Wells Branch Timber Sale
Environmental Assessment

USDA Forest Service
Clinch Ranger District

George Washington and Jefferson National Forests

Lee and Wise Counties, VA

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1.1 Introduction

The Forest Service proposes to treat vegetation on National Forest lands in compartments 2088, 2089, 2090, and 2094 on the Clinch Ranger District of the Jefferson National Forest. This area is located approximately 1.5 miles south of Exeter, VA off State Route (SR) 623 in Lee County. The project area lies in the Laurel Fork Drainage of Pigeon Creek and the Wells Branch drainage of the North Fork Powell River (see project area map).

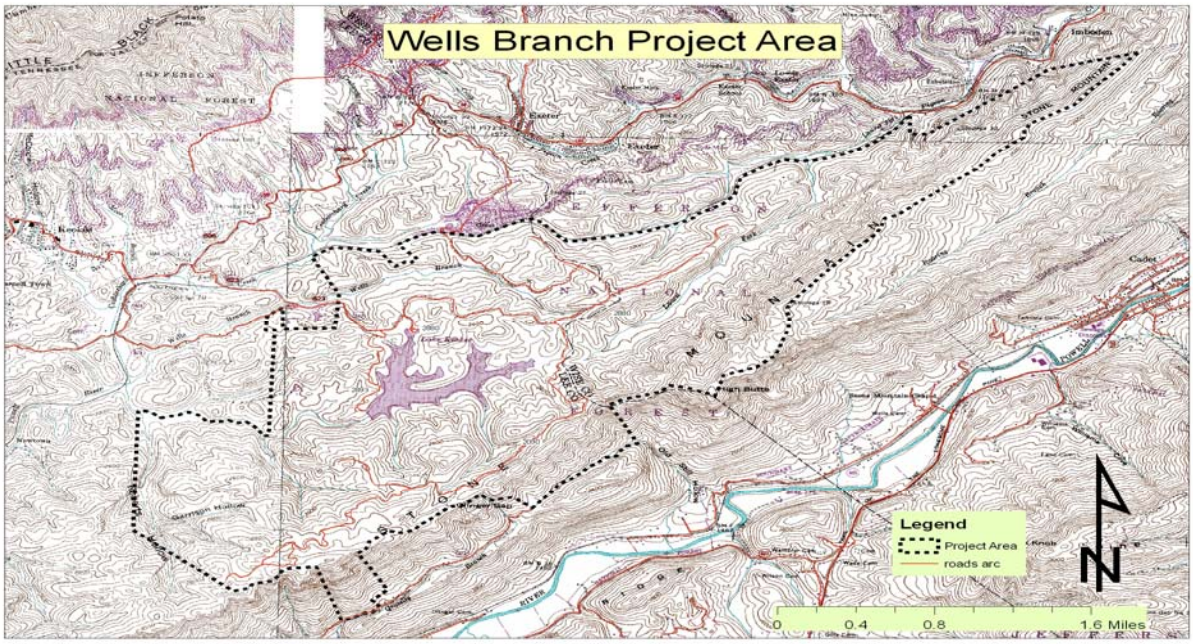


Figure 1: Wells Branch Project Area Map

1. 2 Proposed Action

The following summary discusses the vegetation management actions proposed, harvest prescriptions and objectives, acres, and transportation needs. Chapter 2 of this Environmental Assessment (EA) provides

more detail regarding the proposed action, including stand management objectives; post harvest treatments, and a description of desired residual stands. The following is a summary of the proposed Vegetation Management as well as associated transportation and recreation oriented projects.

- **Timber harvest** on approximately 461 acres
  -- **Regeneration** (coppice w/ reserves) is proposed on approximately 200 acres.
  -- **Regeneration** (shelterwood) is proposed on approximately 85 acres.

  Removal of timber would be through ground-based (i.e. skidders and tractors) equipment.
  Natural regeneration will be accomplished from coppice, stump sprouting, and seeding.

  -- **Stand Improvement** (free thinning) is proposed on approximately 176 acres.
  Removal of timber would be through ground based and skyline based systems.

- **Prescribed Burning** is proposed on approximately 2900 acres to treat slash and woody fuels in regenerated stands and site preparation for natural regeneration. Other objectives would include reduction of fuels, to begin the process of changing the fire regime condition class, to improve stand composition, and to promote herbaceous growth in the understory.

  Transportation Needs About 1.1 miles of new system road construction and 1.2 miles of temporary road construction is proposed. Pre-haul maintenance would be completed on FSR 2880 and on FSR 2090.

  Post Harvest Treatments proposed include (see attached associated projects map):
  - Seeding all landings, temporary roads, and portions of some skid roads with a quality wildlife seed mix to create approximately 20 acres of wildlife openings/strips.
  - Performing a mechanical (chainsaw) stand improvement and mid-story treatment on areas that are commercially thinned.
  - Performing mechanical (chainsaw) and herbicide site preparation on areas that are regenerated through coppice

1.3 Forest Plan Direction

This EA tiers to the Final Environmental Impact Statement (FEIS) and the Revised La**n**d Resource Management Plan (RLRMP) for the Jefferson National Forest, which was signed in January, 2004. Copies of this plan can be obtained from the Supervisors Office at 5162 Valleypointe Parkway Roanoke, VA 24019
or online at:
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_000381.pdf.

The Forest Plan is the first level of decision making process that satisfies many requirements of the National Forest Management Act (NFMA, 1976). It sets direction for the Forest Service to make site-specific proposals and to implement these proposals over time.

The Wells Branch project area is broken into four different management prescriptions. The first prescription is 8A1 – Mix of Successional Habitats in Forested Landscapes. This management prescription is intended to ". . . Provide a mix of habitats for plants and animals associated with mid-to late-successional forest habitats." The 8A1 management prescription is designated as "suitable for timber production". There is more 8A1 in the project area than any other management prescription.

The second management prescription found in the Wells Branch Project Area is 4D Botanical – zoological areas. Areas with the 4D prescription ". . . serve as a network of core areas for conservation of significant elements of biological diversity." (RLRMP 3-27). No sale units are planned in 4D areas.

Another management prescription found in the Wells Branch Project Area is 7B Scenic Corridors. This prescription has an emphasis on ". . . providing, through maintenance or restoration and design, high quality scenery in sensitive recreational and travel way settings." (RLRMP 3-88). The "recreational setting" in this case is Lake Keokee. These areas are "suitable for timber production". "Timber harvest practices are modified to recognize and enhance the aesthetic and recreational values of these lands." (RLRMP 3-88).

The final management prescription in the project area is 7D concentrated recreation area. These areas are managed "to provide the public with a variety of recreational opportunities in visually appealing and environmentally healthy settings." (RLRMP 3-96). This area is only about 15 acres and is centered on the parking and boat launch area at Lake Keokee.

1.3.1 Existing and Desired Conditions

The Forest Plan provides guidance in establishing the desired condition for resources within a project area based on site-specific factors such as the management prescription designation, featured habitat designations for species types, and forest type. The following is a brief summary of the existing condition and desired condition for project area resources. Additional discussions on existing and desired conditions are provided in chapter 3 of this EA.

1.3.2 Wildlife

Desired Conditions

According to the Forest Plan, Chap. 3, page 3-112, the desired condition in terms of wildlife habitat is a mixture of forest successional stages, where a minimum of 60 % of the area is greater than 40 years of age. In addition, 4 to 10 % of the contiguous prescription area is in early-successional forest. Many patches of these habitats are greater than 20 acres in size to provide optimum habitat for these early successional species. The management prescription would provide mid– to late– successional deciduous forest habitats for a variety of mid- to late- successional and area sensitive species as well as suitable habitat for early successional species. The overstory canopy generally consists of mixed hardwood forest composed primarily of oaks and hickories in the uplands and are relatively closed, multi-layered, and moderately to densely stocked.

Existing Conditions

The age-class distribution for the contiguous management prescription area is approximately 76% (about 3000 ac) mid- to late- successional with approximately 5% (about 200 acres) of the prescription area early successional (0 to 10 years) as shown on Table 1. The objective condition (Forest Plan, 8A1-OBJ2, 3-114) for late-successional to old growth characteristic stands is 20% of the prescription area. Currently, approximately 4% of the prescription area meets this objective.

Stand structure is an important factor for suitable wildlife habitat. High stand densities limit the amount of sunlight reaching the ground, thereby decreasing within and between stand structural diversity. In addition, because of the limited light reaching the ground, less desirable species such as red maple, magnolia, and birch increasingly dominate the understory.

1.3.3 Forest Health

Desired Condition

The desired condition of the area is a healthy, vigorous forest, able to withstand degradation by insects and disease. Less vigorous and poorly formed trees should be removed during selective harvesting, and regeneration areas should be created during harvest operations. From the air the project area should look

like a mosaic of differing age classes with regeneration areas of differing shapes and sizes scattered over the landscape. The dominant species would be hard mast producing species such as oak and hickory. Less desirable species such as red maple and magnolia would occupy a smaller portion of the area.

Existing Condition

Currently, the general condition of the forest across the project area is overstocked. Most stands are 71-90 years old, and have received no species or stocking control. Average Basal Area (BA) for most stands is around 110 sq. feet. Forests grown under these conditions are increasingly susceptible to insect attack and disease. With increased mortality from insect and disease outbreaks, the potential for catastrophic fire also increases. Tree quality across the project is average and where overstocking occurs, growth is relatively slow. The project area lacks age class diversity, contains very little edge habitat, and virtually very little early successional habitat. Recent prescribed burns in the project area have had desirable effects including mid-story mortality that opened up stands allowing more sunlight to reach the forest floor and, as a result, increasing herbaceous growth and diversity of species on the ground. Some overstory trees were also killed during recent prescribed burns. This overstory mortality has created canopy gaps and scattered small patches of early successional habitat. TSI (timber stand improvement) treatments were also implemented on 8 younger stands in 2005. These treatments improved the species composition and health of the stands regenerated in the 70's and 80's. More information on the existing and desired condition of the project area can be found in chapter 3.

1.4 Purpose and Need for Action

The following purposes for this proposal and associated needs for the action are as follows:

Purpose #1: To create increased diversity in the current age class distribution.

<table>
<tr><th>Forest Plan Desired Condition (DFC)</th><th>On-The-Ground Current Condition Contiguous Prescription Area.</th><th>Need For Action (Contiguous 8A1)</th></tr>
<tr><td rowspan="3">1. Maintain a minimum of 60% of contiguous 8A1 block >40 years of age.
2. Maintain a minimum of 4% (up to 16% of individual proposed project area) in early successional habitat (ESH; 0-10 years).
3. Increase vertical and horizontal structural diversity.</td><td>1. 80% of 8A1 management prescription area > 40 years.
2. 1% 8A1 management prescription area currently is in early successional habitat (ESH; 0-10 years).</td><td>• Need early successional habitat. Create early successional habitat in the management prescription area (129 ac to 323 acres) to achieve the 4 – 10% range.</td></tr>
<tr><td>On-The-Ground Current Condition 3900 acre project area.</td><td>Need for Action – 3900 acre Project Area</td></tr>
<tr><td>1. 87% of the project area > 40 years.
2. 1% of project area currently in early successional habitat (stands aged 0 -10 years).
3. 80% of acres proposed for harvest in the project area are overstocked, reducing within stand structural diversity.</td><td>Create ESH in the project area (158 to 630 ac). Can establish up to 16% ESH in an individual project area to achieve the objective of the contiguous block.
Reduce stocking in stands to increase vertical structural diversity.</td></tr>
</table>

Table 1. Desired Condition vs. Current Condition. The difference between the DFC and the current condition is defined as the need for action, shown in column 3.

Need: The majority of the project area is located in management prescription 8.A.1 as described in the Revised Land and Resource Management Plan for the Jefferson National Forest. This management type is intended to "sustain a mixture of successional habitat distribution across the landscape with emphasis

increasing the spatial heterogeneity by increasing both early and late successional habitat conditions" (pg 3-112 RLMP) as shown in table 1.

Currently, upland oak/hickory and yellow poplar/white oak/red oak forests greater than 60 years dominate the prescription area. There is virtually no early successional habitat in the project area or in the prescription area (Table 1). According to the Forest Plan, regeneration areas may occupy up to 16% of a project analysis area in order to provide 4 to 10% in a contiguous management prescription block in early successional forest habitat conditions. These early successional habitat areas are often clustered on the landscape and provide optimum habitat for dependent species.

Indicators:

Table 1: The approximate percentage of project area by age class

Age Class	0-10 yrs	11-40 yrs	41-100 yrs	100+ yrs
Project Area (App 3900 Ac)	<1% (32ac)	9% (336 ac)	82% (3198 ac)	8% (313 ac)
Contiguous 8A1 (App 3230 ac)	1% (32 ac)	9% (296 ac)	80% (2582 ac)	10% (313 ac)

Purpose #2: To manipulate stand structure and density.

Need: The management philosophy on suitable lands includes a planned periodic harvest applying biological and scientific principles to influence tree-species composition, control stocking, ensure adequate reforestation, facilitate harvesting of trees and protect the productivity of the site while providing for a healthy vigorous forest within the growth capabilities of the sites (RLRMP 2-30). Much of the project area is designated as 8.A.1, which emphasizes:

- Increasing spatial heterogeneity in both early and late successional habitat conditions,
- Increasing vertical vegetative diversity, and
- Maintenance or enhancement of hard and soft mast production (RLRMP 3-112).

Currently, many of the stands in this project area are overstocked. The average BA of these stands is approximately 110 sq.ft/acre, of which, an approximate average of 50% of the overstory stocking is less desirable, non-mast producing species, such as red maple, magnolia, or yellow poplar. The resulting stands,

- have little or no within-stand structural diversity (little or no amounts of shrub/brush soft-mast or seedling/sapling layer),
- have lower growth/vigor and,
- Contain less desirable species which out compete desirable mast bearing species.

The RLRMP calls for the use of silvicultural systems, including commercial thinning, to provide for structural diversity (RLRMP, FW – 70, 2-26). Removing a variety of overstory trees would increase the amount of sunlight reaching the forest floor which increases structural diversity (RLRMP 3-115). Decreasing the number of trees in a stand will result in reduced competition for sunlight, water, and nutrients. This will result in increased growth and vigor, increased mast producing capability, and increased capacity to resist insects/diseases, thereby moving the project area towards the desired future condition (RLRMP 3-112 and 3-113). Prescribed burning is another tool proposed for this project area to increase structural diversity in the stand.

Indicators:

- Number of acres treated to improve structural diversity.

1.5 Project Objectives

1. **Create early successional habitat**
2. **Increase growth and vigor**
3. **Maintain or increase oak component**
4. **Re-introduce fire into the ecosystem**
5. **Provide raw wood material to local markets**

Objective 1: Increase the acreage of early successional forest habitat in this portion of management prescription 8.A.1. Approximately 3230 acres of contiguous land is present in the 8.A.1 management prescription, and approximately 1% contains early successional vegetation (stands less than 10 years old). The proposed action will create approximately 285 acres of ESH in the project area, bringing the total of ESH in the contiguous (8A1) land base to about 10%.

Objective 2: Improve the growth and vigor of stands adjacent to the ESH created by our proposed action. Growth and vigor of selected trees will increase after competing vegetation is removed during proposed thinning harvests. The increased growth and vigor will help the treated stands resist insect infestation, the occurrence of disease, and increased production of hard and soft mast in the project area.

Objective 3: Manipulate species composition. The proposed action (including both timber harvests and prescribed fire) would increase the amount of sunlight reaching the ground therefore should encourage regeneration of more desirable timber and wildlife species. One objective is to maintain or increase the amount of hard mast in a stand. Oak is a valuable mast producer and timber species. Another goal is to increase the diversity of species in the understory. Prescribed burning helps accomplish this as does selective timber harvesting.

Objective 4: Re-introduce fire into the Appalachian Mountain ecosystem. Historically, fires burned more frequently than they do in this age of fire suppression (Sutherland et al, 2008). Prescribed burns are intended to manipulate the species composition, increase structural diversity, increase browse, and reduce less desirable vegetation in the understory, resulting in improved wildlife habitat and improved species composition. This action would also reduce fuels available for wildfire and mimic the historic fire regime found in this forest type in the Appalachian Mountains (Sutherland et al, 2008).

Objective 5: Provide raw wood material to local markets. Trees and the products derived from them are a highly valued forest resource. The estimated demand for timber products from the Jefferson National Forest is 68 million board feet for the next decade (Forest Plan 2-30). The majority of our project area has been designated as suitable for timber production. Given the congruent wildlife habitat goals, it is logical to market the wood products created by our proposed action.

1.6 Scoping/Public Involvement

A scoping letter, dated August 8, 2007 was posted on the forest correspondence database and mailed to all groups and individuals on the scoping list (approximately 75). A request for public comment was printed in The Coalfield Progress on August 9, 2007. Due to elapsed time and changing conditions a second scoping was sent out on May 27, 2010 with the ad appearing in the Coalfield on June 1, 2010.

The initial scoping effort generated 6 responses to the proposed action and potential alternatives; One phone call from an interested private citizen, two letters from special interest groups, and three letters from State agencies. The second scoping generated three letters (Some were copies of the original letters) and one phone call. All responses were carefully reviewed and a list of comments was generated as a result. The Interdisciplinary Team (ID) team then met and discussed the comments and the issues they raised. The team then determined which resources and issues needed to be analyzed in detail, and/or

addressed in the EA. Many of the responses had similar themes that were repeated within and between the letters and/or commenter. See appendix for specific responses to comments received.

1.7 Issues

Four issues identified during the scoping process were considered in detail and carried forward in the analysis of this project.

Issue # 1: Effects of harvesting, roadwork, and associated projects on water quality and riparian areas

Issue Statement – Ground-disturbing activities could result in sedimentation of adjacent streams, causing reduced water quality and aquatic habitat in those streams as well as the Powell River.

Indicators – **Water quality:** *% increase of sediment yield over background levels at designated critical reaches – tons/acre/year*
Riparian Areas: *acres disturbed*

Issue # 2: The effects of harvesting, roadwork, and associated projects on visual quality.

Issue Statement – Management activities adjacent to Lake Keokee will significantly impact the visual quality of the viewshed.

Indicators – *Management activities meet the Scenic class objectives for the project area.*

Issue # 3: The effects of harvesting, roadwork, and associated projects on Threatened, Endangered Species (TES) habitat.

Issue Statement – Management activities could have a negative impact on TES habitat within the project area.

Indicator – *Effects determination by species.*

Issue # 4: The effects of harvesting, roadwork and associated projects on Management Indicator Species (MIS) habitat**.**

Issue Statement – Management activities could have a negative impact on MIS habitat in the Wells Branch Project area.

Indicator – *%* *affected habitat by species*

1.7.1 Issues considered but NOT carried forward in detailed analysis

The following issues were discussed during the comment analysis process, but were dealt with in the project design features and mitigation measures or agency policy. They were not carried forward in the analysis.

Impacts of fragmenting habitat

The fragmentation of forests (mature or not) is a problem that the Forest Service considers at the Forest Plan level. In general, fragmentation of the forest occurs when a land-use is permanently changed from a forested environment, not when timber harvesting occurs. This project does not propose any permanent change to the forested environment; the proposed action is within standards and guidelines set forth in the Forest Plan for Mgmt Rx 8A1. As a result, the IDT decided that this issue would not be carried forward into detailed analysis.

Impacts on old growth

The RLRMP states “There are no existing large (>2,500 acres) patches of old growth found on the Jefferson National Forest”. However, large areas unsuitable for timber harvest have been identified and are set aside for future large patches of old growth (FEIS, 3-117). A specific project area analysis is not used to delineate large patches of old growth. The forest plan is where landscape level decisions are made. Medium and small patches were also identified as a part of the Forest Plan process using the

Regional guidance. These were to be used to improve spatial distribution between large patches of old growth (RLRMP, B-1). While large, medium and small patches were identified solely in conjunction with the Forest Plan, medium and small patches could also be identified as a part of the project area analysis.

The DFC for late successional/old growth forested conditions greater than 100 years in this management prescription is 20% across the contiguous management prescription area, or approximately 1730 acres. Currently, none of the stands within the prescription area currently meet all four Region 8 criteria for old growth, nor does the area meet the 20% objective for late successional conditions. Further analysis indicates that the prescription area will achieve this late successional objective within 13 years (2020). This project does not propose harvest in any areas greater than 100 years old. Harvesting the planned acres will not change the status of the late successional deficit nor will it retard the achievement of this objective in 13 years. In addition, the creation of late-successional to old growth characteristics was not defined as a purpose and need for this project. As a result, the IDT determined that this issue would not be carried forward into detailed analysis.

Impacts on cultural resources
An archeological survey and report was conducted for this project (project file). The Forest Service recognizes the importance of protecting cultural sites and, in general, excludes all archeological sites from management activities. No archeological sites were found during the surveys conducted for this analysis. The ID team decided that this issue would not be carried forward into detailed analysis.

Effects on economics
The IDT recognized the value of this area to the local community, for not only recreational use (hunting and hiking), but as a source of potential revenue to the local community. The value of keeping National Forest timber revenue flowing through the local economy is an important aspect of forest management and an economic analysis was completed to weigh the benefit/cost ratio and the present net value of all activities in each alternative (Economic Analysis: Project File). Based on this information, the ID team determined that this issue would not be carried forward into detailed analysis.

Impacts to soils
Protecting soil productivity was a key consideration in the formulation of the proposed action and design features of this project and the interdisciplinary team determined that a soils analysis was necessary. The Forest Soil Scientist examined the area and completed the analysis. The resulting analysis identified no severely erosive soils, and found that management activities would be well within the Forest Plan Standards for soil disturbance (Project file: Soil Resource Report for the Existing Conditions and the Estimated Effects for this Proposed Project). As a result, the ID team determined that this issue would not be carried forward into detailed analysis.

Chapter 2: Alternatives

- **2.1 Introduction**
- **2.2 Alternatives Eliminated from Detailed Analysis**
- **2.3 Alternatives Considered in Detail**
- **2.4 Alternative Formulation**
- **2.5 Mitigation Measures**
- **2.6 Monitoring**

2.1 Introduction

This chapter describes the alternatives eliminated from detailed analysis and the alternatives considered in detail. Alternatives were designed with an interdisciplinary approach considering:

1. the size and scope of the project,
2. the purpose and need,
3. the significant issues,
4. the expected environmental impacts.

The alternatives include design features and monitoring requirements. This chapter also provides a brief comparison of the alternatives. This information, along with the disclosure of projected environmental consequences in Chapter Three and in other included analysis found in the project file, provides the decision-maker with the information necessary to make a reasoned choice between the alternatives.

2.1.1 Past Actions Relevant to Current Resource Conditions

Vegetation in the project area has been modified over the years preceding this analysis primarily from extensive timber harvests around the turn of the century (1890-1910). Later, some harvesting was associated with the decline of the American chestnut. The Forest Service conducted some timber sales in the area during the 1980's and early 1990's. Timber stand improvement was implemented on these younger stands in 2004 and 2005.

2.1.2 Present Actions of Relevance

Habitat management in the project area has occurred in limited amounts in the past. Underwater habitat has been manipulated by drawing down the lake and cutting snags that were left standing when the lake was created. Prescribed burning has been on the increase in the area for the past ten years. Extensive timber harvesting and coal mining has occurred in recent years on private land adjacent to the project area. No other known or foreseeable actions are planned or have taken place in or adjacent to the analysis area.

Several yards on private property immediately adjacent to the project area are planted grass. The District Biologists determined these areas do not meet forested early successional habitat conditions and will not be used for ESH acreage. Wildfire in the area has been suppressed quickly due to the proximity of homes near the project area. Recreation in the area includes boating, fishing, hunting, and hiking.

2.1.3 Silvicultural Prescriptions

This section describes each treatment type, including treatment objectives and a description of each stand post-treatment. Trees would be removed through commercial timber sales under the silvicultural systems described below.

a. Coppice with Reserves – This is a regeneration treatment. The purpose of this treatment is to provide early successional habitat for a variety of wildlife and plant species including: deer, ruffed grouse, and various songbirds. It provides a distribution of wildlife and plant habitat diversity across

the landscape and raw wood materials to the local market. It also promotes hardwood regeneration while maintaining an overstory hard mast component.

A residual BA of approximately 15-25 sq.ft./acre of mostly oaks and other hard mast species would remain, including wildlife reserve trees. This would average about 10-40 trees/acre in about the 10 – 25" diameter at DBH range. Non-commercial trees less than 6" DBH would be cut during post harvest treatments as needed to meet regeneration objectives. This post-harvest action is referred to as site preparation and the effects are considered a part of the regeneration harvest.

b. Standard Shelterwood – This is a two stage regeneration treatment. The purpose of this treatment is to provide early successional habitat for a variety of wildlife species, including deer, ruffed grouse and various songbirds. This treatment reduces the sunlight reaching the ground, which also can reduce the vigor and number of intolerant regeneration, such as yellow poplar and red maple. These treatments also reduce the impact of harvesting activities on the visual resource.

A residual BA of approximately 30 – 50 ft^2/acre of a diversity of hard mast, soft mast, and wildlife reserve trees would remain. An average of approximately 25 to 60 trees/acre with a DBH range of 12 to 24 inches is desired. Non-commercial trees less than 6" DBH would be cut during post harvest treatments. Site preparation effects are considered a part of the regeneration harvest.

c. Free Thinning – This is a cultural treatment designed reduce stand density of trees primarily to improve growth, enhance forest health, control species composition, and recover potential mortality. The stand is marked to leave an average residual BA of approximately 60-80 sq.ft./acre of dominant and codominant trees. The leave trees would be chosen to control stand spacing and to favor desirable trees, using a combination of thinning criteria without regard to crown position. Non-commercial and less desirable vegetation in the understory would be reduced through the use of chainsaws and prescribed fire after harvesting is complete. The post-action use of chainsaws to control less desirable non-commercial stocking will improve understory shrub, brush and herbaceous component, and the effects are considered a part of the thinning treatment.

d. Prescribed Burning – To deliberately burn wildland fuels in either their natural or their modified state and under specified environmental conditions, which allows the fire to be confined to a predetermined area and produces the fireline intensity and rate of spread required to attain planned resource management objectives.

In this case the management objectives for prescribed burning include: the reduction of fuels, control of thin barked species such as red maple, and the enhancement of herbaceous growth in the understory. This would improve species composition, promote the development of oak in the understory, and improve the shrub, brush and herbaceous component. Restoring the historical presence of fire in the ecosystem, under a controlled environment, is a management objective for the Wells Branch project area.

2.2 Alternatives Eliminated from Detailed Analysis

The following is a summary of alternatives considered by the ID team, but eliminated from detailed analysis and the rationale for dismissal.

Cut and Leave

This alternative would meet the purpose and need for the project area by creating ESH without entering stands with machinery. All trees would be cut by chainsaw to create similar browse habitat without removing any of the timber that was cut. Estimated direct costs/acre:

Regeneration

- $2.25/tree * 150 trees/ac = **$337.50**/ac. $337.50/ac * 308 regeneration ac = **$103,950** for project.

Intermediate Treatments

- $2.25/tree * 40 trees/ac = $**90.00**/ac. $90.00/ac * 173 thin ac = **$15,570** for project.

Total project cost = $ 119,520

This project would require appropriated funds to complete, which is not likely to happen. Also, the habitat conditions created by cut and leave would have limited wildlife value due to large amounts of woody debris remaining post treatment. The dense downed timber would represent a fire hazard by drastically increasing project area fuel loading. While the direct impacts to soil resources might be decreased, the risk of catastrophic fire in these areas greatly increases. Catastrophic fire increases the risk of severe damage to soil resources. Therefore, this alternative was dropped from detailed analysis.

All Thinning and/or Uneven-aged Mgmt

An uneven-aged management, individual tree selection, and/or thinning alternatives were considered by the ID Team. The Forest Plan provides guidance for ESH requirements within the project area on page 3-115. To manage the project area with only thinning or individual tree selection would not create the ESH standards set forth in the Forest Plan (8A1 – 013). Uneven-aged management is also implemented using group selection harvests. The Forest Plan has established standards for uneven aged management, which include a contiguous block of 100 acres with < 30% slope (FW-119, pg 2-34). There are no blocks of land within the proposed project area that meet this criteria, therefore uneven-aged management was dropped from detailed analysis.

A long rotation alternative (200-300 + yrs) was also considered by the ID team. The Forest Plan provides guidance on rotation ages (3-115), and in the general age-class structure (8A1 OBJ1, OBJ2, 3-118), which includes the provisions for regeneration prior to rotation age to 'meet long-term desired condition of a particular management prescription' (Forest Plan, FW-113 pg 2-33). Many Appalachian hardwood (cove and upland oak types) species show signs of reduced vigor by age 100 with increasing mortality between 100 and 200 years. To manage most stands for greater than 200 years would drastically reduce the economic feasibility of harvest and vegetative ability to regenerate hard mast species (red and white oaks and hickories). As a result, the DFC of the project area would not be met on an extended rotation. Therefore, an all thinning and/or uneven-aged management alternatives were dropped from detailed analysis.

Clearcutting

An all clearcutting alternative was considered by the interdisciplinary team. An alternative that would involve clearcutting was considered, but eliminated from detailed study because of the current effort to reduce clearcutting acres. A commitment was made in the Revised Jefferson Land Resource Management Plan to reduce clearcutting as a result of social considerations. Scientifically, it has been determined that clearcutting does not result in noticeably improved regeneration (number of stems per acre and species composition) as compared to the seedtree and shelterwood harvests. Therefore, clearcutting was eliminated from detailed study since the DFC for regenerating the area can be met with a modified shelterwood while meeting our commitment to reduce clearcutting.

Ecosystem restoration

An ecological restoration alternative was not considered in detail for two reasons. First, ecological restoration has not been defined as it relates to this particular project area. It could mean restoration of American Chestnut, or the restoration of yellow pine, or even watershed restoration. While these are not mutually exclusive, it is open to broad interpretation and without more specific context, can not be reasonably considered. Second, based on previous comments, ecological restoration implies no

harvesting. No early successional habitat would be created, therefore the purpose and need would not be met for the project area nor would the project area move toward the DFC for management prescription 8A1, which calls for a mixture of successtional habitats. For these reasons, an ecological restoration alternative was dropped from detailed analysis.

All Horse Logging

An alternative that would utilize horse logging was suggested and considered by the IDT. An overwhelming majority of the area is too steep for animal logging. Most horse logging is completed in areas where slopes are less than 20% and skids are less than 400 feet. There is only a small portion of the project area that would meet this requirement. If we examined just those areas that could be animal logged, the resulting project would not meet the purpose and need for the project. Therefore, this alternative was dropped from detailed study.

2.3 Alternatives considered in detail

The interdisciplinary team analyzed two alternatives for this project area: the no action alternative and the proposed action hereafter referred to as alternatives 1 and 2 respectively. Table 3 provides an overview of the different alternatives.

2.3.1 Alternative Formulation – The alternatives listed below were all carefully considered by the ID team during the analysis.

Table 2. Comparison of all actions by alternatives, including acreage treated, and miles managed

	No Action	Alt. 2
STAND TREATMENTS (acres)		
Approximate Acreage treated	0	3000
Regeneration	0	285
Thinning	0	176
Prescribed Burning	0	2900
Wildlife Opening Created	0	10
Herbicide Site Preparation	0	50
Spot Treatment of Noxious weeds	0	10
ROADS (miles)		
Road Construction	0	1.1
Pre-haul maintenance	0	5.0
Temporary Roads	0	1.2

2.3.2 No Action Alternative - This alternative (no new management activities initiated) is required by the Council on Environmental Quality {40 CFR 1502.12(d) and provides a baseline analysis for comparison with the effects of the other alternatives. This provides the Deciding Official with a clearer basis for a reasoned choice among the alternatives studied in detail. If project area was unmanaged for the next 50 years, the forest would grow into a large block of mature timber, providing habitat for mostly late successional species, but would not provide ESH that is necessary for early and mid successional plants and animals. Furthermore, forest health would likely decline. This is a result of overstocking, in which tree vigor would be reduced, and thereby, increasing susceptibility to insects or diseases. This alternative responds to issue 1, 2, 3, and 4.

If the no action alternative were selected, the project area would not meet the Forest Plan standards for this management prescription in regards to ESH.

2.3.3 Alternative 2 (proposed action alternative) - This alternative was outlined in the scoping notice sent out to the public. The proposed alternative includes about **285 acres of Standard Shelterwood and Coppice w/ Reserves harvest** in twelve blocks ranging from 10 to 40 acres, approximately **176 acres of free thinning**, approximately **2900 acres of prescribed burning**, and approximately **1.1 miles of system road construction.** FSR 2880 and FSR 2090 access the rest of the project area and would receive pre-haul maintenance. Approximately **1.2 miles of temporary road** is proposed to reach landing locations. **Post harvest treatments** proposed include: discing and seeding approximately 20.0 ac of linear wildlife strip and openings, performing a mechanical (chainsaw) site preparation cultural activity in areas proposed for stand improvement harvest, planting of pine and hard mast species on approximately 100 acres.

This action responds to all issues. Issue 1: By following Forest Plan standards and VA BMP's, sediment produced from harvest activities is minimal. Sediment produced from illegal ATV trails will be reduced by placing slash on all skid trails and other potential ATV routes. Issue 2: By using the design features stated in section 2.4 of this EA and the Scenic Integrity Objectives (SIO) standards found in the forest plan, visual quality standards will be met. Issue 3: An effects determination is made in the BE to have no effect by following mitigations found in section 2.4 of this EA. Issue 4: By increasing vertical and horizontal structural diversity wildlife habitat diversity for a variety of species is increased.

PROJECTS ASSOCIATED WITH ALTERNATIVE 2 (proposed action)

1. Approximately 285 ac of regeneration harvest; 200 acres coppice w/ reserves, 85 acres standard shelterwood. 285 acres of natural regeneration w/ chainsaw site prep. Free Thinning; approximately 176 acres w/ Post Harvest Mechanical Stand Improvement.
2. Approximately 1.1 miles of system road construction.
3. Pre-haul maintenance on approximately 5.0 miles of FSR 2880 and 2090.
4. When practicable, utilize landings, temporary roads, and skid trails as wildlife openings/strips. Seeding will occur upon completion of use.
5. Approximately 2900 acres of prescribed burning in project area.
6. Herbicide site preparation where necessary (around 50 acres) and spot herbicide treatment of noxious weeds (about 10 acres)
7. Incorporate all design features and mitigation measures listed in section 2.4.

Table 3: Treatment acreages by purpose and alternative

Purpose #1: To create early successional habitat for associated species	No Action	Alt. 2
Contiguous 8A1 Management Prescription Area		
Existing ESH (Pre-Harvest)	1% (32 ac)	1% (32 ac)
Existing ESH (6-yrs Post-Harvest)	0	10% (324 ac)
Permanent Wildlife Openings (Created)	0	12 ac
Project Area		
Existing ESH (Pre-Harvest)	1% (32 acres)	1% (0 acres)
Early Successional Habitat (6-yrs Post-Harvest)	1% (0 acres)	8% (324 ac)
Permanent Wildlife Openings (Created)	0	12 ac
Purpose #2: To manipulate stand structure and density		
Overstocked Stands (acres)	2000	1539
Acreage Treated		
Thinning (acres)	0	176

Regeneration (acres)	0	285
Prescribed Burning (acres)	0	2900
Total Acreage Treated	0	2988
*Note: All treatments utilized will create change in stand structure and/or density.		

2.4 Mitigation Measures
(Applicable to All Action Alternatives)

1. Stream crossings will be stabilized before road construction proceeds beyond the stream (VA state BMP's and RLRMP, 2-7, FW-1).
2. Timber, wildlife, and soils specialists will develop seed mixtures for soil stabilization
3. Irregular harvest area boundaries on regeneration units to maximize edge and reduce the visual impact (RLRMP, 2-48, FW-186).
4. Slash will be placed in skid trails and existing ATV trails to discourage illegal ATV use.
5. Favor the retention of large (> 20" DBH.) standing snags and den trees when implementing silvicultural treatments (RLRMP, 3-114, 8A1 – 003)
6. Retain a diversity of hard and soft mast species to minimize yearly fluctuations in hard and soft mast production (RLRMP, 8A1 – 006, 3-115)
7. Roads will be used as unit boundaries where feasible (only corners will be painted where the road is the line).
8. Projects are designed to avoid, minimize, or mitigate negative effects on potentially significant heritage resources. Identified special archeological features will be protected under the timber sale contract (RLRMP, 2-50, FW-204).
9. Day lighting of all Forest Service system roads and temporary haul roads by removing overstory trees and brush adjacent to the road bed.
10. To ensure public safety, existing closed system roads will remain closed to the public during harvesting activities.
11. Removal of known Indiana Bat roost trees shall be avoided. If a roost tree needs to be cut for any reason, an informal consultation with the U.S. Fish and Wildlife Service (FWS) shall occur prior to removal (if possible). If a tree is identified as an immediate threat to public or personnel safety, it can be removed at any time, but preferably not before notification of an FS biologist and the FWS. If a tree must be removed prior to notification, FWS shall be notified as soon as possible. The removal would occur when the bats are in hibernacula (November 15 through March 15).
12. To reduce the potential for sedimentation from harvest activities and associated projects, riparian buffers are designed to meet and/or exceed all VA State BMP's and Forest Plan Standards.
13. Any slash that falls in a stream or onto private property shall be removed as soon as practicable.
14. Wildlife Trees will be white banded and protected under the sale contract.
15. A minimum average of 6 trees per acre $\geq$ 9" DBH shall be retained in all regeneration harvest areas to provide Indiana Bat summer roost habitat.
16. All shagbark hickories shall be retained in harvest units unless they pose a safety hazard. Any shagbark hickory felled for safety reasons will be tracked by the Timber Sale Administration team in inspection reports.
17. All skid roads/trails, temporary roads, and stream crossings are designated and approved by the Forest Service. All stream crossings will be as close to right angles as possible, and will meet Forest Service standards

2.5 Monitoring Items

Monitoring is an important part of the environmental assessment process to assure that actions proposed by the selected alternative are carried out as planned and that the results are as predicted. In addition to

general Forest Plan monitoring, the following project specific monitoring would occur with implementation of each action alternative as noted.

1. Timber sale layout would be monitored to insure that Forest Plan standards and guidelines, Virginia BMP's, the Indiana Bat Recovery Strategy and project-specific mitigation measures are carried out. Examples of items to be verified are execution of stream and seep/spring buffers, snag guides, and road closures.
2. Once awarded, Contracting Officers and their representatives would monitor the timber sale or service contract(s) to assure contract compliance and to assure that design features are being carried out and that they are effective.
3. Regeneration quantity and quality will be monitored to ensure that adequate stocking of desirable species occurs within five years of the execution of the timber sale contract.
4. The wildlife clearing and strips would be monitored to ensure they are providing the desired habitat for wildlife.
5. Post sale monitoring by the forest management staff to review effectiveness of layout, marking, sale administration etc . . . in meeting the objectives of the silvicultural prescriptions will occur within two years of sale closure.

Chapter 3: Affected Environment and Environmental Consequences

This chapter describes the Wells Branch Project Area affected environment as well as the direct, indirect, and cumulative effects of carrying out the proposed or alternative actions. These effects can be either adverse or beneficial. The area of potential effects varies by resource, but it can generally be considered to incorporate the 710 acres in compartment 2094, 1030 acres in compartment 2090, and 1120 acres in compartment 2088, 610 acres in 2089 and 250 acres in2082 (approximately 3720 acres) unless otherwise specified.

The effects analysis for each resource follows a specific format. The format is as follows:

1. Summary of the past, present, and reasonably foreseeable future activities that occur in or have an influence on project area resources.
2. Issues related to a given resource are then presented, followed by the scope of the analysis.
3. The existing resource condition of the affected environment and a discussion of the desired resource condition follow.
4. A discussion of the direct, indirect, and cumulative environmental effects of the specific actions of alternatives will be presented as they relate to the issues identified during scoping.

3.1 Cumulative Activities Summary

The following discussion provides a summary of the known past, present and reasonably foreseeable future activities in the Wells Branch Project Area. This discussion focuses mainly on activities on National Forest lands, but also includes information on private land.

3.1.1 Historic National Forest Management Following Federal Purchase

The land in and around the project area was purchased from several landowners in 1936 and in 1950. At the time of purchase, most lands in the area had been cut-over and contained mainly seedlings/saplings/and some small sawtimber. All low and high quality sawtimber had been removed in previous years. Since most stands were 0-30 years old at the time of purchase it makes sense that today most of the stands are 70 - 100 years old.

3.1.2 National Forest Management 1970 to Present and Future The project area remained relatively untouched from the time of purchase until the 1970's. Lake Keokee was constructed in the mid 1970's and opened to the public in 1977. Fire suppression has been a perennial management activity. In the 1980's existing roads were maintained and improved and some timber harvesting began to take place.

Harvesting was completed with ground-based (tractor or rubber-tired skidders). Since 1970, regeneration harvest has occurred on approximately 300 acres within the project area. Table 5 displays past timber harvest activities in the Wells Branch Project area.

When timber harvest occurred around the turn of the century, roads were constructed to remove the products harvested. Many of these roads were located in the drains and are no longer used. Since the 1970's, when the Forest Service began implementing significant management activities in this project area, approximately 6 miles of roads have been constructed. These roads are gated year-round.

Several small wildfires have burned in the project area over the last 20 to 30 years. The District has also implemented two prescribed burns on approximately 1155 acres of the project area. These areas have now been burned twice (in the past 6 years) and are exhibiting positive effects. An additional burn of 36

acres has been implemented around the dam on Lake Keokee. Within areas planned for harvest, the fire generally had flame lengths less than an average of 4 feet, or a cool burn.

Table 4: Approximate Past Timber Harvest acreage in the Wells Branch Project Area

Period	Acres	Yarding Method / Harvest Type
1870 – 1920	4000	Ground / Regeneration
1920 – 1975	200-400	Ground Based Thinning And Regeneration
1975 – 1995	300	Regeneration (Ground based) And Ground Based Thinning
1996 – present	0	N/A

Lands/Special Uses/Mineral Rights

There are currently no active gas wells in the project area. All minerals in the area are outstanding or reserved. There is no current activity for mineral access. The dam on Lake Keokee is operated by the Virginia Department of Game and Inland Fisheries (VDGIF) under permit.

Recreation Activities

Hunting, Fishing, and Day Hiking are the most popular recreation activities in the project area. Other forms of dispersed recreation such as backpacking, horseback riding, and bird watching also occur to a lesser extent. All terrain vehicles (ATV) have been a popular prohibited activity in the area. There is a developed recreation area (Keokee boat ramp and picnic area) and developed trails. The Stone Mountain Trail, Keokee loop trail, and the connector trail between the two all lay within or partially within the Wells Branch Project Area. Other than the lake there are no other fishable waters on public land in the project area.

Private Lands

The Wells Branch project area is in the headwaters of the Laurel Fork drainage, which is a tributary to the Powell River. A small private parcel is located just west of the dam on Lake Keokee and adjacent to proposed timber sale units. This private parcel contains a mix of old fields, an old coal? mine, and woodland. The other private land adjacent to the project area is generally cleared fields or overgrown fields of varying ages less than 30 years. The houses in the community of Keokee have yards and are generally surrounded by fields, old fields, and woodlands. Much of the rest of the surrounding area is owned by the railroad or coal companies and has been cutover and/or mined for coal.

Future Actions

Maintenance of existing State roads is likely to continue as well as the maintenance of newly created wildlife openings and fire suppression. Coal mining is also likely to continue. Other than these activities, no new activities are planned in the project area foreseeable future.

3.2 Ecological Components

Both physical and biological components enable a diverse ecological community of plants and animals to exist in this area. A basic ecological principle related to ecosystem management is to “care for the land” by protecting or restoring the integrity of its air, soil, water, biological diversity and ecological processes. The components discussed in this section relate primarily to those physical and biological entities that make up the area ecology.

3.2.1 Hydrology

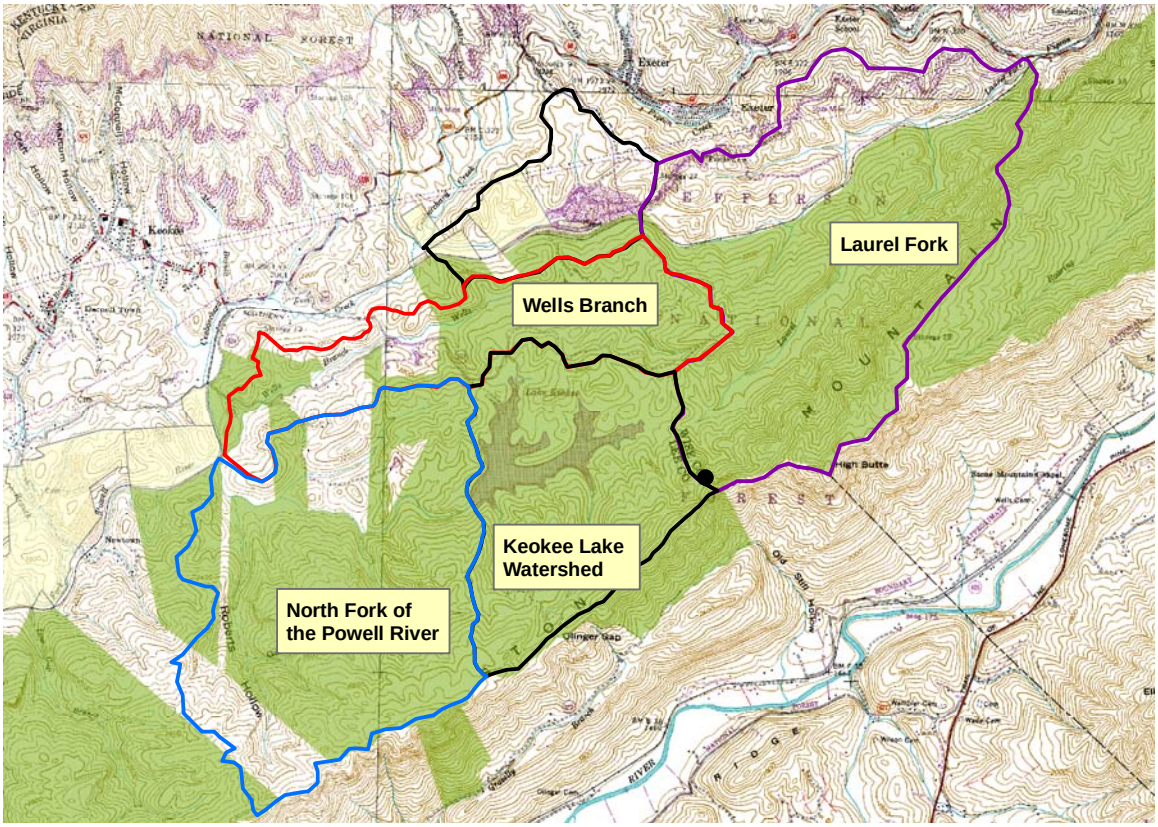
Significant Issue(s) Related to this Resource:

1. Effects of Harvesting, Roadwork, and Associated Projects on Water Quality and Riparian Areas.
2. Effects of Harvesting, Roadwork, and Associated Projects on TES habitat.

Scope of the Analysis:

For Alternative 1, the scope of the analysis for determining the effects on hydrologic resources includes the following watersheds in the North Fork of the Powell River: Wells Branch, a tributary of Craborchard Creek, and the North Fork of the Powell River above its confluence with Craborchard Creek. The remaining watershed is Laurel Fork; which is in the South Fork of the Powell River watershed.

Figure 2. Project Area Watersheds



Existing Condition:

Wells Branch, Craborchard Creek, and the headwaters of the North Fork of the Powell River are subwatersheds of the Reeds Creek [6th level hydrologic unit code (HUC) 060102060202]; a subwatershed of the North Fork of the Powell River. Laurel Fork is a subwatershed of Pigeon Creek (6th level HUC 060102060104); a subwatershed of the South Fork of the Powell River. The watershed area and annual background sediment production of these watersheds is given in Table 5. Annual precipitation over the project area averages 50 to 54 inches. The majority of the watersheds are in forested land cover; the exception being Craborchard Creek. The private portion of Craborchard Creek was clearcut

approximately 8 years ago and is currently in an early successional growth stage with numerous unvegetated roads and log landings spread throughout the watershed.

Table 5. Watershed Area and Annual Background Sediment for the Project Area Watersheds

Watershed	Watershed Area (acres)	Annual Background Sediment (tons)
Craborchard Creek	1251	197.7
Wells Branch	830	61.4
Roberts Hollow	2286	361.2
Laurel Fork	1635	258.3

Past and present actions that have affected the existing situation in the Back Valley Cumulative Effects Analysis Area -

Past – Timber harvest has occurred several different times in the past in the project area. All BMP's were followed during the recent harvests of these stands. Sedimentation from past timber harvest on public lands would have returned to near background levels after approximately 4 years. The exceptions to this are the areas that are experiencing illegal ATV traffic. Illegal ATV traffic is the past and present activity causing the majority of the sedimentation occurring in the Project Area. Impacts from illegal ATV traffic are discussed in the cumulative effects discussion below.

The general watershed condition of Craborchard Creek on private lands would be considered "Fair," largely due to the amount of logging infrastructure in the watershed that did not properly revegetate after the commercial timber harvest. On public lands, the watershed condition is good, the only impacts being those from the illegal ATV use.

The general watershed condition of Laurel Fork on private lands would be considered "Fair," largely due to the amount of logging infrastructure in the watershed that did not properly revegetate after the commercial timber harvest. A deep coal mine (subsurface mining) is also in the watershed. On public lands, the watershed condition is in excellent condition.

The watershed conditions of all the other project area streams are good, the only impacts being those from illegal ATV use.

Effects from Past and Present Illegal ATV Use

Parts of the project area have been heavily utilized by illegal ATV riders over the past several years. Multiple attempts by Forest Service law enforcement officers to curtail this activity have been ineffective. These groups have even blazed their own trails and built cabins on public land in the area. Because of this use, system roads, system trails, and old state roads are being ridden in the project area and are causing sediment impacts to streams in the area. Sediment analysis was conducted to capture the impact of these illegal activities to accurately characterize the existing condition of the watersheds. Documentation of the method used to estimate the sediment produced by these illegal activities is provided below in the "Direct, Indirect, and Cumulative Effects" section below. Table 6 illustrates the sedimentation by watershed as a result of these illegal activities.

Table 6. Sediment Produced by Illegal ATV Traffic in the Project Area.

Stream	Total Sediment	Normal Background	% of Normal

	Produced from ATV's	Sediment	Background
North Fork of the Powell	4.03	361.19	1.11
Keokee Lake	3.58	61.42	5.83
Wells Branch	3.61	49.06	7.35
Craborchard Creek Tributary	0.02	197.66	0.01
Laurel Fork	0.2	258.33	0.08

Future Foreseeable Actions

No known activities are planned on private property in the project area and no activities are anticipated on public lands that should affect potential for sedimentation other than those outlined in this EA.

STREAM CHEMISTRY AND HEALTH

Powell River

The Powell River at its confluence with Pigeon Creek is identified in the Forest Plan as a Priority Watershed, having a below-average Watershed Condition Ranking (WCR) (Forest Plan 2-3). The following discussion from the Final Environmental Impact Statement (FEIS) of the Forest Plan (FEIS 3-36) explains the assignment of a WCR of "below average" as follows:

> *The watershed includes stream reaches that have been identified as impaired and are included on Virginia's 303d list, and the Clinch and Powell Valley Watershed Ecological Risk Assessment (US EPA, 2002) identifies sediment as a stressor affecting native mussels and native fish in this watershed. Based on the weight of evidence, the Powell River watershed has been assigned a modified WCR of "below average" (BA).*

As sediment has been identified as the main stressor (most likely due to surface mining, which is prevalent in the watershed at and above Appalachia) effects to the WCR status of the South Fork of the Powell River will be discussed in the "Cumulative Effects" section below.

Water Quality

Water samples have been taken annually on an in intermittent basis in the project area. All streams exhibit good water quality.

Table 7. Stream Chemistry Data for the Project Area Streams

Stream	Sample Year	pH	ANC	Na	K	Mg	Ca	Cl	NO3	SO4	Al	Ca/H
Wells Branch	2007	5.77	11.34	0.4	0.5	0.7	0.8	0.4	0.0		3.8	11.3
	2006	8.73	11384.3	11.5	84.3	513.8	930.0	1342.0	23.9	3031.0	36	499440
	2005	6.16	44.0	17.8	14	52.1	44.2	13.0	2	77.9	13	30.6
	2004	6.07	19.7	11.6	19.4	53.5	38.9	12.7	1.4	84.8	0	33.1
	2003	5.97	11.0	17.2	10.1	56.9	54.1	12.6	2.3	96.5	0.0	50.5
	2002	6.58	31.9	15.3	12.6	49.9	54.2	14.7	2.5	72.8	ND	206.1
	2001	6.25	48.8	22.4	10.7	58.4	52.7	15.4	4.7	72.7	11	93.7
Laurel Fork	2007	6.5	48.0	1.4	0.8	2.0	3.1	0.7	0.2		14.9	48.0
	2005	6.2	15.9	19.7	12.4	50.8	28.7	13.7	0.8	77.8	0.0	20.3
	2004	6.2	15.5	12.2	21.3	53.7	30.2	12.2	0.3	81.3	0.0	19.1
	2003	6.0	10.2	20.7	11.1	52.8	28.6	14.0	2.2	84.7	0.0	29.3
	2002	6.1	10.2	16.3	11.5	51.4	34.4	15.5	1.6	81.9	12.0	46.4
	2001	6.3	39.4	27.7	9.4	52.4	35.0	16.1	2.3	71.2	17.0	63.7
North Fork of the Powell	2005	6.32	31.8	15.7	17.1	48.2	59.3	14.3	1.4	69.3	82	28.4
	2004	6.80	222.1	10.6	12.8	92.7	22.5	10	4.7	123.4	0	3.56
	2003	6.61	179.1	13.7	11.3	95.8	167	13	3.4	152.9	0	680.3
	2002	6.86	56.0	14.2	18.5	47.1	79.3	13.5	1.7	58.6	ND	574.5
	2001	6.42	76.7	20.9	13.9	48.6	58.9	14.3	3.1	63.1	9	154.9
Unnamed Trib of Roberts Hollow	2005	5.86	8.6	13.7	8.9	46	33.6	11.2	2.5	74.2	11	46.38
	2004	5.87	13.5	14.2	11.4	46	30.3	13.3	1.2	74.4	0	40.87
	2003	5.55	1.2	12.8	10	45	38.1	12.1	3.9	84.7	10.56	13.52
	2002	6.17	8.2	14	11.9	48.2	48.8	13.8	3.3	75.1	18	72.18

2001	6.11	15.6	16.2	7.7	46.2	31.8	14.5	4.2	65.5	10	40.97

The results from the water quality monitoring are typical of the majority of the Clinch Ranger District streams, with lower pH and buffering capacities due to the carbonate-poor nature of the geology underbedding the area.

Stream Habitat

Craborchard Creek Tributary

Craborchard Creek does not exist as a surface feature on National Forest lands. A portion of the project area drains into the stream; which flows west toward a confluence with Wells Branch. On the private portion of the watershed, stream segments on the higher gradient slopes exhibit streambeds embedded with sand and silt due to the disturbance history of the watershed; which includes strip mining and large-scale industrial clearcutting. As the stream flows west and the gradient decreases, the channel is dominated by a complex of beaver meadows.

Wells Branch

Wells Branch was surveyed in 1999. The stream was sampled for approximately a mile and a half, with habitat consisting of 42% riffle, 27% pool, and 30% glide. The dominant substrate (90%) was sand/silt with gravel as the secondary substrate (10%). Embeddedness was high throughout the reach, but this is to be expected with the low gradients (1-2%) through most of the surveyed area, which limit the transport of fine sediments. Sand is a natural component in streams in this area; due to the sandstone that underbeds the streams and the low gradients of the stream channels.

Today, the stream is much the same, with a flat, sandy channel. The main difference is that beavers have constructed dams across the lower parts of the drainage, forming meadows in the western portions of the project area. As time progresses, beavers should continue to recolonize all the low gradient portions of the drainage, forming extensive meadows that were most likely the norm for this stream before beavers were extirpated.

Laurel Fork

The portion of Laurel Fork that occurs on the National Forest was also surveyed in 1999. The stream was sampled for approximately 2.3 miles on the National Forest with habitat consisting of 55% riffle, 18% pool, and 28% glide. The dominant substrate was sand/silt (80%) with gravel (12%), cobble (5%), and bedrock (2%) forming the remainder. Finer substrates and glides were more prevalent in the upper reaches of the stream where gradients were lower, while riffles and pools were more prevalent in the higher gradient reaches in the eastern part of the project area.

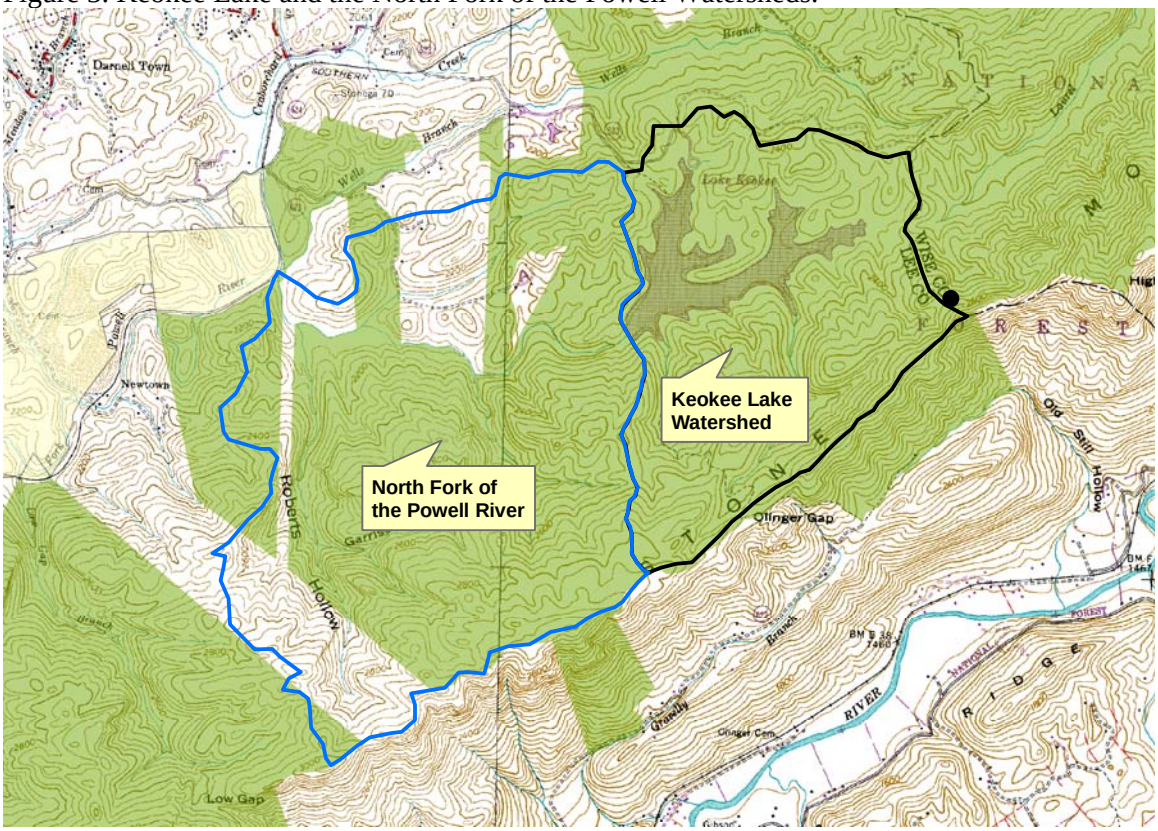
Today the stream is essentially unchanged on the National Forest. There is a possibility that beavers will recolonize parts of the stream in the project area, due to the low gradients and the presence of beavers downstream on private property; but as of the writing of this EA, there was no beaver activity on the National Forest. Overall, the stream habitat is healthy with no impaired reaches.

Low gradient reaches of the stream on private property are impounded by beavers with meadows in various stages of evolution. The higher gradient reaches are similar to the riffle/pool reaches on the National Forest, but with a higher prevalence of fine sediments due to the mining and commercial clearcutting that has occurred in the watershed.

North Fork of the Powell

For purposes of this analysis, the North Fork of the Powell (which includes Keokee Lake) will be divided for individual discussion and then combined for the final determination of effects. The discussion will be divided as: Keokee Lake and the tributaries that drain into it, and then the North Fork of the Powell as the drainage area below the lake (see Figure 3 below.

Figure 3. Keokee Lake and the North Fork of the Powell Watersheds.

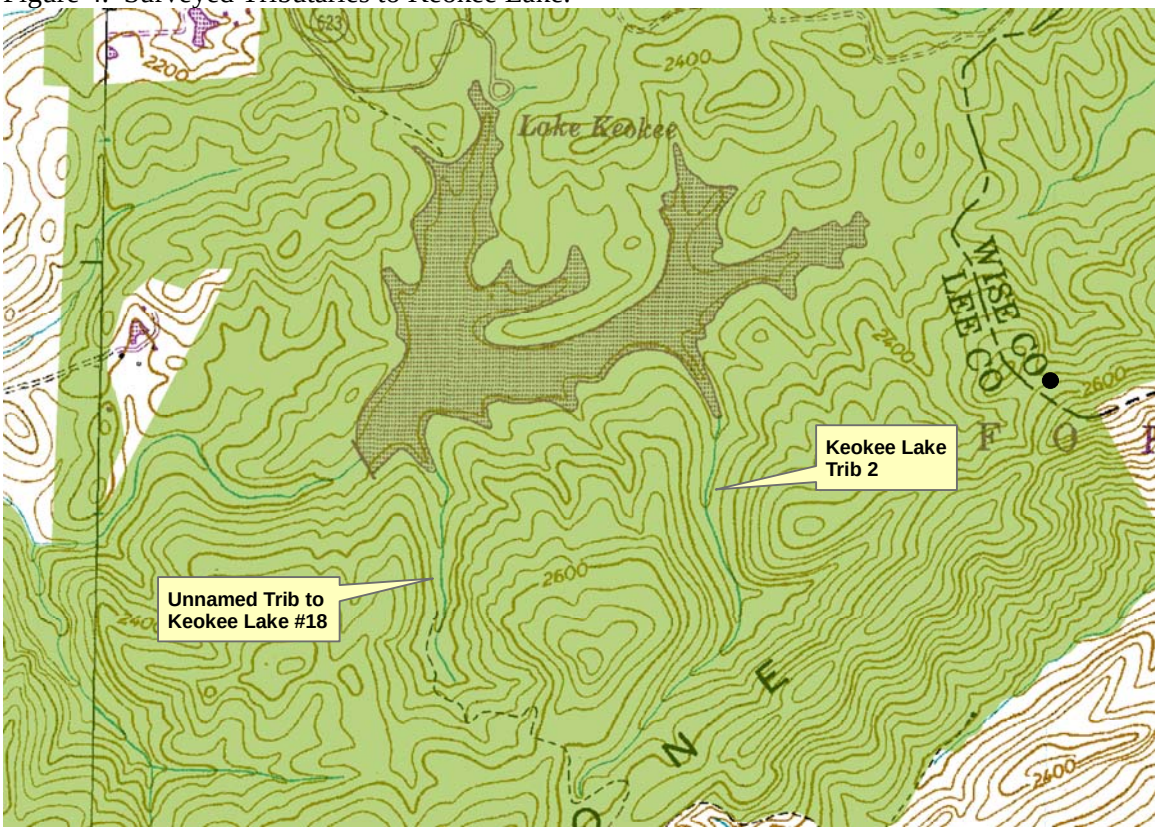


Keokee Lake

Two tributaries of Keokee Lake were surveyed in 1998 and 1999: one named Keokee Lake Tributary 2 surveyed and one named unnamed tributary to Keokee Lake #18 surveyed (see figure below).

During those summers, both streams were dry with channels dominated by sand. At base flow, both streams are watered for a significant portion of their reaches. Keokee Trib 18 now has a beaver meadow at about 2400 feet elevation. Both streams have sand beds with gravel, cobble, and some bedrock intermixed. All the drainages that empty into Keokee Lake have slack, low gradient channels primarily bedded with sand. This is a natural state for very flat streams in areas with sandstone geology.

Figure 4. Surveyed Tributaries to Keokee Lake.



The North Fork of the Powell River

A short section of the North Fork of the Powell was surveyed in August of 1998. Approximately 0.4 miles were surveyed (of which 75% was watered) in the area immediately downstream of Keokee Lake on the National Forest. The habitat consisted of 55% riffle, 23% dry channel, and 23% glide. The dominant substrate was cobble (43%) with sand (29%), small boulder (14%), and bedrock (14%) forming the remainder. The substrate in this reach is considerably coarser when compared with upstream reaches and comparable reaches in adjacent watersheds, due to retention of sediment in Keokee Lake.

The lower reaches of the river, near its confluence with Craborchard Creek are more typical of the streams in the area. The channels are very low gradient, with primarily a sand substrate. The lower half mile of the stream is a complex of beaver dams, with unimpounded areas consisting of slack channels that are downcutting through relic beaver meadows.

<u>Sedimentation</u>

Virginia State Code 9VAC25-260-20 states that:

> *State waters, including wetlands, shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.*
>
> *Specific substances to be controlled include, but are not limited to: floating debris, oil, scum, and other floating materials; toxic substances (including those which bioaccumulate); substances that produce color, tastes, turbidity, odors, or settle to form sludge deposits; and substances which nourish undesirable or nuisance aquatic plant life.*

Sediment can cause turbidity, and is therefore subject to this standard. In addition, Virginia's antidegradation policy (9VAC25-260-30) applies to this area. That policy says that actions may not interfere with or become injurious to existing beneficial uses unless the State Water Control Board determines that such action is socially or economically justified.

Sediment is also subject to the nonpoint source pollution regulations for Virginia. These regulations require the voluntary application of Best Management Practices (BMP's) to control sedimentation during timber management activities. The Virginia Department of Forestry's handbook of BMP's for forestry (revised 2002) lists the "voluntary" BMP's. Standard 206 of the Forest Plan requires the use of the Virginia BMP's, and the Forest Plan lists specific BMP's to provide additional resource protection. Finally, standards set by the "Federally Listed Endangered and Threatened Mussel and Fish Conservation Plan" developed for the Jefferson National Forest in consultation with the US Fish and Wildlife Service, were incorporated into the Jefferson National Forest Land and Resource Management Plan. These standards provide additional protections to prevent sediment impacts to downstream Threatened and Endangered mussel and fish species.

All Forest Plan standards meet or exceed the Virginia BMP's for forestry activities. The Forest has initiated a monitoring program to evaluate the effectiveness of the standards. The result of this program will be a feedback process to continually adjust standards as needed to improve effectiveness.

The Virginia Department of Forestry conducted water quality monitoring in association with timber harvests from 1989 to 1996 (Va. Dept. of Forestry, 1998). At sites in the mountains, Piedmont, and coastal plain, water temperatures were taken at 10-minute intervals, and water samples were collected automatically before, during, and after storm events, both upstream and downstream from logging. Aquatic macroinvertebrates were also sampled periodically. This monitoring showed that, when forestry BMP's are properly implemented, timber harvests can be accomplished without a large or persistent increase in sediment, an increase in stream water temperatures, or a shift in macroinvertebrate species composition.

Direct and Indirect Effects:

Sedimentation

Some sediment occurs naturally in all stream systems and is part of the natural geologic processes. Natural watershed disturbance regimes of fire, flood, insect, and disease result in a range of natural variability of sediment to which the stream channel has adjusted. However, human caused soil disturbing activity such as road construction activities, log landings, skid roads, and skid trails can produce volumes and rates of sediment delivery to streams that are in excess of the stream's ability to accommodate it. Excess sediment in streams can coat the stream bottom, fill pools, and reduce the carrying capacity of the stream for fish and stream insects. Fine sediment can fill the voids between gravel particles in the streambed, reducing the movement of aquatic insects, water and oxygen. The effects of sediment delivered to a stream channel diminish as watershed size increases. Most vulnerable are small sensitive headwaters catchments where concentrated timber harvest activity can have profound results.

In reality, there is a great deal of variability of a watershed's sediment yield between years (interannual variability). Sediment yield is much greater during high runoff years with more stormflow to erode and transport sediment. Conversely, sediment yield is much less during drought years when high flows may be less than bankful. Data from the USGS gage on the Powell River at Speers Ferry provides an expression of the variability of annual sediment yield. For the 62 years with flow and sediment data, each year's percent difference from the long term mean ranges from + 143 percent to – 100 percent. A change of annual sediment yield of plus or minus 52 percent represents one standard deviation from the long term mean, and values less than 52 percent are interpreted as being within the range of interannual variability.

The effect that naturally occurring forest fires or prescribed burns can have on increased sediment production within a watershed depends on burn intensity. Low intensity burns do not scorch the soil organic layers nor do they burn the roots of existing vegetation, which starts to re-grow during the next growing season. No bare mineral soil is exposed as the result of the burn. Research on wildfire and prescribed burning indicates that low intensity or "cool" burns result in only minor increases in erosion and sedimentation. Beschta (1990) observes that

> *Where organic matter comprising the forest floor is only partially consumed by fire, the effects of fire upon surface erosion processes may be minimal…. Relatively "cool" burns should have little impact on erosion and sedimentation, regardless of general watershed slope.*

This observation from Oregon is supported by similar conclusions from Anderson and others (1976), Douglas and Van Lear (1983), Neary and Currier (1982), and Van Lear et al. (1985). Mineral soil will be relatively undisturbed. Accordingly, this activity will have little impact on erosion and sedimentation.

A sediment model was used to estimate the tons of sediment produced by each road, landing, or excavated skid trail, and delivered to respective stream channels. The modeling approach is largely based on the USDA Forest Service "Guide for Predicting Sediment Yield from Forested Watersheds" (1981). This guide tiers to another procedural guide 'An Approach to Water Resources Evaluation of Non-Point Silvicultural Sources' and abbreviated as WRENSS (1980). The procedure assumes a basic road erosion rate as determined from research data from North Carolina and West Virginia (Swift, 1984; Kochenderfer and Helvey, 1984). The research data expresses the tons per acre moved from the road during the first year after construction. This unit rate is multiplied by the disturbed area in acres to obtain unmitigated road erosion in tons. This figure is then adjusted for factors of geology and soils, road gradient, and mitigation to obtain an adjusted value of total road erosion. Total road erosion is then delivered to the stream channels based on aggregated sediment delivery ratios from the WRENSS document. The sediment delivery ratio for each road segment is calculated using factors based on sideslope, soil texture, and distance from the road to the nearest channel or drainway, and also factors of surface roughness, slope position, percent ground cover, and slope shape. These combined factors are translated into a Sediment Delivery Index that represents the portion of eroded material that is actually delivered to a stream. When multiplied by road segment, landing, skid trail, and prescribed burn fire line erosion, it gives an estimate of tons of sediment delivered to the adjacent stream channel at the time of the soil disturbing activity (first year). This sediment increase is compared with existing annual sediment yield from each watershed as determined by data from Patric, Evans, and Helvey (1984) and displayed as a percent increase over existing.

Rates of soil erosion and sedimentation are greatest at the time of soil disturbing activity and decrease as the soil stabilizes and vegetation begins to grow. Second year sediment rates are estimated to be only 35 percent of first year rates. After four years, sediment rates have usually returned to pre-disturbance levels.

Sediment modeling is based on a number of assumptions that may not be accurately reflected on the ground. The results provide very rough approximations of the changes in sediment delivery that might be expected as a result of proposed activities. Nevertheless, they allow a comparison of the impacts of various alternatives and provide a measure of relative risk to the aquatic ecosystem. The model assumes that Forest Plan standards and guidelines as well as Virginia Best Management Practices for Forestry will be implemented. It also assumes that all the proposed management activities will take place in the same year; which will not occur; therefore, actual levels of sediment reaching the receiving streams will likely be lower, but will not be higher. This insures that Critical Habitat downstream in the Powell River will be protected. The model assumes a "normal" runoff and sediment year.

Sediment Effects from the Action Alternative

For Alternative 1, pre-haul maintenance of system roads, landing construction and new temporary and bladed skid road construction could cause sediment effects to the watersheds listed above. Table 8 below displays the results of the sediment model by watershed, both in tons of sediment from the activity and in percent increase over background sediment production from the watersheds.

Table 8. First Year Sediment Production from Soil Disturbing Activities in the Wells Branch Vegetation Management Project

	Tons from Timber Activities	Total	Normal Background Sediment	Percent Increase Over Background
North Fork of the Powell River	5.40	5.40	361.19	1.50
Keokee Lake	5.86	5.86	61.42	9.55
Wells Branch	7.35	7.35	49.06	14.98
Crab Orchard Tributary	1.39	1.39	197.66	0.70
Laurel Fork	4.419	4.42	258.33	1.71

* Includes portion that exits Keokee Lake (see explanation below).

North Fork of the Powell River and Keokee Lake

Keokee Lake

Direct Effects

Sediment modeling predicted that about 9.6 tons of sediment produced by management actions would make its way into Keokee Lake. Once sediment enters a still body of water, such as a lake, the coarse sediments almost immediately drop out and are retained; especially in a lake like Keokee where the water exits the lake through a standpipe. A portion of the fine sediments may stay suspended long enough to exit the reservoir and be transported downstream.

The sediment trapping efficiency of a reservoir can be calculated from the storage capacity and the annual inflow with a method developed by Brune (1953) and refined by Dendy (1974). The storage capacity was calculated by multiplying the surface area of the lake in acres by the mean depth. The numbers supplied by the Virginia Department of Game and Inland Fisheries in their online description of Keokee Lake (92 acres and 17 feet) were used for this calculation (http://www.dgif.virginia.gov/fishing/waterbodies/reports/2010%20Keokee%20Lake%20Bio%20Rpt.pdf). Annual inflow was estimated by back-calculating annual runoff from the stream gage in the North Fork of the Powell River at Jonesville, VA, and then scaling this amount to the drainage area of Keokee Lake. These figures can then be plugged into a formula that generates a trapping efficiency for a given reservoir. In this case, the trap efficiency of Keokee Lake was found to be 97.2%. Therefore, 2.8 % of the predicted sediment total was added to the North Fork of the Powell River total and used to discuss effects to that watershed.

The effects from the remainder can be discussed as a reduction in lake volume. This is a simple calculation based on the data developed for the trap efficiency calculation above. The lake capacity is converted from acre-feet to cubic yards (multiply by 1613.33) and then cubic yards of sediment are calculated (divide tons by 1.35). Then, it is a simple percent calculation, which in this case turns out to be less than 0.0002% - a negligible reduction in lake volume. There will be no direct effect to Keokee Lake from implementing the proposed action.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

North Fork of the Powell River

Direct Effects

As discussed in the habitat description above, the reaches of the North Fork of the Powell River below Keokee Lake are considerably coarser than neighboring drainages. This is likely due to sediment starvation due to capture by Keokee Lake; which has a drainage area of 830 acres (about 36% of the total drainage area of the North Fork of the Powell watershed) and is very effective at trapping sediment, as seen in the discussion above.

Sediment analysis revealed a 1.5% increase in sediment production from the proposed action. With the design features mentioned below, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There would be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable direct effect to the North Fork of the Powell River or its tributaries in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Wells Branch

Direct Effects

Wells Branch had a predicted sediment increase over background levels of about 15%. Much of the sediment produced by the proposed action will drop out and be retained behind the beaverdams in the lower part of the watershed. With the slash design features mentioned below, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There will be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable direct effect to Wells Branch or its tributaries in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Craborchard Tributary

Direct Effects

Sediment analysis revealed an approximate 0.7% increase in sediment production from the proposed action. With the design features mentioned previously, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There will be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable or observable direct effect to the Craborchard Tributary in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Laurel Fork

Direct Effects

Sediment analysis revealed an approximate 1.7% increase in sediment production from the proposed action. With the design features mentioned previously, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There would be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable or observable direct, indirect, or cumulative effects Laurel Fork or its tributaries in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Cumulative Effects

North Fork of the Powell River and Keokee Lake

As has been previously stated, the upper reaches of the North Fork of the Powell are sediment starved as a result of the efficient sediment trapping of Keokee Lake. The lower reaches are in excellent condition, with typical channels and stream habitats. The streams that drain into Keokee Lake are in good condition, with typical stream habitats and substrates for their stream types. The lake itself shows no effect from any past sedimentation. The persistent illegal ATV use is relatively light in this watershed, and there has been no detectable degradation in stream or lake habitat from the increased sediment. It is very likely that the watershed has adjusted to the slightly higher sediment loads and is at equilibrium, forming a new background sediment level. The projected sediment totals, coupled with the background use of the area that is likely to persist are well within background levels. There will be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

Wells Branch

The available stream habitat in Wells Branch is in good condition. The amount of free-flowing stream channel habitat decreases each year as the influence of beavers spreads upstream. It is likely, short of

extirpation through trapping, that most of the watershed will eventually become a large beaver meadow. This would be the desired future condition for this watershed.

Because the streams still have acceptable habitat, it is likely that the sediment from the persistent illegal ATV traffic has become incorporated as a modified background sediment level for this watershed. The natural substrate for much of this watershed would naturally be sand, due to the low gradient and parent geology. Excessive sediment in the system should express itself as overloaded, braided channels. This is not the present state of the watershed. The projected sediment levels coupled with the amount of sediment computed for the illegal ATV use are within background levels for this system. As the effects from the proposed action fade into the background, the watershed will return to its current, modified background sediment level. There will be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

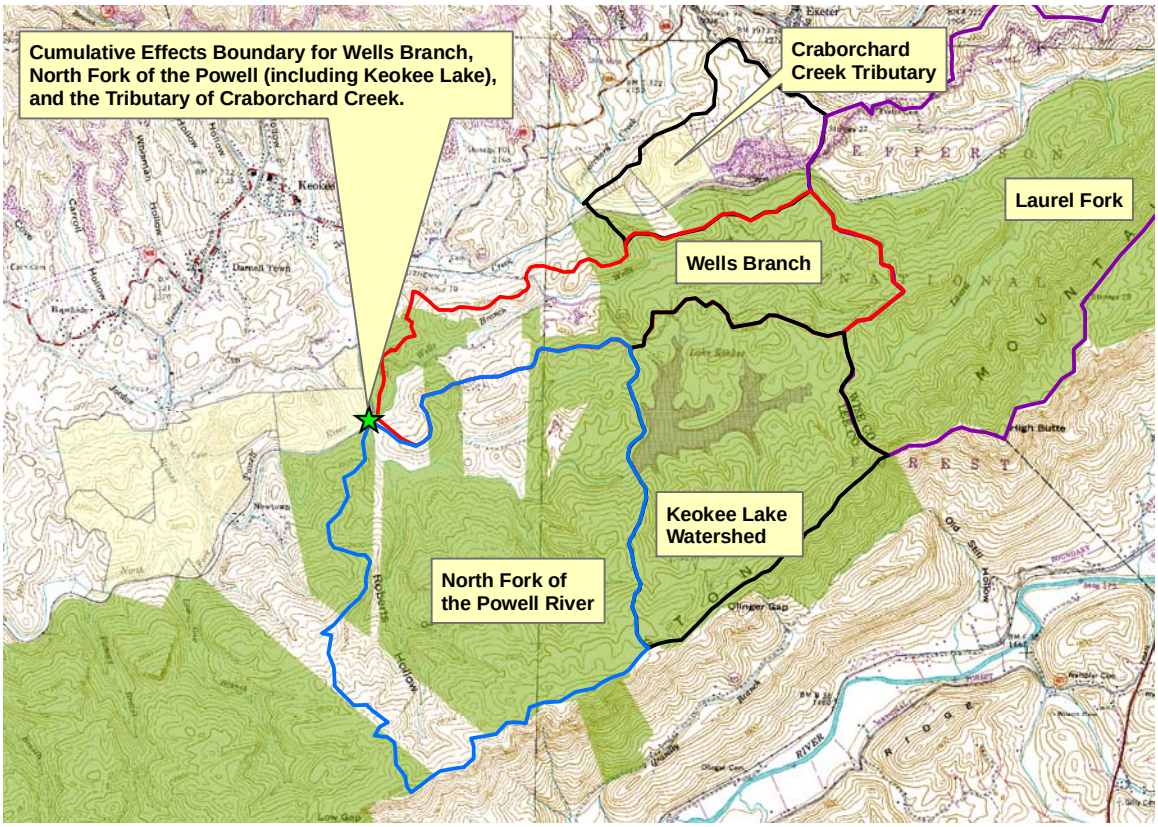
Crab Orchard Tributary
As mentioned above, the Crab Orchard Tributary does not exist as a surface feature on the National Forest. The projected sediment levels anticipated from the project, coupled with the estimates of the effects from past and present illegal use, are less than 1% of the background sediment level for this system. With the design features in place, there should be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

Laurel Fork
Projected sediment levels from the proposed action coupled with the estimates of the effects of illegal ATV use represent about a 2.5% increase over background levels. With the design features in place, there should be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

Effects to the WCR status of the South Fork of the Powell River
As mentioned above, the South Fork of the Powell River is identified as a Priority Watershed in the Forest Plan, due to the impacts from sediment in the watershed. Some portion of the sediment transported downstream from Laurel Fork would eventually make its way to the South Fork of the Powell River. However, in the context of the larger watershed, the cumulative sediment generated project area represents 0.005% of the natural background sediment of a watershed the size of the South Fork of the Powell at Appalachia. The background sediment of this watershed is likely orders of magnitude higher due to the land use history of the watershed. There will be no cumulative negative effect to the Priority Watershed from the proposed action.

Cumulative Effects Boundary for Effects to Project Area and Downstream Aquatic Organisms
Because the streams in the project area flow in two different directions and empty into widely separated river systems, multiple cumulative effects boundaries will need to be set for this project. For effects from the management actions planned in the Wells Branch, North Fork of the Powell, and the Craborchard Creek Tributary, the Cumulative Effects Boundary is set as the confluence of the North Fork of the Powell River with Craborchard Creek (see Figure 5).

Figure 5. Cumulative Effects Boundary set for the Management Actions Planned in the Wells Branch, North Fork of the Powell, and the Craborchard Creek Tributary.



For the management actions planned in Laurel Fork, the Cumulative Effects Boundary is set as the confluence of Laurel Fork with Pigeon Creek. Beyond these two points, the effects are immeasurable and indistinguishable from background levels.

3.2.2 Geology

There are no significant issues pertaining to geology identified during the scoping process. The interdisciplinary team did consider the impacts of harvesting and the possible effects on slope stability and received input and analysis from Tom Collins, the Forest Geologist.

The conclusion of this analysis determined that appropriate placement of logging infrastructure would not appreciably increase the potential for landslides, mast wasting, or debris flow. As a result, this issue was dropped from detailed analysis.

3.2.3 Soils

The report "Soil Resource Report for the Existing Conditions and the Estimated Effects for this Proposed Project", written by Tom Bailey, Forest Soil Scientist, is incorporated by reference and is located in the project file. The results of a detailed soil survey are displayed on maps available at the Forest Supervisor's Office in Roanoke, VA, and are incorporated by reference.

No issues directly related to soil resources were identified during scoping. Table 16 shows the direct and indirect; and short and long term effects, while Table 17 shows the percentage of the project area affected

in short and long term. Although soils can indirectly affect water and aquatic resources, mitigation measures (Chapter 2.5), Forest Plan Standards, and VA BMP's, reduce this potential to well within the range of natural variability (see hydrology section and write-up in project file), and therefore will have no significant effect.

ALTERNATIVE 2

TABLE 9: Estimated Acreage of Short and Long Term Effects to Soil Productivity for alt. 2

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ACTIVITY	SHORT TERM	LONG TERM	TOTAL
Bladed Skid Roads (10 mi)	9.7 acres	14.5 acres	24.2 acres
Primary Skid Trails (3.3 mi)	4 acres	0	4 acres
Log Landings (25 @ 0.25ac.)	3.3 acres	3.3 acres	6.6 acres
Fire line construction hand	5.3 acres	0	5.3 acres
Temporary Road Construction	2.7 acres	3.6 acres	6.3 acres
Totals	**25 acres**	**21.4 acres**	**46.4 acres**

Assumptions used for above table:

1. Bladed Skid roads have 12 feet of travel way and 20 feet cleared right-of-way and are 75% of total skid roads and trails.
2. Primary skid trails are 25% of total skid roads and trails and 10 feet wide, unbladed and a short term impact.
3. Log landings are .25 acre each and 50% has reduction in soil productivity due to blading and compaction.
4. Hand tool construction of fire line is a short term impact to soil productivity due to the shallow depth of disturbance hand line is 5 feet wide plus 2 feet of spoil.
5. Temporary road has 35 feet of cleared right-of-way with 20 feet of travel way, including a cut slope. Temporary road has long-term effect on 20 feet of the cleared right of way.

Short-term impacts would occur on approximately 25 acres with Alternative 2. Long-term impacts would occur on approximately 21.4 acres with Alternative 2.

To put the magnitude of these impacts into perspective, the estimated acres impacted by Alternative 2 are compared to the total acres in the activity areas in the table below. This will show the percentage of the activity area impacted by the proposed activities for the alternatives. First, the activity area will be computed as follows:

- Acres treated by commercial timber harvest outside the prescribed burn treatment = 88
- Acres of the prescribed burn treatment = 2900

The activity area for Alternative 2 is 2994 acres. This will include all areas proposed for treatment.

TABLE 10: Estimated Acreage of the Activity Area Soils Affected by the Alternatives.

Alternative	Extent of Activity Area (acres)	Percent of the Activity Area		Percent of Activity Area Affected Long Term
		Short term	**Long term**	
Alternative 2	2988	25 acres	21.4 acres	<1%

The table above shows that the proposed alternative would affect a small part of the overall activity area of proposed alternative 2 and that much of the impact would be short term.

Cumulative Effects

Based on knowledge of these treatment areas the proposed actions of Alternative 2 when combined with past and future proposed actions for these treatment areas are not expected to cause a significant reduction in soil productivity for these areas. No future treatments are planned for these areas that would impact soil productivity and effects to soil productivity from past actions in these 2988 acres.

3.2.4 Vegetation

There were no issues identified during the scoping process related to impacts of management on vegetation in the project area. A detailed discussion regarding the effects of management activities on vegetation in the project area is contained in the project file as well as in Chapter 2: Alternatives.

3.2.6.1 Discussion

Table 2 (page 7) *Project Area Age-Class Distribution*, displays the current age class distribution for the project area and Contiguous 8A1. This table shows the lack of early and mid-successional age classes within the project area and Contiguous 8A prescription area. This lack of diversity in age classes is a primary purpose and need for implementation of this project.

Age-Class Distribution

Vegetation treatments can change stand ages in several ways. A stand regenerated through timber harvest becomes 0 (in the 0 to 10 year age class) upon completion of harvesting and site preparation activities. This is the case even if some overstory trees remain. Age-class for intermediate treatments, including thinning and crown touching release, might change depending on the residual stand composition. For this analysis, stand ages remain the same for all intermediate treatments. Prescribed burning may kill some overstory trees, but in general does not create much ESH. So stand regeneration through commercial timber harvest is the most logical way to create ESH for those species that depend on it.

One important concept to remember is that stand ages are not static. Rather they change every year and in order to keep a balanced age class distribution stand entries must be made every ten years at a minimum in order to stay in compliance with the forest plan (pg 3-112 RLMP).

Alternative 1 (No Action) – This alternative plans no timber harvest or associated activities within the Project area. Because no management activities are planned, there would be no direct effect on age-class distribution, either spatially or temporally, there would be no stands in the 0-10 age-class created unless stand replacing events occur, such as mortality induced by insects, diseases, wildfire or extreme wind events.

This alternative would not create ESH as directed in the Forest Plan, either directly or indirectly. Rather, the project area would move further away from this goal, unless a natural stand replacing event occurred.

Alternative 2 – The action alternative includes regeneration treatments, intermediate harvest, road and landing construction, project area access control, and associated post harvest activities including prescribed burning, and chainsaw site preparation. This alternative would create ESH in the project area.

Regeneration Harvest: Regeneration after harvest will likely occur from a combination of stump sprouting and direct seeding. A combination of oaks, yellow poplar, red maple, hickory, and other hardwoods would occupy the site. On the drier ridgetops and south/west facing aspects, the oaks will compete well with other species trending towards oak/hickory stands; in more mesic coves, yellow poplar will compete favorably against the oaks, trending towards cove hardwoods. Previous harvest units on similar forest types and sites have all naturally regenerated within 5 years of harvest. Based on this anecdotal evidence, and the potential for stump sprouting and seed source potential, stands regenerated will achieve full stocking within 5 years.

Since no regeneration harvest is planned in stands greater than 100 years old the management prescription area will continue to move towards meeting the 8A1-OBJ2 for stands in the 100+ age group. Given the large land base and the current levels of cutting Old Growth objectives will be more easily met in the future than the early and mid-successional objectives.

Stand Improvement Harvest: The stand improvement harvest proposed in Alternative 2 is designed to improve species composition, stocking levels, and overall tree vigor. The percentage of desirable species in the project area would increase as the percentage of non-desirable and non-native species is reduced through harvest. The improvement harvest would also increase growing space for mast producing trees, which should provide for larger crown sizes, increased vigor, and the potential for increased mast production. Improvement harvests also increase the amount of advanced regeneration present in the understory of treated stands, therefore setting the stage for the successful future regeneration harvests that will be needed to maintain acreage in the 0-10 year age class. Increased herbaceous growth is also a benefit of the stand improvement harvest. Stand improvement harvest will have no direct, indirect or cumulative effect to age-class distribution in the project area.

Prescribed Fire: Prescribed fire will have no effect on the age class distribution, although, some mortality will occur in understory trees. Mortality has occurred in small patches immediately following prescribed burns already conducted in the area however these small (generally less than an acre or two) patches do not significantly contribute to ESH given the context of the entire project area. Some of the results we expect from prescribed burns include a release of nutrients that cause a flush of growth, increasing understory herbaceous species, and improvement in species composition (mainly due to an increased percentage of oak).

It is likely that additional cavity trees would be created from fire scars, excess fuels would be removed from the forest floor, and the percentage of thin-barked species such as red maple and magnolia would be reduced. It is also possible that some fire dependent species such as the southern yellow pine and woody shrub growth (notably absent in the project area stands today) will begin to seed in and take hold. Prescribed burning should have no direct, indirect, or cumulative effect to age-class distribution, overstory species composition, overall forest health, or noxious weeds in the project area.

3.3 Social Components

3.3.1 Visuals and Scenery Management

Issue # 2: The effects of harvesting, roadwork, and associated projects on **visual quality.**

- Effects of project on visual quality pertaining to Scenery Management System and compliance with the Forest Plan.

Scope of the Analysis

The geographic bounds for this scenic analysis will include the area visible from the identified viewing points surrounding the Wells Branch area. The primary viewing point is Lake Keokee. Each unit was evaluated from vantage points with high concern to eliminate obtrusive edges, shapes, patterns in conjunction with the shape and density of each unit.

The time periods for this analysis will include projects occurring up to 10 years in the past and into the future. This time period is based on the concept that the greatest harvesting impacts on visuals generally last about 10 years at which time the treated units are not as easily discernible to the casual observer.

3.3.1.1 Affected Environment

Existing Situation

The project area is managed to provide roaded natural recreational opportunities. Thus, the area is not remote. Visitors are expected to experience comfort and security but feelings of solitude, challenge, and risk are to be expected. During most of the year, occasional encounters with other forest visitors can be expected. Recreational activities that occur within the project area are primarily dispersed in nature, but concentrated use does occur at the Keokee Lake picnic and boat launch area.

Scenic Integrity Objectives (SIO) is a system of classification describing the scenic objectives or value of a particular landscape or portions of that landscape. Values in this classification system range from very high to low. There are no very high SIO in the project area. There is a substantial amount of high SIO surrounding Lake Keokee. High SIO areas should appear "unaltered" when viewed from a distance (RLRMP pg 2-47). However this does not preclude timber harvest (including regeneration harvests). FW-187 states that "in seed-tree and shelterwood methods, in High and Moderate SIO areas, delay removal of overstory until understory is 10 feet or more in height" (RLRMP pg. 2-48).

There are three regeneration units proposed in the high SIO areas (stands 2090-1, 2090-19, 2089-10). These units are 18, 4, and 33 acres respectively (55 acres total). A shelterwood harvest is proposed for these areas. When viewed from a distance (from Lake Keokee in this case) shelterwood harvests appear unaltered. The largest area (2089-10) is behind a ridge and will not be visible from the lake at all. In addition to the silvicultural system used a number of other mitigations will be implemented to reduce the visual impact from proposed harvests. Many of these standards are listed on page 2-48 of the RLRMP.

3.3.1.2 Environmental Effects

Direct and Indirect Effects

Alternative 1 (No Action)
There would be no effect to the scenic resources in the area.

Alternative 2
Proposed Units and their effects on the Visual Resources of the Area

Stands 2090-1, 2090-19, 2089-10 have an inventoried SIO of high. In order to achieve high SIO, the following actions should be taken prior to and upon completion of harvest.

- Apply leave tree and unit marking so that it is not visible within 100 feet of Keokee loop trail.
- Remove, burn, chip or lop/scatter slash to within 2 feet of the ground within 100 feet of Keokee loop trail.
- Shape and feather the edges of all units.

All Remaining Stands
All of the other stands proposed for treatment have SIO of moderate or low. These units are not visible from Lake Keokee. All actions meet the SIO of the area as adopted by the Forest Plan.

3.3.1.3 Cumulative Effects

Future Actions
All cumulative actions meet the SIO of the area. No significant cumulative impacts to the visual resource are expected to result from this action coupled with past and reasonably foreseeable actions in the viewshed.

3.3.2 Heritage Resources
Cultural Resource surveys were completed under the direction of Forest Archeologist Mike Madden. The results of his findings and concurrence from SHPO indicated that no Cultural Resources were located in the project area. As a result, no significant issues related to Cultural Resources were identified. Any cultural resources found after the start of harvesting will be assessed, and protected according to the recommendations of the Forest Archeologist.

3.3.3 Transportation / Access
The report "Roads Analysis for the Wells Branch Project Area", dated August, 2010, is incorporated by reference. The conclusions of the roads analysis determined the need for pre-haul maintenance on existing system roads, and no opportunities to decommission existing roads.

No significant issues related to transportation were identified during the scoping process, although, road construction can have an effect on various resource areas. The impacts of system

road reconstruction on the issues (water quality and riparian communities, and TES / MIS species, relating to sedimentation and karst areas, and water yield) have been analyzed, the results of which are incorporated in this chapter of the Wells Branch Timber Sale EA. The effects of road reconstruction on other resources areas can be found in the project file under the associated resource.

3.3.4 Minerals and Gas Wells

There are no gas wells in the Wells Branch Project area. No issues pertaining to gas wells were raised as a result of the scoping process.

3.4 Economic Components

A basic economic principle related to ecosystem management is to 'use resources wisely and efficiently to improve economic prosperity' of the communities, regions and the nation by cost-effective production of natural resources such as wood, fiber, water, minerals, energy, livestock forage, and recreation opportunities. No issues related to economics were identified during the scoping process. For economics resources, the area of potential effects is limited to the Wells Branch Project Area, and the products produced thereon.

A detailed Report titled 'Wells Branch Economic Analysis' was completed by Tyler Williamson, District TMA, and is incorporated by reference. This report discusses the estimated costs and revenues associated with this project as well as the alternatives with the highest PNV and B/C ratio.

Direct, Indirect and Cumulative Effects

Alternative 1 has no direct, indirect or cumulative effects. There would be no direct economic costs or benefits resulting from the implementation of this alternative.

Alternative 2: Table 19 provides information regarding estimated costs and benefits associated with each alternative. This alternative proposes regeneration harvest on approximately 285 acres and thinning on approximately 176 acres of the project area.

Benefits: The approximate economic (cash) benefits that occur from the implementation of this project arise from the sale of forest products, including the sawtimber and pulpwood.

Costs: The approximate costs (cash) that occur from the implementation of this project include the harvesting of the project area, sale preparation and administration, road work, and the implementation of any sale area improvement projects associated with the action alternative.

	Alternative 1	Alternative 2
Costs	$ 0	$ -382,418.96
Revenue	$ 0	$ 535,595.15

B/C Ratio	0	1.4
PNV	$ 0	$ 153,176.20

Table 11. Comparison by alternative of the costs, revenues, B/C Ratio, and present net value (PNV)

Summary: Alternative 2 results in a positive present net value (PNV) of approximately $153,000, meaning that the economic (cash) benefits from the project out weigh the costs for the implementation of the project.

3.5 Climatological Factors

There were no s identified regarding this resource: however, climate change can affect the resources in the project area and the proposed project can affect climate change through altering the carbon cycle. Climate models are continuing to be developed and refined, but the two principal models found to best simulate future climate change conditions for the various regions across the country are the Hadley Center model and the Canadian Climate center model (climate Change impacts on the United States 2001). Both models indicate warming in the southern region of the US. However, the models differ in that one predicts little change in precipitation until 2030 followed by much drier conditions over the next 70 years. The other predicts a slight decrease in precipitation during the next 30 years followed by increased precipitation. These changes could affect forest productivity, forest pest activity, vegetation types, major weather disturbances (droughts, hurricanes), and stream flow. These effects would likely be seen across the Forest, though some sensitive areas (such as high elevation communities may be affected sooner than others.

The proposed project has no high elevation treatment units, but does have mid-level treatment units. It is not expected that the action alternatives will substantially alter the effects of climate change in the project area. The regeneration in the areas to be harvested will provide more structural diversity to the area and establish the young, vigorous stand of early successional habitat that may be more resilient and less vulnerable to the changes in climate. Under the NO Action Alternative, there would be no proposed change from the current condition where currently forested stands are expected to be less resilient to possible climate change impacts. Changes in productivity or insect and disease impacts are likely to be more extreme with older, established growth compared to the action alternatives.

The proposed action and alternatives will alter the carbon cycle in that it affects the carbon stock in any one of the pools. Each of the action alternatives will remove biomass as a result of timber harvest and prescribed burning. This will reduce the amount of carbon stored in the treated stands. A portion of the carbon removed will remain stored for a period of time in wood products.

The action alternative affects greenhouse gases. The associated prescribed burn will release carbon into the atmosphere through the chemical reactions of fire. The accelerated decomposition will also generate carbon emissions. However, overall forestry practices (including the accelerated overall growth initiated by harvesting and prescribed burning) have been shown to act as a net carbon sink (EPA 2001).

There will be a direct, short term increase in carbon emissions during prescribed burns and a short term increase due to an increase in dead vegetation following the burn. However the short term loss of biomass resulting from a fire may be offset by the burned area's increased ability to produce herbaceous biomass. There is a direct beneficial effect on climate change of decreased greenhouse gas emission from the acres to be burned because the risk of acres being burned by uncharacteristically severe wildfires would be reduced. There is also an indirect beneficial effect by treating these acres because live stands of trees will retain higher capacity to sequester carbon dioxide compared to stands killed by uncharacteristically severe wildfires, especially if not immediately reforested.

Regeneration harvests will reduce existing carbon stocks at the harvest sites. The harvest of live trees, combined with the likely increase in down, dead wood will temporarily convert stands from a carbon sink that removes more carbon from the atmosphere than it emits, to a carbon source that more carbon through respiration than it absorbs. These stands will remain a source of carbon to the atmosphere until carbon uptake by new trees and other vegetation exceeds the emissions from decomposing dead organic material. The stands will likely remain a carbon source for several years, and perhaps for more than a decade depending on the amount of dead biomass left on the site, the length of time before new trees become reestablished, and their rate of growth once reestablished. As the stands continue to develop, the strength of the carbon sink will increase until peaking at an intermediate age and then gradually decline but remain positive. Similarly, once new trees are established, carbon stocks will accumulate rapidly for several decades. The rate of accumulation will slow as the stands age. Carbon stocks will continue to accumulate, although at a declining rate, until impacted by future disturbances.

Recent scientific literature confirms this general pattern of changes in net ecosystem productivity (NEP) and carbon stocks over the period of forest stand development. Most mature and old stand remained a net sink of carbon. Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon stocks and carbon fluxes boreal, temperate, and tropical biomes. They found that in temperate forests NEP is lowest, and most variable, in young stands (0-30 years), highest in stands 31-70 years, and declines thereafter as stands age. These studies also reveal a general pattern of total carbon stocks declining after disturbance and then increasing, rapidly during intermediate years and then at a declining rate, over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease or other causes) kills large numbers of trees and again converts the stands to a carbon source where carbon emissions from decay of dead biomass exceeds that amount of carbon removed from the atmosphere by photosynthesis within the stand.

The impacts of the action alternatives on global carbon sequestration and atmospheric concentrations of carbon dioxide are not significant. However, the forests of the United States significantly reduce atmospheric concentration of carbon dioxide resulting from fossil fuel emissions. The forest and wood products of the United States currently sequester approximately 200 teragrams of carbon per year (Heath and Smith, 2004). This rate of carbon sequestration offsets approximately 10% of carbon dioxide emissions from burning fossil fuels (Birdsey et al., 2006). U.S. Forests currently contain 66,600 teragrams of carbon. The short-term reduction in carbon stocks and sequestration rates resulting from the proposed project are imperceptibly small on global and national scales, as are the potential long-term benefits in terms of carbon storage.

The currently large carbon sink in U.S. forests is a result of past land use changes, including the re-growth of forest of large areas of the eastern U.S. harvested in the 19th century, and 20th century fire suppression in the western U.S. (Bidsey et al. 2006). The continuation of this large carbon sink is uncertain because some of the processes promoting the current sink are likely to decline and projected increases in disturbance rates such as fire and large-scale insect mortality may release a significant portion of existing carbon stocks (Pacala et al., 2008; Canadell et al. 2007). Management actions – such as those proposed – that improve the resilience of forests to climate-induced increases in frequency and intensity of

disturbances such as fire, and utilize harvested trees for long-lived forest products and renewable energy sources may help sustain the current strength of the carbon sink I the U.S. forests (Birdsey et al., 2007).

3.6 Findings Required by Regulations and Other Laws

3.6.1 Consistency with the Forest Plan

The Forest Plan was prepared in accordance with the National Forest Management Act (16 USC 1601-1610) and 36 CFR 219 implementing regulations for the Act. The proposed action and alternatives to the proposed action are consistent with the Forest Plan's management objectives given in chapter 3. The actions of the project occur in Management Prescription 8B of the Forest Plan, pages 3-116 through 3-119. Management Prescription lands 8B are identified as suitable for timber production. The actions, including mitigation measures, are consistent with the management prescription and the management practices. All action alternatives are feasible and reasonable, and cause applying management practices that meet the Forest Plan's overall direction to assure coordination of multiple-uses (outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness) and sustained yield of products and services.

3.6.2 Coppice with Reserves Treatment

Coppice with reserves treatments would an average of 15 – 25 BA (10 to 40 trees per acre) of hard mast, soft mast and wildlife reserve trees, and allow regeneration to occur via stump sprouts and seeding. Research and experience on sites with similar site-specific conditions show that natural regeneration will occur in sufficient quantities to achieve NFMA requirements regarding post harvest regeneration. While the retention of trees would shade the understory, monitoring of past two-aged treatments cut in similar stands have shown that required levels of regeneration can be obtained with this treatment. This harvest method would also provide hard mast production in the stand and maintain vertical structure beneficial to wildlife species requiring these characteristics. For these reasons, this method is appropriate for achieving the objective of managing for vigorous two-storied, two-aged hardwood stands, which would provide wildlife browse habitat in the short term, and hard mast and vertical structure in the short and long-term.

3.6.3 Standard Shelterwood

This is a two-stage regeneration treatment. The purpose of this treatment is to provide early successional habitat for a variety of wildlife species, including deer, ruffed grouse and various songbirds. This treatment would retain 30 to 50 ft^2/acre of BA, retaining a variety of hard mast, soft mast, and wildlife reserve trees. Studies and experience on sites with similar site-specific conditions show that natural regeneration will occur in sufficient quantities to achieve NFMA requirements regarding post harvest regeneration. This treatment reduces the sunlight reaching the ground (as compared with other regeneration treatments), which also can reduce the vigor and number of intolerant regeneration, such as yellow poplar and red maple. These treatments also reduce the impact of harvesting activities on the visual resource. Once regeneration is established, an overstory removal can occur.

This harvest method would also provide a diversity of hard and soft mast production and maintain vertical structure beneficial to wildlife species requiring these characteristics. For these reasons, this method is appropriate for achieving the objective of managing for vigorous hardwood stands in visually sensitive

areas, which would provide wildlife browse habitat in the short term, and hard mast / vertical structure in the long-term.

3.6.4 Effects to Other Resources

No effects to consumers, civil rights, minority groups, or individuals are expected from implementing any alternative in this EA. No effects to wetlands, floodplains, prime farmlands, or range lands are expected under any alternative discussed in this EA.

3.6.5 Other Laws/Regulations

Management of National Forests is consistent with applicable federal and state laws. Due to the number of laws applicable, listing these laws is not feasible. Because the proposed action causes ground disturbance, it is worth noting that the action alternatives comply with the Clean Water Act, the Virginia Water Quality Act, the Forestry Best Management Practices for Water Quality in Virginia, the National Historic Preservation Act, and the Endangered Species Act.

A scoping letter, dated July 25, 2006, was posted on the forest correspondence database and mailed to all groups and individuals on the scoping list (approximately 75). A request for public comment was printed in The Coalfield Progress on Thursday, July 27, 2006.

The initial scoping effort generated 13 responses to the proposed action and potential alternatives; five comment letters from interested private citizens, six letters from special interest groups, and two from State agencies. One issue was raised regarding the scoping process. The issue specifically addressed the Forest Service not contacting affected parties downstream from the project area. As a result of this concern, an additional 30-day comment period was initiated. An additional 8 comments letters were received, three of which were new comments from interested private citizens. Three comments were received outside the dates of both comment periods. They were included and considered, but will not be granted legal standing to appeal.

All responses were carefully reviewed and a list of comments was generated as a result. These comments were grouped into categories according to the resource area they primarily addressed. The IDT then met and discussed each comment and determined the need to analyze in detail, and/or to address in the EA. Many of the responses had similar themes that were repeated within and between the letters and/or commenters. See appendix A for specific responses to comments received.

4.0 List of Agencies, Organizations and Individuals Consulted

A. Summary of Scoping Effort

B. Forest Service Interdisciplinary Team

Team Member	Title
Terry Adams	District Fire Management Officer
Mike Madden et. al.	Forest Archaeologist
Lois Boggs	District Wildlife Biologist
Charles Lane	District Fisheries Biologist
Tyler Williamson	Team Leader: Silviculture and Timber Specialist
Tom Bailey	Forest Soils Scientist
Tom Collins	Geology
Jessica Bier	Botany
Dick Patton	Hydrology
Jorge Hersel	District Ranger
Other Specialists Consulted	
Gary Kappasser / Dick Patton	Forest Hydrologists
Mike Tripp	Engineer
Karen Overcash	Forest Planner
Dawn Kirk	Forest Fisheries Biologist
Carol Hardy-Croy	Forest Wildlife Biologist
Steve Croy	Forest Ecologist
David Skinner	NEPA and Recreation

Biological Evaluation/Biological Assessment
for
Threatened, Endangered, and Sensitive (TES) Species
Wells Branch Vegetation Management Project
Lee County, Virginia

Clinch Ranger District
George Washington and Jefferson National Forests

Introduction

Forest Service Manual (FSM) Section 2672.41 requires a biological evaluation (BE) and/or biological assessment (BA) for all Forest Service planned, funded, executed, or permitted programs and activities. The objectives of this BE/BA are to: 1) ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native species or contribute to trends toward federal listing, 2) comply with the requirements of the Endangered Species Act (ESA) so that federal agencies do not jeopardize or adversely modify critical habitat (as defined in ESA) of federally listed species, and 3) provide a process and standard to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process using the best available science.

The Clinch Ranger District supports known occurrences and suitable habitat for several TES species, all of which were considered in this analysis. This BE/BA documents the analysis of potential impacts of the proposed project to TES species and associated habitat. It also serves as biological input into the environmental analysis for project-level decision-making to ensure compliance with the ESA, National Environmental Policy Act (NEPA), and National Forest Management Act (NFMA).

Project Area and Cumulative Effects Analysis Area

The proposed action is to harvest timber in the vicinity of Lake Keokee: the approximate location is to the south of Craborchard Creek, west of Laurel Fork of Pigeon Creek, and north of the ridge of Stone Mountain near Olinger Gap in Lee County. Also proposed are approximately **2900** acres of prescribed burning and spot-treatment of invasive species with approved herbicides.

The geographic scope of this biological analysis for terrestrial plants and animals is the project area. The geographic scope of the analysis for the Indiana bat is the entire George Washington and Jefferson National Forests (GWJNF). Hydrologic analysis conducted for the Proposed Action. Because the streams in the project area flow in two different directions and empty into widely separated river systems, multiple cumulative effects boundaries will need to be set for this project. For effects from the management actions planned in the Wells Branch, North Fork of the Powell, and the Craborchard Creek Tributary, the Cumulative Effects Boundary is set as the confluence of the North Fork of the Powell River with Craborchard Creek. For the management actions planned in Laurel Fork, the Cumulative Effects Boundary is set as the confluence of Laurel Fork with Pigeon Creek. For Roaring Branch, the Cumulative Effects Boundary is set as the confluence of Roaring Branch with the South Fork of the Powell River. Beyond these three points, the effects are immeasurable and indistinguishable from background

levels. Part of the project area is in the Reeds Creek – North Fork of the Powell River 6th level HUC watershed under the Mussel and Fish Conservation Plan.

Past Actions

The agency planned prescribed fires within the proposed timber harvest area that were part of previous decisions. These prescribed burns were analyzed and implemented as follows: "Biological Evaluation/Biological Assessment for Threatened, Endangered, and Sensitive (TES) Species for the Wells Branch, Back Valley, and Pine Orchard Branch Prescribed Burn Units in Wise, Lee, and Scott Counties, Virginia" dated August 31, 2006, and implemented in April 2007 and March 2009; "Biological Evaluation/Biological Assessment for Threatened, Endangered, and Sensitive (TES) Species for the Glades, High Knob, Harvey, Machine Creek, Keokee and Mountain Fork Prescribed Burns" dated December 9, 2005, and a Decision Memo dated December 21, 2005, and implemented April 2006; and "Biological Evaluation/Biological Assessment for Threatened, Endangered, and Sensitive (TES) Species for the Machine Creek, Keokee, Low Place Branch, and Bear Rock Prescribed Burn Units in Wise, Lee, and Scott Counties" Virginia dated February 11, 2005 and implemented March 2005 and April 2006.

Proposed Management Actions

The Clinch Ranger District is proposing the following management actions:

- Harvest approximately 285 acres with even-aged management (regeneration): 85 acres with shelterwood cuts, and 200 acres with a treatment called coppice with reserves.
- Thin approximately 176 acres through scattered canopy gap creation (pre-commercial thinning) to improve crown development and favor desirable crop trees. There will be a total of 461 acres harvested, including the regeneration treatments and thinning treatments.
- Non-native, invasive weed and tree species in the project area would be spot-treated with approved herbicides.
- Approximately 1.1 miles of system road, approximately 1.2 miles of temporary road, 13.3 miles of skid trails, and approximately 12.5 acres of landings will be constructed.
- Prescribed burning is proposed on approximately 2900 acres to treat slash and woody fuels in regenerated stands and site preparation for natural regeneration to enhance oak and other mast producing trees. Other objectives would include reduction of fuels, to begin the process of changing the fire regime condition class, and to promote herbaceous growth in the understory. Multiple entries of prescribed fire will be needed to accomplish the prescribed burning objectives.

Additional post-harvest actions include:

- Seeding all landings, temporary roads, and some skid roads with a quality wildlife mix to create approximately 20 acres of wildlife openings/strips.
- Performing a mechanical (chainsaw) stand improvement and mid-story treatment on areas that are commercially thinned.
- Performing mechanical (chainsaw) site preparation on areas that are regenerated through coppice.

The project was designed knowing the area is potential habitat for the Indiana bat and that Forest Plan standards for its management will be followed.

Future Actions

The prescribed burn portion of the vegetation management proposal could be repeated within the next five years. Cumulative effects from that action and the proposed action to each species are discussed below. The agency knows of no other activities planned within the watershed. Activities on private land within these watersheds are expected to remain the same for the next 10 years. Other than the proposed actions, there are no new foreseeable future projects planned on National Forest System (NFS) land within the project area at this time that may have an effect on terrestrial plants and animals. On-going projects include maintenance of roads, trails, and existing wildlife openings.

Species Reviewed

Federally listed threatened and endangered species, species proposed for federal listing, and Southern Region sensitive species (TES) that may potentially be impacted by this project were examined using the following existing available information:

1. Reviewing the list of TES plant and animal species known, or likely to occur, on the George Washington and Jefferson National Forests, and their habitat preferences. This review included the current list of federal endangered, threatened, and proposed species for the Forest concurred with by the U.S. Fish & Wildlife Service on January 4, 2007, and the August 7, 2001 Southern Region Sensitive Species list, revised for known or possible Forest occurrences on March 4, 2004, with Forest-specific updates current as of August 6, 2007 (list attached as Appendix A).

2. Consulting element occurrence records (EOR's) for TES species as maintained by the Virginia Division of Natural Heritage (VDNH), and supplied to the Forest.

3. Consulting species information, including county occurrence records, as maintained in the online database (http://www.vafwis.org/wis/asp/default.asp) titled Virginia Fish and Wildlife Information Service (VAFWIS) of the Virginia Department of Game and Inland Fisheries (VDGIF).

4. Consulting with individuals in the private and public sector who are knowledgeable about the area and its flora and/or fauna.

5. Reviewing sources listed in the reference portion of this report.

6. Reviewing the results of past field surveys that may have been conducted in the area.

Most TES species known to occur on the Forest have unique habitat requirements, such as shale barrens, rock outcrops, bogs, caves, and natural ponds. Information gathered, analyzed, and presented in the Southern Appalachian Assessment dated July 1996 states that approximately 84% of threatened and endangered species and 74% of sensitive species are associated with rare or unique habitats, often referred to as rare communities.

Through cooperative agreements between the Forest and VDNH and WVNHP, Special Biological Areas have been identified and delineated on the Forest. These include rare and significant natural communities and vegetative types. These areas reflect current knowledge of the location, management, and protection needs of rare species and associated significant natural communities on the Forest. These areas are identified in the 2004 Jefferson National Forest Revised Forest Plan (Plan), pages 3-27 through 3-30, as Botanical and Zoological Areas

(Management Area 4D). There is a Management Area 4D within the project area. A discussion of the effects to the 4D prescription area follows below.

No timber harvest or ground disturbance is proposed for the Management Area 4D other than maintenance of existing system roads. The area has been extensively surveyed for additional occurrences of the small whorled pogonia, and none have been located. The area around the know occurrence of small whorled pogonia will be protected with firelines and additional mitigations described in the small whorled pogonia discussion under the "Effects to Threatened Species" below will be in place. Herbicide treatments will be hand-applied along the road and should not affect the interior habitat in this prescription. Lighter leaf litter loads and more open canopies could benefit the habitat for the small whorled pogonia in the absence of ground disturbance. There should be no net negative effect to the MA 4D for the small whorled pogonia from the proposed actions.

The need to conduct site-specific surveys of TES species for this project was assessed. Based on this assessment, affected potential habitat in the project area was surveyed for TES species. Appendix A of this document lists all 190 TES species currently known, or expected to occur, on or near the George Washington and Jefferson National Forests. All species on the list were considered during the analysis for this project.

A "step down" process was followed to eliminate species from further analysis and focus on those species that may be affected by proposed project activities. Species not eliminated are then analyzed in greater detail. Results of this "step down" analysis process are displayed in the Occurrence Analysis Results (OAR) column of the table in Appendix A. First, the range of a species was considered. Species' ranges on the Forest are based on county records contained in such documents as the "Atlas of the Virginia Flora", but are refined further when additional information is available, such as more recent occurrences documented in scientific literature or in Natural Heritage databases. Many times range information clearly indicates a species will not occur in the project area due to the restricted geographic distribution of most TES species. When the project area is outside a known species range, that species is eliminated from further consideration by being coded as OAR code "1" in the Appendix A table. For this project, 134 species were eliminated from further consideration because the project area is not within the species known range.

For the remaining species, after this first step, results from past surveys and knowledge of the areas and potential for suitable habitat were considered.

Field Surveys and Results

Some species could not be eliminated from further consideration based on known range. Botanical surveys of the areas were conducted in the growing seasons of 2004, 2005, 2006, and 2007 by Jessica Bier, District Biological Sciences Technician (Botany) and Candace Justice (Clinch Ranger District Wildlife Intern). Additional surveys specific for the small-whorled pogonia (*Isotria medeoloides*) were conducted in June, 2010 and June 2011 by Jessica Bier and Lois Boggs (Clinch Ranger District Wildlife Biologist). Wildlife habitat surveys were conducted in the proposed project area in 1999, 2002, 2007 by Lois Boggs (Wildlife Biologist), Chris Owens and Brandon Sluss (Clinch Ranger District Biological Sciences Technicians), and Nicole Sorrell, Randi Wiele, Angela Burkhart, Susie Kacenas, Jose Velazco (Clinch Ranger District Wildlife Interns).

The field surveys did not sample every acre, but were distributed throughout all habitat types found in the project area. The survey method consisted of walking through the project area searching for different habitat types and TES species occurrences. The animal survey consisted of searching for individuals, signs of their presence (such as scat, tracks, calls, or nests), and/or potential habitat. The plant survey utilized meander search methodologies (Goff, Dawson, and Rochow, 1982) in which new habitat variations or unique areas are constantly being searched for, in order to maximize floristic variation. Additional surveys specific for the small whorled pogonia were requested by the USFWS. These surveys also utilized the meander method and were conducted in areas of proposed ground disturbance.

From the field surveys and knowledge of the area, species were eliminated from further consideration because of: a) lack of suitable habitat in the project area (OAR code "2"); b) habitat present and the species has been searched for, but has not been found (OAR code "3"); c) species occurs in the project area, but out of the actual area of activity (OAR code "4"); and d) aquatic species or habitat known or suspected downstream of project or activity area but outside of identified geographic bounds of water resource cumulative effects analysis area (defined as the point below which sediment amounts are immeasurable and insignificant) (OAR code "7"). The results of the field surveys are documented in Appendix A. For this project, 48 species were eliminated from further consideration because of one of the above reasons.

Species Identified as Being In the Action Area or Potentially Affected by the Action

From past field surveys and knowledge of the area, and given the proposed action, those species which are analyzed and discussed further in this document are those that: a) are found to be located in the activity area (OAR code "5"); b) were not seen during the survey(s), but possibly occur in the activity area based on habitat observed during the survey(s) or field survey was not conducted when species is recognizable (OAR code "6"); c) for aquatic species, they are known or suspected downstream of project or activity area and within identified geographic bounds of water resource cumulative effects analysis area (OAR code "8") and d) Federally listed mussel and/or fish species known in 6th level watershed of project area. Conservation measures from USFWS/FS Conservation Plan applied (OAR code 9).

As a result of this process, the 6 following species are known to occur in or near the area or are potentially impacted by the proposed action and are coded OAR 5 or 6:

OAR Code	**Scientific Name**	**Common Name**	***Taxa***	***TES***
6	*Myotis sodalis*	Indiana bat	Mammal	Endangered
6	*Myotis leibii*	Eastern small-footed bat	Mammal	Sensitive
6	*Speyeria diana*	Diana fritillary	Insect	Sensitive
6	*Cicindela patruela*	Barrens tiger beetle	Insect	Sensitive
5	*Monotropsis odorata*	Sweet pinesap	Vascular plant	Sensitive
5	*Cleistes bifaria*	Small spreading pogonia	Vascular plant	Sensitive

The George Washington and Jefferson National Forest (GWJNF) has developed a conservation plan for federally listed mussel and fish species that have potential to be affected by our

activities. The Conservation Plan includes life history information, threats, conservation needs, and specific measures. This Plan is the result of close work with the US Fish and Wildlife Service (USFWS) over a two-year period.

Craborchard Creek, Wells Branch, and Roberts Hollow are within the Reeds Creek – Powell River 6th level HUC watershed (060102060202) covered by the MFCP. Effects to the Federally Threatened blackside dace *Phoxinus cumberlandensis* will be discussed below in the "Effects to Species Covered by the MFCP" section of this document.

Other than the 7 species coded OAR 5, 6, or 9, no other TES species or associated potential habitat was seen during past field surveys or considered to exist within the project area.

Effects of Proposed Management Action on Each Identified Species

The analysis of possible effects to species identified as known or expected to occur in the vicinity of the proposed project, or likely to be impacted by the action includes the following existing information:

1. Data on species/habitat relationships.
2. Species range distribution.
3. Occurrences developed from past field surveys or field observations.
4. The amount, condition, and distribution of suitable habitat.

Effects to Endangered Species

Direct, Indirect and Cumulative Effects to Indiana Bat

Effects to the federally endangered Indiana bat (*Myotis sodalis*) were considered in this BE/BA because it is assumed the entire Forest is potential habitat for this species. See USFWS's Biological Opinion (BO) of January 13, 2004 and the Revised Land and Resource Management Plan for the Jefferson National Forest, 2004.

The project area contains potential habitat consisting of tree species of the size and type (mature forests with trees having exfoliating bark) known to be used by the Indiana bat. Based upon professional judgment and known cave surveys, there are no caves with winter microclimate habitat conditions suitable for Indiana bats in the project area and the area is not within either the primary or secondary cave protection areas surrounding known hibernacula.

Timber Harvest

As stated in the BO and Forest Plan, the retention of some snags, shagbark hickory, and hollow trees (as available) in this sale area would allow potential Indiana bat roost sites to be maintained. Decreasing canopy closure in the harvest units would increase the degree of exposure of some potential maternity roost trees to solar radiation, providing improved thermal conditions for raising young during a wide range of weather conditions. Harvest units would create insect-rich foraging areas and flight corridors leading to any potential roost tree. Harvesting would produce a mosaic of regeneration areas intermixed with mature and late successional forests. This will indirectly provide feeding areas since bats are known to forage

within the canopy openings of upland forests, over clearings with early successional vegetation, along the borders of croplands or wooded strips (fencerows), and over ponds. On the other hand, negative impacts to the Indiana bat would be: (a) the slight chance that individuals or small groups of roosting bats (including summer maternity colonies) may be unintentionally killed by the felling of trees harboring undetected roosts (e.g. dead limbs with loose bark, or small cavities in the boles), or by the accidental felling of occupied snags or damaged or hollow trees during timber harvest or other activities; and (b) a short-term reduction in the total amount of foraging habitat available to individual Indiana bats which would be the temporary result of regeneration cuts. Although the likelihood is very low, this project could result in the inadvertent loss of individual Indiana bats or small groups of Indiana bats, by the removal of some large-diameter hardwood trees occupied by bats during the period from approximately April 1 to October 15.

Prescribed Fire

The potential negative impacts to the Indiana bat will be the inadvertent loss of individual Indiana bats or small groups of Indiana bats, via burning of some large-diameter hardwood trees occupied by bats during the period from approximately April 1 to October 15.

This project-level analysis has tiered to the Jefferson National Forest's Revised Forest and Resource Management Plan (Forest Plan) and Final Environmental Impact Statement (FEIS). This project-level analysis includes, and is in addition to, the entire Indiana bat effects analysis (pages 3-175 through 184) documented in the Forest Plan EIS. Because of its length, the Forest Plan's discussion is not repeated here. However, findings of that analysis concluded that individual bats might be killed or harmed by such activities as associated with this project. Prescribed burning during the summer season could result in direct mortality or injury to the Indiana bat caused by burning or smoke inhalation, especially death to young bats that are not able to fly. Prescribed bums could consume standing snags,-thus removing potential roost trees. Living trees suitable as roosts could potentially be killed from the heat/flames from prescribed fire. While this may remove potential live roost trees, it is also likely that the fire will increase the availability of snags. Snags could be created either directly by fire mortality or indirectly by making them more susceptible to insect attacks or pathogens. Depending on the tree species, live trees subsequently killed by fire activity would remain as suitable potential roost trees until such a time that peeling/lost bark renders them unsuitable as summer roost sites.

Yet the U.S. Fish and Wildlife Service have determined that such take, within authorized levels, would be incidental take, and would not result in jeopardy to the Indiana bat. The maximum acres to be impacted by prescribed burning and the proposed timber harvest, as proposed in this project (2,800 acres), is about 20% of the16,800 acres (15,000 acres prescribed burning and 1,800 acres other activities) allowed to be altered annually on the Jefferson NF under the incidental take provisions of the Indiana bat Biological Opinion.

There is potential unoccupied habitat for the Indiana bat within the project area, but with implementation of measures described in the BO under the Terms and Conditions section of the Incidental Take Statement, there will be no cumulative effects. The USFWS also states in their BO that, "We also recognize that prescribed burning may improve habitat for the Indiana bat on the JNF by creating additional roost trees and open understory." They further state that,

"Prescribed fire may also improve Indiana bat foraging and roosting habitat by creating a mosaic of early to late successional forest stages. Prescribed burning most often results in some degree of midstory mortality to small-diameter trees and shrubs, producing more open understory conditions. Opening of the midstory may improve foraging and roosting habitat conditions. Individual mortality to trees would increase the number of snags and create scattered canopy gaps, which would improve roosting. Increased insect populations produced in burned areas for foraging is also likely to occur in successional years."

The U.S. Fish and Wildlife Service supported the Determination of Effect for the Indiana bat as follows:

> In the January 13, 2004 U.S. Fish and Wildlife Service's Biological Opinion concerning the Indiana bat on the Forest the following conclusion was reached, "After reviewing the current rangewide status of the Indiana bat, the environmental baseline for the action area, the effects of forest management and other activities on the JNF as described in the 2003 Revised Land and Resource Management Plan, and the cumulative effects, it is the FWS's biological opinion that implementation of forest management and other activities authorized as specified in the Jefferson Land and Resource Management Plan are not likely to jeopardize the continued existence of the Indiana bat. Critical habitat for this species has been designated in Kentucky, Tennessee, Illinois, Missouri, and West Virginia. However, this action does not affect those areas and no destruction or adverse modification of that critical habitat will occur as a result of JNF management activities". There are no foreseeable activities in the area that would directly affect the Indiana bat. Therefore there will be no cumulative effects to the Indiana bat.

Determination of Effect – Indiana Bat

For the Indiana bat this project will be in compliance with the BO issued by the USFWS on January 13, 2004 and therefore constitutes compliance with ESA Section 7 requirements. Since implementation of this project will be in compliance with, and tiers to, the BO that was issued as a result of formal consultation and it provides both specific Plan and project level direction, plus no new information has been identified as of this date, a finding of the effect to the Indiana bat for this proposed project is: no effect, beyond that which is already disclosed in the Revised Land and Resource Management Plan of March 2004 and by the USFWS in the BO of January 13, 2004. Therefore, given the project level effects analysis for the Indiana bat and the authorized level of incidental take, further Section 7 consultation is not necessary for the Indiana bat.

<u>Endangered Mussel Species Outlined in the Mussel and Fish Conservation Plan</u>

On April 23, 2004, the GWJNF received a letter from the USFWS stating:

> "Since the standards of this Conservation Plan were incorporated into the 2004 Jefferson Land Resource Management Plan (JLRMP), further consultation on activities that may affect listed mussels and fish is not required for projects that adhere to the conservation measures in the JLRMP and this Conservation Plan."

As agreed to by the USFWS, the development and implementation of this plan covers Section 7 consultation requirements under the Endangered Species Act, and serves as informal consultation.

Since implementation of this project will be in compliance with, and tiers to, the Conservation Plan that was developed as a result of informal consultation with the USFWS and it provides specific project level direction, plus no new information has been identified as of this date, a finding of the effect to these species for this proposed project is "may affect, not likely to adversely affect." Therefore, given the project level effects analysis for these species, further Section 7 consultation is not necessary.

A discussion of the habitat needs for the species covered by the Conservation Plan are given in Appendix A of the Mussel and Fish Conservation Plan (pp 24-28, in the project file). Habitat exists for one species identified from the Mussel and Fish Conservation Plan, blackside dace *Phoxinus cumberlandensis*, beyond the cumulative effects boundary for the project. A population of this Federally Threatened minnow species was introduced to the North Fork of the Powell River and has been found from several tributaries in the Reeds Creek 6th level HUC watershed. This species is most likely found in tributaries, not the main river and the known occurrences are well downstream from the cumulative effects boundary set for this project.

Therefore, there will be no measurable direct, indirect, or cumulative effects to the species covered by the Conservation Plan, other than the effects discussed above from the proposed management activities.

Effects to Threatened Species

Small whorled pogonia (*Isotria medeoloides*)

The small whorled pogonia is a federally listed Threatened plant, with the largest cluster of sites found in the Appalachian Mountains of New England and coastal Massachusetts, and two moderate-sized clusters centered in the southern Appalachians and the Coastal Plain and Piedmont of Virginia, Delaware, and New Jersey. The small whorled pogonia is a native orchid, usually found in acidic soils, in dry to mesic second-growth, deciduous or deciduous-coniferous forests. It typically is in an area with light to moderate leaf litter, an open herb layer (occasionally dense ferns), moderate to light shrub layer, and relatively open canopy. *Isotria medeoloides* frequently occurs on flats or slope bases near canopy breaks.

The project area contains a population of the small whorled pogonia discovered in 1994. Since its discovery, the population has been monitored annually. Over time, the number of flowering plants declined; until eventually, no plants emerged at all. After two years of no emergence, a plan to try to stimulate re-emergence, and hopefully flowering, was developed, based on recommendations from researchers and through informal consultation with the USFWS. The project involved selectively cutting down roughly half of the overstory canopy cover to stimulate the plants through increased sunlight reaching the forest floor. Monitoring since project implementation has not revealed emerging or flowering plants at the site.

At the request of the USFWS, additional surveys specifically for the small whorled pogonia were conducted in all areas proposed for ground disturbance. No additional individuals or populations were located.

Prescribed burns implemented in the past have protected the known occurrence of small whorled pogonia by placing temporary fire lines constructed with a leaf blower around the known

occurrence and misting the area periodically with water to prevent ignition from embers drifting into the site from the adjacent burn. These same measures would be implemented for this and future prescribed burns.

No harvest units, road building or skid trails/roads are planned in the vicinity of the small whorled pogonia.

Non-native, invasive weeds treatment will not be allowed in the immediate vicinity of the known occurrence. Treatments in the general area will be hand-application; targeting only nonnative species.

A "may affect, not likely to adversely affect" determination is therefore made for the small whorled pogonia for the proposed actions. Informal consultation with the USFWS is necessary.

Effects to Sensitive Species

Eastern small-footed bat *(Myotis leibii)*

The eastern small-footed bat is a Sensitive species that typically uses caves for hibernation, and roosts and sleeps in cracks and crevices in rock outcrops and clifflines during summer. Since there are no known caves in the project areas, there will be no effect on winter habitat. The harvest may be done during times when bats could be present in the clifflines/outcrops. Even though there is potential spring and summer roosting habitat in some of the project areas, clifflines in the project areas will be avoided in harvest units. Leave-trees will be "clumped," and may be located adjacent to or near significant clifflines/outcrops.

Harvest units would create insect-rich foraging areas and flight corridors. Fire burning over much of the prescribed burn area would be a backing fire that should not significantly alter the overstory around potential summer roosting habitat. Prescribed burning should thin the midstory, allowing for enhanced flight corridors for foraging. Like the other *Myotis* species mentioned above, the eastern small-footed bat is an insectivore, capturing its prey in flight. More open understory conditions should be favorable to this species as it forages.

Non-native, invasive weeds in the project area would be spot-treated with approved herbicides, and this should have a beneficial effect on the eastern small-footed bat. Spot treatment will remove competing vegetation. This will allow native vegetation to recover from the competition, and also allow native insects to better colonize and reproduce in the treated area. This should benefit the eastern small-footed bat.

Since likely roosting sites will be avoided during harvest, and prescribed burning, timber harvest, and herbicide treatment should enhance foraging for this species, the net effect should be beneficial. There will be no direct, indirect, or cumulative effect from the stand improvement, site preparation, stand improvement, or planting and seeding proposed post-harvest. The proposed actions should not impact the species as a whole, or cause a trend toward federal listing.

Diana fritillary (*Speyeria diana*)

The Diana fritillary butterfly is a Sensitive species that requires violet leaves for its overwintering larvae. The butterfly lays its eggs on the leaves of the host plant (the violets); the eggs hatch in the autumn and then metamorphose into the first larval stage. The larvae then pass the winter without eating; when spring returns, they complete their development, feeding

primarily at night. The Diana fritillary was not seen during field surveys of this project area, but favorable habitat is present and could be enhanced. Harvest may enhance some of the sites, creating open understory that violet species would favor. Prescribed burning should thin the midstory, allowing more light to reach the forest floor, and should favor the violet hosts of this species. The reopening and daylighting of roads in the project area should create favorable conditions for the growth of common milkweed *Asclepias syriaca*, a favorite food source for adults of this and many other butterflies. The project may decrease the current size of the local Diana fritillary population through:

- vehicle mortality from collisions with adults, and crushing of pupa, larvae, and eggs by skidders
- eggs, pupa, and larvae could be destroyed by prescribed fire, depending on the season of the burn
- short-term reduction in the larval and adult food sources by reduction in violets (for the larvae) directly impacted by the prescribed fire and reduction of the amount of milkweed available in the project area due to road improvements, maintenance, and brushing
- herbicide application could have a short term effect on the Diana fritillary, since the spot treatment of the non-native invasive plants may occasionally impact the violet species favored by the butterfly. Treatment would be confined to the spots of vegetation that occur along roads, so herbicide would not be applied in a continuous or large area. Removal of the non-native invasive plants will allow better growth of the native violets and milkweed, thus providing more food source in the long-term for the larvae and adults.

Wider roads clearances created by the road maintenance and brushing will provide better habitat for milkweed, and a more open canopy created by prescribed fire will benefit the violets. Due to the abundance of violet species found in the general area, the likelihood that prescribed burning and spot herbicide treatments will enhance the habitat for the violets favored by this species, and the likelihood of the re-population of the proposed harvest units by Diana fritillary present in adjacent stands, this project may impact individuals, but the actions should not affect the species as a whole, or cause a trend toward federal listing. There should be no direct, indirect, or cumulative effects to Diana fritillary from the proposed activities of this project.

In the long term, the net effect should be an improvement in habitat for both the larvae and adults of this species.

Small spreading pogonia *(Cleistes bifaria)*

The small spreading pogonia is a Sensitive species that may benefit from the effects of the proposed actions. *Cleistes bifaria* is an orchid that requires open habitat with a sparse woody canopy, and harvest would help create such a habitat by temporarily removing competing herbaceous vegetation and shrubs. Prescribed burning will also thin the midstory, allowing more light to reach the forest floor. Non-native, invasive weeds in the project area would be spot-treated with approved herbicides, and this should have a beneficial effect on the small spreading pogonia, since spot treatment will remove competing vegetation. This will allow the native vegetation to recover from the competition. This should benefit the small spreading pogonia.

There are known occurrences of *C. bifaria* in the project area, including some that occur in proposed harvest units. Depending on the placement of landings and skid trails, these individuals could be impacted. Individual plants not identified in surveys could be destroyed by skid road construction and skid trail traffic in harvest stands. Since the small spreading pogonia would in all likelihood benefit from clearing of vegetation both by timber harvest and spot herbicide treatments, and the thinning of the midstory by prescribed fire, there should be no net negative effects from this proposed action. This species is known from all counties of the Clinch Ranger District and known occurrences number in the hundreds. Therefore, the proposed actions should not impact the species as a whole, or cause a trend toward federal listing. There should be no direct, indirect, or cumulative effects to the small spreading pogonia from the proposed activities of this project.

In the long term, the net effect should be an improvement in habitat for this species.

Effects to sweet pinesap *(Monotropsis odorata)*

Sweet pinesap is a saprophytic, vascular plant inhabiting pine dominated forests and pine-oak heaths. It is a monotypic endemic species centered in the Appalachian Mountains, found more frequently in North Carolina and Virginia and becoming rarer towards the limits of its range. The range is from Maryland and West Virginia south to Alabama, Georgia and possibly Florida. This species is known to occur in at least 20 Virginia counties and has been found in the project area.

Sweet pinesap typically grows in well drained, dry to mesic, acidic soil in oak-heath woodlands, often with white pine and rhododendron. It flowers very early in the year (February to early April) and has been seen flowering when snow is on the ground. It is often overlooked since it grows well hidden under the leaf litter and is usually found by smell since it is quite fragrant.

Some individual sweet pinesap plants may be killed with implementation of the project by skidders, or placement of skid roads or landings. Harvest activities should have no effect on the sweet pinesap. Favoring oak species in the thinning areas should benefit the sweet pinesap in the long term since the sweet pinesap is saprophytic on oak roots.

Herbicide application should have no effect on the sweet pinesap, since a very small portion of the area would actually be spot treated. Treatment would be mostly confined to the spots of vegetation that occur along roads, so herbicide would not be applied in a continuous or large area.

Prescribed burning activities could impact individuals, but should be beneficial to the species as a whole since prescribed burning would favor the oaks, the sweet pinesap host.

While these proposed activities may impact individuals, the actions should not affect the species as a whole, or cause a trend toward federal listing. There should be no direct, indirect, or cumulative effects to the sweet pinesap from the proposed activities of this project.

Effects to Barrens tiger beetle *(Cicindela patruela)*

The Barrens tiger beetle is a Sensitive species, and is prefers dry sandy soils with sparse vegetation, such as along woodland roads and at edges of sandstone quarries. The beetle has a two-year life cycle, overwintering the first year as a mature larva and the second year as an adult. The adult will emerge in late summer, and may be encountered for a short time before hibernating. The beetle is usually more abundant during the following spring when it feeds and

reproduces; it then later dies during early summer. It may be generally uncommon, but abundant locally if suitable habitat is present.

The road re-construction associated with timber harvest may impact individuals by crushing or destroying larvae or their burrows, although adults can escape the machinery by flying away. Timber harvest itself should have no effect on the Barrens tiger beetle, since they are not typically found in a forested area.

Some beetles may be killed by a growing season burn; however, the Barrens tiger beetle is capable of flying quickly away from threats, or burrowing.

Spot application of herbicide may affect individuals since most of the applications would be along roadsides and in clearings, places where the Barrens tiger beetle would be found. Since these beetles and their larvae are predatory and very mobile (adults), they may consume other insects who may have consumed plants that have been treated with the herbicide. This action may affect individuals of the Barrens tiger beetles.

While these proposed actions may affect individuals, the actions should not affect the species as a whole, or cause a trend toward federal listing. There should be no direct, indirect, or cumulative effects to the Barrens tiger beetle from the proposed activities of this project.

Critical Habitat for Threatened and Endangered Aquatic Species

Critical habitat has been defined by the Fish and Wildlife service as:

> "A specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery."

Critical habitat for two fish species, yellowfin madtom and slender chub, has been identified in the mainstem Clinch and Powell Rivers, and in Copper Creek. Critical habitat has also been identified for four mussel species: the rough rabbitsfoot, oyster mussel, Cumberlandian combshell, and purple bean, in the mainstem Clinch and Powell Rivers, Indian Creek, and Copper Creek.

Determination of Effect to Critical Habitat

The Critical Habitat reaches in the mainstem Powell River defined above exist over 25 river miles downstream of the proposed burn unit, timber harvest, and associated projects. The designated critical habitat is well outside the cumulative effects boundary set by the hydrologic analysis, the point beyond which the effects from the proposed action would be immeasurable and indistinguishable from background levels.

Therefore, there will be no measurable direct or indirect cumulative effects on designated critical habitat. There will be no destruction or adverse modification to designated critical habitat.

Determinations of Effect to species

The proposed project will have no effect or no effect beyond that which has previously been determined during formal and informal consultation with the USFWS on any federally listed threatened, endangered, or proposed species.

The project will have no impact on sensitive species.

APPENDIX A
Documentation of Threatened, Endangered or Sensitive Species Occurrences for
Wells Branch Vegetation Management Project
Coding for Occurrence Analysis Results (OAR)

Forest update September 8, 2009 (based on Region 8 sensitive species list effective Jan. 1, 2002)

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
VERTEBRATES										
Fish										
7		X	Ammocrypta clara	Western sand darter	Clinch R, Powell R	Aquatic-rivers	S	G3	S1	-
1		X	Cottus baileyi	Black sculpin	Little R, Upper Clinch R, S Fork Holston R	Aquatic-streams	S	G4Q	S2	-
1		X	Cyprinella monacha	Spotfin chub	Lower N Fk Holston R	Aquatic-streams	T	G2	S1	-
7		X	Erimystax cahni	Slender chub	Two sites - Powell R, Lee Co	Aquatic-rivers	T	G1	S1	-
1		X	Etheostoma acuticeps	Sharphead darter	S and Middle Fk Holston R	Aquatic-rivers	S	G3	S1	-
1		X	Etheostoma susanae	Cumberland Johnny darter	Endemic to Upper Cumberland R watershed near VA	Aquatic-streams	S	G2	S1 (KY)	-
1		X	Etheostoma osburni	Candy darter	Big Stony Ck, Laurel Fork in New R watershed	Aquatic-streams	S	G3	S1	S2
1		X	Etheostoma percnurum	Duskytail darter	Copper Ck, Clinch R	Aquatic-rivers	E	G1	S1	-
1		X	Etheostoma tippecanoe	Tippecanoe darter	Four sites Clinch R, lower Copper Ck	Aquatic-rivers	S	G2	S1	S2
7		X	Icthyomyzon greeleyi	Mountain brook lamprey	M, N Fk Holston R, Copper Ck, Indian Ck, Clinch R, Powell R	Aquatic-rivers	S	G3G4	S2	S1
7		X	Notropis ariommus	Popeye shiner	N Fk Holston R, Clinch R, Powell R	Aquatic-rivers	S	G3	S2S3	S2
1	X	X	Notropis semperasper	Roughhead shiner	Upper James R watershed above Buchanan	Aquatic-rivers	S	G2G3	S2S3	-
7		X	Noturus flavipinnis	Yellowfin madtom	Lower and Middle reaches of Copper Ck, Powell R	Aquatic-streams	T	G1	S1	-
1	X	X	Noturus gilberti	Orangefin madtom	S Fk Roanoke R watershed, Roanoke R above Salem, Craig Ck, Johns Ck, Cowpasture R	Aquatic-streams	S	G2	S2	-
1		X	Percina burtoni	Blotchside logperch	N Fk Holston R, Clinch R, Copper Ck, Little R	Aquatic-rivers	S	G2	S1	-
1		X	Percina macrocephala	Longhead darter	N Fk Holston R above Saltville, lower Copper Ck	Aquatic-rivers	S	G3	S1S2	S2
1		X	Percina rex	Roanoke logperch	Upper Roanoke R watershed	Aquatic-rivers	E	G1G2	S1S2	-
1		X	Phenacobius crassilabrum	Fatlips minnow	Unimpounded lower S Fk Holston R, Whitetop Laurel Ck	Aquatic-rivers	S	G3G4	S2	-
1		X	Phenacobius teretulus	Kanawha minnow	Upper New R watershed	Aquatic-streams	S	G3G4	S2S3	S1
9		X	Phoxinus cumberlandensis	Blackside dace	Upper Cumberland R, Upper Powell R, Poor Fk Cumberland R	Aquatic-streams	T	G2	S1	S3 (KY)
1		X	Phoxinus tennesseensis	Tennessee dace	Lick Ck, N Fk Holston R, Beaverdam Ck, M Fk Holston R	Aquatic-streams	S	G3	S1	-
Amphibian										
1		X	Plethodon hubrichti	Peaks of Otter salamander	Peaks of Otter, Apple Orchard Mtn	Mixed oak, late successional with loose rocks and logs, >1800'	S	G2	S2	-
1	X		Plethodon punctatus	Cow Knob salamander	Shenandoah Mtn, VA & WV	Mixed oak, late successional with loose rocks and logs, >2500'	S	G3	S2	S1
1	X		Plethodon shenandoah	Shenandoah salamander	Three isolated populations in SNP: Hawksbill Mtn, The Pinnacles, Stony Man Mtn. GW occurrence questionable.	Talus slopes	E	G1	S1	-
1		X	Plethodon welleri	Weller's salamander	Mt Rogers & Whitetop Mtn	Spruce-fir forests and adjacent northern hardwoods	S	G3	S2	-
Birds										
1	X	X	Falco peregrinus	Peregrine Falcon	Hack sites late 80s & early 90s – Mt Rogers, Grayson; Cole Mtn, Amherst; Big Schloss, Shenandoah; Elliot Knob, Augusta; High Knob, Rockingham Cos. No nests, current migrant.	Nests on ledges or cliffs, buildings, bridges, quarry walls. Non-breeding sites, farmland, open country, lakeshores, broad river valleys, airports. Prefers pigeons, ducks.	S	G4	S1B/S2N	S1B/S2N
1	X		Haliaeetus leucocephalus	Bald Eagle	Potomac R, James R watershed	Feeds and nests on or near large lakes and rivers	S	G5	S2S3B/S3N	S2B/S3N
1	X		Lanius ludovicianus migrans	Migrant Loggerhead Shrike	Ridge & Valley (Shenandoah Valley)	Open grasslands with trees and shrubs, fencerows	S	G4	S2B/S3N	S1B/S2N
1	X	X	Thryomanes bewickii altus	Appalachian Bewick's wren	Historical records in Botetourt, Giles, Highland Washington Cos	Thickets, old fields, fencerows, old home sites	S	G5T2Q	S1B/SZN	S1B/S1N

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
Mammals										
2	X	X	Corynorhinus townsendii virginianus	Virginia big-eared bat	Summer: VA - Tazewell Co. (3 caves), Highland Co. (1 cave), WV - Pendleton Co. (4 caves); Winter: Highland, Rockingham, Bland, & Tazewell Cos. (6 caves), Pendleton Co. (6 caves), largest VA population in Tazewell Co. & largest WV population in Pendleton Co. Small #'s of bats (usually <10) in a few other widely scattered caves during summer months. Bath & Pulaski County records are historic, no occupied caves currently known.	Resides in caves winter and summer. Short distance migrant (<40 miles) between winter and summer caves. Forages primarily on moths and foraging habitat is common (fields, forests, meadows, etc.). Forages within 6 miles of summer caves. USFWS Critical Habitat is 5 caves in WV (4 Pendleton Co. & 1 Tucker Co.). Closest Critical Habitat cave to GWJNF is ~3 miles in Pendleton Co., WV. OAR code of "2" used when project further than 6 miles from summer or winter occupied cave.	E	G4T2	S1	S2
1		X	Glaucomys sabrinus coloratus	Carolina northern flying squirrel	Mt Rogers & Whitetop area	Spruce-fir forests and adjacent northern hardwoods	E	G5T1	S1	-
1	X		Glaucomys sabrinus fuscus	Virginia northern flying squirrel	Laurel Fork area, Highland Co	Spruce-fir forests and adjacent northern hardwoods	S	G5T2	S1	S2
1	X		Microtus chrotorrhinus carolinensis	Southern rock vole	Alleghany Mtn, Bath Co	Cool, moist, mossy talus under oaks/northern hardwoods	S	G4T3	S1	S2
1		X	Myotis grisescens	Gray bat	Ridge & Valley, Clinch R watershed	Caves winter and summer, forages widely	E	G3	S1S2	-
6	X	X	Myotis leibii	Eastern small-footed bat	Ridge & Valley	Hibernates in caves during winter, roosts in crevices of large rock outcrops, cliffs, & under large rocks in talus & boulder-fields during summer, forages widely in all forested and open habitat types over both ridges and valleys.	S	G3	S1	S1
6	X	X	Myotis sodalis	Indiana bat	Blue Ridge, Ridge & Valley, Cumberland Mtns	Caves winter, upland hardwoods summer, forages widely along riparian areas and open woodlands	E	G2	S1	S1
1	X		Sorex palustris punctulatus	Southern water shrew	Alleghany Mtn, Bath Co; & Laurel Fork, Highland Co	Riparian areas w/in spruce-fir forests and northern hardwoods	S	G5T3	S1S2	S1
INVERTEBRATES										
Snail (Mollusk, Class Gastropoda)										
1	X	X	Glyphyalinia raderi	Maryland glyph	Alleghany, Montgomery Cos	Calciphile, edge of seeps within leaf litter	S	G2	S1S2	S2
1	X		Helicodiscus diadema	Shaggy coil	Alleghany Co	Calciphile, limestone rubble and talus	S	G1	S1	-
1	X		Helicodiscus lirellus	Rubble coil	Rockbridge Co	Calciphile, limestone rubble and talus	S	G1	S1	-
1	X	X	Helicodiscus triodus	Talus coil	Alleghany, Botetourt, Rockbridge Cos	Calciphile, limestone rubble on wooded hillsides and caves	S	G2	S1S2	SH
1		X	Io fluvialis	Spiny riversnail	Clinch R, N Fk Holston R	Aquatic-rivers	S	G2	S2	-
1		X	Paravitrea reesi	Round supercoil	Monroe, Summers Cos, WV	Calcareous woodlands and glades	S	G3	S2	S1
Clam and Mussel (Mollusk, Class Bivalvia)										
1	X		Alasmidonta varicosa	Brook floater	Potomac drainage	Aquatic-rivers	S	G3	S1	S1
1		X	Cumberlandia monodonta	Spectacle case	2 sites Clinch R	Aquatic-rivers	S	G2G3	S1	-
1		X	Cyprogenia stegaria	Fanshell	Lower Clinch R, Scott Co	Aquatic-rivers	E	G1	S1	S1
7		X	Dromus dromas	Dromedary pearlymussel	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	E	G1	S1	-
1	X	X	Elliptio lanceolata	Yellow lance	Roanoke R, James R	Aquatic-rivers	S	G2G3	S2S3	-
7		X	Epioblasma brevidens	Cumberlandian combshell	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	E	G1	S1	-
7		X	Epioblasma capsaeformis	Oyster mussel	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	E	G1	S1	-
1		X	Epioblasma florentina walkeri	Tan riffleshell	Clinch R, M Fk Holston R, N Fk Holston R	Aquatic-rivers	E	G1T1	S1	-
1		X	Epioblasma torulosa gubernaculum	Green-blossom pearlymussel	Clinch R, N Fk Holston R	Aquatic-rivers	E	G2TX	SX	-
7		X	Epioblasma triquetra	Snuffbox	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	S	G3	S1	S2
7		X	Fusconaia barnesiana	Tennessee pigtoe	Clinch R, Powell R, N Middle, S Fk Holston R	Aquatic-rivers	S	G2G3	S2	-
7		X	Fusconaia cor	Shiny pigtoe	Clinch R, Powell R, N Fk Holston R, Copper Ck	Aquatic-rivers	E	G1	S1	-
7		X	Fusconaia cuneolus	Fine-rayed pigtoe	Clinch R, Powell R, Copper Ck, Little R	Aquatic-rivers	E	G1	S1	-
1		X	Fusconaia masoni	Atlantic pigtoe	Roanoke R, Craig Ck drainage	Aquatic-rivers	S	G2	S2	-
7		X	Hemistena lata	Cracking pearlymussel	Clinch R, Powell R	Aquatic-rivers	E	G1	S1	-
1		X	Lampsilis abrupta	Pink mucket	Clinch R	Aquatic-rivers	E	G2	SX	S1
1		X	Lasmigona holstonia	Tennessee heelsplitter	Upper Clinch, N and M Fk Holston R drainages; Wolf Ck, Bland Co below Burkes Garden	Aquatic-streams	S	G3	S1	-
1	X		Lasmigona subviridis	Green floater	Widely distributed in N & S Fk Shenandoah R, Pedlar R, James R	Aquatic-rivers	S	G3	S2	S2
7		X	Lemiox rimosus	Birdwing pearlymussel	Clinch R, Powell R, Copper Ck, Little R	Aquatic-rivers	E	G1	S1	-
1		X	Lexingtonia dolabelloides	Slabside pearlymussel	Clinch R, M Fk Holston, N Fk Holston R	Aquatic-rivers	S	G2	S2	-
1		X	Pegias fabula	Little-winged pearlymussel	Clinch R, N Fk Holston R, Little R	Aquatic-streams	E	G1	S1	-
7		X	Plethobasus cyphyus	Sheepnose	Clinch R, Powell R	Aquatic-rivers	S	G3	S1	S1
1	X	X	Pleurobema collina	James spinymussel	Potts Ck, Craig Ck, Johns Ck, Patterson Run, Pedlar R, Cowpasture R, Mill Ck (Deerfield)	Aquatic-rivers	E	G1	S1	S1
1		X	Pleurobema cordatum	Ohio pigtoe	Clinch R	Aquatic-rivers	S	G3	S1	S2
1		X	Pleurobema oviforme	Tennessee clubshell	Clinch R, Powell R, N, Middle, S Fk Holston R	Aquatic-streams	S	G3	S2S3	-
1		X	Pleurobema plenum	Rough pigtoe	Clinch R	Aquatic-rivers	E	G1	SH	-
1		X	Pleurobema rubrum	Pyramid pigtoe	Upper Clinch R	Aquatic-rivers	S	G2	S1	-
7		X	Quadrula cylindrica strigillata	Rough rabbitsfoot	Clinch R, Powell R, N Fk Holston R, Copper Ck	Aquatic-streams	E	G3T2	S2	-
7		X	Quadrula intermedia	Cumberland monkeyface	Powell R	Aquatic-rivers	E	G1	S1	-

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
7		X	Quadrula sparsa	Appalachian monkeyface	Clinch R, Powell R	Aquatic-rivers	E	G1	S1	-
1		X	Toxolasma lividus	Purple lilliput	N Fk Holston R, Clinch R	Aquatic-rivers	S	G2	S1	-
1		X	Villosa perpurpurea	Purple bean	Clinch R, Copper Ck	Aquatic-rivers	E	G1	S1	-
1		X	Villosa trabalis	Cumberland bean	Clinch R	Aquatic-rivers	E	G1	SX	-
Spider (Arachnid)										
1		X	Microhexura montivaga	Spruce-fir moss spider	Mt Rogers	Damp, well-drained moss and liverwort mats on boulders in mature spruce-fir forests	E	G1	S1	-
Pseudoscorpion (Arachnid, Order Pseudoscoriones)										
1		X	Kleptochthonius orpheus	Orpheus cave pseudoscorpion	Patton cave, Monroe Co, WV	Caves	S	G1	-	S1
Amphipod (Crustacean, Order Amphipoda)										
1		X	Stygobromus abditus	James cave amphipod	James & Sam Bells caves, Pulaski Co; Watsons cave, Wythe Co; & other New River caves	Caves	S	G2G3	S2	-
2		X	Stygobromus cumberlandus	Cumberland cave amphipod	Lee, Scott, Wise Cos	Caves	S	G3G4	S1S2	-
1		X	Stygobromus estesi	Craig County cave amphipod	Caves in Upper Sinking Ck Valley and Potts Ck, Poverty Hollow seeps, Captain seeps	Caves, seeps	S	G4	S3	-
1		X	Stygobromus fergusoni	Montgomery County cave amphipod	Botetourt, Montgomery Cos	Caves	S	G2G3	S1	-
1	X		Stygobromus gracilipes	Shenandoah Valley cave amphipod	Frederick, Rockingham, Shenandoah, Warren Cos	Caves	S	G3G4	S2S3	S1
1	X		Stygobromus hoffmani	Alleghany County cave amphipod	Lowmoore cave, Alleghany Co	Caves	S	G1	S1	-
1	X		Stygobromus mundus	Bath County cave amphipod	Alleghany, Bath Cos	Caves	S	G2G3	S1S2	-
Isopod (Crustacean, Order Isopoda)										
1		X	Caecidotea incurva	Incurved cave isopod	Smyth, Wythe Cos	Caves	S	G2G4	S2	-
1	X	X	Miktoniscus racovitzai	Racovitza's terrestrial cave isopod	Alleghany, Botetourt, Page, Rockbridge, Shenandoah Cos	Caves	S	G3G4	S2	-
Millipede (Class Diplopoda)										
1		X	Brachoria dentata	a millipede	Known only from Pennington Gap and Cave Spring Recreation Area, Lee Co	Leaf litter, deciduous forests	S	G1	S1	-
1		X	Brachoria eutypa ethotela	Hungry Mother millipede	Pine Mtn above Troutdale	Leaf litter, deciduous forests	S	G2	S2	-
1		X	Buotus carolinus	a millipede	Brush Mtn, Whitetop Mtn, Apple Orchard Mtn, Tazewell Beartown	Beech leaf litter, deciduous forests	S	G1	S1	-
1		X	Cleidogona hoffmani	Hoffman's cleidogonid millipede	Mt Rogers, Whitetop Mtn, Elk Garden; Hamilton cave (private) Bland Co	Mountaintop species, leaf litter, deciduous forests	S	G2	S2	-
1		X	Cleidogona lachesis	a millipede	Whitetop Mtn & Mt Rogers	Beech leaf litter, deciduous forests	S	G2	S1	-
1		X	Dixioria fowleri	Fowler's millipede	Walker Mtn; Comers Rock on Iron Mtn; Laurel Ck, Damascas; 1/2 mile west of NRA office; Tazewell Beartown	Leaf litter, deciduous forests	S	G2	S2	-
1		X	Dixioria pela coronata	a millipede	Endemic to Mt Rogers	Leaf litter, northern hardwood and spruce-fir forests. Altitudinally restricted, >5000'.	S	G2T2	S2	-
1	X		Nannaria shenandoah	Shenandoah Mountain Xystodesmid millipede	One site: along Long Run Road, Rockingham Co	Leaf litter, mixed oak forest	S	G1	S1	-
1	X		Pseudotremia alecto	a millipede	Griffith Knob, Alleghany Co; near Mountain Grove saltpetre cave, Bath Co	Leaf litter, deciduous forests	S	G1	S1	-
1	X	X	Semionellus placidus	a millipede	Hawksbill Mtn, Apple Orchard Mtn, Tomahawk Mtn	Leaf litter, deciduous forests	S	G3	S2	-
Centipede (Insect, Order Chilopoda)										
1	X	X	Escaryus cryptorobius	Montane centipede	The Priest, Nelson Co; Whitetop Mtn, Washington Co	Upper soil horizon, spruce - birch forests	S	G2	S2	-
1		X	Escaryus orestes	Whitetop Mountain centipede	Whitetop Mtn, Washington Co	Dark moist soil and litter, spruce - birch forests	S	G1G2	S1S2	-
1	X		Nampabius turbator	a cave centipede	One known site: Lowmoore cave, Alleghany Co	Caves	S	G1G2	S1	-
Springtail (Insect, Order Collembola)										
2	X	X	Arrhopalites carolynae	A cave springtail	Augusta, Highland, Bath, Lee, Wise Cos	Caves	S	G2G4	S1	-
2		X	Arrhopalites commorus	A cave springtail	Giles, Lee, Wise Cos	Caves	S	G2G4	S1	-
1	X		Arrhopalites sacer	A cave springtail	Bath Co	Caves	S	G1G2	S1	-
Mayfly (Insect, Order Ephemeroptera)										
1		X	Leptophlebia johnsoni	Johnson's prong-gill mayfly	One location: Lewis Fk north slope Mt Rogers	Aquatic-streams	S	G4	S1	-
Dragonfly and Damselfly (Insect, Order Odonata)										
1	X	X	Gomphus viridifrons	Green-faced clubtail	New R, Craig Ck, Pound R, Locust Spring	Aquatic-rivers	S	G3	S2	S2
1		X	Ophiogomphus incurvatus alleghaniensis	Allegheny snaketail	Rich Ck, Giles Co	Aquatic-streams	S	G3T3	S1	S1
Stonefly (Insect, Order Plecoptera)										
1		X	Acroneuria kosztarabi	Virginia stonefly	Station Spring Ck, Tazewell Co	Aquatic-streams	S	G1	S1	-
1		X	Isoperla major	Big stripetail stonefly	Burkes Garden, Tazewell Co	Aquatic-streams	S	G1	S1	-
1		X	Megaleuctra williamsae	Smokies needlefly	Mt Rogers & Whitetop Mtn	Aquatic-streams	S	G2	S1	-
1		X	Taeniopteryx nelsoni	Cryptic willowfly	Lewis Fk & Grindstone Branch N of Mt Rogers	Aquatic-streams	S	G1	S1	-
Beetle (Insect, Order Cloeoptera)										
1	X	X	Cicindela ancocisconensis	Appalachian tiger beetle	Alleghany, Bath, Highland, Lee, Rockbridge, Washington, Wise Cos	Riparian – sandy/silty edges of streams and rivers	S	G3	S2	S3
6	X	X	Cicindela patruela	Northern barrens tiger beetle	Blue Ridge, Ridge & Valley	Eroded slopes of exposed sandstone and conglomerate	S	G3	S2	S2S3
1		X	Cyclotrachelus incisus	a ground beetle	Breaks Interstate Park, Dickenson Co	Dry, well drained site, red maple, magnolia, mountain laurel	S	G4	S1	-

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1	X	X	Hydraena maureenae	Maureen's shale stream beetle	Alleghany, Bath, Botetourt, Bland, Craig, Cos	Interstitial water in riparian-shale substrate along stream edge	S	G1G3	S1S3	-
Scorpionfly (Insect, Order Mecoptera)										
1		X	Brachypanorpa jeffersoni	Jefferson's short-nosed scorpionfly	Sugar Run Mountain, Giles Co; Whitetop Mtn, Smyth Co	Moist soil around seeps. Only known from high elevation. Larvae use short burrows in loose soil and moss.	S	G2	S1S2	-
Butterfly and Moth (Insect, Order Lepidoptera)										
1	X	X	Callophrys irus	Frosted elfin	Frederick, Montgomery, Page, Roanoke Cos	Dry, open woods, clearings, and road/powerline ROWs w/ abundant wild indigo (*Baptisia tinctoria*)	S	G3	S2?	S1
2	X	X	Erynnis persius persius	Persius duskywing	Blue Ridge, Ridge & Valley	Bogs, wet meadows, open seepages in boreal forests	S	G5T1T3	S1	-
2	X		Pyrgus centaureae wyandot	Appalachian grizzled skipper	Ridge & Valley	Shale barrens, open shaley oak woodlands	S	G5T1T2	S1S2	S1
6	X	X	Speyeria diana	Diana fritillary	Blue Ridge, Ridge & Valley	Grasslands-shrublands, near streams with thistles and milkweeds, larval host plant, violets	S	G3G4	S3	S2S3
1	X	X	Speyeria idalia idalia	Regal fritillary	Blue Ridge, Ridge & Valley	Riparian, grasslands-shrublands	S	G3T1Q	S1	S1
1	X	X	Catocala herodias gerhardi	Herodias underwing	Bald Knob, Bath; Poverty Hollow, Montgomery Co; Sand Mtn, Wythe Co (non FS property)	Pitch pine/bear oak scrub woodlands, >3000'	S	G3T3	S2S3	SU
1	X		Erythroecia hebardi	Hebard's noctuid moth	Bath Co	Rich, mesic hardwood forest. Larvae host plant is Canada horse-balm (*Collinsonia canadensis*).	S	GU	SH	-
1	X		Euchlaena milnei	Milne's euchlaena moth	Warm Springs Mtn, Catawba Creek Slopes, Sweet Spring Hollow, Salt Pond Mtn. (Doe Creek)	Moist, forested slopes of mixed pine hardwoods. Acidic oak woods.	S	G2G4	S2	S2
NON-VASCULAR PLANTS										
Lichen										
1		X	Gymnoderma lineare	Rock gnome lichen	Whitop Mtn.	Spruce-fir forests	S	G2	S1	-
1	X	X	Hydrothyria venosa	Waterfan	Amherst, Alleghany, Bedford, Botetourt, Giles, Madison, Nelson, Rockbridge, Shenandoah Cos	Aquatic – in streams/springs/cascades	S	G3G5	S1	-
1		X	Hypotrachyna virginica	a foliose lichen	Mt Rogers & Whitetop Mtn	Spruce-fir forests	S	G1G2	S1	-
Liverwort										
1		X	Bazzania nudicaulis	a liverwort	Mt Rogers & Whitetop Mtn	Bark and rock outcrops in spruce-fir forests	S	G2G3	S?	-
1		X	Frullania oakesiana	a liverwort	Mt Rogers & Whitetop Mtn	Bark in spruce-fir forests	S	G3?	S?	-
1		X	Mertzgeria fruticulosa	a liverwort	Whitetop Mtn	Bark in spruce-fir forests, >5000'	S	G2Q	S?	-
1		X	Nardia lescurii	a liverwort	Blue Ridge, Ridge & Valley	Riparian – on peaty soil over rocks, usually in shade and associated w/ water, <3000'	S	G3?	SU	-
1		X	Plagiochila austinii	a liverwort	Little Stony Ck – Cascades; Red Ck on Beartown Mtn	Rich, moist, densely forested ravines; shaded outcrops	S	G3	S?	-
1		X	Plagiochila sullivantii var sullivantii	a liverwort	Whitetop Mtn, Salt Pond Mtn	Moist shaded rock outcrops, under cliff ledges, in crevices	S	G2T2	S?	-
1		X	Sphenolobopsis pearsonii	a liverwort	Mt Rogers & Whitetop Mtn	Bark of Fraser fir, mountain ash, occasionally red spruce, >5000'	S	G2	S?	-
Moss										
1		X	Sphagnum flavicomans	a peatmoss	Whitetop Mtn	Bogs, seeps	S	G3	SU	-
VASCULAR PLANTS										
3	X	X	Aconitum reclinatum	Trailing white monkshood	Blue Ridge, Ridge & Valley	Rich cove sites, streambanks, seepages all with high pH	S	G3	S3	S3
1	X	X	Allium oxyphilum	Nodding onion	Monroe, Summers, Mercer, Greenbrier Cos, WV	Shale barrens, sandstone glades	S	G2Q	-	S2
2	X	X	Arabis patens	Spreading rockcress	Frederick, Lee, Page, Shenandoah, Warren Cos	Shaded, calcareous cliffs, bluffs, and talus slopes	S	G3	S2	S2
1	X		Arabis serotina	Shale barren rockcress	Ridge & Valley N of New R watershed	Shale barrens and adjacent open oak woods	E	G2	S2	S2
3	X	X	Berberis canadensis	American barberry	Blue Ridge, Ridge & Valley	Calcareous open woods, bluffs, cliffs, and along fencerows	S	G3	S3S4	S1
1		X	Betula uber	Virginia round-leaf birch	One location: Cressy Ck, Smyth Co	Riparian, mixed open forest, usually disturbed sites	T	G1Q	S1	-
1		X	Botrychium jennmanii	Dixie grapefern	Scott, Wise Cos	Open woods, old fields, pastures	S	G3G4	S1	-
3	X	X	Buckleya distichophylla	Piratebush	Blue Ridge S of Roanoke R, Ridge & Valley S of James R	Open oak and hemlock woods	S	G2	S2	-
3	X	X	Cardamine clematitis	Mountain bittercress	Blue Ridge, Ridge & Valley, S of New R watershed	Riparian, spring seeps, rocky streamsides	S	G3	S1	-
3	X	X	Cardamine flagellifera	Bittercress	Blue Ridge, Ridge & Valley, S of New R watershed	Riparian, spring seeps, rocky streamsides	S	G3	SH	S2
1	X	X	Carex polymorpha	Variable sedge	Blue Ridge, Ridge & Valley, N of James R	Open acid soil, oak-heath woodlands, responds to fire	S	G3	S2	S1
1	X	X	Carex schweinitzii	Schweinitz's sedge	Bath, Montgomery, Pulaski, Washington Cos	Bogs, limestone fens, marl marshes	S	G3G4	S1	-
1		X	Chelone cuthbertii	Cuthbert turtlehead	Blue Ridge Plateau, Grayson, Carroll Cos	Bogs, wet meadows, boggy woods and thickets	S	G3	S2	-
3		X	Cimicifuga rubifolia	Appalachian bugbane	Lower Clinch R watershed	Moist, rich wooded bluffs over limestone	S	G3	S2	-
5		X	Cleistes bifaria	Small spreading pogonia	Craig, Dickenson, Scott, Wise Cos	Well drained, rather open, scrubby hillsides, oak-pine-heath woodlands, acidic soils	S	G4?	S2	S1
1		X	Clematis addisonii	Addison's leatherflower	Montgomery, Roanoke, Botetourt, Rockbridge Cos	Open glades & rich woods over limestone & dolostone	S	G2	S2	-
2	X	X	Clematis coactilis	Virginia white-haired leatherflower	Ridge & Valley, Rockbridge Co, S to Wythe Co	Shale barrens, rocky calcareous woodlands	S	G3	S3	-

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1	X	X	Corallorhiza bentleyi	Bentley's coralroot	Alleghany, Bath, Giles Cos VA; Monroe, Pocahontas Cos WV	Dry, acid woods, along roadsides, well-shaded trails	S	G1G2	S1	S1
3	X	X	Delphinium exaltatum	Tall larkspur	Blue Ridge, Ridge & Valley	Dry calcareous soil in open grassy glades or thin woodlands	S	G3	S3	S2
1	X		Echinodorus tenellus	Dwarf burhead	Pines Chapel Pond, Augusta Co	Pond margins, wet depressions in sandy soil	S	G5?	S1	-
1	X	X	Echinacea laevigata	Smooth coneflower	Alleghany, Montgomery Cos	Open woodlands and glades over limestone or dolomite	E	G2G3	S2	-
3	X	X	Euphorbia purpurea	Glade spurge	Blue Ridge, Ridge & Valley	Rich, swampy woods, seeps and thickets	S	G3	S2	S2
1		X	Gentiana austromontana	Appalachian gentian	Mt Rogers, Whitetop Mtn, High Knob	High elevation forests and grassy balds. Southern Appalachian endemic.	S	G3	S3	S1
1		X	Hasteola suaveolens	Sweet-scented Indian-plantain	Giles, Montgomery, Pulaski Cos	Riverbanks, wet meadows	S	G4	S2	S3
1	X		Heuchera alba	White alumroot	Shenandoah Mtn	High elevation rocky woods and bluffs	S	G2Q	S2?	S2
1	X	X	Hypericum mitchellianum	Blue Ridge St. John's-wort	Blue Ridge, Ridge & Valley	Grassy balds, forest seepages, moderate to high elevations	S	G3	S3	S1
1	X		Helenium virginicum	Virginia sneezeweed	Endemic to Augusta, Rockingham Cos	Seasonally dry meadows and sinkhole depressions	T	G3	S2	-
1	X		Helonias bullata	Swamp-pink	Augusta, Nelson Cos	Sphagnum bogs, seeps, and streamsides	T	G3	S2S3	-
1	X	X	Ilex collina	Long-stalked holly	Blue Ridge, Ridge & Valley	Bogs, seep, shrubby streamheads, >3100'	S	G3	S2	S2
1		X	Iliamna corei	Peter's Mountain-mallow	One location: Narrows, Peters Mountain, Giles Co	Rich, open woods along sandstone outcrops, soil pockets, fire maintained	E	G1Q	S1	-
1	X	X	Iliamna remota	Kankakee globe-mallow	Alleghany, Botetourt, Rockbridge, Bedford Cos	Open, disturbed riverbanks and roadsides	S	G1Q	S1	-
1	X		Isoetes virginica	Virginia quillwort	Augusta Co	Seasonally dry sinkhole depressions	S	G1	S1?	-
4	X	X	Isotria medeoloides	Small whorled pogonia	In mountains of VA known only from Bedford, Craig, and Lee Cos; other VA occurrences in Piedmont & Coastal Plain	Open, mixed hardwood forests on level to gently sloping terrain with north to east aspect	T	G2	S2	S1
3	X	X	Juglans cinerea	Butternut	Blue Ridge, Ridge & Valley	Well-drained bottomland and floodplain, rich mesophytic forests mostly along toeslopes	S	G4	S3?	S3
3	X	X	Liatris helleri	Turgid Gayfeather	Blue Ridge, Ridge & Valley	Shale barrens, mountain hillside openings	S	G3	S3	S2
3		X	Lilium grayi	Gray's lily	Blue Ridge, Mt Rogers & Whitetop Mtn (occurrences north of Floyd Co questionable)	Bogs, open seeps, wet meadows, grassy balds	S	G3	S2	-
1	X		Lycopodiella margueritae	Marguerite's clubmoss	Bath Co	Seasonally moist soils, wet acidic ditches, borrow pits	S	G2	NA	-
5	X	X	Monotropsis odorata	Sweet pinesap	Blue Ridge, Ridge & Valley	Dry oak-pine-heath woodlands, soil usually sandy	S	G3	S3	S1
2		X	Packera millefolium	Piedmont ragwort	Lee, Scott Cos	Open limestone outcrops and cedar barrens	S	G2	S2	-
2	X		Paxistima canbyi	Canby's mountain lover	Ridge & Valley	Calcareous cliffs and bluffs, usually undercut by stream	S	G2	S2	S2
3	X	X	Phlox buckleyi	Sword-leaf phlox	Blue Ridge, Ridge & Valley	Open, often dry oak woodlands and rocky slopes, usually over shale in humus rich soils, often along roadsides	S	G2	S2	S2
2	X	X	Poa paludigena	Bog bluegrass	Blue Ridge, Ridge & Valley	Shrub swamps and seeps, usually under shade	S	G3	S2	S1
1	X		Potamogeton hillii	Hill's pondweed	Bath Co	Clear, cold calcareous ponds	S	G3	S1	-
3	X		Potamogeton tennesseensis	Tennessee pondweed	Ridge & Valley	Ponds, back water of streams and rivers	S	G2	S1	S2
1		X	Prenanthes roanensis	Roan Mountain rattlesnake-root	Mt Rogers & Whitetop Mtn	Grassy balds, open high elevation forests and outcrops	S	G3	S3	-
1	X	X	Pycnanthemum torrei	Torrey's mountain-mint	Bland, Bath, Giles Rockbridge, Wythe Cos	Open, dry rocky woods, roadsides, and thickets near streams, heavy clay soil over calcareous rock	S	G2	S2?	S1
1		X	Rudbeckia triloba var. pinnatiloba	Pinnate-lobed coneflower	Wise Co	Dry calcareous soil of open woods and roadsides	S	G5T3	S1	-
3		X	Saxifraga caroliniana	Carolina saxifrage	Blue Ridge, Ridge & Valley, S of New R	Moist, shaded rocks and cliffs	S	G3	S3	S1
1	X	X	Scirpus ancistrochaetus	Northeastern bulrush	Ridge & Valley	Mountain ponds, sinkhole ponds in Shenandoah Valley.	E	G3	S2	S1
3	X	X	Scutellaria saxatilis	Rock skullcap	Blue Ridge, Ridge & Valley	Rich, dry to mesic ridgetop woods, 32 counties in VA, likely G4/S4	S	G3	S3	S2
2	X	X	Sida hermaphrodita	Virginia mallow	Ridge & Valley, James R watersheds	Riverbank glades with loose rock or sandy soil	S	G3	S1	S3
3		X	Silene ovata	Mountain catchfly	Lee, Wise Cos	Rich woodlands and forests over limestone	S	G3	S1	-
3		X	Spiraea virginiana	Virginia spiraea	Blue Ridge, Ridge & Valley, S of New R	Scoured banks of streams, riverside or island shrub thickets	T	G2	S1	S1
1	X		Trillium pusillum var. moniticulum	Mountain least trillium	Great North Mtn & Shenandoah Mtn, VA & WV	Open oak woodlands in well drained soil and margins of thickets	S	G3T2	S2	S1
1		X	Tsuga caroliniana	Carolina hemlock	Blue Ridge north to James R.	Rocky ridges and slopes, usually dry and well drained	S	G3	S3	-
2	X	X	Vitis rupestris	Sand grape	Ridge & Valley	Scoured banks of rivers and streams over calcareous bedrock	S	G3	S1?	S2

LEGEND FOR TES SPECIES LIST IN OCCURRENCE ANALYSIS RESULTS:

OAR CODES:

1 = Project located out of known species range.
2 = Lack of suitable habitat for species in project area.
3 = Habitat present, species was searched for during field survey, but not found.
4 = Species occurs in project area, but outside of activity area.
5 = Field survey located species in activity area.

6 = Species not seen during field survey, but possibly occurs in activity area based on habitat observed. or Field survey not conducted when species is recognizable (time of year or time of day). Therefore assume presence and no additional surveys needed.
7 = Aquatic species or habitat known or suspected downstream of project/activity area, but outside identified geographic bounds of water resource cumulative effects analysis area (defined as point below which sediment amounts are immeasurable and insignificant).
8 = Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.
9 = Project occurs in a 6th level watershed included in the USFWS/FS T&E Mussel and Fish Conservation Plan (August 8, 2007 U.S. Fish & Wildlife Service concurrence on updated watersheds). Conservation measures from the USFWS/FS T&E Mussel and Fish Conservation Plan applied.

SPECIES: The term "species" includes any subspecies of fish, wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife, which interbreeds when mature. (Endangered Species Act of 1973, as amended through the 100th Congress)

RANGE: The geographical distribution of a species. For use here "range" is expressed as where a species is known or expected to occur on or near the George Washington and Jefferson National Forests in terms of landform (feature name, physiographic province), political boundary (county name), or watershed (river, or stream name).

HABITAT: A place where the physical and biological elements of ecosystems provide a suitable environment and the food, cover and space resources needed for plant and animal livelihood. FSM 2605-91-8, pg 10 of 13

GLOBAL RANK: Global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species or variety. This system was developed by The Nature Conservancy and is widely used by other agencies and organizations as the best available scientific and objective assessment of taxon rarity and level of threat to its existence. The ranks are assigned after considering a suite of factors including number of occurrences, numbers of individuals, and severity of threats.

G1 = Extremely rare and critical imperiled with 5 or fewer occurrences or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G2 = Very rare and imperiled with 6 to 20 occurrences or few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range; or vulnerable to extinction because of other factors. Usually fewer than 100 occurrences are documented.
G4 = Common and apparently secure globally, though it may be rare in parts of its range, especially at the periphery.
G5 = Very common and demonstrably secure globally, though it may be rare in parts of its range, especially at the periphery.
GH = Formally part of the world's biota with the exception that may be rediscovered.
GX = Believed extinct throughout its range with virtually no likelihood of rediscovery.
GU = Possibly rare, but status uncertain and more data needed.
G? = Unranked, or, if following a ranking, ranking uncertain (ex. G3?).
G_Q = The taxon has a questionable taxonomic assignment, such as G3Q.
G_T = Signifies the rank of a subspecies or variety. For example, a G5T1 would apply to a subspecies of a species that is demonstrably secure globally (G5) but the subspecies warrants a rank of T1, critically imperiled.

STATE RANK: The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources (NHRs) are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The criterion for ranking NHRs is the number of populations or occurrences, i.e. the number of known distinct localities; the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals; the quality of the occurrences, the number of protected occurrences; and threats.

- **S1** - Extremely rare; usually 5 or fewer populations or occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.

- **S2** - Very rare; usually between 6 and 20 populations or occurrences; or with many individuals in fewer occurrences; often susceptible to becoming extirpated.
- **S3** - Rare to uncommon; usually between 21 and 100 populations or occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
- **S4** - Common; usually >100 populations or occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
- **S5** - Very common; demonstrably secure under present conditions.
- **SA** - Accidental in the state.
- **S#B** - Breeding status of an organism within the state.
- **SH** - Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.
- **S#N** - Non-breeding status within the state. Usually applied to winter resident species.
- **SR** – Reported for Virginia, but without persuasive documentation that would provide a basis for either accepting or rejecting the report.
- **SU** - Status uncertain, often because of low search effort or cryptic nature of the element.
- **SX** - Apparently extirpated from the state.
- **SZ** - Long distance migrant, whose occurrences during migration are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected.
- **NA** – Not Applicable- A conservation status rank in not applicable because the species is not a suitable target for conservation activities.

These ranks should not be interpreted as legal designations.

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Glossary

acid neutralizing capacity – ability of a waterbody to resist changes in pH.

advanced regeneration – Seedlings or saplings that develop or are present in the forest understory.

afforestation - the process of restoring and recreating areas of woodlands or forest that once existed but were deforested or otherwise removed or destroyed at some point in the past.

age-class distribution – A distinct aggregation of trees originating from a single natural event or regeneration activity, or a grouping of trees, e.g., a 10-year age class, as used in inventory or management. An age-class distribution is the location and/ or proportionate representation of different age classes in a forest.

analysis area – A collection of land areas, not necessarily contiguous, sufficiently similar in physical, biological, and administrative character that they can be considered a single unit for the purpose of analysis.

antecedent soil moistures – existing level of soil moisture before a rainfall event.

aquatic habitat types – The classification of instream habitat based on location within channel, patterns of water flow, and nature of flow controlling structures. Habitat is classified into a number of types according to location within the channel, patterns of water flow, and nature of flow controlling structure. Riffles are divided into three habitat types: low gradient riffles, rapids, and cascades. Pools are divided into seven types: secondary channel pools, backward pools, trench pools, plunge pools, lateral scour pools, dammed pools, and beaver ponds. Glides, the third habitat type, are intermediate in many characteristics between riffles and pools.

basal area – The cross sectional area of a single stem, including the bark, measured at breast height.

best management practices – A practice, or usually a combination of practices that are determined by a state or a designated planning agency to be the most effective and practicable means of preventing or reducing the amount of pollution generated by non-point source pollutants to a compatible level with water quality goals.

browse – Any woody vegetation consumed, or fit for consumption, by livestock or wild animals.

canopy – The foliar cover in a forest stand consisting of one or several layers.

Continuous Inventory of Stand Condition (CISC) – A database system that, when operational, reflected an up-to-date description of timber stands in the forest. It was used to store, maintain, and retrieve vegetation data.

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government.

commercial thinning: Any kind of thinning producing merchantable material at least equal to the value of the direct costs of harvesting.

compartment: A portion of a forest under one ownership, usually contiguous and composed of a variety of forest stand types, defined for the purposes of locational reference.

confluence: The point at which two or more streams join to form a larger one.

coppice – A method of regenerating a stand in which all trees from the previous stand are harvested and the majority of regeneration is from stump sprouts or root suckers.

crown – The part of a tree or woody plant bearing live branches and foliage.

crown class – A category of tree based on its crown position relative to those adjacent trees.

- **codominant** – a tree or shrub receiving full light from above, but comparatively little from the sides. Crowns usually form the general level of the canopy. seral level of the main canopy in even or uneven-aged stands, the main canopy of the tree's immediate neighbors, receiving full light from above and comparatively little from the sides.
- **dominant** – a tree whose crown extends above the general level of the main canopy of even or un-even aged stands, above the crowns of the tree's immediate neighbors and receiving full light from above and partial light from the sides.
- **intermediate** – A tree whose crown extends into the lower portion of the main canopy of even or uneven-aged stands, into the lower portion of the canopy formed by the tree's immediate neighbors, but shorter in height than codominants and receiving little direct light from above and none from the sides.
- **overtopped (suppressed)** – a tree whose crown is completely overtopped by the crowns of one or more neighboring trees.

crown closure – The point at which the vertical projections of the crown perimeters within a canopy touch.

crown cover – The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area.

crown density – The amount and compactness of foliage of the crowns of trees or shrubs.

cubic Feet – A unit of true volume that measures 12 inches long, 12 inches wide, and 12 inches thick.

cultural resources (heritage resources) – The physical remains of human cultural systems and conceptual context of an area, which is useful or important for making land-use planning decisions. The remains include such items as artifacts and ruins, whose contents were significant in an historic, prehistoric, legendary, or sacred context to the culture.

curve numbers – (or runoff curve number) an empirical parameter used in hydrology for predicting direct runoff or infiltration from rainfall excess.

den trees – Trees having rainproof, weather – tight cavities used by wildlife.

desired future condition (DFC) – An expression of resource goals that have been set for a unit of land. It is written as a narrative description of the landscape as it appears when goals have been achieved.

developed recreation – Recreation use or opportunities occurring at developed sites.

diameter at breast height (DBH) – The diameter of the stem of a tree measured at breast height (4.5 feet) from the ground.

dispersed recreation – Recreation outside of developed recreational facilities. Examples are hiking, driving for pleasure, or hunting.

distance zone – One of three categories used in the Scenery Management System (SMS) to divide a view into near and far components. The three categories are:

- Foreground: Part of a scene or landscape nearest to the viewer, usually ¼ - ½ mile from the viewer.
- Middleground: Part of a scene or landscape that extends 1/4 – ½ miles to 3-5 miles from the viewer.
- Background: The distant part of a landscape, located 3 – 5 miles to infinity from the viewer.

diversity – The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

early succession forest – The biotic community that develops immediately following the removal or mortality of most or all of the forest canopy. As used in the RLRMP and EIS, a stand age of 0 to 10 years.

early successional species – Plant or animal species characteristic of early successional forest conditions.

early successional habitat – Vegetative condition typically characterized by low density to no canopy cover and an abundance of herbaceous ground cover. May include forest 0 to 10 years of age, maintained openings, pastures, balds, or open woodlands.

environmental effects – Results achieved or expected to be achieved relative to physical, biological, social, and economic factors resulting from management activities.

- direct effects – Those effects that occur as a direct result of an activity. These effects occur at the same time and place as the activity.
- indirect effects – Those effects that occur as an indirect result of an activity. These effects occur sometime after the activity and/or in a different location.
- cumulative effects – The combined effects of the current activity with other past, present, and reasonably foreseeable future activities. Cumulative effects are incremental in nature.

Endangered Species Act of 1973 – An act that enables conservation of plant and animal species threatened endangered throughout all or a significant portion of its range. It provides a program for the conservation of such species, and takes steps to achieve the purposes of the (relevant) treaties and conventions.

environmental analysis – A concise public document containing a federal agency's analysis of the significance of potential environmental consequences.

erosion – The wearing away of the land surface by running water, wind, ice, or other agents.

even-aged silviculture – A planned sequence of treatments designed to maintain and regenerate a stand with one age class.

existing condition – Representation of a resource condition, level of resource output or effect that exists within a defined area for a specified time period.

exotic species – A plant or species introduced from another country or geographic region outside its natural range.

feathering – A treatment used along the edges of openings in the forest canopy to reduce shadow contrasts by manipulating the density and size of vegetation.

featured species – A species whose habitat requirements will guide planning, timber, and wildlife habitat management coordination and direct habitat improvements to a unit of land. The species represents an association of species with similar habitat requirements.

floodplains – Lowland and relatively flat areas adjacent to water. The minimum area included is subject to a one-percent (100-year occurrence) or greater chance of flooding in any given year. Although floodplains and wetlands fall within the riparian area, they are defined here separately as described in the FS Manual.

forage – All browse and non-woody plants that area available to livestock or game animals used for grazing or harvested for feeding.

ford – The point at which a road or trail crosses a stream without benefit of a bridge or other structure. This is a wet-water crossing.

forest health – The perceived condition of a forest derived from concerns about factors as its age, structure, composition, function, vigor, presence of unusual levels of insects or disease, and resilience to disturbance.

forest development road – A road wholly or partly within, or adjacent to, and serving a part of the National Forest System. It also has been included in the forest Development road System Plan.

forest type – Current forest cover type represented by the commercial tree species existing in a stand.

habitat – The native environment of an animal or plant in which all the essentials for its development, existence, and reproduction are present.

herbicide – A pesticide used for killing or controlling the growth of undesirable plants.

hyporheic – referring to a region beneath and lateral to a stream bed, where there is mixing of shallow groundwater and surface water.

improvement treatment – A cutting method in a stand past the sapling stage primarily to improve composition and quality by removing less desirable trees of any species.

insolation - a measure of solar radiation energy incident on a surface.

interannual variability – natural variations in the background sediment yield of a watershed.

interdisciplinary team (ID Team) – A group of individuals with skills for management of different resources. An interdisciplinary team is assembled because no single scientific discipline is sufficient to adequately identify and resolve issues and problems. Team members ensure integrated use of natural and social sciences as required by the NEPA and NFMA.

interior forest habitat – high canopy forest conditions suitable to meet the requirements of area sensitive species that are adversely impacted by forest edge, including microclimate change (warmer, windier), increased predation, increased brood parasitism, and increased competition.

intermediate treatment – Any treatment designed to enhance growth, quality, vigor, and composition of the stand after establishment of regeneration and before final harvest.

issue – A point of discussion, debate, or dispute about the environmental effects of the proposed action. Not all issues are significant issues. Issues are significant because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict.

karst - An area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns.

large woody debris (LWD) – Live or dead trees, parts or pieces of trees that are large enough or long enough or sufficiently buried in the stream bank or bed, to be stable enough to provide effective fisheries habitat such as shade or cover.

late successional stage – The stage of forest development at which overstory trees have attained most of expected height growth and have reached ecological maturity. As used in the EIS and RLRMP, a stand age greater than 80 years. Old-growth forests occur during the later periods of this stage at ages that vary by forest community type.

log landing – The site at which harvested logs are gathered before they are loaded onto a truck and hauled away. Conventional landings are those associated with ground-based and cable logging systems and are usually immediately adjacent to or within the harvest unit. Helicopter landings are those landings used during a helicopter logging operation and are generally separate from the actual harvest unit.
management indicator species (MIS) – A particular type of plant or animal whose presence in a certain location or situation is a fairly certain sign or symptom that particular environmental conditions are also present.

management prescription – A Forest Planning term denoting areas of land with similar desired conditions, objectives, and standards for achieving them. Management practices and intensity are selected and scheduled for implementation to attain multiple-use goals and objectives.

mast tree – Generally hardwood trees of the heavy seeded variety including oaks, hickories, walnut, beech: 25 years and older capable of producing frequent seed crops to feed a variety of wildlife species.

mitigation measure (design feature) – Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

monitoring – The periodic evaluation on a sample basis of Forest Plan management practices to determine how fully objectives have been met, how closely management standards have been applied, and what effects those practices had on the land and environment.

natural range of variability – In planning, the full range of ecosystem processes and disturbance regimes that occur within the current climatic period.

neotropical migratory birds – A group of bird species that breeds in North America and winters in South America, Mexico or Costa Rica.

no-action alternative – The most likely condition expected to exist in the future if current management direction would continue unchanged.

non-point source pollution – Pollutants detected in a concentrated water source, such as a stream, river or lake, which come from a wide range of sources

open road density – The measure of open road miles per land area. An open road is a motorized travelway used on a regular basis.

preferred alternative – The alternative recommended for implementation by the responsible official.

prescribed burning – Fire burning under conditions specified in an approved plan to dispose of fuels, control unwanted vegetation, stimulate growth of desired vegetation, change successional stages, and maintain fire-dependent communities in order to meet a variety of management objectives.

present net value (PNV) – The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area. Future estimated revenues and costs are 'discounted' to the present by an interest rate that reflects the changing value of a dollar over time. Also called present net worth and net present value.

Priority Watershed - watersheds identified in the Forest Plan as having below average Watershed Condition Ranking1 (WCR), impaired stream segments or outstanding aquatic biodiversity.

reconstruction – Work that includes, but is not limited to, widening of roads, improving alignment, providing additional turnouts, and improving sight distance that improves the standard to which the road was originally constructed. Also undertaken to increase the capacity of the road or to provide greater traffic safety.

regeneration – the re-establishment of forest cover by seeding, planting, and natural means (also called reforestation). Also used as a known referring to the young trees themselves.

regeneration cutting - Any removal of trees intended to assist regeneration already present or to make regeneration possible.
regeneration method – Cutting procedure by which a new age class is created. Major methods are Clearcutting, seed-tree, shelterwood, selection, and coppice.

residual trees – The live trees remaining after a natural or artificial disturbance.

responsible line officer – The Forest Service employee who has the authority to select and/or carry out a specific planning action.

reserve trees – Trees, pole size or larger, retained after the regeneration period under Clearcutting, seed-tree, shelterwood, or coppice methods.

riparian – Land areas directly influenced by water. They usually have visible vegetative or physical characteristics showing this water influence. Streamside, lake borders and marshes are typical riparian areas.

riparian area – Areas with three-dimensional ecotones of interaction that include terrestrial and aquatic ecosystems that extend down into the groundwater, up above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the watercourse at a variable width.

ripping – a process where the soil is mechanically sliced or broken to improve tilth, aeration, and permeability.

road – a motor vehicle path more than 50 inches wide, unless classified and managed as a trail. It may be classed as a system or non-system road.

road closure – a techniques used by management to regulate and control the use of facilities to achieve transpotation economy, user safety, protection of the public investment, and accomplishment of forest resource objectives. It may be intermittent or long term.

road construction – Acitvity that results in the addition of forest system or temporary road miles.

road reconstruction – activity that results in improvement or realighment of an existing system road defined as followes:

- **road improvement –** Activity that results in an increase of an existin road's traffic service level, expansion of its capacity, or a change in its original design function.
- **road realignment –** Activity that results in new location of an existing road or portions of an existing road, and treatment of the old roadway.

road analysis process (RAP) – roads analysis is an integrated ecological, social, and economic science based approach to transportation planning that addresses existing and future road management options. The intended effects are to ensure that decisions to construct, reconstruct, or decommission roads will be better informed by using a roads analysis. Roads analysis may be completed at a variety of different scales, but generally begins with a broad forest-scale analysis to provide a context for future analyses.

sapling – A usually young tree that is larger than a seedling, but smaller than a pole. Size varies by region.

sawtimber – Trees suitable in size and quality for producing logs that can be processed into dimension lumber.

scenic attractiveness – The scenic importance of a landscape based on human perception of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. Classified as A (Distinctive), B (Common), C (Undistinguished).

scenic class – A system of classification describing the importance or value of a particular landscape or portions of that landscape. Values range from 1 (highest value) to 7 (lowest value).

Scenery Management System (SMS) – A system for the inventory and analysis of the aesthetic values of the National Forest Lands. It replaces the Visual Management System (VMS), as defined in Agricultural Handbook #462.

scenic integrity – A measure of the degree tow which a landscape is visually perceived to be 'complete.' The highest scenic integrity ratings are given to those landscapes, which have little or no deviation from the character valued for its aesthetic appeal. Scenic integrity is used to describe an existing situation, standard for management, or desired future condition.

Scenic Integrity Objective (SIO) – A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration to the valued attributes of the characteristic landscape. Objectives include Very High, High, Moderate, and Low.

> **Very High (VH) –** Generally provides for only ecological changes in natural landscapes and complete intactness of landscape character in cultural landscapes.
>
> **High (H) –** Human activities are not visually evident to the casual observer. Activities may only repeat attributes of form, line, color, and texture found in the existing landscape character.
>
> **Moderate (M) –** Landscapes appear slightly altered. Noticeable human-created deviation must remain visually subordinate to the landscape character being view.
>
> **Low (L) –** Landscapes appear moderately altered. Human-created deviations begin to dominate the valued landscape character being viewed but borrow from valued attributes, such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed.

scoping – The process of notifying the public and other local, state and other federal agencies of proposed Forest Service actions on National Forest lands and requesting public input related to the proposal.

sediment – Solid mineral and organic material that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice

sensitive species - Those species that are placed on a list by the Regional Forester for which population viability is a concern.

silviculture – The art and science of controlling the establishment, growth, composition, health and quality of forests and woodlands. Silviculture entails manipulating forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis.

site class – a classification of site quality, usually expressed in terms of ranges of dominant tree height at a given age or potential mean annual increment at culmination.

site preparation – the preparation of the ground surface prior to reforestation. Various treatments are applied as needed to control vegetation that will interfere with the establishment of the new crop of trees or to expose the mineral soil sufficiently for the establishment of the species to be reproduced.

site index – A series-specific measure of actual or potential forest productivity (site quality, usually for even-aged stands), expressed in terms of the average height of trees included in a specified stand component (defined as a certain number of dominants, codominants, or the largest and tallest trees per unit area) at a specified index or base age.

site quality (productivity) – The productive capacity of a site, usually expressed as volume production of a given species.

skid road – A temporary blade-constructed pathway having a road-like function and appearance, used to drag felled trees or logs to a landing. Several skid trails normally branch off of a skid road.

skid trail – A temporary pathway through the woods formed by loggers dragging (skidding) logs from the stump to a log landing or skid road, without dropping a blade and without purposefully changing the geometric configuration of the ground over which they travel.

slash – the residue left on the ground after felling, silvicultural operations, or as a result of storm, fire, girdling, or poisoning. All vegetative debris resulting from the purchaser's operations.

snag – A dead or partially dead (more than 50%) hardwood or conifer tree which is used by many species for perching, feeding, or nesting.

soil compaction – Reduction of soil pore space volume (capacity) that results in alteration of the soil chemical and physical properties.

soil productivity – the inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. soil productivity may be expressed in terms of volume or weight/unit area/year, percent plant cover, or other measures of biomass accumulation.

stand – A contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure and growing on a site of sufficiently uniform quality to be a distinguishable unit.

stand density – A quantitative, absolute measure of tree occupancy per unit of land area in such terms as numbers of trees, basal area, or volume.

stocking – The degree of occupancy of land by growing stock trees, measured by basal area or number of trees per unit area and spacing compared with a minimum standard: which varies by tree size and species or species group: to the occupancy that is required to fully utilize the growth potential of the land.

suitable land – Land that is managed for timber production.

temporary haul road – A temporary haul road is built to a standard that allows tractor-trailers to drive to and from a landing site for the purpose of hauling logs from a harvest unit. Temporary haul roads are usually excavated and may include surfacing and drainage structures. These roads are not maintained as part of the Forest permanent road system, rather, they are rehabilitated following short-term use by closing access, ripping, seeding, and sometimes planting.

thinning – A cutting made to reduce stand density of trees primarily to improve growth, enhance forest health, or to recover potential mortality.

threatened species – Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and that has been designated in the Federal Register by the Secretary of the Interior as a threatened species.

timber stand improvement (stand improvement) – an intermediate treatment made to improve the composition, structure, condition, health, and growth of even or uneven-aged stands.

two-aged stand – Stand composed of two distinct age-classes separated in age by at least 20% of rotation.

understory – The trees and other vegetation growing under a more or less continuous cover of branches and foliage formed collectively by the upper portion (overstory) of adjacent trees and other woody growth.
uneven-aged regeneration methods – Methods of regenerating a forest stand, and maintaining an uneven-aged structure by removing some trees in all size classes, either singly, in small groups, or strips. The methods are single-tree or group selection.

uneven-aged silvicultural system – A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

unsuitable lands – Forest land that is not managed for timber production because: 1) it has been withdrawn by Congress, Secretary, or Chief; 2) it is not producing or capable of producing crops of wood; 3) technology is not available to prevent irreversible damage to soils, productivity, or watershed conditions; 4) there is no reasonable assurance that lands can be adequately restocked within 5 years after final harvest based on existing technology and knowledge; 5) there is, at present, a lack of adequate information to responses to timber management activities; or 6) timber management is inconsistent with or not cost efficient in meeting the management requirements and multiple use objectives specified in the Forest Plan.

watershed – The total area above a given point on a stream that contributes water to the flow at that point.

yarding – A term used to describe operations used to move logs stump to point where logs are loaded for transport to mill. Methods used in yarding include ground-based, cable based, and aerial based.