1 Record.	In rock crevices submerged in swift running, shallow water. Riparian dependent.	S	G2G3
1a	Frullania appalachiana	A liverwort	Mountains of TN, NC, GA, and SC	0 Records.	Usually on the bark of hardwoods (*Acer spicatum, Betula allegheniensis, Sorbus americana*) above 3,500 ft. in spruce/fir zone. Also known from mesic forests and escarpment gorges on the bark of *Castanea dentata* and *Liriodendron tulipifera*.	S	G1?
1a	Frullania oakesiana	A liverwort	Northern Europe, Japan, and Mountains of VT to NC and TN	0 Records.	Tree bark in spruce/fir forests.	S	G3?
1a	Gymnoderma lineare	Rock gnome lichen	TN, NC, SC, GA	1 Record, Roan Mountain	High elevation rocky summits and rock outcrops.	E	G2

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1a	Homaliadelphus sharpii	Sharp's homaliadelphus	Japan, Vietnam, Mex; MO, VA, NC, and TN	0 Records.	Vertical surfaces and ledges of calcareous cliffs and boulders. Dry mafic or calcareous rocks in gorges.	S	G3
1a	Hydrothyria venosa	An aquatic lichen	CA to MT and Canada; Appalachians from Canada to TN & NC. Monroe Co.	1 Record	On rock substrates in clear, cold mountain streams. Riparian dependent.	S	G3
1a	Lejeunea blomquistii	A liverwort	Mountains of NC, TN, and GA. Monroe Co.	2 Records.	Rock and bark in humid gorges, and dead trees or vertical rock faces of spray cliffs.	S	G1G2
1a	Lejeunea dimorphophylla	A liverwort	The Caribbean; coastal plain of FL and NC	~~1 possible Record, Monroe County~~. This has proven to be *Lejeunea ulicina* ssp. *bullata*.	On bark of trees in the outer coastal plain. Riparian dependent.	S	G2G3
1a	Leptodontium excelsum	Grandfather Mountain leptodontium	VA, TN, NC, and GA	Unkown # on Roan Mountain	Bark of trees in high elevation, spruce/fir forests.	S	G2
1a	Leptohymenium sharpii	Mount Leconte moss	TN, NC, and SC	0 Records.	On shaded, moist or wet rock (often cliffs and waterfalls) and within hemlock/hardwood cove forests. Elevation ranged from 1900- 5400'.	S	G1
-	Lophocolea appalachiana	A liverwort		see Chiloscyphus appalachianus	See Chiloscyphus appalachianus	S	G1G2?
1a	Marsupella emarginata var. latiloba	A liverwort	Range unknown	0 Records.	Moist rocks in humid gorges, waterfall spray zones, wet rock & seeps along streams, or humid microclimates at high elevation. Riparian dependent.	S	G5T1T2
1a	Megaceros aenigmaticus	A hornwort	NC, TN, and GA. Monroe and Cocke Co's.	25+ Records (often abundant in areas where found).	Shaded rocks in small streams and springs, or spray cliffs. Riparian dependent.	S	G2G3
1a	Metzgeria fruticulosa (= M. temperata)	A Liverwort	Asia, Europe; PNW US; VA, NC, and TN	1 Record, Roan Mountain	Rock and bark of trees from spruce/fir zone to hemlock/hardwood forests above 3000'.	S	G2Q
1a	Metzgeria furcata var. setigera	A liverwort	NC and SC, possibly TN	0 Records.	In humid gorges or on damp, shaded rocks in spruce/fir forests.	S	G4T1
1a	Metzgeria uncigera	A liverwort	PR; SE coast to mountains of NC	0 Records.	On *Rhododendron* bark in mountains.	S	G3
1a	Nardia lescurii	A liverwort	VA, WV, KY, TN, NC, SC, and GA. Monroe Co.	3 Records	Low elevations in mountains, on peaty soil over rock near shaded streams. Riparian dependent.	S	G3?
1a	Pellia appalachiana	A liverwort	MN, NC, SC, TN, and GA. Monroe and Polk Co's.	3 Records.	Permanently damp or wet sites and moist outcrops, usually near waterfalls. Mostly riparian dependent	S	G1?
1a	Plagiochila austinii	A liverwort	NH and VT to NC and TN	0 Records.	On shaded, moist rock outcrops in the mountains	S	G3
1a	Plagiochila caduciloba	A liverwort	Mountains of TN, NC, SC, and GA. Monroe Co. (Historic record from Greene County)	2 Records.	Damp, shaded rock faces, usually along streams in mountain gorges and on spray cliffs; 1000-4900 ft. Riparian dependent.	S	G2
1a	Plagiochila echinata	A liverwort	Mountains of TN, NC, and SC. Monroe and Polk Co's.	4 Records.	Damp, shaded rock faces and crevices in mountain gorges, above cascades and near waterfalls. Riparian dependent.	S	G2
1a	Plagiochila sharpii	Sharp's leafy liverwort	TN, NC, SC, and GA	0 Records.	Shaded, moist rocks in humid gorges. Riparian dependent.	S	G2G3
1a	Plagiochila sullivantii var spinigera	A liverwort	Mountains of VA, WV, NC, SC, and TN. Monroe Co.	1 Record.	Moist, shaded rock outcrops, under cliff ledges, and in rock crevices; spray cliffs and spruce/fir forests; > 2500 ft.	S	G2T1
1a	Plagiochila sullivantii var sullivantii	Sullivant's leafy liverwort	Mountains of VA, WV, KY, TN, NC, SC, and GA. Monroe Co.	1 Record.	Moist, shaded rock outcrops, cliff ledges and rock crevices; spray cliffs and spruce/fir forests; > 2500 ft.	S	G2T2
1a	Plagiochila virginica var caroliniana	A liverwort	VA, NC, SC, and TN	2 Records, no varietal info.	On moist rock near waterfalls; humid gorges, and rocky banks of shaded streams. Riparian dependent. Generally at lower elevations.	S	G3T2

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1a	Plagiochila virginica var virginica	A liverwort	WV, to NC, SC, TN, GA, and MS	2 Records, no varietal info.	On shaded rock along streams and moist rock faces, especially limestone. Riparian dependent. Generally at lower elevations.	S	G3T3
1a	Plagiomnium carolinianum	Carolina plagiomnium	TN, NC, SC, and GA	0 Records.	Moist, granitic or humus covered rock, especially on cliff ledges near streams or waterfalls; rocks or streambanks in humid gorges. Riparian dependent.	S	G3
1a	Platyhypnidium pringlei	A moss	Mexico, AZ; NC, SC, and suspected in TN	0 Records.	Attached to acidic rock in running water, permanent seeps, or spray cliffs of waterfalls in hemlock/hardwood forests. Riparian dependent.	S	G2
1a	Polytrichum appalachianum	Appalachian haircap moss	TN and NC	0 Records.	High elevation rocky summits, rock outcrops, and shrub balds.	S	G3
1a	Porella wataugensis	Watauga porella	KY, TN, NC, and SC. Monroe Co.	2 Records	Rock faces in humid gorges & wet rock near small streams above inundation. Riparian dependent.	S	G2
1a	Radula sullivantii	A liverwort	Mountains of NC, SC, TN, and GA	0 Records.	Shaded rock outcrops near streams and waterfalls in mountain gorges. Riparian dependent.	S	G2
1a	Radula voluta	A liverwort	Europe, South America; mountains of NC and TN. Monroe Co.	1 Record	Shady rock faces in spray areas around waterfalls. Riparian dependent.	S	G3
1a	Riccardia jugata	A liverwort	Mountains of NC and TN. Monroe and Polk Co's.	3 Records.	On moist wood and humus in mesic areas and humid gorges.	S	G1G2
1a	Sphenolobopsis pearsonii	A liverwort	Europe, Africa, Asia, Atlantic and Pacific Islands, Pacific NW; NC and TN	Roan Mountain (Undocumented)	On rock and bark of *Abies fraseri*, *Picea rubens*, *Prunus pennsylvanica*, and *Sorbus americana* in spruce/fir forests.	S	G2
1a	Sticta limbata	A foliose lichen	Canada to CA; mountains of NC and TN	0 Records.	Bark of hardwoods in high elevation northern hardwood forests	S	G3G4
1a	Taxiphyllum alternans	Japanese yew-moss	Asia; MD to FL, NC, and LA	0 Records.	Soil, humus, or bark in wet, swampy areas; on limestone in the spray area of waterfalls. Riparian dependent. .	S	G3?
1a	Tortula ammonsiana	Ammons' tortula	Africa; WV, NC, and TN	0 Records.	Cliff overhangs and crevices with seepage in rich hardwood forests. Riparian dependent.	S	G2?
Vascular Plants							
1a	Aconitum reclinatum	Trailing white monkshood	South and central mountains of NC, PA, TN, VA, WV. Carter Co.	1 Record.	Rich forest habitats on seepage slopes, boulderfields, streambanks, and coves at high elevations, associated with mafic rock.	S	G3
1a	Aster georgianus	Georgia aster	AL, FL, GA, NC. Suspected in SE TN	0 Records	Dry, rocky, open woods and roadsides in areas with a history of frequent fire; Likely associated with historic post or blackjack oak woodlands.	S	G2G3
5a	Berberis canadensis	American barberry	PA to IL, south to AL, GA; IL, MO. Monroe, Johnson, Sullivan, Washington, Carter, and several ridge and valley counties.	0 Records	Open rocky woods, openings, and streambanks, usually over mafic or calcareous rock; occurring in thin soil. Historic habitats were fire maintained.	S	G3
1a	Botrychium jenmanii	Dixie grapefern	MD to FL; TN, AL, MS, LA. Monroe, Hamblen, Putnum Co's.	0 Records	Dry to moist forests; open, grassy areas; and disturbed areas.	S	G3G4
1a	Buckleya distichophylla	Piratebush	Mountains of NC, TN, VA. Carter, Cocke, Greene, Sullivan, Unicoi, Washington Co's.	14 Records.	Open, dry, rocky woods and bluffs, typically calcareous-shaley soils; Known sites occur between 1900-3300 ft.	S	G2
1a	Calamagrostis cainii	Cain's reed grass	Mountains of NC, TN. Sevier Co.	0 Records	High elevation rocky summits and disturbed areas 4000-6000 ft.	S	G1
1a	Cardamine clematitis	Small mountain bittercress	Mountains of AL, NC, SC, TN, VA. Carter, Johnson, Unicoi, Washington, Monroe, Sevier Cos.	13 Records	Wet, rocky areas; springs, seeps, and streambanks; moss or moist soil; > 3,500'; Mostly riparian dependent.	S	G2G3

	Scientific Name	Common Name	Range/Watersh/Co*	CNF Records	Habitat Information	TES	G-Rank
1a	Carex misera	Wretched sedge	Mountains of GA, NC, TN. Blount, Sevier, Carter, Unicoi	4 Records	Medium to high elevation cliffs, balds and rocky areas	S	G3
1a	Carex roanensis	Roan sedge	GA, KY, NC, TN, VA. Carter, Johnson, Unicoi, Cocke, Sullivan	25 Records	Mesic forests; often associated with birch and beech at high elevations.	S	G1
1a	Cimicifuga rubifolia	Appalachian bugbane	AL, IL, IN, KY, TN. Monroe, Sullivan, & several Ridge and Valley cos.; Primary Cumberland Plateau in TN.	0 Records	River bluffs, ravines, and rich cove forests over talus and rocky calcareous soils; typically north facing slopes; 800-1500 ft.	S	G3
5a	Collinsonia verticillata	Stoneroot	MD to GA; OH, KY, TN. Monroe, McMinn, Blount, Sevier, Johnson, and several counties to west.	0 Records	Rich forests in moist coves to dry oak forests over mafic or calcareous rock.	S	G3
1a	Coreopsis latifolia	Broadleaf tickseed	Mountains of GA, NC, SC, TN. Polk, Carter, Greene	6 Records	Rich, moist cove and slope forests 1,500 to 4,500 ft. Flowering triggered by canopy gaps.	S	G3
1a	Danthonia epilis	Bog oat-grass	GA, NC, NJ, SC, TN. Cocke	0 Records	Seeps around rock outcrops in the mountains. Riparian dependent.	S	G3?
1a	Delphinium exaltatum	Tall larkspur	OH, PA south to TN, NC; AL, MO, ME. Mostly Ridge and Valley Co's, but reported from Cocke Co.; Known from the Blue Ridge in NC.	0 Records;	Dry to moist habitats over mafic rock, usually in full or partial sun (grassy balds or forest edges). Also rich woods (and edges of woods), rocky slopes, semi-open woodlands, glades and prairie openings.	S	G3
1a	Diervilla rivularis	Riverbank bush-honeysuckle	Mountains of AL, GA, NC, TN. Unicoi, Washington, Polk, and some Ridge and Valley Co's.	12 Records	Bluffs, rock outcrops, and riverbanks	S	G3
1a	Fothergilla major	Large witchalder	AL, AR, GA, NC, SC, TN. Polk, Sevier, Greene, and some west of Blue Ridge	3 Records	Dry ridge top and bluff forests of moderate elevations.	S	G3
2a	Gentiana austromontana	Appalachian gentian	Mountains of NC, TN, VA, WV. Carter, Greene, Johnson, Sullivan, Unicoi, Washington Cos.	70 Records	High elevations in open forests, grassy balds, and along roads and trails.	S	G3
1a	Geum geniculatum	Bent avens	Mountains of NC, TN. Carter Co.	5 Records	High elevation peaks, seeps, wet boulderfield forests, grassy balds, cliff bases, and stream banks.	S	G2
1a	Geum radiatum	Spreading avens	Mountains of NC, TN. Sevier, Blount, Carter.	3 Records	Thin soil on rocky summits, cliffs, & ledges; open, grassy balds near *Rhododendron catawbiense*; >4200'.	E	G1
1a	Glyceria nubigena	Great Smoky Mountain mannagrass	Mountains of NC, TN. Sevier.	0 Records	Moist to soggy ground at higher elevations, especially seepage areas on heath balds and high ridges and miry places in spruce-fir forests	S	G2
1a	Hedyotis purpurea var. montana	Roan Mountain bluet	Mountains of NC, TN. Carter	1 Record	Habitat includes crevices in rock outcrops and gravelly soils at the edges of grassy balds.	E	G5T2Q
5a	Helianthus glaucophyllus	Whiteleaf sunflower	AL, NC, SC, TN. Carter, Greene, Johnson, Unicoi Cos.	12 Records	Mesic forests and woodlands at medium elevations. Flowering associated with increased light.	S	G3
1a	Heuchera longiflora var. aceroides	Maple-leaf alumroot	Range for H. longiflora is AL, KY, NC, OH, TN, VA, WV. No published range info for variety. Cocke, Greene Cos.	9 Records	Moist ravines and rich cove forests, especially over mafic or calcareous rock.	S	G4T2Q
1a	Hymenophyllum tayloriae	Taylor's filmy fern	NC, SC, TN, GA. Sevier, Fentress, Overton.	0 Records	Humid gorges, moist ceilings of rock grottoes and spray cliffs. Riparian dependent.	S	G1G2
1a	Hypericum graveolens	Mountain St. Johnswort	Mountains of NC, TN. Sevier, Unicoi, Carter, Johnson.	3 Records	High elevation grassy balds and forest openings.	S	G3

	Scientific Name	Common Name	Range/Watersh/Co*	CNF Records	Habitat Information	TES	G-Rank
5a	Hypericum mitchellianum	Blue Ridge St. Johnswort	Mountains of NC, TN, VA, WV. Unicoi, Carter, Cocke, Greene, Johnson, Sevier, Blount, Monroe.	12 Records	Grassy balds, seeps, and forest openings.	S	G3
1a	Ilex collina	Longstalked holly	NC, VA, WV. Suspected in TN	0 Records	Wetlands, seeps, or streambanks >2,000 ft often in association with *Tsuga canadensis, Betula lenta, Ilex montana, Picea rubens*, and *Rhododendron maximum*. Also moist, rocky slopes in northern hardwood or mixed spruce/hardwood forests.	S	G3
1a	Isotria medeoloides	Small whorled pogonia	ME to GA; Midwestern US and CAN. Washington, Hamilton.	0 Records	Open deciduous, or mixed pine-deciduous forests, often on dry to moist leaf litter.	T	G2G3
5a	Juglans cinerea	Butternut	Central and eastern US and southeastern CAN. All Blue Ridge counties and scattered throughout TN.	11 Records	Moist, rich forests especially along rivers in bottomlands and floodplains.	S	G3G4
1a	Lilium grayi	Gray's lily	Mountains of NC, TN, VA. Carter and Johnson Co's.	8 Records	Bogs, seeps, grassy balds, moist forest edges, and wet meadows at medium to high elevations.	S	G3
1a	Lysimachia fraseri	Fraser's yellow loosestrife	Regional endemic of AL, GA, NC, SC, TN; KY, IL. Polk, Sevier, Cocke, Hamilton, and a few counties in west TN.	10 Records	Forest edges, road banks, Along streams and rivers, and thin soil near rock outcrops. Locally abundant in the Ocoee River Gorge. Dependent upon cyclical natural disturbances to maintain open conditions.	S	G2
5a	Minuartia godfreyi	Godfrey's stitchwort	Regional endemic AL, AR, FL, NC, SC, TN. Carter, Johnson.	3 Records	Wet ditches, meadows, seeps, streams banks, and springs; associated with calcareous soils. Riparian dependent.	S	G1
1a	Monotropsis odorata	Sweet Pinesap	DE to FL, AL, KY, TN, WV; Centered in Appalachians. Polk, Monroe, Blount, Sevier, Cocke, Greene, and a few counties west.	8 Records	Dry to mesic pine and mixed pine/hardwood forests.	S	G3
5a	Penstemon smallii	Small's beardtongue	Mountains of AL, GA, NC, SC, TN. Polk, Cocke, Greene, Washington, Unicoi, Carter, and several counties west.	0 Records	Woodlands, cliffs, glades, and roadsides.	S	G3
1a	Pityopsis ruthii	Ruth's golden aster	Southeast TN	12 Records; Polk Co.	Crevices in phyllite & graywacke boulders in historical flood zone Ocoee & Hiwassee Rivers.	E	G1
1a	Platanthera integrilabia	White fringeless orchid	VA to GA, KY to AL, MS. Polk, Monroe and several Cumberland Plateau counties	2 Records	Forested wetlands with open or semi-open canopy. Wet, flat, boggy areas at the head of streams or seepage slopes. Often found in association with *Sphagnum* and *Osmunda cinnamonea, Woodwardia areolata*, and *Thelyptris novaboracensis*, in acidic muck or sand, and in partially, but not fully shaded areas.	S	G2G3
1a	Potamogeton tennesseensis	Tennessee pondweed	OH, PA, TN, VA, WV. Polk, Monroe, Blount and counties west	1 Record	Slow moving streams and rivers. Riparian dependent.	S	G2
1a	Prenanthes roanensis	Roan Mountain rattlesnake root	Mountains of NC, TN, VA. Polk, Sevier, Greene, Unicoi, Carter, Johnson	48 Records	High elevation rich woods, grassy balds, and forest openings.	S	G3
1a	Pycnanthemum beadlei	Beadle's mountain mint	Mountains of southwest VA to GA, TN. Carter	0 Records	Forests and woodland borders.	S	G2G4

	Scientific Name	Common Name	Range/Watersh/Co*	CNF Records	Habitat Information	TES	G-Rank
1a	Rosa obtusiuscula	Appalachian Valley rose	TN endemic. Only known collection from Cocke Co.	0 Records; not tracked by TDEC; NY Botanical Garden Database lists one record (1897) in Cocke County near French Broad River between Paint Rock and Del Rio.	Listed by TN Natural Heritage (1999) as a rare endemic, known from wooded slopes and riverbanks. Taken off after Rare Plant Advisory Committee meeting (1999) until taxonomic issues are resolved. It could be *Rosa palustris*. At this point it is considered to be "State Historic".	S	G1G3Q
1a	Rugelia nudicaulis	Rugel's Indian plantain	Mountains of NC, TN. Cocke, Sevier, Blount	0 Records	Spruce/fir and northern hardwood forest openings	S	G3
7b	Saxifraga caroliniana	Carolina saxifrage	Mountains of GA, NC, TN, VA, WV. Carter, Cocke, Johnson Cos.	4 Records	Moist rock outcrops and cliffs; wet soil at the base of rocks; cool, shaded, rocky woods. Almost always in steep terrain and often in areas misted by spray from nearby waterfalls or in areas where water trickles down the rocky slopes.	S	G2
1a	Scutellaria arguta	Hairy skullcap	GA, KY, NC, TN, VA. Unicoi	0 Records	High to mid elevation forests and moist talus slopes	S	G2?Q
7b	Scutellaria saxatilis	Rock skullcap	CT to IN, south to AL, GA, SC, AR. Polk, Blount, Unicoi, Carter, Johnson, Cocke, Greene	43 Records	Rocky, dry to mesic forests and open areas	S	G3
1a	Sedum nevii	Nevius' stonecrop	AL, GA, TN. Polk	9 Records all restricted to the Ocoee River Gorge.	Shaded, rocky bluffs and cliffs	S	G3
1a	Sida hermaphrodita	Virginia fanpetals	KY, MD, OH, PA, TN, VA, IN, MI, Ontario. Cocke, Washington, Claiborne	0 Records	Sandy or rocky riverbanks	S	G2
1a	Silene ovata	Blue Ridge catchfly	AL, AR, GA, IL, IN, KY, MS, NC, SC, TN, VA. Polk, Sevier, Cocke, Greene, Unicoi and west.	4 Records	Mid elevations over mafic or calcareous soils. Rich cove and oak/hickory forests.	S	G2G3
1a	Solidago spithamaea	Blue Ridge goldenrod	Mountains of NC, TN. Carter Co, Roan Mtn.	1 Record	Rocky places (outcrops, ledges, cliffs, balds) above 4500 ft.	T	G1
1a	Spiraea virginiana	Virginia spiraea	AL, GA, KY, LA, NC, OH, PA, TN, VA, WV	1 Record, no longer extant; Unicoi Co., Nolichucky River	Riverbanks and riverside shrub thickets; rocky areas susceptible to flood scour. Riparian dependent.	T	G2
1a	Stachys clingmanii	Clingman's hedge-nettle	AL, IN, MD, NC, SC, TN, WV. Monroe, Sevier, Blount, Cocke, Unicoi	7 Records	Rich boulderfields, cove, northern hardwood, and spruce/fir forests, and clearings at high elevations.	S	G2Q
1a	Thaspium pinnatifidum	Cutleaved meadow parsnip	AL, GA, KY, NC, OH, TN, VA. Greene, Cocke, Hamilton	1 Record	Forests and woodlands over calcareous rock	S	G3?
1a	Thermopsis mollis var. fraxinifolia	Ashleaf goldenbanner	Mountains of GA, NC, SC, TN; AL. Polk, Monroe, Blount, Greene	28 Records	Openings and ridges in dry woodlands. Often on road banks.	S	G4? T3?
1a	Trillium rugelii	Southern nodding trillium	Mtns & Piedmont of AL, GA, NC, SC, TN. Carter, Cocke, Unicoi, Washington, Polk, Blount, Sevier	6 Records	Rich forests and coves often over mafic or calcareous substrates.	S	G3
1a	Trillium simile	Sweet white trillium	Mountains of GA, NC, SC, TN. Polk, Monroe, Sevier, Blount, Cocke	Several Records, not in database.	Rich soils of slopes or coves over mafic or calcareous rock.	S	G3
1a	Tsuga caroliniana	Carolina hemlock	Mountains of GA, NC, SC, TN, VA. Carter, Johnson, Sullivan, Unicoi, Washington	51 Records	Ridge tops, rocky bluffs and open forests. Generally dry conditions.	S	G3

*PRC = Project Review Code; to get the appropriate code for each species use the Project Review Code Key.

* Co. = Counties from which the species is currently known. Counties of occurrence for vascular plants obtained from University of TN Plant Atlas, online version, 4/04.

Range abbreviations refer to the major watersheds: Conasauga, Ocoee, Hiwassee, Little Tennessee, Pigeon, French Broad, Nolichucky, Watauga, and South Holton.

Forest Occurrence Data is based upon currently known records; Habitat Information is only a summary.

For streams the following definitions apply:

Orders	Gradients	Elevations
small 3, 4	low <=2%	low<=1200'
medium 5, 6, 7	moderate>2% - <=4%	high>1200'
large 8, 9	high>4%	

Attachment B
Project Review Code (PRC) for each TES Species

1a = The project is located out of the species known range, or suitable habitat does not exist in the project area.

2a = All requisite habitat has been identified and excluded from disturbance associated with the project. Therefore, the project is expected to have no effects regardless of the number and location of individuals in the area affected by the project.

3a = The project is being implemented for the benefit of the species, and is expected to have totally beneficial effects regardless of the number and location of individuals in the area affected by the project.

4a = It is assumed that the species is present. Additional information on the number and location of individuals is not needed to improve the design and/or application of mitigation to reduce adverse effects, or to allow a better assessment of effects to viability of the population.

5a = The species is already covered by a current site-specific inventory for the project area and additional inventories are not needed.

6a = Inventory methods are not technically or biologically feasible and effective for providing substantial information on the number and location of individuals. It is assumed that the species is present.

7a = A site-specific inventory was conducted, but the species was not found in the project area.

7b = A site-specific inventory was conducted, and the species was found in the project area.

Appendix C: Response to Comments

Comments were received from Harold Lampkin, Powell Foster, Joe DeLoach of Tennessee Eastman Hiking & Canoeing Club, Candace Dinwiddie of Tennessee Forestry Association.

The comments displayed below are excerpted from the original letters and e-mails to represent the essence of the comment or concern. The complete text of the comment may be read in the originals in the project file.

--*Harold Lampkin*

Comment: "I highly approve of your aggressive action to eradicate the gypsy moth…I want to commend you and all involved in this very important undertaking…"

Response: Thank you for your comment.

--*Powell Foster*

Comment: "The proposed action is needed and an appropriate method of handling infestation is described."

Response: Thank you for your comment.

--*Joe DeLoach*

Comment: "…The Tennessee Eastman Hiking & Canoeing Club enthusiastically supports this proposal. The pheromone-based treatment planned seems not only to have the best chance of effectiveness but also has minimal potential adverse consequences…We hope that the treatment is effective at eradicating the gypsy moth before they reach the Trail, where not only adverse impacts to the Trail environment could result but their transport could be facilitated by hikers…."

Response: Thank you for your comment. The Scenery and Recreation resources section addresses the Appalachian National Scenic Trail (A.T.) Specifically, the affected environment states that "…(A.T.) traverses Holston Mountain approximately one mile upslope from the RRTA near the Abingdon Gap trail shelter. No portion of the RRTA is located within the foreground of the A.T." (EA, p. 28). Under Alternative 1, gypsy moth "…impacts may spread to the A.T. corridor in the foreseeable future. Effects would impact the use, maintenance and recreational experience of the A.T." (EA, p. 28) Under Alternative 2, "[t]he actions taken would help to control the gypsy moth population and

thereby minimize the defoliation of the trees that contribute to the aesthetic appeal of the landscape." (EA, p. 29).

--*Candace Dinwiddie*

Comment: "…voice our organization's support for the gypsy moth eradication project…supports our Tennessee's healthy hardwood forests and could potentially stop a disaster similar to the southern pine beetle problems…The health of our hardwood forests are integral to the state's economy for tourism…"

Response: Thank you for your comment. Under Economics resource section, Alternative 1 would "…continue defoliation, the recreational and visual impact would continue to increase, therefore, deterring visitor use, experience and monetary contributions to the local community." (EA, p. 30) Under Alternative 2 "…the surrounding hemlock community could be saved which would benefit the loggers in the long-term…benefits to the recreation and scenery would continue which could bring revenues into the local community." (EA, p. 30) With respect to Forest Resources, under Alternative 1, the gypsy moth population would increase throughout the treatment area ranging in density levels from low to high with varying degrees of defoliation. The vegetation composition would shift. (EA, pp. 15-56) Under Alternative 2 the gypsy moth population could be completely eliminated within the treatment area and the area would only be impacted by natural occurring events. (EA, pp. 16-17)