Tygart-Chesnut Ridge
Wildlife and Watershed Project

Final Environmental Assessment

Region 9—Monongahela National Forest
Greenbrier Ranger District
Randolph County, West Virginia
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CHAPTER 1 – INTRODUCTION
The Forest Service prepared this Environmental Assessment (EA) in accordance with National Environmental Policy Act (NEPA) regulations at 40 CFR 1500-1508 and 36 CFR 220, other relevant Federal laws, regulations, policies, and the 2006 Monongahela National Forest Land & Resource Management Plan (Forest Plan). This EA is intended to provide sufficient evidence and analysis about the estimated environmental effects of a proposed habitat improvement project to determine whether or not to prepare an Environmental Impact Statement or Finding of No Significant Impact. The effects analysis reports and other supporting documents are available upon request.

Project Overview
The Greenbrier Ranger District of the Monongahela National Forest (MNF) proposes to implement wildlife and watershed improvements within the Upper Tygart-Chestnut Ridge (TyChest) project area over the next ten years to help meet direction in the Monongahela National Forest Land and Resource Management Plan (Forest Plan, 2006). Both commercial and non-commercial timber activities will be used to improve potential habitat for the endangered plant species, Running Buffalo Clover, as well as the federally-listed endangered Indiana and threatened northern long-eared bat. Proposed activities will also increase the structural complexity within the forest and enhance transition areas between forested and non-forested habitats. These activities will create a mosaic of habitat types and benefit a variety of wildlife species, including those dependent on early successional habitat. Other non-commercial activities, such as stream habitat improvement and vernal pool creation, will continue to add value to the wildlife habitat.

Location
The project is located along the east slope of Cheat Mountain, southeast of Huttonsville, in Randolph County, West Virginia. Because it is located in the Tygart Valley watershed in the general area of Chestnut Ridge, it is named TyChest (Figure 1). The entire project area, 4,533 acres in size, is entirely on National Forest System (NFS) land.
Project Development and Forest Plan Direction

In September 2013, Forest Service staff met with a variety of partners, including the Wildlife Management Institute, the National Wild Turkey Federation, the Ruffed Grouse Society and the West Virginia Division of Natural Resources. The main purpose of the meeting was to identify opportunities to enhance wildlife habitat on NFS lands. The final action at that meeting was for District staff to meet with the local WVDNR Wildlife Area Managers to identify and set priorities for potential future projects on each District of the Monongahela National Forest. The TyChest project has been developed as a result of that meeting with wildlife partners and agencies.

In the Forest Plan (2006), management of lands is guided by Forest-wide and Management Prescription (MP) direction that describes specific desired conditions, goals, objectives, standards, and guidelines.

Forest-wide management direction for several disciplines have helped shaped the TyChest proposed action, as briefly summarized:

- **Soil and Water Resources:**
  - Soils have adequate physical, biological, and chemical properties to support desired vegetation growth.
  - Improve watershed conditions.

- **Vegetation:**
  - Forested lands exhibit variable patterns of size classes, densities, structural stages, and species composition due to a combination of successional development, disturbance regimes, and management activities.
  - Age class distribution ranges from openings maintained for wildlife habitat to a network of late successional stands.

- **Wildlife and Fish:**
  - The amount, distribution, and characteristics of habitat are present at levels necessary to maintain viable populations of native and desired non-native wildlife and fish species.

- **Threatened, Endangered and Sensitive Species:**
  - Provide habitat capable of contributing to the survival and recovery of species listed under the ESA.

Over 98% of the project area falls within MP 6.1 – Wildlife Habitat Emphasis and less than 2% of the project area falls within MP 4.1 – Spruce and Spruce-Hardwood Restoration. All activities of the proposed action occurs in MP 6.1. Among other things, this prescription emphasizes the following:

- A vegetation management strategy that emphasizes sustainable production of mast and other plant species that benefit wildlife.
- Active restoration of pine-oak and oak-hickory communities.
- Restricted motorized access and a network of security areas that reduce disturbance to wildlife.
- A mix of forest products.

**Purpose and Need for the Proposal**

The “Need” for taking action can be thought of as the problems identified in the area based on existing conditions. The “Purpose” can be thought of as objectives – what the end results should be when the problems are solved or lessened.
The MNF is proposing to take action in the TyChest project area to work toward the desired conditions for the project area. Although our desired future conditions for the project area are guided by the goals of MP 6.1 as described in the 2006 Forest Plan and summarized above, all of our proposed actions have and will continue to be designed to protect sensitive resources (soil, water, archeology, etc.) while implementing a variety of activities to improve habitat for endangered or threatened species (running buffalo clover, Indiana bat and northern long-eared bat) and species dependent upon early successional habitat (Table 1). This project is being driven by the value derived from wildlife habitat improvement and ecosystem services.

Ecosystem services are commonly defined as the benefits people obtain from ecosystems. Ecosystem services include basic services - provisioning services like the delivery of food, fresh water, wood and fiber, and medicine - and services that are less tangible and harder to measure but equally critical: regulating services like carbon sequestration, erosion control, and pollination; cultural services like hunting, recreation, ecotourism, and educational and spiritual values; and supporting services like nutrient cycling, soil formation, and primary productivity.

Less tangible ecosystem services are the backbone for the TyChest project. Improvement of habitat for endangered species is a critical element to ensuring that these species have a landscape to take refuge with the pressures of climate change, changing forest habitats, and development from outside pressures like highways and pipelines. This project also aims to improve wildlife habitat which would enhances hunting opportunities for a variety of game species (deer, turkey, bear, ruffed grouse, etc.). This project acts to move the landscape more towards a condition that promotes species diversity for those species at the most risk (running buffalo clover, native bats and species dependent upon early successional habitat).

Nearly ninety percent of flowering plants and one third of agricultural food crops are pollinated by insects. Wildlife at all levels of the food chain depend directly or indirectly on pollinators, either for the fruit and seed they help create, or as food sources themselves. However, pollinator populations have been declining rapidly in the last decade, with potentially serious detrimental effects to both the human economy and our native ecosystems.

To address this, public land managers are beginning to incorporate pollinator habitat improvement into terrestrial ecosystem restoration projects. The TyChest project would seed and plant wildlife openings with a variety of locally sourced native species that are beneficial to pollinators and other wildlife. Restoration would also include creation and/or protection of habitat components critical for nesting, young, and overwintering pollinators.

No single project can accomplish all desired conditions, goals, and objectives, but this project would help accomplish some of them in this project area (Table 1).

**RUNNING BUFFALO CLOVER (RBC)**

Running buffalo clover, a federally-listed endangered plant, has a high affinity for calcium-rich soil, which is abundant in a portion of the TyChest project area where the Greenbrier Limestone formation is exposed. It is most often found in disturbed locations underlain by limestone or other calcareous bedrock. This species persists in mesic woodlands with partial sunlight and periodic disturbance, and is scattered throughout the limestone-influenced forests of the project area on old logging roads, skid roads, and other partially disturbed areas. Due to lack of disturbance, the general condition of the project area is a closed canopy, shaded environment. Although there are several occurrences of RBC throughout the project area (all along forest
Table 1. Existing and Desired Conditions within the TyChest project area.

<table>
<thead>
<tr>
<th></th>
<th>Existing Conditions</th>
<th>Desired Conditions*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running Buffalo Clover</td>
<td>Several occurrences of species throughout, with stagnant or even decreasing populations</td>
<td>Increase suitable conditions, such as ground disturbance and canopy gaps, for species to establish new populations and expand where currently existing</td>
</tr>
<tr>
<td>Early Successional Habitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintained wildlife openings and herbaceous habitat</td>
<td>54 acres (1%)</td>
<td>136-362 acres (3-8%)</td>
</tr>
<tr>
<td>Young forested areas (&lt;20 years)</td>
<td>0 acres (0%)</td>
<td>360-907 acres (8-25%)</td>
</tr>
<tr>
<td>Open to Closed canopy transitional habitat</td>
<td>Very little edge habitat management</td>
<td>More edge management to increase structural complexity throughout project area</td>
</tr>
<tr>
<td>Vernal pools</td>
<td>Some within existing wildlife openings</td>
<td>Increase the accessibility to water resources to improve wildlife habitat</td>
</tr>
<tr>
<td>Indiana and Northern Long Eared Bat</td>
<td>Limited roosting and foraging opportunities due to lack of structural complexity</td>
<td>Improve bat habitat by managing forested areas, transitional areas, and openings for a variety of roosting and foraging opportunities</td>
</tr>
</tbody>
</table>

* Desired Conditions are based on Management Prescription direction within the 2006 Forest Plan and outcomes of joint planning meetings with partners.

service roads, old skid trails or other disturbed areas), the existing populations are stagnant or even decreasing in size and extent because of the lack of ground disturbance and the closed canopy above the populations.

Ongoing research on the Fernow Experimental Forest (Fernow) by the Northern Research Station (NRS) and the U.S. Fish and Wildlife Service (USFWS), indicates that timber management can be beneficial to the RBC. On the Fernow, running buffalo clover is most often found on logging trails that are disturbed approximately once every 10 years during timber removal. Recent research and management on adjacent State property confirms the notion that RBC needs filtered (or ‘dappled’) sunlight. Additionally, and as the name implies, RBC needs occasional ground disturbance to propagate the species. The last disturbance in the form of timber management in the TyChest project area occurred 20-30 years ago. Based on consultation with the USFWS, NRS and the WVDNR, there is overwhelming support to manage for RBC in the TyChest project area by replicating what has been done on the Fernow. There is an opportunity to enhance RBC habitat by implementing a vegetation management strategy on limestone soils in the project area that would...
follow the silvicultural practices implemented by the NRS, which would include controlled ground disturbance and tree removal to create small canopy gaps and filtered sunlight.

EARLY SUCCESSIONAL HABITAT (ESH)
Several wildlife species, including mourning warbler, golden-winged warbler, ruffed grouse and American woodcock, are dependent upon early successional habitat. ESH-dependent species need a matrix of different habitats, including herbaceous habitat, edge habitat, shrubby habitat and transitional forest connecting open areas and mature forest.

*Maintained openings and herbaceous habitat:*
- Approximately 1% (54 acres) of the project area is maintained as wildlife openings. Additionally, there is an abrupt edge from the opening to the surrounding mature forest.
- Based on MP 6.1 guidance, the desired future condition for herbaceous openings is approximately 3-8% of a given area, in this case that would be 136-362 acres. Furthermore, more edge habitat needs to be created along with transitional areas from openings to mature forest. More herbaceous openings and a variety of habitat is needed throughout the project area.

*Young forest habitat:*
- None of the forested area within the project area is less than 20 years old. Approximately 192 acres, or 4% of the project area, is 20-30 years old. Very little high stem density or shrubby habitat exists and what little does, will not exist for much longer as the forest continues to age.
- Based on MP 6.1 guidance, the desired future condition for young forests (less than 20 years old), is 8-25% of a given area, depending on forest type. In this case that would be approximately 360-907 acres. More young forest is needed throughout the project area.

INDIANA AND NORTHERN LONG-EARED BAT HABITAT
- Because of the onset of white nose syndrome, which has had a devastating impact on several native bat populations, it is critically important to improve bat habitat, particularly in locations that bats frequent. Disturbance is important to create diversity within forested areas. Without natural or managed disturbance, there are few roost trees within the project area, such as standing dead trees with loose bark and canopy openings that allow sunlight to warm bark/crevices. Additionally, the lack of disturbance has limited foraging opportunities due to the lack of habitat for a variety of insect species. Habitat conditions are less than optimal without conditions necessary (e.g. solar radiation, cracks, crevices or loose bark, and proximity to food and water) to raise young.
- The project area is in close proximity to several cave hibernacula and the northern portion of the project area is within five miles of known Indiana and northern long-eared bat hibernacula. A vegetation management strategy that increases roosting opportunities and provides a variety of habitat conditions in close proximity would greatly enhance bat habitat, especially through the creation of shrubby habitat to increase insect production and the creation of vernal pools to provide water sources.
Public Involvement

Public involvement related to the proposed action began in January 2015 with listing the project on the Forest’s Schedule of Proposed Actions. The Schedule of Proposed Actions is available on the Forest website and distributed to over 120 interested parties. On July 22, 2015, a detailed description of the proposed activities was distributed to approximately 100 interested parties for a 30-day public scoping period, in accordance with 36 CFR Part 218, and a legal notice was published in the paper of record, the *Pocahontas Times* (July, 2015). Three comments, all generally positive, were received as a result of the scoping. Consultation with the U.S. Fish and Wildlife Service (FWS) is being completed in accordance with Endangered Species Act requirements. As described in Chapter 2, the proposed action that was a part of the initial scoping period has changed slightly, partially as a result of coordination and a field review with the USFWS.

The draft environmental assessment was released and distributed for a 30-day notice and comment period, in accordance with 36 CFR Part 218, with a legal notice published in the *Pocahontas Times* on April 21st, 2016. A news release was also placed in the Randolph County newspaper, the *InterMountain*, to further notify the public. The EA and accompanying legal notice was posted on the Forest website as well. Two comments were received from the West Virginia Division of Natural Resources. Their input was taken into consideration when finalizing this EA and drafting the DN/FONSI for the objection period. The response to these comments are included in Appendix C.

The final EA, draft Decision Notice and Finding of No Significant Impact for this project will be posted on the Forest website and a legal notice will be published in the newspaper of record, the *Pocahontas Times*, to begin the 45-day objection period, in accordance with 36 CFR Part 218. These documents will be directly forwarded to those who responded during the 30-day comment period.

Agency Involvement

The Monongahela National Forest (MNF) has worked in cooperatively with the Northern Research Station (NRS), the West Virginia Division of Natural Resources (WVDNR), and U.S. Fish and Wildlife Service (FWS), to jointly develop these management strategies for the running buffalo clover enhancement. We are also working very closely with the WVDNR, the West Virginia Division of Forestry, the Ruffed Grouse Society, and the National Wild Turkey Federation for the early successional habitat component of this project. Based on this collaborative planning, this project provides a variety of management activities to enhance habitat for threatened and endangered species while protecting a multitude of resources through implementation.
CHAPTER 2 – PROPOSED ACTION AND ALTERNATIVES

Two alternatives were considered and analyzed in detail:

Alternative 1: No Action Alternative
Under the no action alternative, current management plans would continue to guide management of the project area. No wildlife restoration activities, native plantings, wildlife stand improvement activities, or watershed restoration activities would be implemented to accomplish the purpose and need of the project. The existing condition would persist with only the influence of natural disturbances and influences.

Alternative 2: Proposed Action Alternative
The proposed action was developed to improve habitat for bats, birds and running buffalo clover, while protecting other resources. It has also been designed to improve soil and water conditions and improve native pollinator habitat. Because of the overlap of objectives for the various resources (i.e. improving bat habitat may also improve RBC habitat or ESH habitat), the proposed action is organized based upon whether there would be commercial or non-commercial timber activities. Although it is organized this way, the ultimate goal of this project is to improve various types of wildlife habitat, and ecosystem services as described in the purpose and need. Therefore, if we determine through the environmental analysis or through public comment that commercial timber activities are not the appropriate tool to achieve our objectives, we would pursue non-commercial activities to achieve the MP goals and desired conditions.

Based on information received from internal field reviews by Forest resource specialist and recommendations from the FWS and NRS in August and September 2015, the proposed action alternative was refined from the initial project scoping conducted on July 22, 2015. These changes include:

- Shifting the Commercial Daylighting of NFS Road 1560 for RBC management to meet ESH goals, per recommendation from the NRS and FWS. Two additional acres were added to this activity.
- Decreasing net acreage of RBC thinning and single tree selection based on field reviews and evaluation of potential RBC habitat.
- Additional acreage to receive commercial ESH management as a result of areas no longer included as potential RBC habitat to receive RBC management.
- No longer pursuing the collection, propagation, and seeding of RBC, per recommendation from the NRS and FWS.

COMMERCIAL ACTIVITIES

Running Buffalo Clover (RBC) Management (165 acres):
- Thinning, single-tree removal or uneven-aged management to encourage filtered sunlight on limestone soils (Figure A-1). This would include commercial timber harvest using ground-based operations, where appropriate to create filtered sunlight by reducing the basal area to 60-80 square feet to encourage RBC propagation. We would continue to work in collaboration with the NRS to develop the silvicultural prescription for all RBC management areas. Use existing skid trails and create new skid trails to expand potential
areas of RBC habitat. Although the areas were identified to avoid riparian areas and sensitive soils, any such areas encountered during layout would be avoided to protect other resources and follow Forest Plan guidance.

**Early Successional Habitat (ESH) Management (616 acres):**
Within the commercial ESH polygons, the following vegetative treatments and associated small landings and skid trails would be placed as necessary to achieve the habitat goals of the project (Figure A-2). In order to take advantage of existing features on the ground, the exact location of a particular activity would not be determined until the layout phase of the project after the NEPA decision has been signed. Although the commercial ESH areas were identified to avoid riparian areas and sensitive soils, any such areas encountered during layout would be avoided to protect other resources and follow Forest Plan guidance. It is anticipated that up to approximately 60-75% of the ESH areas would be regenerated to provide brushy habitat.

- Herbicide may be used on these areas to eliminate undesirable vegetation or prepare the site for desirable regeneration. Types of potential treatment include: imazyphyr injection through hack and squirt, glyphosate foliar spray, and/or triclopyr basal stem application. Generally, most application will be direct, which will limit the potential for movement away from target stems. Imazyphyr will only be used within the western portion of the project area, where geologies support soils with a pH value above 5, to minimize the potential for movement in soils adjacent where RBC management is planned.

- **Small patch cuts:** Create small irregularly shaped areas of brushy habitat by removing the majority of mature trees in an irregular fashion. Stands would be commercially harvested at intervals of every 2-5 years across the project area to create a diversity of age classes and vegetation structure thus providing habitat for several ESH dependent species.

- **Cutback Borders:** Varying degree of tree removal between the small patch cuts or existing open areas to provide a mosaic of uneven-aged forested habitat interspersed with brushy habitat and mature trees.

- **ESH wildlife corridors:** Within a portion of the commercial ESH areas, the main skid trail would provide a corridor for the linear wildlife openings. The corridor adjacent to the linear opening would entail removing selected trees on the edges of the initial skid trails to be up to approximately 200 feet wide as research has suggested is best for wildlife feeding. Vernal pools would be put into these areas for bat feeding corridors and the area would be maintained (via mowing and/or diskng).

- **Open Woodland Management to encourage Oak restoration:** Heavy tree removal to leave area with scattered Oak trees. Disc ground to discourage undesirable plant regeneration and encourage forb growth.

The following guidelines would be employed as applicable in the layout of management activities to improve habitat for ESH-dependent species. Species benefitting from these project designs include: the golden-winged warbler, mourning warbler, ruffed grouse, wild turkey and American woodcock.

- Limit regeneration units to approximately 5-10 acres, when possible
- Increase the proportional amount of edge by adjusting the shape of the regeneration harvest units
- Provide a forested edge within 250 feet of areas that are regenerated
- Create feathered edges that promote a gradual transition
- Retain approximately 10-15 residual trees per acre in areas that are regenerated
- Residual trees should be greater than 9 inches, diameter at breast height (DBH)

**Commercial Daylighting (38 acres)**
This activity involves commercial timber harvesting to daylight NFS Road 1560 for up to approximately 100 feet on either side of the road to provide transitional forest along the road (Figure A-3). This practice would be similar to cutback borders in that a varying degree of tree removal from the road to the mature forest to provide a mosaic of habitat from the road to the surrounding mature forest. This activity includes the creation of small landings adjacent to the road on flat areas that would not cause soil and water issues to reduce the amount of heavy equipment on the road. After the project, these small landings would serve as small wildlife openings. Although the commercial daylighting areas were identified to avoid riparian areas and sensitive soils, any such areas encountered during layout would be avoided to protect other resources and follow Forest Plan guidance.

**NON-COMMERCIAL ACTIVITIES**

**Early Successional Habitat (ESH) Management**
- Orchard Restoration (54 acres): Although all of these areas are already considered maintained wildlife openings (Figure A-4) some have become overgrown. Activities will include: reclaiming areas with planted fruit trees via pruning and releasing of trees and removing large rocks and stumps in order to re-establish as a maintained opening. May also include vernal pool construction and activities to improve pollinator habitat, such as native pollinator plant propagation by planting and/or seeding.
- Young forest habitat with ESH component (192 acres): Utilize the WVDNR mulcher to create 10-15 ft. paths through stands less than 30 years old (Figure A-2). This would provide a variety of size classes in an irregular fashion in stands that are still relatively young, but no longer provide ESH. Approximately 20-50% of an individual unit would be treated with the mulcher. Areas that have existing desirable regeneration would be avoided, as would areas with saturated soils. Direct application of herbicides (hack and squirt or basal spray) may also be used to eliminate undesirable vegetation and remove competition for tree species beneficial to wildlife (e.g. crop tree release). Imazapyr, triclopyr and/or glyphosate would be used. No foliar spray would occur, only direct application (hack and squirt and/or basal bark spray). Based on soils input suggesting concern to using imazapyr in soils derived from limestone, imazapyr would be limited to the western portion of the project area, if at all.

**ESH Management and Bat Habitat Improvement**
- Cutback borders and Bat Roosting Habitat Enhancement (up to approximately 1,000 acres): Cutback borders would be created by cutting down, girdling, or direct application of herbicide on approximately 50% of the standing trees to create snags (bat roosts) while removing less desirable tree species (i.e. striped maple) and provide an irregular transition from mature forest to open habitat and be up to approximately 300 feet wide. Trees to be removed would be left onsite, either as standing snags or downed wood. This management activity could occur in areas adjacent to existing or created openings, roads, and young forest areas (Figure A-2). Generally, more trees would be treated (more sunlight to the forest floor) adjacent to the existing opening or young
forest, transitioning to less tree removal (less sunlight to the forest floor) adjacent to mature forest. Although direct application of herbicide could occur on the larger trees to create snags, the preferred method of snag creation would be girdling. There would be no foliar spraying and little, if any, basal bark spray of herbicide because high stem density of woody vegetation (regardless of species) is a desired outcome. If unique features, such as seeps, rocky outcrops, or riparian areas are found within the cutback borders, they can be avoided, based on coordination with the various resource specialists. Because all of the wood would be left on-site, there would be no heavy equipment for tree removal associated with this activity.

**Watershed/Wildlife Improvements**

- **Terrestrial/Aquatic Habitat Improvement (21 acres and 2,500 feet of stream)**: Improve in-stream habitat conditions in Shavers Run through the addition of large and small woody material (Figure A-4). In conjunction with stream improvements, wildlife habitat in surrounding riparian areas may be improved by wetland creation, wildlife opening maintenance, and the addition of woody material in the riparian area.

- **Linear wildlife opening management (6.9 miles)**: Through collaboration with the WVDNR, maintain a series of linear wildlife openings (closed to vehicle traffic) after the project (Figure A-4). Work would include actions to perpetuate native or desirable herbaceous vegetation such as mowing, disking, seeding, lime/fertilizer, or herbicide application. Where RBC habitat exists, actions would be implemented that improve RBC habitat. This would also include watershed work on any linear wildlife openings to hydrologically neutralize linear wildlife openings while still maintaining occasional tractor access. Actions may include installation of water bars, seasonal avoidance, or other activities that would reduce soil loss and erosion.

- **Wetland Creation**: Create vernal pools in areas that are gentle in slope and have enough clay in the soil to create an impervious bottom, especially in close proximity to other habitat management. This would only occur in areas with other ground disturbing activities proposed (i.e. where appropriate clearance surveys have been completed).

**Watershed Improvements**

**Rehabilitate Skid Road/Trail Hydrology**

- Reduce erosion associated with channelized flow (e.g. culverts, skid trails, etc.) across the project area. This may include adding or moving road culverts, hardening areas at culvert outlets to decrease erosion, and/or rehabilitating eroded areas (e.g. skid trails).

- Rehabilitate erosional areas associated with stream channel and riparian degradation.

- Build a new NFS Road in a sustainable location to access the Chestnut Ridge area and existing savannah (Figure A-3). Once new access is constructed, decommission existing access trail to Chestnut Ridge savannah. The existing Chestnut Ridge hiking trail will follow approximately 1 mile of the new system road.

- Rehabilitate a portion of NFS Road FS92A, and decommission a portion that is no longer needed for administrative purposes and causing resource and safety concerns.

**DESIGN FEATURES**

The Forest Plan provides direction through standards and guidelines to ensure that effects to resources are minimized during implementation. In addition, several resource areas have recommended design features to reduce or minimize impacts. Many of these project design features
are applicable project-wide, while some are specific to areas or activities associated with the proposed action. The complete list of design features and where they are applicable in relation to the proposed actions of Alternative 2 can be found in Appendix B.
CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This chapter summarizes the existing condition of physical, biological, and social resources in the project area, and explains how they may be impacted by the alternatives (40 CFR 1508.7 - 1508.8). These direct, indirect, and cumulative environmental consequences of implementing proposed alternatives are organized by resource area, with a description of the scope of analysis and methodologies used to analyze for effects. Additional information regarding the analysis of effects for each resource topic is documented in resource specialist reports and/or other files available in the project record.

Direct effects are those environmental consequences that are caused by the action and occur at the same time and place. Indirect effects are the environmental consequences that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Cumulative effects are the consequences to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions.

Where appropriate, the analysis tiers to the Final Environmental Impact Statement for Forest Plan Revision (FEIS) for the 2006 Land and Resource Management Plan (Forest Plan) of the Monongahela National Forest, which describes the general effects that activities on Monongahela National Forest System lands may have on vegetation, wildlife, water, soils, recreation, etc. (FEIS, pp. 3-1 through 3-497).

Values for acres of treatment, road miles, and so on are all best estimates based on the latest available information and technology. The analysis conducted for this EA is intended and designed to indicate relative differences between the alternatives, rather than to predict absolute amounts of activities, outputs, or effects.

Past, Present, and Reasonably Foreseeable Activities

Known past, present, and reasonably foreseeable future actions on federal and non-federal lands within and near the project area may contribute to the cumulative effects of implementing the proposed activities (Table 2). The cumulative effects analysis considers these activities, as well as the direct and indirect effects of each action alternative. The existing conditions and effects described under the no action alternative are also analyzed for cumulative effects. More information about these activities is available in the project file.

Table 2. Past, Present, and Reasonably Foreseeable Activities within the TyChest project area.

<table>
<thead>
<tr>
<th>Activity &amp; Description</th>
<th>Location</th>
<th>Active Years</th>
<th>Acres or Miles Affected</th>
<th>Past</th>
<th>Present</th>
<th>Reasonably Foreseeable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities on All Lands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Atmospheric acid deposition</td>
<td>Entire project area</td>
<td>Continuous</td>
<td>Unknown</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Activity &amp; Description</td>
<td>Location</td>
<td>Active Years</td>
<td>Acres or Miles Affected</td>
<td>Past</td>
<td>Present</td>
<td>Reasonably Foreseeable</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------</td>
<td>--------------</td>
<td>-------------------------</td>
<td>------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td>2. Timber harvest prior to federal ownership</td>
<td>Most of project area</td>
<td>Late 1800's and early 1900's</td>
<td>Exact figure unknown-98 acres of project area is greater than 130 years old.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3. Timber harvest since federal ownership</td>
<td>Throughout project area</td>
<td>Within the last 40 years</td>
<td>Regen. harvests: 273 acres Thinning: 427 acres</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4. System road construction &amp; maintenance</td>
<td>Throughout project area</td>
<td>1930-Present</td>
<td>22 miles</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5. Non-system roads and skid trails</td>
<td>Throughout project area</td>
<td>1900-2000</td>
<td>unknown</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>6. Wild fires</td>
<td>Entire Project area</td>
<td>Unknown</td>
<td>Exact figure unknown</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7. Orchard Creation and maintenance by WVDNR</td>
<td>Throughout project area</td>
<td>1950’s - Present</td>
<td>Exact figure unknown</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>8. Conifer plantations planted for thermal cover by WVDNR</td>
<td>Throughout project area</td>
<td>1950’s-1960’s</td>
<td>Exact figure unknown</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>9. Wildlife openings created &amp; maintained by WVDNR</td>
<td>Throughout project area</td>
<td>1960’s-1980’s</td>
<td>54 acres</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>10. Herbicide use for NNIS control</td>
<td>Along roads and in wildlife openings</td>
<td>2014-Present</td>
<td>Exact figure unknown</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Activity &amp; Description</td>
<td>Location</td>
<td>Active Years</td>
<td>Acres or Miles Affected</td>
<td>Past</td>
<td>Present</td>
<td>Reasonably Foreseeable</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------</td>
<td>--------------</td>
<td>-------------------------</td>
<td>------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Recreational use: sightseeing; hiking; biking; fishing; hunting</td>
<td>Through-out project area</td>
<td>1930-present</td>
<td>Unknown</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Special Use Permit for DNR Office</td>
<td>US Tract 823</td>
<td>1967-present</td>
<td>1.8 acres</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Special Use Permit for Rain Gauge</td>
<td>US Tract 823</td>
<td>2011-present</td>
<td>Less than 1 acre</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Special Use Permit for Powerline</td>
<td>US Tract 51h</td>
<td>1994-present</td>
<td>Less than 10.50 acres</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Emerald ash borer</td>
<td>Within the project area</td>
<td>Unknown-present</td>
<td>4,533 acres</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Beech bark disease</td>
<td>Within the project area</td>
<td>Unknown-present</td>
<td>4,533 acres</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Deer browsing</td>
<td>Through-out project area</td>
<td>Unknown-present</td>
<td>4,533 acres</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Activities on Private lands

| No private land in project area |  |  |  |  |  |  |
Vegetation Resource

RESOURCE IMPACTS/ISSUES ADDRESSED
This report addresses the impacts that the TyChest project alternatives will have on the forest vegetation on National Forest lands in the area. Vegetation treatments would occur within compartments 5, 6, 7, and 8. The total acreage of areas that include commercial timber harvesting is approximately 819 acres (RBC mgmt: 165 acres; ESH mgmt: 616 acres; daylighting: 38 acres). In order to meet Forest Plan standards and meet the purpose and need of this project, the estimated acreage of commercial activities within these areas are shown in Table 3, as not the entire area would be treated uniformly; approximately 663 acres would receive commercial harvesting. Additionally, mulcher activity and/or crop tree release could occur on up to approximately 192 acres of young forest and cutback borders (noncommercial) could occur on up to approximately 1,000 acres. Although these activities are designed to improve wildlife habitat through the creation of edge habitat and/or transitional forest, these actions would be designed to also favor desirable tree species (oaks and cherry). Additionally, other wildlife and watershed treatments could be implemented on up to approximately 75 acres (orchard restoration and water/wildlife improvements). In summary, approximately 46 percent of the National Forest lands in the project area would be impacted by the treatments.

Table 3. Summary of acres associated with proposed harvest activities associated with the proposed action.

<table>
<thead>
<tr>
<th>Harvest Method</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearcut with Reserves</td>
<td>0</td>
<td>330</td>
<td>Includes approximately 53% of Commercial ESH areas</td>
</tr>
<tr>
<td>Thinning</td>
<td>0</td>
<td>295</td>
<td>RBC Management and cutback borders to transition between clearcut with reserves and forested</td>
</tr>
<tr>
<td>Daylighting</td>
<td>0</td>
<td>38</td>
<td>NFS Road 1560 Commercial Daylighting</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>663</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Clearcut with reserves acreage is estimated based on approximately variably sized, patchy clearcuts with reserves within the early successional habitat units. Flexibility of size and distribution will ensure the Forest Plan standard TR15 is maintained. Thinning acreage is estimated based on the Running Buffalo Clover units (165 acres) and additional areas of cut back borders around patchy clearcuts with reserves within the ESH units (130 acres).
SCOPE OF ANALYSIS
The impacts of the treatments on both the overstory and understory vegetation will be discussed in this report. This analysis pertains to the 4,533 acres of National Forest lands within the 6.1 prescription area within the project area.

METHODOLOGY
All the units were evaluated using the standards and guidelines set for prescribing silvicultural treatments in mixed-oak hardwood stands (Brose et al. 2008). Understory and overstory data was collected in all of the units in the project area. Research foresters for the NRS were also consulted during the development of stand treatments in the project area. More detail specific to the various prescriptions can be found in the Vegetation report of the project file.

EXISTING CONDITIONS
The three major issues affecting vegetation in the TyChest Project are lack of advanced regeneration, deer, and age-class distribution.

The TyChest project area is dominated by mature sawtimber sized mixed oak and mixed hardwood forests (Table 4 and Figure 3). The forests in the project area are approximately the same age, having been regenerated in the 1920’s. Stands within the project area have an overall lack of advanced regeneration. Advanced regeneration is the small seedlings sized trees (1-5 feet tall) growing in the understory of the forest. This advance regeneration will determine the future species composition of the timber stand to be harvested. Establishing advance cherry and oak regeneration can be very difficult. First seed or acorns must be produced in large enough quantities to establish new seedlings. Large seed or acorn crops only occur every 5 to 10 years and predation of seed and acorns by animals (squirrel, deer, turkey etc.) reduces the amount of seed and acorns for germination. Next, after germination the new oak and cherry seedlings must have enough moisture and light to grow larger and establish sufficient root systems in order to survive. The stands in the project area have been subjected to heavy deer browsing, resulting in dense understories of undesirable shade-tolerant trees like striped maple and beech. Dense shade and competition for moisture from other species in the understory like striped maple and beech have prevented oak and cherry seedlings from surviving.

Over browsing by white-tailed deer has also impacted the vegetation within the project area. Regeneration failures in Allegheny hardwood forest in Pennsylvania and New York have been attributed to browsing by white-tailed deer (Marquis and Brenneman 1981; McWilliams et al. 2003). Many of the desirable crop tree species such as black cherry, red oak, sugar maple, and red maple are preferred browse species for deer. Species like striped maple, ferns, and beech are not heavily browsed by deer. Selective browsing by deer has also resulted in dense ground covers of fern and grass which have interfered with woody regeneration. Grass and fern competition limit light to woody seedlings and have been shown to reduce survival and growth of black cherry seedlings (Horsley and Marquis1983). This selective browsing results in low proportions of
desirable species, like oak, in the understories of stands and encourages the development of dense understories of these undesirable interfering plants, like striped maple. In many stands in the project area this has resulted in a loss of diversity and understories comprised of plants which inhibit the development of desirable regeneration and which do not have very high wildlife or timber values.

Table 4. Acres of direct forest types by age class for NFS lands in project area.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Age Class</th>
<th>0-19</th>
<th>20-39</th>
<th>40-79</th>
<th>80-120</th>
<th>&gt;120</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Oak</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>777</td>
<td>53</td>
<td>832</td>
<td></td>
</tr>
<tr>
<td>Mixed Oak</td>
<td>0</td>
<td>35</td>
<td>25</td>
<td>860</td>
<td>0</td>
<td>920</td>
<td></td>
</tr>
<tr>
<td>Cherry-maple-ash</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td>118</td>
<td>0</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>Mixed Hardwood</td>
<td>0</td>
<td>188</td>
<td>215</td>
<td>1,402</td>
<td>38</td>
<td>1,843</td>
<td></td>
</tr>
<tr>
<td>Sugar-Basswood</td>
<td>0</td>
<td>35</td>
<td>35</td>
<td>643</td>
<td>18</td>
<td>731</td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>61</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>---</td>
<td>61</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>258</td>
<td>306</td>
<td>3,800</td>
<td>109</td>
<td>4534</td>
<td></td>
</tr>
</tbody>
</table>

Currently, 1% of the area is less than 20 years old and 86% is greater than 80 years old or in the mid-late successional habitat. The desired age-class distribution for mixed cove hardwoods and mixed oak forest types is 10-20% in early and 20-30% in mid-late successional habitat (Forest Plan III-28).

Figure 2. Current and desired age class distribution for the forest in the project area.
The TyChest project area is dominated by mixed hardwood forest types, these timber stands are composed of red, white, and chestnut oak. (Figure 3). The mixed hardwood forest type also makes a large proportion of the forests in the area, these stands are composed of maple, basswood, cherry, and oak.

**Figure 3. Different forest types present in the TyChest project area.**

**DIRECT & INDIRECT EFFECTS**

**Alternative 1**

Alternative 1- No Action The vegetation in the project area would remain the same in the no action alternative. The overstories would be mixed-oak hardwood stands and the understories would be dominated by beech, fern, and striped maple.

The vast majority (85%) of the stands in the project area are mature forest (>80 years old). A small portion (1%) of the area is in early successional habitat (0-19 years old), without regeneration the amount of early seral habitat will stay about the same since most of the early successional habitats are wildlife openings.

As these stands age, many of the shade-intolerant species such as black cherry, white ash, and red oak will die out and be replaced by shade tolerant species like red maple, red spruce, and beech.

**Alternative 2 – Proposed Action**

The proposed action would regenerate 368 acres using the clearcut with reserves and daylighting of NFS Road 1560. This would increase early successional habitat from the existing 1% to 8% of the project area. The proposed action would decrease the amount of mature forest by 9 percent. The proposed action moves the project area toward the balanced age class structure called for in the Forest Plan. All the harvesting units fall in landclass types compatible with timber production.
Figure 2 shows how the proposed action moves the 6.1 management lands in the project area towards the desirable age class distribution.

![Age class distribution changes for MP 6.1 in the Tychest project area for Alternative 1 (No Action) and Alternative 2 (Proposed Action) compared to the Desired Future Condition.](image)

**Figure 4.** Age class distribution changes for MP 6.1 in the Tychest project area for Alternative 1 (No Action) and Alternative 2 (Proposed Action) compared to the Desired Future Condition.

The clearcutting with residual method of harvest was chosen for all of the regeneration harvests. This method maximizes the sunlight available for growth of the new stand, and is considered optimum for regenerating a rapidly-growing stand of diverse tree species that will resist changes in deer pressure that could occur over time. Placing wire cages around stumps or seedlings and applying deer repellants may be used to prevent deer browsing of desirable regeneration in the regeneration units. These measures would have the effect of ensuring the successful regeneration of desirable species.

Felling of unmerchantable stems (mostly those less than 9-inches in DBH) after harvesting is required. These mostly small-diameter stems sprout from the roots and provide a source of well-formed regeneration. If not cut, they can develop into poorly formed trees and shrubs that overtop other regeneration.

The 192 acres of young forest work in the proposed action would have the effect of increasing future stand values and mast supply in the future. Black cherry and red oak would be two of the main species released in the stands that would be crop tree release; they both have high timber and wildlife value. Areas within the stands that get mulching would also have the short-term effect of increasing the amount of herbaceous vegetation by increasing the amount of light reaching the forest floor.
Glyphosate and imazapyr would control woody species such as beech and striped maple. Triclopyr would be selectively used to control individual woody stems in the understory. Foliar herbicide application will not directly affect overstory vegetation. Foliar spraying would at most reach vegetation 6 feet tall and basal spray and injection treatments would be used on sapling-sized stems in the mid- and understory of the forest. Herbicide would control ferns and grass and prevent re-establishment of fern and grass on the site for a 2-3 year period. After herbicides are applied, extra light will get to the forest floor causing seeds lying dormant in duff and new seeds from the overstory trees to germinate and become established before the overstory trees are harvested. Herbicide treatment would increase understory diversity during the growing seasons following application. Elimination of the understory interference would permit a larger variety of plants to occupy the area than are now present on the site. There would a short-term decrease in vegetative diversity after herbicide application but would recover within 3-4 year (Horsley 2003).

Construction and continued maintenance of roads would remove some acreage of land from the land currently available for tree growth. Skid trails have some of the same effect, but crown closure of adjacent trees over the skid trail surface minimizes the effect on growing space. Since skid trails experience temporary use, the growing space would be occupied by tree species that become established on disturbed soils after harvesting. Grass seeding that is used to prevent erosion can prevent or delay the establishment of some species. These effects are temporary, because the anticipated growth and development of trees, in clearcut with reserves harvests will soon result in decrease in the mostly shade-intolerant grass species seeded, allowing for additional establishment of other forest species. Evidence of this process is provided by the many trees currently present on unmaintained roads and skid trails within the area. Some reductions in diversity, numbers and size of trees growing on skid trails is expected.

The aquatic habitat improvement would have a minimal effect on vegetation, trees would cut and placed into the stream from the adjacent stand, but only about ½ mile of this activity is proposed so the total number of trees would be minimal. Waterhole construction would affect 17 acres within the project area, a majority of these would be constructed in existing wildlife openings and have minimal effect on the existing vegetation. Linear wildlife openings would be created for old skid roads after the completion of logging in the project area. A total of 16.7 acres would be maintained by mowing the skid roads in order to keep them in a grassy state. Liming would be done of 273 acres, this would little effect on existing vegetation, some species that like high pH soils such as sugar maple and black walnut would have increase growth temporarily until the effects of the liming would wear off. Orchard restoration and terrestrial wildlife habitat improvements would occur on 75 acres in the project area. This would involve clearing brush that has grown in on existing wildlife openings, in order to maintain them by mowing in the future.
CUMULATIVE EFFECTS

Alternative 1 – No Action

Under the no action alternative, the forest would retain a high proportion of mature sawtimber. Early successional forest habitat would stay the same within the project area, leading to an overall lack of age class diversity in the project area which discriminates against plant and wildlife species requiring early successional habitat. There would also be an effect on the forest type; without proper regeneration on public lands, mixed oak and Allegheny hardwood forest types would decrease and be replaced with more shade-tolerant species like sugar maple, red maple, striped maple, and beech.

Cumulative impacts of forest pest outbreaks in combination with taking no action to regenerate or thin forest stands could occur. Forest pest outbreaks of beech bark disease, hemlock wooly adelgid, emerald ash borer, and gypsy moth are somewhat expected, since these pests are present in the area. Mature stands are less resistant to gypsy moth, and more trees are likely to die after outbreaks when more mature trees are present in dense stands. Suppressed and intermediate trees, and even codominant trees with small crowns, are more likely to die from heavy or repeated gypsy moth outbreaks. Deer have had the largest cumulative impact on the project area. Since the early 1980’s the deer population has been very high on the MNF, the result of this 35 years of over browsing is a lack of advance woody regeneration and herbaceous plants in the understory of the project area.

Alternative 2 – Proposed Action

Past timber harvests added to those in the proposed action would amount to about 15% of the N.F. lands having been harvested since the 1980s. By the end of the project, 368 acres would be regenerated. The regeneration in this project, along with 535 acres from previous regeneration cuts will have the cumulative effect of improving age class distribution.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of vegetative resources would occur from any of the alternatives. As discussed above, early successional vegetation is expected to grow into the later successional stages, and over time, mature forest is again expected to occupy the stands regenerated at this time. Species composition in the regenerated stands would be expected to vary from the current condition of these stands, but overall there would not be substantial change in the forest types, or the diversity of tree species in the area.

CONSISTENCY WITH THE FOREST PLAN

Alternative 1 - No Action

This alternative is consistent with the Forest Plan, in that the Forest Plan does not require action in any particular area. However, it would not move the area towards the desired conditions from the Forest Plan.
Alternative 2- Proposed Action
The proposed action is consistent with the management prescription for 6.1 areas. It would increase the amount of early successional habitat; this will ensure the availability of mast producing species into the future and improve the age class structure for the area. It would also provide forest products. The proposed action also is consistent with the Forest Plan by promoting sound timber management practices.

CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS, AND EXECUTIVE ORDERS
All the alternatives are consistent with the following laws and regulations:

- National Forest Management Act of 1976
- Multiple Use Sustained Yield Act of 1960
- FSH 2409.17 chapters 8, 9, and 50
Non-native Invasive Species

RESOURCE IMPACTS OR ISSUE ADDRESSED
This section discloses expected direct, indirect, and cumulative effects of the TyChest project on nonnative invasive plants. Throughout this report the terms “NNIS plants” and “invasive plants” are used as synonyms for nonnative invasive plants. This report does not address nonnative invasive invertebrates and pathogens, which are addressed in the silviculture report. Nonnative invasive vertebrates are generally not considered to be a problem in the project area, so they also are not addressed in this report.

SCOPE OF ANALYSIS
The spatial boundary used to evaluate direct and indirect effects is the boundary of the TyChest project area (Figure 1). The spatial boundary used to address cumulative impacts is the Proclamation and Purchase Unit boundary for the Monongahela National Forest, because this is the boundary to which the National Forest Management Act’s species diversity and viability requirements apply.

The temporal boundary used to assess direct and indirect effects to non-native invasive plants is 30 years from the beginning of project implementation. The same temporal boundary is also used for the cumulative effects analysis because the contribution to cumulative effects ends when the direct and indirect effects no longer exist.

METHODOLOGY
Surveys for NNIS plants were conducted in conjunction with surveys for TES plants. Most proposed activity areas that would involve soil disturbance and/or canopy removal were surveyed. Field surveys also covered most areas proposed for commercial and non-commercial daylighting, running buffalo clover management, early successional habitat management, non-commercial watershed improvement work, construction of the new system road to access Chestnut Ridge, and wetland construction. Most existing roads that will be used as haul roads received some survey effort through travel along the roads, and in conjunction with surveys of proposed harvest units adjacent to roads. Most areas proposed for aquatic habitat improvement and hydrological rehabilitation were not surveyed because these activities have little potential to affect NNIS plants, but any activity with the potential for ground disturbance that has not been surveyed to date will be surveyed for NNIS plants prior to any work being done.

Surveys were conducted by experienced botanists and consisted of winding walks through the proposed activity areas. Surveys covered representative habitats in all parts of the activity areas, with a goal of traversing 100 linear feet per acre of activity area on average. For linear features such as roads, surveys covered representative portions of the existing grades and followed many grades in their entirety. Locations of “high priority” invasive plants (i.e., those capable of invading forest and wetland ecosystems) were noted and documented using global positioning system technology. Botanists generally listed all plant species that were encountered.

Field surveys were conducted during the summers of 2014 and 2015. All surveys were conducted between June 1 and September 30, inclusive, which constitutes the active growing season for most invasive plants that are known to occur on the Monongahela National Forest. Analyses of the
effects of proposed activities were based on reviews of scientific literature and other information, as well as the general observations and experience of the Forest Ecologist.

**EXISTING CONDITION**

Seven nonnative invasive plant species are known to occur in the TyChest project area (Table 5). Of these, five are considered high priority species that can cause serious ecological impacts in forested ecosystems: garlic mustard, Japanese barberry, Japanese knotweed, reed canary grass and Japanese stiltgrass. Reed canarygrass is found throughout the project area and should be treated aggressively. Multiflora rose and autumn olive are found in a few patches, with one very large patch of autumn olive in a wildlife opening.

In this project, these species tend to be closely associated with roads, trails, and wildlife openings, indicating that transportation features and clearing maintenance have served as the primary invasion route in the project area. Mechanisms of seed transport probably include vehicles, construction and maintenance equipment, horses, illegal ATV traffic, boots, etc. Although many invasions of these species have not progressed far from the disturbance features facilitated their establishment, several have been found away from roads and under a forest canopy. Barberry in particular seems to have dispersed away from obvious dispersal vectors. These populations may have been introduced either by foot traffic or by bird and mammal dispersal of berries. Invasions of NNIS plants that are less shade tolerant have been facilitated by the disturbed habitat provided by road corridors and wildlife openings. Such species pose less of a threat to the forested ecosystems that predominate in the project area, but in some cases they can spread and cause ecosystem disruption after being released by a natural or human-caused disturbance.

**Table 5. NNIS plants known to occur in the TyChest project area.**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th># Occurrences</th>
<th>Total acres</th>
<th>High Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Alliaria petiolata</em></td>
<td>Garlic mustard</td>
<td>1</td>
<td>0.0019</td>
<td>X</td>
</tr>
<tr>
<td><em>Berberis thunbergii</em></td>
<td>Japanese barberry</td>
<td>14</td>
<td>0.0229</td>
<td>X</td>
</tr>
<tr>
<td><em>Eleagnus umbellata</em></td>
<td>Autumn olive</td>
<td>5</td>
<td>0.3593</td>
<td></td>
</tr>
<tr>
<td><em>Microstegium vimineum</em></td>
<td>Japanese stiltgrass</td>
<td>14</td>
<td>0.1471</td>
<td>X</td>
</tr>
<tr>
<td><em>Phalaris arundinacea</em></td>
<td>Reed canary grass</td>
<td>11</td>
<td>79.6*</td>
<td>X</td>
</tr>
<tr>
<td><em>Polygonum cuspidatum</em></td>
<td>Japanese knotweed</td>
<td>1</td>
<td>0.004</td>
<td>X</td>
</tr>
<tr>
<td><em>Rosa multiflora</em></td>
<td>Multiflora rose</td>
<td>2</td>
<td>0.007</td>
<td></td>
</tr>
</tbody>
</table>

*The entire length of FR92, on the project’s eastern boundary, is likely to have infestations of reed canary grass, due to many scattered patches along the roadside. Actual acres of occurrence is likely far less.

Surveys for invasive plants focused on proposed activity areas, so it is likely that many other infestations exist in the project area. However, infestations that are not in or near proposed activity areas would not be affected by the project and are not given detailed treatment in this analysis.
DESIRED FUTURE CONDITIONS
The Forest Integrated Desired Conditions (Forest Plan p. II-6) call for containing the expansion of existing non-native invasive species infestations and preventing the establishment of new invasive species. Desired conditions for vegetation (p. II-17 and II-18) envision use of an early detection/rapid response strategy to prioritize control needs based on threat severity and ability to achieve control. The desired conditions also call for using native species and desired non-invasive non-native species for revegetation efforts.

DIRECT & INDIRECT EFFECTS

*Alternative 1 – No Action*
Alternative 1 would not implement any new activities. Therefore, it would not cause any new or expanded invasive plant infestations beyond those that occur due to natural processes and ongoing management activities such as road maintenance, wildlife opening maintenance, dispersed and developed recreation activities, operation and maintenance of existing natural gas pipelines and facilities, etc. Alternative 1 also would not reduce any existing infestations beyond reductions that may occur due to ongoing invasive plant treatment programs.

*Alternative 2 – Proposed Action*
The potential effects of the action alternatives on nonnative invasive plant infestations is summarized in Table 6. The total amounts of all of the major soil- and vegetation-disturbing activities are used as indices to possible effects. Disturbance levels would be higher under Alternative 2 for all activities. Therefore, Alternative 2 would present a higher risk for spreading invasive plants than the No-Action Alternative.

**Table 6. Impacts of the TyChest project related to potential spread and control of NNIS plants.**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total acres of commercial RBC Management</td>
<td>0</td>
<td>165</td>
</tr>
<tr>
<td>Total acres of commercial ESH Management</td>
<td>0</td>
<td>616</td>
</tr>
<tr>
<td>Total acres of commercial daylighting</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>Total acres of orchard restoration</td>
<td>0</td>
<td>54</td>
</tr>
<tr>
<td>Total acres of young forest habitat with ESH component</td>
<td>0</td>
<td>192</td>
</tr>
<tr>
<td>Total acres of cutback borders &amp; bat roosting habitat improvement</td>
<td>0</td>
<td>1000</td>
</tr>
<tr>
<td>Total acres of terrestrial and aquatic habitat improvement</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Total miles of linear wildlife openings created</td>
<td>0</td>
<td>6.9</td>
</tr>
<tr>
<td>Total number of vernal pools created</td>
<td>0</td>
<td>TBD</td>
</tr>
<tr>
<td>Total miles of road decommissioning</td>
<td>0</td>
<td>0.79</td>
</tr>
<tr>
<td>Total miles of new road construction</td>
<td>0</td>
<td>1.04</td>
</tr>
<tr>
<td>Total miles of existing road maintenance</td>
<td>14.40</td>
<td>21.47 (7.07 additional)</td>
</tr>
</tbody>
</table>

Activities with potential to spread or facilitate NNIS invasions
Most commercial and non-commercial activities proposed for this project have the potential to spread existing occurrences of NNIS through physical transport of seeds and plant material by
machinery, through soil disturbance that releases existing seed beds, and/or through increasing sunlight and reducing competition on the forest floor.

All types of commercial timber harvest (hardwood regeneration, hardwood thinning, and spruce restoration through commercial thinning) have the potential to spread invasive plants and facilitate the natural spread of invasive plants (Evans et al. 2006). Harvests that are yarded conventionally using skidders would have the greatest potential to spread invasive plants directly. Dirty log skidders and construction equipment can deposit invasive plant seeds on skid trails and landings. Erosion control measures used on landings and skid trails can spread invasive plants through contaminated mulch and seed mixes.

Also, harvests have the potential to facilitate the natural spread of invasive plants by opening the tree canopy and removing other natural vegetation, which increases the amount of light and other resources available for invasive plants. For both direct spread and indirect spread, the potential is greatest in activity areas that are near existing infestations, which would provide a ready seed source. However, invasions could occur in other areas due to long-distance dispersal of seeds via log skidders, contaminated seed and mulch, and natural means such as birds and wind.

Linear wildlife openings created from main skid trails will not only pose similar risks of spreading or introducing NNIS at the time of creation, but will remain an ongoing risk because of the need for regular mowing and/or diskig.

New road construction to Chestnut Ridge, decommissioning of FR92A, and maintenance of system roads would all have some potential to spread invasive plants via dirty construction equipment; contaminated mulch, seed, and gravel; and the bare ground that would result from the activities.

Activities involving some degree of soil disturbance include commercial activities such as RBC management, daylighting through timber harvest, ESH management (small patch cuts, cutback borders, wildlife corridors, and open woodland management to encourage oak restoration), as well as non-commercial activities such as vernal pool establishment.

In many cases management activities would reduce the amount of native understory vegetation, thereby freeing resources for potential exploitation by invasive plants. Activities that may affect NNIS through increasing sunlight and decreasing competition include non-commercial activities such as orchard restoration, ESH habitat creation in young stands, cutback borders for bat roosting habitat, creation of linear wildlife openings, and road decommissioning, construction and maintenance.

Where a seed source is available or infestations currently exist, the partial canopy openings created by commercial and non-commercial vegetation management could facilitate invasions by opening up niche space for invasive plants to exploit. For example, Japanese stiltgrass, although considered shade-tolerant, tends to invade areas that have brief moments of direct sunlight coming through canopy (Cole and Weltzin 2005).
In all activity areas, passenger vehicles used to access the work zones could spread invasive plants along roads if the vehicles were previously operated in infested areas. Workers accessing the sites on foot present a small risk of spreading invasive plants via seeds stuck to clothing and boots.

Activities not likely to spread or facilitate NNIS invasions
Both commercial and non-commercial vegetation management activities could result in some limited control of woody invasive plants. If any woody invasive plants are present in treatment units, they could be cut or killed with herbicides to release desirable native trees.

Non-commercial activities such as terrestrial and aquatic habitat improvement would have a low risk of spreading invasive plants. These activities would not involve ground disturbance, significantly increased daylighting, or reduced competition, and would not require the use of log skidders, heavy equipment, mulch, or seed.

CUMULATIVE EFFECTS

Alternative 1
Because Alternative 1 would have no direct or indirect effects on invasive plant infestations, it would not contribute to the cumulative effects of other past, present, and reasonably foreseeable future actions.

Alternative 2
The major potential negative effect of the TyChest project relative to nonnative invasive plants is the potential for introduction and spread of invasive plants in areas disturbed by project activities. This effect would add to the effects of past activities that may have caused the introduction and spread of invasive plants. Examples of such past activities include widespread timber harvest, soil erosion, and fires between the years 1880 and 1930, Forest Service timber sales and road building in more recent years, recent timber harvests and road building on private land, and small amounts of residential and agricultural development. Other ongoing activities that are not easily quantifiable may contribute to the spread of invasive plants. These activities include continued recreational use of National Forest land, particularly motorized travel on Forest roads, horseback riding, and unauthorized ATV use; road maintenance; operation and maintenance of facilities and roads that are associated with utilities; maintenance of wildlife openings; and activities on private lands such as timber harvest, road construction, and residential and agricultural development.

Specific information on the introduction and spread of non-native invasive plants in the project area due to activities in the distant past and activities on private land is not available. However, the current distribution of invasive plants in disturbed areas strongly indicates that these activities were collectively responsible for the introduction and spread of existing infestations.

Any effects of the proposed activities would be additive to the effects of recently completed, ongoing, and reasonably foreseeable future activities within the cumulative effects boundary. Table 2 summarizes recently completed, ongoing, and reasonably foreseeable future activities on National Forest land within the cumulative effects boundary that may contribute to the spread or control of nonnative invasive plants. It is likely that other activities occurred during this time frame for which
records no longer exist. Therefore, the numbers in Table 2 represent a minimum estimate of recent, ongoing, and future activity that may affect invasive plant infestations in the cumulative effects analysis area.

Item 10 in Table 2 is of particular importance, as this refers to the implementation of the Forest-wide NNIS EA in the project area. The Forest-wide NNIS EA identifies multiple known NNIS infestations in the TyChest project area and plans for their treatment, and provides a simple administrative protocol for additional sites to be added and treated as needed. All NNIS species known in the TyChest project area and their treatment protocols are analyzed in the NNIS EA for their effects on TES plant species.

The Action Alternative would contribute to cumulative activity levels compared to the No Action Alternative, though the actual cumulative amount of infested land is impossible to predict under either alternative. If the Forest Plan and project design/mitigation measures are not followed, there is potential for a significant increase in the acreage of NNIS populations within the project area, and potential for a concurrent decline in habitat quality for both common and threatened, endangered, and sensitive species. However, design criteria and mitigation measures, if applied to the action alternative, would reduce the potential for a large cumulative increase in infested acreage, and may even reduce NNIS populations to some degree. In addition, the implementation of the Forest-wide NNIS EA as planned will control or reduce the spread of known occurrences in the project area.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES
Alternative 1 would implement no action and have no effects. Therefore, Alternative 1 would cause no irreversible or irretrievable commitment of resources with respect to invasive plants.

Under Alternative 2, an undetermined portion of the RBC and ESH units, roads, skid trails, landings, wildlife openings, and cutback borders would be irretrievably infested by non-native invasive plants. Project design criteria include control measures to combat these infestations, so the infestations would not be considered irreversible.

CONSISTENCY WITH THE FOREST PLAN
Alternative 1 would have no new direct and indirect effects, so it would be consistent with Forest Plan direction for minimizing the spread of invasive species.

Alternative 2 would include incidental pre-activity control, as well as design criteria to reduce the risk of spreading invasive plants via mulch, seed, equipment, gravel, and borrow material. This project is taking place concurrently with implementation of the Forestwide NNIS EA, the sole purpose of which is to identify and treat NNIS species on Forest lands, including all species known to be present in the TyChest project area. These measures ensure consistency with Forest Plan direction for non-native invasive species (see Forest Plan direction VE19 through VE23 on pages II-19 and II-20).
CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS AND EXECUTIVE ORDERS
The primary federal direction that relates to management of non-native invasive species by federal agencies is Executive Order 13112 (February 3, 1999). The provisions of this order that are relevant to the TyChest project stipulate that federal agencies use their programs and authorities to prevent the spread of invasive species, control invasive species in a cost-effective and environmentally sound manner, and refrain from funding, authorizing, or carrying out activities that are likely to promote the spread of invasive species.

Alternative 1 would not implement any activities or have any direct or indirect effects with respect to invasive species. Therefore, Alternative 1 would be consistent with EO 13112.

Alternative 2 includes design criteria and mitigation measures to reduce the spread of invasive plants with the potential to cause disruption of forested ecosystems, and follow-up monitoring in areas of concern. These provisions make the action alternatives consistent with EO 13112.
Herbicide Application

RESOURCE IMPACTS OR ISSUES ADDRESSED
Herbicide use is preferred over other vegetative management methods such as mechanical treatments. Mechanical treatments are not preferred because of their lack of effectiveness. Previous harvests in the area cut all stems 1-inch diameter breast height (DBH) and greater, this resulted in low proportions of desirable species such as oak and black cherry. The main reason for this is many of the less desirable species such as beech and striped maple vigorously sprout after being cut. Herbicides are a type of pesticide used to control plants. Herbicides affect biochemical pathways that are specific to plants, making herbicides the least toxic form of pesticides.

SCOPE OF ANALYSIS
Herbicide treatments could occur within the identified areas over a ten-year period. Approximately 1,808 acres of the project area could receive some type of herbicide treatment (Table 7). Herbicides are used infrequently to accomplish forest management objectives. Herbicides would only be applied a few times to a forest stand during an 80-100 year rotation. This shows the maximum area of potential treatment and not probable that all acres included in the treatment area would receive herbicide application in their entirety.

Table 7. Summary of areas proposed for herbicide treatment within the project area.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Successional Habitat</td>
<td>616</td>
</tr>
<tr>
<td>Cut back borders</td>
<td>1,000</td>
</tr>
<tr>
<td>Young Stands</td>
<td>192</td>
</tr>
<tr>
<td>Total</td>
<td>1,808</td>
</tr>
</tbody>
</table>

Three different application methods, foliar spray, basal spray, and cut-surface treatments could be used to apply the herbicides for the TyChest project (Table 8). Again, this shows the maximum area of potential treatment and not probable that all acres included in the treatment area would receive herbicide application in their entirety.

Table 8. Summary of the types of herbicide application in the regeneration units in the project area.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foliar spray</td>
<td>0</td>
<td>616</td>
</tr>
<tr>
<td>Cut surface</td>
<td>0</td>
<td>1,808</td>
</tr>
<tr>
<td>Basal Spray</td>
<td>0</td>
<td>616</td>
</tr>
</tbody>
</table>

METHODOLOGY
All the units were evaluated using the standards and guidelines set for prescribing silvicultural treatments in mixed-oak forest (Brose et al. 2008). Also other resource professionals from inside and outside the Forest Service were consulted.

A risk assessment was done for the herbicides proposed in this project. A risk assessment is required under the National Environmental Policy Act (40 CFR Part 1502.22). Syracuse
Environmental Research Associates (SERA) recently created new models for the Forest Service to better predict the effects of purposed pesticide use. Older versions of risk assessments used margin of safety to determine the potential effects of pesticides to humans and the environment. In the newest version the hazard quotient is used to determine the relative hazard of using a proposed herbicide. Hazard quotients between zero and one indicate a low relative hazard of using an herbicide. Hazard quotients above one indicate an increased risk of effects from exposure. When a hazard quotient is above one, additional measures would be taken to minimize any effects.

**DIRECT AND INDIRECT EFFECTS**

*Alternative 1 – No Action*
Under the No Action alternative, no herbicides would be applied in the project area, therefore no direct or indirect consequences would occur in this alternative.

*Alternative 2 – Proposed Action*

**Public Risk**
The term public includes hikers, campers, hunters, fuelwood gatherers, and other forest users. It basically it includes all people who use or work in the project area except those who work with the herbicide treatments. Results of the public health portion of the risk assessments done for the herbicides used in this project are shown in Table 9.

Represented in the table is worst case scenarios for any of the given herbicides used. The high hazard quotients for dermal exposure of triclopyr are because triclopyr is mixed with oil making it easier to penetrate the skin. The dermal exposure in the table is a result of the public coming into contact with treated vegetation, which is highly unlikely since triclopyr is applied directly to the lower portion of treated stems.

**Table 9. Summary of the hazard quotients for the general public as a result of the proposed action within the project area.**

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Category</th>
<th>Average Hazard Quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>Vegetation contact</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>Contaminated Fruit</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td>Fish Consumption</td>
<td>.00009</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Vegetation contact</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Contaminated Fruit</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Fish Consumption</td>
<td>.00008</td>
</tr>
<tr>
<td>Sulfometuron methyl</td>
<td>Vegetation contact</td>
<td>.0002</td>
</tr>
<tr>
<td></td>
<td>Contaminated Fruit</td>
<td>.023</td>
</tr>
<tr>
<td></td>
<td>Fish Consumption</td>
<td>.00002</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>Vegetation contact</td>
<td>.0003</td>
</tr>
<tr>
<td></td>
<td>Contaminated Fruit</td>
<td>.009</td>
</tr>
<tr>
<td></td>
<td>Fish Consumption</td>
<td>.000004</td>
</tr>
</tbody>
</table>

**Worker Risk**
The term ‘workers’ includes all personnel involved in the herbicide application in this project. Results of the risk assessment for the project show the typical exposure rates for a worker are not a
concern, expect for the use of gloves contaminated with triclopyr for more than one hour. This means gloves contaminated on the inside with triclopyr, chemical resistant gloves are used and if contaminated on the inside, the gloves are disposed of, and new ones used. This is to reduce the risk of exposure to workers. There is a slight chance that a sensitive worker could experience problems, the maximum rate of exposure was used to account for sensitive workers. Only the triclopyr had hazard quotients above one for worker exposure (Table 10).

Table 10. Summary of the hazard quotients for workers resulting from the proposed action within the project area.

<table>
<thead>
<tr>
<th>Herbicides</th>
<th>Category</th>
<th>Average Hazard Quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>Accidental Exposure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>----Spill on Worker</td>
<td>.0006</td>
</tr>
<tr>
<td></td>
<td>----Contaminated Gloves</td>
<td>.0005</td>
</tr>
<tr>
<td></td>
<td>General Exposure</td>
<td>.1</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Accidental Exposure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>----Spill on Worker</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>----Contaminated Gloves</td>
<td>.1</td>
</tr>
<tr>
<td></td>
<td>General Exposure</td>
<td>2</td>
</tr>
<tr>
<td>Sulfometuron methyl</td>
<td>Accidental Exposure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>----Spill on Worker</td>
<td>.00001</td>
</tr>
<tr>
<td></td>
<td>----Contaminated Gloves</td>
<td>.00004</td>
</tr>
<tr>
<td></td>
<td>General Exposure</td>
<td>0.01</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>Accidental Exposure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>----Spill on Worker</td>
<td>.008</td>
</tr>
<tr>
<td></td>
<td>----Contaminated Gloves</td>
<td>.038</td>
</tr>
<tr>
<td></td>
<td>General Exposure</td>
<td>.0096</td>
</tr>
</tbody>
</table>

CUMULATIVE EFFECTS

*Alternative 1 – No Action*

Since no herbicides would be applied, there would be no cumulative impact from the No Action Alternative.

*Alternative 2 – Proposed Action*

Since the herbicides used do not bioaccumulate and degrade rapidly in the environment no cumulative impacts would result from Alternative 2.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

There are no irreversible or irretrievable commitments of resources to the public or workers from applying the herbicides proposed in this project.

CONSISTENCY WITH THE FOREST PLAN

*Alternative 1 – No Action*

The No Action alternative is consistent with the Forest Plan standards and guidelines for pesticide management (Forest Plan II-20).
Alternative 2 – Proposed Action
The Proposed Action is consistent with the Forest Plan standards and guidelines for pesticide management (Forest Plan II-20).

CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS, AND EXECUTIVE ORDERS
All the alternatives are consistent with the following laws and regulations:

- Federal Insecticide, fungicide, Rodenticide, Act of 1947
- West Virginia Pesticide Control Act of 1990
- FSH 2109.14-Pesticide Use Management
Threatened, Endangered, and Sensitive (TES) Plant Species
This section addresses effects to threatened and endangered plants, as well as Regional Forester’s Sensitive Species plants, for the TyChest Restoration project. Regional Forester’s Sensitive Species Plants are hereafter referred to as sensitive plants; threatened, endangered, and sensitive plants are collectively referred to as TES plants.

SCOPE OF ANALYSIS
For direct and indirect effects on TES plants, the spatial boundary of the analysis is the boundary of the TyChest project area (Figure 1).

For cumulative effects, the spatial boundary of the analysis is the Proclamation and Purchase Unit boundary for the Monongahela National Forest. This is the boundary to which the National Forest Management Act’s species diversity and viability requirements apply.

The temporal boundary for direct and indirect effects on TES species is 120 years from the beginning of project implementation. This is the time frame within which effects to forested habitat will persist. While effects to each individual species may not persist that long, successional changes set in motion by regeneration harvesting will continue for at least that long, potentially affecting some species that occur in forested habitats. This temporal boundary is also used for the cumulative effects analysis because the contribution to cumulative effects ends when the direct and indirect effects no longer exist.

METHODOLOGY
Surveys for TES plants were conducted in most proposed activity areas that would involve soil disturbance and/or canopy removal. Field surveys covered most areas proposed for commercial and non-commercial daylighting, running buffalo clover management, early successional habitat management, non-commercial watershed improvement work, construction of the new system road to access Chestnut Ridge, and wetland construction. Most existing roads that will be used as haul roads received some survey effort through travel along the roads, and in conjunction with surveys of proposed harvest units adjacent to roads. Most areas proposed for aquatic habitat improvement and hydrological rehabilitation were not surveyed because these activities have little potential to affect TES plants. Any activity with the potential for ground disturbance that has not been surveyed to date will be surveyed for TES plants prior to any work being done.

Surveys were conducted by experienced botanists and consisted of meandering walks through the proposed activity areas. Surveys covered representative habitats in all parts of the activity areas, with a goal of traversing 100 linear feet per acre of activity area on average. For linear features such as roads, surveys covered representative portions of the existing grades and followed many grades in their entirety. Surveys were intended to locate substantial populations of TES plants that could be important for maintaining Forest-wide population viability. Locations of TES plants were noted and documented using global positioning system technology. As a precaution in case additional species are listed prior to project implementation, botanists generally listed all plant species that were encountered.

Field surveys were conducted during the summers of 2014 and 2015. All surveys were conducted between June 1 and September 30, inclusive, which constitutes the active growing season for most TES plants that are known to occur on the Monongahela National Forest.
Field surveys were supplemented by existing records of TES plants from files at the Monongahela National Forest Supervisor’s Office and the West Virginia Division of Natural Resource’s Natural Heritage programs.

Analyses of the effects of proposed activities were based on reviews of scientific literature and other information, as well as the general observations and experience of the Forest Ecologist. The likelihood of occurrence in the project area for each TES species was assessed in the Likelihood of Occurrence document, which is filed in the project record. Likelihood of occurrence was based on field surveys, historic records, and the presence of potential habitat in the project area.

This report uses the term “occurrence” to refer to locations of TES plants. This term simply means a discrete site where the plant occurs. “Occurrence” is not necessarily equivalent to the term “element occurrence,” which is the unit used by NatureServe and state Natural Heritage Programs to track biological populations that are more or less separated from other populations of the same species (NatureServe 2002).

**DESIREND FUTURE CONDITIONS**

The Forest Plan addresses TES species at several places in the Forest-wide direction.

The Forest Integrated Desired Conditions (USDA Forest Service 2006, p. II-6) call for maintaining habitats that support populations of TES species. Desired conditions for vegetation (p. II-17) emphasize protection and enhancement of rare plants and their habitats. Desired conditions for threatened and endangered species (p. II-22) call for managing habitats to maintain or enhance populations consistent with recovery plans, and for keeping adverse effects at levels that do not threaten population persistence.

**FEDERALLY LISTED THREATENED AND ENDANGERED PLANT SPECIES**

*Affected Environment*

Four federally-listed threatened and endangered plant species are known to occur on the Monongahela National Forest: running buffalo clover (*Trifolium stoloniferum*), shale barren rockcress (*Arabis serotina*), Virginia spiraea (*Spiraea virginiana*), and small whorled pogonia (*Isotria medeoloides*). Based on field surveys and existing records, only running buffalo clover is known to occur in the TyChest Project Area. The following is a brief description of typical habitat and the likelihood of occurrence in the project area.

**Virginia Spiraea** – Virginia spiraea is a clonal shrub found on damp, rocky banks of large, high-gradient streams (USFWS 1992a). The closest known occurrence is along the Greenbrier River approximately 60 air miles southwest of the project area. Virginia spiraea is not known to occur anywhere in the Potomac River drainage, so the probability of occurrence anywhere in the project area is considered low. There are no large, high-gradient streams in the project area; therefore, there is no potential habitat for Virginia spiraea.

**Running Buffalo Clover** – Potential habitat for running buffalo clover typically exists in lightly disturbed forests and woodlands on soils derived from geologic features with a neutral pH (NatureServe 2006a, USFWS 2007). The Monongahela National Forest is a stronghold for running buffalo clover, with the largest and highest quality populations range-wide occurring on the Forest (USFWS 2007). Most of the Forest’s populations are associated with old skid trails, lightly used
roads, or other features that cause moderate soil disturbance, many of which are found throughout the project area. The RBC management areas were placed according to the 60 known and historic populations of running buffalo clover within the project boundaries. RBC restoration is one of the primary purposes of this project.

Small Whorled Pogonia – Habitat preferences for small whorled pogonia are poorly known, but could include a variety of forested habitats. The available literature indicates occurrence in mixed deciduous and pine-hardwood habitats of a variety of ages, often near partial canopy openings (USFWS 1992b) or in open understories. Small whorled pogonia appears to be associated with acidic soils having a pan layer, and slopes of 11 to 17 percent near small streams (USFWS 2008, 2008a). Likelihood of occurrence for small whorled pogonia is considered to be low because it is not known to occur near the project area, and site-specific surveys have not located it. Potential occurrence cannot be completely ruled out based on habitat preferences and due to the difficulty of locating this species using conventional survey techniques.

Shale Barren Rockcress – Shale barren rockcress occurs in specialized habitats known as shale barrens in eastern West Virginia and western Virginia (USFWS 1991). The nearest known shale barrens are located approximately 26 miles to the east of the project area on the George Washington National Forest. The nearest known shale barrens on the Monongahela are located approximately 27 miles south of the project area. Therefore, shale barren rockcress is not likely to occur in or near the project area due to lack of shale barren habitat.

**Direct & Indirect Effects**

**Alternative 1 – No Action**

Running buffalo clover—Because studies have shown that RBC depends on recurring low-intensity disturbance, and because the No Action Alternative would not include any silvicultural or other manipulative treatments in the TyChest project area, habitat for RBC would continue to decline under the No Action alternative.

Small whorled pogonia—Alternative 1 would not implement any new activities. Therefore, it would not have any effects on small whorled pogonia beyond those that occur due to natural processes and ongoing management activities such as road maintenance, wildlife opening maintenance, etc. Even these activities would be unlikely to affect this species because no occurrences are known to occur in the project area.

**Alternative 2 – Proposed Action**

Running Buffalo Clover—For all proposed management in occupied and potential RBC habitat, the primary goal is to improve RBC habitat. The direct and indirect effects of these silvicultural treatments may include loss of individuals and populations during timber harvesting and related operations (creation of new skid trails and opening of existing skid roads and log landings). However, indirect effects of timber harvesting should benefit RBC. Following a subsequent disturbance, population density declines initially but then rebounds within two or three growing seasons. Some ground disturbing activities, such as skid roads and logging decks, provide mechanical seed scarification and provide an area for species dispersal. Results of RBC studies on the Fernow suggest that controlling the intensity of ground disturbance combined with a reduction in canopy density, such as that associated with uneven-aged harvests, may help sustain populations of running buffalo clover (Burkhart et al. 2013).
For all proposed management outside of areas of currently and historically occupied RBC habitat, including commercial and non-commercial daylighting, bat habitat improvement, watershed improvement work, wetland construction, aquatic habitat improvement, and hydrological rehabilitation, any potential direct or indirect effects to RBC are thought to be discountable.

**Small Whorled Pogonia**—Project activities would be unlikely to affect small whorled pogonia because surveys of the proposed activity areas did not locate this species and small whorled pogonia is not known to occur in this part of the Forest. Potential habitat could be negatively impacted by commercial and non-commercial daylighting, running buffalo clover management, early successional habitat management, non-commercial watershed improvement work, construction of the new system road to access Chestnut Ridge, hydrological rehabilitation, and wetland construction, but such effects on habitat would not translate into actual impacts on small whorled pogonia unless undiscovered populations exist. This possibility is sufficiently remote that the potential for direct and indirect effects is considered discountable.

Proposed activity areas were not surveyed for low-intensity activities, including aquatic habitat restoration and road maintenance. Small whorled pogonia is not likely to be affected by these because work would be limited to the existing footprint of heavily traveled roads that are not likely to support small whorled pogonia. Aquatic habitat restoration could have beneficial effects on small whorled pogonia, if any is present. Small whorled pogonia is believed to prefer the type of partial canopy openings that could be created by felling trees for woody debris (USFWS 1992b). However, the potential for such beneficial effects is considered remote because of the low likelihood that small whorled pogonia occurs in the project area.

**Cumulative Effects**

**Alternative 1 – No Action**

Because Alternative 1 would have no direct or indirect effects on Virginia spiraea, small whorled pogonia, and shale barren rock cress, it would not contribute to the cumulative effects of other past, present, and reasonably foreseeable future actions.

The No Action Alternative would not include any silvicultural or other manipulative treatments in the TyChest project area. Studies have shown that RBC depends on recurring low-intensity disturbance; therefore habitat for RBC would continue to decline under the No Action alternative.

**Alternative 2 – Proposed Action**

Under Alternative 2, the potential for direct and indirect effects to Virginia spiraea, small whorled pogonia, and shale barren rock cress is so small it is considered discountable. Therefore, Alternative 2 would be unlikely to make any measurable contribution to the effects of other past, present, and reasonably foreseeable actions.

Under Alternative 2, there is potential for both positive and negative effects to running buffalo clover from timber harvesting, associated skid road re-opening and use, and other activities that disturb the vegetation or soil. Silvicultural treatments in the TyChest project area over the next ten years are not expected to make a substantial contribution to the cumulative negative effects of timber harvest on the landscape scale. The cumulative effect of lack of disturbance over the last 20-30 years in the project area has presumably reduced habitat suitability for RBC. Therefore, actions included in this proposal are assumed to increase the likelihood of persistence of local populations of the RBC throughout the project area. Potential cumulative effects to this species also include competition from non-native invasive species and altered natural disturbance regimes. Roads and
other soil disturbance associated with timber harvest have the potential to facilitate the spread of non-native invasive plants, and USFS and WVDNR personnel have documented NNIS plant populations in the project area. NNIS treatments are permitted under existing NEPA decisions. Therefore, contribution of the proposed actions to the cumulative negative effects of NNIS is expected to be small compared to the contribution of private activities, which generally do not include any special measures to prevent the spread of NNIS.

The cumulative effect of repeated disturbances over the past 50 years on the Fernow has maintained a refugium for running buffalo clover, and the species has responded positively to silvicultural practices occurring on there since 2000 as the overall population has continued to increase. However, timber stands throughout RBC habitat show a trend towards increasing age (Widmann & Cook 2008) with less disturbance due to timber harvesting, therefore the amount of RBC habitat available on the landscape scale is declining. There would be little cumulative effects to this species, as such a small portion of the population and habitat would be involved. Thus the cumulative trend is most likely stable, with increasing populations on the Fernow and throughout the TyChest project area and decreasing populations in surrounding areas of RBC habitat.

**Effect Determinations for Threatened and Endangered Plants**

**Virginia Spiraea**
Virginia spiraea has no potential to occur in the project area. Therefore, both alternatives would have no effect on Virginia spiraea.

**Running Buffalo Clover**
Alternative 1 would take no new actions. Therefore, a determination of “May affect, likely to adversely affect” is made for the RBC for the No Action Alternative. The No-Action Alternative would not include any silvicultural or other manipulative treatments in the project area, and studies have shown that without periodic, low-intensity disturbance, habitat for the RBC would diminish.

Under Alternative 2, due to the possibility of short-term adverse effects from vegetative manipulation, including timber harvesting and associated activities (i.e. skid trail creation and use, landing creation, etc.) a determination of “May affect, likely to adversely affect” is made for RBC for the Action Alternative.

**Small Whorled Pogonia**
Alternative 1 would take no new actions. Therefore, Alternative 1 would have no effect on small whorled pogonia.

Under Alternative 2, the potential for direct and indirect effects on small whorled pogonia would be so low as to be discountable. Therefore, Alternative 2 may affect, but is not likely to adversely affect, small whorled pogonia.

**Shale Barren Rockcress**
Shale barren rockcress has no potential to occur in the project area. Therefore, both alternatives would have no effect on shale barren rockcress.

**Irreversible or Irretrievable Commitment of Resources**
Project activities would not result in irreversible or irretrievable commitment of T&E plants species or their habitats.
**Consistency with the Forest Plan**
The alternatives would be consistent with direction in the Forest Plan, and would meet the requirements of laws, regulations, and Forest Service policy.

**Consistency with the Forest Plan, Laws, Regulations, and Handbook**
All alternatives would be unlikely to affect threatened and endangered plants adversely except for running buffalo clover. RBC is likely to be adversely affected by both alternatives, but in different ways. The adverse effects of the action alternative will facilitate population growth in the future, whereas the adverse effects of the no action alternative will likely lead to population decline. USFWS has been consulted and has concurred with this determination. Therefore, the action alternative would be consistent with Endangered Species Act protections and consultation requirements, as well as all regulations, directives, and policies that implement that act with respect to threatened and endangered plants.

**REGIONAL FORESTER SENSITIVE PLANT SPECIES**

**Affected Environment**
Sixty-one plant species are listed as Regional Forester’s Sensitive Species on the Monongahela National Forest. Based on field surveys and existing records, two sensitive plant species are known to occur in the TyChest project area: 34 known occurrences of Roan mountain sedge (*Carex roanensis*), all but two of which are in project areas, and 5 occurrences of butternut (*Juglans cinera*), two of which are in project activity areas. Potential habitat exists for an additional 23 species, for a total of 25 sensitive species that could occur within the project area. However, for the 23 species with potential habitat but no known occurrences, project surveys did not locate them in the activity areas. Therefore, the probability of occurrence of these 23 species in the activity areas is low.

To facilitate analysis, sensitive plant species have been grouped according to their primary habitat (Tables 11-14). The five habitat groupings are wetland/riparian habitat, mesic forest, dry rocky habitat, moist rocky habitat, and dry oak forest. Some overlap among the habitat types occurs. For example, mesic forest, wetland/riparian habitat, and moist rocky habitat co-occur in the deep, narrow coves. Dry rocky habitat often occurs within dry oak forests.

Riparian habitat and small areas of wetland habitat occur along streams throughout the project area (Table 11). Small seep wetlands also occur on slopes in areas that are not near streams.

**Table 11. Wetland and riparian RFSS plants that could occur in project activity areas.**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Habitat Comments</th>
<th>Known Occurrence</th>
<th>Potential Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Baptisia australis var. australis</em></td>
<td>Blue wild indigo</td>
<td>Primarily early successional wetlands</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
### Mesic Forest RFSS Plants That Could Occur in Project Activity Areas

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Habitat Comments</th>
<th>Known Occurrence</th>
<th>Potential Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Euphorbia purpurea</em></td>
<td>Darlington’s spurge</td>
<td>Open or closed canopy in wetlands to uplands</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Hasteola suaveolens</em></td>
<td>Sweet-scented Indian plantain</td>
<td>Riverbanks and disturbed wetlands</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Hypericum mitchellianum</em></td>
<td>Blue Ridge St. John’s wort</td>
<td>Riverbanks and disturbed wetlands</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Ilex collina</em></td>
<td>Long-stalked holly</td>
<td>Open or closed canopy wetland/riparian</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Listera cordata</em></td>
<td>Heartleaf twayblade</td>
<td>Mossy hummocks in forested wet areas; moist, mossy sites in conifer and conifer-hardwood forests; known occurrence just south of project area.</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Mesic forest is a broad grouping that includes mixed hardwood and northern hardwood forests dominated by black cherry, maples (*Acer* spp.), beech (*Fagus grandifolia*) and birch (*Betula* spp.), as well as hemlock (*Tsuga canadensis*)-hardwood and red spruce-hardwood mixed forests (Table 12). The central part of the project area is mostly mixed upland hardwoods, transitioning in the east and southeast into higher elevation mesic forests composed of sugar maple, beech, and yellow birch.

### Table 12. Mesic Forest RFSS Plants That Could Occur in Project Activity Areas

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Habitat Comments</th>
<th>Known Occurrence</th>
<th>Potential Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Botrychium lanceolatum var. angustisegmentum</em></td>
<td>Lanceleaf grapefern</td>
<td>Moist, shady woods and swamp margins</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Botrychium oneidense</em></td>
<td>Bluntlobe grapefern</td>
<td>Moist to wet wooded areas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Carex roanensis</em></td>
<td>Roan Mountain sedge</td>
<td>Mid- to high-elevation mesic forests</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Clematis occidentalis var. occidentalis</em></td>
<td>Purple Clematis</td>
<td>Mid to high-elevation mesic rich, rocky, shady woodlands.</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Dry rocky habitat includes dry rock outcrops and ledges that occur at various elevations along ridge tops and side slopes, whereas moist rocky habitat includes the wet outcrops and moist colluvial rubble that occur along streams and in cove bottoms (Table 13). The TyChest project area has the potential to contain small patches of both types of habitat. Commercial ESH will take place around several rocky outcrops in red oak stands, but design criteria will avoid disturbance of those areas, so any unknown occurrences of RFSS will not be affected.

Table 13. Moist rocky habitat RFSS plants that could occur in project activity areas.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Habitat Comments</th>
<th>Known Occurrence</th>
<th>Potential Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Arabis patens</em></td>
<td>Spreading rockcress</td>
<td>Moist, rocky woods</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Gymnocarpium appalachianum</em></td>
<td>Appalachian oak fern</td>
<td>Rocky woods along streams</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><em>Scutellaria saxatilis</em></td>
<td>Rock skullcap</td>
<td>Variety of rocky situations, but most common in moist, partially shaded talus.</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Scientific Name | Common Name | Habitat Comments | Known Occurrence | Potential Habitat
--- | --- | --- | --- | ---
*Taxus canadensis* | Canada yew | Moist, rocky habitats along streams; also wetlands and spruce forests. | | X

Dry mesic forests dominated by mixed oaks comprise the major forest community in the northwestern parts of the project area, interspersed in the north with tulip poplar and stands of white ash and black cherry, and in the south with stands of sugar maple-basswood and northern red oak (Table 14).

**Table 14. Dry mesic forest RFSS plants that could occur in project activity areas.**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Habitat Comments</th>
<th>Known Occurrence</th>
<th>Potential Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Allium allegheniense</em></td>
<td>Allegheny onion</td>
<td>Rocky and other thin-soiled areas in oak forests</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><em>Paxistima canbyi</em></td>
<td>Canby’s mountain lover</td>
<td>Dry, open woods, calcareous soils.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><em>Pycnanthemum beadlei</em></td>
<td>Beadle’s mountainmint</td>
<td>Rocky, open woods, often associated with oaks.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><em>Silene virginica var. robusta</em></td>
<td>Robust fire pink</td>
<td>Dry, open woods</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><em>Taenidia montana</em></td>
<td>Mountain pimpernel</td>
<td>Dry open limestone woods, mesic to xeric</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Direct & Indirect Effects**

*Alternative 1 – No Action*
Alternative 1 would would take no new actions, so it would have no impacts on any sensitive plant species.

*Alternative 2 – Proposed Action*
Activities that are unlikely to affect sensitive plants
Aquatic habitat restoration proposed by Alternative 2 has little or no potential to affect sensitive plants, even if undiscovered populations exist. Aquatic habitat restoration will primarily consist of placing large and small woody debris in one section of stream and associated riparian areas to improve habitat, which will involve no ground disturbance and will maintain current levels of shade, thus being unlikely to alter habitat for any unknown occurrences of sensitive plants.

Activities that may affect sensitive plants
Several activities that could affect RFSS include commercial thinning for running buffalo clover management, commercial and non-commercial ESH for bats and oak management, installation and maintenance of wildlife corridors and linear wildlife openings, and commercial daylighting. Project
activities’ potentials to affect sensitive plant are analyzed individually, and then according to the species’ five broad habitat groupings (wetland/riparian habitat, mesic forest, dry rocky habitat, moist rocky habitat, and dry oak forest). This possibility is sufficiently remote that the potential for direct and indirect effects is considered discountable.

Management for open oak forest, which is included under the commercial ESH category, will involve removal of a significant percentage of tree canopy and possibly disking to reduce competition and encourage forb growth. Disking has the potential to negatively impact any existing sensitive species unless they are avoided through design criteria. However, all areas that have not been surveyed will be surveyed prior to any ground-disturbing activities being implemented, and design criteria will protect any existing or newly found occurrences of RFSS from disturbance. Despite the low probability that sensitive plant occurrences will be missed during surveys, the possibility cannot be completely discounted. While the probability is considered low, some potential exists for impacts to sensitive plants.

Wetland creation will only occur in areas already cleared by surveys for other ground-disturbing activities, such as open forest management for oak regeneration. Road creation and maintenance is unlikely to disturb sensitive plants because most are unlikely to occur in or alongside active roads, and surveys did not discover any occurrences of sensitive plants. However any undiscovered populations that exist within road-related activity areas are likely to be eliminated.

Herbicide may be used in the creation of bat habitat, creation and maintenance of linear wildlife openings, and non-commercial ESH work. All known occurrences of RFSS will be protected from exposure to herbicides through design criteria, but there is a small chance that undiscovered populations could be affected.

**Wetland and Riparian Habitat Species:** No occurrences of wetland or riparian sensitive plant species are known in the project area, so the potential for effects to species in this group is low. However, due to the representative nature of the surveys, the potential for impacts to undiscovered occurrences cannot be ruled out completely. Project activities have been designed specifically to avoid sensitive areas such as wetlands and riparian habitats. There is a slim chance that vernal wetland creation could directly damage undiscovered RFSS plant species by equipment during construction activities, but all areas that have not been surveyed will be surveyed prior to any ground-disturbing activities being implemented, and design criteria will protect any existing or newly found occurrences of RFSS from disturbance. Despite the low probability that sensitive plant occurrences will be missed during surveys, the possibility cannot be completely discounted, and some potential exists for impacts to sensitive plants.

**Mesic Forest Species:** Butternut and Roan Mountain sedge are known to occur at multiple locations in the project area. Design criteria would require that all proposed project activities avoid soil disturbance or damage to these known occurrences. Increased daylighting associated with several project activities may benefit both butternut and Roan Mountain sedge. Herbicide use associated with several project activities is unlikely to affect Roan Mountain sedge because design criteria will protect known occurrences from being affected.

**Butternut:** There is one butternut tree in the area proposed for large woody debris additions, one in a commercial RBC management stand, and one in a commercial ESH stand. Design criteria would protect these and any newly found occurrences from disturbance.
**Roan Mountain sedge:** This species is abundant throughout the project activity areas, with one occurrence in an area proposed for commercial daylighting, six in commercial RBC units, and 25 in commercial ESH units. Commercial daylighting will not involve ground disturbance, but will alter habitat on the ground by increasing light, dryness, and surface soil temperature. Because this species prefers moderately vegetated sites with a sparse to moderate understory (Smith and Waterway 2008), these conditions may create a positive effect. Thinning may also increase competition, especially if invasive species are present. The effect of competition on Roan Mountain sedge is unknown. Commercial RBC and ESH management will create some areas of ground disturbance, but known occurrences will be protected through design criteria.

It is possible that undiscovered occurrences of Roan Mountain sedge and other RFSS exist in project activity areas. Major soil-disturbing activities within the project area, including disking for oak woodland management, wetland creation, and construction of the new system road to access Chestnut Ridge, would likely remove RFSS from within the footprint of the disturbance if any unidentified occurrences exist. However, all areas that have not been surveyed will be surveyed prior to any ground-disturbing activities being implemented, and design criteria will protect any existing or newly found occurrences of RFSS from disturbance.

**Moist Rocky Habitat Species:** No occurrences of moist rocky habitat sensitive plant species are known in the project area, so the potential for effects to species in this group is low. However, due to the representative nature of the surveys, the potential for impacts to undiscovered occurrences cannot be ruled out completely. All project activities except aquatic habitat improvement are designed to avoid sensitive habitats such as rocky areas along streams and seeps, and aquatic habitat improvement is not likely to impact any existing RFSS, even if undiscovered. If occurrences are discovered, they will be protected by project design criteria.

**Dry Rocky and Oak Forest Species:** No occurrences of dry rocky or oak forest sensitive plant species are known in the project area, so the potential for effects to species in this group is low. However, due to the representative nature of the surveys, the potential for impacts to undiscovered occurrences cannot be ruled out completely. Major soil-disturbing activities within the project area, including disking for oak woodland management, wetland construction, and construction of the new system road to access Chestnut Ridge, would likely remove RFSS if any unidentified occurrences exist within the footprint of the disturbance. However, all areas that have not been surveyed will be surveyed prior to any ground-disturbing activities being implemented, and design criteria will protect any existing or newly found occurrences of RFSS from disturbance.

**Cumulative Effects to Regional Forester’s Sensitive Species Plants**

*Alternative 1 – No Action*
Because under Alternative 1 there are no anticipated direct or indirect effects to RFSS plants, there will be no cumulative effects to any RFSS plants. Under this alternative, the project area would continue to provide very little habitat for RFSS.

*Alternative 2 – Action Alternative*
Known occurrences of butternut and Roan Mountain sedge would be protected from the effects of ground-disturbing activities and herbicides. Four of the known forty-one total occurrences occur outside project activity areas; the rest will be protected through design criteria. These effects would be the only likely contributions of the project to the cumulative effects of other past, present, and
reasonably foreseeable activities. No other reasonably foreseeable actions are known for this project that could impact butternut or Roan Mountain sedge.

Within the Forest boundary, numerous past activities likely have affected butternut and Roan Mountain sedge. Because both species occur in mesic forested habitats, the most important past impact probably was the large-scale clearcut logging that took place around the turn of the 20th century. No data on these species are available from that time period, but it is likely that at least some occurrences of these species were reduced in size or eliminated. Other development activities likely contributed to past impacts, including railroad and road construction, mining, natural gas development, urban development, and conversion of land to agriculture. In more recent decades and in the project area specifically, populations or individuals may have been affected by the installation of the rain gauge on Tract 823 and powerline on Tract 51h; by the orchards, conifer plantations, water holes, and wildlife openings created and maintained by the West Virginia Division of Natural Resources; and by Forest Service management activities such as timber harvest and road building. Comprehensive botany surveys have been conducted for Forest Service projects for only approximately the last decade, so even these more recent impacts cannot be reliably quantified. No records exist of any recent activities at known occurrences for these two species. Potential cumulative effects to this species also include competition from non-native invasive species and altered natural disturbance regimes. Roads and other soil disturbance associated with timber harvest have the potential to facilitate the spread of non-native invasive plants, and USFS and WVDNR personnel have documented NNIS plant populations in the project area. NNIS treatments are permitted under existing NEPA decisions. Therefore, contribution of the proposed actions to the cumulative negative effects of NNIS is expected to be small compared to the contribution of private activities, which generally do not include any special measures to prevent the spread of NNIS.

*Butternut and Roan Mountain sedge:* Butternut is known to occur in at least 125 locations on the Forest, 5 of which are found in the TyChest project. Roan Mountain sedge is known to occur in 72 locations on the Forest, 34 of which are on the TyChest project. The majority of the rest are found in Big Rock and Big Mountain projects. Several reasonably foreseeable future activities, including commercial and non-commercial ESH management, daylighting, and RBC management, could have a positive impact on both butternut and Roan Mountain sedge. Butternut is shade intolerant and requires sunlight to germinate, and Roan Mountain sedge does best in open habitat with a sparse mid-canopy and open to moderate herbaceous layer. No other reasonably foreseeable actions with the Forest boundary would affect robust butternut or Roan Mountain sedge, so the potential impacts of the TyChest project, together with unquantified past impacts, would constitute the entire cumulative effect on this species. The species is expected to persist at all known sites on the Forest for the reasonably foreseeable future.

*Other undiscovered RFSS:* Alternative 2 would have a small chance of affecting undiscovered occurrences of other sensitive plant species. However, because other sensitive plant species are not known to occur within any of the proposed activity areas, the potential for such effects is considered low. Because no measurable direct and indirect effects are expected, Alternative 2 likely would not make a measurable contribution to the cumulative effects of past, present, and reasonably foreseeable future actions on these species.

**Effects Determinations for Regional Forester’s Sensitive Species Plants**

**Alternative 1 – No Action**
Alternative 1 would take no new actions, so it would have no impacts on any sensitive plant species.

**Alternative 2 – Proposed Action**
There are no ongoing or reasonably foreseeable future Forest Service actions would negatively impact known RFSS occurrences. Any impacts to known occurrences are likely to be neutral to
positive. Therefore, the direct and indirect effects of the TyChest Restoration Project, added to the effects of other past, present, and reasonably foreseeable future actions, are not expected to impact population viability within the analysis area. Also, project activities would pose a very small risk of damaging or extirpating occurrences of other sensitive plant species with potential habitat in the project area. Therefore, for all sensitive plant species listed in Tables 11-14, the action alternative may impact individuals, but is not likely to lead to loss of viability or a trend toward federal listing. Sensitive plant species that are not listed in Tables 11-14 are not expected to occur in the project area. Therefore, there will be no impacts to these species.

Irreversible or Irretrievable Commitment of Resources
Alternative 1 (No Action) would not affect sensitive plants, so it would not make any irreversible or irretrievable commitments of resources with respect to sensitive plant species.

Alternative 2 would be unlikely to negatively affect butternut and Roan Mountain sedge. Though it could affect undiscovered occurrences of other sensitive plant species, the likelihood of extirpation of any occurrences is extremely low. Therefore, Alternative 2 would not make any irreversible or irretrievable commitments of resources with respect to sensitive plants.

Consistency with the Forest Plan
Alternative 1 (No Action) would not affect sensitive plants, and therefore would be consistent with Forest Plan direction that requires protection of sensitive plants.

Alternative 2 would be unlikely to negatively affect butternut and Roan Mountain sedge, and could affect undiscovered occurrences of other sensitive plant species either negatively or positively. Damage to all known occurrences would be prevented by protecting them from the effects of ground disturbance and herbicides through avoidance. Therefore, Alternative 2 would be consistent with Forest Plan direction to avoid and minimize negative impacts on sensitive plants to the extent practical (see Forest Plan standard VE13, p. II-19).

Consistency with Laws, Regulations, Handbooks, and Executive Orders
Alternative 1 would take no actions and have no effects on sensitive plants, so it would be consistent with all laws, regulations, handbooks, and executive orders relating to the protection and management of sensitive species.

Under Alternative 2, effects to sensitive plant species would be avoided and minimized to the extent practical, and would not result in loss of viability or a trend toward federal listing. Because of this maintenance of viability, Alternative 2 would be consistent with requirements in the National Forest Management Act and its implementing regulations related to maintenance of biological diversity and population viability.
Terrestrial Wildlife

THREATENED AND/OR ENDANGERED WILDLIFE SPECIES

Resource Impacts/Issues Addressed

A biological assessment (BA) was completed to determine the effects of the No Action and Proposed Action alternatives on federally-listed and proposed threatened and endangered species that have been identified as having at least part of their range on the Monongahela National Forest (MNF). This section summarizes the data and analysis of effects on terrestrial animals from the BA.

Scope of Analysis

The effects analysis for federally-listed species focuses on potential effects to species and changes to suitable habitat due to activities included in the TyChest project. For direct and indirect effects, the spatial boundary includes the TyChest project area as described in Chapter 1, unless otherwise noted. Temporal boundaries for direct effects on terrestrial wildlife species are not expected to last beyond the actual time to complete the activity. Although the temporal boundary used to assess cumulative and indirect effects is generally about 25 years, it depends on how long habitat is impacted.

Methodology

To determine which T&E species could be potentially affected by the proposed activity, a “Likelihood of Occurrence” (LOO) table specific to the project area was completed. In this table, all MNF T&E species are listed along with their current federal/state ranking, habitat description requirements and known locations. A comparison between species habitat requirements and existing project area habitat was made. Species information was collected from District/Forest T&E records and files, records from the WV Natural Heritage Program, research literature, field surveys, and personal communication with specialists to determine each species’ likelihood of occurrence in this project area. The LOO table and other supporting information can be found in the project file Biological Assessment submitted to the USFWS.

Conclusions drawn from the LOO table dictate the level of analysis needed for each T&E species. T&E species determined not to occur or unlikely to occur in the project area due to lack of habitat are not carried through further analysis. As such, it has been determined that the proposed activity will have no effect on the Cheat Mountain salamander. No further analysis will be completed for this species because implementation of any activities would have no direct, indirect, or cumulative impacts on these species.

Two other listed species, gray wolf (*Canis lupus* – endangered) and eastern cougar (*Puma concolor couguar* – endangered), formerly existed in the area, but are believed to have been extirpated in the late 1800s or early 1900s (WVDNR 1988). One listed species, the gray bat (*Myotis grisescens*), is known from one record from a winter hibernaculum survey in 1991. This record is considered accidental, and the species is not considered to occur in West Virginia (Stihler pers. comm. 2000). These three species will not be discussed further in this analysis.
The effects analysis and determination of effects analysis are provided for the Virginia big-eared bat (*Corynorhinus townsendii virginianus*), northern long-eared bat (*Myotis septentrionalis*), and Indiana bat (*Myotis sodalis*).

**Affected Environment**

**Virginia big-eared bat**

Virginia big-eared bats (VBE) roost in caves and feed at night predominantly on moths, but also on beetles, true flies, mosquitoes, bees, wasps, and ants (USDA 2006b). VBE generally forage near their summer caves. In West Virginia, VBEB bats have been documented foraging in hay fields, forests, old fields and riparian corridors. Although white nose syndrome (WNS) has had a devastating impact on native bat species, it does not appear to be a threat to the VBEB. The area of influence for the VBEB is six miles from known maternity caves or hibernacula. This is consistent with the Biological Opinion for the Forest Plan (USFWS 2006).

**Potential habitat in project area**

The area of influence as it relates to the TyChest project area boundary will serve as the spatial area covered in this portion of the analysis. No VBEBs have been captured during mist net surveys or detected during acoustic surveys in the project area. No VBE caves are located within the project area. Caves within 6 miles of the project area known to harbor VBEBs are Harper Trail and Izaak Walton. These caves are considered winter hibernacula. There are no known maternity or bachelor colonies within six miles of the project area. There are no mine adits or abandoned buildings on federal property within the project area that could be used as day or night roosts.

**Northern long-eared bat**

The greatest current threat to the northern long-eared bat (NLEB) is White Nose Syndrome (WNS), so called due to the presence of white fungal growth on the muzzles, ears, and/or wing membranes of affected bats. This fungus has been identified as *Pseudogymnoascus* (formerly *Geomyces*) *destructans* (USFW 2015a). Besides the presence of the white fungus on hairless portions of the face, wing and tail, affected bats have little to no fat reserves and can found moving near cave entrances and/or leaving the caves and flying in the middle of the day during hibernation season. The disease is associated with massive bat mortality in the northeastern and mid-Atlantic United States. Since the winter of 2006-07, bat population declines ranging from 90 percent to 100 percent have been documented at surveyed hibernation areas that have been most severely affected. Although exact numbers are difficult to determine, biologists estimate that losses may exceed five million bats since 2007. As of August 2014, bats with WNS were confirmed in 25 states and five Canadian provinces, including West Virginia. Cave closures have been ordered in an effort to prevent human-assisted transmission from WNS affected hibernacula to unaffected hibernacula; however preliminary work has indicated that the transmission of WNS is primarily bat-to-bat, so these closures could have little effect on the spread of WNS.

**Potential Habitat in Project Area**

NLEB typically uses mature, intact interior forest for roosting, though younger, managed forests are also used; roost selection is likely adaptable and variable depending on forest characteristics in an area (Broders et al. 2006, Carter and Feldhamer 2005, Ford et al. 2006, Henderson et al. 2008, Lacki and Schwierjohann 2001, Loeb and O’Keefe 2006, Perry and Thill 2007). The entire project area is considered suitable habitat for the NLEB.
Survey Efforts in and near Project Area
Based on mist net surveys throughout the project area, 235 bats of 7 different species have been captured throughout the project area. Of the four mist net sites, two sites included the capture of reproductively active female NLEBs, suggesting maternity activity in the project area.

The only other survey information for the project area with regard to bats is acoustic data collected via stationary detectors in the summer of 2015. We collected 9 nights of acoustic data at 16 sample sites scattered throughout the areas proposed for commercial management using Wildlife Acoustics ZC units. We recorded 24 total calls. We analyzed recorded calls using Kaleidoscope v 3.1.0 under the most sensitive setting to establish species identity and presence. Maximum likelihood estimates indicated the likely presence of northern long-eared and Indiana bats, with 2 calls of each species recorded. Hand-review of these calls supported the likely presence of northern long-eared and Indiana bats. The likely presence of NLEB is in close proximity to where the NLEB were captured via mist net surveys. However, with so few calls recorded, it is difficult to establish 100% surety of presence. Furthermore, acoustic data showed that relative bat activity was extremely low and was not indicative of a large number of either bat species (NLEB or IB).

Indiana bat
For information regarding the life history of the Indiana bat and population status rangewide and on the MNF, please see the Forest Plan Revision BA (pages 36-42) and Tier I BO (pages 27-47). As described above for the NLEB, the greatest current threat to the NLEB is WNS.

Potential Habitat in Project Area
According to WVDNR data, there are not any mapped caves in the project area. The only Indiana bat cave within five miles of the project area is Gooseberry Cave. Given the distance from the project area to the known hibernaculum, project actions would not affect this cave environment. Approximately 19 acres, or 0.4% of the TyChest project area does fall within the 5-mile primary foraging habitat for Gooseberry Cave.

Survey Efforts in and near Project Area
To determine if Indiana bats are present, mist-net surveys have been conducted at four locations during the maternity period throughout the project area over the last several years. Sites were surveyed in 2001, 2003, 2005, 2008, 2010, 2011 and 2013. Per the tier I BA/BO, mist net sets were selected based on quality of bat habitat in a given area rather than being limited to the specific area proposed to be affected. To date, a total of 235 bats of 7 different species have been captured in the project area. USFWS mist-netting protocol was followed. One Indiana bat, a non-reproductive adult male was captured. No other Indiana bats have been captured in the project area.

The only other survey information for the project area with regard to bats is acoustic data collected via stationary detectors in the summer of 2015. In summary, while few bat calls were encountered with the stationary acoustic detectors, the presence of IB was documented at one out of the 16 stationary bat detectors. The detector that confirmed IB presence was located within ½ mile of the IB capture via mist net surveys.

Desired Future Conditions
The Forest Plan addresses TES species at several places in the Forest-wide direction. The Forest Integrated Desired Conditions (USDA Forest Service 2006, p. II-6) call for maintaining habitats
that support populations of TES species. Desired conditions for Threatened, Endangered, and Proposed Species (USDA Forest Service 2006, II-22) include providing habitats that are managed to maintain or enhance populations consistent with established and approved recovery plans, and for keeping adverse effects at levels that do not threaten population persistence.

Direct & Indirect Effects

Alternative 1 – No Action
Under this alternative, there would be no potential for negative effects from management actions. Also, there would be no beneficial effects related to this species or its habitat. As such, the majority of the project area would remain in relatively unbroken forest and no actions (snag creation, vernal pool construction, etc.) would be taken to improve habitat for this endangered species.

Alternative 2

Virginia Big Eared Bat
Determination of Effects: May affect, not likely to adversely affect.
Implementation of the proposed action is not expected to directly or indirectly have an effect on the VBEB, or its habitat. There are no known caves in the project area used by the VBEB, be it winter hibernacula, maternity colonies or bachelor colonies. Approximately 2,613 acres in the analysis area occur within a 6-mile foraging area from known VBEB caves. However, these are all winter hibernacula rather than maternity sites. Therefore, it is unlikely that VBEBs would travel to forage within the project area, as evidenced by the lack of capture or detection of VBEB from mist net surveys and acoustic surveys. Project implementation would have a beneficial effect on foraging habitat for the VBEB through the creation of a mosaic of habitat conditions, including wildlife openings that would mimic old fields. However, any effects to this species under the action alternative are considered discountable because of the low probability of VBEB frequenting the project area.

Northern Long-Eared Bat
As evidenced by the capture of reproductively active females over multiple years before and after the arrival of WNS, maternity activity is present in the project area. However, no maternity roosts have been identified.

For a summary of anticipated effects to the NLEB and its habitat, please see the relevant sections within the “Potential Effects of Management Activities” of the Conferencing Report (pages 6 and 8-9); the “Effects of the Action” section of the CO (pages 14-16); the Regional BA (pages 50-82); and the Regional BO (pages 38-77).

A design feature for this project is to prohibit all tree (>5” dbh) clearing activities from mid-May to mid-July within a 0.75 mile radius of the two areas where reproductively active female NLEB have been captured (See Map 7). This will reduce the likelihood of direct take of the NLEB in the areas most likely to harbor NLEB maternity activity.

This project has been designed to improve habitat for bats (especially those federally-listed, including the NLEB), birds (especially those dependent on ESH) and clover (i.e. RBC). Therefore, it is anticipated that the outcome of this project will improve habitat for the NLEB over the long-
term. However, because the vegetation manipulation activities involve cutting of trees greater than 5” dbh, there is the potential for short term negative impacts, particularly to roosting habitat, on approximately 1,800 acres of forested habitat (165 acres of commercial RBC management; 616 acres of commercial ESH management; 38 acres of commercial daylighting; and up to approximately 1,000 acres of non-commercial ESH/bat habitat management). This risk would be greatly reduced by the implementation of seasonal clearing restrictions.

In addition to the vegetation management described above, there would be approximately one mile of new road construction associated with this project. This would be within 0.25 miles of the capture of reproductively active female NLEB. All tree clearing operations associated with the new road construction would be conducted outside of the pup season for the NLEB (cutting would occur from mid-July to mid-November).

Determination of Effects for NLEB: May effect, Not Likely to Adversely Affect. All applicable S&G from the 2006 Forest Plan, as listed in Appendix A of the 2006 BO and pages 184-190 of the programmatic BA (USDA 2015) meant to avoid and minimize incidental take in both summer and winter habitat have been incorporated into the proposed action. Additionally, the six conservation measures described on pages 58-59 of the Regional programmatic BA and RPM 1.2 on page 24 of the CO have been incorporated into this project. This includes the prohibition of cutting down trees greater than 5” dbh from mid-May through mid-July within a 0.75 mile radius around the capture of reproductively active female NLEB. This will greatly reduce the risk of direct take. Additionally, actions that benefit habitat for bats (snag creation, creation of a mosaic of habitat conditions across the landscape, wetland creation, linear WL opening creation, etc.), are the foundation of this project. This effects determination is based upon the need for approximately one mile of new road construction within 0.25 miles of the capture of reproductively active female NLEB.

There is no permanent conversion of suitable NLEB habitat to unsuitable habitat, and the proposed action is likely to improve summer roosting and foraging habitat over the long-term: snag creation, reduced understory clutter, maintenance of canopy-covered foraging/travel corridors and likely improvement in abundance and diversity of insects.

There would be no effects beyond those previously disclosed and addressed in the Conferencing Report (USDA 2014) and the associated Conferencing Opinion (USFWS 2015a); and the Regional programmatic BA (USDA 2015) and associated BO (USFWS 2015b). The activity would have no effect on designated critical habitat for the NLEB.

**Indiana Bat**

While maternity activity could be present in or near the project area, the negative data as it relates to maternity activity from mist net surveys suggests that any Indiana bat maternity activity is so low that it cannot be detected via mist net surveys. However, and as evidenced by the capture of a non-reproductive adult male Indiana bat and the detection (albeit low) of Indiana bat use via stationary acoustical surveys, the likelihood of Indiana bat presence in the project area cannot be dismissed. Otherwise the lack of any Indiana bat captures or detection via acoustical surveys, despite extensive surveys, suggests that the likelihood of Indiana bat presence, especially females raising young, is highly unlikely. Because project implementation will exceed the length that mist net survey data is considered valid (3 years), it cannot be definitively determined that Indiana bats may not occupy other parts of the project area during the length of project implementation. Indiana bat survey
efforts will continue in the affected areas into the future as identified in the terms and conditions of the Biological Opinion.

As previously described, a design feature for this project is to prohibit all tree (>5” dbh) clearing activities from mid-May to mid-July on approximately 65% of the proposed activities. Although this design feature is a result of our Conferencing with the USFWS for the NLEB, this will reduce the likelihood of direct take of the Indiana bat.

**Fall/Winter Habitat:** Gooseberry Cave is the only hibernacula within five miles of the project area. The only proposed activities within Indiana bat primary range (19 acres in the extreme western corner of project area) would affect less than 0.5% of the project area.

No detrimental effects to Indiana bat are anticipated from any other proposed activities.

**Summer Habitat:** This project has been designed to improve habitat for bats (especially those federally-listed, including the Indiana bat), birds (especially those dependent on ESH) and clover (i.e. RBC). Therefore, it is anticipated that the outcome of this project will improve habitat for the Indiana bat over the long-term. However, because the vegetation manipulation activities involve cutting of trees greater than 5” dbh, there is the potential for short-term negative impacts, particularly to roosting habitat, on approximately 1,800 acres of forested habitat (165 acres of commercial RBC management; 616 acres of commercial ESH management; 38 acres of commercial daylighting; and up to approximately 1,000 acres of non-commercial ESH/bat habitat management).

While information gaps still exist, Romme et al. (1995) found that Indiana bats prefer to forage within upper forest canopy layers where overstory canopy cover ranges from 50 to 70 percent. Additionally, roosts with solar radiation and in close proximity to good foraging habitat are important criteria for IB maternity roosts in this part of the range. All of the commercial RBC management, approximately 2/3 of the non-commercial ESH/bat habitat management and approximately 1/4 of the commercial ESH habitat management would result in an overstory canopy that ranges from 50 to 70 percent. All of the commercial daylighting, the majority of commercial ESH and approximately 1/3 of the non-commercial ESH/bat habitat management would reduce forest canopies below 25 percent in areas treated. Snags, culls, and “reserve” trees would provide a small number of potential roosts in these units. Except for removing potential roost trees, all proposed vegetative treatments are expected to indirectly benefit Indiana bats by reducing canopy closure to a more optimal level for Indiana bat foraging. Opening up canopy cover improves foraging, as well as improves roosting conditions. These effects are short term, because canopy closure occurs in approximately 5 to 10 years after management occurs. A more long-term effect of thinning is increased residual growth on the remaining trees, creating larger diameter and suitable roost trees over time. Additionally, the creation of wetlands throughout the areas of commercial management are anticipated to improve Indiana bat habitat.

Habitat changes due to implementation of the action alternative would primarily involve loss of suitable roost trees, but an improvement of conditions throughout the project area. This vegetation manipulation would provide a mosaic of habitat conditions across the project area, ranging from mature forest, to small openings. Additionally, the linear wildlife openings would provide foraging corridors for the Indiana bat. However, loss of potential roost trees as a result of the vegetation treatments cannot be discounted, especially due to the felling of culls and snags in regeneration cuts. Damage to residual trees during felling can also improve roosting quality and quantity as
damaged areas turn to cavities, and crevices are more likely to develop due to resulting pathogen and insect attack at the injury point. Due to the widespread availability of potential roost trees in the remaining available habitat and creation of potential roost sites by exposing remaining trees in and adjacent to cutting units to sunlight, negative impacts are difficult to quantify.

Road and landing construction would have the same effects as timber harvesting, as far as habitat alteration. Roads provide travel corridors and may also provide water sources if standing water collects on road surfaces. The proposal includes approximately one mile of new road construction.

Although tree removal activities outside of the primary range could unknowingly affect Indiana bats, mist net surveys suggest a lack of use by Indiana bats for maternity activity within the areas that would be impacted. In summary, potential effects to the Indiana bat as a result of all tree cutting activities would not exceed those disclosed in the programmatic BA and BO.

Snag creation activities would have no short term effects and would have a beneficial effect because it would create potential roost trees.

Determination of effects for Indiana Bat:  *May effect, likely to Adversely Affect.*
All applicable S&G from the 2006 Forest Plan, as listed in Appendix A of the biological opinion meant to avoid and minimize incidental take in both summer and winter habitat have been incorporated into the proposed action. Also, the prohibition of cutting down trees greater than 5” dbh from mid-May through mid-July will greatly reduce the risk of direct take to the Indiana bat. Additionally, actions that benefit habitat for bats (snag creation, creation of a mosaic of habitat conditions across the landscape, wetland creation, linear WL opening creation, etc.), are the foundation of this project.

Despite all the measures meant to avoid loss of potential roost trees, it is still possible that adverse effects could occur when an undetected roost tree is cut down. All activities would occur within a heavily forested landscape and proposed activities are planned to be mosaic in nature. Volant bats may be present during implementation of the various activities and they are expected to temporarily abandon the area. However, displaced bats are expected to have sufficient alternate roosts nearby.

There is no permanent conversion of suitable Indiana bat habitat to unsuitable habitat, and the proposed action is likely to improve summer roosting and foraging habitat over the long-term: snag creation, reduced understory clutter, maintenance of canopy-covered foraging/travel corridors and likely improvement in abundance and diversity of insects.

There would be no effects beyond those previously disclosed and addressed in the Biological Assessment for the 2006 Forest Plan (USDA 2006b) and the associated Biological Opinion (USFWS 2006). The activity would have no effect on designated critical habitat for the Indiana bat.

**Cumulative Effects**

Alternative 1 – No Action

To combat the devastating effects of White Nose Syndrome (WNS), efforts should be made where possible in the project areas to improve habitat for federally-listed bat species affected by WNS, particularly in areas that currently have these species (near capture areas, around caves, etc.) The No Action Alternative would not improve habitat for federally-listed bat species, particularly those
affected by WNS, nor would it make progress toward the desired future conditions or goals identified in the Forest Plan.

Alternative 2 – Proposed Action

*Virginia Big-eared Bat*

Any cumulative effects to this species under the action alternative are considered discountable because of the low probability of VBEB frequenting the project area.

*Northern Long-eared Bat*

With implementation of this project, vegetative manipulation would occur on up to approximately 1,800 acres over the next 10 years. There would be approximately 1 mile of new road construction associated with the commercial timber harvest to improve wildlife habitat. Various other activities would occur, all of which were determined to have a minimal impact on the NLEB and its habitat. The vegetative manipulation and associated activities (linear WL opening creation, orchard restoration, wetland construction, etc.) would have a long-term beneficial effect on approximately 40% of the project area. This is anticipated to have a beneficial effect on resident bat populations, including the NLEB, within the approximately 4,500 acre project area.

The Forest Service has a Regional Programmatic BA and associated BO for projects with similar short-term effects as this project, with the exception of the reduced risk of adverse effects to bats due to the implementation of the seasonal clearing restrictions, as described in the Conference Opinion. It is our understanding that with the exception of the proposed new road construction, as described above and summarized below, all proposed activities fall under RPM 2 of the Regional BO, which states:

- “Project-level documentation that an activity is excepted from incidental taking prohibitions and does not require terms and conditions. The FS will provide written documentation to the Service Field Office of applicable jurisdiction when it determines that timber harvest, prescribed burning, roads, trails, and habitat improvement/non-timber clearing projects may affect the NLEB, that that any taking resulting from such projects is excepted from the taking prohibitions applicable to the NLEB.”

The long-term cumulative effects from implementation of this project are expected to improve bat habitat throughout the project area (see discussion below). White Nose Syndrome (WNS) has not been linked to Forest management practices or activities. Therefore, we conclude that, from the best science we have available to us now, this project would not significantly contribute to negative cumulative effects to bat populations or critical habitat. No critical habitat has been designated for the NLEB.

*Indiana Bat*

With implementation of this project, vegetative manipulation would occur on up to approximately 1,800 acres over the next 10 years. There would be approximately 1 mile of new road construction associated with the commercial timber harvest. Various other activities would occur, all of which were determined to have a minimal impact on the Indiana bat and its habitat. The vegetative manipulation and associated activities (linear WL opening creation, orchard restoration, wetland construction, etc.) would have a long-term beneficial effect on approximately 40% of the project area.
area. This is anticipated to have a beneficial effect on resident bat populations, including the Indiana bat, within the approximately 4,500 acre project area.

Even though we have a BA determination for the Forest Plan of May Affect, Likely to Adversely Affect, the EA analysis shows there would be no direct, indirect, or cumulative effects to primary habitat, hibernacula, key areas, or known maternity sites with implementation of this project. White Nose Syndrome (WNS) has not been linked to Forest management practices or activities. Therefore, we conclude that, from the best science we have available to us now, this project would not significantly contribute to negative cumulative effects to bat populations or critical habitat. Hellhole, a cave in Pendleton County, WV, approximately 27 miles east of the project area, is the only designated critical habitat for the Indiana bat in West Virginia.

*Cumulative Total of Incidental Take that has been authorized annually and to date*

As described in the incidental take statement in the aforementioned Tier I BO, the annual allowable acreage for activities involving: timber harvest is 6,900 acres (regeneration - 4,000 acres; thinning - 1,300 acres; spruce restoration - 500 acres); and road work – 78 acres. To date no management similar to this project (using commercial and noncommercial vegetative treatments to expressly improve federally-listed species habitat and ESH) has occurred in this fashion. In order to stay in compliance with the allowable acreage, all activities proposed with the TyChest project will be included in projects scheduled for the entire Forest and the annual amount of any of the proposed activities will not exceed take thresholds for a given year, unless coordinated with the USFWS.

*Irreversible or Irretrievable Commitment of Resources*

**Alternative I – No Action**

Because this alternative is the no action alternative, there would be no irreversible or irretrievable commitment of resources.

**Alternative 2 – Proposed Action**

There are no actions identified in the action alternative that would be considered irreversible or irretrievable. Even-aged harvest units, roads, and landings may be considered irretrievable commitments due to the long period of time it would take to return to mature forest. However, these actions would not be considered irreversible because the harvest units would eventually grow back to mature forest, and roads and landings could be abandoned and returned to riparian, or mature forest habitat.

*Consistency with the Forest Plan*

Because Alternative 1 does not implement actions that improve or enhance the habitat of federally-listed wildlife species or help move these species towards de-listing, this alternative does not help achieve the desired future conditions for the project area and is therefore inconsistent with the Forest Plan.

Alternative 2 was developed to benefit federally-listed wildlife species by improving habitat conditions, which could lead to increased populations and/or resilience to new or changing threats. This alternative is consistent with Forest Plan and moves towards achieving the goals and objective for the project area.
Consistency with Laws, Regulations, Handbooks, and Executive Orders
Although the no action alternative does not enhance or improve potential suitable habitat for federally-listed wildlife species, it is not inconsistent with law, regulations, policy, or agency direction.

In regards to the proposed actions of alternative 2, the USFWS has been consulted and has concurred with this determination. Therefore, the action alternative would be consistent with Endangered Species Act protections and consultation requirements, as well as all regulations, directives, and policies that implement that act with respect to threatened and endangered plants.

All alternatives would be consistent with the following:
- Multiple Use and Sustained Yield Act of 1960
- National Environmental Policy Act of 1969
- Endangered Species Act of 1973 (ESA)
- Sikes Act of 1974
- Forest and Rangeland Renewable Resources Planning Act of 1974

REGIONAL FORESTER SENSITIVE WILDLIFE SPECIES
Resource Impacts or Issues Addressed
This report addresses effects to Regional Forester Sensitive Species. This analysis addresses terrestrial animal species that are listed as Regional Forester Sensitive Species (RFSS) on the Monongahela National Forest (MNF), including insects and other invertebrates. Aquatic species and RFSS plants are addressed in the hydrology and botany sections, respectively.

Scope of Analysis
The effects analysis for RFSS focuses on potential effects to species and changes to suitable habitat due to activities included in the TyChest project. For direct and indirect effects, the spatial boundary includes the TyChest project area as described in Chapter 1, unless otherwise noted. Temporal boundaries for direct effects on terrestrial wildlife species are not expected to last beyond the actual time to complete the activity. Although the temporal boundary used to assess cumulative and indirect effects is generally about 25 years, it depends on how long habitat is impacted.

Methodology
Field surveys, GIS layers pertaining to wildlife, layers specific to federally listed, or RFSS, as well as layers pertaining to unique habitat features such as soils and rock outcrops were reviewed. Sixty-five terrestrial animals are listed as RFSS on the MNF. This number does not include aquatic species. A Likelihood of Occurrence (LOO) table was created and updated based upon the December, 2011 RFSS update to aid in the analysis to determine which RFSS are likely to occur in the TyChest project area. Through this analysis, it was determined that the planning area is considered potential habitat for 9 terrestrial RFSS. Species determined not to occur or unlikely to occur in the project area due to lack of habitat (based on the LOO) were not brought forward for
further analysis because no impacts are anticipated due to the lack of potential habitat in the project area.


Although transient bald eagles could frequent the project area, there are no documented instances of nesting. Therefore, no further analysis will be completed for bald eagle. Implementation of Alternatives 1 or 2 would have no direct, indirect, or cumulative impacts on the bald eagle.

The key to determining effects is evaluating how the action alternative affects species and habitat, and, in particular, how the action alternative affect factors that limit a species’ ability to thrive (limiting factor). Direct and indirect effects to RFSS species and habitat lead to a “determination of effect” for each species. These determinations can be: 1) “no impact”; 2) “beneficial impacts”; 3) “may impact individuals but not likely to cause a trend to federal listing or a loss of viability”; or 4) “likely to result in a trend to federal listing or a loss of viability”.

RFSS species have been grouped into the following habitat types for effects analysis: riparian, mature forest, rocky areas, savannahs, and early successional habitat.

**Affected Environment**

Riparian Habitat and Species

Riparian areas are ecotones of interaction that include terrestrial and aquatic ecosystems extending into the groundwater, above the canopy, across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the water course (Verry et.al. 2000). Both the abundance and richness of species tend to be greater in riparian ecosystems than in adjacent uplands (Verry et al. 2000).

Riparian acres have been calculated based on 100-foot buffers on ephemeral and perennial streams. There are approximately 232 acres of riparian habitat within the analysis area. This is a coarse number based on 9.4 miles of streams. The aquatic/riparian zones in the analysis area provide potential habitat for the RFSS terrestrial animals (Table 15).

**Table 15. Limiting Factors for RFSS riparian habitat species.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Limiting Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern bog lemming</td>
<td>Disturbance to wetlands</td>
</tr>
<tr>
<td>Tri-colored bat</td>
<td>Disturbance to winter hibernacula</td>
</tr>
<tr>
<td>Little brown myotis</td>
<td>Disturbance to winter hibernacula</td>
</tr>
</tbody>
</table>

*Southern Bog Lemming.* These animals are found in mixed forests, wetlands and grasslands in eastern North America, especially, in or near bogs, wet meadows and fields near ponds and creeks. The southern bog lemming has been documented in the southern portion of the project area. However, no activities are proposed nearby.
**Tri-colored Bat.** The tri-colored bat (also known as the eastern pipistrelle) occurs throughout most of eastern North and Central America and into parts of the Midwestern United States (Thompson 2006). The tri-colored bat hibernates in caves and mines and establishes maternity sites and night roosts in buildings, tree cavities and tree foliage. This bat forages in open country with woodland edges and along water. Although the tri-colored bat is not expected in large numbers in the project area, two individuals of this species have been captured during mist net surveys in the project area. Because the roosting behavior of the tri-colored bat appears to be generalized and potential roosting habitat is widely distributed and available, the threat to the tri-colored bat is the availability of winter hibernacula. To a much lesser degree, exposure to pesticides, especially in agricultural areas, is thought to be a potential risk (Thompson 2006).

**Little Brown Myotis.** Prior to the onset of White nose syndrome (WNS), the little brown myotis was common throughout much of the United States. In the Eastern States, the southern limit of its range reaches into northern portions of South Carolina, Georgia, Alabama, and Mississippi (Fenton and Barclay 1980, in Menzel et al. 2003). The little brown myotis hibernates in caves and mines and establishes maternity sites and night roosts in buildings, tree cavities, under rocks, and in piles of wood, among other sites. This bat prefers to forage along streams where insect abundance is higher. The little brown myotis has been captured via mist netting throughout the project area.

**Mature Forest Habitat and Species**
Mature forests are ecosystems distinguished by old trees and related structural attributes, including tree size, accumulations of large, dead woody material, number of canopy layers, species composition, and function. Mature forest stands exhibit a wider range of age classes and tree diameters, elevated densities of large trees, larger canopy gaps, greater vertical differentiation of the canopy, and higher volumes of large woody debris (LWD), including snags and downed wood than immature or early successional stands. The mature forest in the project area provides potential habitat for the sensitive terrestrial animals (Table 16).

**Table 16. Limiting Factors for RFSS Mature Forest Habitat Species.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Limiting factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noctuid moth</td>
<td>Removal of host and nectar plants</td>
</tr>
<tr>
<td>Green salamander</td>
<td>Disturbance to habitat</td>
</tr>
</tbody>
</table>

**Noctuid Moth.** There is very little information available for this species; Nature Serve is a limited source. We do know that this moth is found in northern hardwoods with high concentrations of starry campion. Although this species is hard to survey for, starry campion was found in Units 255, 280, 44 and 88, including the eastern prescribed burn block. The habitat and the existence of starry campion have been documented in the project area.

**Green Salamander.** The range of the green salamander extends from southwestern Pennsylvania, western Maryland, and southern Ohio, to central Alabama and northeastern Mississippi. Preferred habitat for the green salamander is crevices in well-shaded and moist, but not wet, rock faces in mesophytic forests. Because of their microhabitat preferences, green salamanders probably do not compete with other salamanders that restrict their activity to the forest floor. Green salamanders can occasionally be found under logs and loose bark on trees in the absence of suitable rock formations (Green and Pauley 1987; Petranka 1998; Wilson 1999).
Rock formations within the TyChest project area are not extensive; however, green salamanders are also known to occur under rotting bark and logs. This type of habitat can be found within the project area. Green salamander surveys were not conducted in the project area, as they are assumed to be present.

Rocky Habitat and Species
Rocky habitat consists of areas with surface rock, small outcrops, and ledges. There are approximately 18 acres within the analysis area that provide potential habitat for the species (Table 17).

Table 17. Limiting Factors for RFSS Rocky Habitat Species.

<table>
<thead>
<tr>
<th>Species</th>
<th>Limiting factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber rattlesnake</td>
<td>Disturbance during hibernation and direct killing of individuals</td>
</tr>
<tr>
<td>Southern rock vole</td>
<td>Disturbance to habitat</td>
</tr>
</tbody>
</table>

Timber Rattlesnake. Timber rattlesnakes occur in timbered areas with rocky outcroppings, dry ridges, and second growth deciduous or coniferous forests. They prefer areas with high rodent populations and southern exposures. Rattlesnakes feed primarily at night, preferring warm-blooded prey. Small mammals, especially rodents, are the major prey of rattlesnakes. Hibernation occurs from September to April in rocky crevices that are usually overgrown with brush found in emergent rocky areas. Females return to hibernation dens to give birth to young.

Specific timber rattlesnake surveys were not conducted. There are no known den sites or extensive rocky areas located within the TyChest project area, but rattlesnakes can be found almost anywhere within the MNF, so timber rattlesnake presence is assumed within the project area.

Southern Rock Vole. The range of the southern rock vole extends from eastern West Virginia and western Virginia southward through the Appalachian Mountains to North Carolina and Tennessee. Southern rock voles inhabit boulder fields, talus slopes, and other rocky areas in a variety of forest types, including red spruce and deciduous forests. Forest age where southern rock voles live ranges from recent clearcuts to uncut forests (Whitaker and Hamilton 1998; Wilson and Ruff 1999). Another seemingly important habitat feature is water, as either a surface or subsurface stream. The presence of mosses, forbs, and other ground-cover plants also determines the presence or absence of this species (Kirkland and Jannett 1982). Riparian areas in the project area provide potential habitat for the southern rock vole. Although specific vole surveys were not conducted, this species is assumed to be present.

Savannahs/Grasslands Species
Savannahs and grasslands include hayfields, pastures, old grassy fields, and the larger maintained wildlife openings. In the project area, this habitat is provided largely by private lands, with the exception of several of the larger maintained wildlife openings and the three grazing allotments. The savannah grasslands in the project area provides potential habitat for the sensitive terrestrial animal species (Table 18).
Table 18. Limiting Factors for RFSS Savannah, Grassland Habitat Species.

<table>
<thead>
<tr>
<th>Species</th>
<th>Limiting factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobweb skipper</td>
<td>Host plant (little bluestem, big bluestem) availability</td>
</tr>
</tbody>
</table>

*Cobweb Skipper.* The cobweb skipper butterfly’s range stretches from southern Maine south to the Gulf States and eastern Texas in sporadic populations. Its range in West Virginia is restricted to those sites that have a considerable amount of beard grass on them. It has only been reported from five counties; however, it is certain to be found elsewhere where suitable habitat exists. It is found on dry hillsides, usually rocky sites where its host plants (beard grasses, little bluestem, and big bluestem) are found. Nectar sources include early spring flowers (bird’s foot violet, spring beauty, wild strawberry, and clovers).

**Early Successional Habitat and Species**

Early successional habitat consists of areas with vegetation ranging from persistent shrubs or seedlings to sapling-sized trees. Succession is the gradual replacement of one plant community by another. In a forested ecosystem, tree cover can be temporarily displaced by natural or human disturbance (e.g., flooding by beaver, logging). The open environments created by removal of tree cover often support very different plant species than a full-canopied forest (Table 19). These open environments are generally referred to as “early-successional” habitats because, as time passes, trees will return. Thus, the open conditions occur “early” in the sequence of plant communities that follow disturbance.

Table 19. Limiting Factors for RFSS Early Successional Habitat and Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Limiting factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden-winged warbler</td>
<td>Habitat succession</td>
</tr>
</tbody>
</table>

*Golden-Winged Warbler.* The golden-winged warbler thrives in shrubby, early-succession fields that appear after a disturbance such as logging, fire, or agricultural use, and are close to a forested edge. Golden-winged warbler nests are located on the ground at the base of a supporting plant along the shaded forest-field edge such as wildlife openings, logging roads, power line rights-of-way, or low areas where saturated soil retards woody growth. Habitat loss is a major threat to the golden-winged warbler. Habitat tracts of 50 to 300 acres can support several pairs and are preferred over both smaller and larger areas (Aldinger 2010). Golden-winged warblers avoid patches less than 5 acres, and use increases with area as patch size ranges from 25 to 100 acres (Aldinger 2010).

**Desired Future Condition**

For all RFSS, the desired conditions seek to avoid contributing to a trend toward federal listing (FP II-29).
Direct & Indirect Effects

Alternative 1

Riparian Habitat and Species
Under this alternative, there would be no potential for negative effects from management actions. Also, there would be no potential for beneficial effects related to riparian habitat, other than time to continue to slowly heal from past anthropogenic impacts. However, with no action, forest structure would continue to be primarily even-aged, with a continued gradual decline in tree growth.

Mature Forest Habitat and Species
As there are no project activities proposed in Alternative 1, there would be no direct effect to mature forest species, and viable populations would be maintained. Natural disturbances such as wildfires, ice and wind storms, and disease or insect outbreaks could occur, but the extent of their effects cannot be predicted. Most trees are now in the 60 to 100 year old age class; with the No Action Alternative, these forested stands would continue to age and mature. Vertical stand structure would increase in diversity within stands, and diversity between stands would slowly decrease as all stands trend toward uneven-aged conditions.

Rocky Habitat and Species
Under this alternative, there would be no potential for negative effects from management actions; however, rocky areas that were historically maintained open by Native Americans through the use of fire would continue to be shaded.

Savannah and Grasslands Habitat and Species
Under this alternative, there would be no potential for negative effects from management actions.

Early Successional Habitat and Species
As there are no project activities proposed in Alternative 1, there would be no direct effect to early successional habitat species. However, while this alternative would avoid direct impacts to sensitive species now, it would indirectly decrease habitat quality and quantity over time. Lack of additional management activity on federal lands would result in a continued loss of early successional habitat as recently harvested areas mature (see the Vegetation section in this chapter). Natural succession would favor a dense shade-tolerant understory, which would reduce habitat suitability for cobweb skipper. Nesting areas for golden-winged warbler would continue to be nonexistent in the project area.

Effect Determinations for RFSS
Alternative 1 would take no new actions. Therefore, Alternative 1 would have no impact on the potentially affected RFSS.

Alternative 2

Riparian Habitat and Species
Of the activities identified in this alternative, no new road construction would occur within riparian habitat. No commercial timber harvest management is planned within riparian areas. All commercial harvest areas are designed to leave no-harvest zones along streamside areas to prevent or minimize impacts to riparian characteristics. Species using riparian areas would be protected through these no-harvest buffers left along perennial, intermittent, and ephemeral streams. Noncommercial activities (e.g. cutback borders) may occur within riparian areas. However, any trees cut or girdled would be left on site. Therefore, there would be no direct impacts on riparian
Tygart-Chestnut Ridge (TyChest)

species due to timber harvest activities. Road activities (reconstruction, decommissioning, and maintenance) would involve crossing several streams and riparian zones. The new road construction would not occur in any riparian areas. Indirect effects of road activity may include increased stream siltation, thereby decreasing prey availability for southern water shrew if it occurs in these areas.

Herbicide treatments pose little direct risk to riparian species as they are targeted on specific individual trees or plants within riparian zones. Herbicide does represent a risk to water quality if an accidental spill occurs, but following proper handling procedures would minimize this risk (see Forest Plan Standards VE32). The use of herbicides is not anticipated to affect, directly or indirectly, any of the riparian species, and thus viable populations would be maintained.

No new conventional or helicopter landings are proposed in riparian areas. Several existing wildlife openings located within riparian zones would be utilized as landings. The majority of these openings were at one time mowed; however, access problems have since restricted the mowing in some of these openings. Plans to mow openings would continue as long as possible, depending on access, personnel status, and budget. This activity would not affect the RFSS riparian species. This action alternative may impact individuals but is not likely to cause a trend toward federal listing or a loss of viability for the sensitive species inhabiting riparian habitat.

*Mature Forest Habitat and Species*

Potential indirect effects to mature forest habitats primarily come from early successional habitat management, be it commercial or noncommercial, which change the forest stand age and forest structure, open up the forest canopy, increase light to the forest floor, change the microclimate of the area, and create soil disturbance (only in areas that would be managed commercially). Of the aforementioned acres proposed for early successional habitat management, approximately 1,233 acres in mature forest, previously defined as being greater than 80, would be treated for the purpose of early successional habitat management. Approximately 122 acres of older forest would be thinned to improve RBC habitat. This would actually improve mature forest habitat through the retention of larger trees and creation of a vertical structure and small canopy gaps. The remaining forested area in NFS land greater than 80 years old would continue to exhibit characteristics associated with mature forests and older stands (greater than 100 years old) would begin to move into mature forest and exhibit more mature forest habitat characteristics over time.

Direct effects due to ESH management on Diana fritillary, green salamander, and noctuid moth could include crushing individuals and collisions with vehicles, especially for commercial activities.

Indirect effects on mature forest dependent species would be similar. Early successional habitat management would remove canopy, potentially changing forest floor microclimate. Decreasing soil moisture may make those portions of those areas unsuitable for these species, as they prefer moist and well-shaded forest cover and mature trees.

Indirectly, road management may benefit Diana fritillary, as this species tends to utilize roadsides in search of nectar-bearing plants. Indirectly, roads create barriers to salamander movement and dispersal (DeMaynadier and Hunter 1995), and prevent genetic exchange between fragmented populations.

Direct application herbicide treatment would have no direct effect to individual terrestrial species, as this is a specific “hack and squirt” or “basal spray” method, only directly affecting those tree species injected. For broadcast spraying, potential impacts are expected to be negligible because of the small proportion of the project area being treated at a given time. Indirectly, herbicide treatment
may temporarily remove foliage and temporarily decrease soil moisture. These affects would be very localized and negligible.

Overall, the effects of this action alternative on mature habitats and populations would be negligible and short term. Mature community viability would be maintained and no long-term adverse effects on sensitive species would be expected. This action alternative may impact individuals but is not likely to cause a trend toward federal listing or a loss of viability for the sensitive species inhabiting mature habitat.

Rocky Habitat and Species
This habitat is not extensive in the project area. It mostly consists of small areas with large amounts of surface rock, and rockier areas are often avoided by commercial timber operations. However, ESH management could cause direct disturbance as the removal of trees on or near outcrops increases sunlight and winds, changing the microclimate of the rocky areas. This would cause an increase in ground vegetation and a general drying effect.

Direct effects due to proposed ESH management and RBC management and road management activities on timber rattlesnake and southern rock vole include crushing of individuals, collisions with vehicles, and purposeful killing. Rock voles spend much of their time in subterranean burrows in rocky areas, and the likelihood of crushing voles through commercial management would be discountable. Whitaker and Hamilton (1998) state that clearcutting may benefit the southern rock vole. Timber harvesting allows more sunlight to penetrate to the forest floor, encouraging understory growth and thereby increasing food availability for this species. Foraging habitat for southern rock voles should benefit from tree thinning that encourages understory growth and improves foraging habitat.

Herbicide treatments would have no direct, indirect, or cumulative effects to southern rock voles or timber rattlesnakes because of the lack of rocky habitat throughout the project area, especially in areas proposed for broadcast treatment.

This action alternative may impact individuals but is not likely to cause a trend toward federal listing or a loss of viability for the sensitive species inhabiting rocky habitat.

Savanna/Grassland Habitat and Species
The action alternative would not have a measurable effect on savannah habitat or the aforementioned species.

Early Successional Habitat and Species
The golden-winged warbler is the only species listed under this habitat. It depends more on shrubby areas interspersed with openings. Despite numerous efforts, the golden-winged warbler has not been found in the project area, presumably because of the lack of suitable habitat. The ESH management component of this project has been expressly designed to create and improve habitat for the golden winged warbler, with the intent of improving this limited habitat type for many other species because early successional habitat is important for many wildlife species (including various neotropical migrant birds). Implementation of the action alternative would greatly enhance early successional habitat throughout the project area.

Herbicide treatment would have minimal direct or indirect effect on early successional habitat species because of the scope and nature of the proposed activity.

Under Alternative 2, viable populations of early successional species would be maintained, and would be expected to increase due to ESH management. This action alternative would have a beneficial impact on early successional habitat species.
Effect Determinations for RFSS
The action alternative could impact the affected RFSS analyzed; however, as discussed above, such losses would not be expected to impact population viability within the project area or on a Forest-wide basis. Also, the action alternative would be beneficial for RFSS dependent upon early successional habitat (golden-winged warbler). The action alternative would pose a very small risk of negatively impacting RFSS habitat. Therefore, for all sensitive wildlife species analyzed above, both action alternatives may impact individuals, but are not likely to lead to loss of viability or a trend toward federal listing, with the exception of the golden-winged warbler, which would be a beneficial impact.

Sensitive wildlife species that are not analyzed above are not expected to occur in the project area. Therefore, for all sensitive wildlife species not analyzed above, the action alternative would have no impacts.

Cumulative Effects
Alternative 1
Currently, a large percentage of the forest in the project area is at the age where the trees typically reach their peak mast production. Terrestrial wildlife species that use mast and mature second-growth forest are benefitting from the large volume of mast produced within the project area. However, mast production is not sustainable at its current level and early successional habitat is very limited. As mature trees within the project area continue to age, their mast production will eventually decrease. If no new stands are regenerated, as would be the case with Alternative 1, mast levels would continue to be high for a number of years, then drop off as mast trees approach senescence and oak, cherry, hickory, and other shade-intolerant mast producers are gradually replaced by shade-tolerant species. Additionally, early successional would continue to decline to the point of being non-existent throughout the project area.

Under the No Action Alternative, the forest would retain a high proportion of mature saw timber. Early successional forest habitat would continue to decline on NFS land. This would lead to an overall lack of age class diversity and a continuing trend toward shade-tolerant species (maple and diseased beech) and away from oak and cherry and early successional habitat.

Alternative 2
Under the action alternative, the potential for direct and indirect effects to wildlife RFSS is so small it is considered discountable. Therefore, the action alternative would be unlikely to make any measurable contribution to the effects of other past, present, and reasonably foreseeable actions. The action alternatives would have minimal direct or indirect effects on potential RFSS habitat. None of the herbicides proposed for use in the project bioaccumulate. The action alternative would also construct and improve more roads, which would have the long-term and cumulative effect of increasing access for future vegetative treatments and recreation, as well as travel corridors used by some species. The creation and maintenance of linear wildlife openings would be beneficial for many species of wildlife.

Several landing/wildlife openings would exist in riparian areas. These areas are vegetated and are not contributing sediment into streams; therefore, they would not indirectly affect riparian species or habitat.

There are currently no Forest Service “grassland” acres within the project area and currently there are no plans to create large areas (greater than 30 acres) of grassland on NFS land.
Within the Forest boundary, few past activities in the last 30 years have affected the RFSS in the project area. The most important past impact probably was the large-scale clearcut logging that took place around the turn of the 20th Century. No data on these species are available from that time period, but it is likely that at least some occurrences of these species were reduced in size or eliminated. In more recent decades, Forest Service management activities such as timber harvest and road building probably impacted these species over 30 years ago. No records exist of any recent activities at known occurrences for the RFSS species analyzed.

No ongoing or reasonably foreseeable future Forest Service actions would impact known occurrences of the impacted RFSS. Therefore, the direct and indirect effects of the TyChest project, added to the unquantifiable impacts of past actions, would constitute the entirety of all known cumulative impacts on these RFSS species. Although the action alternative could cause the decline or loss of an undetermined number of undiscovered occurrences of the affected RFSS species, such impacts would not be expected to have an appreciable impact on overall population viability within the Forest boundary. Furthermore, species dependent upon ESH would be benefit from the creation and improvement of ESH habitat throughout the project area. In addition to potential habitat for the RFSS in the project area, all other species have potential habitat with known occurrences in locations scattered across the Forest (USFS unpublished data). None of these occurrences are expected to be impacted in the foreseeable future.

Two bat species have recently been added to the RFSS list, the tri-colored bat and the little brown myotis, and the northern myotis as been added to the endangered species list. The addition of these bat species to the RFSS list is because of the devastating impact White Nose Syndrome (WNS) is having on hibernating bats. While the effects to WNS are devastating on bat populations, WNS has not been linked to Forest management practices or activities. Additionally, this project is designed to improve bat habitat through the creation of roosts and management actions that provide a variety of habitat in a small area. This would improve foraging habitat for bats. Therefore, we conclude that, from the best science we have available to us now, this project would not significantly contribute to cumulative effects to bat populations, including the little brown myotis and tri-colored bat. The northern myotis is discussed in more detail in the endangered species analysis.

Irreversible or Irretrievable Commitment of Resources

There are no actions identified in any alternative that would be considered irreversible or irretrievable. Early successional habitat management and associated actions may be considered irreversible commitments due to the long period of time it would take to return to mature forest. However, these actions would not be considered irreversible because the ESH areas would eventually grow back to mature forest, and roads and landings could be abandoned and returned to riparian, or mature forest habitat.

Consistency with the Forest Plan

All alternatives would be consistent with Forest Plan standards and guidelines. The Proposed Action is consistent with the management prescription for MP 6.1 areas. The action alternative would increase the amount of early successional habitat, ensuring the availability of mast-producing species into the future and improving age class structure for the area.

Consistency with Laws, Regulations, Handbooks, and Executive Orders

All alternatives would be consistent with the following:

- Multiple Use and Sustained Yield Act of 1960
- National Environmental Policy Act of 1969
- Endangered Species Act of 1973 (ESA)
- Sikes Act of 1974
- Forest and Rangeland Renewable Resources Planning Act of 1974

BIRDS OF CONSERVATION CONCERN

Resource Impacts Addressed
This section of the EA has been prepared in response to the President’s Executive Order 13186 “Responsibilities of Federal Agencies to Protect Migratory Birds” of January 10, 2001. Pursuant to this Executive Order, the U.S. Fish and Wildlife Service developed a list of birds of conservation concern (BCC) for the Appalachian Mountain Bird Conservation Region (USFWS 2008). This section addresses the impacts of the Proposed Action and alternatives on BCC.

Scope of the Analysis
The spatial boundary to analyze direct, indirect, and cumulative consequences for this project is the project area. This approach is adequate because the BCC are migratory and have habitat requirements that can be evaluated to determine if analysis of the project area adequately addresses potential impacts to those species.

Direct and indirect effects to birds of conservation concern are not expected to last beyond the management periods. Once management is complete, it is anticipated the species discussed would remain in the suitable habitat within the project area. The temporal boundary used to assess cumulative impacts is about 20 years because it is anticipated that the management areas would regenerate and trend toward maturity and start producing mast by that time.

Methodology
The Monongahela National Forest and the State of West Virginia occur within the Appalachian Mountain Bird Conservation Region. Twenty-seven species of birds are listed as BCC for the Appalachian Mountain Bird Conservation Region. Birds of conservation concern were grouped according to primary habitat usage based on information from the West Virginia Breeding Bird Atlas (Buckelew and Hall 1994). In addition to the atlas, several other sources of information were used to determine which species occur or could occur in the project area. For example, there are three point count survey routes in the project area: Chestnut Ridge 41, 42, and 43. Information on habitat preferences was used to assess the likely effects of management activities on the species in each habitat group.

To simplify a discussion of the effects of the proposed management action, these species have been grouped by the type of habitat they use. A description of each of these species and its habitat is provided below. Of the 24 species of BCC in the Appalachian Bird Conservation Region that are applicable to the MNF, 13 (54 percent) use primarily mature forest habitats. Permanent herbaceous
openings and young forest/brushy habitat are each used by 5 species (21 percent). One species (4 percent) has very specific nest site requirements, but forages over a broad variety of habitats.

**Affected Environment**

**Species Using Forested Habitat**

- Kentucky Warbler (*Oporornis formusus*) – dense understory of mature, humid deciduous forest, wooded ravines, oak-pine or northern hardwood forest. Of the 1,541 records from PCS surveys, there is one occurrence of this species in the project area.

- Louisiana Waterthrush (*Seiurus motacilla*) – along streams flowing though heavily wooded valleys, deciduous forest, some hemlock, northern hardwoods. Of the 1,541 records from PCS surveys, there are three records for this species at two separate location in the project area.

- Swainson’s Warbler (*Seiurus motacilla*) – dense under story under an older forest, rhododendron or mountain laurel thickets in woods, mostly found in the south and west part of the state. There are no records of this species from the northern half of West Virginia.

- Worm-eating Warbler (*Helmitheros vermivorus*) – mature deciduous woodland that lacks dense ground cover, mature beech-maple or oak-pine forest. Of the 1,541 records from PCS surveys, there are seven records for this species at six different locations in the project area.

- Cerulean Warbler (*Dendroica cerulea*) – mature forest, mixed mesophytic and oak forest below 600 meters in elevation, common in the west part of the state, sparse in the mountains. Of the 1,541 records from PCS surveys, there is one occurrence of this species in the project area.

- Wood Thrush (*Hylocichla mustelina*) – mature or near mature deciduous forest, prefers dense shade on forest floor. This species has confirmed occupancy in the project area. Of the 1,541 records from PCS surveys, there are 67 records for this species at 21 different locations in the project area.

- Acadian Flycatcher (*Empidonax virescens*) – mature mixed deciduous forest dissected by small streams and ravines; lower elevations; not in spruce, oak, or pine forest; nests over water; more common in the west side of the state. This species has confirmed occupancy in the project area. This species has confirmed occupancy in the project area. Of the 1,541 records from PCS surveys, there are 64 records for this species at 17 different locations in the project area.

- Yellow–bellied Sapsucker (*Sphyrapicus varius*; breeding populations only) – upland black cherry forest, cut over mature hardwoods, spruce-hardwoods. There are no confirmed records for this species in the project area.

- Whip-poor-will (*Caprimulgus vociferus*) – mixed deciduous woods, upland oak-hickory forest; not in spruce, hardwood-pine or hardwood-hemlock, few in northern hardwoods, rare in dense forest. This species is not expected in the project area.

- Saw-whet owl (*Aegolius acadicus*; breeding populations only) – spruce and mixed spruce-hardwoods, swampy areas in coniferous forest, high elevations. Potential habitat for this species does not occur in the project area.
• Black-billed Cuckoo (*Coccyzus erythropthalmus*) – northern hardwoods, cove hardwoods, oak-hickory forest. Although potential habitat could exist, this species has never been documented in the project area.

• Prothonotary Warbler (*Protonotaria citrea*) – swamps (wooded wetlands) and large streams, not in the highlands. This species is not expected in the project area.

• Red-headed Woodpecker (*Melanerpes erythrocephalus*) – open oak groves with little understory, groves of oaks and grazing lands, Ohio River valley and low elevations in the Allegheny Mountains. This species is not expected in the project area.

Species Using Non-forested Habitat (grassland or other permanent openings)

• Sedge Wren (*Cistothorus platensis*) – wet grass and sedge meadows, nests near surface of water, needs wetlands, grassy marshes. This species is not expected in the project area.

Species Using Young Forest/Brushy Habitat

• Olive-sided Flycatcher (*Nuttallornis borealis*) – in openings in northern spruce forests, such as bogs, old beaver ponds, burned over slash from lumber operations with scattered snags and trees for perches. This species is not expected in the project area due to lack of habitat.

• Bachman’s Sparrow (*Aimophila aestivalis*) – brushy overgrown fields, abandoned pastures growing up in shrubs, often in erosion gullies in steep hill sides, much un-used habitat remains. This species is not expected in the project area.

• Bewick’s Wren (*Thryomanes bewickii*) – dry open country in valleys east of the mountains, in small clearings in spruce at high elevations, bushy thickets, favors old farm buildings, old farmsteads, very local or extirpated. This species is unlikely to occur in the project area as it is nearing extirpation in the region.

• Prairie Warbler (*Dendroica discolor*) – young pine forests and brushy scrub, young second growth hardwoods, overgrown pastures, Christmas tree plantations. This species is not expected in the project area.

• Golden-winged Warbler (*Vermivora chrysoptera*) – low, brushy second growth forest and open woodland, especially power line right of ways, higher elevations, not in spruce. This species is known to occur on State managed lands nearby. Numerous efforts have failed to document this species in the project area, presumably because of the lack of habitat. Refer to Sensitive species section for analysis.

Species Using Both Forest and Non-forest Habitat

• Peregrine Falcon (*Falco mexicanus*) – nests in cliffs, bridges over water, or high rise buildings in urban areas. Feeds over fields, forest, or urban areas by catching birds during flight. No suitable nesting habitat exists in the project area, nor is any likely to occur during the temporal scope of the analysis. This habitat group is not analyzed further.

Species Not Applicable to the MNF

• Red Crossbill (*Loxia curvirostra*; southern Appalachian populations only) – not applicable to WV or the MNF.
- Black-capped Chickadee (*Parus atricapillus*; southern Blue Ridge populations only) – not applicable to WV or the MNF.

- Chuck-will’s-widow (*Caprimulgus carolinensis*) – No nest records from the state, mostly found in western hills portion of the state. The MNF is outside the known breeding range of this species.

- Upland Sandpiper (*Bartramia longicauda*) – grass, old field habitat, grassy mountain tops and reclaimed surface mines, pastures, airports, golf courses. No records from the Monongahela.

- Buff-breasted Sandpiper (*Tryngites subruficollis*) – short grass, not listed in the WV breeding bird atlas, accidental/hypothetical to WV. Nests in the arctic shores of Alaska and Canada. Winters in the pampas of Argentina. Migrates up the Mississippi Valley and to the west.

- Short-eared Owl (*Asio flammeus*) – extensive open grassland, meadows, prairies, plains, marshes, dunes, tundra, not listed in the WV breeding bird atlas.

- Henslow’s Sparrow (*Ammodramus henslowii*) – grassy, weed filled fields, fields of broom sedge and weeds, early years of plant succession. Although there are no observations for Henslow’s sparrow on the Monongahela National Forest, it has been documented at the Canaan Valley National Wildlife Refuge. Discussed in Sensitive species analysis.

**Direct and Indirect Effects**

**Alternative 1 – No Action**
Under the No Action Alternative, no vegetation management activities, or associated action would occur. Therefore, the no action alternative would have no direct effects on BCC. Indirectly, natural succession would continue, and the project area would trend toward older forest conditions. This trend generally would have no effects or beneficial effects on species that use forested habitats. Species using non-forest habitats would not be affected, because no new permanent openings would be created and existing openings would continue to be maintained. Habitat for species using young forest/brushy areas would continue to decline as what little young forest that currently exists in the project area would continue to mature.

**Alternative 2 – Proposed Action**

*Species Using Forested Habitat*
Some individuals could be subject to direct mortality during tree felling operations, particularly if it occurs during the nesting season (generally May through August for these species). Proposed management that involves removal of partial canopy (running buffalo clover management, cutback borders, etc.) would have short-term effects until the canopy closes again in a few years. These effects would be detrimental to those forest species that prefer a closed canopy, but beneficial to those that use dense understory vegetation.

In the short term, commercial early successional habitat management activities under the proposed action (approximately 699 acres) would temporarily remove or adversely alter habitat for species that use forested habitats. Some of these species would cease to use the early successional habitat management areas, while others would persist at lower densities due to available forested habitats adjacent to the early successional habitat management areas. The proposed early successional
habitat management areas (ESH management and commercial daylighting) comprises approximately 14% of the project area.

*Species Using Non-forested Habitat*
Species using non-forest habitats are unlikely to be affected by the proposed action. They are not known to occur in the project area now, and the non-forest habitats created by the proposed management likely would not be large enough to provide habitat for any of these species.

*Species Using Young Forest/Brushy Habitat*
Species that use young forest/brushy habitat likely would not suffer direct mortality from proposed tree felling activities because these species likely would not be present in mature forested areas when management would occur. Commercial RBC management activities are unlikely to affect these species indirectly because thinning or single tree removal would not create the type of open-canopy brushy habitat that these species prefer. Edge habitat created by the early successional habitat management, both commercial (ESH management and commercial daylighting) and noncommercial (cutback borders) would have a beneficial effect. Indirectly, these species would benefit from the brushy habitat created by the proposed management and the edge conditions created, particularly because vegetation management would incorporate best management practices for the golden-winged warbler.

*Cumulative Effects*

**Alternative 1 – No Action**
Lack of management activities under the No Action Alternative would not contribute to the cumulative effects of past, present, and reasonably foreseeable future management actions.

**Alternative 2 – Proposed Action**

*Species Using Forested Habitat*
The direct and indirect effects of the vegetative management (particularly the early successional habitat management) and associated activities under the proposed action would contribute to the cumulative effects of temporary and permanent removal of forest habitat due to past, present, and reasonably foreseeable future actions. The direct and indirect effects of the RBC management could make a small contribution to the cumulative effects of temporary and permanent removal and alteration of forest habitat due to past, present, and reasonably foreseeable future actions. However, most of this alternative’s contribution to these effects would be short term, lasting only 5 to 10 years until the canopy closes again. Most of the proposed project’s contribution to these effects would cease when the management areas achieve canopy closure (15 to 20 years). Minimal cumulative effects due to the road activities would persist as long as they are maintained. Despite the cumulative effects of these actions, the project area is expected to remain dominated by mature forests. Within the project area, populations of species that use forested habitat are likely to decline slightly after implementation of the early successional habitat management.

*Species Using Non-forested Habitat:*
These species are unlikely to be affected directly or indirectly, so there would be no contribution to cumulative effects.
Species Using Young Forest/Brushy Habitat
The direct and indirect effects of the vegetative management (particularly the early successional habitat management) and associated activities under the proposed action would contribute to the cumulative effects of temporary and permanent young forest/brushy habitat due to past, present, and reasonably foreseeable future actions. One of the main purposes of this project is to create early successional habitat in a project area currently dominated by mature forest. Cumulative effects of all of these actions are expected to result in larger populations of these species in the project area over the short term.

Irreversible or Irretrievable Commitment of Resources
The no action alternative would not result in any irreversible or irretrievable commitment of resources.

The proposed action would result in the irretrievable conversion of up to approximately 1,700 (approximately 699 from commercial management and up to 1,000 acres from noncommercial management) of forested habitat to young forest/brushy habitat. These numbers are rough estimates because the vegetation management activities are designed to create a mosaic of habitat conditions instead of uniform regeneration cuts. However, none of these commitments of resources would be irreversible. Vegetation management areas would eventually grow back to forest, and the road could be abandoned and returned to forest habitat.

Consistency with the Forest Plan
The proposed action would be consistent with Forest Plan direction for BCC (Chapter II pg 30-31)3.4.

Consistency with Laws, Regulations, Handbooks, and Executive Orders
Both alternatives are consistent with implementing regulations for the National Forest Management Act (NFMA) under which the 2006 Forest Plan was prepared (36 CFR 219.19). Additionally, the action alternative would address concerns in the Migratory Bird Treaty Act at reducing the amount of direct take of nesting neotropical migrant bird species as a result of the seasonal clearing restrictions.

WILDLIFE MANAGEMENT INDICATOR SPECIES
Resource Impacts/Issues Addressed
This section addresses effects to wildlife Management Indicator Species (MIS). Implementing regulations for the National Forest Management Act (NFMA) under which the 2006 Forest Plan was prepared require National Forests to select MIS to monitor the effects of Forest management activities on fish and wildlife populations and habitat (36 CFR 219.19). The Forest Plan identifies three terrestrial animal species as MIS:

- Cerulean warbler (*Dendroica caerulea*)
- Wild turkey (*Meleagris gallopavo*)
- West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*)
Scope of the Analysis
For direct and indirect effects, the spatial boundary includes the entire project area, unless otherwise noted. Temporal boundaries for direct effects on terrestrial wildlife species are not expected to last beyond the actual time to complete the activity, regardless of activity. The temporal boundary used to assess cumulative and indirect effects is generally about 25 years; however the amount of time when these effects are felt, is more activity-dependent.

Methodology
The analysis of MIS focuses on potential habitat changes due to activities within the project area. For the purposes of this analysis, activities (e.g. nonnative invasive plant control, linear wildlife opening management, watershed improvements to improve hydrology, orchard reclamation, and wetland creation) are not included in the effects analysis because these activities would not affect the unit of measures used for each species, as described below.

General Habitat Requirements of MIS
Habitat and population trends on the Forest and in the project area are discussed where appropriate and information is available. Unpublished monitoring data is incorporated here by reference. The following table summarizes the Forest-wide habitat objectives for MIS considered within this section (cerulean warbler, wild turkey and West Virginia northern flying squirrel).

Table 20. Forest-wide Management Indicator Species considered for analysis and associated habitat objectives.

<table>
<thead>
<tr>
<th>Species</th>
<th>Reasons for Selection</th>
<th>Habitat Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerulean warbler</td>
<td>High-interest non-game species. Associated with large trees, gaps, and complex canopy layering characteristic of old-growth forests. A forest interior species that is believed to be sensitive to fragmentation. The Forest and WV DNR are cooperating on an ongoing songbird point count monitoring program that is expected to provide Forest-wide data on this species.</td>
<td>Maintain at least 50,000 acres of mid-late and late successional (&gt;80 years old) mixed mesophytic and cove forest to meet habitat needs for cerulean warbler.</td>
</tr>
<tr>
<td>Wild turkey</td>
<td>High-interest game species. In the Appalachians, strongly associated with oak mast. Requires herbaceous openings for brood range and is expected to reflect the effectiveness of the cooperative Forest-WV DNR wildlife opening management effort. Uses shrub/sapling stands for nest sites. Ongoing harvest data collected by WV DNR provides a Forest-wide population index.</td>
<td>Maintain at least 150,000 acres of 50-150 year old oak and pine-oak forest in MPs 3.0 and 6.1 to meet habitat needs for wild turkey.</td>
</tr>
<tr>
<td>Species</td>
<td>Reasons for Selection</td>
<td>Habitat Objective</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>West Virginia northern flying squirrel (WVNFS)</td>
<td>High-interest endangered species. Appears to be associated with certain late successional characteristics.</td>
<td>Maintain at least 20,000 acres of mid-late and late successional (&gt;80 years old) spruce forest, with a long-term objective of increasing this to at least 40,000 acres to provide optimum habitat for WVNFS.</td>
</tr>
</tbody>
</table>

The effects analysis for each MIS is based on the following: 1) best available information, including, species specific literature as cited, unpublished information, and best professional judgement; 2) internal agency information (e.g., ArcGIS information, previous surveys, etc.); and 3) field reviews. ArcGIS information is a compilation of wildlife habitat survey and sightings; and habitat mapping/modeling. Field visits, which started in the winter of 2010, continue today and have included extensive coordination with the WVDNR. Field visits have also included field reviews with the Northern Research Station and U.S. Fish and Wildlife Service and several tours with partners and internal management at the Regional and National levels to discuss integration of various resources to manage for ecosystem services. The three terrestrial MIS discussed herein have certain unique habitat requirements, and each can be viewed as representing a particular combination of habitat elements. Cerulean warblers typically occur in mature-to-old mixed mesophytic and oak forests with tall, large-diameter trees and a mostly closed canopy, but with some canopy gaps and complex vertical structure. Wild turkeys in the eastern U.S. are highly dependent on acorns, but they also require herbaceous openings for brood rearing and shrubby cover for nesting (Steffen et al. 2002; Wunz 1990; Ryan et al. 2004). Thus, turkeys represent forests with an oak component that have interspersed openings and regenerating stands. The West Virginia northern flying squirrel (WVNFS) typically occurs in or adjacent to older spruce-northern hardwood forests and is associated with certain late successional characteristics (snags, canopy gaps, moist microclimate, and co-dominance by spruce). Therefore, WVNFS represents older spruce-northern hardwood forests. Little, if any of this type of habitat exists in the TyChest project area and no actions proposed would affect this habitat type; therefore, the WVNFS is dismissed from discussion and not further analyzed.

Unit of measure for Cerulean warbler effects analysis: The units of measure for cerulean warblers are the negative impact of the proposed ESH activities in the analysis area on mature to old forests (greater than 80 years old) and the positive impact measured by the amount of thinning or uneven-aged management on forests.

Unit of measure for Wild Turkey effects analysis: The units of measure for wild turkey are the amount of early successional habitat in the project area and the impact of the proposed activities in the analysis area on early successional habitat.

Affected Environment
Cerulean Warbler
Ceruleans use upland habitats at least as frequently as bottomland habitats (Hamel et al. 2004). They are typically associated with large trees, gaps, and complex canopy layering characteristic of old-growth forests. Habitat loss is assumed to be the primary factor in cerulean warbler decline. In
West Virginia, abundance and territory density had a positive association with forest cover in the landscape and a negative association with large-scale edge created by mining activities (Hamel et al. 2004). Positive response of birds to habitat management has been documented in Tennessee and Missouri, suggesting that management activity such as silviculture can create or improve habitat (Hamel et al. 2004). There are three point count survey (PCS) routes in the project area: Chestnut Ridge 41, 42, and 43. Of the 1,541 records from PCS, there is one record for a Cerulean. Of all the other historic bird surveys within the project area, cerulean warbler has not been documented. Because the cerulean warbler has been documented in the project area and most of the acres proposed for vegetative management have an oak component, it is further analyzed.

Existing habitat conditions in the project area: There are currently 3,875 acres of forests greater than 80 years old in the project area. This number would gradually increase as forests throughout the project area would continue to mature. Habitat conditions throughout the vast majority of the project area are currently favorable for the cerulean warbler.

Wild Turkey
This species is typically associated with grassy openings, thickets of dense cover, and scattered clumps of conifers and extensive tracts of mature/late-successional forests. Although the WVDNR has established population objectives for turkey (31.7 turkey/square mile in a mixed hardwood type), this analysis pertains to habitat and the objectives identified in the Forest Plan (2006). This is largely because of the concept inherent with MIS that population changes indicate the effect of management activities on habitat and vice versa. Although the habitat needs are more complex, turkey is an MIS because it represents forests with an oak component and open habitat provided by WVDNR maintained wildlife openings, or other disturbance. Further, the MIS habitat objective relates to maintenance of oak and pine-oak forest in MPs 3.0 and 6.1.

Existing habitat conditions in the project area: Approximately 1% (54 acres) of the project area is maintained as wildlife openings. There are approximately 190 acres of forest approximately 30 years old. The early successional habitat value of this area is limited and continuing to decline as these areas continue to grow. Additionally, there is an abrupt edge from younger forests and openings to the surrounding mature forest. Wild turkey need a matrix of different habitats, including herbaceous habitat, edge habitat, shrubby habitat and transitional forest connecting open areas and mature forest. Based on MP 6.1 guidance, the desired future condition for herbaceous openings is approximately 3-8% of a given area, in this case that would be 136-362 acres. Furthermore, more edge habitat needs to be created along with transitional areas from openings to mature forest. More herbaceous openings and a variety of habitat is needed throughout the project area.

Direct and Indirect Effects
Alternative 1 – No Action
Under this alternative, there would be no potential for negative effects from management actions. Also, there would be no beneficial effects related to these species or its habitat.

Cerulean warbler
Because there would be no action, there would be no management activities that would degrade or improve habitat.
Wild Turkey
Because there would be no action, there would be no management activities that would improve habitat.

Alternative 2 – Proposed Action

Cerulean warbler
Anticipated effects from the proposed action to the cerulean warbler are summarized in Table 21. There would be a negative effect to forests greater than 80 years old on approximately 1,233 acres. This number is likely inflated because a portion of the areas managed for early successional habitat would still provide potential habitat for cerulean warbler because there would be large trees and canopy gaps remaining. Approximately 2,642 acres of cerulean warbler habitat would remain throughout the project area because no management actions are proposed in these areas.

Running buffalo clover management on 122 acres of forests greater than 80 years old would actually improve cerulean warbler habitat by promoting the development of forests with large trees, gaps, and complex canopy layering.

Table 21. Anticipated effects of Proposed Action Related to Cerulean Warbler.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Negative Effect on forests &gt;80 years old (acres)</th>
<th>Positive Effect by Thinning or uneven-aged management (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial ESH Management</td>
<td>538</td>
<td>N/A</td>
</tr>
<tr>
<td>Commercial Daylighting</td>
<td>29</td>
<td>N/A</td>
</tr>
<tr>
<td>Commercial RBC Management</td>
<td>N/A</td>
<td>122</td>
</tr>
<tr>
<td>Noncommercial Cutback Borders</td>
<td>666*</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,233</td>
<td>122</td>
</tr>
</tbody>
</table>

*Due to the programmatic nature of the cutback borders, this is an estimate based on assumption that approximately 2/3 of the cutback borders areas would appreciably reduce cerulean warbler habitat quality.

Possible effects of the proposed action to cerulean warbler include the displacement of individuals, death or injury of individuals, and the loss of nests. Approximately 32 percent of the forests greater than 80 years old would be affected over the life of the project. Although these actions may impact individuals, there would still be adequate remaining suitable habitat distributed throughout the project area. In summary, there is a level of risk to adversely impacting individuals and the activities proposed for early successional habitat would degrade the habitat upon which the cerulean warbler depends. However, there would be enough remaining suitable habitat distributed throughout the project area that the habitat objectives (maintenance of >80 year old forests) identified in the Forest Plan (2006) would be maintained.

Wild Turkey
Anticipated effects from the proposed action to the wild turkey are summarized in Table 22. There would be a positive effect to the unit of measure for wild turkey on all areas that are managed for early successional habitat (up to approximately 1,650 acres). Additionally, the proposed activities that would not affect the unit of measure (e.g. orchard reclamation, wetland construction, linear wildlife openings, etc.) would have an unquantifiable positive effect on wild turkey habitat throughout the project area.
Table 22. Anticipated effects of Proposed Action to Wild Turkey

<table>
<thead>
<tr>
<th>Activity</th>
<th>Positive Effects by Increasing Early Successional Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial ESH Management</td>
<td>Positive effect on 616 acres</td>
</tr>
<tr>
<td>Commercial Daylighting</td>
<td>Positive effect on 38 acres</td>
</tr>
<tr>
<td>Commercial RBC Management</td>
<td>N/A</td>
</tr>
<tr>
<td>Noncommercial Cutback Borders</td>
<td>Positive effect on up to approximately 1,000 acres</td>
</tr>
<tr>
<td>TOTAL</td>
<td>Up to 1,654</td>
</tr>
</tbody>
</table>

Possible effects of the proposed action to eastern wild turkey include the displacement of individuals, death or injury of pouls, and the loss of nests. Hens with nests damaged or destroyed may or may not re-nest. Approximately 31 percent of the area within MPs 6.1 would be affected over the life of the project. Although these actions may impact individuals, the goal to improve early successional habitat throughout the project area offers the greatest opportunity for improving or maintaining suitable nesting and brood habitat for this species. In summary, although there is a level of risk to adversely impacting individuals, the activities proposed would greatly enhance the habitat upon which the wild turkey depends, resulting in a trend towards the habitat objectives (maintenance of oak dominated forest and openings) identified in the Forest Plan (2006).

**Cumulative Effects**

**Alternative 1 – No Action**

*Cerulean warbler*

All forested areas throughout the project area would continue to mature. Lack of management activities under the No Action Alternative would not contribute to the cumulative effects of past, present, and reasonably foreseeable future management actions.

*Wild turkey*

All forested areas throughout the project area would continue to mature. Lack of management activities under the No Action Alternative would not contribute to the cumulative effects of past, present, and reasonably foreseeable future management actions and there would continue to be a lack of early successional habitat throughout the project area.

**Alternative 2 – Proposed Action**

*Cerulean warbler*

The entire project area is National Forest System (NFS) lands. Therefore, when considering past, present and anticipated future actions throughout the project area, the only pertinent actions are those taken by the Forest Service of the West Virginia Division of Natural Resources on NFS lands. There have been no measurable actions taken throughout the project area over the last 30 years and no other known foreseeable future actions that would affect cerulean warbler habitat. Therefore, the cumulative effects are the same as the effects of the proposed action. There would be enough remaining suitable habitat distributed throughout the project area that the habitat objectives (maintenance of >80 year old forests) identified in the Forest Plan (2006) would be maintained.

*Wild turkey*

As described above, when considering past, present and anticipated future actions throughout the project area, the only pertinent actions are those taken by the Forest Service of the West Virginia Division of Natural Resources on NFS lands. There is small level of past, present and future
actions taken by the West Virginia Division of Natural Resources throughout the project area to maintain wild turkey habitat. When combined with the proposed action, wild turkey habitat would be greatly improved throughout the project area.

**Irreversible or Irretrievable Commitment of Resources**

The no action alternative would not result in any irreversible or irretrievable commitment of resources.

The proposed action would result in the irretrievable conversion of up to approximately 1,700 (approximately 699 from commercial management and up to 1,000 acres from noncommercial management) of forested habitat to young forest/brushy habitat. These numbers are rough estimates because the vegetation management activities are designed to create a mosaic of habitat conditions instead of uniform regeneration cuts. However, none of these commitments of resources would be irreversible. Vegetation management areas would eventually grow back to forest, and the road could be abandoned and returned to forest habitat.

**Consistency with the Forest Plan**

The no action alternative would not be consistent with the Forest Plan because actions would not be taken to improve conditions for MIS.

The action alternative is consistent with Forest-wide standards and guidelines for wildlife (Forest Plan, p. II-29); guidance for management prescription 6.1 (Forest Plan pp. III-31); and MIS direction (Forest Plan, Appendix D-1).

**Consistency with Laws, Regulations, and Handbook**

The action alternative is consistent with implementing regulations for the National Forest Management Act (NFMA) under which the 2006 Forest Plan was prepared (36 CFR 219.19).
Hydrology and Aquatic Species

RESOURCE IMPACTS/ISSUES ADDRESSED
This section discloses issues and concerns related to aquatic, riparian, and hydrologic resources in around the proposed TyChest project area. For the purposes of this analysis, aquatic, riparian, and hydrologic resources include streams, springs, seeps, groundwater, riparian areas, wetlands, associated watershed processes and the biota dependent on these habitats and processes. Issues or resource concerns addressed in this analysis consider the effects to these resources in terms of erosion and sedimentation, water quantity and quality, and aquatic and riparian habitat quality.

SCOPE OF ANALYSIS
The spatial boundary used to evaluate direct, indirect, and cumulative impacts includes the area occupied by the watersheds of the perennial, intermittent, and ephemeral tributaries within the project area, and which have activities planned within their watershed boundaries (Figure 1). The spatial boundary is generally defined as the affected watershed extending upslope from the treatment activities to the watershed divide and downslope to the nearest confluence with a stream of equal or greater size. Only those watersheds where project activities might have an impact were analyzed.

The temporal boundary used to evaluate direct and indirect consequences is approximately ten years. Research has shown that sediment and stormflow effects from timber harvesting generally return to pre-harvest levels in about 5-10 years (Kochenderfer et al. 1997, Hornbbeck et al. 1997, Swank et al. 2001). Duration of effects for lighter harvest levels, such as in a thinning or TSI treatment, may be less. For permanent openings, like wildlife openings, some landings and savannas, the temporal boundary will be longer because the area is maintained in a permanently un-forested or partially un-forested condition, although these generally occupy a relatively small area. Any effects to water quality and aquatic biota from herbicide would likely be fairly short, on the order of weeks to a few months, because the herbicides that may be used, their methods of application, and mitigations measures have been designed into the herbicide treatment and are designed to eliminate or minimize effects to water quality and aquatic biota. The effects of the removal of trees within the riparian buffers can be expected to last decades before riparian vegetation returns to a fully functioning condition. Shallow groundwater that has been intercepted by the cut-slopes of roads or skid roads and expressed to the surface can be expected to remain in that condition indefinitely without specific remedial actions to address the prism of the road or skid road and the cut-slope.

The temporal boundary used to evaluate cumulative impacts is also about 10 years for most past and future timber harvest actions, because the evapo-transpiration capacity and re-vegetation of the site is generally restored within that time frame. Some other past land management activities, however, that have occurred further back in time than 10 years are believed to be continuing to contribute to cumulative watershed effects. These are generally related to activities such as installation and use of roads and skid roads, often placed in inappropriate locations. Actions that result in extensive road and skid road development, particularly in areas of wet soils and coves, on steeper slopes, and near streams or with numerous stream channel crossings, may continue contributing to sediment and hydrologic effects for period of time much greater than 10 years.
METHODOLOGY
Existing conditions, analysis of potential effects and a determination of conclusions for aquatic and riparian resources are based upon various sources of information. These include:

- various aquatic resource surveys conducted as part of annual Forest Plan monitoring and project level planning efforts
- site investigations and assessments of the project area by interdisciplinary team (IDT) members and other targeted efforts
- literature reviews
- databases associated with the Forest’s Geographic Information System (GIS)

The effects of erosion and sedimentation (and thus indirectly water quality and aquatic habitat) are largely a result of ground-disturbing activities. In particular, road activities (e.g. building, repairing, decommissioning, etc.), skid roads, landings, are among the most likely to have effects. The measurement of this type of activity will be “Acres Disturbed”, with new roads and such representing new disturbance and (although not necessarily exactly correct, for simplicity’s sake) roads decommissioned representing a removal of disturbance (i.e. negative acres). An activity that has not been done in the past, at least on this Forest, is the creation of linear wildlife openings.

Water quantity will evaluated based upon the percentage of a stream catchment that will be treated and the assumed basal reduction of the treatment. For example, commercial harvesting are considered to remove 100% basal area from the area treated, while non-commercial activities like cutback borders are considered to remove roughly 50% basal area from the area treated. Catchments that have 20% or more of its basal area removed will be considered as having an impact upon the stream’s base flow.

The effects to aquatic and riparian habitat include positive or negative changes in stream/riparian shading, soil disturbance within or hydrologically connected to streams or riparian zones, stream crossings, and large wood material.

AFFECTED ENVIRONMENT

Watershed Description
The project lies within the headwaters of Tygart Valley River watershed between Riffle Creek to the south and Shavers Run to the north (Figure 5). With the exception of a small (~18 acre) area approximately 0.5 km above Dry Run, all streams of the treatment units flow in to either Riffle Creek or Shaver’s Run (either directly or indirectly via their tributaries). Riffle Creek drains the northeast corner of the Becky Creek-Tygart Valley River 6th level hydrologic unit code or “HUC” (050200010104). Shavers Run drains the southeast corner of the Shaver’s Run-Tygart Valley River 6th level HUC (050200010402). Both Riffle Creek and Shavers Run are tributaries to the Tygart Valley River a few miles downstream. The primary streams within the analysis area are McGee Run, Back Fork, Ash Run, and Laurel Run (all tributaries of Riffle Creek), and Shavers Run. In addition to these named streams, several un-named tributaries also drain the project area. The elevation of the analysis area ranges from approximately 2,200 feet to 3,900 feet. This area receives an average of 53-59 inches of precipitation annually.

Land coverage within the project area is almost completely forested. Several small areas throughout the project area have been cleared and are maintained as wildlife openings (approximately 30 acres total). Most of the private land immediately below the project area is also
forested. The lower (downslope) approximately one quarter of these HUC 6 watersheds is more developed with more roads, buildings, and agriculture land usage as the mountains and ridges give way to the more level valley bottom land.

Figure 5. Project Area within 6th level HUCs, split between Becky Creek in the southern portion and Shavers Run in the north.
**Geology**

The majority of surficial geology of the analysis area is rated low or moderate sensitivity to acid deposition. The Chemung Group and the Hampshire Formation are both rated as moderate sensitivity, and the various formations of the Greenbrier Group and Mauch Chunk Group are rated as low sensitivity. Between these areas of moderate and low sensitivity geology lies the narrow band of the Pocono Group which is rated as high sensitivity to acid deposition and which runs through the treatment units (Figure 6). Although the New River Formation of the Pottsville Group also has a high sensitivity to acid deposition rating, it lies mostly outside the watersheds and only a narrow band of this formation lays along the very upper portion of the Becky Creek and Shavers Run watersheds, and well upslope any treatment units, thus is unlikely to be impacted. Water chemistry sampling was conducted on two streams within these two watersheds. The pH and Acid Neutralization Capacity (ANC) results from this sampling indicate pH values of both streams are consistently greater than “7” and ANC values are consistently greater than 400µeq/L. These values support the sensitivity ratings for surface geology (mostly “low” sensitivity) and it is appears unlikely that the project area will have issues with sensitivity to acid precipitation and deposition.

![Tygart Valley-Chestnut Ridge Wildlife Habitat Project](image)

*Figure 6. Soil acid sensitivity map, showing mostly low to moderate acid sensitivity levels within the project area.*

**Sensitive Soils**

Sensitive soil types within or in the immediate vicinity of the treatment units includes wet soils, soils with slopes of 30-70%, limestone with 30-70%, and soils with slippage potential (mostly...
upslope of the treatment areas). The project area also overlies a band of karst geology approximately 150 to 200m wide and extends the entire length of the project area. The soil overlying the Mauch Chunk geology mentioned above, while having low sensitivity to acid precipitation, is highly susceptible to erosion. Much of the terrain in the area exceeds slopes of 40-50%, although the steeper slopes are excluded from the treatment units. Slopes greater than 50% also occur within the project area and adjacent to some of the ground disturbance treatment units.

**Existing and Historic Road/Skid trails**

Several occurrences of breached water bars are currently contributing to erosional problems within the project area. Skid roads that currently exist in the project area from harvesting activities several decades past are generally not located high on the ridges and are often located wet areas. Some, including some that are currently used as linear wildlife openings, are poorly located and continue to have on-going erosion problems at ephemeral channels and within the general forested areas adjacent to them. These problems are exacerbated by continued use of them (by tractors) to access and maintain wildlife openings.

Historic logging is believed to have had substantial adverse effects on the watershed. While many of the obvious scars of raw, bare soil and severe erosion are healed, many other less obvious impacts remain. Flow patterns have been permanently altered by roads, skid roads, and gullying. These same factors (roads and skid roads) have intercepted the slow migration of shallow groundwater and brought it onto the surface, often on to a road or similar surface where it is channeled rapidly downslope. In general, the areas that appear to be most severely impacted by previous activities are the areas upslope of FR1560, as this area is much wetter and the activities have concentrated overland flows and brought groundwater to the surface and concentrated it as well.

The Becky Creek and Shaver’s Run watersheds have a substantial system of roads in place, a combination of Federal, State, Forest and private roads. Of the 511 miles of roads within the combined area of both 6th level HUC watersheds, approximately 28.4 miles of roads lies within the project area. These classified roads have erosion rills and extended lengths of connected flow at several locations. One is in the immediate vicinity of McGee Run, an important brook trout stream in the project area. In addition to these roads, an extensive system of skid roads and woods roads were developed to support previous timber management activities and much of this system currently exists within the project area. As no timber harvesting has occurred in the last 20 years, and approximately 192 acres of timber harvesting has occurred 20 to 30 years ago, all skid roads in the project area are at least that old. Many of these continue to have impacts on the hydrologic and/or aquatic resources. These impacts include interrupted surface and groundwater flow that is captured by the skid roads and flows down them, often through breached water bars, and eventually into the forest. Active erosion and even new channels have formed from this interrupted flow regime. Some skid roads have ruts from continued tractor use. An unclassified road crosses the upper reaches of Shaver’s Run to access a wildlife opening approximately a quarter of a mile from FR1560.

**Water Quantity: Stream and Storm Flows**

Stream flows in the vicinity of the project are highly variable and largely dependent upon the season. The highest mean flows generally occur in late winter through early spring and largely as a result of snowmelt, precipitation, and the limited evapotranspiration rates during this dormant
season. The lowest mean flows generally occur in the late summer through early fall, largely due to higher evapotranspiration rates and lower precipitation during this time of year. Stream flows tend to be not only variable according to season, but also flashy; quickly responding to precipitation amounts and intensities due to influences of topography, soil and geologic characteristics, soil moisture conditions at the time of precipitation, and rainfall amounts and intensities. In addition to these naturally occurring conditions, land uses can impact stream flows. The project area contains roads and skid roads, wildlife openings, and trails. Only a small proportion (approximately 1%) of the project area is cleared for wildlife openings. All of these uses (roads/skid roads, cleared areas, etc.), to some extent, increase surface runoff rate, and thus the rate at which water flows from the uplands to the streams and then out of the watershed. These uses are generally much more extensive in the more developed valley bottom in the lower portions of the HUC 6 watersheds. In the project area roads and skid roads have the greatest impact on the stream flows.

Storm flow within the assessment area is characterized as intense and frequent. Streams are frequently flashy in their response to storms, especially more intense storms. Streamflow tends to rise rapidly under those conditions, and falls rapidly as well, returning to base flow conditions rather quickly. Major frontal weather systems and tropical storms from the south can carry very substantial quantities of rainfall. The largest 24-hour rainfall event for this area that occurs annually is, on average, about 2.5 inches (US Weather Bureau 1961). However, periodic storms occur which produce much greater amounts and intensities of rainfall. Major storm events can be fairly frequent, and generally occur during the dormant season of the year (November through mid-May) when evapotranspiration losses are minimal. This further adds to rapid storm runoff, and in less frequent cases to downstream flooding. Examples of recent dormant season major runoff events include the November 1985 flood, and the January and May 1996 floods. As with stream flows, storm flows are affected by topography, soil/geologic characteristics, soil moisture conditions at the time of precipitation, and rainfall amounts and intensities and land uses.

**Water Quality and Aquatic/Riparian Habitat**

Within the two 6th level HUCs, fine sediment and stream temperatures are measured only at Shaver’s Run. The most recent sediment results (July 2012) indicate elevated levels of fine sediment with 30% of the sediment <4mm in size and 9% less than 1mm. This level of fine sediment is likely to be detrimental to trout productivity.

As with most streams across the Monongahela National Forest, channels within the analysis area have a deficiency of Large Wood Material (LWM) and associated cover. The Upper Tygart Valley Watershed (5th level HUC) in general is deficient in LWM and associated habitat. A survey on Stewart Run in 1989-1990 indicated generally less than one piece of wood per 100 feet of stream. A recent site visit to Shaver’s Run revealed large wood in the channel that was trapping significant amounts of sediment, however, the overall stream, like many others, is lacking in LWM.

Streambeds throughout the project area, and indeed, throughout the Forest, have eroded down to bedrock as a result of past practices and thus have lost much of their former diversity of habitats to the point that riffles compose the vast majority of the stream habitat. Shaver’s Run is one of these streams that have eroded to bedrock in many places. At a few locations on this stream, trees have fallen in the stream and these trees have begun to accumulate a significant amount of sediment, thus beginning the process of building the stream bed back up above its current bedrock elevation (Photo 5). At this stage in its recovery, (i.e. large wood debris still sparse in the stream), it is more vulnerable to being washed out by flooding.
A wildlife opening exists in the close proximity to Shaver’s Run. A portion of this wildlife opening lies within the Shaver’s Run riparian buffer. Also, a portion of this wildlife opening has not been regularly maintained which has allowed to become reclaimed by trees and other vegetation, much of this within the riparian buffer.

Acid precipitation and dry deposition (of acidic compounds) cause a significant impact to the MNF and indeed to the entire region. The acid precipitation and deposition often cause streams to be too acidic for many aquatic species, in particular, brook trout (a management indicator species). Most aquatic species that are native to the project area cope better when stream pH is roughly neutral (pH values around 7.0) and relatively stable through time. Aquatic community structure (e.g. species composition, richness, and abundance) and productivity (e.g. biomass) can experience increasing degrees of impairment as pH values deviate 1 standard unit or more away from 7.0. Not all streams, however, are impacted equally. Some streams have a much greater buffering capacity that prevents the acid precipitation and deposition from causing the stream to become acidic. This buffering capacity is controlled in large part by the geology of the stream’s watershed. Two locations within these two 6th level HUC watersheds monitor stream pH and acid neutralization capacity (ANC), Tygart Valley River and Big Branch. The results of this monitoring indicate that the streams are not acidic and are well buffered from the adverse effects of acid precipitation and deposition (Table 23). As this is largely influenced by the geology of the area, the other streams in these watersheds are most likely also well buffered and not acidic.

Table 23. Water sampling results for pH and Acidic neutralization capacity (ANC)

<table>
<thead>
<tr>
<th>Stream</th>
<th>Date of Sampling</th>
<th>pH</th>
<th>ANC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tygart Valley River</td>
<td>11/2/2001</td>
<td>7.65</td>
<td>920</td>
</tr>
<tr>
<td>Tygart Valley River</td>
<td>4/1/2002</td>
<td>7.51</td>
<td>424</td>
</tr>
<tr>
<td>Tygart Valley River</td>
<td>4/6/2010</td>
<td>7.33</td>
<td>556</td>
</tr>
<tr>
<td>Tygart Valley River</td>
<td>9/27/2011</td>
<td>7.37</td>
<td>827</td>
</tr>
<tr>
<td>Big Branch</td>
<td>3/31/2008</td>
<td>7.27</td>
<td>641</td>
</tr>
<tr>
<td>Big Branch</td>
<td>9/23/2008</td>
<td>7.86</td>
<td>1266</td>
</tr>
<tr>
<td>Big Branch</td>
<td>4/6/2010</td>
<td>7.60</td>
<td>742</td>
</tr>
<tr>
<td>Big Branch</td>
<td>9/27/2011</td>
<td>7.63</td>
<td>1164</td>
</tr>
</tbody>
</table>

1 A pH value of 7 is neutral and a value above 7 is “basic” and below 7 is acidic.
2 ANC values above 100 are generally considered to be well buffered against the effects of acid precipitation and deposition.

Stream habitat (AEUI) monitoring in Shaver’s Run (2012) recorded a stream temperature of 17°C. This is in line with continuous temperature monitoring in 2007 (June 29 through October 3) which produced an average temperature of 13.24°C. This temperature monitoring also recorded a maximum temperature of temperature during the monitoring period of just over 20°C. Of the 97 days the data logger was in place, 16 days registered a maximum temperature above 18°C. This is important because 18°C is approximately the temperature above which brook trout begin to experiences adverse effects due to stream’s temperature. The stream temperature of Shaver’s Run thus appears to generally be sufficiently cold for brook trout to thrive, with occasional times when temperatures begin to become stressful for them.

Shavers Run 6th level HUC watershed is drained by approximately 94 miles of streams, based on USGS National Hydrography Dataset. Streams within this watershed are inhabited by 21 native fish species and one non-native species (fathead minnow). Becky Creek 6th level HUC watershed is
drained by 103 miles of streams, based on USGS National Hydrography Dataset, containing 22 native fish species and no non-native species (Table 24).

Table 24. Fish species occurrence in Becky Creek and Shavers Run.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Species</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>rock bass</td>
<td>Ambloplites rupestris</td>
<td></td>
</tr>
<tr>
<td>central stoneroller</td>
<td>Campostoma anomalum</td>
<td></td>
</tr>
<tr>
<td>white sucker</td>
<td>Catastomus commersoni</td>
<td></td>
</tr>
<tr>
<td>rosy side dace</td>
<td>Clinostomus funduloides</td>
<td></td>
</tr>
<tr>
<td>mottled sculpin</td>
<td>Cottus bairdii</td>
<td></td>
</tr>
<tr>
<td>spotfin shiner</td>
<td>Cyprinella spiloptera</td>
<td></td>
</tr>
<tr>
<td>fantail darter</td>
<td>Etheostoma flabellare</td>
<td></td>
</tr>
<tr>
<td>northern hog sucker</td>
<td>Hypentelium nigricans</td>
<td></td>
</tr>
<tr>
<td>green sunfish</td>
<td>Lepomis cyanellus</td>
<td></td>
</tr>
<tr>
<td>striped shiner</td>
<td>Luxilis chrysocephalus</td>
<td></td>
</tr>
<tr>
<td>smallmouth bass</td>
<td>Micropterus dolomieu</td>
<td></td>
</tr>
<tr>
<td>river chub</td>
<td>Nocomis micropogon</td>
<td></td>
</tr>
<tr>
<td>rosy face shiner</td>
<td>Notropis rubellus</td>
<td></td>
</tr>
<tr>
<td>black side darter</td>
<td>Percina maculate</td>
<td></td>
</tr>
<tr>
<td>blunt nose minnow</td>
<td>Pimephales notatus</td>
<td></td>
</tr>
<tr>
<td>long nose dace</td>
<td>Rhinichthys cataractae</td>
<td></td>
</tr>
<tr>
<td>western black nose dace</td>
<td>Rhinichthys obtusus</td>
<td></td>
</tr>
<tr>
<td>creek chub</td>
<td>Semotilus atromaculatus</td>
<td></td>
</tr>
<tr>
<td>brook trout</td>
<td>Salvelinus fontinalis</td>
<td></td>
</tr>
<tr>
<td>brown bullhead</td>
<td>Ameiurus nebulosus</td>
<td>Shavers Run only</td>
</tr>
<tr>
<td>golden shiner</td>
<td>Notemigonus crysoleucas</td>
<td>Shavers Run only</td>
</tr>
<tr>
<td>fathead minnow</td>
<td>Pimephales promelas</td>
<td>Shavers Run only – Non-native</td>
</tr>
<tr>
<td>pumpkin seed sunfish</td>
<td>Lepomis gibbosus</td>
<td>Becky Creek only</td>
</tr>
<tr>
<td>bluegill sunfish</td>
<td>Lepomis macrochirus</td>
<td>Becky Creek only</td>
</tr>
<tr>
<td>largemouth bass</td>
<td>Micropterus salmoides</td>
<td>Becky Creek only</td>
</tr>
</tbody>
</table>

Aquatic Regional Forester Sensitive Species (RFSS): A goal of the Forest Plan is to maintain viable populations of native and desired non-native species, and keep RFSS from a trend toward federal listing. In some cases, sensitive fish have not been reported in an area for several decades and their presence is questionable. But, in the absence of conclusive data, the assumption is that potential habitat still exists and will be considered. In the case of both Shaver’s Run and Becky Creek watersheds, there are currently no aquatic RFSS species known to exist in either watershed.

Aquatic Management Indicator Species (MIS): Several streams within the two watersheds support populations of native brook trout, which are identified in the Forest Plan as a Management Indicator Species (MIS). The Becky Creek watershed has brook trout in at least portions of Becky Creek, Back Fork, McGee Run, Laurel run, and Big Branch. McGee Run has one of the most robust brook trout for this project area. Stocked trout are present within the upper portions of the Tygart Valley River. Within the Shavers Run watershed, brook trout are found within Shavers Run and Crawford Run. The management objective for MIS is to maintain or improve their habitat. Brook trout...
Tygart-Chestnut Ridge (TyChest)

prefer streams with cold, clear water, an approximate pool to riffle ration of 1:1, and abundant cover (USFWS 1982). While present on several steams within these watersheds, brook trout productivity is likely below its potential due to historic and contemporary pressures on the streams in the area. A combination of impacts to water quality, habitat conditions, passage barriers, and harvest pressures are considered limiting factors.

**Impaired Streams**

No streams within the project area are listed as impaired under Section 303d of the Clean Water Act. The only stream within the two 6th level watersheds that is currently listed as impaired is the Tygart Valley River. The causes for its listing are fecal coliform and algae in this part of the river. The lower portion of Riffle Creek was previously listed as impaired due to biological impairments, but recent data has indicated improved conditions such that it has since been delisted.

**Desired Future Condition**

In general, among the desired future conditions given by the Forest Plan, are ecosystems that have ecological and watershed integrity and are resilient to natural and man-caused disturbances and changes, including climate change. Additionally, soils should be productive and in a condition that promotes vegetative growth, hydrologic function, and erosional stability. Streams and lakes are to provide clean water, appropriate temperatures and a variety of connected habitats. Riparian areas are to connect upland and aquatic habitats and promote stable and diverse stream channel conditions. The Forest should continue to provide a positive response to climate change by growing trees that absorb carbon dioxide and produce oxygen, by storing carbon in above-ground vegetation and below-ground roots and soil nutrients, and by promoting sustainable operations that conserve resources and reduce our environmental imprint.

Stream systems should function within natural ranges of flow, sediment movement, temperature, and other variables that provide for healthy aquatic systems. Streamside vegetation should be in such a condition, composition, and abundance to contribute to protection and maintenance of water quality, water quantity, nutrient inputs, and physical channel integrity to support channel function, aquatic biota, aquatic and wildlife habitat, floodplain function, aesthetic values and designated uses.

This is accomplished, in part, with the following Forest Plan direction for channel and riparian buffer protection and road and skid road management in the following Standards and Guidelines:

- Standards SW34, SW35, SW36, SW37, SW40, SW44, SW46, RF06, RF15
- Guidelines SW26, SW50, SW51, RF10, RF12, RF13, RF14

**Direct and Indirect Effects**

*Alternative 1: No Action*

Under the No Action Alternative, current management activities and natural processes would continue, but no new actions would be implemented. In the short term, current aquatic habitat conditions in the TyChest project area are likely to persist and continue to suppress trout populations. As the existing forest matures and trees adjacent to functioning channels fall, LWM levels should increase in places like Shaver’s Run and its adjacent riparian area, although at a slower rate than by actively placing large wood into this environment. As a result, sediment levels may decrease through time as sediment storage within the watershed increases with increased levels
of LWM in perennial, intermittent and ephemeral channels. Fish habitat diversity will likely also increase as LWM is incorporated into channels and improves spawning and rearing habitat. No new sources of sediment would be created by this proposed project under the No Action Alternative, but existing sources would not be repaired and would continue to contribute sediment to the streams in the planning area. Erosion and sedimentation would continue at roughly its current rate on the non-system road to Chestnut Ridge and on FR92. With no change in the design or use of linear wildlife openings, these would continue to function as tractor routes through the Forest and would continue to have the same erosion and sedimentation impacts as currently observed in the project area, although no new routes would be created. No vegetative treatments would be implemented so the hydrologic response of the watershed would largely remain as is and the source for LWM recruitment would not be reduced. Any changes in runoff patterns, sedimentation rates, or LWM recruitment would be due to natural events that create openings in the forest, such as fire, wind or disease, or from increased activities on private lands.

**Alternative 2: Proposed Action**

The following direct and indirect effects associated with the proposed action are organized by the resource concerns identified as the issues associated with this project: Erosion and sedimentation, Water quality and quantity, and Aquatic and Riparian Habitat.

**Erosion and sedimentation**

Primary sources of erosion and sedimentation from conventional timber harvesting activities, such as those proposed in this alternative include landings, skid roads and haul-roads, and system roads. These actions create large areas of complete or nearly complete removal of the protective ground cover and are generally connected over extensive lengths. If not adequately addressed, these types of activities have the potential for considerable erosion and sedimentation impacts that can continue for years or decades.

While some disturbance to the ground cover in the overall treatment areas is expected, the ground cover is generally not completely removed and bare areas are not normally extensively connected. Additionally, slash and woody debris from the harvesting activities also help to protect exposed soil and interrupt connected flow paths prior to the regrowth of vegetative cover. Impacts from this disturbance to ground cover (in the overall treatment areas) are considered short-term as new vegetation begins to grow and leaves and other debris begin to accumulate.

**Roads (new construction and decommission)**: A new length of system road is proposed to access Chestnut Ridge. This stretch is approximately 1.1 mile in length, representing an estimated 4.4 acres of new and permanent ground disturbance. While roads represent a major source of sediment, their proper location, construction, and regular maintenance can reduce their impact. The proposed layout for this new road construction goes from the intersection of FR1560 and FR765 to the top of Chestnut Ridge. The placement of this section of road and standard BMP implementation appear to be adequate to prevent a significant risk of excessive erosion or sedimentation problems. The addition of approximately 1.1 miles of new road construction to access Chestnut Ridge represents an increase of indirect erosion and sedimentation effects. However, this new road is intended to replace an unmaintained, non-system “road” that is currently existing erosion and sediment source. The effects of this new road construction are expected to be approximately offset by the decommissioning and restoration of the existing non-system road it is replacing.
A new haul-road of approximately 1 mile is also proposed, but as it is coincident with the proposed system road, according to the GIS shapefiles, it will not represent an additional disturbance beyond that of the system road if it appropriate BMPs are applied during its existence. A GIS review of the proposed new road construction layout (to access Chestnut Ridge) does not indicate that the route crosses any stream channel or riparian areas and thus it is not expected to produce any direct sedimentation effects to streams and riparian areas.

Additionally, the upper approximately 0.75 miles of NFS Road FR92A, from FR92 down to the existing wildlife openings, is proposed to be decommissioned as part of this project. Road decommissioning will involve a great deal of ground disturbance (approximately 7 acres), creating a risk of a short-term erosion and sedimentation. Although decommissioning creates a short-term disturbance, BMPs and design features can be implemented to minimize these effects.

**Skid roads:** Approximately 17.4 miles of skid roads are proposed (13.3 miles new and 4.1 miles existing). At 1.82 acres of disturbance per mile (assuming an average width of 15’), this represents approximately 31.7 acres of disturbance.

The locations of treatment units for this project selected to reduce the likelihood that the new skid roads needed to access them will avoid perennial or intermittent streams and thus reduce the likelihood of direct sedimentation effects to these streams or their riparian areas. Crossing of ephemeral streams by the proposed new skid roads is more likely, but still uncertain, and this uncertainty creates a potential for direct sedimentation effects to ephemeral channels or their riparian buffers exists, but through proper use of National BMPs and design features this risk can be minimized.

In some cases, existing skid roads have a greater potential for direct impacts than the proposed new skid roads because of existing erosion and sedimentation problems currently occurring. The project file shows an existing skid road crossing of Ash Run, a tributary to Back Fork. After decades of not being used for timber harvesting activities, returning this skid road crossing to active use for harvesting activities would represent an increased risk of direct erosion and sediment delivery into Ash Run and subsequently downstream. If use of existing skid road that cross at this crossing is necessary, direct impacts can be reduced, but not avoided, by applying appropriate National BMPs and design features. Other skid roads exist in the project area, but are not displayed in the GIS layer, and some of these cross channels of various types, representing a potential for additional direct effects at these crossings.

Once their temporary use is completed, they must be adequately treated to prevent hydrologic and erosional problems. The Forest Plan (Guidelines RF12-13 and Standard RF15) and the National Core BMP Technical Guide address the treatment of skid roads and other temporary roads once their use is no longer needed. Incorporating these items, as necessary, into the decommissioning of skid roads can be expected to avoid, minimize, or mitigate adverse effects to water and riparian resources.

The layout of the commercial treatment units on this project were intentionally placed on the drier ridgetops with generally less steep slopes in order to minimize the potential for these adverse effects from new skid roads, so the effort needed to restore natural slopes and flow patterns, and minimize soil erosion, will likely be less extensive on most of the new skid roads than on many of the existing skid roads in the project area.

As mentioned in the Existing Conditions section, many existing skid roads within the project area are poorly located and have on-going erosion and sedimentation problems. New use on these
would be expected to exacerbate any existing problems and create a greater potential for long-term erosion and sedimentation effects. These sites, in contrast to most of the proposed new skid roads, would likely require more extensive efforts to avoid or mitigate long-term impacts upon completion of the project.

**Skid road-to-linear wildlife opening conversion:** While the impacts of these skid road-to-linear wildlife openings is not completely known, current skid roads that are being used as linear wildlife opening are displaying serious and ongoing signs of erosion and sedimentation concerns. The proposed use of these linear wildlife openings includes the use of tractors for maintenance and access to other wildlife opens for maintenance. It is expected that tractor use of many of the skid roads will continue in perpetuity after the timber harvest is completed. Continuation of the current use of this linear wildlife would not represent an increase in risk of erosion and sedimentation; however, expanded use or new ground disturbing activities within the linear wildlife opening would represent an increased erosion and sedimentation risk.

In particular, activities within the riparian buffer of Ash Run would pose the greatest risks of direct effects to aquatic and hydrologic resources. Unless the management and use of the linear wildlife openings changes from the current use and management, not only will the current problems continue, but the proposed addition of more of these linear wildlife openings will be expected to result in an increase in the same erosion and sedimentation problems.

Generally, existing (non-linear) wildlife openings in the project area currently exhibit minimal erosion and sedimentation impacts. Some of the conditions that protect these wildlife openings from erosion and sedimentation are:

- a dense, hardy vegetative ground cover that and is able to withstand occasional tractor use and to protect the soil from this tractor use,
- plenty of unfiltered sunlight reaching this vegetation on the ground surface, and
- a limited, dispersed (i.e. non-concentrated) use by tractors for maintenance of the openings.

Conditions that currently exist in the existing “linear wildlife openings” are the exact opposite of those listed above. These conditions all contribute to the current erosion problems that currently exist.

- The forest floor vegetation currently is not dense enough or hardy enough to withstand tractor use or to protect the ground surface from tractor use. There is a potential that this could change when the canopy is cut and sunlight is allowed to reach the ground surface, but I am not qualified to make this assertion one way or the other.

- The forest canopy prevents direct sunlight from reaching the forest floor. Initially, the proposed treatment for these linear wildlife openings calls for clearing of up to 300’ on either side them. This would allow direct sunlight to reach the ground surface, at least for the first several years. Although the canopy would not be expected to reach a height that it could shade the linear wildlife openings for several years, their use as linear wildlife openings is proposed to continue indefinitely, and their maintained width is proposed to be 10-20’, thus the regrowth of the canopy is expected to eventually be a factor affecting the potential for erosion and sedimentation once again.

- The current width of only 10-20’ doesn’t permit a “dispersed” use from tractors. There is also a likelihood that because these linear wildlife openings are used to access other wildlife openings, their use may be more than occasional. Even with direct sunlight reaching the
ground surface, concentrated use along any single track could greatly increase the potential for the any protective vegetation ground cover to be destroyed and damage from rutting and erosion to occur.

All the factors above combine to create a situation where the outcome is uncertain. We currently do not have an example of where a linear wildlife opening is used and maintained without rutting and erosion. Damage that occurs to a wildlife opening will likely require greater care to avoid aggravating the problem and may preclude use of the area for a period until the problem is corrected. Additionally, preventative measures such as water bars or dips are also impractical in a setting such as that of a linear wildlife opening with tractor usage (e.g. water bars will likely become breached and rendered ineffective by tractor use).

In addition to the conditions listed above pertaining to exposure to direct sunlight, establishment of a dense and hardy (i.e. “tractor-resistant”) vegetation ground cover, and limited and dispersed tractor usage, the following conditions are also recommended for any linear wildlife opens that are created and maintained:

- ensure that they have an outslope that restores natural drainage and flow patterns, and does not interrupt or divert the natural flow
- do not cut trees within the riparian buffers
- conduct regular monitoring to detect any erosional or other problems that may arise,
- correct any problems that arise in a timely manner, and
- if the problems cannot be corrected, discontinue use as a linear wildlife opening.

This project proposes that many of the new and currently existing skid roads be converted to linear wildlife openings at the end of their use for timber harvesting. This proposed future and permanent use of many of the skid roads presents a new and largely unknown potential for erosion and sedimentation effects. The direct and indirect effects of these skid roads will depend largely upon how they are used and maintained.

**Landings:** Landings represent another potential for soil disturbance and erosion and sedimentation effects. Forest Plan direction (Standard SW40) restricts landing sites from within 100 feet of perennial, intermittent, and ephemeral channels which protects the streams with filter and buffer strips. Although the specific landing locations of this project are not known, my assumption for this analysis is that the landings will be approximately 1.4 acre in size and located close to classified roads and near higher and drier areas of the ridges since that is where most of the timber harvest activity is proposed. Risks to aquatic and hydrologic resources from landings can be minimized by locating them away from streams and establishing a uniformly distributed ground cover of at least approximately 70% upon the conclusion of their use for the harvesting activities of this project.

Overall, the combination of commercial harvesting activities in Alternative 2 will disturb an estimated 51 acres of soil in the project area (Table 25). This represents 1.1% of the overall project area (4,533 acres) and 6.0% of the 819 acres of proposed commercial treatment area. Activities in Alternative 2 are distributed throughout the project area and can potentially affect a number of streams, although the commercial (i.e. mechanical) treatment units were located mainly on drier, more level ridge tops in an effort to reduce their potential for adverse impacts.
Table 25. Acres of disturbed soils, which could potentially impact aquatic or hydrological resources.

<table>
<thead>
<tr>
<th>Alternative 2: Proposed Action</th>
<th>Disturbance Factor</th>
<th>Miles or #</th>
<th>Acres Disturbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skid Roads/Trails (1.82 acres/mile)</td>
<td>1.82</td>
<td>17.4</td>
<td>31.7</td>
</tr>
<tr>
<td>Landings (0.25 acres each)</td>
<td>0.25</td>
<td>25</td>
<td>6.3</td>
</tr>
<tr>
<td>New Road Construction (4 acres/mile)</td>
<td>4.0</td>
<td>1.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Decommissioning (4 acres/mile)</td>
<td>4.0</td>
<td>1.75</td>
<td>-7.0</td>
</tr>
<tr>
<td>Linear Wildlife Opening (1.82 acres/mile)</td>
<td>1.82</td>
<td>6.9</td>
<td>12.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>-----</strong></td>
<td><strong>-----</strong></td>
<td><strong>51.0</strong></td>
</tr>
</tbody>
</table>

Orchard Restoration: In general, orchard restoration activities are not expected to create significant erosion and sedimentation effects. By avoiding stump/root removal and vernal pool placements within riparian buffers, flow paths, and ephemeral channels, erosion and sedimentation to aquatic and hydrological resources are expected to be minimal or non-existent.

Aquatic and Riparian Habitat

Stream Temperature: The only proposed activities in this project that would potentially bring about a removal of vegetation within the riparian buffer are the restoration work (large wood additions and wetland creation) within the Shaver’s Run riparian buffer. No tree removal from any riparian buffer is proposed for this project, including for the purpose of wildlife opening restoration, thus no increase in stream temperature is anticipated as a result of this activity. Large wood additions would likely have the beneficial effect of increasing the number and depth of pools in the stream, which would result in maintaining a lower stream temperature. Wetland creation within a riparian area would be of a small scale such that the removal of trees would be unnecessary or very limited and would thus not be expected to result in exposing the stream or riparian buffer to increased sunlight, and thus no increase in stream temperature is anticipated.

Fine sediment levels: One of the mitigations to minimize the impacts of sedimentation on aquatic habitat is the implementation of riparian buffers or filter strips. Forest Plan Standards and Guidelines provide for the protection of these riparian buffers, thus providing a great degree of protection from sedimentation from most activities. The interruption of any connected flow paths, such as roads, skid roads, linear wildlife openings, etc., will provide an additional measure of protection of the streams from sedimentation.

An existing wildlife opening along Shaver’s Run has been allowed to partially regrow and is proposed to be reclaimed as a wildlife opening to its full former extent. This area includes mature trees and native riparian vegetation. Although some of this regrown portion lies within the 100 foot riparian buffer of Shaver’s Run, no tree removal within riparian buffers is proposed.

Water Quality and Quantity

Surface and Groundwater Hydrology: Although the treatment units were intentionally chosen to avoid wetter areas and minimize the risk with those wetter areas, there remains a not inconsequential risk of such an impact. This is especially true of the area east of NFS Road FS1560. Any interception of groundwater by skid roads would have an immediate and direct effect upon the hydrology of the watershed. Depending upon the volume of groundwater flow produced...
by such an interception, this could create erosion on the skid road and continue off of it into the forest and even create a new channel as has happened previously within the project area. This impact can generally be minimized by restoration actions on the road or skid road.

*Stream chemistry*: The activities of this project are not expected to produce direct or indirect effects to stream chemistry.

*Water Quantity (Streamflows/Flooding)*: Surface runoff and groundwater have a direct effect on both streamflow and flooding. Runoff from forested watersheds is influenced by a number of factors such as precipitation patterns, vegetative cover, roads and skid trails, soil characteristics, elevation and topography. Extensive watershed harvesting of timber can sometimes alter the hydrology and storm flow characteristics of the watershed. Studies of the effects of timber harvesting on streamflows in small, headwater drainages have shown that as hardwood forests are harvested evapotranspiration is reduced and streamflows can increase (Lull and Reinhart 1967, Hornbeck et. al., 1997, Kochenderfer et. al., 1997). This effect is most pronounced during the growing season and the increase is relatively short lived (Hewlett and Helvey 1970, Douglass and Swank 1972, Swank et. al., 2001). This increase can be beneficial to aquatic and riparian communities by increasing the amount of water available during low flow conditions. As the harvested sites revegetate, the influence on streamflows is greatly reduced and the hydrologic response of the site generally returns to pre-harvest conditions in 5-10 years (Hornbeck et. al., 1997, Swank et. al., 2001). Studies also show that timber harvesting can affect stormflows and peakflows, mainly during the growing season, and to a lesser extent during the dormant season (Hewlett and Helvey 1970, Swank et. al., 2001). The amount of streamflow increase is largely dependent upon the type of harvest (e.g. clearcutting, partial cutting or thinning) and the size of the area harvested (Reinhart et. al., 1963, Douglass and Swank, 1972, Arthur et. al., 1998, Swank et. al., 2001).

Approximately 20-30% of the watershed basal area needs to be removed before an increase in flows due to harvesting can be detected (Hornbeck et. al., 1997, Hornbeck and Kochenderfer 2000). This alludes to the importance of scale in discussing effects on streamflows. Although increases in stormflows and peakflows have been measured on small, headwater channels where the entire catchment has been harvested, the effect on downstream channels is quickly diminished due to the limited treatment area relative to the increasing drainage size. In order to influence large-scale floods, large-scale harvesting would have to occur throughout a watershed (Hornbeck and Kochenderfer, 2000). Researchers have concluded that contemporary timber harvesting in forests of the eastern United States is not on a scale that affects flooding downstream (Douglass and Swank 1972, Hornbeck, 1973, Hornbeck et. al., 1997). The effect of increased streamflow in small, headwater channels has little influence on downstream floodflows, but may result in localized bank cutting and erosion (Arthur et. al., 1998).

The collective area of treatments approaches or exceeds 20% of some watersheds of smaller headwater streams. Without the effects of the vegetation on evapotranspiration, these watersheds may experience changes in stream flows, especially during the first year following treatment. The effect may be an increase in base flow during dry periods or increases in flows resulting from precipitation events. These effects are most significant in small watersheds and usually during smaller precipitation events and when initial soil conditions are dry. Larger precipitation events produce runoff, stream flow increases, and possibly flooding due to natural conditions of the areas
mentioned previously, and any stream flow impacts caused by the treatment would be overwhelmed by the overland flow produced by a large precipitation event.

Roads, skid trails and landings can also influence the hydrologic response of a watershed by compacting soil and reducing the infiltration rate of water, or by intercepting groundwater along road cuts (Coats, 1999). Improving existing roads and abandoning unneeded roads in the project area would slightly reduce the current effect of roads on the watershed. The construction of new roads and skid roads are considered to be areas of new disturbance over existing conditions.

A number of the treatment units are proposed to have activities that include the use of herbicides. All of these treatments are proposed to be direct basal application (i.e. “hack-and-squirt” and no broadcast spraying). These treatments pose little risk to streamflow, flooding or sedimentation. The influence of killing vegetation with the use of herbicides would not require any ground disturbance, would not be used within riparian buffer strips and the loss in basal area is accounted for by the assumption that regeneration treatments remove 100% of the basal area.

The use of herbicides represents a risk to water quality if an accidental spill occurs but following the proper handling procedures, application rates and use away from channels can reduce this risk. In addition, the use of herbicides is not anticipated to affect large woody debris recruitment as herbicides would not be used within 100 feet of stream channels.

CUMULATIVE EFFECTS
The cumulative effects of the alternatives are considered in context with past, present, and reasonably foreseeable future action within the Becky Creek and Shaver’s Run watersheds. Any substantial or measurable influence associated with the project is not expected to extend beyond the boundaries of these two watersheds. However, the combination of activities on NFS and private lands can create an effect at a watershed scale that otherwise would not be perceived as a problem at the project, or subwatershed scale. Future activities can contribute to these effects or alleviate some of the problems. On NFS lands, the reasonably foreseeable future actions are considered to be the continuation of existing activities such as roads, trails, utility corridors, developed and dispersed recreation, and the new activities proposed in the TyChest planning area. On private lands, the foreseeable future activities are assumed to be similar to activities currently taking place in the watershed. No significant development is anticipated and agricultural and logging practices are assumed to continue on a similar pace.

The effects to aquatic resources of many of the activities proposed by this project will be temporary and not anticipated to contribute to cumulative effects beyond the ten-year timeframe stated earlier. The reduced evapotranspiration and any resultant increase in stream flows resulting from an extensive removal of timber from a watershed, for example, will be only temporary and the evapotranspiration and stream flows will return to pre-project levels within a relatively few years as stated earlier. Likewise, a dispersed disturbance to groundcover from harvesting activities will be expected to recover quickly as vegetation returns and duff and other organic material cover disturbed areas. Any erosion from landings that is not arrested by applied BMPs is also expected to be temporary due to growth of vegetation and accumulation of organic material.

Other actions are less certain to be limited to this ten-year timeframe. Skid roads and other temporary roads, when adequately treated to allow water to quickly drain off of it, will also have a short-term effect and will quickly recover. When flow is not broken up and water not allowed to drain from the road surface rapidly enough, erosion is likely to occur and, depending upon other
conditions, this may continue for a considerable time. More information on where this is occurring in the project area can be found in the Aquatic-Hydrology Resource Report in the project file. Unlike many of the existing skid roads, most of the proposed new skid roads are intentionally located on ridge tops or on relatively dry slopes and are unlikely to produce this level of impact. Activities that have the greatest potential for long-term effects include the approximately 1 mile of new system road, the conversion of skid roads to permanent linear wildlife opening after their temporary function for timber transport is completed, and the interception of shallow groundwater by roads and skid roads.

Although most of the new skid roads are proposed to be located higher on the ridges, where it is likely to be drier and not as steep, and thus are likely to require less substantial work to restore natural drainage and are less likely to intercept shallow groundwater. Some of the existing skid roads are not as strategically placed and are more likely to require significant work to restore natural drainage. With appropriate and adequate restoration of these skid roads, they will not contribute to cumulative effects. Without adequate decommissioning and restoration, these skid roads should be considered to contribute to the long-term cumulative effects of the watershed.

The potential for long-term effects is especially a concern for those skid roads that are proposed for conversion to linear wildlife openings after their need for timber transport is concluded. The only examples of this type of use occur within this project area and they have been discussed previously in this report. The current condition of the existing linear wildlife openings and the fact that no change in their use is proposed, lead me to conclude that the proposed new skid road-to-linear wildlife opening conversions, at least those located in similar settings as the existing ones, will result in similar conditions as exist on the existing linear wildlife openings. These conditions include extensive rutting and erosion, both in uplands and near and in stream channels. Considering that these linear wildlife openings will be a permanent impact upon the landscape, their effects need to be considered not only in this project, but as a cumulative effect in any future projects within these watersheds.

The potential of intercepting shallow groundwater by a roadcut is more difficult to predict, but the only new occurrences of this would on the new roads and skid roads. Those new skid roads located on ridgetops are unlikely to intercept groundwater, but those new skid roads positioned on the side of the mountain, such as those in RBC8, represent the greatest potential for intercepting shallow groundwater. Such groundwater interceptions, if they occur, are difficult to reverse and can be considered as a permanent change of condition.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES
It is expected that there would be no irreversible or irretrievable commitments of aquatic or riparian resources as a result of either alternative analyzed in this report.

CONSISTENCY WITH FOREST PLAN
It is anticipated that this project will be consistent with the Forest Plan.

One possible exception pertains to the treatment of skid roads upon the completion of their use for removing timber. Coordinating with the watershed group and other resource areas on treatment of skid roads that are not needed to meet project objectives will ensure compliance with RF15.
CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS, AND EXECUTIVE ORDERS
All alternatives would be implemented in a manner consistent with all applicable Federal and State laws and regulations, Forest Service regulations, manuals and handbooks, and Executive Orders pertaining to aquatic and riparian resources management. These include, among others, the Clean Water Act of 1977 as amended, West Virginia Legislative Rules (Title 47 Series 2, and Title 60 Series 5) for the protection of water quality, Executive Orders 11988 (floodplain management) and 11990 (wetland protection), and Forest Service Manual chapters 2520 (Watershed Protection and Management) and 2600 (Wildlife, Fish, and Sensitive Plant Habitat Management).
Soils

RESOURCE IMPACTS/ISSUES Addressed
This section outlines the soil resource issues and effects associated with proposed actions. The Forest Plan (2006) has many management standards and guidelines that address the effects of soil disturbing activities and additional measures can be identified and implemented at the project level to reduce risks to soil movement while also helping to ensure soil stability and quality. Most physical soil related concerns within the project area revolve around management-created disturbance, specifically road building and road use. The severity of creating or using roads is exacerbated in wetter soils, typically located in coves. Soil disturbance related to construction, reconstruction, and the decommissioning of roads, and the use of heavy equipment in steep and/or wet areas is of particular concern on sensitive soils.

SCOPE OF ANALYSIS
The spatial boundary used to evaluate direct consequences is the activity areas where actions are proposed within the project area boundary. This spatial boundary was chosen because it can be used to determine threshold effects to soil quality for proposed actions associated with this project. Indirect consequences are also bounded within the project area because effects are not expected to move outside of the subwatershed areas within the project area.

The spatial boundary used to address cumulative impacts is the entire project area. For the resource issue of acid deposition, the boundary would include the source of pollutants. This allows for the assessment of past and future effects and the determination of threshold impacts to soil quality as defined in the Region 9 Soil Quality Standards FSSH 2551 (2011) and FSM 2550, when added to the proposed actions.

Although specific units are provided for all ground disturbing activities (commercial RBC Management, Commercial Daylighting and ESH management), in order to generally describe soil conditions within the project area the entire project area (as defined by the project boundary) was evaluated in terms of risk for activities associated with the proposed actions.

Effects are analyzed in the short- and long-term. Direct, indirect, and cumulative effects can occur within both time frames. Short-term effects to soils are those that occur over a decade or less. If recovery of the soil properties does not occur within the short-term, effects then are considered to be long-term. Soil formation, and thus, soil replacement are long-term processes that require a century or longer to occur. Long-term effects from historic disturbances remain evident within the TyChest project area, so these are considered in the analyses.

METHODOLOGY
Soils within the project area were surveyed and mapped by the USDA Natural Resources Conservation Service (NRCS) (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm). Soil surveys of the TyChest Project Area are limited to Randolph County, WV. Web Soil Survey provides data at a scale of 1:24000, with the goal of delineating uniform management areas. This scale is acceptable for large scale planning. However, it should be noted that inclusions of different soil types may be found within map units. These inclusions can have more or less severe management restrictions. The severity of management restrictions of inclusions cannot be determined without on-the-ground investigation. There are known discrepancies within the county.
soil surveys. NRCS Soil Survey staff are aware of the following soil survey mapping errors within Randolph County:

- In general, more acres of colluvial soils exist on the landscape than are mapped.
- Soil mapping may not be correlated between counties, however, given the fact that the entirety of this project area is located within one county, this should not be an issue.
- The concept of frigid soil temperature regimes is not incorporated throughout the Randolph County Soil Survey. In general elevations above 3200 feet have colder soils which in turn affect soil properties and indirectly affect other resources.

Interpretations were also drawn from a Monongahela National Forest (MNF) soil sensitivity layer and an in-depth field analysis conducted in 2014 and 2015.

The Soil Quality Standards (SQS) of the 1980’s and 1990’s focused on protecting soil productivity from timber and range management activities. Generally, these SQS took a ‘one size fits all’ approach that did not adjust to varying ecological conditions, and has in some cases either put unnecessary restrictions on resource management or inadequately protected resources. Recent research and litigation indicate a need to base the SQS on biotic and abiotic ecosystem components and their relationship to each other at the appropriate hierarchical level.

National and Regional SQS are generic by design and at times may be difficult to implement at the site or project level. This process is outlined in the following nine steps:

1. Review identified Desired Conditions for the project area (Reference or Forest Plan Desired Conditions).
2. Conduct an Interdisciplinary Landscape Assessment to identify departure from Desired Conditions and any cultural or resource issues and concerns (used to design a management action and to evaluate the risks associated with implementing the action).
3. Interdisciplinary team designs management actions to move a landscape towards desired conditions or address issues and concerns.
4. Identify potential soil property changes due to a proposed action.
5. Estimate the likelihood of each potential soil property change occurring due to the proposed action.
6. Identify ecosystem components, functions, or services at risk (departing from reference conditions or moving away from desired conditions) from changes in soil properties that result from implementing the planned action.
7. Estimate ecological risk as having a low, moderate or high likelihood of a negative change in an ecosystem component, function, or service due to a minor, moderate or extreme change in a soil property.
8. Modify management activities to mitigate changes in soil properties that have a moderate or high ecological risk (this step is where SQS are followed or if they do not exist they are inferred from literature and expert opinion).
9. Monitor results and adjust SQS

The 9 steps outline the methodology for the soil resource from the beginning of the project out to the point that the project is implemented. The following units of measure are used in this analysis to evaluate the soil resource issues:
Tygart-Chestnut Ridge (TyChest)

- Sensitive soil types for steep slopes, erositivity, and wet soils in the scope of proposed management activities on these soils
- Risks associated with herbicide use
- Acres of disturbed soils from proposed activities
- Risks associated with vernal pool creation
- Risks associated with wildlife opening maintenance
- Impact of soil restoration activities

The Forest Soil Disturbance Monitoring Protocol (Page-Dumroese et al., 2009) will also be used in an effort to assess and quantify detrimental soil effects that could be a result of proposed activities. Soil disturbance classes (including classes 0-3, with the most severe disturbance class being class 3) will be referenced throughout this section to address levels of disturbance deemed acceptable for proposed activities. Additional illustrations and descriptions of the methodology used can be found within the Soil Resource Report in the project file.

The proposed logging system was analyzed in ArcGIS using the proposed skid system layer and the landing layer overlain with the sensitive soils layer and slope gradient to identify potential problems and concerns with proposed plans. This analysis includes, but separates, new skid road construction and existing skid roads that would be brought back into service.

Estimated values for activities used to calculate soil disturbance acres are as follows:

1. Width of a skid road – 15 feet (1.82 acres/mile)
2. New road construction – 33 feet wide (1 mile of road is = 4 acres)
3. Landing – 0.25 acre
4. Road decommissioning – 33 feet wide (1 mile of road is = 4 acres), restoration improves soil quality
5. Decommission woods roads – 15 feet wide (1.82 acres/mile)
6. Vernal pools – 0.25 acre

AFFECTED ENVIRONMENT

Soils within the TyChest Project Area have been managed extensively over the past century. The soils within the Project Area have been subjected to the effects of extensive tree cutting and slash burning, most of which occurred between 1890 and 1935. These human-induced activities resulted in damaging floods, severe erosion, topsoil loss, and pollution of streams used for water supply. The fires at the turn of the century burned so hot that soil carbon was lost to the atmosphere, and lost soil productivity in some areas of the Forest was irreversible. Although there has been recovery over the past century, soils on many forested landscapes on the Forest still have relatively thin surface horizons. After a short period of recovery, various landscapes in the mountains were then utilized for agricultural purposes, both cultivation of crops and for pasture/grazing of livestock. Today, the landscape is primarily forested.

Prime Farmland

No prime farmland or farmland of statewide importance exists within the boundary for any proposed activities of the TyChest project area (NRCS, 2015). However, approximately 50 acres of farmland of statewide importance do exist in the project area (consisting mostly of the Calvin and Cookport soil series). Regardless, this project does not propose activities on prime farmlands; therefore, no effects analysis is performed for this part of the landscape.
**Soil Sensitivity**
Sensitive soils are grouped in the following categories: soils that are prone to mass wasting and/or slippage, slopes > 30%-70% (slope range as defined by the soil map unit description from the county soil survey report), prime farmland, hydric soils, flood plain soils, soils that form on limestone and karst topography, soils that are moderately well-drained or wetter (having a seasonal water table at 18 inches or higher in the profile), and soil susceptibly to carbon loss. Soils rated as sensitive may require mitigation measures beyond those in the Forest Plan that are routinely applied during project implementation. Just over one-third of the project area soils are within the 30-70% slope sensitivity type and nearly one-fifth are noted as limestone (Table 26). See Soil Sensitivity overview map of the project area in Soils Resource Report in project file.

**Table 26. Acres by Sensitivity Type in the TyChest project area.**

<table>
<thead>
<tr>
<th>Sensitivity Type</th>
<th>Acres</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>slope 30 to 70%</td>
<td>1523</td>
<td>34%</td>
</tr>
<tr>
<td>non-sensitive</td>
<td>1311</td>
<td>29%</td>
</tr>
<tr>
<td>limestone</td>
<td>807</td>
<td>18%</td>
</tr>
<tr>
<td>slippage-slope 30 to 70%</td>
<td>402</td>
<td>9%</td>
</tr>
<tr>
<td>wet</td>
<td>270</td>
<td>6%</td>
</tr>
<tr>
<td>slippage</td>
<td>110</td>
<td>2%</td>
</tr>
<tr>
<td>limestone-slope 30 to 70%</td>
<td>70</td>
<td>2%</td>
</tr>
<tr>
<td>flood-wet</td>
<td>44</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>4537</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Soil Erosivity and Sedimentation**
Soils are actively eroding within the TyChest project area. The majority of the legacy erosion is concentrated along skid roads from past logging operations. In many instances, the skid road intercepts a subsurface water table which leads to concentrated water flow down an unvegetated, compacted soil surface. By contrast, some erosion within the project area is the result of using heavy equipment during wet conditions on roads that have not been maintained. Other instances of erosion and sedimentation may be viewed in the Hydrology report.

The soil erosion hazard rating is an interpretation within the Web Soil Survey program. This information can also be found in Soils Resource Report in the project file. These ratings are based on factors such as slope, surface texture, and rock fragment content. Both erosion hazard and sensitivity can be indicators of potential soil instability, such as where rill and gully erosion or slippage may occur. Approximately 86% of the project area has a severe erosion hazard rating, while nearly all of the remaining acreage has an erosion hazard rating of moderate equating to 13% of the project area (Table 27).

**Table 27. Erosion Hazard (Road, Trail) - Summary of Rating by acres for the TyChest project area.**

<table>
<thead>
<tr>
<th>Hazard Rating</th>
<th>Acres</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe</td>
<td>3887</td>
<td>86</td>
</tr>
<tr>
<td>Moderate</td>
<td>606</td>
<td>13</td>
</tr>
<tr>
<td>Slight</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not Rated</td>
<td>44</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>4537</td>
<td>100</td>
</tr>
</tbody>
</table>
Acid Deposition
During the past century in particular, the central Appalachian Mountains (including the Monongahela National Forest) have received some of the highest sulfate and nitrate deposition in the nation, primarily due to its location downwind of many older coal-fired power plants that have had minimal or no pollution control required. Historically-high sulfate (SO$_4$) deposition from sources in the Ohio River Valley has contributed to acidification of streams and could affect soil productivity on parts of the Forest.

The majority of the geologic formations in this project area are moderately to highly sensitive to acid deposition effects (Table 28). The exact amounts of buffering or alkalinity that each geologic formation provides to associated soil profiles are unknown. Water quality data suggest that acidity is buffered downstream of the highly-sensitive geologic Price Formation (Forest Water Quality Monitoring Reports from 2003-2014; refer to the Hydrology report for detailed data describing the water quality in the major streams within the project area).

Table 28. Acid Sensitivity rating based on geologic formation within the TyChest project area.

<table>
<thead>
<tr>
<th>Geologic Formation</th>
<th>Acid Sensitivity Rating (Acres)</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemung Group</td>
<td>High: 2176, Moderate: 243, Low: 941</td>
<td>1184</td>
<td>100%</td>
</tr>
<tr>
<td>Greenbrier Group</td>
<td>High: 243, Moderate: 430, Low: 197</td>
<td>1164</td>
<td>100%</td>
</tr>
<tr>
<td>Hampshire Formation</td>
<td>High: 543, Moderate: 197, Low: 434</td>
<td>1174</td>
<td>100%</td>
</tr>
<tr>
<td>Mauch Chunk Group</td>
<td>High: 941, Moderate: 434, Low: 197</td>
<td>1164</td>
<td>100%</td>
</tr>
<tr>
<td>Pocono (Price) Group</td>
<td>High: 197, Moderate: 434, Low: 197</td>
<td>1164</td>
<td>100%</td>
</tr>
<tr>
<td>Pottsville Group</td>
<td>High: 2176, Moderate: 243, Low: 941</td>
<td>1184</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>High: 631, Moderate: 2719, Low: 1184</td>
<td>4534</td>
<td>100%</td>
</tr>
</tbody>
</table>

Soils within the TyChest project area that derived from geologies mapped as having high risk for acid sensitivity were sampled in 2014. These samples were analyzed for basic forest soil chemistry. This analysis focused on the base saturation, effective cation exchange capacity, calcium to aluminum ratios and pH (raw data can be viewed in Soils Resource Report project file, Soil Pit Descriptions).

The USDA Natural Resource Conservation Service (NRCS) and MNF have sampled soil series on the Forest in the moderately-sensitive geologies from 2002 to 2007. Data from these soil series for base saturation, effective cation exchange capacity, calcium to aluminum ratios, and pH indicate that the soils in this area are still able to buffer acidic atmospheric inputs. Refer to the Upper Greenbrier EA, Soil Resource Report, the Hogback EA Soil Resource Report, and the Little Beech Mountain EA Soil Resource Report for this information. Full soil characterization data for soils pits located on the Hampshire Formation and Chemung Formation also are located on the National Soil Survey Lab Data website for soils in Randolph County, WV (http://ssldata.nrcs.usda.gov/).

Updated Geologic Information
In 2010, the West Virginia Geological Survey remapped some geologic formations. This remapping involved both a renaming and a redrawing of geologic formations and the lines that designate the contacts between associated geologies. This effort resulted in the newly named Price formation. The Price formation includes the previous polygons identified at the Pocono Formation.
and the portion of the polygons that represented the upper (approximately) 300 feet of contact within the Hampshire formation.

The former Pocono formation was designated as highly sensitive to the effects of acid deposition, while the Hampshire Formation was designated as moderately sensitive. Therefore, to determine if the upper elevation of the Hampshire Formation also was sensitive, soil chemistry data from soil pits in this elevation of the Hampshire across the Forest were reviewed by the Forest Soil Scientist and Forest Geologist. Data suggested that this geologic material also is poorly buffered and may form soils that are exceptionally low in based cations (Randolph County, WV soil pedons http://soils.usda.gov/survey/nscd/).

Soil Chemistry and Forest Productivity
Forest productivity and sustainability have been issues of concern during recent years. Forest health decline and decreasing species diversity have been observed across North America and Europe (Binkley et al. 1998). Forest productivity throughout eastern United States and Canada has been declining for the past several decades (Bailey et al. 2004). Several factors influence the productivity and sustainability of forests, including disease, insect infestations, soil moisture, nutrient status, and acidic deposition.

Some soil chemical factors believed to affect forest health and sustainability relative to acidic deposition are base cations (calcium, magnesium, potassium, sodium), effective cation exchange capacity, nutrient availability, acidity, nitrogen and sulfate saturation, and toxic metals, including aluminum and manganese (Adams et al. 2000). Base cations are important for sustaining forest health because they are macronutrients; calcium is particularly important because it is a primary component of bole wood. Base cations also neutralize soil acidity, thereby making other nutrients more available to forest vegetation. The principal inputs of calcium to soils are weathering, litter fall, and atmospheric deposition (Huntington 2000; Jenkins 2002; Johnson and Todd 1990). Slope position can play an important role in determining soil base cation levels. Lower slope positions accumulate more litter fall due to wind and gravity than higher slope positions (Johnson and Todd 1990); therefore, they can have higher base cation concentrations.

The parameters included in the soil acidity data set are pH, acidity, effective cation exchange capacity (ECEC), and base saturation of the effective cation exchange capacity (BSECEC). ECEC typically increases as pH increases (Brady and Weil 2002). However, research conducted in the northeastern United States has found that sometimes pH and ECEC can have an inverse relationship (as pH goes up, ECEC goes down). This has been attributed to the fact that these soil systems are aluminum controlled rather than base-cation controlled (Johnson, 2002). The TyChest soil pH and ECEC display both direct and indirect relationship.

In the mineral horizons, soil pH typically increases slightly with depth (A→B→C). The pH of soils in the northeast typically decreases with depth given low base status of the present geologies (Drohan and Sharpe 1997). However, the highest pH values were observed in organic horizons. This pattern can be explained by the incorporation of organic materials into the mineral soil. As they decompose, organic materials provide nutrients, but also organic acids to the mineral soil (Brady and Weil, 2002; Johnson, 2002). The higher pH values observed in the lower most horizons indicate that these layers of soil have retained some of their nutrients and are weathering out of the parent material.

Base cations are calcium, magnesium, potassium and sodium. Calcium (Ca) was the dominant base cation found within the soils of the TyChest project area. The second most prevalent base cation was potassium (K). For the purpose of this analysis emphasis is placed on Ca and Magnesium
(Mg) because the geologic formations within the project area have a limited supply of Ca and Mg (Jenkins, 2002) and are consequently in short supply in the soil. Ca and Mg are further susceptible to depletion due to the continual additions of strong anions (SOx and NOx) from atmospheric deposition. Calcium and magnesium decreased with depth in the soils sampled within the project area. Base saturation (the sum of the bases divided by the effective cation exchange capacity) decreases with depth (excluding instances where limestone soil was sampled).

Acid cations present in the TyChest project area include aluminum (Al), iron (Fe), and manganese (Mn). When pH drops below 5.5, Al influences acidity and ECEC of the soil (Skylberg, 1999). This occurs because between pH values of 4.0-5.5, aluminum and iron hydroxide minerals become available (Skyllberg, 1999). This releases iron and aluminum oxides into the soil solution. The low pH values present in the subsoil of the TyChest project area suggest that greater amounts of aluminum and iron are present in the soil solution.

As previously mentioned, Ca: Al molar ratios can be used as an indicator of forest damage from acidic deposition and subsequent aluminum stress. Risks for the soils of the TyChest project area (Table 30) were assigned according to the thresholds shown in Table 29 below. It should be noted that select areas of the project area (specifically those that fall on Mauch Chunk or Greenbrier geologic formations) have Ca: Al ratios that are dissimilar from those displayed below. Such areas would be at low risk for acidic deposition effects.

### Table 29. Acid Risk Assessment Threshold for TyChest Project Area

<table>
<thead>
<tr>
<th>Risk</th>
<th>Ca:Al Molar Ratio</th>
<th>BSECEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 %</td>
<td>3.0+</td>
<td>--</td>
</tr>
<tr>
<td>&lt;50%</td>
<td>1.1-2.9</td>
<td>--</td>
</tr>
<tr>
<td>50%</td>
<td>0.7-1.0</td>
<td>--</td>
</tr>
<tr>
<td>75%</td>
<td>0.5-0.6</td>
<td>--</td>
</tr>
<tr>
<td>&gt;75%</td>
<td>0.3-0.4</td>
<td>&lt;15%</td>
</tr>
<tr>
<td>100%</td>
<td>0.0-0.2</td>
<td>&lt;15%</td>
</tr>
</tbody>
</table>

### Table 30. Ca: Al Ratios and Associated Risk Thresholds from Table 29.

<table>
<thead>
<tr>
<th>Soil Horizon</th>
<th>Ca:Al Ratio</th>
<th>% Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>21.5</td>
<td>0%</td>
</tr>
<tr>
<td>B</td>
<td>1.5</td>
<td>&lt;50%</td>
</tr>
<tr>
<td>C</td>
<td>0.4</td>
<td>&gt;75%</td>
</tr>
</tbody>
</table>

Summary of Acid Risk Assessment and Future Productivity

The data indicate that the concentrations of available base cations (especially Ca and Mg) in the soil currently are high in the organic horizons and very low in the subsoil. Based on information about acidic deposition inputs in this region and substantial documentation in the scientific literature, leaching losses of base cations combined the inherent low nutrient status of these geologies are believed to be the primary reasons for their low abundance in the subsoil. Inputs of base cations from bedrock weathering are slow and the associated geologies do not have large reserves of base cations compared to other geologies within the project area, such as limestone and alkaline shales.
Consequently, there is a slight level of concern that forest management timber extractive or disturbance-related actions could result in the loss of nutrients for the future timber growth in these stands.

There is much uncertainty as to what future site productivity would be for areas that are harvested. The issue is complex and difficult to predict. The time frame for determining the presence or absence of significant adverse effects to soil productivity is long, at least several decades. However, if the thresholds presented by Cronan and Grigal (1995) are applicable to field conditions, soil data from the TyChest indicate less than 50% likelihood of regeneration failure. It is even more difficult to determine, what if any portion of future forest decline would be attributable to changes in base cation status or other soil chemistry changes from harvesting trees in the area. Other environmental factors, such as ongoing acid deposition, climate change, and disease and pests may contribute to the success or health of the next regenerating stand.

**DESIRED FUTURE CONDITIONS**

The desired condition for the soil resource on the Monongahela National Forest (MNF) is to maintain or improve soil quality and soil productivity. Soil protective cover, soil organic matter, and coarse woody material are at levels that maintain the natural infiltration capacity, moisture regime, and productivity of the soil. Soils also have adequate physical, biological, and chemical properties to support desired vegetation growth. Exposed mineral soil and soil compaction from human activity may be present but are dispersed and do not impair the productivity and fertility of the soil.

**DIRECT & INDIRECT EFFECTS**

*Alternative 1 – No Action*

Alternative 1 proposes no activities, and consequently, no new soil disturbing activities. However, although no soil disturbing activities are proposed, current ecological and soil issues within the project area would not be addressed. The project area would continue to move towards a point of natural succession with both positive and negative consequences. Currently exposed areas of bare soil would continue to have soil movement. Known signs of erosion around culverts and poorly revegetated cut banks would continue to degrade. Surface water flowing on skid roads would continue to degrade the soil and water resources. Proposed roads for rehabilitation would remain on the landscape and continue to degrade soil quality while contributing to sediment load produced in the project area. Soils would continue to erode in these areas until some physical point of stabilization is met thereby having direct effects to the sediment load in the watershed which could impair over watershed health. Herbicides would not be used to meet desired future conditions and therefore would not have an effect on the soil resource.

*Alternative 2 – Proposed Action*

Most soils concerns in this project area revolve around management-created disturbance on steep slopes and accelerated erosion in wet areas even with mitigations applied. Therefore, in developing the proposed action, ground disturbance activities associated with commercial timber management were limited to non-sensitive soils to the maximum extent practicable. The one exception is that commercial management was purposely designed on limestone derived soils to benefit the RBC. Soil disturbance from road construction/re-construction and heavy equipment operation in steep or
wet areas is of particular concern. The Forest Plan has many management requirements that address soil disturbance, and additional measures can be identified and used at the project level to reduce risks to soil stability and movement and other detrimental effects. Detrimental soil disturbance is tied directly to soil quality standards in FSM 2550 (Page-Dumroese et al., 2009; USDA-USFS, 2010). A second issue that indirectly affects soils is herbicide use, particularly as it affects soil flora and fauna.

Running Buffalo Clover (RBC) Management (165 acres)
Running buffalo clover management is proposed in 165 acres of the project area (Table 31). A map of proposed skid road construction and respective slope ranges can be found in the Soil Resources Report.

The layout of the implemented logging system would avoid steep slopes (>30%) in soils that are sensitive to slippage. Timber harvesting and ground disturbance needed for RBC habitat creation can be supplemented with identifying key logging roads during layout and pulling timber up to those roads. Use of 200-250 feet of cable from conventional harvesters may be required. Dragging logs on the ground would create surficial disturbance and expose mineral soil. Detrimental soil effects both existing and newly created would be mitigated to the level that the soil disturbance would no longer be classified as detrimental (Page-Dumroese, 2009).

Table 31. Acres of sensitive soils within proposed RBC Management.

<table>
<thead>
<tr>
<th>Soil Sensitivity</th>
<th>Acres</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone</td>
<td>83</td>
<td>50%</td>
</tr>
<tr>
<td>Limestone, 30-70% Slope</td>
<td>25</td>
<td>15%</td>
</tr>
<tr>
<td>Slippage</td>
<td>19</td>
<td>12%</td>
</tr>
<tr>
<td>Slippage, 30-70% Slope</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Non-Sensitive</td>
<td>36</td>
<td>22%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>165</td>
<td>100%</td>
</tr>
</tbody>
</table>

When a unit is closed out after harvesting, the overall management goal would be that adverse soil disturbance would be mitigated to the degree that the unit would actually be characterized as having a soil quality improvement by addressing any existing deteriorating soil quality conditions in the unit such as severe rutting, ponding of water, severe compaction, and areas where subsurface flows are present on skid roads and creating channels resulting in rill and gully erosion.

Early Successional Habitat (ESH) Commercial Management (616 acres) and Commercial Daylighting (38 acres)
Commercial timbering activities by far have the greatest impact to the soil resource in this project. The severity of effects associated with commercial timber harvest is partially due to the need for use or creation of old or existing skid roads and log landings. Creation of these features results in a permanent dedication of the soil resource to that land use. Reuse of existing features could result in exacerbated erosion and compaction issues. The effects for these types of activities are both short- and long-term. They occur directly to the soil resource via disturbance.
Table 32. Acres of sensitive soil within proposed ESH Management.

<table>
<thead>
<tr>
<th>Sensitivity Type</th>
<th>Acres</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-sensitive</td>
<td>370</td>
<td>60%</td>
</tr>
<tr>
<td>slope 30 to 70%</td>
<td>205</td>
<td>33%</td>
</tr>
<tr>
<td>limestone</td>
<td>24</td>
<td>4%</td>
</tr>
<tr>
<td>wet</td>
<td>17</td>
<td>3%</td>
</tr>
<tr>
<td>limestone-slope 30 to 70%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>617</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 33. Acres of sensitive soils within proposed commercial daylighting along NFS Road 1560.

<table>
<thead>
<tr>
<th>Sensitivity Type</th>
<th>Acres</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>limestone</td>
<td>22</td>
<td>58%</td>
</tr>
<tr>
<td>slippage-slope 30 to 70%</td>
<td>5</td>
<td>13%</td>
</tr>
<tr>
<td>non-sensitive</td>
<td>4</td>
<td>10.5%</td>
</tr>
<tr>
<td>slippage</td>
<td>4</td>
<td>10.5%</td>
</tr>
<tr>
<td>slope 30 to 70%</td>
<td>3</td>
<td>8%</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>100%</td>
</tr>
</tbody>
</table>

New Road Construction

A new road location is proposed across Chestnut Ridge to access proposed activities for wildlife habitat creation and maintenance. This road is located higher on the landscape and would be properly designed and maintained compared to the non-system road that currently accesses the area. Approximately 4 acres of soil would be disturbed and permanently converted to a dedicated resource as a road that would be integrated into the national forest road system and receive routine maintenance as necessary.

The proposed road crosses 57 feet of soils sensitive to slope and can easily be avoided during implementation (Table 34). Three hundred feet of wet soils are intercepted in the headslope position. It is highly likely that a subsurface water table will be encountered in this section. The road should be designed such that water can easily pass through culvert and away from the roadbed surface. This is likely to be a more intermittent source of water, if not perennial, given the slope position and the field observations made during 2014 while excavating soil pits near the ridge line. The remainder of the road crosses soils that are non-sensitive.

Table 34. Length of sensitive soils for new road construction.

<table>
<thead>
<tr>
<th>Sensitivity Type</th>
<th>Length (Feet)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-sensitive</td>
<td>5171</td>
<td>94%</td>
</tr>
<tr>
<td>Wet</td>
<td>300</td>
<td>5%</td>
</tr>
<tr>
<td>slope 30% to 70%</td>
<td>57</td>
<td>1%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5528</td>
<td>100%</td>
</tr>
</tbody>
</table>

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**Skid Roads and Landings: Construction and Use**

Most soil disturbance is associated with timber transport rather than timber felling. This includes temporary roads (e.g., skid roads), permanent roads (e.g., haul roads) and landings. The most important soil resource concern for the project area is slope steepness. All soils independent of soil type or series located on slopes greater than 30 percent are considered sensitive according to the ratings given by USDA-NRCS in the Soil Survey Report for TyChest and by the MNF watershed staff because they naturally have a high risk of erosion which increases when soil disturbance occurs.

The Forest Plan requires that additional attention and required analysis be given to proposed management with mechanized equipment on slopes 40 percent and greater (SW07, 2006.) Approximately 13 miles (24 acres of soil disturbance) of new skid roads are proposed for construction (Table 35). The majority of new skid road construction is proposed on slopes less than 30 percent. Twenty-one percent of proposed skid road construction falls on slopes between 30 and 40% slopes. Approximately eight percent of proposed skid road construction falls on slopes 40% or greater. During implementation, skid road construction will be adjusted and is not expected to occur on slope steeper than 40%.

**Table 35. Length of proposed skid roads and the respective slopes (3-m digital elevation model) crossed in harvest units.**

<table>
<thead>
<tr>
<th>Slope Range (%)</th>
<th>Length in feet (miles)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>8,608 (1.6)</td>
<td>12%</td>
</tr>
<tr>
<td>10-20</td>
<td>19,642 (3.7)</td>
<td>28%</td>
</tr>
<tr>
<td>20-30</td>
<td>21,806 (4.1)</td>
<td>31%</td>
</tr>
<tr>
<td>30-40</td>
<td>14,678 (2.8)</td>
<td>21%</td>
</tr>
<tr>
<td>40-50</td>
<td>3,960 (0.8)</td>
<td>6%</td>
</tr>
<tr>
<td>50+</td>
<td>1,690 (0.3)</td>
<td>2%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>70,435 (13.3)</td>
<td>100%</td>
</tr>
</tbody>
</table>

Approximately half of the proposed skid roads occur on non-sensitive soils. The remainder of the skid roads fall on limestone 13,939 ft. (2.67 miles), steeply sloping areas 20,381 ft. (3.86 miles), and wet soils 581 ft. (0.11 miles) (Table 36).

**Table 36. Feet of proposed skid road construction and relative disturbance of sensitive soils.**

<table>
<thead>
<tr>
<th>Soil Sensitivity</th>
<th>Length in Feet (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone</td>
<td>13,939 (2.67)</td>
</tr>
<tr>
<td>Slope 30-70%</td>
<td>20,381 (3.86)</td>
</tr>
<tr>
<td>Wet</td>
<td>581 (0.11)</td>
</tr>
<tr>
<td>Non-Sensitive</td>
<td>35,640 (6.75)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>70,435 (13.3)</td>
</tr>
</tbody>
</table>

The creation of these skid roads in sensitive soils could lead to decreased soil quality as already indicated by the existing condition within these units and on the landscape from historic operations. This project proposes 24 acres of new soil disturbance created by blading in the new skid roads. This type of disturbance often results in detrimental soil disturbance (class 2 or 3). This could occur via the interception of ground water tables, increased erosion or mass movement, or compaction. The severity of adverse effects is also dependent on which geology and soil series on which the disturbance occurs. Within this project area, soils like Shouns and Cateache that form
from the Mauch Chunk geologic formation, are at high risk for soil slippage, compaction, and erosion due to their mineralogy and ability to expand and contract when wetting and drying.

Specific design criteria and mitigations would be implemented to avoid adverse impacts are discussed in the design criteria and mitigations section. Long term effects of road construction should be minimized as outsloping and remediation of any surface water or erosional issues is supposed to be addressed.

Part of this proposed activities of the Proposed Action - Alternative 2 include the creation of small landings. Landings require extensive soil disturbance to prepare for use. During utilization soil mixing of the surface and subsurface horizons would occur; however, severe detrimental disturbance should not occur and should be prevented by the addition of gravel for soft wet spots, the addition of temporary drainage structures to remove any ponding of water from the landing, or a temporary shutdown of the site until weather conditions improve and the soil moisture drops and allows for acceptable conditions for operation as administered by the Timber Sale Administrator.

Many of the proposed landings are existing and much less soil disturbance would need to occur than in the development of new landings. The project’s proposed action indicates that efforts would be made to locate these landings on non-sensitive soils. However, if landings are inappropriately located, or subsurface water tables are intercepted, adverse effects could still occur and detrimental soil disturbance is likely to result. Details regarding how to decrease the risk associated with these activities can be found in the Design Criteria and Mitigations section of this document. Upon closure of a landing, the area would be fertilized, limed, and seeded with native grasses, legumes, and wildflowers for pollinator habitat. Tree planting of hardwoods would also be acceptable. (Forest Plan, p. II-10, SW03, SW13, 2006). Proposed landings are slated to be left on the landscape as wildlife openings.

There would be a positive indirect effect associated with all of the action alternatives in areas that receive topsoil from excavated areas, such as road fill slopes. With the added nutrients and organic matter, increased soil depth and associated moisture-holding capacity, productivity on these areas could be improved. However, these improvements do not fully offset soil degradation in other areas, such as the road driving surface and cutbanks where soil quality and productivity are reduced.

**Compaction**

Areas where general timber harvest activities occur are expected to recover quickly from compaction caused by harvesting. Research has shown that the upper few inches of soil can recover quickly from light to moderate compaction (Adams 1991; Burger, 1985; Hatchell, 1971; Kozlowski, 1999). Recovery is often attributed to organic matter additions from logging debris, soil biotic activity, freezing and thawing, and plant root growth.

Decreased recovery is common in areas where severe compaction occurs. Severe compaction is almost always a result of skid road construction and use (which is further exacerbated with increased heavy equipment traffic). Compaction, loss of surface water infiltration, and loss of overall long-term soil productivity are to be expected in areas converted to skid roads. To resolve severe compaction, ripping or soil tillage to the depth of compaction must be conducted to encourage water infiltration and plant root growth. Regional SQS recommend that bulk density values be no greater than 1.54 to 1.63 g/cm³ for loamy soils (range dependent upon specific soil textures). Site specific analysis would be required to determine the degree of compaction and any changes in bulk density of the soil profile. Untreated, severely compacted areas have long term impacts to soil productivity.
A total of 5,528 feet of existing skid trails and roads exist within the project area. Currently, no road rehabilitation or decommissioning efforts have been applied to these road systems; consequently, the entirety of the road is likely compacted to an average depth of 3 to 7 inches as seen in past road decommissioning projects that address restoration of historic skid roads (Upper Greenbrier EA, 2010). Of those, the majority (5,171 feet) intersect non-sensitive soils. However, 300 feet fall on wet areas and 57 feet fall in areas with steep slopes (30-70%). Upon closure of the use of these existing roads, mitigations would be applied so that the skid roads are outsloped and the severe compaction and rutting and ponding of water is no longer a concern. Soil quality would be improved. Skid roads would not be fully rehabilitated to restore soil hydrologic connectivity across the entirety of the system but severe issues would be addressed that are resulting in erosion and sediment and leading to watershed issues down slope.

Non-commercial Early Successional Habitat (ESH)

Shredder Mulcher Use
Effects related to soil quality as a result of the use of the shredder mulcher are expected to be limited given limited proposed activities in conjunction with the return of shredded organic material back to the soil surface. Every effort should be made to use the shredder mulcher on existing skid roads, on dry soils, and on gentle slopes (<15%). Use of the shredder mulcher off road could result in disturbance of the soil surface horizons, which are critical to soil health. It is expected that the degree of disturbance would be no more than a class 1 as described by the Detrimental Soil Disturbance Monitoring Protocols (Page-Dumroese et al., 2009). In rare instances where stumps are larger and vegetation may be thicker and surface horizons are also thicker resulting in more organic matter in the soil surface, class 2 detrimental disturbance may occur. No class 3 detrimental disturbance would be observed except in the actual hole where the stumps is located in the soil as it is ground down and/or removed. Seeding and mulching can help to mitigate any excessive soil disturbance. Risk of soil erosion and compaction when operating off trail could be partially diminished by high percentage or rock fragments (on surface or subsurface).

Additionally, operating on wet or saturated soils could lead to adverse effects and should be avoided. In general, operations should cease during wetter times of the year and aim to work during dry periods and this could vary depending on the year’s given precipitation patterns. Specifically, the use of heavy equipment on wet soils could lead to rutting which would in turn become a soil quality issue and result in detrimental soil disturbance (Page-Dumroese et al. 2009) as well as a source of sedimentation. Preemptively, wet soils can be avoided by looking to the sensitive soils layer. One should determine if shredder/mulcher use is proposed in areas that are mapped as having wetness sensitivity. Soils that are wet are most likely to be found in riparian corridors, coves and footslope/toeslope positions. A field test (squeezing soil to see if excess water drips from your hand) can also be performed to assess wetness in conjunction with known recent weather conditions. Second, efforts to return shredded organic matter to the soil surface should be made. This helps ensure the health of the soils surface horizon, which in turn helps promote soil health and soil quality. Remediating compaction that would occur would require ripping the soils to the depth of compaction and slightly deeper to return porosity and break up the platy structure.

A third concern with soil chemistry exists in the area where the Price geologic formation is located (See Geology Map in Soils Report in project file). Extra care should be taken to minimize mixing and disturbance of the surface horizon because these soils forming from this geologic material are at most risk for nutrient losses from management activities. Liming is one possible mitigation that could be used to offset any nutrient losses in this units. It is recommended that 2-3 tons of
limestone sand be applied to ensure no nutrient losses are occurred as a result of the activity. Also as a result of any liming additions it is possible that soils could be enriched enough to raise the pH and nutrients to support RBC expansion into these units.

ESH/Bat Habitat Management
While it is beneficial that all killed trees would a) not be drug across the soil surface and b) remain on site to contribute to organic matter, some actions proposed to achieve the desired conditions (i.e. herbicide use) are of concern regarding soil resources as previously described. Care should be taken not to use herbicides within 50 feet of culverts, and riparian restrictions should be applied where roads cross streams (See Hydrology Report for further discussion.) Trees should also not be cut on steep slopes where the root wad is stabilizing the bank and playing a role in stabilizing the road. No trees should be cut on slopes greater than 50% and no trees should be removed on soils prone to slippage on slopes greater than 40%. Also tree cutting should not occur with the riparian area and standards for tree removal should be followed (See Hydrology Report for further discussion.)

Terrestrial/Aquatic Habitat Improvement
Additions of woody material, creation of wetlands and maintenance of wildlife openings all call for heavy equipment use. This can problematic given the proposal to conduct these activities in proximity to a stream and on soils that are likely to have inclusions of wet soils and hydric soils that are not mapped out due to the limitation of the scale of the soil survey. Soils along streams and in riparian areas are notoriously wet and therefore especially vulnerable to activities that could lead to soil compaction, erosion or slippage. Efforts to minimize use of large equipment within the riparian area should be made and or use of cribbing and mats to disperse the weight of the equipment can also be done to limit soil compaction and detrimental disturbance. Activity in the riparian area should only be conducted when soils are dry, preferably in the driest portion of the year. If soil conditions are moister, cribbing (running equipment over downed debris) can be used to minimize the opportunities for compaction and erosion. Proposed actions like these have been conducted successfully in recent history in the Upper Greenbrier project area and are documented in the monitoring reports for those watershed restoration projects. No long-term soil quality impacts are expected. Soil quality improvements are expected to occur resulting in an improvement in overall subwatershed health.

Linear Wildlife Opening Management
Maintenance of wildlife openings would require the use of heavy equipment. As stated previously, efforts to avoid tractor or equipment activity when the soil is saturated would help reduce the immediate and short term effects of proposed activities.

Vernal Pool Creation
This project proposes that vernal pools (a maximum of 68 vernal pools, each with a ¼ acre footprint, with a total of 17 acres of soil disturbance) be created within some of the wildlife orchards. The exact number and location of vernal pools would not be determined until project implementation. However, effects and efficacy of vernal pool creation were evaluated for the entirety of the project area using the pond viability tool in Web Soil Survey. Results of the analysis are described in the paragraphs below.

The creation of these wetlands would require soil disturbance, soil compaction, and displacement. Each site would be approximately 1/2 acre or less in size and is located throughout various landscape positions. The wetlands are designed based on the landform, the type of soil present, and
the type of hydrologic situation present (spring, ditch line, or the presence of no water source.) In addition to the creation of the wetlands at each site, access would need to be designated to bring equipment into each site for excavation. The proposed locations would use an existing road or trail. The use of heavy equipment is being proposed for excavation of the wetlands and therefore any soil quality degradation or detrimental soil disturbance would be remediated prior to leaving the site.

Efficacy of the creation of vernal pools would be increased where soil conditions (such as a subsurface layer that impedes water movement or soil textures are higher in clay content (clay loams, heavy loams, or silty clay loams) ) are such that water could easily pond with the appropriate compaction of the soil subsurface. Vernal pool creation should be focused on areas that do not steeply slope (<30%). Creating a vernal pool in an area with steep slopes could result in adverse effects to the soil resource (erosion and slippage). In areas where water impeding subsurface soil layer does not exist, the use of natural materials such as bentonite or borrowing soil with a higher clay component can be used to seal the bottom of the pond and prevent percolation of water into the soil profile. Borrow material does exist within the project area (See the Soil Survey Report for identifying soils with heavier clay textures).

In Web Soil Survey, a pond viability interpretation was ran for the entire project area. While the actions required to build a pond are not the same as those implemented when constructing vernal pools, the pond interpretation gives the best available evaluation for creation of vernal pools for this project. The pond interpretation in web soil survey uses soil seepage above 60 inches (measured by ksat), slope, and depth to bedrock as indicators for pond creation viability. According the pond interpretation in Web Soil Survey, almost 99 percent of the project area is rated as being severely limited for pond construction. The remainder (1%) of the project area is rates as somewhat limited. Given the scale of the information in web soil survey (1:24000), there could be places on the landscape that are more suitable for vernal pool creation. During project implementation, it is the recommendation of the soils staff that those overseeing the project hand select areas for vernal pools based on field observations. Areas that would be more acceptable for vernal pool creation might be indicated by topography (depressions) and standing water. An interpretation to determine percent clay in the upper 50 cm of soil was ran in Web Soil Survey. This soil property was chosen as part of the vernal pool analysis given the ability of high clay layers to impede water movement. The results of this analysis can be seen on the Web Soil Survey report, however, areas of Belmont (which have the highest clay percentage) would offer some of the best habitat for shallow vernal pool creation or offer a source of soil that could be used to seal vernal pools on soils that have less clay and therefore more likely to naturally fail over time.

Herbicide for Vegetative Control
The effects of using herbicides in a forested ecosystem vary in the soil resource. If all label application guidelines are followed, the risk of the herbicide leaving the site prior to reaching its half-life and degrading is low unless erosion issues are a concern. The highest risk would be seen on slopes over 30 percent. These are the slopes that are at greatest risk for erosion both natural and management induced. Hand and spot (wick) application would need to occur in these areas and then re-vegetated post herbicide application with adequate time for the herbicide to have degraded or the site(s) would be with a mix that would not be susceptible to the herbicide residues left behind once the target plants die and decompose. However, given the concentration of project units on gently sloping areas, the risk of herbicide movement via soil erosion on steep slopes is low.

Chemical and physical factors of the soil play a role in determining how mobile. Mobility is affected by soil pH and other soil chemistry factors. Physical characteristics such as rockiness, restricted layers, percent organic matter, and soil texture (percent clay) also affect mobility.
Generally soils are loamy in the project area. Rock fragment content can be high and comprise as much as 70 percent of a soil on ridge tops and colluvium. This could greatly influence the infiltration potential of any herbicide that would reach the soil surface during application. Timing of application with soil moisture, precipitation events, and wind all become important factors that must be monitored prior to application until conditions are such that risk of application is low having herbicide become more mobile than predicted.

Most concerns for the soil resource are how herbicides affect microbial populations and the soil community as a whole. Research is limited on this topic; however, it is discussed for each herbicide where information is available.

**Triclopyr**
The five commercial formulations of triclopyr contain one of two forms of triclopyr, BEE (butoxyethyl ester) or TEA (triethylamine) (SERA, 2003a). Triclopyr BEE is much more toxic to aquatic organisms than triclopyr TEA. A breakdown product, TCP (3,5,6-trichloro-2-pyridinol), is more toxic than either form of triclopyr. Site-specific cumulative effects analysis buffer determinations need to consider the form of triclopyr used and the proximity of any aquatic triclopyr applications, as well as toxicity to aquatic organisms.

- Triclopyr has not been studied on soil invertebrates.
- Soil fungi growth was inhibited at concentrations 2 to 5 times higher than concentrations expected from USDA Forest Service application rates.
- Triclopyr has an average half-life in soil of 46 days, while TCP has an average half-life in soil of 70 days. Warmer temperatures decrease the time to degrade triclopyr.
- Soil adsorption is increased as organic material increases and decreased as pH increases. Triclopyr is weakly adsorbed to soil, though adsorption varies with organic matter and clay content. Both light and microbes degrade triclopyr.

**Imazapyr**
There are no studies on the effects of imazapyr on soil invertebrates, and incomplete information on the effects on soil microorganisms (SERA, 1999).

- Imazapyr is weakly bound to soil, but adsorption increases with lower pH and increasing clay and organic matter content.
  - Soils in the TyChest project area tend to be on the higher pH range of forest soils especially those forming from limestone and alkaline shale geologic formations.
  - Soil textures are also higher in % clay (See TyChest Soil Survey Report in Soil Resource Report appendix.) Modeling results indicate imazapyr runoff is highest in clay and loam soils with peaks after the first rainfall.
  - Field studies indicate that imazapyr remains in the top 20 inches of soil and do not indicate any potential for imazapyr to move with surface water. However, above pH 5, the herbicide will take on an ionized form, increasing the risk of herbicide runoff.
  - This increased risk is present in this project area – especially in RBC treatment areas where soils are forming from limestone and alkaline red shales and soil pH values are greater than 5.
In forest field studies, imazapyr did not run off and there was no evidence of lateral movement.

- Some sensitive plant species could be affected by the off-site drift or by off-site movement in runoff of imazapyr depending on local site-specific conditions.

- Some effects are also plausible in aquatic plants. Aquatic macrophytes appear to be more sensitive to imazapyr than unicellular algae. Peak concentrations of imazapyr in surface water could be associated with adverse effects in some aquatic macrophytes.

- Imazapyr percolation is highest in sandy soils.

**Glyphosate**

Numerous soil bacteria, fungi, invertebrates, and other microorganisms have been studied for effects of glyphosate application (SERA, 2003b).

- There is nothing in the current literature to suggest glyphosate would adversely affect soil organisms.

- Glyphosate is readily metabolized by soil microorganisms and some species can use glyphosate as a sole source of carbon.

- It is degraded by microbial action in both soil and water.

- Glyphosate degrades in soil, with an estimated half-life of 30 days.

- Glyphosate is highly soluble, but adsorbs rapidly and tightly to soil.

- Glyphosate has low leaching potential because it binds so tightly to soil.

- Modeling results indicate glyphosate runoff is highest in loam soils with peaks after the first rainfall.

**Watershed Improvements**

*Rehabilitate Road/Skid Road (Trail) Hydrology*

Project-area aquatic habitat restoration proposed activities would provide benefits to soil quality. Location and amount of erosion control measures and riparian rehabilitation will be conducted on an ad-hoc basis as needed. These activities are designed to restore various physical properties of the soils, and improve the condition of the riparian area. This indirectly improves the soil chemistry by catching organic matter, nutrients from run off, and pollutants associated with sediment transport. These activities can have short-term adverse effects from soil disturbance while the activity is being implemented. However, the long-term beneficial effects are lasting and move the watershed toward accelerated recovery from historic actions. With the application of best management practices for protecting water quality and working near water bodies, controlling sediment and erosion during construction and in the long-term, and restoring soil physical properties, short-term adverse effects can be minor (see Hydrology Resource Report for further discussion). Using tools like cribbing to disperse equipment weight, de-watering stretches of stream and diverting flows temporarily to reduce soil moisture while operating, using temporary sediment control structures, and mulching and seeding all can help to control or even prevent adverse soil effects.
Monitoring these types of projects in the Upper Greenbrier watershed as part of that collective restoration effort has shown effects both immediately and 1-2 years later. Riparian areas and their associated soils are recovering and leading to improved watershed condition.

**Large Woody Material Additions**
Placement of large wood material into streams results in a beneficial restorative effect to soil quality in the riparian area and floodplain. Project implementation can result in very little soil disturbance to moderate disturbance that is localized and occurs when large root wads and stems from mature trees are anchored. Adding large wood into stream channels and riparian areas stabilizes stream banks and prevents erosion and soil loss.

Large wood structures catch sediment and create deposition areas in pools and similar slow-water areas. Riparian soils are enriched with nutrients and help to keep nutrients high within the headwaters of larger watersheds. This is evident of a comparison of soil chemistry of soils in riparian areas verses soils in upland positions (Forest Soil Chemistry Monitoring Data for all projects 2002-2014). Soils in riparian areas or with alluvial parent materials have higher nutrient levels, higher cation exchange capacity and higher base saturation (Soil pedon data for USDA-NRCS MLRA 127 [http://ssldata.nrcs.usda.gov](http://ssldata.nrcs.usda.gov)). Soil with more base cations are more likely to buffer atmospheric deposition inputs such as acidity and other pollutants.

**Road Decommissioning**
In the proposed actions road decommission equates to road obliteration, in which hillslope hydrology is restored. Road decommissioning would have beneficial effects to the soil resource in the long-term because the soil quality and soil productivity are improved above the existing condition.

Road decommissioning disturbs most of the existing road prism width. These activities provide a moderate risk of sediment generation. Mulching, liming, fertilizing, seeding exposed soils, and installing temporary sediment control features would control the movement of sediment off site (MNF Forest Plan, SW03, SW04 II-10, 2006). The installation of sediment barriers near and adjacent to all stream crossings would be especially important in preventing sediment from reaching the stream channel. Sediment barriers need to be cleaned and maintained, and the disturbed soil needs to be stabilized with either geotextile fabric or seed and mulch. Recent post-decommissioning project monitoring has shown little soil moves onsite site after decommissioning is completed. Current monitoring from the Watershed Staff (personal communication, Mike Owen – Watershed Staff Program Manager) suggests that little to no mulch is needed in areas where the soils are ripped to restore infiltration capacity on hillslopes that are <15 percent.

It has been determined in interdisciplinary team review that road decommissioning is a suitable practice to restore soil quality and return degraded unmaintained roads and linear compacted features back to productivity sites. This is especially true for FR 92A, which is located almost entirely on the Mauch Chunk geologic formation and steep slopes. Such restoration is consistent with the Forest Plan, as any negative effects from decommissioning on steep slopes are short-term, and in the long-term decommissioning improves watershed health.
CUMULATIVE EFFECTS

Alternative 1 – No Action
If the No Action Alternative is selected, 0 acres of soil disturbance would occur and no soil rehabilitation efforts would take place. The No Action Alternative would not implement actions that would cause unavoidable adverse impacts, but existing erosion on the road system in the project area would continue especially in locations where the slopes exceed 30 percent and soils are prone to slippage. Also legacy erosional features from past activities are currently producing sediment. Soil quality would remain impaired on “roads or linear openings not maintained as wildlife openings” that are not a dedicated resource and not listed in the US Forest Service INFRA Roads Database.

Alternative 2 – Proposed Action
The majority of obvious resource effects to the soil resource from the Proposed Action are either direct or indirect. By contrast, cumulative effects for soil resources are more difficult to identify conclusively, partly because future effects involve speculation and probability.

Land management and practices have improved on Forest Service lands within the TyChest project area since the 1970s following passage of the Clean Water Act and as the result of the implementation of Forest Plan standards and guides and BMPs for soil erosion control. Soil quality has been recovering on federal lands but legacy effects remain. Some of the mitigations proposed in the current project will have lasting effects into the future, and therefore, will continue to contribute to soil quality improvements locally. Implementing the restorative practices proposed in this project area would offset the effects from soil quality degradation on all lands in the project area. Cumulatively this project would result in improvement to soil quality within the project area if implemented as proposed.

Other cumulative effects include atmospheric deposition and climate change. Both of these environmental influences affect soils. Atmospheric deposition accelerates soil acidification, but soils in this watershed as a whole tend to buffer that acidity through an exchange of base cations from the soil. The ability to continue to buffer acidification is expected in the foreseeable future. Climate change affects the soils by altering many factors, such as soil moisture, soil temperature, soil ecology, soil chemistry related to carbon. These changes would be overlaid on the changes to the overall ecology in the project area that are expected to occur. The specific changes are difficult to define precisely due to the interactions that will result within the ecosystem, but some of the expected changes are discussed in lengthy detail in the Monongahela National Forest’s recent involvement in the Central Appalachians Climate Change Response Framework (Butler et al., 2015). Over time, the soil would change at least some of its characteristics under a drier warmer climate, if predictions for the area are accurate. The general results would be: soils would lose carbon; soil biota would shift; and more southern vegetative communities would expand northward. Soil-forming factors would change fundamentally and cause soils and soil ecosystems to respond accordingly. Atmospheric deposition and climate change would not affect soils solely independently, but there is little research to understand how they would interact to influence soil quality or the overall soil environment.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES
For the soil resource in Alternative 2 there would be irreversible commitments of the soil resource because not all soil disturbances would be completely mitigated to result in all detrimental soil
effects being addressed. This means that the soil would be manipulated to a degree that soil properties would change for the long term until either a decision is made to restore soil function to those acres or until long term soil forming processes take over and restore the soil resource to a state where vegetation grows naturally on the site such as in a log landing. If the Proposed Action Alternative is implemented approximately 48 acres of class 1 and 2 and 3 soil disturbance would occur in commercial activities. Also there would be a small acreage of soil disturbance associated with landings and small wildlife openings. Non-commercial activities are expected to have primarily class 1 soil disturbance not classified as detrimental as well as a small portion being classified as class 2. Restoration activities are expected to have varying levels of class 1 through 3 disturbance in the immediate short term; however these activities are designed so that the long term effects are restorative to the soil resource and soil quality is improved. Specific acreages are not listed because these activities will be implemented as needed or as opportunity arises during project implementation.

CONSISTENCY WITH THE FOREST PLAN
The Proposed Action – Alternative 2 would be consistent with the Forest Plan with the implementation of the Design criteria listed in the Appendix. Additionally, mitigations would need to be applied in areas where activities appear to be located on steeper slopes (from the project GIS analysis completed in ArcMap) so as to avoid areas of soils sensitive for severe erosion and slippage potential. This statement is based on avoidance techniques and measures outlined within project design features included in the proposed action.

CONSISTENCY WITH LAWS, REGULATIONS, AND HANDBOOK
All alternatives would be implemented consistent with Forest Service laws, regulations, and handbooks regarding management of the soil resource.
Heritage and Cultural Resources
This section discloses issues and concerns to historic properties within and around the TyChest project area and the potential direct, indirect and cumulative effects of the proposed alternatives being considered for implementation. For the purposes of this analysis, effect means the alteration to the characteristics of a historic property qualifying it for inclusion in, or eligibility for, the National Register of Historic Places (NRHP) per the definition in 36 CFR 800.16(i). Historic property means any prehistoric or historic district, site, building, structure, object or historical/cultural landscape included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term also applies to any cultural resource or property not yet evaluated to determine whether it is eligible for the NRHP. This term includes artifacts, features, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or native Hawaiian organization and that meet the National Register criteria per the definition in 36 CFR 800.16(l).

SCOPE OF THE ANALYSIS
The spatial boundary, or area of potential effects (APE), used to evaluate direct effects included the respective boundaries of the proposed action and alternatives. The spatial boundary used to evaluate the indirect effects included a one-mile radius of the project area.

The temporal boundary used to evaluate direct, indirect and cumulative effects was ten years because the proposed actions will be implemented between 2017 and 2021 and the visual effects are likely to continue for up to five years post-treatment.

METHODOLOGY
The proposed action and alternatives were reviewed in accordance with the programmatic agreement among the U.S.D.A. Forest Service, Monongahela National Forest, The West Virginia Division of Culture and History, and the Advisory Council on Historic Preservation regarding the process for compliance with Section 106 of the National Historic Preservation Act, as amended.

The Forest Service had previously surveyed approximately 157 acres of the project area for other undertakings. Approximately 38 acres of the APE was surveyed for the Small Timber Sales – (A) Stewart Run BL; (B) Chestnut Ridge BL; (C) Smoke Camp Tower, which was documented in Cultural Resource Report #092103062 (CRR 03-062). Another survey was conducted during 1986 for the Small Timber Sale – Black Fork Locust CRR 03-064, which covered approximately 108 acres of the APE. Then during 1988, another 12 acres was surveyed for the Chestnut Ridge Savannah Project CRR 03-078.

The entire APE was surveyed for the identification of historic properties during 2014, and documented in CRR 03-306. All previously recorded historic properties were monitored as part of the investigation.

EFFECTS
The no action alternative and proposed action alternative will have no adverse effects to historic properties. Standard protection measures will include avoidance or other appropriate forms of mitigation of all direct and indirect effects to historic properties, as stipulated in the MNF programmatic agreement. Heritage resources that have been previously evaluated and found to be
not eligible for the National Register require no further consideration during project planning or implementation.

**Direct/Indirect Effects**
All standard protection measures will avoid direct and indirect effects to historic properties and are in accordance with the MNF programmatic agreement.

**Alternative 1 – No Action**
The no action alternative will have no adverse effect to historic properties. Current management plans within the project area are addressed programmatically and reviewed by the MNF Heritage Program Manager on a case-by-case basis.

**Alternative 2 – Proposed Action**
The proposed action alternative will have no adverse effect on historic properties. Standard protection measures will be carried out for each undertaking in accordance with the programmatic agreement among the U.S.D.A. Forest Service, Monongahela National Forest, The West Virginia Division of Culture and History, and the Advisory Council on Historic Preservation regarding the process for compliance with Section 106 of the National Historic Preservation Act, as amended.

**Commercial Activities**

Running Buffalo Clover Management (165 acres)
There is one historic property within the proposed running buffalo clover management area. Standard protection measures will be implemented to eliminate or minimize adverse effects to the historic property. Activities within the boundaries of each property shall be prohibited with the exception of those approved by the MNF Heritage Program Manager. Activities that do not involve ground disturbance, such as noncommercial thinning, girdling, brush cutting, or mulching may be permitted in coordination with the MNF Heritage Program Manager in an effort to create the desired filtered sunlight to encourage RBC propagation without the disturbance of commercial thinning.

Early Successional Habitat (ESH) Management (616 acres)
There are seven historic properties within the ESH areas proposed for commercial thinning to establish small patch cuts, cutback borders, wildlife corridors, and open woodland management. Standard protection measures will be implemented to eliminate or minimize adverse effects to the historic properties. Activities within the boundaries of each property shall be prohibited with the exception of those approved by the MNF Heritage Program Manager. Activities that do not involve ground disturbance, such as noncommercial thinning, girdling, brush cutting, mulching, or herbicide application may be permitted in coordination with the MNF Heritage Program Manager to achieve the desired condition and benefit the historic properties.

Commercial Daylighting (38 acres)
There are three historic properties within the area proposed for commercial daylighting. Standard protection measures will be implemented to eliminate or minimize adverse effects to the historic properties.

**Non-Commercial Activities**

Early Successional Habitat (ESH) Work:
- Orchard Restoration: The activities proposed for orchard restoration, such as pruning and releasing of trees, and planting and seeding of native plants are exempt from Section 106
review. Historic properties will be avoided during the creation of vernal pools and the removal of large rocks and stumps.

- Create ESH habitat in recently (<30 years) timbered areas: Herbicide application and the use of a mulcher are exempt from Section 106 review. These activities do not involve ground disturbance and will not adversely affect historic properties.

ESH/Bat Habitat Management:
- Cutback borders and Bat Roosting Habitat Enhancement: Cutback borders would be created by cutting down, girdling, or direct application of herbicide to selected trees. All of the wood would be left on-site there would be no heavy equipment for tree removal associated with this activity. These activities will have no adverse effect to historic properties.

Watershed/Wildlife Improvements:
- Terrestrial/Aquatic Habitat Improvement (21 acres and 2,500 feet of stream): There is one historic property adjacent to a location where stream improvements, wetland construction, and the addition of woody material to riparian area is being proposed. Standard protection measures will be implemented eliminate or minimize adverse effects to the historic property.
- Linear wildlife opening management (6.9 miles): Mowing, disking, seeding, seasonal avoidance, and herbicide application are exempt from Section 106 review. These actions will not adversely affect historic properties. Water bar installation will avoid historic properties.
- Wetland Creation: Historic properties will be avoided during the creation of vernal pools.

Watershed Improvements:
- Rehabilitate Skid Road/trail hydrology:
  1. Activities associated with erosion control within an existing road prism is exempt from Section 106 review.
  2. The rehabilitation of erosional areas associated with stream channel and riparian degradation will not adversely affect historic properties.
  3. No historic properties will be affected by the construction of a new system road to access the Chestnut Ridge area as it is proposed, or the decommission of the existing access trail to Chestnut Ridge savannah while maintaining the Chestnut Ridge hiking trail (Approximately 1 mile of new road).

Cumulative Effects
The potential for cumulative effects is not substantial. Most of the surrounding area is under stewardship of the MNF heritage program. All present and future undertakings must be reviewed for effects to historic properties.

Alternative 1: No Action
Alternative 1 will result in no cumulative effects. Alternative 1 will result in no cumulative effects.

Alternative 2: Proposed Action
Alternative 2 will result in no cumulative effects.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES
The proposed action and alternative will not result in irreversible or irretrievable commitment of heritage resources because standard protection measures will be implemented.
CONSISTENCY WITH THE FOREST PLAN
The standard protection measures spelled out by the MNF programmatic agreement are consistent with the Forest Plan.

CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS, AND EXECUTIVE ORDERS
There are no conflicts with laws, regulations, handbooks, and executive orders. The alternatives and standard protection measures are consistent with the National Historic Preservation Act of 1966 (16 USC 470), Archaeological Resources Protection Act of 1979 (16 USC 470), Forest Service Manual 2360, Forest Service Handbook 2309.12, 36 CFR Parts 219.24 and 261.2
Transportation

RESOURCES IMPACTS/ISSUES ADDRESSED
This section addresses the transportation impacts in the Tygart Chestnut project. The transportation system provides access for management activities occurring on the Forest. The road system is needed by a variety of resources such as recreation, special uses, timber harvest, range management, minerals development, and fire protection.

SCOPE OF ANALYSIS
The spatial boundary for the analysis is the project area boundary. The project area boundary includes all parcels of land that would be affected by project activities; therefore, it is an appropriate boundary for the analysis of direct and indirect effects on the transportation system.

METHODOLOGY
A spatial analysis was conducted to determine effects to the road system in the project area. Routes were identified with the analysis and summarized in tables shown by alternative. Road densities were calculated and compared to Forest Plan Standards and Guidelines. Road density and road mileages have been calculated using system road data under the jurisdiction of the Monongahela National Forest. National Forest System Road 92 serves as the eastern project boundary and was not used in the computation of road density for this analysis.

DESIRED FUTURE CONDITIONS
Forest Plan direction provides guidance for the desired conditions related to Forest road network (Forest Plan, 2006). The road network matches the level of management activities occurring on the Forest and supplies the transportation system needed for recreation, special uses, timber harvest, range management, minerals development, fire protection, and other resource management needs. The transportation network is managed, using a variety of tools to reduce adverse effects to resources. Roads needed for long-term objectives are maintained to provide for user safety and resource protection. Roads not needed for long-term objectives are decommissioned and stabilized. For the project area and MP 6.1, a system of roads and trails should provide access within the area for administrative and management purposes, including the transportation of forest products. Non-motorized recreation is emphasized and public motorized access is generally restricted. New collector/local roads are typically barricaded or gated. Many roads are seeded and managed for wildlife habitat and travel routes. Only a small portion of existing NFS Road 92A and 2% of the project area is within MP 4.1, limiting the project’s ability to achieve desired conditions associated with this direction.

DIRECT/INDIRECT EFFECTS
Alternative 1 – No Action
The transportation system would be maintained to the existing objective maintenance levels (Table 37). Road activities associated with ongoing road maintenance programs by the Monongahela National Forest would be implemented in the project area. No additional improvements or decommissioning would be performed. The current road density by management prescription would remain the same (Table 38). The current open road density for the TyChest project area is currently
0 miles/square mile would also remain the same.

Table 37. Current Transportation System.

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Name</th>
<th>Jurisdiction</th>
<th>Maintenance Level</th>
<th>Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td>92A</td>
<td>Cheat Mountain – A</td>
<td>Forest Service</td>
<td>2</td>
<td>1.43</td>
</tr>
<tr>
<td>765</td>
<td>Back Fork</td>
<td>Forest Service</td>
<td>2</td>
<td>2.12</td>
</tr>
<tr>
<td>765A</td>
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<td>Forest Service</td>
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<td>0.41</td>
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<td>1560</td>
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<td>Forest Service</td>
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<td>6.04</td>
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<td>Forest Service</td>
<td>2</td>
<td>1.53</td>
</tr>
<tr>
<td>1560B</td>
<td>West Side of Cheat Mtn. – B</td>
<td>Forest Service</td>
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<td>0.50</td>
</tr>
<tr>
<td>1560C</td>
<td>West Side of Cheat Mtn. – C</td>
<td>Forest Service</td>
<td>2</td>
<td>1.41</td>
</tr>
<tr>
<td>1560D</td>
<td>West Side of Cheat Mtn. – D</td>
<td>Forest Service</td>
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<td>0.76</td>
</tr>
<tr>
<td>1560E</td>
<td>West Side of Cheat Mtn. – E</td>
<td>Forest Service</td>
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<td>0.20</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>14.40</strong></td>
</tr>
</tbody>
</table>

Table 38. Current Road Density, as it would remain under the No Action Alternative.

<table>
<thead>
<tr>
<th>Management Prescription</th>
<th>Road Density (mi/sq. mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Prescription 4.1 - Spruce and Spruce-Hardwood Ecosystem Management</td>
<td>0.1</td>
</tr>
<tr>
<td>Management Prescription 6.1 – Wildlife Habitat Emphasis</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Alternative 2 – Proposed Action

Alternative 2 will include road maintenance, road construction, and road decommissioning. The Interdisciplinary Team spatially analyzed routes (system and non-system) to develop the minimum transportation system in the project area. The objective of the analysis was to develop a road system that is safe and responsive to public needs and desires, is affordable and efficiently managed, has minimal negative ecological effects on the land, and are in balance with available funding for needed management actions.

Proposed activities and a summary of activities across the project area are shown in Tables 39 and 40. Road maintenance in these tables represents the road work that will be performed specifically to support the activities in the Proposed Action. It does not include the “usual” road maintenance conducted as part of ongoing road maintenance programs by the Forest, the State of West Virginia, or other entities. The road density by management prescription for this alternative is shown in Table 41.
Table 39. Proposed Road Activity by NFS Road.

<table>
<thead>
<tr>
<th>Road Number</th>
<th>Activity</th>
<th>Length (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>92A</td>
<td>Decommissioning</td>
<td>0.79</td>
</tr>
<tr>
<td>92A</td>
<td>Maintenance</td>
<td>0.64</td>
</tr>
<tr>
<td>765</td>
<td>Maintenance</td>
<td>2.12</td>
</tr>
<tr>
<td>765A</td>
<td>Maintenance</td>
<td>0.41</td>
</tr>
<tr>
<td>1560</td>
<td>Maintenance</td>
<td>3.19</td>
</tr>
<tr>
<td>1560A</td>
<td>Maintenance</td>
<td>0.71</td>
</tr>
<tr>
<td>1560</td>
<td>No activity proposed (remainder)</td>
<td>2.85</td>
</tr>
<tr>
<td>1560A</td>
<td>No activity proposed (remainder)</td>
<td>0.82</td>
</tr>
<tr>
<td>1560B</td>
<td>No activity proposed</td>
<td>0.49</td>
</tr>
<tr>
<td>1560C</td>
<td>No activity proposed</td>
<td>1.41</td>
</tr>
<tr>
<td>1560D</td>
<td>No activity proposed</td>
<td>0.76</td>
</tr>
<tr>
<td>1560E</td>
<td>No activity proposed</td>
<td>0.19</td>
</tr>
<tr>
<td>1560F</td>
<td>Construction</td>
<td>1.04</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>15.42</td>
</tr>
</tbody>
</table>

Decommissioning could include: clearing; excavating; cut and fill; removing existing culverts, dips, or other drainage features; seeding and mulching; ripping the surface; planting; adding or maintaining closure devices; adding or maintaining signs; placing drains back to contour, putting sideslope back to contour; and/or oursloping roadway.

Maintenance may include items such as: mowing; clearing and grubbing; grading; pulling ditches; seeding and mulching; cleaning, adding, and replacing culverts; adding or cleaning dips; adding or replacing signs; adding or maintaining gates or other closure devices; placing aggregate surfacing and or outlet pads; minor excavation; cutting or filling; widening; and realigning sections.

Construction involves building a new road where no road bed currently exists, or bringing an existing non-system road up to standard and adding it to the system. Construction could include items such as: clearing and grubbing; adding culverts and dips; adding gates or other closure devices; adding signs; adding aggregate; seeding and mulching; excavation with cut and fill; and grading and reshaping road prism.

Table 40. Summary of Proposed Road Activities.

<table>
<thead>
<tr>
<th>Type of Work</th>
<th>Length (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>1.04</td>
</tr>
<tr>
<td>Maintenance</td>
<td>7.07</td>
</tr>
<tr>
<td>Decommissioning (System Roads)</td>
<td>0.79</td>
</tr>
<tr>
<td>No activities proposed</td>
<td>6.52</td>
</tr>
<tr>
<td>Total</td>
<td>15.42</td>
</tr>
</tbody>
</table>
Table 41. Proposed Road Density by Management Prescription for Alternative 2: Proposed Action.

<table>
<thead>
<tr>
<th>Management Prescription</th>
<th>Road Density (mi/sq. mi)</th>
<th>Forest Plan Allowable Road Density (mi/sq. mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Prescription 4.1 - Spruce and Spruce-Hardwood Ecosystem Management</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td>Management Prescription 6.1 – Wildlife Habitat Emphasis</td>
<td>2.1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

There are no changes in public motorized access from the existing condition proposed for Alternative 2. For example, if the national forest system road is currently closed, the proposed action would not change the status of the route or include additions to the route. Alternative 2 proposes the decommissioning of 0.79 miles of Forest Road 92A to address resource concerns along the route. The remainder of this route would remain on the National Forest road system. Forest Road 92A is currently closed and would remain closed to public motorized access through the proposed action.

CUMULATIVE EFFECTS

*Alternative 1 – No Action*

No cumulative effects, existing condition would persist.

*Alternative 2 – Proposed Action*

The proposed action will include the construction of 1.04 miles of road. This mileage would be added as National Forest System Roads. The proposed action would also include 7.07 miles of road maintenance to existing system roads, and 0.79 miles of decommissioning of existing system roads in the project area.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Alternative 2 would bring some new and existing road prisms onto the road system. This addition would add approximately 1.04 miles of road onto the existing system with maintenance requirements from ongoing road maintenance programs by the Forest.

CONSISTENCY WITH THE FOREST PLAN

Both alternatives are consistent with the Road Management Forest Plan direction, as well as the road density and open road density desired conditions for Management Prescriptions (Forest Plan, 2006). Several Forest-wide and MP standard and guidelines would be integrated into project implementation, including RF04, RF06, RF08, RF09, RF10, RF11, RF12, RF13, RF14, RF15, and RF20.

CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS, AND EXECUTIVE ORDERS

No conflicts with Laws, Regulations, Handbooks, and Executive Orders.

Forest Service Manual 7700 – Travel Management
Forest Service Handbook 7709.57 – Road Construction Handbook
Recreation

RESOURCE IMPACTS OR ISSUE ADDRESSED
This section describes the effects of the Upper Tygart – Chestnut Ridge No Action and Proposed Action on Recreation, Scenery, Roadless Areas and Wilderness.

SCOPE OF THE ANALYSIS
The scope of this analysis was limited to recreation resources (dispersed camping, fishing, hunting, viewing scenery) within TyChest project area and areas adjacent to or in proximity of the project areas from which lands within the project area may be viewed. The scope of analysis was selected, in part, because the recreation resources and scenic attributes within the TyChest project area are not limited or unique to this area; they are similar to those found in many other areas of the Monongahela National Forest. Secondly, the direct, indirect, and cumulative effects of proposed activities are not expected to extend beyond the Upper Tygart - Chestnut Ridge Project Area.

METHODOLOGY
A review current laws and policies, comments and issues generated during project scoping, guidance in the Monongahela’s Forest Plan, past history of recreational use in this area, site visit to the project area, and professional judgement to was used to generate the effects of the No Action and Proposed Action alternatives contained in this report.

EXISTING CONDITION
Table 42. Existing Recreation Resources within the TyChest project area.

<table>
<thead>
<tr>
<th>Recreation Resource</th>
<th>Status within project area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed Campgrounds</td>
<td>No developed campgrounds are present or planned in the project area.</td>
</tr>
<tr>
<td>Dispersed Camping</td>
<td>Few dispersed (roadside) campsites have been noted adjacent to this project area along FR 92.</td>
</tr>
<tr>
<td>Class Q Roads</td>
<td>There are no Class Q roads located in the project area.</td>
</tr>
<tr>
<td>System Trails</td>
<td>There is one system trail in the project area: Chestnut Ridge Trail (TR 327)</td>
</tr>
<tr>
<td></td>
<td>Traveling from east to west, the Chestnut Ridge Trail enters the project area from FR 92, near its junction with FR 47. The trail cuts down the hill alongside McGee Run. Then it is co-located with FR 1560, north. The trail leaves the road after its junction with FR 1560A and ascends Chestnut Ridge. The trail ends at FR 1560, forming a loop. The total length of this Class 2 trail is 5.5 miles. The WV Division of Natural Resources maintains the Chestnut Ridge Trail by mowing it.</td>
</tr>
<tr>
<td>User-made (non-system) Trails</td>
<td>There are few user-made pedestrian trails noted in the project area. However, there is evidence of ATV use on the Chestnut Ridge Trail and on other roads within the project area.</td>
</tr>
</tbody>
</table>
Recreation Resource | Status within project area
--- | ---
Wild and Scenic Rivers | There are no designated or candidate Wild and Scenic Rivers within or adjacent to the project area.
Wilderness | There are no designated Wildernesses within or adjacent to the project area.
Roadless Area Conservation Rule Areas (RACR) | There are no Inventoried Roadless Areas within or adjacent to the project area.
Recreation Opportunity Spectrum (ROS) | The Monongahela Forest Plan segments the project area into two ROS categories:
| • Roaded Natural (RN): The majority of the project areas has been classified Roaded Natural.
| • Semi-primitive Motorized (SPM): The national forest land on the western edge of the project area has been classified Semi-primitive, Motorized.
Scenic Integrity | According to the Monongahela Forest Plan, two levels of Scenic Integrity exist in the project area:
| • Moderate: the western and southwestern portions of the project area
| • Low: the majority of the project area
Inherent Scenic Attractiveness | According to the Monongahela Forest Plan, the entire project area has a “typical or common” Inherent Scenic Attractiveness.
Scenic Class | According to the Monongahela Forest Plan, all Scenic Classes are represented in the project area.
| • Classes 1-2 (scenery with high public value): the bulk of the project area
| • Classes 3-5 (scenery with moderate public value): the southwestern section of the project area – west of FR 1560 and around Ash Run.
| • Classes 6-7 (scenery with low public value): small areas within the Classes 3-5 area that are not visible from US 250 due to topography

The major recreational uses of the TyChest project area are dispersed recreational activities, such as hunting, fishing, hiking, and wildlife watching.

**DIRECT/INDIRECT ENVIRONMENTAL EFFECTS BY ALTERNATIVE**

*Alternative 1 – No Action*
Under the No Action Alternative, there would be no direct or indirect effects to the recreation resource or scenery within the project area. Dispersed recreation activities would continue and forested stands would continue to grow into older age classes.
Alternative 2 – Proposed Action
There will be no direct or indirect effects of implementing the Upper Tygart - Chestnut Ridge Proposed Action on the following resource areas because these resource areas are not present in the Upper Tygart - Chestnut Ridge project area:

- Developed campgrounds
- Wild and Scenic Rivers
- Wilderness
- Inventoried Roadless Areas
- Class Q roads

Dispersed Camping
Roadside dispersed camping (along FR 92/eastern edge of the project area) and backcountry camping would continue. Recreationists may hear noise from logging operations during active logging operations.

System Trails
The Chestnut Ridge Trail (TR 327) would likely be used as a skid trail. In that case, the following Forest Plan standards would apply:

- RC28 “Damage to or loss of system trails from timber harvest, road construction, mining, special uses, or prescribed fire activities shall be repaired or mitigated by the program initiating or proposing the activity.” (p. II-34)
- RC29 “If a trail is temporarily used as a road, relocate the trail for the duration of the project.” (p. II-34)

The Chestnut Ridge Trail is not heavily used. During project implementation, the Timber Sale Administrator should monitor the number individuals/groups using the Chestnut Ridge Trail. If s/he becomes concerned about the safety of trail users while active timber operations are occurring, then the trail must be relocated, per RC29.

User-made (non-system) Trails
Anglers and hikers using non-system trails may notice increased noise with logging operations.

ROS
All of the activities in the Proposed Action occur in the Roaded Natural or Semi-primitive Motorized areas of the project area. Seeing or hearing management activities, such as those in the Proposed Action, are consistent with RN or SPM classifications.

Scenery
Nearly all of the activities in the Proposed Action occur in the Low Existing Scenic Integrity class. Landscapes in the Low Existing Scenic Integrity class appear moderately altered.
Activities in the extreme western and southwestern portions of the project area occur in the Moderate Existing Scenic Integrity class. Landscapes in the Moderate Existing Scenic Integrity class appear slightly altered.

While it would be consistent with either of these classes to see a landscape altered by logging and the other actions described in the Proposed Action, whenever possible, the form, line, color, texture, pattern and scale common to the unaltered landscape should be repeated to help blend the human activities into the landscape. For example, do not use straight lines as the edges of the Early Successional Habitat cutting units. Blend the cutting units into the landscape by following topography, streams, and other natural patterns.

During leaf-off, the results of the Proposed Action would be more visible when not already blocked by topographic features. With leaf-on (the majority of the recreation season), existing trees along FR 92 would hide these effects.

**CUMULATIVE EFFECTS**

*Alternative 1 – No Action*

Because there were no direct or indirect effects under the No Action Alternative, there will be no cumulative effects to the recreation resource or scenery within the project area.

*Alternative 2 – Proposed Action*

This cumulative effect of the proposed actions combined with the past, present, and reasonably-foreseeable actions, will not affect the existing use of the TyChest project area by recreationists. The landscape is already altered by human use.

**IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES**

There are no irreversible or irretrievable commitments of resources in the No Action or Proposed Actions Alternatives because no permanent changes to the environment are proposed.

**CONSISTENCY WITH THE FOREST PLAN**

The following sections of the Monongahela National Forest Land and Resource Management Plan (September 2006, revised 2011) and used their guidance while writing this report:

- Forest-wide Management Direction for Recreation Resources
- Forest-wide Management Direction for Scenery Management
- Management Prescription 6.1
- Appendix C – Roadless Area Inventory and Wilderness Evaluation

After review and analysis, both alternatives are consistent with the Forest Plan.
CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS, AND EXECUTIVE ORDERS
The following sections of the Forest Service Manual (FSM) and used their guidance while writing this report:

- FSM 2300 – Zero Code
- FSM 2310 – Planning
- FSM 2380 – Landscape Management

The following Handbooks and used their guidance while writing this report:

- ROS Users Guide

After review and analysis, both alternatives are consistent with this direction.
Economic Analysis
This report addresses the economic impacts of the Upper Tygart-Chestnut Ridge project.

SCOPE OF ANALYSIS
Randolph County is the area that would be most directly impacted by the effects of the project. Surrounding counties could also be impacted since sawtimber products may be transported to mills in Pendleton, Grant, Pocahontas, and Webster counties. Also labor for this project may come from people living in surrounding counties.

METHODOLOGY
The economic analysis was done by obtaining cost and prices from various sources. Quarterly stumpage reports from the Appalachian Hardwood Center were used to determine average stumpage prices (Table 43). It was assumed that a total of 15,000 board feet per acre (bf/ac) would be removed in the clearcut with reserve units. It was assumed that 3,500 board feet per acre would be removed from the thinning units. From this information the amount of revenue generated from the various cutting methods was determined (Table 44). Herbicide and fencing cost information were determined from previous contracts on the MNF. Cost figures for the Monongahela National Forest developed from previous timber sales were used for this project when available (Table 45). The economic software QuickSilver (version 7.0) was used for analysis of the cost and benefits. Short-term economic projections were made for a ten year period and long-term projections were made to the end of the next timber rotation (80 years) for the TyChest project.

Table 43. Stumpage prices used for this analysis of the TyChest project.

<table>
<thead>
<tr>
<th>Species</th>
<th>Value (per mbf*)</th>
<th>Percent of total Volume per acre</th>
<th>Per acre Value ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Oak</td>
<td>$286</td>
<td>30</td>
<td>$1287</td>
</tr>
<tr>
<td>Black cherry</td>
<td>$490</td>
<td>10</td>
<td>$735</td>
</tr>
<tr>
<td>Chestnut Oak/White Oak</td>
<td>$314</td>
<td>10</td>
<td>$471</td>
</tr>
<tr>
<td>Red Maple</td>
<td>$272</td>
<td>15</td>
<td>$612</td>
</tr>
<tr>
<td>Sugar Maple</td>
<td>$380</td>
<td>15</td>
<td>$855</td>
</tr>
<tr>
<td>Mixed Hardwoods</td>
<td>$100</td>
<td>20</td>
<td>$300</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td>$4,260</td>
</tr>
</tbody>
</table>

*mbf=1,000 board feet

Table 44. Summary of revenue generated per acre.

<table>
<thead>
<tr>
<th>Item</th>
<th>Per Acre Revenue ($/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearcut with reserves</td>
<td>4,260</td>
</tr>
<tr>
<td>Thinning</td>
<td>994</td>
</tr>
<tr>
<td>Daylighting</td>
<td>4,260</td>
</tr>
</tbody>
</table>
Table 45. Cost of activities associated with the proposed action of the TyChest project.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>conventional</td>
<td></td>
</tr>
<tr>
<td>Road/Maintenance</td>
<td>$22,500/mile</td>
</tr>
<tr>
<td>Road/Construction/Reconstruction</td>
<td>$100,000/mile</td>
</tr>
<tr>
<td>Road/Decommission</td>
<td>$26,000/mile</td>
</tr>
<tr>
<td>Herbicide/Site Preparation</td>
<td>$125/acre</td>
</tr>
<tr>
<td>Sale Administration</td>
<td>$170/acre</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>$100/acre</td>
</tr>
<tr>
<td>Timber Stand Improvement</td>
<td>$100/acre</td>
</tr>
<tr>
<td>Sale Preparation/regeneration</td>
<td>$155/acre</td>
</tr>
<tr>
<td>Contract Preparation</td>
<td>$25/acre</td>
</tr>
<tr>
<td>Stocking Surveys</td>
<td>$15/acre</td>
</tr>
<tr>
<td>Woody Debris Placement</td>
<td>$13,000/mile</td>
</tr>
<tr>
<td>Liming</td>
<td>$2,000/acre</td>
</tr>
<tr>
<td>Orchard Restoration</td>
<td>$2,500/acre</td>
</tr>
<tr>
<td>Waterhole construction</td>
<td>$2,000/waterhole</td>
</tr>
<tr>
<td>Wildlife opening construction</td>
<td>$5,000/acre</td>
</tr>
<tr>
<td>Sale Preparation-regeneration</td>
<td>$155/acre</td>
</tr>
<tr>
<td>Sale Preparation-thinning</td>
<td>$180/acre</td>
</tr>
<tr>
<td>Stand Certification-5th year</td>
<td>$5/acre</td>
</tr>
<tr>
<td>Deer Caging/Repellant</td>
<td>$550/acre</td>
</tr>
</tbody>
</table>

Table 46. Alternative Comparison of timber sale costs and revenues.

<table>
<thead>
<tr>
<th>Item</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>0</td>
<td>145,800</td>
</tr>
<tr>
<td>Construction &amp; Reconstruction</td>
<td>0</td>
<td>150,000</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$295,800</td>
</tr>
<tr>
<td>Timber Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract Preparation</td>
<td>0</td>
<td>16,575</td>
</tr>
<tr>
<td>Sale Administration</td>
<td>0</td>
<td>112,710</td>
</tr>
<tr>
<td>Sale Preparation</td>
<td>0</td>
<td>110,140</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$239,425</td>
</tr>
<tr>
<td>Reforestation Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Harvest Herbicide site Preparation</td>
<td>0</td>
<td>77,000</td>
</tr>
<tr>
<td>Mechanical site Preparation</td>
<td>0</td>
<td>36,800</td>
</tr>
<tr>
<td>Post-Harvest Herbicide site Preparation</td>
<td>0</td>
<td>41,250</td>
</tr>
<tr>
<td>Stocking Surveys</td>
<td>0</td>
<td>11,040</td>
</tr>
<tr>
<td>Certification</td>
<td>0</td>
<td>1,840</td>
</tr>
<tr>
<td>Deer Caging/Repellant</td>
<td>0</td>
<td>165,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$332,930</td>
</tr>
<tr>
<td><strong>Non-Commercial Treatment Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timber Stand Improvement</td>
<td>0</td>
<td>$5,100</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$5,100</td>
</tr>
<tr>
<td><strong>Watershed Project Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Decommissioning</td>
<td>0</td>
<td>$40,040</td>
</tr>
<tr>
<td>Woody Debris Placement</td>
<td>0</td>
<td>$6,500</td>
</tr>
<tr>
<td>Liming</td>
<td>0</td>
<td>$546,000</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$592,540</td>
</tr>
<tr>
<td><strong>Wildlife Project Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orchard restoration openings</td>
<td>0</td>
<td>$165,000</td>
</tr>
<tr>
<td>Waterholes</td>
<td>0</td>
<td>$136,000</td>
</tr>
<tr>
<td>Cutback borders</td>
<td>0</td>
<td>$375,000</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>$676,000</td>
</tr>
<tr>
<td><strong>Grand Total Cost</strong></td>
<td>0</td>
<td>$2,141,795</td>
</tr>
<tr>
<td><strong>Stumpage Value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearcut with reserves</td>
<td>0</td>
<td>$1,405,800</td>
</tr>
<tr>
<td>Thinning</td>
<td>0</td>
<td>$293,230</td>
</tr>
<tr>
<td>Daylighting</td>
<td>0</td>
<td>$161,880</td>
</tr>
<tr>
<td>Grand Total Revenue</td>
<td>0</td>
<td>$1,860,910</td>
</tr>
</tbody>
</table>

**DIRECT AND INDIRECT EFFECTS**

**Alternative 1 – No Action**
There are no incremental revenues or benefits associated with the No Action alternative. This alternative would not produce any revenues for the US Treasury from timber harvest activities. People from local communities would not be employed for logging activities, reforestation, timber stand improvement, wildlife habitat enhancement, watershed improvement projects.

**Alternative 2 – Proposed Action**
The proposed action would generate revenues associated with the sale of timber. Under the proposed action the local economy would benefit from the sale of timber. The total revenues for the proposed action are about $1.86 million, with the 84% of the revenue being generated from regeneration harvests (Table 46). The proposed action would cost $2.14 million dollars over a 10-12 year period, with wildlife work being the largest cost accounting for 32% of total costs (Figure 7).
The action alternative also has road improvement, reforestation activities, non-commercial treatments, aquatic improvement, and wildlife improvement work that would provide jobs to private companies in the area. These factors make the economic analysis show a deficit for Alternative 2.

Figure 7. Costs associated with activities of the proposed action.

CUMULATIVE EFFECTS

Alternative 1 – No Action
The No Action alternative would not have a long-term adverse effect on the local economy, since so little timber is harvested on the MNF most wood products industries obtain timber from private land. It would have the long-term impact of on the current value of the timber on National Forest lands in the project area. As the stands age the higher value timber will begin to die out and be replaced with lower value timber. This is not only a problem in this project area but across the entire MNF. Forest inventory data for the MNF indicates that the annual mortality averages 0.9% of the inventory volume (Widmann and Griffith 2004). The No Action alternative would add to this problem and would have an adverse cumulative impact on the timber value of the National Forest lands. For example, if none of the units in the proposed action were harvested, approximately 77,085 board feet, or $21,868, would be lost to mortality per year.

Alternative 2 – Proposed Action
There would be only negligible cumulative economic impacts as a result of the Proposed Action. The MNF does not produce enough timber to have a large long-term influence on the local and statewide economy. Timber harvesting on private lands has a much greater impact on the local and state economies.
IRREVERSIBLE OR IRREVERSIBLE COMMITMENT OF RESOURCES
Since the stands harvested would be replaced with stands having similar future value no irreversible or irretrievable commitment of economic resources would occur from this project.

CONSISTENCY WITH FOREST PLAN

Alternative 1 – No Action
There are no Forest Plan standards and guidelines concerning economics. However, Alternative 2 would be consistent with the Forest Integrated Desired Conditions on page II-7: “Forest ecosystems provide a variety of sustainable products and services for current and future generations. Timber, range, wildlife, water, recreation, minerals, and special use programs offer opportunities for economic development, and contribute to local community needs, while maintaining ecological integrity.” Alternative 1 would not offer any specific opportunities for economic development.

Alternative 2 – Proposed Action
The Proposed Action are consistent with the Forest Plan prescription by contribute to the local and regional economies (Forest Plan II-40).

CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS, AND EXECUTIVE ORDERS
All the alternatives are consistent with the following laws and regulations:

- National Forest Management Act of 1976
- Multiple Use Sustained Yield Act of 1960
- Forest Service Handbook 1909.17 Chapters 10, 20, and 30
CHAPTER 4 – PREPARERS AND REFERENCES

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The Monongahela National Forest has worked cooperatively with the following agencies and organizations in developing this project proposal:

Northern Research Station (NRS)
West Virginia Division of Natural Resources (WVDNR)
U.S. Fish and Wildlife Service (USFWS)
West Virginia Division of Forestry
Ruffed Grouse Society
National Wild Turkey Federation
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Tygart-Chestnut Ridge (TyChest)


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APPENDIX A: PROPOSED ACTION MAPS

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Figure A - 2. Proposed Action: Commercial and Non-Commercial Early Successional Habitat Management. .......................................................................................................................... 148
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Figure A - 4. Proposed Action: Terrestrial and Aquatic Wildlife Habitat Improvements.
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APPENDIX B: APPLICABLE FOREST PLAN STANDARDS AND GUIDELINES & RECOMMENDED DESIGN FEATURES
### Forest Plan Standard & Guidelines and Recommended Design Features

#### Vegetation

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Description</th>
<th>Forest Plan Location</th>
<th>Where Applicable</th>
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</thead>
<tbody>
<tr>
<td>VE13</td>
<td>For management actions that have been identified by the Forest as likely to cause a negative effect on RFSS populations, negative effects shall be avoided or minimized to the maximum extent practical while still accomplishing the purpose of the project or action. Unavoidable negative effects shall be mitigated to the extent practical and consistent with the project purpose.</td>
<td>Chapt II, pg 19</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>VE13a</td>
<td>RFSS Butternut: Avoid damaging butternut through road maintenance, hauling, and skidding. Avoid herbicide contact with butternut trees. When using broad-spectrum or dicot-specific herbicides within 150 feet of butternut trees, use only precisely targeted spot applications. If widespread spraying for Japanese stiltgrass control must occur within this buffer, use a monocot-specific herbicide. Soil-mobile herbicides (including but not limited to imazapyr) may not be used within 150 feet of butternut trees. Avoid cutting and applying herbicide to butternuts in harvest units, savannas/wildlife openings, and TSI units. Due to similarity of appearance to butternut, species identification of black walnuts to be cut or treated with herbicide must be confirmed by checking nut shape and/or pith color.</td>
<td>Project specific for VE13</td>
<td>Known Locations: One in the aquatic/terrestrial wildlife enhancement stand at the north end of Shaver’s Run approximately 180 feet west of the stream edge. One on the north side of the far western tip at the southern end of ESH15. One on the southeast edge of RBC8 where it touches a tip of ESH7.</td>
</tr>
<tr>
<td>VE13b</td>
<td>Do not cut pole size or larger trees within 30 feet of Roan Mountain sedge, or as marked. Within 30 feet of Roan Mountain sedge or as marked (exact buffer TBD in field), avoid all new soil disturbance, including, but not limited to, road construction/reconstruction, skid trails, overland skidding, landing construction, or other disturbance associated with RBC management. Avoid foliar herbicide application within 150 feet of Roan Mountain sedge unless necessary to control NNIS that directly threaten this species or running buffalo clover. Any such application must not expose Roan Mountain sedge or running buffalo clover to herbicide. Cut surface and basal bark application of herbicide for the control of saplings, underbrush, or NNIS is allowed near Roan Mountain sedge; however, any such application must not expose Roan Mountain sedge to herbicide. Monitoring will consist of annual visits to RMS populations in RBC4 and RBC7 to assess population size of each patch the year before treatment, and for 3 years post-treatment. If no changes are detected or the population is growing, design features will be assumed to be effective. If populations show decline after treatment activities, design features will be re-assessed and mitigation measures considered.</td>
<td>Known Locations: Multiple locations in the western prong and along the northwestern border, and one on the eastern border, of ESH15. Multiple locations along the southern border of ESH14. Multiple locations throughout ESH12. One occurrence in RBC8 just east of ESH10. One occurrence in the eastern portion of RBC7. Several occurrences in RBC4. Multiple occurrences throughout ESH6. Two occurrences in ESH2. One occurrence in Commercial Daylighting DL2.</td>
<td>Project specific for VE13</td>
</tr>
<tr>
<td>VE21</td>
<td>On-Forest source sites for gravel and borrow materials shall be inspected for NNIS before materials are processed, used, or transported from the source site to the project area. Gravel or borrow material source sites with NNIS present shall not be used, unless effective treatment or other mitigation measures are implemented to prevent the spread of NNIS.</td>
<td>Chapt II, pg 19-20</td>
<td>Timber activities, road construction/maintenance</td>
</tr>
<tr>
<td>VE22</td>
<td>Projects that may contribute to the spread or establishment of noxious weeds shall be designed to include measures to reduce the potential for spread and establishment of noxious weed infestations.</td>
<td>Chapt II, pg 19-20</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>VE22a</td>
<td>Before entering National Forest land, all logging equipment, construction equipment, maintenance equipment, decommissioning equipment, and any vehicles to be used off of currently maintained roads must be free of all soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Equipment and vehicles that are used on infested sites must be cleaned to the above standard before being moved to other harvest units, landings, or road segments on National Forest land.</td>
<td>Project specific for VE22</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>VE22b</td>
<td>When equipment used for constructing, reconstructing, maintaining, or decommissioning roads is operated in a known infestation of high priority NNIS, it should be cleaned as thoroughly as is practical using dry methods prior to continuing along the route.</td>
<td>Project specific for VE22</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>VE22c</td>
<td>Any necessary wet cleaning of equipment and vehicles used by contractors and timber purchasers should be conducted off of National Forest land, or at a Forest Service-approved wash station if cleaning on National Forest land is the only practical option. Any necessary wet cleaning of Forest Service equipment and vehicles should be conducted at an administrative site or other designated wash station. Cleaning must not introduce invasive plants to non-impacted sites and must not contaminate soil or water.</td>
<td>Project specific for VE22</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>VE23</td>
<td>All seed used on National Forest System lands should free of seeds from noxious weeds. Ideally, all seed mixtures used for soil stabilization, wildlife openings, etc. should be certified weed-free. In the case that certified seed is not available, the seed vendor’s test results for noxious weed content should accompany the seed shipment and should demonstrate that the seed is substantially free from noxious weed seeds.</td>
<td>Chapt II, pg 19-20</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>VE24</td>
<td>NNIS management should determine the presence, location, and amount of infestation. Management strategies should also identify: a) Methods and frequency for treating infestations, b) Treatment procedures and restrictions, c) Reporting requirements, and d) Follow-up or monitoring requirements.</td>
<td>Chapt II, pg 19-20</td>
<td>Project-wide activities, monitoring and identification of newly discovered NNIS populations. Tier to protocols established in Forest-wide NNIS Treatment EA.</td>
</tr>
</tbody>
</table>
As activities are implemented, newly discovered NNIS populations will be inventoried. Several locations have been analyzed and will receive treatment as described in the Forest-wide NNIS Treatment EA. These additional sites will be incorporated into Forest-wide NNIS Treatment EA and subsequently treated and monitored according to the protocols required in this management document.

<table>
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<tbody>
<tr>
<td>VE24a</td>
<td></td>
<td>Project specific for VE24</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>VE32</td>
<td>Unless specifically registered for aquatic use, ground application of pesticides shall be conducted such that they do not enter surface waters, wetlands, or sink holes.</td>
<td>Chapt II, pg 20</td>
<td>Activities specific to herbicide application for undesirable vegetation control</td>
</tr>
<tr>
<td>VE34</td>
<td>When a water carrier is used on pesticide projects and water is drawn from natural sources, the natural source must be protected from back siphoning.</td>
<td>Chapt II, pg 20</td>
<td>Activities specific to herbicide application for undesirable vegetation control</td>
</tr>
<tr>
<td>VE38</td>
<td>Use application techniques that provide proper pesticide placement on the target area or species. Low pressure spray equipment is preferred.</td>
<td>Chapt II, pg 20</td>
<td>Activities specific to herbicide application for undesirable vegetation control</td>
</tr>
</tbody>
</table>

**Threatened and Endangered Species**

<table>
<thead>
<tr>
<th>Reference No.</th>
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</thead>
<tbody>
<tr>
<td>TE71</td>
<td>To the extent practicable, avoid implementing activities in areas that support running buffalo clover that have the potential to eliminate or have long-term detrimental effects to populations, such as placement of fill and gravel; paving; constructing new roads, well sites, or ditching for pipelines.</td>
<td>Chapt II, pg 27-28</td>
<td>All activities within the RBC units. Complete avoidance will not achieve project objectives; focused, strategic disturbance has been shown as an effective in aiding RBC population growth. See TE71a and TE73.</td>
</tr>
</tbody>
</table>
| TE71a | Pre- and post-project monitoring will be conducted by Forest Ecologist and trained Botanist to ensure that project activities are achieving the objectives of disturbing the existing populations and preparing these areas to aid in the reproduction of RBC.

Monitoring will take place annually in the RBC management units. A baseline assessment will be conducted the year before each treatment, and for 3 years subsequently. If the population is growing, design features will be assumed to be effective.

Short-term decline of patches in treatment areas is expected due to surface disturbing activities. If populations show no change or persistent decline several years after treatment activities, design features will be re-assessed and mitigation measures considered. |
| Specific to TE71 | All activities within the RBC units |

| TE73 | Where needed to help maintain or restore running buffalo populations, the Forest should implement habitat management measures such as creating selective canopy openings, initiating controlled levels of disturbance, controlling invasive species, or creating patches of potentially suitable habitat in adjacent areas. Measures should be coordinated with the USFWS and WVDNR prior to implementation, and include pre and post implementation site evaluations. |
| Chapt II, pg 27-28 | All activities within the RBC units |

| TE75 | Surveys for running buffalo clover should be conducted June through no later than mid-August. Surveys should be conducted by personnel trained specifically to identify running buffalo clover. |
| Chapt II, pg 27-28 | All activities within the RBC units |
| TE76   | Prior to initiating project activities, running buffalo clover locations should be flagged so that managers, contractors, permittees, or cooperators are aware of running buffalo clover locations, unless it is determined on a case-by-case basis that marking populations would have more potential to cause negative effects. | Chapt II, pg 27-28 | All activities within the RBC units. Project is designed to benefit RBC. Complete avoidance will not achieve project objectives; focused strategic disturbance has been shown as an effective in aiding RBC population growth. See TE71a and TE73. |
| TE77   | Prior to initiating project activities, managers, contractors, permittees, or cooperators should be informed about avoiding or limiting management activities in the immediate vicinity of running buffalo clover populations within the project area. Projects should be monitored to ensure that populations are not detrimentally affected over the long term. | Chapt II, pg 27-28 | All activities within the RBC units |
| TE78   | Maintenance mowing should be timed to benefit the species by reducing competition from other plants while avoiding periods of flowering and seed set. | Chapt II, pg 27-28 | All activities within the RBC units |
| TE80   | Piling slash around running buffalo clover populations should be avoided. | Chapt II, pg 27-28 | All activities within the RBC units |
Where possible, roads supporting running buffalo clover that are created or disturbed during timbering operations should be closed to additional traffic after the project is completed. Seeding/mulching plans should be coordinated to avoid the use of potentially invasive species, particularly non-native invasive species known to compete with running buffalo clover such as European white clover and red clover.

Where RBC units. Due to the risk of spreading NNIS, seeding and mulching should only occur as necessary to mitigate soil loss in high risk areas (slopes greater than 40%).

### Soil and Water Resources

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<tbody>
<tr>
<td>SW03</td>
<td>Disturbed soils dedicated to growing vegetation shall be rehabilitated by fertilizing, liming, seeding, mulching, or constructing structural measures as soon as possible, but generally within 2 weeks after project completion, or prior to periods of inactivity, or as specified in contracts. Rip compacted sites when needed for vegetative re-establishment and recovery of soil productivity and hydrologic function. The intent is to minimize the time that soil is exposed on disturbed sites or retained in an impaired condition.</td>
<td>Chapt II, pg 27-28</td>
<td>Project-wide activities, except seeding and mulching in RBC units, as described in TE81.</td>
</tr>
<tr>
<td>SW03a</td>
<td>Seeding of disturbed soils where erosion is a concern, such as next to moving water, culverts, and other areas where this is a link to a stream channel or ditch line. Armoring of culvert outlets should be done in order to prevent head cutting.</td>
<td>Project specific for SW03</td>
<td>As applicable, project-wide activities, except seeding in RBC units, as described in TE81.</td>
</tr>
<tr>
<td>SW04</td>
<td>Erosion prevention and control measures shall be used in program and project plans for activities that may reduce soil productivity or cause erosion.</td>
<td>Chapt II, pg 10-14</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td></td>
<td>SW05</td>
<td>Chapt II, pg 10-14</td>
<td>Project-wide activities</td>
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<td>Maintain at least 85 percent of a vegetation management activity area in a non-detrimentally disturbed condition. Existing system roads and trails, and other administrative facilities within the activity area, are not considered detrimentally disturbed conditions when assessing compliance with this standard.</td>
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<tr>
<td>SW05a</td>
<td>To reduce the risk of soil degradation, operations to improve terrestrial and aquatic habitat should take place during drier soil conditions (saturated soils are more prone to rutting, compaction and erosion). Any efforts to reduce the use of heavy equipment will also decrease the risk of compaction and erosion.</td>
<td>Project specific for SW05</td>
<td>Terrestrial and aquatic wildlife habitat improvement unit.</td>
</tr>
<tr>
<td>SW05b</td>
<td>As much as possible, the shredder/mulcher should be used on existing skid roads and on gentle slopes (&lt;15%). Cease use during wetter times of the year and aim to work during dry periods. Return shredded organic matter to the soil surface. Seeding and mulching can help to mitigate any excessive soil disturbance.</td>
<td>Project specific for SW05</td>
<td>Tracked mulcher equipment user within young forest stands treatment units and other management</td>
</tr>
<tr>
<td></td>
<td>SW06</td>
<td>Chapt II, pg 10-14</td>
<td>Project-wide activities</td>
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<tr>
<td></td>
<td>Severe rutting resulting from management activities shall be confined to less than 5 percent of an activity area.</td>
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</tbody>
</table>
| SW07 | Use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site area conditions:  
| a) Steep Slopes (40 to 50 percent) – Operation on these slopes shall be analyzed on a case-by-case basis to determine the best method of operation while maintaining soil stability and productivity.  
| b) Very Steep Slopes (more than 50 percent) – Use is prohibited without recommendations from interdisciplinary team review and line officer approval.  
| c) Susceptible to Landslides – Use on slopes greater than 15 percent with soils susceptible to downslope movement when loaded, excavated, or wet is allowed only with mitigation measures during periods of freeze-thaw and for one to multiple days following significant rainfall events. If the risk of landslides during these periods cannot be mitigated, then use is prohibited.  
| d) Soils Commonly Wet At Or Near The Surface During A Considerable Part Of The Year, Or Soils Highly Susceptible To Compaction. Equipment use shall normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur. | Chapt II, pg 10-14 | Project-wide activities |
| SW07a | No mechanized operations would occur on slopes 40 percent or greater. Mechanized equipment would be limited on slopes 30-40 percent to areas where soils are wet or are prone to slipping due to their parent material such as the Mauch Chunk geologic formation and corresponding soils (Shouns and Cateache). Other methods would be used to implement the treatment needed on these slopes, such as using cable to pull timber upslope across sensitive slope positions to stable skid roads. | Project specific for SW07 | Project-wide activities using mechanized equipment (harvesting activities, including skid trail construction, etc.) |
| SW11 | Soil stabilization procedures should take place as soon as practical after earth-disturbing activities are completed or prior to extended periods of inactivity. Special revegetation measures may be required. | Chapt II, pg 10-14 | Project-wide activities |
| SW13 | Consider liming soils with a surface pH of less than 5.5 on seeding projects, except where there is an objective to maintain acidic ecosystems. | Chapt II, pg 10-14 | Wildlife openings, landings, other areas of soil disturbance |
| SW13a | Terrestrial liming on soils sensitive to acid deposition or within project activity units to ensure revegetation and promote desirable plant growth. Liming would occur on base poor soils to ensure soil quality is maintained after ESH treatments are implemented. Any efforts to seed wildlife openings or legacy orchards would benefit from pre-seeding lime application in order to raise the pH of these soil to provide a more suitable environment for grass species. Lime would be applied at a rate of 3-5 tons per acre. Soil testing should occur prior to application to ensure appropriate amounts are added to the soil. | Project specific for SW13 | As indicated on map, Figure A-5, within ESH units and wildlife openings. |
| SW14 | Mulch should be applied on severely eroded areas, or areas with high potential for erosion, such as new road cut and fill slopes. | Chapt II, pg 10-14 | Project-wide activities |
| SW19 | Management activities that may result in accelerated erosion and loss of organic matter should have one or more of the following practices applied to mitigate potential effects:
  a) Limiting mineral soil exposure,
  b) Appropriately dispersing excess water,
  c) Ensuring sufficient effective groundcover,
  d) Stabilizing disturbed soils through revegetation, mulching, or other appropriate means,
  e) Preventing or minimizing excessive compaction, displacement, puddling, erosion, or burning of soils, and
  f) Preventing or minimizing the initiation or acceleration of mass soil movement (e.g., slumps, debris flows, or landslides). | Chapt II, pg 10-14 | Project-wide activities |
| SW23 | Logging and construction equipment shall not be washed in stream courses, nor shall material from washed equipment be allowed to drain into surface waters. | Chapt II, pg 10-14 | Project-wide activities |
| SW26 | Management activities should maintain stream flow regimes to provide for channel stability and stream functions that support healthy riparian habitat, aquatic habitat, and downstream uses. | Chapt II, pg 10-14 | Project-wide activities |
| SW34 | No programmed timber harvest shall occur within the channel buffers identified in the table in SW37. Tree removal from the buffers may only take place if needed to meet aquatic or riparian resource management needs, or to:  
  a) Provide habitat improvements for aquatic or riparian species, or threatened, endangered, sensitive, and locally rare species;  
  b) Provide for public or worker safety;  
  c) Construct or renovate an approved facility;  
  d) Construct temporary road, skid road, or utility corridor crossings;  
  e) Conduct aquatic or riparian-related research, or  
  f) Allow for cable yarding. | Chapt II, pg 10-14 | Project-wide activities |
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<tbody>
<tr>
<td>SW35</td>
<td>Where new roads and skid roads cross stream channels, channel and bank stability shall be maintained.</td>
<td>Chapt II, pg 10-14</td>
<td>Road construction to access Chestnut Ridge and skid road construction associated with harvest, as applicable.</td>
</tr>
<tr>
<td>SW36</td>
<td>When stream crossing structures are removed, stream channels shall be restored to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces). Disturbed soil shall be stabilized.</td>
<td>Chapt II, pg 10-14</td>
<td>Road decommissioning activities</td>
</tr>
</tbody>
</table>
| SW37 | During project-level planning and implementation, determine channel buffers for streams that would potentially be affected by proposed activities. The following table represents default buffer widths to be applied to both sides of the channel.  
Stream Classification (Buffer Width)  
Perennial (100 feet)  
Large Intermittent (>50-acre drainage area) (100 feet)  
Small Intermittent (<50-acre drainage area) (50 feet)  
Ephemeral (25 feet)  
Buffer widths may be adjusted based on interdisciplinary review and site-specific field investigation. The buffers shall, at a minimum, encompass the riparian area defined on the basis of soils, vegetation and hydrology and the ecological functions and values associated with the riparian area. | Chapt II, pg 10-14 | Project-wide activities, as applicable. |
| SW40 | Skid trails and landings shall not be constructed within 100 feet of perennial, intermittent, and ephemeral channels except at crossings or when location outside the 100-foot zone pose a greater risk to aquatic or riparian resources. The 100-foot filter strip may be modified based on site-specific conditions such as soil type, slope, and stability. | Chapt II, pg 10-14 | Activities associated with commercial harvesting, thinning, and daylighting, as applicable |
| SW44 | New roads are allowed within channel buffers but are restricted to essential crossings. Construction of roads parallel to the channel shall be avoided within the channel buffer. | Chapt II, pg 10-14 | As necessary for construction of access road to Chestnut Ridge area |
| SW50 | Maintained wildlife openings and associated access routes identified as degrading riparian or aquatic conditions should be mitigated or closed and restored. New wildlife openings within channel buffers may occur where needed to provide habitat for riparian species, or TEP, RFSS, or locally rare species, and where maintenance for these openings and their access routes can be achieved without degrading riparian or aquatic conditions. | Chapt II, pg 10-14 | Linear Wildlife openings, Orchard Restoration and Terrestrial/Aquatic Wildlife Opening activities |
| SW50a | To ensure that linear wildlife openings (existing access and existing/new skids roads to be used after harvest activity) are sustainable and reduce potential impacts to soil and aquatic resources, the following design features should be incorporated into their management: Maintaining wildlife openings when soils are dry and not prone to rutting, exposing surface to direct sunlight by maintaining a canopy opening along the corridor, establish a dense and hardy vegetation ground cover, and limited and dispersed tractor usage, ensure that they are outsloped sufficiently to restore natural drainage and flow patterns. Monitor regularly detect any rutting, erosional, or other problems that may arise, correct any problems that arise in a timely manner, and if the problems cannot be corrected, discontinue use as a linear wildlife opening. | Project specific for SW50 | Linear wildlife openings |
Ground disturbance should be avoided within seeps, vernal pools, bogs, fens, and other wetlands during project implementation. These areas should be managed to protect wet soils and rare plants and provide wildlife watering sources using the following protection:

a) No new system roads or skid roads should be located within these areas except at essential crossings. Such crossings should be designed to minimize disturbance to the extent practical.

b) Logs should not be skidded through these areas. Keep slash and logs out of them.

c) Where available, a canopy of 60-100 percent crown closure should be maintained within and adjacent to these areas, unless a more open canopy is needed for TEP species or RFSS management.

d) Mast trees or shrubs may be planted in seeps if mast plants are currently lacking.

All ground-disturbing activities, including road construction to access Chestnut Ridge and skid road construction associated with harvest, as applicable.

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<tbody>
<tr>
<td>RF04</td>
<td>Roads shall be constructed to the standard appropriate to their intended use, considering safety and other resource concerns.</td>
<td>Chapt II, pg 55-56</td>
<td>New Construction to access Chestnut Ridge</td>
</tr>
<tr>
<td>RF06</td>
<td>New road construction shall avoid wetlands where feasible. If a wetland cannot be avoided, road construction may be allowed as long as the subsurface drainage patterns can be preserved and maintained. Any road that would cross a wetland shall cross in a way that minimizes disturbance to the wetland.</td>
<td>Chapt II, pg 55-56</td>
<td>New Construction to access Chestnut Ridge</td>
</tr>
<tr>
<td>RF08</td>
<td>In support of road management decisions, use an interdisciplinary science-based roads analysis process such as Roads Analysis: Informing Decisions About Managing the National Forest Transportation System (USDA FS, 1999 Report FS-643).</td>
<td>Chapt II, pg 55-56</td>
<td>Project-wide in determining where and to what level decommissioning will occur.</td>
</tr>
<tr>
<td>RF09</td>
<td>Evaluate existing routes during transportation planning to determine whether they should be retained, reconstructed, replaced, or decommissioned. Evaluate transportation needs based on existing uses and condition, the access needs of cooperators, permittees, and private landowners, environmental and economic impacts, and compatibility with management prescriptions. Coordinate evaluation with information in the Roads Analysis Report for the Monongahela National Forest (January 2003) or updated versions.</td>
<td>Chapt II, pg 55-56</td>
<td>Upper portion of NFS Road 92A.</td>
</tr>
<tr>
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</tr>
</tbody>
</table>
| RF10 | During watershed or project-level analysis, opportunities for road decommissioning should be identified and prioritized based on:  
  a) Hazard assessments in the Roads Analysis Report for the Monongahela National Forest (January 2003) or updated versions  
  b) Identified needs in drainages with 303(d) impaired water bodies  
  c) The access needs of cooperators, permittees, and private landowners  
  d) Prescription units that exceed road density standards for the management prescription  
  e) Other site-specific concerns identified in the watershed or project analyses. | Chapt II, pg 55-56 | Project-wide in determining where and to what level decommissioning will occur. |
| RF11 | The process to determine road maintenance levels should evaluate the purpose of the road, the type of vehicles expected, the duration and frequency of use, and necessary environmental protection measures. | Chapt II, pg 55-56 | Project-wide activities |
| RF12 | Roads that are no longer needed for access or management should be decommissioned. Evaluate long-term access needs and potential trail conversion or linear wildlife opening opportunities prior to making a decision to decommission a road. | Chapt II, pg 55-56 | Project-wide in determining where and to what level decommissioning will occur. |
| RF13 | Road decommissioning should include the following:  
a) Road should be physically blocked to prevent vehicle use, unless designated for use by trail vehicles.  
b) Drainage structures should be removed and natural drainage re-established, unless needed for use by trail vehicles.  
c) The road profile should not normally be returned to contour during decommissioning, but recontouring may occur to meet special environmental or visual needs.  
d) Exposed soils should be revegetated and natural plant succession should be allowed to occur, unless needed for trail purposes.  
e) Decommissioning should normally be accomplished in conjunction with other project work but may occur independently if funding is available. | Chapt II, pg 55-56 | Upper portion of NFS Road 92A and existing non-system route to access Chestnut Ridge to be replaced with new construction of system road. |
| RF14 | Temporary roads may be constructed and used to provide for short-term management access needs. | Chapt II, pg 55-56 | Within project-wide activities, as included in proposed action. |
| RF15 | Temporary roads shall be rehabilitated and returned to productivity following their use. | Chapt II, pg 55-56 | Within project-wide activities, as included in proposed action. |
| RF20 | Vehicle use on closed roads by permittees, contractors, or other cooperators may be authorized to conduct official business or to perform resource management activities. | Chapt II, pg 55-56 | Linear wildlife openings or access roads, skid roads retained for RBC management |
## Recreation

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Description</th>
<th>Forest Plan Location</th>
<th>Where Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC28</td>
<td>Damage to or loss of system trails from timber harvest, road construction,</td>
<td>Chapt II pg 34</td>
<td>Chestnut Ridge Trail (TR 327) along new road construction and within the ESH units along Chestnut Ridge.</td>
</tr>
<tr>
<td></td>
<td>mining, special uses, or prescribed fire activities shall be repaired or</td>
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<td></td>
<td>mitigated by the program initiating or proposing the activity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC29</td>
<td>If a trail is temporarily used as a road, relocate the trail for the duration</td>
<td>Chapt II pg 34</td>
<td>Chestnut Ridge Trail (TR 327) along new road construction and within the ESH units along Chestnut Ridge.</td>
</tr>
<tr>
<td></td>
<td>of the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC2829a</td>
<td>Although Chestnut Ridge Trail is not heavily used, the Timber Sale Administrator should monitor use levels during implementation. If public safety is of concern due to use level, visitors should be redirected to an alternate route until the trail is no longer impacted and returned to previous condition.</td>
<td>Project specific for RC28 and RC29</td>
<td>Chestnut Ridge Trail (TR 327) along new road construction and within the ESH units along Chestnut Ridge.</td>
</tr>
</tbody>
</table>

## Wildlife

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Description</th>
<th>Forest Plan Location</th>
<th>Where Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>WF13</td>
<td>For management actions that have been identified by the Forest Service as likely to cause a negative effect on RFSS or Birds of Conservation Concern populations, negative effects shall be avoided or minimized to the maximum extent practical while still accomplishing the purpose of the project or action. Unavoidable negative effects shall be mitigated to the extent practical and consistent with the project purpose.</td>
<td>Chapt II pg 30-31</td>
<td></td>
</tr>
</tbody>
</table>
| WF13a | The following guidelines would be employed as applicable in the layout of management activities to improve habitat for ESH-dependent species. Species benefitting from these project designs include: the golden-winged warbler, mourning warbler, ruffed grouse, wild turkey and American woodcock.  
- Limit regeneration units to approximately 5-10 acres, when possible  
- Increase the proportional amount of edge by adjusting the shape of the regeneration harvest units  
- Provide a forested edge within 250 feet of areas that are regenerated  
- Create feathered edges that promote a gradual transition  
- Retain approximately 10-15 residual trees per acre in areas that are regenerated  
- Residual trees should be greater than 9 inches, diameter at breast height (DBH) | Project-specific for WF13 |  
| --- | --- | --- |  
| WF16 | When consistent with management prescription emphasis and direction, openings may be created and maintained in coordination with other resource projects to provide for vegetation diversity. Mechanical or chemical means, prescribed fire, or grazing may be used to help maintain openings. Native or desirable non-native, non-invasive trees and shrubs with high value for wildlife may be planted, released or pruned. | Chapt II, pg 30-31 | Wildlife openings, orchards restoration, and terrestrial/aquatic habitat improvement activities  
<p>| WF18 | Use Forest Service-approved portions of Conservation Strategies and Agreements, as appropriate, in the management of RFSS habitat to help keep management actions from contributing to a trend toward listing for these species. | Chapt II, pg 30-31 |<br />
| WF22 | Habitat improvement structures should be designed to complement riparian areas and management prescription emphasis. Improvement structures should be constructed of native materials where available. | Chapt II, pg 30-31 | Terrestrial/Aquatic Habitat improvement unit. |</p>
<table>
<thead>
<tr>
<th>WF22a</th>
<th>Vernal pool and wetland creation should be focused in areas flat to gently sloping areas. Vernal pool and wetland construction should be focused on areas where soils are suitable (naturally wet, depressions) during project implementation. Soils with higher clay content in the project area can be borrowed from in order to line pools with sandier soil textures.</th>
<th>Project specific for WF22 and soil and water resources</th>
<th>In areas proposed for vernal pool creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WF24</td>
<td>Habitat maintenance, enhancement, and restoration opportunities for migratory birds that are identified during watershed or project-level analysis should be implemented to the extent they are consistent with management prescription emphasis and project purposes, and to the extent practical and allowed by budget constraints.</td>
<td>Chapt II, pg 30-31</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>TE-Northern Long Eared Bat</td>
<td>All applicable S&amp;G from the 2006 Forest Plan, as listed in Appendix A of the 2006 BO and pages 184-190 of the programmatic BA (USDA 2015), are meant to avoid and minimize incidental take in both summer and winter habitat have been incorporated into the proposed action. Additionally, the six conservation measures described on pages 58-59 of the Regional programmatic BA and RPM 1.2 on page 24 of the CO have been incorporated into this project. This includes the prohibition of cutting down trees greater than 5” dbh from mid-May through mid-July within a 0.75 mile radius around the capture of reproductively active female NLEB.</td>
<td></td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>TE-Indiana Bat</td>
<td>All applicable S&amp;G from the 2006 Forest Plan are meant to avoid and minimize incidental take in both summer and winter habitat have been incorporated into the proposed action. No trees greater than 5” dbh will be felled from mid-May through mid-July.</td>
<td></td>
<td>Project-wide activities</td>
</tr>
<tr>
<td><strong>Timber</strong></td>
<td><strong>Description</strong></td>
<td><strong>Forest Plan Location</strong></td>
<td><strong>Where Applicable</strong></td>
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<tr>
<td><strong>TR07</strong></td>
<td>Stands less than 10 acres in size should only be created to meet resource objectives other than timber production. Existing stands less than 10 acres should be maintained in the corporate database until such time that it is feasible to incorporate them with one or more adjoining stands.</td>
<td></td>
<td>Commercial ESH habitat activities</td>
</tr>
<tr>
<td><strong>TR08</strong></td>
<td>Activity fuels (slash) shall be removed from permanent roads and recreation trails as part of normal harvest operations. Slash may be retained in wildlife openings if it is arranged into brush piles that would provide beneficial habitat structure without impeding wildlife movement and maintenance of openings. Slash may be retained in streams when considered beneficial for aquatic resources.</td>
<td></td>
<td>Commercial harvest activities adjacent to NFS roads and Chestnut Ridge Trail (TR327)</td>
</tr>
<tr>
<td><strong>TR09</strong></td>
<td>Skid trails should normally be a minimum of 200 feet apart, but may be closer to adjust to ground conditions. System roads should not be used for skidding.</td>
<td></td>
<td>Activities associated with commercial harvest activities, with the exception of NFS Road 1560. Daylighting this road and its subsequent use for this proposed activities will benefit the project through stewardship funds. Road would be maintained or repair as necessary throughout and immediately after this activity.</td>
</tr>
<tr>
<td>TR10</td>
<td>System roads should not be used as log landings unless they are determined to be environmentally preferable and do not result in irreversible road damage. Within one growing season after completion of harvest activities, wildlife openings that are used as log landings should be rehabilitated using vegetation beneficial to wildlife.</td>
<td>Activities associated with commercial harvest activities</td>
<td></td>
</tr>
<tr>
<td>TR11</td>
<td>Log landings, equipment storage areas, portable sawmill sites, and other concentrated activities should be located outside of channel buffers.</td>
<td>Activities associated with commercial harvest activities</td>
<td></td>
</tr>
<tr>
<td>TR13</td>
<td>Minimize bole damage by reducing the number of skid trails and using “bumper trees”.</td>
<td>Activities associated with commercial harvest activities</td>
<td></td>
</tr>
<tr>
<td>TR18</td>
<td>Regeneration harvest units shall be separated by manageable stands of trees. This spacing requirement applies to regeneration units until regenerated trees have reached 20 percent of the height of the surrounding vegetation.</td>
<td>Activities associated with commercial harvest activities</td>
<td></td>
</tr>
<tr>
<td>TR22</td>
<td>An area shall be considered reforested when it meets the stocking and species requirements specified in the detailed silvicultural prescription for the site-specific area.</td>
<td>Project-wide activities</td>
<td></td>
</tr>
<tr>
<td>TR22a</td>
<td>Placing wire cages around stumps or seedlings and applying deer repellants may be used to prevent deer browsing of desirable regeneration in the regeneration units.</td>
<td>Clearcut with reserve areas, as well as cut back borders and thinning activities</td>
<td></td>
</tr>
<tr>
<td>TR22b</td>
<td>Make regeneration harvest units at least 5-10 acres in size (or greater) to reduce the impacts on deer browsing</td>
<td>Clearcut with reserve areas</td>
<td></td>
</tr>
<tr>
<td>TR22c</td>
<td>Black cherry and red oak would be two of the main species released in the young stands as both have high timber and wildlife value.</td>
<td>Project-wide activities</td>
<td></td>
</tr>
<tr>
<td>TR22d</td>
<td>Treat yellow-poplar and black locust as crop tree for pollinators</td>
<td>Project-wide activities</td>
<td></td>
</tr>
</tbody>
</table>
### TR24
Consider the needs of other appropriate resources when prescribing TSI activities.

<table>
<thead>
<tr>
<th>TR24a</th>
<th>Felling of unmerchantable stems (mostly those less than the minimum product size) after harvesting is required. These mostly small-diameter stems sprout from the roots and provide a source of well-formed regeneration. If not cut, they can develop into poorly formed trees and shrubs that overtop other regeneration.</th>
</tr>
</thead>
</table>

### TR24b
Do not treat sapling sized beech within 20 feet of immune beech

<table>
<thead>
<tr>
<th>Heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference No.</td>
</tr>
<tr>
<td>HR05</td>
</tr>
<tr>
<td>HR05a</td>
</tr>
<tr>
<td>HR05b</td>
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<tr>
<td>---</td>
</tr>
<tr>
<td>HR05c</td>
</tr>
<tr>
<td>HR09</td>
</tr>
</tbody>
</table>
### Management Prescription 4.1
### 1900 - Vegetation

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Description</th>
<th>Forest Plan Location</th>
<th>Where Applicable</th>
</tr>
</thead>
</table>
| 6107          | Maintain culls and snags to provide for wildlife habitat. Manage culls to provide dens and future snags. If non-commercial and in excess of wildlife needs, culls may be girdled to produce snags. When thinning or implementing other vegetation management, retain at least 5 culls per acre, if available. Retain culls and all snags except as noted below.  
  a) Snags and culls may be removed when they are public safety hazards along roads, trails, or established campsites, or safety hazards in harvest units.  
  b) Snags and culls may be removed for scenery management purposes in locations of very high or high scenic integrity such as in a vista or in the immediate foreground of a road open for public motor vehicle travel.  
  c) See also snag and cull direction in TEP Species section for those areas that intersect with Indiana bat habitat. | Chapt III, pg 15-16 | Project-wide activities |
| 6108          | Grapevines should not be controlled unless necessary to achieve wildlife habitat objectives. Grapevine control needs should be evaluated at the project level. | Chapt III, pg 15-16 | Project-wide activities, with consideration to remove grapevine from crop-trees release in conjunction with Young Forest Stand Treatment Units. |
| 6109          | Camphor vines should be controlled when needed to ensure adequate stocking of desirable species. | Chapt III, pg 15-16 | Project-wide activities |
| 6110          | Oak species should be restored, maintained, or enhanced in stands where existing natural vegetation includes an oak component and or there is some oak present in the overstory or understory within or adjacent to the stand. Final overstory removal should not normally be conducted in stands without adequate advance reproduction of oak or sprouting potential. | Chapt III, pg 15-16 | Project-wide activities |
### 2350 – Recreation: General Forest Areas

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Reference</th>
<th>Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>6120</td>
<td>In areas where oak restoration is emphasized, work with WVDNR to facilitate hunter access during deer season.</td>
<td>Chapt III, pg 15-16</td>
<td>Within wildlife opening units</td>
</tr>
</tbody>
</table>

### 2410 - Timber Resource Management Planning

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Reference</th>
<th>Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>6122</td>
<td>No more than 40 percent of forested NFS lands within each 6.1 prescription area unit shall be harvested over a 10-year period. Thus, at least 60 percent of each unit shall provide security areas for wildlife during the 10-year period.</td>
<td>Chapt III, pg 15-16</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>6123</td>
<td>Unforeseen activities, such as timber salvage or pipeline installation, shall be counted toward the 40 percent disturbance standard above.</td>
<td>Chapt III, pg 15-16</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>6124</td>
<td>The prescription area may be entered every year for ecological restoration or silvicultural treatments, based on the consideration of multiple resources.</td>
<td>Chapt III, pg 15-16</td>
<td>Project-wide activities</td>
</tr>
</tbody>
</table>

### 2470 - Silvicultural Systems

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Reference</th>
<th>Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>6127</td>
<td>Emphasize use of the even-aged silvicultural system to improve or maintain wildlife habitat diversity.</td>
<td>Chapt III, pg 15-16</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>6128</td>
<td>In areas where oak restoration, enhancement, or maintenance is practiced, silvicultural treatments, including prescribed fire, should be designed to achieve oak regeneration or to maintain oak dominance of the site. Active management should not seek to convert oak-pine or oak-hickory stands to conifer.</td>
<td>Chapt III, pg 15-16</td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>6129</td>
<td>On sites where mast-producing tree species normally occur, oaks or other site-appropriate mast-producing tree species should be planted if natural regeneration does not provide an adequate future mast source.</td>
<td>Chapt III, pg 15-16</td>
<td>Project-wide activities</td>
</tr>
</tbody>
</table>
| 6130 | In areas where oak restoration, enhancement, or maintenance is practiced, even-aged and stand improvement cuts are the preferred silvicultural treatments.  
   a) Two-age harvest and group selection methods are preferred when the objective is oak ecosystem restoration, enhancement, or maintenance.  
   b) Even-aged harvests and/or prescribed fire may be used to mimic medium to large disturbance events.  
   c) Group selection may be used where deer browsing on regeneration is not a concern.  
   d) Thinning in oak stands should leave at least 65 percent of the existing basal area and should leave trees capable of producing relatively stable supplies of mast.  
   e) Restoration or enhancement treatments may be implemented at any stand age. | Chapt III, pg 15-16 | Project-wide activities |
| 6131 | When designing even-age regeneration areas retain a one-third acre clump of trees or shrubs for each five to eight acres of regeneration cutting. Where possible, clumps should include retained culls or snags. Channel buffers may be counted toward this guideline where the configuration allows them to serve both purposes. | Chapt III, pg 15-16 | Project-wide activities |
| 2470 - Timber Stand Improvement and Reforestation | Non-merchantable stems greater than 1” dbh should be cut in regeneration areas. Exceptions may include:  
   a) Leave clump trees,  
   b) Marked cull trees and snags,  
   c) Trees capable of producing an adequate growth response after release,  
   d) Shrubs beneficial to wildlife, or  
   e) Areas where site preparation is not necessary to achieve desired regeneration. | Chapt III, pg 15-16 | Project-wide activities |
<p>| 6133 | TSI and reforestation activities should retain trees and shrubs beneficial to wildlife (e.g., dogwood, crabapple, hawthorn, witch hazel, American hazel nut, American hornbeam, and serviceberry), if available on site. | Chapt III, pg 15-16 | Project-wide activities |</p>
<table>
<thead>
<tr>
<th>2630 – Wildlife Habitat</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>6138</td>
<td>Developed openings should be located away from open roads or main collector roads, and from active hiking and mountain biking trails. They should be accessible for maintenance and where feasible, dispersed within the prescription area.</td>
</tr>
<tr>
<td></td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>6139</td>
<td>Conifer trees may be planted or controlled where needed to maintain or enhance vegetation diversity for wildlife. Habitat management should not seek to convert conifer stands to hardwoods or eliminate the conifer component of mixed stands.</td>
</tr>
<tr>
<td></td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>6140</td>
<td>Between periods of use, local roads closed to public vehicle use should be seeded to wildlife food plants and managed as wildlife openings and hiking travel ways.</td>
</tr>
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<td></td>
<td>Project-wide activities</td>
</tr>
<tr>
<td>7100 - Transportation System Planning</td>
<td></td>
</tr>
</tbody>
</table>
| 6147                    | Road densities and impacts should be minimized to reduce disturbance in the area.  
   a) Construction of new classified roads should not cause road density within the prescription area unit to exceed 1.0 mile per square mile for collector roads, or 2.5 miles per square mile for any combination of collector and local roads.
   b) New collector roads should generally be gated and maintained for recurring administrative use.
   c) New local roads should generally be closed between projects by physical barricades. Use should be intermittent. Public motorized use should generally not occur from April 15 to August 1 to reduce disturbance to wildlife. See also Guideline 6119 and Standard 6125. | Chapt III, pg 15-16 |
|                         | Project-wide activities | |
APPENDIX C: RESPONSE TO COMMENTS
### Scoping (07/22/2015)

<table>
<thead>
<tr>
<th>Letter</th>
<th>Comment No.</th>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>This is one of the most needed habitat programs on the Monongahela National Forest and I gladly state that I agree with the project scoping at this time.</td>
<td>Thank you for the support of the project.</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>I would propose the project expand [wildlife openings] to 10% of the area in order to make up for the vast lack of ESH in the surrounding Forest.</td>
<td>Thank you for the support of the project and will take your comment into consideration as the formal project proposal continues to develop. Increasing openings and improving transition between open areas and mature forests will increase habitat diversity and help the Forest meeting goals and objectives for MP 6.1 areas.</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>To improve habitat I would suggest less caving be allowed on the Forest during hibernation periods.</td>
<td>According to WVDNR data, there are no mapped cave openings within the project area. As of 2013, there has been a Forest Closure Order in place restricting access to any cave openings on the Monongahela National Forest to decrease the impact to bat species and as a response to the concern of that this recreational activity may aid in the spread White Nose Syndrome.</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Establishing a project directed by wildlife habitat needs and ecosystem services provided as the primary goal vs. secondary following commercial timber management will better ensure success in obtaining the desired condition sought.</td>
<td>Thank you for reviewing the project proposal and your support of the project.</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>I would suggest prior to setting back the existing developing (&lt;30 years) pole stands, an evaluation for stem diversity and structure take place. … In doing so, you can maintain 4 successional stages within the unit rather than eliminating the pole stage. I understand that pole stands will only have meandering swaths of disturbance but feel the above warrants consideration.</td>
<td>This information will be taken into consideration during implementation of creating swaths through these young forest stands. Tree species beneficial to wildlife, such as oak and other mast producing species, will be treated as crop-trees to ensure that food sources from established young trees will be maintained.</td>
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</tr>
<tr>
<td>2</td>
<td>4</td>
<td>I would encourage species monitoring to assist in evaluating overall project success ad individual methodologies.</td>
<td>Monitoring Running buffalo clover, as well as several regional forester sensitive species will take place, before during, and after project implementation to ensure that the goals of the project are being achieved. On-going acoustic bat surveys take place on an annual basis. This suggestion will be taken into consideration as we continue to develop the project proposal.</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>The WV DNR, Wildlife Resources Section, strongly supports the proposed actions as outlined in the Upper TyChest/Chestnut Ridge project scoping notice.</td>
<td>Thank you for the support of the project.</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>The habitat developments (i.e. E/S [early successional] forest management, clearing and linear opening development, waterhole development etc.) incorporated into this project will benefit a diversity of wildlife species including E/S dependent and RTE [rare, threatened, and endangered] species, pollinators, as we as numerous other game and non-game species.</td>
<td>Thank you for the support of the project. This project is geared towards increasing habitat diversity to meet the MP 6.1 goals and objectives outlined in the Forest Plan.</td>
</tr>
<tr>
<td>Letter</td>
<td>Comment No.</td>
<td>Comment</td>
<td>Response</td>
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<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>1</td>
<td>1</td>
<td>The project area include a high quality forest block on limestone which has not been significantly disturbed by human activities since the early 1900s. … We recommend that this block of high quality natural forest including contiguous forest on limestone, shale, and sandstone, be managed as a natural area and that logging, roads, and other intional canopy and ground disturbance be precluded from this area.</td>
<td>Across the forest, several botanical areas of interest have been designated and are managed only through natural disturbances. None of these are within the project area. The project does not aim to shift species composition away from what currently exists. The draft decision to address is comment includes dropping one unit of Early Successional Habitat (Unit 1) and the associated cut-back border. While this removes approximately 30 acres from the proposed action to increase the availability of ESH within the project area, the purpose and need to provide a mosaic of habitat type prescribed in forest-wide and MP direction can still be achieved. Dropping these units will result in an approximately 152-acre block of undisturbed forest in the WVDNR’s area of concern, located in the southwestern portion of the project area. Based on stand data, this block includes a 30-acre stand that is estimated to have originated around 1883. Management activities on limestone geologic areas were designed cooperatively to support population growth of established occurrences of the federally-listed species, running buffalo clover. Management activities are designed to mimic natural disturbances by re-introducing age class diversity to the project area.</td>
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<td>There are a number of non-native invasive plants established in the project area. These populations are expected to increase and additional non-native invasive plant species to be introduced during timber harvest and road construction.</td>
<td>Several design features and mitigations to minimize the risk of spreading NNIS, and to incorporate newly discovered populations in the Forest-wide NNIS Treatment EA, are included in the EA Appendix B. There are several locations of NNIS that will be treated under the Forest-wide NNIS Treatment EA. Monitoring will be ongoing throughout project. Equipment cleaning requirements, consideration of where seeding is and is not necessary, and use of straw or other weed-free substitutes for soils stabilization will be utilized.</td>
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<td>2</td>
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<td>The WVDNR strongly supports the proposed project.</td>
<td>Thank you for the support of the project.</td>
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<td>We recently acquired new information regarding the forest community in the southern end of the project area and we feel strongly that there should be modifications made to that portion of the project area to address our agency's concerns. Subsequently, the WVDNR recommends a minor modification to the overall project with the removal of the two (2) southernmost commercial early successional habitat management unit and their surrounding cutback borders.</td>
<td>The draft decision to address is comment includes dropping one unit of Early Successional Habitat (Unit 1) and the associated cut-back border. While this removes approximately 30 acres from the proposed action to increase the availability of ESH within the project area, the purpose and need to provide a mosaic of habitat type prescribed in forest-wide and MP direction can still be achieved. Dropping these units will result in an approximately 152-acre block of undisturbed forest in the WVDNR’s area of concern, located in the southwestern portion of the project area.</td>
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<td>We recommend that all of the remaining unit be retained including all of the units and corresponding cutback borders designed to benefit running buffalo clover.</td>
<td>In further coordination with the WVDNR since receiving their response, I have also decided to ensure that terrestrial liming will not take place within this 152-acre block of the project area.</td>
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<td>3</td>
<td>1</td>
<td>In order to further limit the disturbance to the 152-acre block resulting from dropping ESH unit 1 and cutback border Unit 18, we request that no terrestrial lime be apply in this area.</td>
<td>In further coordination with the WVDNR since receiving their response (Comment Letter #2), terrestrial liming will not take place within this 152-acre block of the project area.</td>
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