Chapter 3 - Environmental Consequences

This chapter: (1) summarizes the existing condition of physical, biological, and social resources in the Hogback project area; and (2) explains how they may be affected by Hogback alternatives. Where appropriate, the analysis tiers to the Final Environmental Impact Statement for Forest Plan Revision (FEIS) for the 2006 Land and Resource Management Plan of the Monongahela National Forest, which describes the general effects activities on Monongahela National Forest System lands may have on vegetation, wildlife, water, soils, recreation, etc. (FEIS, pp. 3-1 through 3-497).

This chapter describes the direct, indirect, and cumulative environmental consequences of implementing proposed alternatives (40 CFR 1508.7-1508.8). 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. The methodologies used to evaluate effects are briefly mentioned in each section. More details are documented in individual resource reports in the project file.

3.1 Past, Present, and Reasonably Foreseeable Future Actions

Table 3.1 below displays known past, present, and reasonably foreseeable future actions on federal and non-federal lands within and near the Hogback project area that may contribute cumulatively to the direct and indirect effects of proposed Hogback activities. More information about these activities is available in the project record.

Table 3.1: Past, present, and reasonably foreseeable future actions considered in the Hogback project analysis

	Activity	Location	Years Implemented	Acres or Miles Affected	Past	Present	Reasonably Foreseeable
Activities on National Forest System (NFS) Lands							
1.	Timber harvest prior to federal ownership	Within the project area	Turn of the 20th Century	Exact figure unknown – less than the 13,446 acres in the watershed	Y	N	N
2.	Mt. Grove Timber sale	Comp. 5	1992	300 acres thinning	Y	N	N
3.	Previous Sales	Comp. 5	1981-1985	74 acres of regeneration	Y	N	N
4.	Hile Run Sale	Comp. 6 & 7	1985-1987	224 acres of regeneration	Y	N	N
5.	Hile Run Sale	Comp. 6 & 7	1995-2000	178 ac of regeneration	Y	N	N
6.	Close Mt Sale	Comp. 12	1998-2000	55 ac regeneration. 35 ac thinning	Y	N	N
7.	Dry Run	Comp. 13	1995-2000	123 acres of regeneration	Y	N	N
8.	Mill Run Sale	Comp. 21	2003	35 acres of regeneration. 100 acres of thinning	Y	N	N
9.	Wolf Run Sale	Comp. 21	1988-1993	66 acres of regeneration. 80 acres of thinning	Y	N	N
10.	Previous Sales	Comp. 21	1969-1970	47 acres of regeneration	Y	N	N
11.	Recreation on NFS lands (e.g., hunting, fishing, hiking, camping, wildlife viewing, driving for pleasure, gathering forest products) has occurred in the past, present and will occur into the future.	Entire watershed	All	All	Y	Y	Y

	Activity	Location	Years Implemented	Acres or Miles Affected	Past	Present	Reasonably Foreseeable
12.	Trail Maintenance	701 Trail	Various	All	Y	Y	Y
13.	Rifle Range Special Use Permit (SUP)	Across from Organization Camp	All	Less than 1 acre	Y	Y	Y
14.	Horseshoe Campground Construction planned 2008/2009 Paving roads/spurs, upgrading sites with electricity, adding short road, replacing restrooms, upgrading sewer/water systems.	Along Horseshoe Run just west of Hile Run	1940? & into the future.	Just outside the project area	Y	Y	Y
15.	OH-WV YMCA Organization Camp SUP	Along Horseshoe Run	1939 & into the future	Just outside project area	Y	Y	Y
16.	WV DOT – Maxwell Run bridge replacement project	Placement of temp bridge for detour while replacing permanent bridge, on Maxwell Run < 1 mile SW of YMCA Horseshoe Camp	Sept 2007 – June 2008		N	N	Y
17.	N-1 Well	Preston County, north end of Forest	Latter 60's?	≈1.5 Acre	Y	Y	Y
18.	T-1 Well	Tucker County	Latter 60's?	≈1 Acre	Y	Y	Y
19.	Nichols Pipeline	Tucker County, between SR7 & SR7	2007-2008?	2.75 Acres	N	N	Y
20.	Nichols Access Road	Tucker County, between SR7 & SR7	2007-2008?	0.40 Acres	N	N	Y
21.	C-363 Woods Road Pipeline	East of Camp Kidd, Jct. of SR1 and SR25	2006	1.10 Acres	Y	Y	Y
22.	Lead Mine Seismic Program	Tucker County, between SR 5 & SR7 and between St. George & N. Forest Boundary	2005	≈46 Miles in Length	Y	N	N
23.	FR929 Road Use Permit	Tucker County, E. of SR5	2003	3.8 Miles	Y	Y	Y
24.	Nine Pipeline	Tucker County, Area of FR929	2007-2008?	4.46 Acres	N	N	Y

	Activity	Location	Years Implemented	Acres or Miles Affected	Past	Present	Reasonably Foreseeable
25.	C2 Well	Tucker County, Area of FR929 and SR1	2008?	Unknown as of yet	N	N	Y
26.	C-3 Well	Tucker County, Area of FR929 and SR1	2008?	Unknown as of yet	N	N	Y
27.	C2-C3 Pipeline	Tucker County, Area of FR929 and SR1	2008?	Unknown as of yet	N	N	Y
28.	Hile Run Pipeline	Tucker County, along SR9, crossing Horseshoe Run and Hile Run Creeks	2002		Y	Y	Y
29.	Laurel Mountain Wind Generation project	Planning and timelines not yet determined		Unknown as of yet	N	N	Maybe
30.	Corridor H	Planning and timelines not yet determined		Unknown as of yet	N	N	Maybe
Activities on Private Lands							
1.	Private logging	Tucker County: Laurel, Hile, Leadmine, & Long Runs	1996	485 acres	Y	N	N
2.	Private logging	Preston County: North Fork Wolf & Horseshoe Runs	1996	70 acres	Y	N	N
3.	Private logging	Tucker County: Wolf, Horseshoe, & Mill Runs	1997	208 acres	Y	N	N
4.	Private logging	Preston County: Horseshoe, Leadmine, & Wolf Runs	1997	211 acres	Y	N	N
5.	Private logging	Tucker County: Horseshoe & Maxwell Runs	1998	80 acres	Y	N	N
6.	Private logging	Preston County: Wolf, Leadmine, & Bear Runs	1998	216 acres	Y	N	N
7.	Private logging	Tucker County: Maxwell, Leadmine, & Lime Hollow Runs	1999	601 acres	Y	N	N
8.	Private logging	Preston County: Bear & South Branch Wolf Runs	1999	145 acres	Y	N	N
9.	Private logging	Tucker County: Laurel & Horseshoe Runs	2000	165 acres	Y	N	N

	Activity	Location	Years Implemented	Acres or Miles Affected	Past	Present	Reasonably Foreseeable
10.	Private logging	Preston County: South Branch Wolf Run	2000	6 acres	Y	N	N
11.	Private logging	Tucker County: Lime Hollow, Twelvemile, Dry, & Horseshoe Runs	2001	160 acres	Y	N	N
12.	Private logging	Preston County: Wolf, North Fork Wolf, South Branch Wolf, & Horseshoe Runs	2001	73 acres	Y	N	N
13.	Private logging	Tucker County: Wolf, Lime Hollow, & Mike Runs	2002	66 acres	Y	N	N
14.	Private logging	Preston County: Leadmine & Bear Runs	2002	54 acres	Y	N	N
15.	Private logging	Tucker County: Thunderstuck Run	2003	27 acres	Y	N	N
16.	Private logging	Preston County: Twelvemile & Horseshoe Runs	2003	14 acres	Y	N	N
17.	Private logging	Tucker County: Maxwell & Mill Runs	2004	130 acres	Y	N	N
18.	Private logging	Preston County: Horseshoe & Bear Runs	2004	76 acres	Y	N	N
19.	Private logging	Tucker County: Mill, Dry, & Horseshoe Runs	2005	140 acres	Y	N	N
20.	Private logging	Preston County: Horseshoe Run	2005	40 acres	Y	N	N
21.	Private logging	Tucker County: Leadmine, Horseshoe, & Mill Runs	2006	355 acres	Y	N	N
22.	Private logging	Preston County: Horseshoe & South Branch Wolf Runs	2006	401 acres	Y	N	N
23.	Herbicide application	On private utility rights-of-way	??	??	Y	Y	Y
24.	Allegheny Power 500 Kv transmission line	Planning and timelines not yet determined	??	??	N	N	Y

In the future, additional development and disturbances may occur, such as timber sales on private lands or gas well drilling. However, the Forest is not aware of any specific plans or the extent of such activities.

3.2 Physical Resources

3.2.1 Soils/Geology

Resource Impacts or Issues Addressed

This section discloses the soil resource issues and impacts identified during interdisciplinary meetings and public scoping. The Forest Service identified soil resource issues associated with proposed actions:

- Sensitive soil types for steep slopes, erosivity, and wet soils
- Soil effects from herbicide use

Scope of the Analysis

The spatial boundary used to evaluate **direct** consequences is the activity areas where actions are proposed within the project area boundary displayed in Figure 2.2, the map for the Proposed Action. Activity areas are those areas in which harvesting, herbicide treatment, and wildlife opening (associated with log landings) creation are proposed. This spatial boundary was chosen because it can be used to determine threshold effects to soil quality from proposed actions associated with this project**. Indirect** consequences also are bounded within the project area because effects are not expected to move outside of the sub-watersheds within the project area. Refer to Figures 2.2, 2.3, and 2.4 for the locations of the proposed activities.

The spatial boundary used to address **cumulative** impacts is the entire project area. This allows 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 FSH 2509.18, when added to the proposed actions.

Methodology

The Proposed Action and alternatives have the potential to affect soil resources as a result of commercial timber sale activities, road construction and reconstruction, and log landing construction and use. The effects of these activities may include soil disturbance, soil compaction, soil rutting, erosion, slumping and mass wasting, accelerated decomposition of organic mater, changes in nutrient cycling due to biomass removal and mixing of the soil surface horizons, and changes in soil temperature and moisture. The effects of these activities on soil resources in the activity area can be described in terms of short- and long-term effects on the **productivity or quality** of the soils. **Short-term effects** are those effects expected to last less than a decade. Effects to the soil from tree felling and being skidded out of the stand on the soil surface may be an example. The soil surface is slightly mixed and disturbed. The time for soil properties to recover is short. For soils rarely, large scale disturbances are considered to short-term in nature. It is only when the changes that occur to soil properties happen within the decade and the effects of those changes are no longer noticeable after a decade. In contrast, **long-term effects** are associated with activities that displace soil permanently and change the physical, chemical, and biological properties of the soil. Many years are needed for the soil to recover its original productivity when the surface layers are removed, deeply compacted, or altered in some manner that changes the chemical composition such as the effects with intense fire in these

ecosystems. Additions to the soil profile from fill would also have long-term effects. An example of an addition to the soil may be adding fill to the top of the soil profile from road building. The-long term effects from the acid deposition are in part due to the leaching of the base cation supply and the combination of base poor geologies in the project area. Soil formation typically occurs at a rate of one inch per 200 to 400 years, and depends on many local environmental factors.

Important factors considered in evaluating effects to soil resources from this project are: the extent of the activity area and the current soil chemistry data of different soils within the project area. Effects to the soils from this project are considered not significant when 85 percent of the activity area retains its potential long-term **soil productivity** (Forest Service Handbook, 2509.18.2.2, Soil Quality Standards).

Environmental Consequences Common to All Action Alternatives

Road Reconstruction: All action alternatives propose road reconstruction (Chapter 2). Road reconstruction would cause new soil disturbance and the potential for sediment to enter the stream channels and ditches in the short-term. As necessary, areas of disturbed soil would be limed, fertilized, and seeded thereby reducing the initial impacts of the soil disturbance after the vegetation is established (MNF Forest Plan - SW03, SW04, SW14, 2006).

Road reconstruction would be a positive impact to the soil resource by addressing existing problem areas, which would decrease the amount of sediment being generated by use of the road surface. Examples of problem areas within the project area include eroded road surfaces that allow water to run down the road instead of in the ditch, undersized culverts that do not allow large flows to pass under the road during storm events, and rutting in places where rock has been displace or embedded into subsoil. Replacing undersized culverts with adequately sized culverts would allow water to flow through the drain unrestricted, thereby decreasing the amount of sediment movement. Proper alignment of culverts would help to decrease the amount of soil eroded by water moving through the culverts and would prevent upslope and downslope undercutting of road fill material. Existing areas of active erosion on road banks and road surfaces would be eliminated or reduced by the use of mulch and seeding and/or additional applications of surface gravel to the roadbed.

Although the reconstruction of roads would result in short-term impacts to the soil resource by displacement of new soil or stabilized soil, overall, these activities would have a long-term positive impact on the soil resource because the roadbed would be made more stable with the added gravel and reshaping. The risk of rutting and tires sinking into the subgrade of the road during wet periods would be less, and water would be less likely to flow on the roadbed and rather into the ditch line and onto native, undisturbed soil in the down slope area.

Road Decommissioning: All action alternatives propose road decommissioning (Chapter 2). Road decommissioning would benefit the soil resource in the long-term because the landscape would be returned to an area of increased soil productivity and lessen the amount of disturbed soil available for producing sediment during precipitation events. Roads indirectly increase sediment delivered to streams. This increase would be caused by the following scenarios. One, soil compaction associated with roads prevents infiltration of surface water into the roadbed. Two, roads disrupt the natural drainage patterns by intercepting subsurface flow, causing overland flow down the road surfaces and ditch systems, and allowing water to be channeled into

the channels at a much higher rate as compared to subsurface rates. Three, roads and ditches are a direct source of sediment because of the exposed soil material used to create the road and ditch line. The road decommissioning would initially disturb up to 100 percent of the existing prism. Disturbance would occur from ripping, reshaping, and removal of all culverts and some other road bed features. Swales and dips would be place in areas where water would be present to allow for restoration of soil hydraulic conductivity and infiltration of surface water to the hillslope.

Short-term impacts to the soil resource with road abandonment would result from the soil disturbance associated with culvert removal and ripping of the compacted road surface. Culverts would be removed so that stream channels are allowed to return to their natural contour. These activities would provide a moderate risk of sediment generation. Mulching, liming, fertilizing, seeding exposed soils, and installing temporary silt fences would minimize the movement of sediment off site (MNF Forest Plan, SW03, SW04 II-10, 2006). The installation of silt fences near and adjacent to stream crossings of all types would be especially important in preventing sediment from reaching the stream channel. Silt fences would need to be cleaned and maintained, and the disturbed soil would need to be stabilized with either geotextile fabric or seed and mulch.

Road Maintenance: Short-term effects would include increases of soil movement as the soil on the road surface and in the ditch line would be exposed to surface water. There would be a slight to moderate risk of destabilizing the toe-slope when ditches are cleaned by removal of the soil material. This could cause additional soil movement. However, overall road maintenance would be a positive effect to the watershed (see Hydrology Resource Report.).

Topsoiling: There would be an additional effect in areas which receive the topsoil from excavated areas, such as fill slopes along roads. With this added mineral soil material and organic matter, **productivity** on these areas would be improved by increasing soil depth, moisture holding capacity, organic matter, and nutrients.

Log Landings/Wildlife Openings: Permanent openings would be developed to provide open, grassy habitat for wildlife as a result of the creation of log landings in association with nearby harvest units. Once the overstory is cut down, the stumps would be grubbed out, and then the trees, stumps, and other logging debris would be pushed into piles and retained in the downslope position of the disturbed soil to help prevent sediment from leaving the site. As needed, the area would be fertilized; limed; seeded with native grasses, legumes, and wildflowers; and planted with shrubs or trees (Forest Plan, p. II-10, SW03, SW13, 2006). Each opening would be approximately 0.5 to 1.5 acres and represents an immediate loss of soil productivity. Immediate mitigation post harvest use of this site and conversion to a wildlife opening would then reclaim soil productivity losses to some degree; however, if the site were to be bladed (removal of the A horizon) then a permanent loss of soil productivity for the area would occur. Nutrient cycling and carbon sequestration would be altered because grass lands have different nutrient cycles than forested areas. Effects are expected to be minimal and not adverse since the new openings would occupy 40 to 50 acres within the total project area for both action alternatives.

General Effects from Timber Harvesting

Compaction: General timber harvest areas are expected to recover quickly from compaction caused by harvesting activities. Research has shown that the upper few inches of soil recovers quickly from light to moderate compaction (Adams 1991;Burger 1985; Hatchell 1971;

Kozlowski 1999). This would be due to **organic matter** additions from logging debris, soil biota activity, freezing and thawing, and plant root growth from existing and new vegetation. Recovery from compaction would be slower in the areas where severe compaction occurs. These areas are associated with log landings and primary skid trails/roads, where equipment has passed over the soil many times. Severe compaction must be mitigated by ripping or soil tillage of the upper 7 to 24 inches to break up the compacted soil surface and promote water infiltration and root growth. Untreated, severely compacted areas have long-term impacts to soil productivity. Very few, if any acres of soil within proposed units are currently severely compacted in the project area. However, there are approximately 36 miles of wood roads within the project area that represent areas of soil with compaction that prohibits the regrowth of vegetation to the degree that it would not become merchantable commercial timber. These roads are not maintained by the FS.

New areas of compaction on log landing areas may result from blading of the surface and heavy equipment use while decking logs. These areas could be ripped to mitigate the compaction during the conversion of the site from a landing to a wildlife opening. The result would be to have no ponding of water on the site and vegetation would grow with healthy root systems that are not impeded by any human made compacted soil layers.

Nutrient Cycling: The above ground nutrient content of the forest stand is relatively small compared to the total nutrient pool of the soil (Adams 1999). Probable effects of proposed harvesting activities on nutrient cycling include: 1) increased mineralization of organic material, resulting in increase available nutrients, particularly nitrogen; 2) increased nitrification of soil nitrogen to nitrate, a more mobile form; 3) increased leaching of soil nutrients (nitrogen, calcium, and magnesium) as uptake by plants decreases temporarily due to removal of the overstory; and 4) increases in rates of cycling of some nutrients in the upper soil horizons. Increased soil moisture, surface soil temperatures, and increased organic matter, which have been observed after clear cutting produce ideal conditions for rapid decomposition of the organic matter available on the site. Soil organisms responsible for decomposition would benefit from this surge in organic materials. Mineralization of organic compounds and nitrification has been shown to increase after clearcutting. Effects of nutrient cycling in thinnings and shelterwood cuts are not likely to be detectable in the short-term because of the dispersed nature of the removals. The dispersed removal of trees within the project area has relatively little, if any, effect on microclimate and thus nutrient cycling processes. Also, because the rates of these processes vary considerably spatially within a stand, detecting an adverse effect would be unlikely. Sprouts from the existing root systems on harvested areas along with new germinations would benefit from any increase in available nutrients.

Soil Fertility: Fertility would be expected to increase from pre-harvest levels as increases in soil moisture and soil temperature from timber harvest contribute to an increase in organic matter decomposition. This effect would produce an increase in nutrients available to plants and soil organisms on the sites. This surge in nutrients, along with additions of nitrogen from the atmosphere and precipitation, would be expected to promote rapid growth on the sites as well as benefiting many soil-borne organisms. On roads and landings, where soils have been disturbed, additions of limestone and fertilizers prior to revegetation would contribute to soil fertility by adding calcium. Possible losses of nutrients to ground water and volatization are expected to be offset by the addition of nutrient rich leafy tops and woody debris left on-site after harvest. Although frequently hypothesized, nutrient deficiencies as a result of overstory removal have not

been reported in the eastern hardwood forests (Adams 1999). Therefore, no adverse impacts to soil fertility are expected from the proposed treatments (USDA 2000, pp. 3-60).

Canopy Removal: Canopy removal is proposed to some degree in all action alternatives. The soil surface would be subject to effects from the removal of the tree canopy.

It would be anticipated that an initial surge of nutrients would occur as the vegetation canopy would be opened. Soil moisture, soil surface temperatures, and an increase in organic matter produce ideal conditions for rapid decomposition. Sprouts from the existing root systems on harvested areas along with new germinations would benefit from the increase in these available nutrients. A surge in growth would occur. Possible losses of nutrients to ground water and volatilization are expected to be offset by the addition of nutrient rich leafy tops from harvested trees and woody debris left on-site after the harvest. In addition, a decrease in evapotranspiration would result in increased runoff. These are considered short-term impacts and would be quickly reduced with regeneration of understory species.

Soil Temperature: Timber harvesting activities temporarily disturb the forest floor by mixing the organic layers with the mineral soil. Removal of a portion of the forest stand by harvesting can result in increased sunlight reaching the forest floor, higher soil temperature, increased soil moisture, as well as increased decomposition and mineralization rates resulting from increased microbial activity. The increase in soil temperatures would occur primarily during the growing season, but once the forest canopy closes in (within ten years), temperatures would return to normal. Soil biota activity would increase in the upper horizons of the soil and decomposition rates would increase temporarily. Bacterial activity assumes a more important role in the latter stages of decomposition. The increase in decomposition rates along with increased sunlight to the forest floor leads to an increase of leguminous plants, which are capable of fixing large amounts of nitrogen. Symbiotic nitrogen fixation by actinorhizal plants makes a considerable input of nitrogen to many ecosystems (Youngberg and Wollum 1970).

General Effects Specific to Harvesting Methods other than Conventional Methods:

Cable Yarding – The units proposed for cable yarding were determined to have suitable deflection and slope to operator the appropriate machinery. Forest Service research shows that cable yarding requires less soil disturbance than conventional overland methods. On average, Patric (1980) suggests that in summary approximately 6 percent of a harvest area will have soil disturbance when using a cable system.

Helicopter Yarding: Helicopter yarding would be proposed to varying degrees in Alternatives 2 and 3. Helicopter yarding minimizes the amount of soil disturbance and sedimentation production that occurs because no skid roads are used to move the logs from the unit to the landings. There would be little direct impact to the soils in the form of compaction, rutting, and erosion because of helicopter yarding.

Helicopter yarding would take place during the winter period. The roads in the Hogback project area were not designed for hauling logs during the winter period. The road surfaces would be upgraded to withstand the impact of heavy logging trucks hauling timber.

Herbicide Use in Conjunction with Silviculture Treatments and Non-native and Invasive Species:

For the **Proposed Action** and **Alternative 3**, four herbicides: triclopyr; glyphosate; imazapyr; and sulfometuron-methyl are being proposed for use in units to aid in silviculture treatments.

Chapter 2 provides greater detail on the method of which herbicide would be used in each unit, the method of application, and any minor differences in application when harvesting method changes from conventional to cable or helicopter. In addition, these herbicides may be used to control non-native and invasive species identified in the survey area by the botanist/ecologist.

Riparian buffer strips would be applied along all functioning ephemeral, intermittent, and perennial stream channels. The buffer strips would provide some level of protection from any potential runoff.

Summary of Herbicide Effects: Researchers view the forest floor and soil as a superb environment for minimizing the potential impact of herbicides on the watershed. High infiltration rates of most forest soils prevent overland movement of herbicides to water bodies. The absorptive phenomena of soils and organic matter retard chemical movement through the soil while chemical and biological processes alter the herbicide to a substance not considered harmful to vegetation. Leaching of herbicides, stream pollution, and harmful effects to the soil microorganisms would be minimal when carefully controlled applications of herbicides are made to the application sites. Risk is further reduced because application of herbicides is by hand and this is a more site specific delivery method as opposed to a mechanized application method. General and specific effects are described in detail in the Soils Specialist Report.

Direct/Indirect Environmental Consequences by Alternative

No Action - Alternative 1

Chemung and Hampshire geology underlies the project area (See Map 2 in Soils Specialist Report). Soils formed from these formations are moderately susceptible to compaction. They have a moderate to low shrink-swell potential and moderate to low shear strength potential, factors that are important in determining the capacity of soils to support road and skid road use in the area.

The Chemung geology weathers into soils that have numerous rocks throughout the soil profile and fractured bedrock. These soil properties provide for somewhat stable road surfaces during drier periods of the year. The Hampshire geology weathers in soils that have less rock fragment and would be less fractured. The red sandstones and siltstones weather quicker and are somewhat less stable than the soils forming from the Chemung.

See Table 1 and Map 2 in the Soils Specialist Report, along with descriptions of each soil series found within the soil survey of the project area.

EFFECTS

The No Action Alternative proposes no soil disturbing activities. Areas of bare soil existing in the project area such as roads and trails would continue to have soil movement. Signs of erosion around culverts and on non-revegetated cut banks are evident on the existing road system. Surface water flows down the middle of some roads during heavy precipitation events. The erosion and surface flow over bare soils adds to the already existing sediment load in streams. Soils would continue to erode in these areas until some physical point of stabilization is met.

Proposed Action - Alternative 2

Effects from the Proposed Action are described below and are based on soil interpretations developed from the USDA Natural Resource Conservation Agency, Soil Survey Division. This

soils database is also the program that determines how soils interpret effects of management activities based on soil properties. The soils that interpret as being of high risk or as having "severe" ratings get brought forward in the project as being "sensitive" to management activities. This means that when conducting management activities on these soils, care outside of the normal operating procedures and best management practices should be taken when operating on those soil map units and adverse effects can be expected if care is not taken in implementation of the project's activities.

Sensitive Soils

All action alternatives propose forest management actions on soils considered **prime farmland**. An analysis of those actions was conducted by the Natural Resource Conservation Service, USDA. Those actions were determined to not convert prime farmlands and state wide important farms lands. The map and determination are located in the project record.

Wet soils are those soil series with water tables within 18 to 30 inches of the soil surface and considered to be moderately well drained or wetter. However, for the purpose of this project, the soil series, Laidig, is also considered wet because its seasonal water table is just beneath 30 inches and because of field observations. During field visits to the project area, water has been noted coming out of the soil profile at a shallower depth than 30 inches, so for the purpose of showing the maximum potential of effects when considered soil disturbance (especially with constructed skid roads on steep slopes where cut banks can be as high as 48 inches) the rating for this soil series was changed.

Slope is a sensitivity related to the slope of the landscape. This is brought forward because of limitations with harvesting equipment, erosion potential, and Forest Plan standards and guidelines (SW07). Slope is noted as being of concern starting at 35 percent.

Slippage is a sensitivity given to soil series that form over geologies that have shown high risk for slipping both naturally and when management activities are preformed on these soil series. In this project area those soil series are Cateache and Shouns. In the update mapping process done by USDA NRCS in 2006, there was question as to whether these soil series mapped within the project area were actually derived from the Mauch Chunk formation. Ground truthing was inconclusive; therefore, the higher risk is assigned as a precaution to planning out the management activities.

Map 3 in the Soils Specialist report shows the distribution of these sensitive soils within the units of the Proposed Action, which is the greatest representation of activities occurring within the project area.

Soil Quality: The Soil Management Handbook (FSH 2509.18) suggests a threshold of 15 percent reduction in "measurable or observable soil properties or conditions, or any measurable or observable reduction in soil wetland or hydrologic function", referred to here as soil productivity or soil quality. This measurement would be applied to activity areas. System roads, trails, and administrative facilities such as campgrounds, are not included in measurements for loss of soil productivity. For this analysis, harvest units, helicopter landing sites, and skid trail development would be included in estimates for loss of soil productivity and the measures would be compared between the alternatives.

Timber Harvesting: The majority of soil disturbance in a timber sale occurs during the harvesting of the timber. In conventional harvesting methods, using rubber tire skidders, skid

trails and/or skid roads are created in order to extract the timber. Landings are also created in order to temporarily deck the timber until it can be loaded on to trucks and hauled off-site. The percent of land disturbed would be often dependent upon slope of the activity area. In general, the steeper the slope, the higher the road density would be in order to safely operate on the hill slope. A 1970s study conducted near Parsons, WV showed that the lowest measured road density of 5.6 percent occurred in a selectively cut harvest area with slopes less than 30 percent (Kochenderfer 1977). A study on the nearby Fernow Experimental Forest indicated that roads in Haddix watershed occupied 10.6 percent of the logged area (Kochenderfer and Edwards 1997). Slopes in the Haddix watershed were greater than 30 percent.

Kochenderfer et al. (1997) reported that the amount of exposed soil because of skid trails and trucking roads decreases rapidly after logging. This would be because grasses and shrubs become re-established in the disturbed areas. The study measured skid and truck roads in 1987, and again five years later in 1992. The percent of the disturbed area in the skid roads decreased from 6.2 percent of the logged area in 1987 to 5.1 percent in 1992 measurements. The percent of disturbed area in truck roads decreased from 4.5 percent to 3.1 percent. It is thought that practically all of the skid roads, especially in heavily cut areas, would eventually convert back to forest. However, Kochenderfer et al. (1997) recommended that water-control structures are necessary on closed out roads, whether they are skid roads, skid trails, or abandoned system roads, because bare soil (up to 24 percent of the area) can remain on these roads even after six growing seasons.

Logging Plan: There would be a preliminary logging plan developed for the Hogback project that displays tentative landing locations and skid trail/road placement for the Proposed Action and Alternative 3. If resource concerns are identified during implementation, specialists would be called into the field to help with locating skid trail/roads and landing sites as needed. The width of disturbance on the road bed may vary due to the type of equipment used, operator style, or logistics of moving within the unit.

It is estimated that approximately 50 percent of the landing sites would have reduced soil productivity because most of the topsoil would be cleared away and side cast as well as some of the mineral soil in order to create a relative flat area for loading logs. The remainder of the landing remains relatively intact with some mixing occurring as logs are stacked and moved on and off the site.

New Road Construction: The direct effects of new road construction include a complete removal of the O and A horizons (organic material) and removal of the subsoil material to varying depths in creating a road base in the cut locations. In the fill locations, there would be areas where soil material would be borrowed and placed over the native soil surface to bring the soil to grade for the road bed. Soil properties in the roadbed surface and borrow areas are altered to the degree where they do not resemble native soil properties after construction. Compaction, loss of surface water infiltration, and loss of overall long-term soil productivity are to be expected.

New Road Openings: Opening a closed road to public use would potentially increase use of this road, thereby increasing the amount of sediment generated from the road.

Soil Productivity Restoration in Hile Run: This project would require ripping and seeding of rutted and ponded areas within stand. The depth of ripping is dependent upon the depth of

compaction. The end result would be to return impacted areas to well-drained soils like the soils under the pine stand. Water would infiltrate the soil readily and not pond on the surface.

Short-term and Long-term Effects: The extent of ground disturbance and the estimated short- and long-term effects to soils for the Proposed Action and Alternative 3 are displayed below. In conventional harvesting operations, the impacts of unbladed primary skid trails and unbladed log landings are considered to be short-term impacts to soil productivity because there would be no removal of the surface horizons. These horizons may be mixed due to rubber tire movement on top of the soil surface, but the majority of the soil remains on site and relatively in place. The table below displays the estimated effects to soils from the activities proposed in the alternatives considered in this environmental analysis**.** The extent of the effects in the activity areas are computed using these assumptions, reviewed literature, field visits and preliminary logging plans for the proposed project alternatives.

Table 3.2. Estimated acres of short- and long-term effects to soil productivity in activity areas, by alternative

Activity	Alternative 2		Alternative 3	
	Short-Term	Long-Term	Short-Term	Long-Term
New Road Construction	22	NA	16	NA
Skid Roads/Trails	31-47	15-24	19-29	9-15
Log Landings ½ to 2 acres	40	20	42	21
Road Decommissioning	5	0	1	0
Hile Run Soil Restoration	1	0	7	0
Total Maximum Affected Area	**115**	**44**	**95**	**36**

Alternative 3

After the analysis, the primary difference between the Proposed Action and Alternative 3 was the conversion of units to cable or helicopter from conventional harvest methods.

Soil – Hydrological effects on subsurface flows - Effects of disturbing wet soils:

Potential effects of intersecting the subsurface water table are as follows:

- Erosion occurs on the cutbank and head cutting can occur if flows are large enough.
- Sediment from the erosion moves along the ditch line.
- Changes occur in the hydrologic characteristics of the hillslope and the amount of change would be dependent upon the number of times these wet soils are intersected by roads.
- Soil moisture may be reduced.

An effect of converting those units from conventional harvest methods in the Proposed Action to cable or helicopter harvest in Alternative 3 would be to largely reduce the number of feet of skid trail/road that would be constructed across wet soils. Table 3.Soils.2 shows that the reduction.

Table 3.3. Feet of skid road that would intersect wet soils, by alternative

Conventional and Conventional/Cable Units	Alternative 2	Alternative 3
	356 feet	152 feet

Short-term and Long-term Effects: Under this alternative, less ground based skidding would be used to reduce the chance of soil erosion and stream sedimentation. Some units would be harvested via helicopter logging instead of conventional ground based skidding operations to reduce the chance of soil disturbance on steep slopes and/or wet soils.

New Road Construction: The direct effects of new road construction include a complete removal of the O and A horizons (organic material), and removal of the subsoil material to varying depths in creating a road base in the cut locations. In the fill locations there would be areas where soil material would be borrowed and placed over the native soil surface to bring the soil to grade for the road bed. Soil properties in the roadbed surface and borrow areas are altered to the degree where they do not resemble native soil properties after construction. Compaction, loss of surface water infiltration, and loss of overall long-term soil productivity are to be expected.

Comparison of Environmental Consequences across all Alternatives

Comparison of Herbicide Site Specific Effects for Alternative 2 and Alternative 3:

There is a potential risk for surface area exposure within a unit for percolation and leaching of herbicide into subsurface water tables. The difference between Alternative 2 and Alternative 3 is a reduction of approximately 57 acres of wet soils being exposed to herbicides. This is not a great reduction in acres (approximately 14 percent). Therefore, Alternative 3 did not greatly address the soil water concerns associated with herbicide application with regard to wet soils and possible surface and ground water interception of herbicides via any leaching or runoff. However, because the acres of herbicide application are less in Alternative 3, less herbicide would be applied within the project area.

A potential higher risk may occur when herbicide application post harvesting happens over wet soil types under conventional harvesting methods. The units at risk are 203, 301, 1205, 304, 1205, 2105, 2107, and 2109. In the Alternative 3 proposal, the risk drops to units 203, 301, 1205, and 2109. If subsurface water tables are brought to the surface through conventional harvesting and water moves out of the soil profile and down waterbars or over top of the existing skid road to intersecting channels, the risk of contamination to water bodies would be much greater if any residual herbicides are present for transport. Alternative 3 poses a less risk for this effect than the Proposed Action because of the use of more cable and helicopter harvest methods in more of the units and the dropping of 2 units.

Soil Productivity Comparison of Alternatives:
To put the magnitude of these impacts into perspective, the estimated acres impacted by the Proposed Action and Alternative 3 are compared to the total acres in the activity areas. The following table outlines the estimated reduction in soil productivity within the activity area as defined by the total acres receiving treatment that involves soil disturbance for each Alternative. Soil productivity losses are not calculated for activities being conducted on adjacent private lands. Obtaining these numbers would be difficult due to the variability in landowner activities and the absence of any statewide databases documenting soil disturbance. The Forest Service is aware that private land activities include timber harvesting, skid road development, grazing, agriculture activities, and other minor residential disturbances that can reduce soil productivity (see Table 3.1). However, it would be assumed that all of the activities described do contribute to the overall cumulative effect of the decrease in soil productivity both within the project area and the watershed.

Table 3.4. Estimated percentage of the activity area soils affected by the alternatives

Alternative	Extent of Activity Area (acres)	Percent of the Activity Area	
		Short-Term	Long-Term
No Action – Alt 1	0	0	0
Proposed Action – Alt 2	1,499	8	3
Alternative 3	1,340	7	3

The table above shows that the alternatives considered in this analysis would affect an estimated less than 10 percent of the overall proposed activity area, and most of the impacts would be short-term. Less than 1 percent of this Hogback project area under either action alternative would be affected. This estimate falls within the 15 percent threshold for impaired soil productivity loss from the R9 Soil Quality Standard. Some of the noticeable differences in management such as conventional harvest versus helicopter harvest do not actually get reflected in the overall percent reduction in soil productivity calculation when comparing alternatives. This would be primarily due to the trade off in soil disturbance from skid trail/road development to larger landing size for helicopter landings. Conventional harvesting requires much more in unit disturbance all over the unit in a skid trail/road system, which disperses the soil disturbance. Helicopter harvesting requires minimal in unit soil disturbance but a large disturbance area for the landing sites, which results in a more concentrated area of soil disturbance. In this project, there are less adverse effects from the concentrated soil disturbance from the landing sites than the dispersed soil disturbance from skid trail/roads. The landing locations are in general on ridge tops, nose ridges, or other gentle sloping (less than 8 percent) landscapes. Soil movement would be minimal and the risk of intercepting water would be low.

Cumulative Effects

Historical documentation and physical evidence shows us that the soils in this watershed have been severely impacted. Currently the soils are recovering from massive amounts of disturbance including fires. Any disturbances to the soil resource that remove the soil to bedrock start the soil forming process all over, Time = 0. There are no activities proposed in this assessment that do this to the soil; however, there are activities such as conventional logging, landing development, and road reconstruction that disturb the soil surface and to some degree the subsoil. Soil development would be then setback to some time before present, and to see the recovery of that soil to its native state may take a hundred years. In the case of roads, it would take a change in management and road obliteration to see soil recovery occur. The cumulative effect would be that the soil resource and associated soil productivity would be still recovering from historic activities in the watershed and with additional disturbance; the soil resource would take that much longer to recover.

Private Lands: Table 3.1 describes some activities taking place on private lands. Soil productivity losses are not calculated for activities being conducted on adjacent private lands. Obtaining these numbers would be difficult due to the variability in landowner activities and the absence of any statewide databases documenting soil disturbance. The Forest Service is aware that private land activities include timber harvesting, skid road development, grazing, agriculture activities, and other minor residential disturbances that can reduce soil productivity of known activities within the project area and surrounding watershed). However, it would be also assumed that all of the activities described do contribute to the overall cumulative effect of the decrease in soil productivity both within the project area and the watershed. These activities also

contribute to sediment loads within the subwatersheds where private land exists with National Forest System Lands and overall to the subwatersheds within the Hogback project area.

National Forest System Lands: Forest Service activities occurring on NFS lands are listed in Table 3.1 Effects from disturbance that would have cumulative effects to the soil resource would include compaction from heavily used areas such as oil and gas exploration pads, primary skid roads, landings, and other natural gas right of ways. These activities have had mitigations applied to them that have addressed the effects in varying degrees. Forest Plan standards and guidelines within Forest Plan provide for soil resource protection. The majority of this area has been reclaimed to some degree either naturally or through active management and mitigation implementation.

Qualitatively, soil productivity has not been diminished by these activities. No quantitative soil productivity measurements have been made in association with these activities. Many of them are on-going, such as wildlife opening mowing, road maintenance, and recreational activity. So, over time, small amounts of sediment are generated but not measurable at the project level scale.

Acid Deposition: The Monongahela National Forest has been, and continues to be, the recipient of some of the highest sulfate and nitrate deposition in the nation, mainly due to its location downwind of many older coal-fired power plants that have had minimal or no pollution control required. The combination of high emissions and limited buffering capacity of certain geologies and soil types found on the Forest, has led to increased acidity in stream water and possible nutrient depletion in soils. The available data suggests that there would be little to no effect to soil productivity decline in the area.

Harvesting can remove significant amounts of nutrients from a stand. However, because of the relatively dispersed nature of the cuts, the removals are not expected to be significant, particularly for nitrogen (Adams 1999.) The Hampshire and Chemung geologic groups have moderate amounts (when compared to other geologies on the forest) of weatherable minerals that add nutrients back into the system upon weathering.

Irreversible or Irretrievable Commitment of Resources

Construction of landing and skid roads proposed under Alternative 2 would result in an irreversible commitment of soil resources on approximately 115 acres in the short-term and 44 acres in the long-term. Alternative 3 would be 95 acres in the short-term and 36 acres in the long-term. There would be an irretrievable commitment of approximately 22 acres of soil committed for new road construction under the Alternative 2 and 16 acres in Alternative 3.

Consistency with the Forest Plan

All alternatives would be implemented consistent with Forest Plan standards and guidelines as explained in the above discussions

Consistency with Laws, Regulations, and Handbooks

All alternatives would be implemented consistent with Forest Service laws, regulations, and handbooks regarding management of the soil resource.

3.2.2 Hydrology/Watershed and Aquatic Resources

Introduction

The following is a description of the aquatic resources in the Hogback project area, and the potential effects of implementing the alternatives being considered in the environmental assessment. Please refer to Chapters 1 and 2 of this EA for more detailed descriptions of the project area and proposed activities, and the Soil Resources report for more detailed descriptions of soil resources in the planning area and the potential effects of the alternatives.

Affected Environment

The Hogback planning area encompasses approximately 45,100 acres situated within three fifth level watersheds. Horseshoe Run, designated as hydrologic unit code (HUC) 050200004080 contains most of the planning area (34,400 acres) and most of the proposed activities. The remainder of the project area lies within the Cheat River Direct Drains (HUC 05020004090) and Dry Fork (HUC 050200004070) watersheds. Only a limited number of units are proposed within the Cheat River Direct Drains and no activities are proposed within the Dry Fork watershed. Only 30 percent (13,446 acres) of the planning area are National Forest System (NFS) lands.

Watershed Characteristics: The Hogback planning area represents 98 percent of the Horseshoe Run watershed. There is a small area in the southwest portion of the watershed that is not included in the planning area. The watershed is approximately 35,200 acres in size and has a southwest-facing orientation. It ranges in elevation from 1,575 feet above sea-level (asl) at the downstream extent of the watershed to about 3,662 feet asl in the headwaters of Maxwell Run along Backbone Mountain in the southeastern portion of the watershed. The Horseshoe Run watershed receives between 44.0 inches and 54.9 inches of average annual precipitation at various locations, but averages about 47.9 inches across the watershed. Much of the terrain exceeds slopes of 40 to 50 percent, and some slopes exceed 70 percent.

Approximately 68 percent of the Horseshoe Run watershed is classified as forested land use by the West Virginia Gap Analysis Project (WV-GAP). Streamside areas delineated by buffering 100 feet on each side of all mapped streams indicate nearly 7 percent of the watershed is occupied by these streamside buffer areas. Almost 55 percent of these streamside areas are classified as forested land. Non-forested streamside areas are associated primarily with clearings for municipal uses, private dwellings, and roads.

Only 5 percent of the Horseshoe Run watershed is composed of surficial geology (mostly of the Pottsville Group) that is rated high for sensitivity to acid deposition. This geology occurs as two relatively thin bands oriented lengthwise along the southeastern portion of the watershed. Surficial geology in the remaining portion of the watershed consists primarily of the Chemung Group (rated moderate for sensitivity to acid deposition) although the Hampshire Formation (rated moderate for sensitivity to acid deposition) and the Greenbrier Group (rated low for sensitivity to acid deposition) are also present. Approximately 1 percent of streams in the watershed drain from geology with a high rating for sensitivity to acid deposition. Essentially, no streams in the watershed are currently listed as impaired (Section 303d of the Federal Clean Water Act) by the State of West Virginia. Given the arrangement and composition of the different geologies in the watershed, streams in the watershed are believed to possess acid neutralizing capacities (ANC) capable of buffering pH to levels that support aquatic biota.

Aquatic Biota: The Horseshoe Run watershed is drained by approximately 107 miles of streams mapped at 1:24000. Streams within the Horseshoe Run watershed are inhabited by 23 fish species representing the Cyprinidae (minnow), Catostomidae (sucker), Salmonidae (trout), Centrachidae (bass), and Percidae (perch) fish families. There are 22 native fish species (1 non-native), including two Regional Forester's sensitive species (RFSS) - Cheat minnow (*Parahinichthys bowersi)* and pearl dace (*Margariscus margarita)*. No other aquatic RFSS or federally listed aquatic species are known to occur in the planning area. Eastern hellbender, an amphibian on the RFSS list, was once reported in the Cheat River Direct Drains watershed, but that collection was in 1937 and they have not been recorded in or near the planning area since (Heritage database). Eastern hellbenders will not be discussed further within this analysis.

Aquatic 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 towards federal listing. In some cases, sensitive fish have not been reported in the planning area for several decades and their presence is questionable. But, in the absence of conclusive data, the assumption of this analysis is that potential habitat still exists and will be considered.

There is some discussion whether the Cheat minnow represents a valid species or is a hybrid of longnose dace (*Rhinichthys cataractae*) and river chub (*Nocomis micropogon*). For the purposes of this evaluation, we will treat Cheat minnow as a distinct species. Cheat minnow are considered to be relatively rare throughout their range. Little is known of the life history or habitat requirements of the Cheat minnow. They are characterized as using runs and pools of small to medium size rivers with gravel and cobble substrates. The streams where they have been collected are generally cold to cool water systems. Within the planning area, Cheat minnow have been collected in the main stem of Horseshoe Run, with the last record in the Heritage database being from 1977.

Pearl dace can be found in cold headwater streams, spring-fed creeks, cool bogs, and beaver dams. They will utilize pools near aquatic vegetation with sand and gravel substrates. Their diet includes small crustaceans, copepods, aquatic insects, algae, and other items. Cincotta (personal communication 2003) considers pearl dace to be vulnerable to increased water temperatures. A loss of pool habitat could also impact pearl dace populations. Populations that occupy small headwater streams could also be vulnerable to man-made passage barriers.

Aquatic MIS: Many streams in the project area support native brook trout which are identified in the Forest Plan as a management indicator species (MIS). The management objective for MIS is to maintain or improve their habitat. Brook trout prefer streams with cold, clean water, a 1:1 pool to riffle ratio, and abundant cover (USFWS 1982). While well distributed throughout the planning area, 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, fish habitat conditions, passage barriers, and harvest pressures are considered to be limiting factors. Implementation of the Hogback project has the potential to affect each of these factors through forest and transportation management activities.

Aquatic Habitat and Water Quality: A common concern associated with forest management activities is the potential for ground disturbance to lead to increased erosion and sedimentation. Fine sediment in stream channels can affect water quality and trout productivity. The reproductive success of native brook trout is reduced as levels of fine sediment (<6.5mm) exceed 20 percent in spawning gravels (Bjornn and Reeser 1991). On the Monongahela National Forest,

fine sediment is defined as particles less than 4mm in size, which approximates the size of a brook trout egg. An analysis of paired trout and sediment data collected from streams on the Monongahela National Forest showed that trout productivity generally began to decrease around 20 percent fine sediment (Edwards, personal communication 2002). In 2006, fine sediment sampling was conducted in five streams within or immediately adjacent to the planning area. The data shows that fine sediment levels are near 20 percent for most streams (Table 3.5) and additional fine sediment could be detrimental to stream health and brook trout productivity. The exception, Mikes Run, is outside of the project area.

Table 3.5. Percentage of fine sediment (<4mm in size) in potential spawning sites

	Hile Run	Maxwell Run	Mikes Run	Mill Run	Twelvemile Run
% Fine Sediment	18%	16%	6%	19%	21%

Observations made during field reconnaissance for this project, as well as during other aquatic resource monitoring efforts in 2007, support the conclusion that fine sediment levels are generally good in the planning area, but there are localized areas, such as smaller headwater streams, that have elevated levels.

Water quality monitoring for water chemistry and stream temperatures also indicate conditions that are suitable for supporting native brook trout and other aquatic biota. For many parts of the Forest, water chemistry and the effects of acid deposition are a concern due to acid sensitive geologies that result in poorly buffered stream systems and streams with low pH. There is only a limited amount of acid sensitive geology within the Horseshoe Run watershed, so streams are at a lower risk to acid deposition. This is supported by water chemistry data that shows the streams that were sampled were well buffered and had good pH levels (Table 3.6).

Table 3.6. Stream pH and acid neutralizing capacity (ANC) measurements within the Hogback Project Area

Stream/Season	pH	ANC (ueq/L)	Stream/Season	pH	ANC (ueq/L)
Horseshoe Run/Fall 2001	7.44	403.1	Mikes Run/Fall 2001	7.18	200.3
Horseshoe Run/Spring 2002	6.94	100.2	Mikes Run/ Spring 2002	6.99	69.9
Maxwell Run/Fall 2001	7.69	410.4	Mill Run/Fall 2001	7.89	927.9
Maxwell Run/ Spring 2002	7.19	144.7	Mill Run/Spring 2002	7.48	310.7

In each stream, the fall samples have higher levels of pH and ANC than the samples collected the following spring. This is expected and is not necessarily an indication of a declining trend. Stream pH is typically lower during spring runoff conditions and then increases during the summer baseflow conditions. All of the samples had pH levels around 7.0, which is desirable, and ANCs above 50 ueq/L (microequivalents per liter), which is considered adequately buffered.

Water temperature data were also collected in 2006, utilizing temperature recorders that gathered data from mid-June through late-September. Data were collected in Hile Run, Maxwell Run (two sites), Mikes Run, Twelvemile Run, and Horseshoe Run (data on file at the Monongahela N.F. Supervisor's Office). All of the tributaries showed water temperatures favorable for brook trout and other coldwater species, and their patterns were very similar throughout the summer.

Temperatures considered optimal for brook trout are around 18^0C, and they can tolerate temperatures up to 22^0C (USFWS 1982). Stream temperatures above 25^0C can be lethal to brook trout. For Hile Run, and the other tributaries that were sampled, temperatures remained around the optimal range for most of the sampling period. Temperatures of 20 to 21^0C were recorded for brief periods on most tributaries, and lethal temperatures were never observed.

Temperature data for the main stem of Horseshoe Run is warmer than those observed in the tributaries, and the mainstem is considered better suited for cool-water aquatic assemblages characteristic of smallmouth and rock bass communities. Water temperatures within the lower reaches of the main stem may be too stressful for cold-water biota during much of the year, but these areas can offer important seasonal habitat for cold-water biota during winter months.

Fish habitat conditions in the planning area are affected by a loss of large woody debris (LWD). Large woody debris is important for a number of functions in perennial, intermittent, and ephemeral channels. In perennial streams, LWD increases habitat complexity by scouring pools, trapping spawning gravels, providing hiding cover, and helping to dissipate stream energy. In intermittent and ephemeral channels, LWD helps to trap and store sediment in the watershed, provides structure for channel stability, and helps retain moisture (Duncan et al. 1987; Hicks et al. 1991; Flebbe and Dolloff 1995).

Past logging activities have left most streams in the Hogback planning area with limited levels of LWD. The extensive clear cutting around the early 1900s removed trees adjacent to stream channels that were the source of LWD. Because it takes time for the riparian timber stands to mature, recruitment of LWD has been greatly reduced for the past 60+ years. This has resulted in the existing low levels of LWD in stream channels, and stream environments that are simplified and generally lack adequate pool habitat and hiding cover. Plane bed streams generally lack channel structure, have poor pool development, limited hiding cover, and limited habitat complexity. A number of stream reaches in the Hogback planning area have been characterized as plane bed, which limits fish habitat conditions and productivity.

Today, the riparian timber stands are maturing, and natural recruitment of LWD is expected to increase as trees die and fall into the stream channels. Protecting riparian timber stands to retain this source of recruitment is important for the restoration of aquatic habitat conditions and the protection of water quality in the planning area.

Streams within the planning area represent habitat for a number of aquatic organisms. The amount of habitat available is dependent upon a number of factors such as water quality, stream temperatures, habitat characteristics, and accessibility. The influence of culverts on the movement of aquatic organisms is becoming an increasingly important issue related to the connectivity of stream segments and populations. The improper sizing and installation of culverts can result in passage barriers for organisms moving upstream and down. This, in turn, has the potential to isolate populations and habitat upstream of barrier culverts, and reduce the genetic mixing between sub-populations. Should an upstream sub-population fail, for example, during a period of drought, then downstream sub-populations would be able to re-colonize the upstream habitat during more favorable conditions.

Problems typically arise from culverts that are undersized and create water velocities that are impassable, culverts that are set too high so fish and other organisms are unable to enter from downstream, or culverts that are difficult to pass through because of their length, flow conditions, and/or substrate. Direction in the Forest Plan (WF 21) would provide passage when

new roads are constructed or existing roads are reconstructed; unless a passage barrier is needed to meet aquatic resource management objectives (e.g., restrict the movement of non-native or undesirable species).

Utilizing geographic information system (gis) layers for roads and streams, 51 stream crossings associated with system roads were identified within the planning area. All of the stream crossings have not been inventoried, so the types of stream crossings that are present and whether they are passage barriers has not been determined. Opportunities do exist, when roads are reconstructed or when culverts are replaced due to maintenance needs, to correct existing problems when they are encountered.

Resource Impacts or Issues Addressed

Issue 1: Erosion and Sedimentation

Issue: Soil disturbance associated with timber and road management activities may increase erosion and sediment delivery to streams. This can affect soil and water quality, as well as impair trout productivity within the project area through deposition of fine sediment. Measures are identified to compare the potential soil disturbance in each alternative.

Measure 1: Miles of new road construction

Measure 2: Miles of skid roads and trails

Measure 3: Acres of soil disturbance

No other significant aquatic resource issues were identified during scoping. However, the action alternatives can affect aquatic resources in other ways that will be addressed in this analysis. These include potential effects to water quality and quantity, riparian areas, fish habitat conditions, and aquatic organism passage.

Scope of the Analysis

Proposed activities are distributed throughout the planning area and have the potential to affect a number of streams. Of particular concern are the larger, fish-bearing tributaries that support native trout. Each alternative will be evaluated for potential direct and indirect effects on aquatic resources within the planning area. **Direct** effects are caused by activities that have a direct impact on aquatic resources and occur at the time the project is implemented. Activities in the action alternatives that have direct effects on aquatic resources include skid roads that cross stream channels and road construction and reconstruction at stream crossings. Otherwise, management activities are typically designed to avoid direct impacts to stream channels. **Indirect** effects are effects that occur at a later time or location from where or when the project is implemented. Indirect effects can be caused by activities that change runoff patterns, erosion rates, water chemistry or riparian characteristics.

The spatial boundary used to address **cumulative** impacts is the Horseshoe Run watershed. The effects of the alternatives are considered in context with past, present, and reasonably foreseeable future actions of other activities within the watershed. Any substantial or measurable influence associated with the project is not expected to extend further downstream than the limits of the project area at the mouth of Horseshoe Run and its confluence with the Cheat River below Parsons, WV. This is because of the modest acreage of proposed activities relative to the size of

the Horseshoe Run watershed and the mitigation of effects that have been designed into the project. Once Horseshoe Run enters the Cheat River, the ability to measure any effects associated with the project is masked by the greater watershed size.

The temporal boundary used to evaluate direct and indirect consequences is about 10 years. Research has shown that sediment and hydrologic effects from timber harvesting generally return to pre-harvesting levels in about 5 to 10 years (Kochenderfer et al. 1997; Hornbeck et al. 1997; Swank et al. 2001). Therefore, the temporal boundary used to evaluate cumulative impacts will also be about 10 years.

Methodology

Timber harvest and connected actions have the potential to affect a number of watershed processes. The removal of timber, the type of logging method used and the associated transportation system can alter watershed, riparian and aquatic conditions to varying degrees. The potential risk of these activities is dependent upon the scope of the action, the existing site conditions, and the effectiveness of the mitigation measures used. It is assumed that the more acres treated, the greater the risk to watershed, riparian, and aquatic conditions.

Because the amount, type, and distribution of timber harvest varies by alternative, it can be used to show the relative differences between alternatives and their potential impacts related to:

1) Soil erosion and sedimentation effects on aquatic ecosystems,
2) Water quality and quantity, and
3) Channel and floodplain modifications.

The primary concern is the potential to affect watershed and aquatic conditions due to ground-disturbing activities that cause erosion and reduce water quality and fish habitat. The extent of the effect is largely based on the magnitude of the ground disturbance, soil characteristics, topography, proximity to a stream channel, effectiveness of the mitigation measures, and the existing conditions of the receiving channel. Elevated sediment levels can adversely affect spawning and rearing habitat, and macro-invertebrate populations that are important food sources for fish. See the Soil Resources report for more detail on existing soil conditions and potential effects of management activities in the Hogback project area.

The evaluation for sedimentation considers the amount of ground-disturbing activities that may result in increased erosion, and the location of the disturbance relative to the channel network. Ground disturbing activities are primarily associated with timber and road management activities. The greatest source of sediment from timber management activities is generally due to the transportation system and logging roads (Duncan et al. 1987; Waters 1995). Existing road related problems and construction of new roads are the greatest concerns along with the development of skid roads and trails in conventionally logged units. Improving the drainage and surfacing on existing roads and closing any unneeded roads can help reduce sediment inputs (Swift Jr. 1984; Trieu 1999).

The analysis differentiates between acres treated using helicopter logging, cable logging systems, and conventional, ground-based logging systems. The potential for soil disturbance is less in helicopter units and increases with cable and conventional logging systems. The assumption is the greater the level of ground disturbance, the greater the potential for impacts associated with erosion, sedimentation, and modified runoff patterns. Different logging methods also require

different levels of access, so potential road-related problems, including additional ground disturbance, sedimentation, modified runoff patterns, channel and floodplain modifications, and aquatic passage barriers may differ by logging systems. Conventional logging generally requires more roads to access remote units, while helicopter logging is able to access remote units with fewer roads. Cable systems generally require fewer roads than conventional logging systems (Patric 1980). It should be noted that some units in the Proposed Action (Units 201, 302, 501, and 502) have the potential to be helicopter or cable logged depending on access to the units. Because cable logging has the potential for greater ground disturbance, the analysis will consider these units as cable units.

Forest Plan direction (SW40) provides for one hundred foot wide filterstrips between ground disturbing activities, such as skid roads, and functioning stream channels, including ephemeral channels. The exception would be at essential stream crossings, or when other locations outside of 100 feet pose a greater risk to watershed and aquatic resources. Filterstrips are designed to protect groundcover in order to trap sediment into the existing forest floor before it can reach the stream channel and the width can be adjusted to account for soil types and slope. Forest Plan standard SW40 is consistent with recommendations in the West Virginia Best Management Practices (BMPs) on perennial and intermittent channels and exceeds the BMPs for ephemeral channels.

The following assumptions were made to evaluate the area of ground disturbance associated with logging methods. In units that are conventionally logged, soil disturbance occurs along skid roads and at landing sites. Assuming skid roads average 12 feet in width, there are 1.45 acres of soil disturbance for each mile of skid road. Landings for conventional units are assumed to be 0.25 acres in size. Units harvested by cable logging systems have lower levels of ground disturbance than conventional units. For the purposes of this analysis, the assumption is 6 percent of a unit has ground disturbance when cable systems are used (Patric 1980). Units harvested with helicopters are considered to have negligible ground disturbance as the trees are felled and then lifted from the sites. Helicopter landings are estimated to be 1 acre in size.

Road management activities proposed in the Hogback planning area can also affect watershed conditions and aquatic resources. New road construction represents areas of new soil disturbance within the watershed and potential sources of erosion. For the purpose of this analysis, it is assumed that each mile of road construction represents 4 acres of new soil disturbance. This assumes that the average width of system roads is 33 feet, which includes the cut and fill slopes and running surface. Proposed road reconstruction can be beneficial in the long run if existing road related problems are corrected. Increasing the number of drainage structures, gravel surfacing, and replacing barrier culverts may result in short-term impacts, but are considered a long-term improvement over existing conditions. There are some cases where roads that have not been used in several years have revegetated. Reconstruction efforts and the increase in road use for timber hauling can represent an increase in sedimentation over existing conditions. Implementing Best Management Practices and Forest Plan standards and guidelines can minimize the potential impacts of the roads, but the management activity represents a disturbance over existing conditions. Roads that are decommissioned are considered to be an improvement over existing conditions as drainage structures are pulled, soils are decompacted, slope and drainage patterns are restored, and the sites allowed to return to a more natural state. Approximately 4 acres of watershed improvement occur as each mile of road is decommissioned.

In addition to effects associated with erosion and sedimentation, timber management activities can also affect runoff patterns, riparian conditions, and stream channel conditions. Trees play a role in the hydrologic function and nutrient cycling within watersheds. Runoff from forested watersheds is influenced by a number of factors such as precipitation patterns, vegetative cover, soil characteristics, elevation, and topography. Management activities that alter soil or vegetative characteristics can potentially affect the hydrologic response of the watershed if the size and intensity of the activity is great enough.

Studies of the effects of timber harvesting on stream flows in small, headwater drainages have shown that as hardwood forests are harvested, evapotranspiration is reduced and stream flows 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). Within a year, as the harvested sites revegetate, the influence on stream flows is greatly reduced and the hydrologic response of the site generally returns to pre-harvest conditions in 5 to 10 years (Hornbeck et al. 1997; Swank et al. 2001).

Increased stream flows due to timber harvesting primarily occur during the summer and fall when flows are typically at their lowest (Hornbeck 1973; Hornbeck et al. 1997; Swank et al. 2001). Studies show that timber harvesting can affect storm flows and peak flows, mainly during the growing season, and to a lesser extent during the dormant season (Hewlett and Helvey 1970; Swank et al. 2001). In watersheds that receive snow during the dormant season, peak flows can even be reduced because of changes in the distribution and melting of snow packs due to timber harvesting (Hornbeck 1973; Hornbeck et al. 1997). In a 74 acre watershed that was clearcut on the Fernow Experimental Forest, which is located a few miles south of the Hogback planning area; peak flows increased an average of 21 percent during the growing season and decreased 4 percent in the dormant season (Reinhart et al. 1963).

The amount of stream flow increase is largely dependent upon the type of harvest (e.g., clearcutting, partial cutting, 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 to 30 percent 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). Although increases in storm flows and peak flows 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 generally concluded that contemporary timber harvesting in forests of the eastern United States is not on a scale that would affect flooding downstream (Douglass and Swank 1972; Hornbeck 1973; Hornbeck et al. 1997). There is a potential, though, that harvesting that is concentrated in smaller headwater drainages may have localized effects to stream flows.

For the purpose of this analysis, clearcuts and shelterwoods are considered to remove 100 percent of the basal area within the harvest unit and would have the highest potential for affecting streamflows. In addition, the creation of savannahs is also considered to remove 100 percent of the basal area in the treated area. A limited number of units are identified for overstory removal. The overstory is removed when the understory is fully stocked (approximately 10+ years old), so the hydrologic effect of the overstory removal is considered to

be negligible. It is likely that damage to the residual understory stand would occur during harvest, and this is estimated at 10 percent of the area (Hudak, personal communication 2002). This figure was considered in the analysis of basal area removed. Units to be commercially thinned generally remove an average of 33 percent of the basal area. A similar figure of 33 percent is used for stands that are non-commercially treated to release high quality trees.

The analysis will also assume that all vegetative treatments within the project area would occur in the same year. The resulting hydrologic response will represent a "worst case" scenario if all vegetative treatments are conducted at the same time. The first year after treatment is the period when the project area would show the greatest hydrologic response and is most vulnerable to the cumulative effects of increased flows. The analysis considers that a detectable change in streamflow occurs when 20 percent of the existing basal area is removed by all the vegetative treatments combined. It should be noted that the existing baseline conditions represent modified hydrologic conditions due to past and present land management activities, such as roads and past harvest activities. It is assumed that these conditions have been present for several years and channels have adjusted to the modified flows during this time. The analysis will look at the potential effect of the proposed projects on these modified baseline conditions.

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). Roads efficiently route water through the watershed and act as extensions to the stream drainage network. The construction of new roads and skid roads is considered to be new disturbance over existing conditions and can contribute to modifying the hydrology of the project area. Roads that are reconstructed may reduce the current effect of roads on the watershed by improving existing road drainage problems, and opportunities to decommission unneeded roads would also be beneficial.

The role of trees in nutrient cycling is a growing concern in watersheds with geologies that have poor acid-buffering capacity and are sensitive to acid deposition. Geologies and soil types within the Hogback planning area appear to be well buffered (see Soil Resource report for more detail), and no streams within the planning area are known to be impaired by acid deposition. Acid deposition effects on aquatic resources have not been identified as an issue within the Hogback planning area and will not be further analyzed.

Timber harvest has the potential to affect riparian areas, which in turn can affect recruitment of large woody debris, stream shading, and bank stability. Channels that are within or adjacent to timber harvest units would have buffer strips where no programmed harvest would occur. Along perennial channels, the buffer strip would be a minimum of 100 feet wide on both sides of the channel to provide the full potential of LWD recruitment. The buffer strip would also provide bank stability and stream shading along perennial streams. On intermittent channels, where the stream energy and transport of LWD is reduced, buffer strips would be a minimum of 50 feet wide on both sides of the channel. Ephemeral channels within or adjacent to units would have a 25-foot wide buffer strip on both sides of the channel.

Channel buffers are intended to provide for a variety of functions, including recruitment of LWD. There are a number of studies on the importance and role of LWD in stream channels, but few addressing the recruitment potential from riparian stands. McDade et al. (1990) evaluated the source distance of LWD in 39 streams in the Pacific Northwest and found that 70 percent of the LWD that was recruited from riparian areas originated from within 66 feet of the stream

channel. For hardwood species, 83 percent of the recruitment came from within 33 feet, and all hardwood LWD originated from within 82 feet. For conifers with taller average stand heights, the source distances were greater. Approximately 53 percent of the conifer LWD recruitment originated from within 33 feet of the channel, and 87 percent originated within 82 feet. A similar study in Oregon by May and Gressel (2003) found 80 percent of LWD recruitment in headwater streams came from source distances of 30 to 50 meters (98 to 164 feet). We can speculate that our buffers along perennial channels would provide similar rates of recruitment potential as those observed in the studies and protect close to 100 percent of the recruitment potential in treated stands. For small, intermittent and ephemeral channels, the default channel buffers are reduced to 50 feet and 25 feet along both sides of the channel, respectively. These represent a decrease in the recruitment potential within the treated areas, but these streams are typically smaller with less stream energy, so losses of LWD due to transport are reduced.

Roads in the Hogback planning area would be utilized to access units and to haul timber. Aside from their potential effects on erosion and sedimentation as discussed earlier, roads can have direct impacts on riparian areas and stream channels where they cross. Utilizing the Forest geographic information system (GIS) layers for roads and streams in the Hogback planning area, there are approximately 51 intersections associated with streams and system roads. There are additional stream crossings on nonsystem roads and on channels that are not mapped (i.e. intermittent or ephemeral channels). Some identified crossings are a result of mapping errors, where the stream is mapped as crossing the road, but in actuality is running alongside it. Additional field surveys are necessary to identify the types of stream crossings that are present and the level of effect each is having on the stream and its biota. The intent of Forest Plan direction for roads proposed for construction or reconstruction is to provide passage on any existing or potential fish-bearing streams, unless a barrier is needed for aquatic resource management (Forest Plan Standards and Guidelines WF21). Roads proposed for decommissioning could also correct existing passage barriers by removing structures that are barriers.

Many Forest System roads in the Hogback planning area are currently gated and vehicle use is allowed for administrative purposes only. The potential exists to open some of these roads, either seasonally or year-round, to allow public access. The potential increased use on these roads, especially during adverse weather conditions, can result in road-related problems, such as rutting, which can increase erosion and sedimentation. Open roads can also improve access to native brook trout streams and result in increased fishing pressure and harvest.

A number of the units are proposed to have pre and post-harvest activities that include the use of herbicides. Herbicides would also be used to control nonnative invasive species. Information obtained from reviews of the effects of herbicides, and from the results of some monitoring work done elsewhere, have shown that these herbicides are safe to water quality and aquatic biota, and to the public when they are applied according to label directions and all applicable laws and regulations, and with design features for the protection of water and aquatic resources. These design features include filterstrip protection along stream channels, target-specific application methods, and wet weather restrictions on application. Supervision of herbicide treatments would be by a State-certified applicator. As long as all requirements are followed, no substantial offsite adverse effects in streams or groundwater are expected.

Direct/Indirect Environmental Consequences by Alternative

Alternative 1 - No Action Alternative

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 Hogback project area are likely to persist and continue to suppress trout populations. No new sources of sediment would be created 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. In the long term, LWD levels should increase as the existing forest matures and trees adjacent to functioning channels fall. As a result, sediment levels may decrease through time as sediment storage within the watershed increases with increased levels of LWD in perennial, intermittent, and ephemeral channels. Fish habitat diversity will also increase as LWD is incorporated into channels and improves spawning and rearing habitat. No vegetative treatments would be implemented, so the hydrologic response of the watershed would largely remain as is, and the source for LWD recruitment would not be reduced. Any changes in runoff patterns or LWD 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

Alternative 2 is the Proposed Action and has the greatest level of activity.

Erosion and Sedimentation: Overall, the combination of activities in Alternative 2 would disturb an estimated 107 acres of soil in the planning area (Table 3.7). This represents less than 0.7 percent of NFS lands and 0.3 percent of the overall planning area. Activities in Alternative 2 are distributed throughout the Hogback planning area and can potentially affect a number of streams, but, the scope and general location of soil disturbance, coupled with Forest Plan direction to minimize erosion, reduces the potential impacts on aquatic resources.

Table 3.7. Estimated acres of soil disturbance in Alternative 2

Disturbance Mechanisms	Disturbance Factor	Length/ Number	Acres Disturbed
Skid Roads/Trails (1.45 acres/mile)	1.45	26	37.5
Cable Systems (6% of unit area)	0.06	349	20.9
Conv. Landings (0.25 acre each)	0.25	31	7.8
Heli. Landings (1 acre each)	1	24	24.0
New road const. (4 acres/mile)	4.0	4.58	18.3
Road reconstruction (4 acres/mile)	4.0	0.5	2.0
Decommissioning (4 acres/mile)	4.0	0.94	-3.8
Total			**106.7**

Overall, the risk to erosion and sedimentation is low, but there are site specific concerns associated with conventionally logged units in close proximity to perennial streams and/or located on sensitive soil types. In particular, Units 603, 607, 2105, 2106, and 2108 pose more of a risk to aquatic resources than others. Units 603 and 607 are located adjacent to perennial streams that are tributaries to native brook trout streams, and soils within the units are rated sensitive due to steep slopes. Unit 2105 is flatter, but is bordered by two perennial streams, including Wolf Run, a native brook trout stream. Units 2105 and 2108 are located in the Mill

Run drainage, which is a native brook trout stream, and in the recent past has had elevated levels of fine sediment.

An evaluation of GIS layers of the approximate location of the proposed skid roads to perennial channels showed that essentially 100 percent of their length is located at least 100 feet, and 98 percent are 200+ feet, from perennial channels identified on topographic maps. The one exception for skid roads mapped within 100 feet of perennial channels occurs in the Unit 2106. Approximately 340 feet of skid road are mapped within 100 feet of an unnamed tributary to Wolf Run, and nearly 2,200 feet are within 200 feet. When skid roads are laid out on the ground, the skid roads should be located further than 100 feet from this tributary. Frequent water drainage structures, such as water bars, and a quick rehabilitation of disturbed soils following harvest would also help to reduce the risk of erosion and sediment associated with skid roads located in close proximity to stream channels.

Alternative 2 includes the development of 31 conventional landing sites and 23 helicopter landing sites which are distributed throughout the planning area. The conventional landings are approximately 0.25 acres in size and helicopter landings 1 acre. Forest Plan direction restricts landing sites from within 100 feet of perennial, intermittent and ephemeral channels which protects the stream filter and buffer strips. The location of the landings, which are generally close to roads and along ridgelines away from channels, and the rehabilitation of the landing sites (see Soil Resources report), minimize the risk of landings on aquatic resources.

Access to the harvest units would utilize existing roads and the proposed construction of 4.6 miles of new roads. Maintenance of existing roads can be beneficial by adding gravel to road surfaces, cleaning and maintaining culverts and cross-drains. There is 0.5 mile of road reconstruction proposed on FR 751 which is located in the headwaters of Horseshoe Run. This work should correct any existing road related problems along FR 751 and be an improvement over existing conditions. Roads proposed for construction are relatively low risk because of their locations and relatively short lengths. A total of 18 road segments would be constructed, ranging in length from 0.1 to 0.9 miles, with over 75 percent of them less than 0.5 miles in length. They are generally midslope or ridgetop roads and pose limited risk to aquatic resources.

Soil resources and watershed conditions would be improved with decommissioning portions of road 751 and the rehabilitation of floodplain soils in Unit 1101, but the work is relatively limited in scope. Approximately 7 acres would be treated which would benefit onsite soil productivity, but would be undetectable for aquatic resources.

Table 3.8. Estimated basal area (BA) removed in Alternative 2

Activity	Acres	% BA Removed	Clear Cut Equiv	% Planning Area
Clear cut	1,269	100	1269	9.4%
Shelterwood	88	100	88	0.7%
Overstory Removal	63	10	6	0.0%
Thinning	53	33	17	0.1%
Conv. Landings (0.25 acre each)	7.8	100	8	0.1%
Timber Stand Improvement	805	33	266	2.0%
Heli. Landings (1 acre each)	23	100	23	0.2%
New road const.	18.3	100	18	0.1%
Total	**1,522**		**1,430**	**12.6%**

Water Quality and Quantity: Overall, the level of harvest activity should not have an influence on stream flows. Table 3.8 displays the projected percentage of basal area removed by activities in Alternative 2. As discussed earlier, approximately 20 to 30 percent of the basal area needs to be removed before a change in stream flows can be detected. Within the planning area an estimated 13 percent of the existing basal area would be removed from all activities combined in Alternative 2 on NFS lands.

The use of herbicides is proposed on approximately 712 acres distributed throughout the planning area. The herbicides would be used at varying levels and in varying combinations during pre-harvest and post harvest activities to control competing vegetation and nonnative invasive species. Information obtained from reviews of the effects of herbicides have shown that these herbicides are safe to water quality and aquatic biota when they are applied according to label directions and all applicable laws and regulations, and with mitigation measures for the protection of water and aquatic resources. These mitigation measures include filterstrip protection along stream channels, target-specific application methods, and wet weather restrictions on application. Supervision of herbicide treatments would be by a State certified applicator. These measures have been incorporated into the project description and the recommended mitigation measures. As long as all requirements and mitigations are followed, no substantial offsite adverse effects in streams or groundwater are expected. No measurable adverse effects to the aquatic community are expected.

Aquatic Habitat Conditions and Availability: There is minimal concern with the effects of Alternative 2 on LWD recruitment. Riparian buffers along functioning channels would retain the majority of LWD recruitment potential in the areas treated. The buffers coupled with the limited scale of harvest relative to the drainage network should protect riparian functions throughout the planning area. Some localized impacts may occur where new roads cross ephemeral channels, but this should be limited and generally located high in the drainages and near ridge tops. There also may be minor impacts to riparian areas where cable logging occurs. Narrow corridors may need to be created through riparian areas where cables are tied off on the opposite side of the drainage from the units to be harvested. Individual trees could be felled and some damage to residual stands could result from movement of the cables. The level of disturbance is expected to be minimal and not have an appreciable effect on stream shading or LWD recruitment. If trees need to be felled within the riparian areas, then they can be directionally felled towards the channel as LWD.

Aquatic passage barriers would remain the same as the existing conditions. The opportunity to correct existing problems on roads to be reconstructed or decommissioned is not available because the roads to be reconstructed and decommissioned do not cross perennial streams. No barriers to fish-bearing, or potential fish-bearing streams, would be created on the new road construction because the proposed road segments do not cross any perennial streams.

Alternative 3

Alternative 3 is similar to the Proposed Action, but some timber and road management activities have been modified to provide additional protection to soil and water resources. The alternative includes 1,119 acres of regeneration harvest, 66 acres of shelterwood harvest, 60 acres of overstory removal, and 53 acres of commercial thinning. A variety of logging methods would be utilized including 280 acres of conventional logging, 694 acres of helicopter logging and 324 acres of cable logging. The conventional logging would utilize 25 landings, and 23 landings would be developed for helicopter logging. Approximately 20 acres of wildlife openings would

be created from landing sites. Alternative 3 includes 3.3 miles of new road construction, 20 miles of road maintenance, 1.4 miles of road decommissioning and over 15 miles of skid roads and trails. Timber stand improvement (TSI) work is proposed for 805 acres using mechanical and chemical treatments to release high value species. Herbicides are also proposed to be used to control understory vegetation (232 ac.) and non-native invasive species (55 ac.). Soil restoration work is proposed on three acres where off-road vehicles have damaged the Horseshoe Run/Hile Run floodplains.

Erosion and Sedimentation: Overall, the combination of activities in Alternative 3 would disturb an estimated 78 acres of soil in the planning area (Table 3.9). This represents less than 0.5 percent of NFS lands and 0.2 percent of the overall planning area. The primary difference between alternatives is changing logging methods in units of concern to reduce potential soil and water impacts. The result is a 40 percent reduction in skid roads from 25 miles in Alternative 2 to 15 miles in Alternative 3. Total soil disturbance is also reduced and there is a slight increase in road decommissioning.

Table 3.9. Estimated acres of soil disturbance in Alternative 3

Disturbance Mechanism	Length/Size	No.	Acres Disturbed
Skid Roads/Trails (1.45 acres/mile)	1.45	15	21.8
Cable Systems (6% of unit area)	0.06	324	19.4
Conv. Landings (0.25 acre each)	0.25	25	6.3
Heli. Landings (1 acre each)	1	23	23.0
New road const. (4 acres/mile)	4	3.26	13.0
Road reconstruction (4 acres/mile)	4	0	0.0
Decommissioning (4 acres/mile)	4	1.44	-5.8
Total			**77.7**

With the exception of Unit 2106, the conventional units that were identified as higher risk for erosion and sedimentation in Alternative 2, are proposed for cable logging in Alternative 3. This reduces the area of ground disturbance within these units and reduces the risk of sedimentation. Unit 2106 is proposed for conventional logging in both action alternatives, and the concerns identified with skid roads in Alternative 2 are similar.

Alternative 3 includes the development of 25 conventional landing sites and 23 helicopter landing sites which are distributed throughout the planning area. The conventional landings are approximately 0.25 acres in size and helicopter landings 1 acre. Forest Plan direction restricts landing sites from within 100 feet of perennial, intermittent and ephemeral channels which protects the stream filter and buffer strips. The location of the landings, which are generally close to roads and along ridgelines away from channels, and the rehabilitation of the landing sites (see Soil Resources report), minimize the risk of landings on aquatic resources.

Access to the harvest units would utilize existing roads and the proposed construction of 3.3 miles of new roads. Maintenance of existing roads can be beneficial by adding gravel to road surfaces, and cleaning and maintaining culverts and cross-drains. There is no road reconstruction proposed in Alternative 3. Roads proposed for construction are relatively low risk because of their locations and short lengths. A total of 16 road segments would be constructed, ranging in length from 0.1 to 0.9 miles, with 88 percent of them less than 0.5 miles in length. They are generally midslope or ridgetop roads and pose limited risk to aquatic resources.

Soil resources and watershed conditions would be improved with decommissioning portions of road 751 and the rehabilitation of floodplain soils in Unit 1101, but the work is relatively limited in scope. Approximately 9 acres would be treated which would benefit onsite soil productivity, but would be undetectable for aquatic resources.

Water Quality and Quantity: Overall, the level of harvest activity should not have an influence on stream flows. Table 3.10 displays the projected percentage of basal area removed by activities in Alternative 3. Within the planning area, an estimated 11 percent of the existing basal area would be removed from all activities combined in Alternative 3 on NFS lands.

Table 3.10. Estimated basal area removed in Alternative 3

Activity	Acres	% BA Removed	Clear Cut Equiv	% Planning Area
Clear cut	1,119	100	1119	8.3%
Shelterwood	66	100	66	0.5%
Overstory Removal	60	10	6	0.0%
Thinning	53	33	17	0.1%
Timber Stand Improvement	805	33	266	2.0%
Conv. Landings (0.25 acre each)	25	100	25	0.2%
Heli. Landings (1 acre each)	23	100	23	0.2%
New road const.	13	100	13	0.1%
Total	**2,164**		**1535**	**10.7%**

The potential effects of herbicides on water quality are discussed in Alternative 2; the only difference is 11 fewer acres of post-harvest NNIS treatment is proposed in Alternative 3. As long as all requirements and mitigations are followed, no substantial offsite adverse effects in streams or groundwater are expected. No measurable adverse effects to the aquatic community are expected.

Aquatic Habitat Conditions and Availability: There is minimal concern with the effects of Alternative 3 on LWD recruitment. Riparian buffers along functioning channels would retain the majority of LWD recruitment potential in the areas treated. The buffers coupled with the limited scale of harvest relative to the drainage network should protect riparian functions throughout the planning area. Some localized impacts may occur where new roads cross ephemeral channels, but this should be limited and generally located high in the drainages and near ridge tops. There also may be minor impacts to riparian areas where cable logging occurs. Narrow corridors may need to be created through riparian areas where cables are tied off on the opposite side of the drainage from the units to be harvested. Individual trees could be felled and some damage to residual stands could result from movement of the cables. The level of disturbance is expected to be minimal and not have an appreciable effect on stream shading or LWD recruitment. If trees need to be felled within the riparian areas, then they can be directionally felled towards the channel as LWD.

Aquatic passage barriers would remain the same as the existing conditions. There are no opportunities to correct existing problems on the road to be decommissioned. No barriers to fish-bearing, or potential fish-bearing streams, would be created on the new road construction because the proposed road segments do not cross any perennial streams.

Cumulative Effects

Cumulative effects address the environmental consequences from all activities implemented within the Horseshoe Run watershed in the past, present, and reasonably foreseeable future (see project list Table 3.1). 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.

The existing conditions of the aquatic resources in the Horseshoe Run watershed reflect the cumulative effects of past and present actions. As described earlier, streams in the planning area are in relatively good shape given the range of activities that occur on and off Forest. Water quality is generally good in terms of water chemistry and stream temperatures. But, fish habitat conditions in the planning area are considered impaired by the limited amounts of LWD and channel structure, and could be affected by an increase in fine sediment levels associated with ground disturbing activities. 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 Hogback 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. Assuming the activities on private lands remain relatively constant, existing watershed and stream conditions within those areas should persist in the foreseeable future.

On NFS lands, it is anticipated that the implementation of actions identified for Hogback would not result in a change to water chemistry, stream temperatures, LWD recruitment, and habitat connectivity, so it would not have a cumulative effect from activities in the watershed. The following cumulative effects analysis addresses the overall influence of land use activities in the planning area on the aquatic resource issues of sedimentation and stream flows.

Alternative 1: Alternative 1, the No Action alternative, would neither create new sources of sedimentation nor correct existing sources. Ongoing management actions associated with the maintenance of roads, trails, and recreation sites would continue. The cumulative effect on sedimentation is similar to current conditions, and the potential for road related problems remains on a number of roads that have inadequate drainage structures.

In the short term, LWD levels will remain similar to current levels and should increase through time as natural recruitment occurs. The recruitment of wood to channels will improve channel stability, habitat complexity, hiding cover, and a number of other functions that will improve aquatic resource conditions.

Alternative 2*:* Alternative 2, the Proposed Action, has the greatest level of activity of the action alternatives. The combination of Forest Plan standards and guidelines and project design would minimize the potential effects of sedimentation within the streams of the Hogback project area and the addition to cumulative impacts is anticipated to be minor and short term. Disturbed soils, primarily associated with skid roads and landings, would be quickly revegetated, and filterstrips are incorporated in the project design to trap sediment before it can move into the channel network. Some sedimentation would enter the network where roads and skid roads cross intermittent and ephemeral channels. This is expected to be relatively minor and should flush quickly when the stream channels flow during storm events.

Approximately 70 percent of the planning area is on private lands, so activities such as private homes, logging, and agriculture can have a major influence on erosion and sedimentation. To date, the watershed appears to be fairly tolerant of the range of activities that have occurred. The cumulative impacts of activities on-Forest and off have not resulted in any streams being listed on the 303(d) list, and water quality monitoring indicates that water chemistry and fine sediment levels are relatively good.

Effects to Sensitive Species and Aquatic MIS

Alternative 1: No projects would be implemented, so the existing aquatic resource conditions will persist. This is likely to have no effect to the two sensitive fish that have been reported in the planning area. Existing conditions likely limit the presence and productivity of the sensitive species, and those conditions are not likely to change under the No Action alternative. Native brook trout are also found in a number of tributaries within the project area, and existing conditions likely limit their numbers and productivity. These populations should persist and their productivity remain unchanged under the No Action alternative.

Alternative 2 and 3: The risk to sensitive aquatic species in the action alternatives is relatively minor. Cheat minnow generally occupy larger stream systems such as the mainstem of Horseshoe Run and the potential effects associated with the Hogback project are unlikely to be detectable at that scale. Pearl dace inhabit small, cold headwater streams in the headwaters and are more vulnerable to management activities. They are sensitive to increased water temperatures so the retention of riparian buffer strips is important for the protection of stream shading. The riparian buffers and areas of no programmed harvest along stream channels in the Hogback project should protect stream temperatures and potential Pearl dace habitat. The buffer strips would also benefit native brook trout, which prefer cold water temperatures, and provide a source of LWD which would improve habitat conditions through time. Ground disturbing activities identified in the action alternatives have the potential to increase erosion and sedimentation in a number of brook trout streams. The location of activities, design features such as filterstrips, and mitigation measures such as helicopter logging should minimize the potential impacts of sedimentation on brook trout populations.

Irreversible or Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitments of aquatic resources associated with this project. The exception would be if riparian trees are cut for stream crossings, but this is expected to be minimal.

Consistency with the Forest Plan

All alternatives would be implemented consistent with Forest Plan standards and guidelines.

Consistency with Laws, Regulations, and Handbooks

All alternatives would be implemented consistent with Forest Service laws, regulations, and handbooks regarding management of the soil and water resources.

3.2.3 Air

Resource Impacts Addressed

Individual timber harvests are not a regulated activity under the Clean Air Act, which means that it would not be necessary to seek an air quality permit for this project.

However, the Clean Air Act (CAA), as amended in 1977 and 1990, sets the standards for air quality in the United States. One important aspect of air quality regulations is the National Ambient Air Quality Standards (NAAQS). Primary NAAQS are set based on criteria deemed adequate for the protection of human health and have been developed for six specific pollutants called "Criteria" pollutants. The responsibility to ensure these standards are met or "attained" in WV has been delegated to the West Virginia Department of Environmental Protection.

However, it is the responsibility of the Monongahela National Forest (MNF) to ensure that management activities do not significantly contribute to a violation of the NAAQS or hinder the state's progress towards meeting its air quality goals. Emissions from timber harvest activities are a concern only to the extent that they would contribute to the total "criteria" pollutant load.

Environmental Consequences

Previous analyses of criteria pollutant emissions from projects similar to the Proposed Action Alternatives have shown that air quality impacts would be negligible when compared to the current condition. Based on these analyses, impacts to air quality from proposed activities in the Hogback area are also expected to be negligible.

Irreversible or Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitments of air resources as a result of any of the alternatives.

Consistency with the Forest Plan

Direction in the Forest Plan requires that the Forest conduct all management activities in a manner that is consistent with applicable state and federal air quality regulations. Previous analyses have shown that emissions from projects similar to the action alternatives are unlikely to cause substantial impacts to the air resource and therefore, would not contribute to a violation of the NAAQS, or hinder a states progress towards meeting its air quality goals.

Consistency with Laws, Regulations, and Handbooks

As stated previously, individual timber harvests are not a regulated activity under the Clean Air Act, which means that it would not be necessary to seek an air quality permit for project. However, the Forest strives to ensure that air pollutant emissions from management activities do not contribute to a violation of a NAAQS or any other state or federal air quality regulations. As stated previously, emissions from proposed activities in the Hogback area would not contribute to a violation of the NAAQS or any other air quality regulations.

3.3 Biological Resources

3.3.1 Vegetation

Resource Impacts

The Hogback project area is dominated by mature sawtimber-sized mixed oak and mixed hardwood forests. The forests in the project area are approximately the same age, with most having been regenerated in the 1880s through the 1920s.

Over-browsing by deer has impacted the vegetation within the project area. Selective browsing by deer has resulted in dense ground covers of ferns and grasses which have interfered with woody regeneration. Grass and fern competition deny light to woody seedlings (Horsley 1977; Horsley and Marquis 1983). Selective browsing by deer favors the survival of species such as striped maple and beech. These species tend to dominate the understories of many stands in the project area. Striped maple has low wildlife value, and both species have low timber value. Also, beech is imminently threatened by beech bark disease, and is unlikely to survive to maturity in numbers sufficient to make a substantial contribution to future mast production.

This section addresses the impacts that the Hogback project would have on the forest vegetation in the area. The impacts of the treatments on both the overstory and understory vegetation will be discussed

Scope of the Analysis

The 45,068-acre Hogback project area is located in Tucker and Preston counties. Approximately 30 percent of the project area is National Forest System lands (Table 1.1 in Chapter 1). Vegetation treatments would occur within Compartments 2, 3, 4, 5, 6, 7, 11, 12, 13, and 21. Fifty-four separate harvest units ranging from 3 to 40 acres in size and totaling 1,460 acres were identified in these compartments. Approximately 10 percent of the NFS lands in the project area would be impacted by the treatments.

Methodology

All the units were evaluated using the standards and guidelines set for prescribing silvicultural treatments in Allegheny hardwood stands (Marquis et al. 1992). Understory and overstory data were collected in all of the units in the project area. Private consulting foresters and research foresters for the Northern Research Station were also consulted when developing stand treatments in the project area.

Environmental Consequences Common To All Action Alternatives

Early successional habitat would be created in all action alternatives. The action alternatives would move the project area toward a more balanced age class distribution. Herbicide use in the action alternatives would control beech, striped maple, and ferns in the understories of the units. Timber stand improvement work in the action alternatives would have the effect of increasing the amount of red oak and black cherry in young stands in the project area. All the units fall in management prescriptions compatible with timber production.

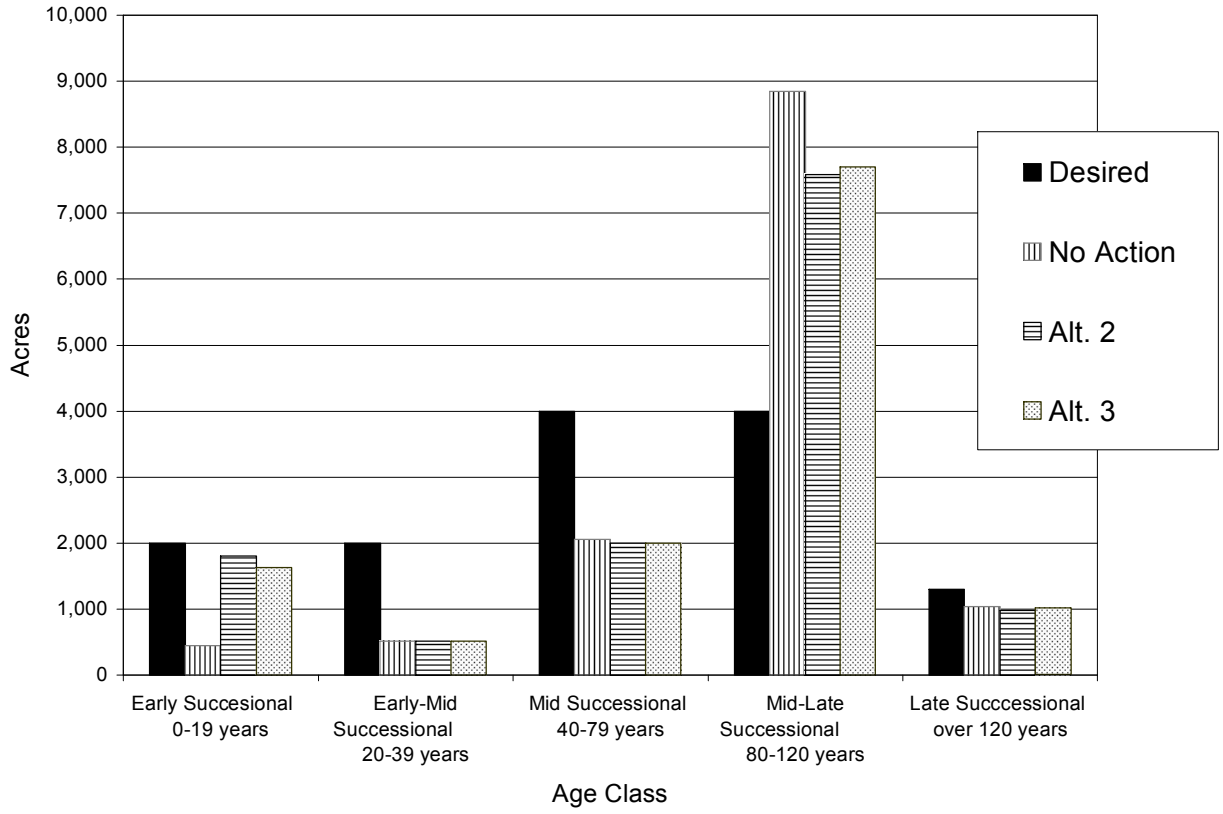
Direct/Indirect Environmental Consequences By Alternative

Alternative 1 - No Action

The vast majority (91 percent) of the stands in the project area are mature forest between 75 and 120 years old. A small portion (3 percent) of the area is in early successional habitat (0 to 19 years old). Without regeneration, the amount of early successional habitat would continue to decrease as the present early successional stands move into sapling/pole size stands.

As these stands age, many of the shade-intolerant species such as black cherry, white ash, red oak, and yellow-poplar would die out and be replaced by shade tolerant species like red maple, sugar maple, and beech. The same is true on private land where black cherry and red oak are harvested due to their high timber value. Species of lesser value are left to continue growing, which hastens the conversion to shale-tolerant species.

Figure 3.1. Projected age class distribution in five years for the Hogback project area



Alternative 2 - Proposed Action

The proposed action would regenerate 1,269 acres using the clearcut with reserves method and 88 acres using the shelterwood method of regeneration. This would result in a 400 percent increase in early successional habitat. The proposed action would decrease the amount of mature forest by 10 percent. The proposed action would move the project area toward the balanced age class structure called for in the Forest Plan. The proposed action would also create approximately 90 acres of oak-pine forest type. Thinning would be done in 53 acres in the project area. The thinning treatments would have no influence on the age class structure.

The proposed action would have only minor effects on forest type. Most of the stands proposed for regeneration are typed as mixed oak and mixed hardwood forest types. The future desired

condition of the regeneration stands is mixed upland hardwood. There would also be approximately 24 helicopter landings constructed. After being used for this project, these areas would remain as wildlife openings and may be used again in the future for landings.

In the proposed action, fencing may be used to prevent deer browsing of desirable regeneration in approximately 104 acres of regeneration units. Fencing would have the effect of ensuring the successful regeneration of the current species mix of red oak, white oak, chestnut oak, yellow-poplar, and black cherry. Fencing would also increase species diversity by preventing the selective browsing of woody and herbaceous plants.

The 805 acres of timber stand improvement in Alternative 2 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; they both have high timber and wildlife value. The timber stand improvement activities would also have the short-term effect of increasing the amount of herbaceous vegetation by increasing the amount of light reaching the forest floor.

Alternative 3

Approximately 150 acres less regeneration harvesting would occur in Alternative 3 than the proposed action (Table 2.1). Alternative 3 would restore 30 percent less of the oak-pine forest type than Alternative 2. The same amount of thinning would be done in Alternative 3 as in Alternative 2. The other major difference between the two alternatives is the logging systems used (Table 2.2). Fifty percent less ground-based logging would occur in Alternative 3 than in Alternative 2. The increased use of helicopter logging in Alternative 3 would also have a negative impact on the follow-up silvicultural treatments, such as fencing and herbicide treatments. Helicopter yarding costs are much higher than other systems, which limits the money available for fencing and herbicides. It also limits access to the stands, since no roads would be constructed to the stands.

Cumulative Impacts

Alternative 1 - No Action

Under Alternative 1, the forest would retain a high proportion of mature sawtimber. Early successional forest habitat would continue to decline on National Forest land. This, coupled with the lack of regeneration harvest on private land, would lead to an overall lack of age class diversity and early successional habitat. There would also be an effect on the forest types. Without proper regeneration on public or private lands, shade-intolerant species in the mixed oak and cove hardwood forest types would decrease and be replaced with more shade-tolerant species like red maple and beech.

Alternative 2 - Proposed Action

By the end of the project, 1,269 acres would be regenerated. The direct cumulative effect would be improvement in age class distribution. Alternative 2 would also have the long-term effect of restoring 90 acres of oak-pine forest type, a forest type that was once common in the area. Approximately 975 acres of the harvest units would be treated with herbicides. This would result in a reduction of ferns, striped maple, beech, and grasses, and a cumulative increase in tree seedlings and other herbaceous understory species. Herbicide treatments of the understories would have no long-term adverse effects on tree species diversity. None of the herbicides proposed for use in the project bioaccumulate. The herbicide treatments would have the

cumulative effect of increasing the amount of shade-intolerant species in the future stand. The direct cumulative effect of fencing would be the establishment of plant species that are preferred deer browse. Fencing would have the indirect cumulative effect of maintaining forest types that are presently in the project area. Alternative 2 would also construct and improve more roads which would have the long-term impact of increasing access for future vegetative treatments.

Alternative 3

Alternative 3 would have cumulative effects similar to Alternative 2. Since less acreage would be regenerated, Alternative 3 would have the cumulative effect of less early successional habitat being created and less oak-pine forest type being restored.

Irreversible or Irretrievable Commitment of Resources

The irretrievable effects of Alternatives 2 and 3 would be the loss of potential harvesting in the units proposed for harvest for the next 50 to 60 years.

Alternatives 2 and 3 would have the irreversible effect of taking approximately land out of timber production to use for helicopter landings and roads.

Consistency With the Forest Plan

All alternatives would be consistent with Forest Plan standards and guidelines. The action alternatives are consistent with the management prescription for 3.0 areas. They would increase the amount of early successional habitat; this would ensure the availability of mast producing species into the future and improve the age class structure for the area. They would also provide forest products. They would provide a sustained yield of timber and contribute to local and regional economies.

Consistency With Laws, Regulations, and Handbooks

All the alternatives are consistent with the following laws and regulations:

- National Forest Management Act of 1976
- Multiple Use Sustained Yield Act of 1960
- West Virginia Silvicultural Best Management Practices for Controlling Soil Erosion and Sedimentation from Logging Operations

3.3.2 Terrestrial Ecosystems - Old Growth & Rare Communities

This report discloses expected direct, indirect, and cumulative effects of the Hogback project on terrestrial ecosystems and botanical resources. Each of the action alternatives under consideration would involve various types of timber harvest. These harvest activities would include clear cuts with reserve trees, shelterwood harvests, overstory removal on previous two-age cuts, and thinning harvests. The amount of harvesting, methods of yarding the logs, and site preparation activities would vary by alternative. Chemical site preparation (herbicide application) would be an integral part of both action alternatives. Mechanical and chemical timber stand improvement (TSI) would also occur under both action alternatives. Chapter 2 of the Environmental Assessment and the silviculturist's specialist reports give detailed descriptions of the proposed action and alternatives.

SCOPE OF THE ANALYSIS

This section addresses effects to terrestrial ecosystems including natural disturbance regimes, old growth, and rare communities. Ecological reserves as defined in the Forest Plan EIS (USDA Forest Service 2006a) are not discussed in detail because the Forest Plan does not allocate any land in or near the project area to management prescriptions that constitute ecological reserves. Indicators used include the following:

- Amount and intensity of effects to old growth.
- Amount and intensity of effects to rare communities.

SPATIAL BOUNDARY

For direct and indirect effects, the spatial boundary of the analysis is the project area boundary (Figure 2.1). 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 terrestrial ecosystem resources. The project area boundary includes 13,446 acres of National Forest land and 31,622 acres of private land.

For cumulative effects, the spatial boundary of the analysis includes the terrestrial ecosystem within which the effects of the project would occur: the low to mid-elevation mountain ridges that surround the Horseshoe Run drainage basin (Project Record, Terrestrial Ecosystems Specialist Report). This boundary includes land from the crest of Backbone Mountain westward to the Cheat River. The Cheat River channel and riparian area on the west and the high elevation spruce-northern hardwood ecosystem east of Backbone Mountain form natural boundaries that contain the mixed mesophytic and oak forest ecosystems in the Horseshoe Run area. The cumulative effects boundary includes 22,120 acres of National Forest land and 49,392 acres of private land.

TEMPORAL BOUNDARY

The temporal boundary for direct and indirect effects is the period of time for which forest age classes would be affected by the harvest activities. In the mixed mesophytic forests that characterize the project area, the even-aged stand structure created by regeneration harvesting begins breaking down at around 120 years after stand initiation, and the regenerated stands become difficult to distinguish from stands that have not been harvested. Therefore, 120 years is the temporal boundary used for this analysis. 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.

AFFECTED ENVIRONMENT

Ecological Setting

The Hogback project area and surrounding lands in the cumulative effects boundary lie within ecological section M221B (Allegheny Mountains) and subsection M221Ba (Northern High Allegheny Mountains). The Northern High Allegheny Mountains subsection consists of an eroded peneplain that is characterized by sandstone, shale, and limestone geology, generally loamy soils, a cool, moist climate, and mesophytic vegetation associations (USDA Forest Service 2002).

The project area and cumulative effects area consist of three Land Type Associations (LTA) (USDA Forest Service 2002). M221Ba14 (Cheat River Hills) occupies most of the project area and cumulative effects area. This LTA is characterized by highly dissected topography and mixed mesophytic vegetation, with oaks present on drier sites. M221Ba10 (Allegheny Front Side Slopes) occupies the slopes of Backbone Mountain on the eastern side of the project area. Distinguishing features of this LTA include nutrient-rich soils and mixed mesophytic vegetation. M221Ba13 (Cheat River) occupies a small portion of the southern part of the project area and cumulative effects area. This LTA consists of floodplains along the Cheat River and is dominated by riparian vegetation.

According to the MNF's ecological classification, the potential natural vegetation of about 67 percent of the land in the cumulative effects boundary is mixed mesophytic hardwoods, with the remainder consisting of oak, hemlock, and spruce. Mixed mesophytic hardwoods are dominated by a variety of hardwood tree species, but typically lack the strong yellow birch component that characterizes northern hardwoods and the strong dry-site oak component that characterizes oak forests. The cumulative effects boundary for this project includes low to middle elevations of the ecological subsection, typically between 1,600 and 3,000 feet, with a few areas along the crest of Backbone Mountain approaching 3,600 feet. The generally low elevations account for the small amount of spruce and northern hardwood forest, and the moist climate favors mixed mesophytic forests over oaks.

Historically, this mixed mesophytic ecosystem likely was subject to primarily small-scale natural disturbances, such as the felling of individual trees or small groups of trees through wind throw, ice damage, and insect and disease damage. Fire and other large disturbances likely were an infrequent part of the natural disturbance regime of this ecosystem. Fire regime modeling conducted by the MNF suggests that the average presettlement return interval for fire in most parts of the cumulative effects area would have been greater than 200 years (Thomas-VanGundy 2005). Return intervals for stand-replacing disturbances in similar landscapes in the northeast have been estimated at 500 to over 1,300 years (Lorimer and White 2003). Such long return intervals would have resulted in old stands (120+ years old) occupying approximately 80 to 90 percent of the landscape and young stands (<40 years old) occupying 3 to 8 percent of the landscape, on average (USDA Forest Service 2006a). However, at smaller scales, openings and young forests could have occupied a substantial part of the landscape for several decades following rare catastrophic disturbances.

Currently, the forest development stage distribution in the Hogback vicinity is dominated by even-aged stands that originated during landscape-scale logging that occurred 80 to 120 years ago, before the land was part of the MNF. Seventy-seven percent of National Forest System land in the project area is occupied by mature, even-aged stands (80 to 119 years old), and 8 percent is occupied by old stands (≥120 years old). Mid-developmental even-aged stands (40 to 79 years old) comprise about 7 percent of National Forest land, and young stands (<40 years old) comprise approximately 8 percent. The forest development stage breakdown on National Forest land within the cumulative effects boundary is similar. The development stage breakdown on private land in the Hogback vicinity is not known due to lack of available stand information. It is not believed to be greatly different from conditions on National Forest land because all land in the area, regardless of current ownership, was cut over during the landscape-scale logging that occurred around the turn of the 20th Century. Anecdotal information suggests that forest structure and composition may be different on private land due to widespread high-grade partial

cut harvesting in recent decades, but little regeneration harvesting occurs, so the age class distribution likely is similar to National Forest land.

Old Growth

Given the history of the area and the development stage distributions outlined above, it appears that there is essentially no existing old growth in the Hogback vicinity. No true virgin stands are known to exist, and it is likely that the 8 percent of stands in the "old" category either were cut very early in the landscape-scale logging period, or were aged based on old cull trees.

Rare Communities

The programmatic analysis for the Forest Plan identified 11 rare ecological communities that provide important habitat components for terrestrial species that may have viability concerns:

- Bogs, fens, seeps, and seasonal ponds
- Open wetlands
- Stream channels
- Glades and barrens
- Rock outcrops and cliffs
- High elevation grassland
- Shrub balds
- Caves and mines
- Woodlands, savannahs, and grasslands
- Remote habitat
- Lakes and ponds

Stream channels and lakes/ponds, being primarily aquatic habitats, are covered in the aquatics analysis and will not be covered further here. Likewise, caves/mines and remote habitat primarily function as habitats for certain threatened, endangered, and sensitive animals. These habitats are covered in the wildlife analysis and will not be covered further here. In this part of the Forest, high elevation grasslands and woodlands, savannahs, and grasslands communities do not occur naturally. Occurrences on National Forest land generally are associated with wildlife habitat management efforts; therefore, these communities are covered in the wildlife analysis.

Based on programmatic (Forest-wide) mapping of rare communities and field experience, the glades/barrens and shrub balds communities are not known to occur in the Hogback vicinity. Therefore, these communities also will not be addressed further in this analysis.

Bogs, Fens, Seeps, and Seasonal Ponds

Bogs, fens, seeps, and seasonal ponds consist of nonriverine wetlands characterized by saturated or seasonally ponded soil. On a Forest-wide basis, these wetland types provide habitat for a number of plants on the Regional Forester's Sensitive Species list (see Threatened, Endangered, and Sensitive Plants analysis later in this document).

Programmatic (Forest-wide) mapping based primarily on a combination of remote sensing data sources (USDA Forest Service 2006a) identified 136 acres of this community within the Hogback cumulative effects boundary. Within the project area, the mapping identified 86 acres of this community. These areas lie in the floodplains of the Cheat River and Horseshoe Run. Most of the acreage lies on private land. Based on field experience in the area, there likely are

numerous additional small seeps located along large and small streams and in moist coves. These features were missed by the remote sensing data that was used to construct the programmatic mapping. These small wetlands are scattered throughout the project area and cumulative effects area, but cannot be quantified based on existing data.

Open Wetlands

Open wetlands include marshes and shallow areas of open water. Programmatic mapping based primarily on a combination of remote sensing data sources (USDA Forest Service 2006a) identified 82 acres of this community within the Hogback cumulative effects boundary. Sixty-two acres were identified within the project area boundary. As with the other wetland types, most open wetlands are located in the floodplains of the Cheat River and Horseshoe Run. However, beaver ponds and man-made farm ponds have created a few areas of open wetlands along smaller tributary drainages. Most of the acreage lies on private land.

Rock Outcrops and Cliffs

A partial site-level inventory of rock outcrops was conducted in the Hogback project area as part of the archaeology surveys that were conducted for this project. The inventory focused on large, overhanging outcrops that could have archaeological significance; very few such sites were located. Forest Service personnel conducting botany surveys of the activity areas reported four rock outcrop areas totaling less than 0.1 acre. Two of these outcrops are in a proposed harvest unit, the other two are associated with proposed landing sites. It is likely that additional rocky habitat exists in the project area, but full inventory data are lacking.

DESIRED CONDITIONS

Old Growth

The Forest Plan does not contain specific Forest-wide or MP 3.0 desired conditions for old growth. However, the concept of providing for old growth is included in the desired conditions for forest development stage distribution, which include old stands in the desired range of age classes.

Forest-wide direction in the Forest Plan calls for a range of forest development stages from maintained openings to a network of late successional stands (USDA Forest Service 2006b, p. II-17). Where management prescriptions emphasize allowing forest succession to occur, the desired condition calls for increases in late successional species composition and canopy structure.

All of the National Forest land to be directly affected by the Hogback project is contained within Management Prescription 3.0. Desired conditions for forest development stages in MP 3.0 call for a mosaic of hardwood stands of varying size, shape, height, and species (USDA Forest Service 2006b, pp. III-6 and III-7). Desired development stages range from young to old stands, but emphasize the mid-development and mature stages (40 to 79 years old and 80 to 120 years old).

Rare Communities

Desired conditions for rare communities are addressed in Forest-wide direction. The Forest Integrated Desired Conditions (USDA Forest Service 2006b, p. II-6) include an emphasis on maintaining rare plant communities. The Forest-wide desired conditions for vegetation call for

protection of rare communities through the designation of botanical areas and through the protection of habitats for Regional Forester's Sensitive Species. MP 3.0 does not include additional desired conditions for rare communities.

ENVIRONMENTAL CONSEQUENCES

Old Growth

Direct and Indirect Effects

Because no old growth is currently known to exist within the Hogback project area, none of the alternatives would affect existing old growth. However, each of the alternatives could affect the potential for development of old growth in the future.

The no action alternative (Alternative 1) does not include any regeneration harvesting. Therefore, the only effects on forest development stage distribution would be due to the continued natural aging of stands. Given the very long average return intervals for catastrophic natural disturbance in this ecosystem, it is unlikely that natural disturbances would reset stand development during the 120-year time span of this analysis. However, if such a disturbance did occur, substantial amounts of young forest could be created. In the absence of such a disturbance, the large proportion of stands that are now in the mature (80 to 119 years old) development stage would begin moving into the old (>120 years old) development stage. While a stand does not automatically become old growth when it reaches 120 years of age, over time these stands would begin acquiring old growth characteristics, such as an uneven-aged stand structure, scattered large-diameter trees, and increased amounts of snags and large woody debris. Forward projection of the existing age class distribution on National Forest land in the project area shows that the proportion of stands in the old development stage would increase from the current 8 percent to 59 percent 30 years from now, 90 percent 50 years from now, and 96 percent in 100 years.

The action alternatives would reset forest development through regeneration harvesting on 1,185 acres (Alternative 3) to 1,357 acres (Alternative 2). This constitutes 8.8 to 10.1 percent of National Forest land in the direct and indirect effects boundary. Therefore, under the action alternatives, the proportion of stands reaching the old development stage in 100 years would be reduced from 96 percent to between 86 (Alternative 2) and 87 percent (Alternative 3).

Both action alternatives would implement 53 acres of thinning harvest. Because thinning leaves most of the canopy in place, it would not reset the forest development stage, and therefore would not affect the timing of stands reaching the old stage. Instead, it would tend to mimic the type of low-intensity natural disturbance that characterizes this ecosystem. This could have the effect of enhancing the development of certain old growth characteristics, such as vertical layering of vegetation and large-diameter trees. However, because thinning tends to preferentially remove defective trees, it could hamper the development of other old growth characteristics like snags and large woody debris.

The action alternatives also would include 60 to 63 acres of overstory removal in old two-age harvest units. This activity would not reset the stand age because the stands were considered to have been regenerated at the time of the initial cut. However, if the mature trees were left in place, certain old growth characteristics such as large diameter trees and vertical layering of vegetation could begin to develop sooner than in typical even-aged stands. With the

implementation of overstory removal, this early development of certain old growth characteristics would not occur.

Cumulative Effects

Because none of the alternatives would have direct or indirect effects on existing old growth, they would not contribute to any cumulative effects on existing old growth.

All of the action alternatives could contribute to cumulative effects on the development of future old growth. However, assessing the contribution is difficult due to uncertainty over the types and amounts of actions that could occur within the cumulative effects boundary, especially on private land. In the absence of past harvesting, the current forest development stage distribution would be heavily dominated by old growth, so the proposed harvesting could be viewed as contributing to the cumulative effects of past harvesting by delaying the recovery of old growth. The areas to be regenerated comprise between 1.7 percent (Alternative 3) and 1.9 percent (Alternative 2) of the total land in the cumulative effects boundary. Therefore, the contribution to the cumulative delay in old growth recovery would be minimal.

It should be noted that if current land management direction and policies are followed, future actions are likely to prevent large scale re-development of old growth within the cumulative effects boundary. All of the National Forest land in the cumulative effects boundary is in MP 3.0. For the forest types that predominate within the boundary, desired conditions for MP 3.0 call for only 5 to 10 percent of the landscape in old stands (>120 years). While these desired conditions may not be achieved due to budget and personnel constraints, it is reasonable to assume that future Forest Service actions will tend to prevent large-scale redevelopment of old growth on National Forest land. Most of the private land in the cumulative effects boundary is owned by small private land holders, so it is difficult to predict how these multiple land holdings will be managed. However, most private land owners expect a financial return from their land, which usually means timber harvesting in this rugged landscape. Private land owners may be inclined toward high grade harvesting, which does not reset stand age. It does, however, remove large trees and disturb the land enough to prevent the development of many old growth characteristics. Therefore, large scale redevelopment of old growth on private land is not anticipated. The regeneration harvesting proposed under the action alternatives would make a small incremental contribution toward the overall trend of retarding the redevelopment of old growth. This overall cumulative trend, while it does not move the land back toward the natural forest development stage distribution, is in accord with desired conditions, goals, and objectives set for this area by the MNF and adjacent private landowners.

The no action alternative (Alternative 1) would contribute toward cumulative re-development of old growth in the cumulative effects area. However, given the activities outlined above that are likely to occur throughout the project area, lack of harvest on less than 2 percent of the land in the cumulative effects area would not make a substantial contribution toward development of future old growth.

Rare Communities

Direct and Indirect Effects – No Action (Alternative 1)

The no action alternative (Alternative 1) would not implement any new activities, therefore it would not directly affect rare communities. The effects of natural vegetation development would continue as the forest communities in which the rare communities are embedded continue to age.

As the majority of stands on the landscape begin reaching the old stage three decades from now, canopy gaps would become more common and could increase the amount of light reaching the rare communities. This could shift the plant species mix toward species that are less tolerant of deep shade.

Direct and Indirect Effects – Action Alternatives

Bogs, Fens, Seeps, Seasonal Ponds – Both of the action alternatives likely would affect seeps. Small seeps are common on the landscape, so it is likely that seeps are included in some of the harvest units in each action alternative. The magnitude of effects cannot be quantified because seeps have not been inventoried. However, two factors are likely to limit effects on seeps. First, seeps tend to be concentrated near streams, so it is likely that some seeps will be contained within the stream channel buffers that are required by Forest Plan direction. Second, seeps themselves are protected by Forest Plan direction (USDA Forest Service 2006b, guideline SW51, p. II-13). This guideline calls for maintaining 60 to 100 percent canopy cover over seeps, avoiding overland skidding through seeps, and limiting skid trails and roads to essential crossings that are designed to minimize disturbance. Therefore, the likely effects on seeps include reduction of the tree canopy cover to around 60 percent, and limited crossings of seeps by skid trails and new road construction.

Larger bogs, fens, seeps, etc. that show up on the programmatic mapping would not be affected by any of the harvest units, skid trails, landings, or roads in either of the action alternatives.

Open Wetlands – The action alternatives likely would have no effects on open wetlands because none are known to exist in any of the proposed activity areas.

Rock Outcrops and Cliffs – Both of the action alternatives likely would affect some rocky habitat in harvest units. Negative effects could include mechanical damage caused by skid trail construction and use, road construction, and dragging logs across the ground in conventional and cable units. Tree removal around rock outcrops would change the light regime from full shade to full sun in regeneration units and partial sun in thinning units. This would have the potential to change the plant species composition.

Because of the lack of inventory data, the effects are difficult to quantify. Both action alternatives would include two known rock outcrops in a helicopter-yarded clearcut unit. Both action alternatives also would place a helicopter landing near a rock outcrop and skid past another outcrop. It is quite likely that other small areas of rocky habitat would be affected by other harvest units, skid trails, and landings. Alternative 2 likely would have greater mechanical impacts on rocky habitat than Alternative 3 because Alternative 2 includes 915 acres of conventional and cable yarding versus 604 acres in Alternative 3.

Cumulative Effects – No Action (Alternative 1)

Continued natural development of vegetation under the no action alternative could contribute to the cumulative effects that aging forests have on rare communities (increased sunlight due to canopy gaps, increased large woody debris). These effects cannot be quantified due to lack of information on future activities that will govern the amount of old forest that develops on National Forest and private land within the cumulative effects boundary. However, based on the discussion above in the old growth section, aging forests are not expected to be widespread in the cumulative effects analysis area.

Cumulative Effects – Action Alternatives

The action alternatives could contribute to cumulative effects on seeps and outcrops. To the extent that other activities damage these communities, the effects of skid trails and cable yarding in the action alternatives would add to the cumulative damage. Because these features have not been fully inventoried in the cumulative effects boundary, and due to lack of information on future activities, the overall cumulative effects cannot be quantified.

3.3.3 Non-native Invasive Species (NNIS)

Scope of the Analysis

This section covers potential effects of the Hogback project on the establishment, spread, and control of non-native invasive plants. Indicators used include the following:

- Length of skid trails
- Length of new road construction
- Total length of road reconstruction, maintenance, and hardening
- Number and acreage of landings

Spatial Boundary

The spatial boundary for direct and indirect effects is the project area boundary, which is the same boundary used for the Terrestrial Ecosystems analysis above. This boundary includes all activities proposed in all alternatives; therefore, it is an appropriate boundary for analyzing direct and indirect effects of the activities.

For cumulative effects, the spatial boundary of the analysis is also the same boundary used for the Terrestrial Ecosystems analysis above. This boundary includes the terrestrial ecosystem within which the effects of the project will occur: the low to mid-elevation mountain ridges that surround Horseshoe Run.

Temporal Boundary

The temporal boundary for analyzing non-native invasive plant effects is 30 years. This time period should allow more than enough time for completion of the control activities that are needed to mitigate potential spread of invasives due to project activities. It should also encompass the time period needed for redevelopment of a forest canopy over disturbed sites such as skid trails. Redevelopment of the forest canopy should greatly reduce any shade-intolerant invasives that become established in these disturbed areas.

Affected Environment

Seven non-native invasive plant species are known to occur in the Hogback project area (Table 3.11). Of these seven species, garlic mustard (*Alliaria petiolata*) and Japanese stiltgrass (*Microstegium vimineum*) can cause serious ecological impacts in forested ecosystems because of their ability to tolerate shade. Additionally, tree of heaven (*Ailanthus altissima*) could cause ecological disruption due to its ability to capture canopy gaps in forests. Currently, all three of these species are closely associated with roads, skid trails, and landings, indicating that these transportation features have served as the primary invasion route in the project area, probably through transport of seeds by vehicles, horses, ATVs, boots, etc. Invasions of NNIS plants that are less shade tolerant, such as multiflora rose (*Rosa multiflora*) and Kentucky 31 fescue (*Festuca arundinacea*), have been facilitated by the disturbed habitat provided by road corridors.

Such species pose less of a threat to the forested ecosystems that predominate in the watershed, but in some cases they can spread and cause ecosystem disruption after being released by a natural or human-caused disturbance.

Table 3.11. Non-native invasive plants known to occur in the Hogback project area

Scientific Name	Common Name
Alliaria petiolata	Garlic mustard
Ailanthus altissima	Tree of heaven
Microstegium vimineum	Japanese stiltgrass
Vinca minor	Periwinkle
Phalaris arundinacea	Reed canary grass
Festuca arundinacea	Kentucky 31 fescue
Rosa multiflora	Multiflora rose

The three species of greatest concern are known to exist in or adjacent to 24 proposed activity areas. Garlic mustard is known to occur in three proposed harvest units and one proposed new road corridor leading to a proposed helicopter landing. These four infestations are estimated to affect a total of approximately 9 acres. Japanese stiltgrass is known to occur in or adjacent to 14 proposed harvest units. These Japanese stiltgrass infestations are estimated to affect approximately 15 acres. Tree of heaven is known to affect approximately 9 acres in five proposed harvest units and one proposed helicopter landing. These species co-occur at some sites, so the total number and acreage of infested sites is less than the sum of the three species. 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 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.

Environmental Consequences

Direct and Indirect Effects

Under both action alternatives, soil and vegetation disturbance associated with skid trails, landings, harvest activities, and road activities has the potential to spread non-native invasive plants. The potential is greatest in the vicinity of existing infestations, but also could occur in other areas due to long-distance seed movement by vehicles and equipment. Both action alternatives would include control and monitoring aimed at all known infestations of garlic mustard, Japanese stiltgrass, and tree of heaven in harvest units, landings, and new road corridors (see the Appendix in the Terrestrial Ecosystems specialist report for details). This control and monitoring would reduce the likelihood of project activities spreading these three invasive plants and would ensure compliance with Forest Plan direction toward that end (p. II-20, Standard

VE22). However, these measures likely would not eliminate all potential for spreading these three invasive plant species. If they do spread into the harvest units and are not effectively controlled, they likely would persist indefinitely and could eventually dominate the herbaceous layer of these stands, or the canopy layer in the case of tree of heaven. The other lower priority invasive plant species likely would spread wherever ground disturbance and canopy reduction occurs. These increased populations of shade-intolerant invasives would persist until the tree canopy closes over the disturbed areas in about 30 years.

Invasive plant impacts would vary by alternative (Table 3.12). Alternative 2 would have a greater potential to spread invasives along skid trails, new roads, maintained roads, and on landings. Alternative 3 would initially have a slightly greater potential than Alternative 2 to spread invasive plants through road decommissioning, but over the long term, the decommissioned roads would remove a potential invasion pathway.

The effects of the introduction and spread of non-native invasive plants could include crowding out of native plant species. This competition could cause reduced species diversity of native plants. If invasions occur near threatened, endangered, or sensitive plants, competition from invasives could lead to reduction in vigor or loss of populations. Additionally, impairment of ecosystem function and reduction of preferred food and cover sources for various wildlife species can occur.

Alternative 1 (No Action) would have no effects on the introduction and spread of non-native invasive plants. The introduction of additional invasives due to other activities (e.g., road maintenance, recreation) likely would continue, and the natural spread of existing infestations also would continue.

Table 3.12. Comparison by alternative of features that may cause the spread of non-native invasive plants in the Hogback project area.

Feature	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Miles of skid trails	0	26.1	15.2
Miles of new road construction	0	4.6	3.3
Miles of road reconstruction, maintenance, and hardening	0	30.1	27.9
Miles of road decommissioning	0	0.9	1.4
Number of landings	0	54	46
Acreage of landings	0	50	44

Cumulative Effects

The major potential negative effect of the Hogback project relative to non-native invasive plants is the potential for introduction and spread of invasives 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 invasives. 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 (see Table 3.1), recent timber harvests and road building on private land, and small amounts of residential and agricultural development. Specific information on the introduction and spread of non-native invasive plants due to these past activities is not available.

However, the current distribution of invasives in disturbed areas strongly indicates that these activities were collectively responsible for the introduction and spread of existing invasives.

Any effects of the Hogback project also would be additive to the effects of future activities within the cumulative effects boundary. On National Forest land, the proposed Nine pipeline is the major reasonably foreseeable future activity that could contribute to the introduction and spread of invasive plants. Another ongoing and reasonably foreseeable future activity with the potential to facilitate invasions is continued recreational use of National Forest land, particularly motorized travel on Forest roads, horseback riding, and unauthorized ATV use. Roads and skid trails associated with timber harvest activities would open up new routes for these modes of travel, thereby making new areas susceptible to invasion. This risk would continue long after control measures used to mitigate direct effects of the project have ceased.

The contribution of the Hogback project to cumulative effects of non-native invasive plants would vary by alternative approximately in proportion to the direct and indirect effects. Thus, Alternative 2 would make a greater contribution to cumulative effects than Alternative 3. Alternative 1 (No Action) would have no direct and indirect effects, therefore it would make no contribution to cumulative effects. Cumulative effects under the action alternatives likely would be measurable, but cannot be quantified currently due to the lack of invasive plant inventory information for most of the land in the cumulative effects boundary.

Irreversible or Irretrievable Commitment of Resources

Under Alternatives 2 and 3, an undetermined portion of the harvest units, roads, skid trails, and landings 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.

Alternative 1 would implement no action and have no effects. Therefore, Alternative 1 would cause no irreversible or irretrievable commitment of resources.

Consistency with the Forest Plan

Alternatives 2 and 3 would include follow-up control and monitoring of non-native invasive plants with the potential to cause disruption of forested ecosystems where these species are spread by project activities. Both action alternatives also include design criteria to reduce the risk of spreading invasive plants via mulch, seed, equipment, gravel, and borrow material. 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, and Handbooks

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 Hogback 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.

Alternatives 2 and 3 include follow-up monitoring and control of invasive plants with the potential to cause disruption of forested ecosystems. These control and monitoring provisions make the action alternatives consistent with EO 13112.

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.

3.3.4 Threatened, Endangered, and Sensitive Flora (plants)

SCOPE OF THE ANALYSIS

This analysis addresses effects to plant species that are federally listed as threatened or endangered, and also those plant species that are listed as Regional Forester's Sensitive Species (RFSS) on the Monongahela National Forest. Threatened, endangered, and sensitive species are collectively referred to as TES species.

SPATIAL BOUNDARY

The spatial boundary for direct and indirect effects on TES species is the project area boundary (see Figure 2.1). This boundary contains all proposed project activities and is the boundary within which all direct and indirect effects would occur. The spatial boundary for cumulative effects on TES species is the Proclamation and Purchase Unit boundary for the Monongahela National Forest. This is the boundary to which the National Forest Management Act viability requirement applies.

TEMPORAL BOUNDARY

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 would persist. While effects to each individual species may not persist that long, successional changes set in motion by regeneration harvesting would 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.

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 spirea (*Spiraea virginiana*), and small whorled pogonia (*Isotria medeoloides*). Fifty-four plant species are listed as Regional Forester's Sensitive Species on the Monongahela National Forest. The likelihood of occurrence for each TES species is assessed in the Likelihood of Occurrence document, which is filed in the project record. Likelihood of occurrence is based on field surveys of the proposed activity areas, historic records, and the presence of potential habitat in the project area. Field surveys covered all areas proposed for timber harvest and new road construction, as well as all proposed skid trails and landings that lie outside the harvest units. Stands proposed for TSI were not surveyed because TSI activities have little potential to affect TES plants (see discussions of direct and indirect effects below).

Threatened and Endangered Plants

Based on field surveys of proposed activity areas and existing records, one of the four threatened and endangered species is known to occur within the project area boundary for the Hogback project. Potential habitat may occur for two other species.

Virginia Spirea

Virginia spirea is a clonal shrub found on damp, rocky banks of large, high-gradient streams (USFWS 1992a). Within the Hogback project area boundary, potential habitat for Virginia spirea is limited to the channels and banks of large streams such as the Cheat River and Horseshoe Run. Potential habitat does not occur within any of the proposed harvest units, road construction areas, landings, skid trails, etc. in any of the alternatives.

Running Buffalo Clover

Potential habitat for running buffalo clover typically exists in lightly disturbed forests and woodlands on soils derived from circumneutral geologic features (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.

Botanical field surveys covered all proposed harvest units, skid trails, landings, and new roads. Existing roads that would be used as haul roads were not covered completely, although they received some survey effort through travel along the roads and in conjunction with surveys of proposed harvest units adjacent to roads.

Potential habitat in the Hogback area appears to be limited due to a lack of favorable geology, although some favorable geology occurs near the eastern edge of the project area on the slopes of Backbone Mountain. Existing records show an occurrence of running buffalo clover near the south end of the project area in the town of Parsons. This site is in the floodplain of the Cheat River and is not characteristic of the type of habitat that comprises most of the project area. Surveys of proposed activity areas did not find this species.

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). Likelihood of occurrence for small whorled pogonia is considered low because it is not known to occur near the Hogback vicinity, and site-specific surveys have not located it. However, 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 is not likely to occur in or near the Hogback vicinity due to lack of shale barren habitat. Shale barrens are limited to the drier areas on the eastern side of the Forest.

Regional Forester's Sensitive Plants

Based on field surveys and existing records, three of the 54 RFSS plants are known to occur within the project area boundary: Appalachian blue violet (*Viola appalachiensis*), butternut (*Juglans cinerea*), and rock skullcap (*Scutellaria saxatilis*). Appalachian blue violet is known from 15 locations in the project area. Butternut is known from two locations in the project area, and rock skullcap is known from one location.

Based on the Likelihood of Occurrence assessment, potential habitat could occur for 30 additional RFSS plants. However, given the lack of known occurrences despite site surveys, it is unlikely that the activity areas support substantial populations that are crucial for the continued viability of these species on the MNF. The total for potential and known RFSS plants in the Hogback project area is 33 species. To facilitate analysis, RFSS plants have been grouped according to their primary habitat (Tables 3.13 through 3-14.). The three habitat groupings are wetland/riparian habitat, mesic/cove forest, and rocky habitat.

Table 3.13. Wetland and riparian habitat RFSS plants that could occur in the Hogback area

Scientific Name	Common Name	Habitat Comments
Baptisia australis var. *australis*	Blue wild indigo	Primarily early successional wetlands
Botrychium oneidense	Blunt-lobed grapefern	Wooded wetlands
Euphorbia purpurea	Darlington's spurge	Open or closed canopy
Hasteola suaveolens	Sweet-scented Indian plantain	Riverbanks and disturbed wetlands
Hypericum mitchellianum	Blue Ridge St. John's wort	Riverbanks and disturbed wetlands
Ilex collina	Long-stalked holly	Open or closed canopy
Juncus filiformis	Thread rush	Open canopy
Marshallia grandiflora	Large-flowered Barbara's buttons	Flood-scoured stream banks in full sun
Menyanthes trifoliata	Bog buckbean	Bogs
Pedicularis lanceolata	Swamp lousewort	May prefer circumneutral soil
Poa paludigena	Bog bluegrass	Sun to partial shade
Polemonium vanbruntiae	Jacob's ladder	Swamps, bogs, riparian zones
Potamogeton tennesseensis	Tennessee pondweed	Standing or slow-flowing water
Taxus canadensis	Canada yew	Also occurs in spruce forests. In the low elevations of the Hogback vicinity, most likely in wetlands and riparian zones.
Vitis rupestris	Sand grape	River banks and washes
Woodwardia areolata	Netted chain fern	Swamps and wet woods

Table 3.14. Mesic forest and cove habitat RFSS plants that could occur in the Hogback area

Scientific Name	Common Name	Habitat Comments
Botrychium lanceolatum var. *angustisegmentum*	Lance-leaf grapefern	Moist, shady woods and swamp margins
Corallorhiza bentleyi	Bentley's coral root	Habitat preferences poorly understood
Cypripedium parviflorum var. *parviflorum*	Small yellow lady's slipper	Moist to wet sites
Cypripedium reginae	Showy lady's slipper	Swamps and woods
Juglans cinerea	Butternut	Most likely in rich alluvial soil, but could occur elsewhere
Triphora trianthophora	Nodding pogonia	Deep leaf litter or humus
Viola appalachiensis	Appalachian blue violet	Often in riparian areas, but can occur in other mesic situations

Table 3.15. Rocky habitat RFSS plants that could occur in the Hogback area

Scientific Name	Common Name	Habitat Comments
Cornus rugosa	Roundleaf dogwood	Rocky areas within forests
Gymnocarpium appalachianum	Appalachian oak fern	Rocky woods
Heuchera alba	White alumroot	Most likely in dry microsites
Juncus trifidus	Highland rush	Rock crevices
Oryzopsis canadensis	Canada mountain rice grass	Open canopy, sandstone
Pycnanthemum beadlei	Beadle's mountainmint	Open canopy over rocks
Scutellaria saxatilis	Rock skullcap	Rocky areas within forests. On the MNF, also known from shaded cut banks and shoulders of infrequently used forest roads.
Syntrichia ammonsiana	Ammon's tortula	Wet, cool microsites
Taenidia montana	Virginia mountain pimpernel	Dry outcrops. Typically a shale barren species, but one occurrence in Tucker County outside project area.
Trichomanes boschianum	Appalachian bristle fern	Dripping rocks

Of these 33 RFSS plants, one species is unlikely to occur within any of the areas proposed for harvest, road construction, landings, etc. Potential habitat for large-flowered Barbara's buttons (*Marshallia grandiflora*) is limited to the flood-scoured banks of large streams and rivers, which are not included in any of the proposed activity sites.

DESIRED CONDITIONS

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

The Forest Integrated Desired Conditions (USDA Forest Service 2006b, 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.

ENVIRONMENTAL CONSEQUENCES

Threatened and Endangered Plants

Direct and Indirect Effects

Virginia Spirea – Proposed activity areas for all alternatives avoid potential habitat for Virginia spirea. Therefore, no alternative has any potential to affect Virginia spiraea.

Running Buffalo Clover – The known occurrence of running buffalo clover is not near any of the proposed activity areas for either of the action alternatives. Therefore, known occurrences would not be affected. If undiscovered occurrences of running buffalo clover exist in any of the activity areas under either action alternative, effects could occur.

If running buffalo clover exists along roads to be used as haul roads, maintenance, hardening, and hauling could harm or destroy these occurrences. Road construction and reconstruction proposed under the action alternatives could extirpate undiscovered occurrences, but it also could

create additional habitat for running buffalo clover, provided post-project use and maintenance of the road maintains the proper conditions of slight disturbance.

If undiscovered occurrences exist within proposed harvest units or landing sites, they could be harmed or destroyed by skidding and landing construction. The open canopy created in clear cut units likely would lead to running buffalo clover being out-competed by sun-loving herbs, shrubs, and saplings. Beneficial effects could occur in thinning or shelterwood units due to partial opening of the canopy, although the benefit in shelterwood units would last only until subsequent removal of the overstory. In conventionally-yarded thinning and shelterwood units, the soil disturbance due to skidding would be an additional benefit by providing suitable substrate for running buffalo clover to colonize. Running buffalo clover is unlikely to occur in overstory removal units due to the intense competition from regenerating saplings.

Foliar spray herbicide application for site preparation and non-native invasive species control could kill running buffalo clover if undiscovered occurrences exist in the treatment areas. Basal spray and cut surface applications are unlikely to affect running buffalo clover due to lack of exposure to the herbicide.

The possible effects outlined in the preceding paragraphs are considered extremely unlikely due to the low probability that undiscovered occurrences of running buffalo clover exist. Therefore, the potential for adverse effects under the action alternatives is considered discountable.

The proposed TSI work in both action alternatives is unlikely to affect running buffalo clover because running buffalo clover is unlikely to occur in the young, dense stands that would receive TSI treatments. Also, TSI would not radically alter the canopy closure of the stands, and all herbicide treatments would be basal spray or cut surface, which have little chance of affecting non-target vegetation.

Alternative 1 (No Action) would not involve any new ground or vegetation disturbing activities, therefore Alternative 1 would have no effect on running buffalo clover.

Small Whorled Pogonia – If undiscovered occurrences exist, the action alternatives could affect small whorled pogonia. Most project activities, including regeneration harvesting, road construction, skid trail construction, and foliar herbicide application, have the potential to harm or kill small whorled pogonia. The effects of thinning harvest are difficult to predict due to lack of specific information on the species' light requirements. Overstory removal and TSI are unlikely to affect small whorled pogonia because it is unlikely to occur in the young, dense stands where these activities are proposed.

The potential for affecting small whorled pogonia is very low because of its low likelihood of occurrence. Also, harvest activities under all action alternatives would affect a small proportion of land in the project area, ranging from 2.9 percent under Alternative 3 to 3.3 percent under Alternative 2. Due to the low likelihood of occurrence and the limited extent of site-disturbing activities, the potential for effects is considered discountable.

Alternative 1 (No Action) would not involve any new ground or vegetation disturbing activities, therefore Alternative 1 would have no effect on small whorled pogonia.

Shale Barren Rockcress – Because shale barren rockcress has no potential to occur in the Hogback vicinity, no alternative would affect this species.

Cumulative Effects

Because the potential for direct effects is either discountable or nonexistent for all four species under all alternatives, no alternative would contribute to cumulative effects on threatened and endangered plants.

Effect Determinations for Threatened and Endangered Plants

Virginia Spirea – Each alternative would have **no effect** on Virginia spirea.

Running Buffalo Clover – Alternative 1 (No Action) would have **no effect** on running buffalo clover. Alternatives 2 and 3 **may affect, but are not likely to adversely affect**, running buffalo clover.

Small Whorled Pogonia – Alternative 1 (No Action) would have **no effect** on small whorled pogonia. Alternatives 2 and 3 **may affect, but are not likely to adversely affect**, small whorled pogonia.

Shale Barren Rockcress – Each alternative would have **no effect** on shale barren rockcress.

Regional Forester's Sensitive Plants

Direct and Indirect Effects

Wetland/Riparian Plants – Forest Plan direction that protects stream channel corridors and wetlands would limit potential effects on RFSS plants that occur in wetland and riparian habitats. Forest Plan direction requires buffers along stream channels that exclude most timber harvest, road building, skidding, and landings (Standards SW34, SW37, SW40, SW44, and SW55). Programmed timber harvest is not allowed in stream channel buffers, and roads, skid trails and landings are allowed only at essential crossings. Standard SW51 provides similar protection for seeps and other wetlands, with ground disturbance limited to essential crossings.

Because of the allowance for essential crossings, the action alternatives (2 and 3) would have some potential to impact wetland and riparian RFSS plants where skid trails and new roads cross streams and wetlands. The potential for impacts is considered low because none of the wetland and riparian RFSS plants is known to occur in the project area. However, surveys may have missed RFSS, so the potential for impacts cannot be completely ruled out. Under both action alternatives, skid trails and new roads would not cross any perennial streams identified on U.S. Geological Survey 7.5 minute topographic maps. However, if perennial streams are not identified correctly on the maps, crossings could occur. The action alternatives undoubtedly also include skid trail crossings of seeps and intermittent streams; however, these features have not been inventoried, so the impacts cannot be quantified. Alternative 2 likely would have greater impacts than Alternative 3 due to greater total mileage of skid trails and new roads. Alternative 2 would include 26.1 miles of skid trails and 4.6 miles of new road construction. Alternative 3 would include 15.2 miles of skid trails and 3.3 miles of new road construction.

In contrast to the negative impacts of road and skid trail crossings, habitat adjacent to the crossings could be improved for species that prefer an open or partially open canopy (blue wild indigo, sweet-scented Indian plantain, Blue Ridge St. John's wort, thread rush, and bog bluegrass). The extent to which the habitat improvement might offset the potential loss of individuals and habitat from the footprint of the crossing is not known.

Both action alternatives propose to use foliar herbicide application for site preparation in many harvest units. Herbicide would not be applied in stream channel buffers, and thus would not impact wetland and riparian plants near streams. Herbicide could be applied in or adjacent to

small seeps outside of stream channel buffers, potentially killing any undiscovered wetland or riparian RFSS that might exist in these seeps.

Foliar herbicide application for non-native invasive plant control would occur under both action alternatives. Current NNIS populations are concentrated along roadsides, old skid trails, and old landings, which are unlikely to support RFSS plants. NNIS occurrences targeted for control do not occur in riparian areas. Therefore, herbicide applications for NNIS would have little or no potential to affect wetland and riparian RFSS.

TSI would be unlikely to affect wetland and riparian habitat RFSS. TSI is not expected to alter the light regime greatly in these stands. Herbicide applications for TSI would be basal spray or cut surface. These application methods have little or no potential to affect non-target vegetation.

The potential effects listed above are considered unlikely to occur under both action alternatives. The low likelihood of effects is due to lack of known occurrences and the protections afforded to riparian and wetland habitats. One wetland/riparian RFSS plant, large-flowered Barbara's buttons, has no potential to be affected. Because habitat for this plant does not occur in any of the areas proposed for activity under all of the alternatives, no alternative would have direct and indirect effects on this species.

Alternative 1 (No Action) would have no direct or indirect effects on wetland and riparian habitat RFSS plants. The detrimental and beneficial effects noted above for the action alternatives would not occur.

Mesic Forest/Cove Plants – Appalachian blue violet has a higher potential to be affected than any other RFSS plant species because it is known to occur at 15 locations scattered throughout the project area. It is known to occur in or immediately adjacent to three proposed harvest units, each of which would be treated the same in both action alternatives. These units include one conventional clearcut unit, one helicopter clearcut unit, and one conventional thinning unit. The conventional clearcut unit would have a pre-harvest cut-surface herbicide application for site preparation, and the helicopter clearcut unit would include pre-harvest basal spray and foliar applications. The known occurrences in these units would be surrounded by 75-foot buffers. Within the buffers, canopy closure would be maintained at 60 percent or greater, and foliar herbicide application would be avoided. Cut surface and basal spray applications could occur in the buffer, but would be conducted such that no herbicide would contact the violets. Skid trails could traverse the buffer, but would avoid disturbing the violets and would not lower canopy closure below 60 percent. These protection measures would prevent adverse effects on the known occurrences of Appalachian blue violet. However, effects to undiscovered occurrences could occur as outlined below. Because of its relatively widespread distribution in the project area, effects to undiscovered occurrences are considered possible, whereas for the other mesic forest RFSS, effects are considered unlikely.

All of the action alternatives include regeneration harvesting that has the potential for negative effects on six of the seven mesic forest RFSS plants (lance-leaf grapefern, Bentley's coral root, small yellow lady's slipper, showy lady's slipper, nodding pogonia, Appalachian blue violet). These forest-dwelling species are not known to be adapted to the full sunlight environment that would be created by regeneration harvesting. Therefore, any individuals that may be present are likely to be outcompeted by sun-adapted vegetation. The remaining species, butternut, likely would benefit from regeneration harvesting because it is shade intolerant and cannot reproduce without a disturbance to remove the canopy. Any existing butternut trees would be protected

from cutting during sale layout. With the exception of Appalachian blue violet, the likelihood of these effects occurring is low, given that five of the seven species are not known to occur in the project area. However, surveys could have missed individual plants, so the potential for effects cannot be ruled out entirely. Among the action alternatives, the potential for effects would be somewhat higher under Alternative 2 (Proposed Action) than Alternative 3, given the higher level of regeneration harvest (see Tables 2-11 and 2-13 in Chapter 2).

Thinning harvests in all of the action alternatives would have uncertain effects on most of the mesic forest RFSS. These species occur in forested environments, but information is lacking on the effects of partial canopy openings. Thinning likely would benefit Appalachian blue violet because it prefers partial sunlight over deep shade. Likewise, thinning could benefit butternut by releasing established individuals from competition. The potential for these effects is the same for both action alternatives because the amount of thinning harvest would be the same.

Overstory removal is unlikely to affect most mesic forest RFSS plants because overstory removal would occur in stands that have already been regenerated. Most mesic forest RFSS plants are unlikely to occur in these young stands due to the intense competition from shrubs and regenerating tree saplings. However, Appalachian blue violet might be able to persist in these stands, particularly in the shade of the residual overstory trees. If any undiscovered occurrences exist, they could be outcompeted by shrubs and saplings that would be released when the overstory residuals are removed. Butternut, being shade intolerant, also could occur in these stands. If undiscovered occurrences exist, overstory removal likely would benefit this species by releasing it from the shade of the overstory trees.

Both action alternatives would involve construction of skid trails and dragging of logs over the ground. If any unidentified occurrences of these plants exist along skid trail routes, skid trail construction would obliterate the occurrences. Dragging logs over the ground could damage occurrences. However, log-dragging and skid trail construction could benefit Appalachian blue violet by creating soil disturbance. Appalachian blue violet often is associated with small areas of soil disturbance (NatureServe 2006b). This beneficial effect would be most likely to occur in thinning units, which would also create the partial canopy openings preferred by this species. Potential effects associated with skidding and log dragging would be greater under Alternative 2 because it contains about twice as much conventional yarding and slightly more cable yarding than Alternative 3. See Table 2-16 in Chapter 2 for a comparison of yarding amounts.

Road construction under the action alternatives also has the potential to destroy occurrences of mesic forest RFSS, should any undiscovered occurrences exist. Impacts would be more likely under Alternative 2 (Proposed Action), which would involve 4.58 miles of new road construction versus 3.26 miles under Alternative 3. Road reconstruction could also impact mesic forest RFSS in areas where road beds have revegetated. Alternative 2 would reconstruct 0.5 miles of road, whereas Alternative 3 would not include any reconstruction. Appalachian blue violet would be the species most likely to be affected because it can occur on old road beds (NatureServe 2006b). Other road activities such as hardening and maintenance likely would not affect mesic forest RFSS plants because these activities generally occur on roads that have not been revegetated to the point that they could be colonized by these species.

Foliar herbicide application for site preparation could extirpate any undiscovered mesic forest RFSS occurrences in the area where herbicides are applied. Alternative 2 would include about 9 percent more acres of foliar application than Alternative 3 (521 acres vs. 477 acres, respectively).

Foliar herbicide application for non-native invasive species control would have the potential to extirpate any undiscovered occurrences of Appalachian blue violet in the areas to be treated. Effects to the other mesic forest RFSS probably would not occur because these species typically do not grow on the roadsides, old skid trails, and landings that would be targeted for control efforts. Foliar herbicide application for non-native invasive species control could occur on up to 66 acres in Alternative 2 and up to 55 acres in Alternative 3.

TSI would be unlikely to affect mesic/cove forest RFSS negatively. Most of these species are unlikely to occur in the young, dense stands proposed for TSI work. Also, TSI is not expected to alter the light regime greatly in these stands. Herbicide applications for TSI would be basal spray or cut surface. These application methods have little or no potential to affect non-target vegetation. If young butternut trees occur in stands proposed for TSI, they could benefit from the release from competition.

Alternative 1 (No Action) would have no direct or indirect effects on mesic habitat RFSS plants. The detrimental and beneficial effects noted above for the action alternatives would not occur.

Rocky Habitat Plants – Rock skullcap is the only rocky habitat RFSS plant species that is known to occur in the project area. This plant occurs along a non-system road that would be upgraded to a system haul road under both alternatives. Road construction activities and timber hauling would be designed to avoid damaging the rock skullcap.

The effects of regeneration harvesting on rocky habitat RFSS plants are likely to vary by species. The probability of any effects occurring is low because there are no known occurrences in proposed harvest units. However, effects could occur if the surveys missed occurrences of these species. Beadle's mountainmint and Virginia mountain pimpernel, which prefer an open canopy (NatureServe 2002), could benefit from the open canopy created by regeneration harvesting. Ammon's tortula and Appalachian bristle fern, on the other hand, prefer moist to wet microsites and likely would be harmed by increased sunlight that could cause such sites to dry out. The remaining species could also be harmed by opening the canopy, given that they all prefer forested habitats. However, information on effects of harvesting is not available, so it is not certain that occurrences would be eliminated by regeneration harvesting. Alternative 2 contains more regeneration harvesting than Alternative 3 and thus would have a somewhat greater potential for effects.

Thinning likely also would have positive effects on Beadle's mountainmint and Virginia mountain pimpernel, should these species occur in the thinning units. Thinning could also harm Ammon's tortula and Appalachian bristle fern, though the potential for harm probably would not be as great as with regeneration harvesting. The potential effects of thinning on the other rocky habitat species are uncertain due to lack of information on the precise canopy closure preferences of these species. The two action alternatives contain the same amount of thinning.

Skid trails, landings, and new roads could damage or destroy rocky habitat RFSS plants if these features are constructed on undiscovered occurrences. Construction of these features typically avoids major outcrops due to excavation difficulties, but smaller outcrops could be damaged. Alternative 2 includes more skid trails, landings, and new road construction than Alternative 3, therefore it would have a somewhat greater potential for effects.

Cable yarding would be less likely than conventional yarding to avoid rock outcrops because logs would be dragged long distances in a straight line. Dragging logs would impact rocky

habitat much less than constructing a skid trail through rocky habitat, but it still would have the potential to damage or kill any RFSS plants that might be present. Alternative 2 contains slightly more cable yarding than Alternative 3 and could have a slightly greater potential to damage rocky habitat RFSS by dragging logs over them.

Foliar herbicide application for site preparation and non-native invasive species control could extirpate any undiscovered rocky habitat RFSS occurrences in the area where herbicides are applied. Alternative 2 would include about 9 percent more acres of foliar application for site preparation than Alternative 3 (521 acres versus 477 acres). Foliar herbicide application for non-native invasive species control could occur on up to 66 acres in Alternative 2 and up to 55 acres in Alternative 3.

TSI would be unlikely to affect rocky habitat RFSS. TSI is not expected to alter the light regime greatly in these stands. Herbicide applications for TSI would be basal spray or cut surface. These application methods have little or no potential to affect non-target vegetation.

The potential effects listed above are considered unlikely to occur under both action alternatives. The low likelihood of effects is due to lack of known occurrences for most species despite widespread survey effort, and to the protection of the one known rock skullcap occurrence.

Alternative 1 (No Action) would have no direct or indirect effects on rocky habitat RFSS plants. The detrimental and beneficial effects noted above for the action alternatives would not occur.

Cumulative Effects

The potential for direct and indirect effects is discountable or non-existent under both action alternatives for all RFSS plants except Appalachian blue violet. Therefore, for all RFSS plants except Appalachian blue violet, neither action alternative would make a measurable contribution to cumulative effects on RFSS plants. Also, Alternative 1 (no action) would have no direct or indirect effects on any RFSS plants; therefore, it would not contribute to any cumulative effects.

Both action alternatives may have direct and indirect effects on Appalachian blue violet. These effects could add to the cumulative effects of other past, present, and reasonably foreseeable future activities within the Forest proclamation and purchase unit boundary. Table 3.1 in Chapter 3 lists such activities within the Hogback project area. Similar activities have occurred in the past, are occurring currently, or are expected to occur in the future on National Forest and private land throughout the Forest. Many of the past activities likely enhanced habitat for this disturbance-adapted species, although they may also have had detrimental impacts to individual plants.

The major ongoing and future activities on National Forest land that have the potential to affect Appalachian blue violet are timber harvest projects, wildlife habitat improvement projects, and utility corridors. Harvest activities and related road construction are ongoing or will begin in the next year on the Upper Williams (Marlinton-White Sulphur District), Desert Branch (Gauley District), Cherry River (Gauley), Lower Clover (Cheat-Potomac District), and Little Beech Mountain (Greenbrier District) timber projects. Timber projects are proposed in future years in the Lower Williams (Gauley District) and Ramshorn (Greenbrier District) project areas. Other ongoing and future activities on National Forest land that may affect potential habitat for Appalachian blue violet include the Upper Williams watershed improvement project, the Upper Williams wildlife habitat improvement project, gas well and gas line activities, access and utility

rights-of-way, grazing allotment improvements, wildlife habitat enhancement, bridge replacement, campsite and trail bridge construction, and prescribed burning.

Only four of these ongoing and future activities would affect known occurrences of Appalachian blue violet or are likely to affect undiscovered occurrences. The ongoing Upper Williams timber project includes three known locations in helicopter-yarded thinning units. The proposed Upper Williams wildlife habitat improvement project would conduct low-intensity Indiana bat habitat improvement in a stand that contains Appalachian blue violet. The proposed Upper Williams watershed improvement project would not affect known occurrences, but is likely to affect undiscovered occurrences on old road beds that are proposed for decommissioning. The proposed Nine pipeline, which is within the Hogback project area, also may affect undiscovered occurrences. These activities may impact individuals, but because Appalachian blue violet is a disturbance-adapted species and the activities will not cause extensive ground or vegetation disturbance, the occurrences are not expected to be extirpated. Any of the other ongoing and proposed activities could affect potential habitat. If undiscovered occurrences exist, individuals may be impacted. Occurrences could be extirpated where habitat is rendered permanently unsuitable (e.g., campsites, bridge abutments, hardened roads), but most of the activities likely would not extirpate occurrences of this disturbance-adapted species. Where these activities create light to moderate disturbances (e.g., thinning harvest, Indiana bat habitat improvement, skid trails, road decommissioning, wildlife habitat improvement); habitat suitability for Appalachian blue violet could be enhanced.

Many ongoing and future activities on private land also have the potential to have detrimental and positive effects on Appalachian blue violet. However, information on specific activities is not available; therefore any consideration of these effects would be speculative. Appalachian blue violet is known from around 40 locations within the Forest proclamation and purchase unit boundary. Only three of these known locations are on private land, so the potential for private actions to lead to a loss of viability is considered very low.

If the proposed action affects undiscovered occurrences of Appalachian blue violets, these effects would add to the effects of other activities outlined above. Major soil disturbance such as skid trail, landing, or road construction has the potential to extirpate small occurrences. However, these activities, along with less destructive activities like thinning harvests, also have the potential to enhance habitat by disturbing soil and increasing the amount of sunlight reaching the forest floor. Given the current distribution of Appalachian blue violet in many parts of the project area, recolonization of these disturbed sites is likely. Because the cumulative actions across the Forest are considered unlikely to extirpate occurrences and/or may be beneficial, and because Appalachian blue violet is known to occur at around 40 locations scattered across the Forest, the cumulative effects of the proposed action and other actions are not expected to lead to loss of viability.

Effect Determinations for RFSS Plants

Action Alternatives – Large-flowered Barbara's buttons could occur in the project vicinity, but is not likely to occur within project activity areas due to lack of habitat. **Therefore, Alternatives 2 and 3 would have no impacts on large-flowered Barbara's buttons.**

Based on the above effects analysis, the following RFSS plants have the potential to occur in the Hogback vicinity and could be affected by project activities. However, occurrences within project activity areas are not known for most species, and the known occurrences of Appalachian

blue violet, butternut, and rock skullcap would be avoided. Therefore, the potential for impacts for most species is considered low. Undiscovered occurrences of Appalachian blue violet could be affected, but this species has enough occurrences distributed across the Forest to maintain viability. **For the following species, Alternatives 2 and 3 may impact individuals, but are not likely to lead to loss of viability or a trend toward federal listing:**

Table 3.16. Species for which Alternatives 2 and 3 may impact individuals, but are not likely to lead to loss of viability or a trend toward federal listing

Scientific Name	Common Name
Baptisia australis var. *australis*	Blue wild indigo
Botrychium oneidense	Blunt-lobed grapefern
Euphorbia purpurea	Darlington's spurge
Hasteola suaveolens	Sweet-scented Indian plantain
Hypericum mitchellianum	Blue Ridge St. John's wort
Ilex collina	Long-stalked holly
Juncus filiformis	Thread rush
Menyanthes trifoliata	Bog buckbean
Pedicularis lanceolata	Swamp lousewort
Poa paludigena	Bog bluegrass
Polemonium vanbruntiae	Jacob's ladder
Potamogeton tennesseensis	Tennessee pondweed
Taxus canadensis	Canada yew
Vitis rupestris	Sand grape
Woodwardia areolata	Netted chain fern
Botrychium lanceolatum var. *angustisegmentum*	Lance-leaf grapefern
Corallorhiza bentleyi	Bentley's coral root
Cypripedium parviflorum var. *parviflorum*	Small yellow lady's slipper
Cypripedium reginae	Showy lady's slipper
Juglans cinerea	Butternut
Triphora trianthophora	Nodding pogonia
Viola appalachiensis	Appalachian blue violet
Cornus rugosa	Roundleaf dogwood
Gymnocarpium appalachianum	Appalachian oak fern
Heuchera alba	White alumroot
Juncus trifidus	Highland rush
Oryzopsis canadensis	Canada mountain rice grass
Pycnanthemum beadlei	Beadle's mountainmint
Scutellaria saxatilis	Rock skullcap
Syntrichia ammonsiana	Ammon's tortula
Taenidia montana	Virginia mountain pimpernel
Trichomanes boschianum	Appalachian bristle fern

All other RFSS plants are unlikely to occur in the Hogback vicinity (see Likelihood of Occurrence document in the project record). **Therefore, Alternatives 2 and 3 would have no impacts on all RFSS plants not listed in the table above.**

Alternative 1 (No Action) – Alternative 1 would not implement any ground- or vegetation-disturbing activities. **Therefore, Alternative 1 would have no impacts on any RFSS plants.**

Irreversible or Irretrievable Commitment of Resources

Alternatives 2 and 3 may irretrievably damage or remove undiscovered populations of Appalachian blue violet through construction of skid trails, landings, and roads. All such sites could be recolonized by Appalachian blue violet after use of the sites ends, so the loss would not be considered irreversible.

Alternative 1 would take no action, therefore it would not cause any irreversible or irretrievable commitment of resources related to TES plants.

Consistency with the Forest Plan

Alternatives 2 and 3 likely would not affect any threatened or endangered plants; therefore, these alternatives are consistent with Forest Plan direction for threatened and endangered species. Alternatives 2 and 3 could affect undiscovered occurrences of sensitive plants, particularly Appalachian blue violet. However, damage to all known occurrences would be avoided, so both action alternatives 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).

Alternative 1 would take no action and have no effects. Therefore, it would be consistent with Forest Plan direction for TES species.

Consistency with Laws, Regulations, and Handbooks

Alternatives 2 and 3 would be unlikely to affect threatened and endangered plants. Therefore, these alternatives would be consistent with the Endangered Species Act, its implementing regulations, and Forest Service directives for threatened and endangered species. Effects to sensitive 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, both action alternatives would be consistent with requirements in the National Forest Management Act and its implementing regulations related to maintenance of biological diversity.

Alternative 1 would take no action and have no effect on TES species, therefore it would be consistent with the Endangered Species Act, the National Forest Management Act, and their implementing regulations.

3.3.5 Terrestrial Threatened, Endangered, and Sensitive Wildlife

Resource Impacts Addressed

A biological assessment (BA) was completed to determine the effects of the proposed action and 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. This section summarizes the data on terrestrial animals from the BA/BE. The following federally listed threatened or endangered terrestrial animals occur on the MNF: Indiana bat (*Myotis sodalis*); Virginia big-eared bat (*Corynorhinus townsendii virginianus*); West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*); and Cheat Mountain salamander (*Plethodon nettingi*).

Aquatic animals are covered in the Aquatic Resources section; terrestrial plants are covered in the Threatened, Endangered, and Sensitive Plants section.

Field surveys, GIS layers pertaining to wildlife, layers specific to federally listed, or Regional Forester Sensitive Species (RFSS), as well as layers pertaining to unique habitat features such as soils and rock outcrops were reviewed. A Likelihood of Occurrence (LOO) table was created to aid in this analysis. Through this analysis, it was determined that the planning area is considered potential habitat for 14 terrestrial sensitive species. Specific information regarding TES species can be found in the project Biological Evaluation (Project Record).

Although it is very unlikely that the project area includes occupied habitat, northern goshawk and bald eagle are addressed below because further explanation of their analysis seemed appropriate due the importance of documenting survey efforts or due to their transient nature.

The project area includes potential habitat for MNF R9 sensitive species in which presence cannot be discounted. Southern rock vole, eastern small-footed bat, Allegheny woodrat, southern water shrew, Henslow's sparrow, migrant loggerhead shrike, red-headed woodpecker, vesper sparrow, golden-winged warbler, timber rattlesnake, green salamander, noctuid moth, cobweb skipper, and Diana fritillary. Several of these species are associated with habitats that either are known to exist in the project area, or, due to the general habitat description and lack of survey data, potential presence cannot be discounted.

There is a high potential for occurrence for three of the lepidopterans (Diana fritillary, columbine duskywing and the noctuid moth) because their obligate plants (columbine and starry campion) are thought to be ubiquitous across the forest and assumed to occur in the project area. While the potential for occurrence of the southern water shrew, Barren's tiger beetle and cobweb skipper is difficult to assess due to the difficulty for surveying or lack of knowledge about preferred habitats, presence is also assumed.

Indiana Bat

Scope of the Analysis

Indiana bat habitat on the Monongahela consists of: Primary range (five mile radius around known hibernacula used for foraging, summer roosting, and swarming); Hibernacula (200' around known hibernacula entrances); Key areas (150 acres of mature or old forest near the hibernacula); Maternity site (2.5 mile radius around a known site). Forest Plan management direction for the Indiana bat along with the Hogback project area boundary would serve as the spatial area covered in this portion of the analysis. The time period considered for direct effects is the duration of the road building, harvest, and yarding activities. The time period for analysis of indirect and cumulative effects is the years post-harvest, when trees reach a minimum of 5"dbh, a size determined adequate to provide roosting habitat.

Methodology

The likelihood of occurrence of each threatened and endangered species and its potential habitat was determined for the Hogback project area (project record). Likelihood of occurrence was based on habitat requirements, district files, Natural Heritage Section of the West Virginia Division of Natural Resources (WVDNR) records, available research literature, various field surveys, and personal communication with species specialists. Conclusions drawn from the likelihood of occurrence table in the project record dictated the level of analysis needed for each

threatened and endangered species (see information in the Affected Environment section). The potential effects of each alternative on species and their habitats were evaluated. Also considered was information presented in the programmatic Biological Opinion for the Monongahela National Forest Plan (USFS 2006) and the recently approved Monongahela National Forest Plan (MNF 2006)

Indiana bat habitat on the Monongahela consists of Primary range (five mile radius around known hibernacula used for foraging, summer roosting, and swarming); Hibernacula (200' around known hibernacula entrances); Key areas (150 acres of mature or old forest near the hibernacula); Maternity site (2.5 mile radius around a known site). ARCMap was used to delineate the Indiana bat habitat areas within Hogback Project area.

Data is available for mist net sites located within the Hogback area. Sites have been surveyed in 1998, 2003, and 2006. A total of 198 bats were captured during the 3 trapping years. USFWL mist-netting protocol was followed.

Environmental Consequences

Environmental Consequences Common to all Action Alternatives

Indiana bat summer roosting and foraging habitat can consist of a wide variety of habitats. Based on Biological Assessment/Evaluations and Opinions completed for the recent Forest Plan revision, it is assumed that Indiana bats are present throughout the Forest including the Hogback analysis area. Previous analysis has shown that activities involving tree cutting during non-hibernation periods (April 1 to November 14) may result in mortality (take) of an individual roosting Indiana bat if a tree containing that bat is removed intentionally or felled accidentally. If a bat using the felled and removed roost tree is not killed by the felling action, the roosting bat would be forced to find an alternative roost tree, potentially expending energy and making the bat vulnerable to predation. According to USFWL and ESA, this action would result in harm or harassment to the bat and constitute take. Both action alternatives include timber harvesting activities.

Direct/Indirect Consequences - No Action (existing condition)

Caves closest to the project area known to harbor Indiana bats are Big Springs Cave (~ 3 miles to project boundary and 5.5 miles to closest activity unit), Coal Run Cave and Cave Hollow Arbogast/Cave (~ 6.4 miles to project boundary and 7.7 miles to closest activity area). Given the distance from the project area to the known caves, project actions would not effect these cave environments. The Hogback project area is approximately 5 miles from the known maternity site/colony on the Monongahela National Forest. Approximately 2,755 acres of the Hogback project area does fall within the 5 mile primary foraging habitat for Big Springs cave.

The Hogback project area is not located within Indiana bat hibernacula, key areas or known maternity sites. Although 2,755 acres occur within primary foraging habitat, no areas would be harvested or otherwise disturbed. Usual road maintenance and wildlife opening mowing activities would continue unchanged. Therefore, implementation of Alternative 1 would have no direct effects on Indiana bat hibernacula, maternity sites, key areas, summer foraging and roosting habitat, or fall swarming and migratory habitat. Because no tree felling or other activity associated with tree felling would occur, Alternative 1 would have no potential for take.

Indirectly, no action in this area would mean that over time, existing timber stands would continue to grow, and potential roost trees would become more available as the stands mature.

Direct/Indirect Consequences Alternative 2– Proposed Action

Alternative 2 includes timber harvest, landing construction, and road work, along with associated timber stand improvement and site preparation activities. All these activities require some degree of tree removal. 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. All regeneration harvest activities proposed in Alternative 2 would reduce forest canopies below 25 percent.

Snags, culls, and "reserve" trees would provide a small number of potential roosts in these units. Except for removing potential roost trees, commercial thinning may 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 improved roosting conditions. These effects are short-term, because canopy closure occurs in approximately 5 to 10 years after thinning occurs. A more long-term effect of thinning is increased residual growth on the remaining trees, creating larger diameter and suitable roost trees.

Damage to residual trees during felling can also improve roosting quality and quantity as damage areas turn to cavities and crevices are more likely to develop due to resulting pathogen and insect attack at the injury point.

The type of logging systems used (helicopter, cable, skidding) would not have any more or less affects to resident bat populations. Helicopter logging usually occurs during winter months, however trees may be felled prior to hauling them out via helicopter.

Road construction, reconstruction, and decommissioning would have the same effects as timber harvesting, as far as habitat removal. Roads will provide travel corridors and may also provide water sources if standing water collects on road surfaces.

No detrimental effects to Indiana bat are anticipated from herbicide use in the project area (see Wildlife/MIS report on herbicide toxicity). The hazard quotients for glyphosate represents a slight toxicity and this, combined with the project area not lying within 5 miles of known hibernacula, minimizes the potential effects from herbicide on Indiana bats.

Waterhole development would have beneficial indirect affects to residential bat populations by providing permanent water sources.

Incidental take associated with both action alternatives would be within the limits prescribed by the U.S. Fish and Wildlife Service's incidental take statement for the continued implementation of the Forest Plan (USFWS 2006).

There would be no direct, indirect or cumulative effects to primary habitat, hibernacula, key areas or known maternity sites with implementation of Alternative 1, Alternative 2, or Alternative 3.

Direct/Indirect Consequences Alternative 3

Alternative 3 effects to Indiana bat would be similar as the only difference in the two is the total number of acres harvested. Alternative 3 proposes to harvest 175 acres less than Alternative 2,

therefore retaining 175 more acres of potential roost and foraging habitat. All other activities are so similar between alternatives; refer to discussions for Alternative 2 for results.

Cumulative Impacts – Alternative 1 – No Action

Alternative 1 would involve no action in addition to currently ongoing activities, so it would not contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Field observations suggest that a large amount of the Forest is above optimal canopy closure for Indiana bat foraging habitat (USFS 2001), but the majority of forested conditions (63 percent greater than 60 years old) make most of the Forest, including the project area, potential habitat.

Cumulative Impacts – Alternative 2 and Alternative 3

By the end of the project, depending upon which alternative is chosen, either 1,473 or 1,269 acres would be regenerated and over 30 miles of associated road work would occur. Although the timber harvests would distribute forest age class distributions closer to that identified as optimal in the Forest Plan, it will have little cumulative affects to resident bat populations. Alternatives 2 and 3 would involve no actions in addition to currently ongoing maintenance activities which would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Irreversible or Irretrievable Commitment of Resources

The tree felling involved with both action alternatives could cause irretrievable loss of Indiana bat roost trees and irretrievable incidental take of Indiana bats. Roost trees and roosting habitat would not be irreversibly lost; they would be replaced over time through snag formation and growth of other trees to maturity. There may be an irretrievable loss of individuals as a result of tree harvesting, but the effects at the population level would not be irreversible because individuals could be replaced through reproduction provided sufficient habitat would remain to support them.

Consistency with the Forest Plan

All alternatives would be consistent with Forest-wide standards and guidelines for threatened and endangered species.

Consistency with Laws, Regulations, and Handbooks

All alternatives are consistent with the following:

- Multiple Use and Sustained Yield Act of 1960
- National Environmental Policy Act of 1969
- Endangered Species Act of 1973
- Sikes Act of 1974
- Forest and Rangeland Renewable Resources Planning Act of 1974
- Federal Land Policy and Management Act of 1976.

Virginia Big-Eared Bat

Scope of the Analysis

The area of influence for this species is six miles from known maternity or hibernacula. This is consistent with the Biological Opinion for the Forest Plan (USFWS 2006). This area of influence as it relates to the Hogback project area boundary will serve as the spatial area covered in this portion of the analysis. The time period considered for direct effects is the duration of the road building, harvest, and yarding activities. The time period for analysis of indirect and cumulative effects is approximately the time harvested stands grow to provide suitable roost trees.

Methodology

GIS files contain cave locations and have been developed thru cooperation with WVNDR, FS personnel, Cave books and individual contributions. Virginia big-eared bats forage near their caves. The maximum distance a male bat has been found from its roost was 5.04 miles (8.4 km). Maximum distance a female was found from the maternity colony was 2.19 miles (3.65 km) (Adam et al. 1994). Based on information that Virginia big-eared bats travel up to 6 miles from their caves to forage (Stihler 1995), areas 6 miles in radius from hibernacula and summer colonies are included within the area of influence for Virginia big-eared bats. Other than the 200-foot buffer around hibernacula and summer colonies, there is no specific management prescription or opportunity area designation for roosting and foraging areas within this 6-mile radius circle.

ARCMap is the tool used to delineate areas of influence within Hogback Project area.

Environmental Consequences

Environmental Consequences Common to all Action Alternatives

The Hogback project area is not located within Virginia big-eared bat area of influence. Caves closest to the project area known to harbor Virginia big-eared bats are Big Springs Cave (~ 3 mi.) and Brooks Stemple Cave (~ 2.2 miles to project boundary; 4.4 mile to activity unit). Given the distance from the project area to the known caves, project actions would not effect cave environments. Therefore, there would be no direct, indirect or cumulative effects to Virginia big-eared bat hibernacula, maternity colony or bachelor colony.

There are no mine adits or abandoned buildings on federal property within Hogback project area that could be used as day or night roosts.

Direct/Indirect Consequences Alternative 1– No Action – existing condition

Caves closest to the project area known to harbor Virginia big-eared bats are Big Springs Cave (~ 3 miles to project boundary and 5.5 miles to closest activity unit), and Brooks Stemple Cave (~ 2.2 miles to project boundary and 4.4 miles to closest activity area).

The Hogback project area is not located within Virginia big-eared bat hibernacula, key areas or known maternity sites. Although 10,795 acres in the analysis area occur within a 6 mile foraging area from a known maternity sites, no harvest activities are planned in these areas. Usual road maintenance and wildlife opening mowing activities would continue unchanged. Therefore, implementation of Alternative 1 would have no direct, indirect or cumulative effects on Virginia

big-eared bats or habitat. Because no tree felling or other activity associated with tree felling would occur, Alternative 1 would have no potential for take.

Direct/Indirect Consequences Alternative 2 and Alternative 3

Implementation of either action alternatives would not directly affect Virginia big-eared bats. There are no known hibernacula within the watershed and no reason to presume that Virginia big-eared bats would travel to forage within the project area. As a result, there are no adverse effects anticipated to this species under any Action Alternative.

Cumulative Impacts – Alternative 1 – No Action

Alternative 1 would involve no action in addition to currently ongoing activities, so it would not contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Cumulative Impacts – Alternative 2 and Alternative 3

By the end of the project, depending upon which alternative is chosen, either 1,473 or 1,298 acres would be regenerated and over 30 miles of associated road work would occur.

Although the timber harvests would distribute forest age class distributions closer to that identified as optimal in the Forest Plan, it will have little cumulative affects to resident bat populations. Alternative 2 and 3 involve no actions in addition to currently ongoing maintenance activities which would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Irreversible or Irretrievable Commitment of Resources

All alternatives result in minimal to no impacts to Virginia big-eared bats and habitat as discussed above. Therefore, there are no irreversible or irretrievable commitment of resources with any alternative selected.

Consistency with the Forest Plan

All alternatives would be consistent with Forest-wide standards and guidelines for threatened and endangered species.

Incidental take associated with either action alternative would be within the limits prescribed by the U.S. Fish and Wildlife Service's Incident Take statement for the continued implementation of the Forest Plan (USFWS 2006).

Consistency with Laws, Regulations, and Handbooks

All alternatives are consistent with the following:

- Multiple Use and Sustained Yield Act of 1960
- National Environmental Policy Act of 1969
- Endangered Species Act of 1973
- Sikes Act of 1974
- Forest and Rangeland Renewable Resources Planning Act of 1974
- Federal Land Policy and Management Act of 1976.

West Virginia Northern Flying Squirrel

There is no suitable habitat for the West Virginia northern flying squirrel in the project area. This species is not analyzed further.

Cheat Mountain Salamander

The project are does not contain habitat for Cheat Mountain salamander. This species is not analyzed

Sensitive Species – Terrestrial Species

Resource Impacts Addressed

A biological evaluation (BE) was completed to determine the effects of the proposed action and alternatives on Regional Forester's Sensitive Species (RFSS) for the Monongahela National Forest. A complete list of RFSS is found in the Likelihood of Occurrence table (in project record). This effects section summarizes the data on terrestrial species. Aquatic animals are covered in the Aquatic Resources section; terrestrial plants are covered in the Threatened, Endangered, and Sensitive Flora section.

Scope of the Analysis

The area considered for direct and indirect impacts to terrestrial sensitive species is the Hogback project area. This area is located in the most north western section of the Forest and encompasses 45,068 acres. Approximately 13,446 acres of National Forest System lands and about 31,622 acres of private lands are contained within the project boundary. Spatial boundaries for this project area were chosen based on timber compartments, private vs. National Forest boundaries and existing road systems. This boundary was determined adequate because this is a project level analysis. The spatial boundary used to address cumulative impacts is more Forest or species range wide.

Temporal boundaries on sensitive species are not expected to last beyond the actual time to complete the activity, whether the activity is timber harvesting, road building or herbicide application. The temporal boundary used to assess cumulative impacts is generally about 25 years; however the amount of time where cumulative effects are felt, is more activity dependant.

Methodology

The effects analysis is based on the following: 1) species specific literature as cited; 2) internal agency information (e.g., ArcGIS information); 3) likelihood of occurrence table; and 4) field reviews. ArcGIS information is a compilation of wildlife survey and sightings. Field visits were conducted from spring 2006 through 2007.

Species information was collected from the West Virginia Natural Heritage Program database, Cheat/Potomac district records, Combined Data System information, Ecological Classification System database and predictive vegetation associations, soil maps, Geographical Information System library, research literature, field surveys, and personal communication with specialists to determine each species' occurrence or likelihood of occurrence in this project area. Occurrence and habitat data were organized into a likelihood of occurrence table (in the project record). Species determined not to occur or unlikely to occur in the project area due to lack of habitat were not brought forward for further analysis.

Sensitive species have been grouped into habitat types for effects analysis. Habitats include: Riparian; Mature forest; Rocky areas; Savannahs; and Early successional habitat.

The key to determining effects is evaluating how each alternative affects species (direct) and habitat (indirect) and, in particular, how alternatives affect factors that limit a species' ability to thrive (limiting factor). Direct and indirect affects to sensitive 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" and 4) "likely to result in a trend to federal listing or a loss of viability". The project Biological Evaluation includes determinations to sensitive species.

No terrestrial RFSS animals are known to occur in the project area, but specific surveys have not been conducted for many of them. Northern goshawk call surveys were completed in 2006 for areas within the analysis area exhibiting suitable habitat; however no birds were detected through this effort. There have been no current or historic goshawk nesting documented in the Hogback area. Therefore, no further analysis will be completed for northern goshawk. Potential habitat for the following terrestrial RFSS could occur in the project area: southern rock vole; eastern small-footed bat; Allegheny woodrat; southern water shrew; Henslow's sparrow; migrant loggerhead shrike; red-headed woodpecker; vesper sparrow; golden-winged warbler; timber rattlesnake; green salamander; a tiger beetle; noctuid moth; cobweb skipper; and Diana fritillary.

Environmental Consequences Common to both Action Alternatives

Forest Plan standards and guidelines will be applied to both Action alternatives and no additional sensitive species mitigations are required. All action alternatives involve thinning and regeneration harvests. Effects due to harvest would be the same in all action alternatives, however, effects may differ when conventionally logged versus helicopter logged. Some action alternatives include several miles of road improvements, construction and reconstruction. The new road construction and the sections of road reconstruction that would occur outside of the existing road beds would result in the removal of linear strips of trees, other woody and herbaceous vegetation, topsoil, leaf litter, and other organic material used by wildlife.

Alternative 1 - Affected Environment/Existing Condition - 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 floodplan, 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 50' buffers on ephemeral streams and 100' buffers on perennial streams. There are approximately 3,002 acres of riparian habitat (139 acres of ephemerals and 2,863 acres of perennial) within the analysis area. This is a course number based on 267 miles of streams. The aquatic/riparian zones in the analysis area provide potential habitat for the following sensitive terrestrial animals:

Table 3.17. Limiting factors for sensitive riparian habitat species

Species	Limiting Factor
Eastern small footed bat	Disturbance to individuals or habitat
Southern water shrew	Disturbance to individuals or habitat
A tiger beetle	Disturbance to individuals or habitat
Southern rock vole	Disturbance to individuals or habitat

Eastern Small-footed Bat: Eastern small-footed bats occur from Maine, Quebec, and Ontario southwestward through the Appalachian region to Arkansas and eastern Oklahoma. Eastern small-footed bats may hibernate close to summer roosting and maternity habitat (Whitaker and Hamilton 1999). Very little is known about their summer ecology. During this time, these bats are sometimes found in unusual roost sites such as under rocks on exposed ridges, in cracks in rock faces and outcrops, in bridge expansion joints, abandoned mines, buildings, and behind loose bark (Erdle and Hobson 2001).

Bridges, along with riparian and woodland habitat are present in the analysis area. Small-footed bats may use areas within the analysis area for foraging however no small-footed bats were captured during the mist-nets surveys conducted in 1998, 2003, and 2006.

Southern Water Shrew: Water shrews are typical animals of northern forests. They most commonly occur along the edge of slow or swift flowing streams with rocks, crevices, and over hanging banks, with boulders, rocks, and woody debris present in the stream and streambed. The species inhabits both perennial and ephemeral streams (Beneski and Stinson 1987; Pagels et al. 1998). The riparian areas are typically in or near northern hardwood forests, often with the dominant trees being yellow and black birch, sugar maple, red maple, black cherry, American beech, and eastern hemlock (Pagels et al. 1998).

Southern water shrews are difficult to capture, which has made this a difficult species to monitor. Riparian areas in the Hogback project area provide potential habitat for southern water shrew. Although specific surveys for southern water shrew were not conducted, they area presumed present.

Tiger Beetle: This species inhabits dry sandy banks and islands along major rivers in West Virginia from the Allegheny Mountains eastward. It is usually found in dry, sandy openings among sparse vegetation above the river shoreline (Allen and Acciavatti 2002). This species has a two-year life cycle, over-wintering the first year as a mature larva and the second year as an adult. Riparian areas in Hogback provide potential habitat for tiger beetle. Although specific surveys for Tiger beetles were not conducted, they area presumed present within the project area. A single occurrence of a tiger beetle is documented outside the watershed boundary.

Southern Rock Vole: The range of the southern rock vole, (*Microtus chrotorrhinus carolinensis*), extends from eastern WV 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 (Kirkland and Jannett 1982; 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 Hogback project area provide potential habitat for southern rock vole, though specific surveys were not conducted.

Alternative 1 - Direct/Indirect Effects - Riparian Species:

Under the No Action Alternative there would be no Forest Service activities creating additional sources of sedimentation that would potentially allow silt/sediment to enter stream channels (see Aquatic section). Water quality would remain status quo and there would be no direct effects to species listed above. Current sediment loads and existing sources are likely to persist in some streams in the planning area under the No Action alternative, and would not be repaired. Additional sedimentation may indirectly affect those species using this habitat, by degrading habitat decreasing prey availability. Viability is expected to be maintained for all species.

Alternative 1 - Affected Environment/Existing Condition - Mature Forest Habitat and Species:

Mature growth 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. 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 LWD, including snags and downed wood. Forest Service lands within the Hogback analysis area contain approximately 1,794 acres of mature habitat 100 years and older. The mature forest in the project area provides potential habitat for the following sensitive terrestrial animals:

Table 3.18. Limiting factors for sensitive mature forest habitat species

Species	Limiting factor
Diana fritillary	Insecticide application
Noctuid moth	Removal of host and nectar plants
Green salamander	Disturbance to habitat
Timber rattlesnake	Disturbance during hibernation and direct killing of individuals
Eastern small-footed bat	Disturbance during hibernation
Southern rock vole	Disturbance to individuals or habitat
Red-headed woodpecker	Removal of available cavity trees

Diana Fritillary: The Diana fritillary is a southern Appalachian mountainous forest species that ranges from Virginia and West Virginia south to northern Georgia and Alabama. It prefers moist and well-shaded forest covers with rich soils. The butterfly uses small openings and roadsides in search of nectar plants (milkweed and thistles are preferred) but will not stray far from the woods (Allen 1997). They will also use butterfly weed and swamp milkweed. Later in the season, wild bergamot, Joe-pye weed and ironweed are the common plants selected. As with other *Speyeria*, woodland violets serve as host plants for Diana in West Virginia (Allen 1997).

This species is not known to occur within Tucker County; however, the plant species listed as nectar sources and host plants do occur within the Hogback project area.

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 **(*Silene stellata*).** This species is hard to survey for and there is

only one known occurrence on the Forest. There have been no surveys completed for this species within the project area, however the habitat and the existence of starry campion can not be discounted, therefore presence is assumed.

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 1995).

There are no rock formations within the Hogback project area; however green salamanders are 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.

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, primarily mice, comprise 87 percent of prey taken, but they will also feed on rabbits, shrews, chipmunks, squirrels, bats, songbirds, and other snakes. 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 Hogback project area, but rattlesnakes can be found almost anywhere within the Monongahela National Forest, so timber rattlesnake presence is assumed within the project area.

Eastern Small-footed Bat: See discussion above under Riparian Species.

Southern rock vole: See discussion above under Riparian Species.

Red-headed woodpecker: Occupies a wide range of habitats, but most are characterized by open areas (> 2 hectares) for catching flying insects, large snags for nesting and roosting, and a secure food supply. Will forage on ground, capture insects in flight, glean food from vegetation, or chisel trees for wood-boring insects and sap. Will store food for winter (grasshoppers, nuts, corn, and fruit) in natural crevices of trees and posts, in tree cavities, under bark, and under railroad ties and shingles.

Alternative 1 - Direct/Indirect Effects - Mature Forest Species:

As there are no harvests or related projects, road construction, or reconstruction projects proposed in Alternative 1, there would be no direct effect to mature forest species (see Old Growth/Mature Habitat section), and viable populations would be maintained. Natural disturbances such as wildfire, ice and wind storms, and disease or insect outbreak 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. Eventually, as these trees continue to age, mast production would begin to decrease. Vertical stand structure would increase in diversity within stands and diversity between stands would slowly decrease as all stands trend toward uneven-aged conditions.

Alternative 1 - Affected Environment/Existing Condition - Rocky Habitat -

Areas with surface rock, small outcrops and ledges. There area areas within the Hogback analysis area that provide potential habitat for the following species:

Table 3.19. Limiting factors for sensitive rocky habitat species

Species	Limiting factor
Southern rock vole	Disturbance to habitat
Allegheny woodrat	Disturbance to habitat
Timber rattlesnake	Disturbance to habitat and individuals
Green salamander	Disturbance to habitat

Southern rock vole: See species discussion listed under Riparian Species.

Allegheny woodrat: Allegheny woodrats live almost exclusively in rocky areas located in or around hardwood forests that have an abundance of oaks and other mast-bearing trees. Woodrats are herbivores; they rely almost exclusively on plant materials for their food. Among their favorite foods are acorns and other nuts, berries, twigs, leaves, and fungi. Occasionally they may feed on snails, insects, or other invertebrates. In autumn, woodrats habitually cache (store) large quantities of acorns, twigs, leaves, and other edible vegetation to ensure a constant food supply throughout the winter months. No woodrat surveys have been completed; however, habitat is available within the analysis area.

Timber rattlesnake: See species discussion listed under Mature Forests.

Green salamander: See species discussion listed under Mature Forests.

Alternative 1 - Direct/Indirect Effects - Rocky Habitat Species:

Allegheny woodrat and the timber rattlesnake prefer rocky areas and ledges within forested areas. These areas have been avoided in both action alternatives. These areas are often steep, inaccessible, and of low timber quality. This reduces the chances of future disturbance to these areas from timber harvesting either on federal or private lands. Since no new roads would be constructed, the effects are limited to existing ones. Most roads are closed on federal lands and the chance of a snake or a woodrat being run-over is minimal and not significant. Overall road densities are low, averaging only about 2 miles per square mile. Herbicide use is stem specific and not a broadcast application. Cumulatively the impacts of project activities are not significant.

Alternative 1 - Affected Environment/Existing Condition - Savannahs/Grasslands:

Savannahs and grasslands include hayfields, pastures, and old grassy fields. In the Hogback project area, this habitat is provided almost completely by private lands. The Forest Service has no grazing allotments or wildlife openings within the Hogback analysis area large enough to solely support these grassland species.

Table 3.20. Limiting factors for sensitive savannah grassland habitat species

Species	Limiting factor
Henslow's sparrow	Field size and mowing
Migrant loggerhead shrike	Loss of available fields
Vesper sparrow	Field size and mowing
Cobweb skipper	Host plant (little bluestem, big bluestem) availability

Henslow's sparrow: Open fields and meadows with grass interspersed with weeds or shrubby vegetation, especially in damp or low-lying areas, adjacent to salt marsh in some areas. Uses unmowed hayfields (abandoned if cut). Found in a variety of habitats that contain tall, dense grass and herbaceous vegetation (Smith 1968, 1992). Open fields and meadows with grass interspersed with weeds or shrubby vegetation, especially in damp or low-lying areas, adjacent to salt marsh in some areas. Breeds in a variety of grassland habitats, hayfields, pastures, wet meadows, and old grassy fields. Woven grass nests are typically constructed on or near to the ground. Population declines have been attributed to the loss of grassland breeding habitats, either from encroaching urbanization or succession to shrublands and forests. Management activities that enhance grassland productivity such as mowing, burning, and grazing should be encouraged, but units subject to these management efforts should not be disturbed from mid-May through August. In general, mowing, grazing, and/or burning may be needed to maintain habitat in the long term but may be detrimental to local populations in the short term.

Migrant Loggerhead Shrike: The shrike typically nests in dense brush, hedgerows, or isolated trees in pastureland. Year-round, shrikes generally concentrate their activity in grassland habitats. Winter foraging habitat does not seem to differ strikingly from summer habitat with hayfields and idle pastures heavily used.

Habitat loss has been caused by farmland abandonment, development, and widespread changes in farming practices. There are no confirmed breeding records for Tucker County (Buckelew and Hall 1994).

Vesper Sparrow: The vesper sparrow is a ground nester, found in pastures, hayfields, and along the edges of cultivated fields where hedgerows, scattered trees, power lines, or other tall structures can be used as song perches.

Cobweb Skipper: The Cobweb skipper ranges from southern Maine south to the Gulf states and eastern Texas in sporadic populations. Its range in WV is restricted to those sties 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).

Alternative 1 - Direct/Indirect Effects - Savannah and Grasslands

National Forest System land within the Hogback analysis area does not provide characteristics suitable for this habitat type, therefore these species are not known to occur on National Forest System land within Hogback. This habitat is discussed briefly in this analysis only so far as to say that private lands within the analysis boundary may provide savannah/grassland habitat required for the species identified below.

Alternative 1- Affected Environment/Existing condition - Early Successional Habitat and Species:

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 supports very different plant species than a full-canopied forest. 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 3.21. Limiting factors for early successional habitat species

Species	Limiting factor
Golden-winged warbler	Habitat succession
Timber rattlesnake	Disturbance during hibernation and direct killing of individuals
Cobweb skipper	Host plant (little bluestem, big bluestem) availability

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, powerline rights-of-way, or low areas where saturated soil retarded woody growth. Habitat loss is a major threat to golden-winged. Habitat tracts of 10 to 50 hectares can support several pairs and are preferred over both smaller and larger areas (Confer 1992a). Golden-winged warblers avoid patches < 2 hectares, and use increases with area as patch size ranges from 12 to 40 hectares (Buehler et al. unpublished *in* Hunter et al. 2001).

Timber rattlesnake: See species discussion under mature habitat.

Cobweb skipper: See species discussion under savannah/grassland habitat.

Alternative 1 -Direct/Indirect Effects - Early Successional Habitat

As there are no harvests or related projects, road construction or reconstruction projects 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 loss of early successional habitat as recently harvested areas mature (see Vegetation effects). Natural succession would favor a dense shade tolerant understory, which would reduce habitat suitability for Cobweb skipper. Nesting areas for golden-winged warbler, and sunning conditions for rattlesnakes would probably decline as recently harvested areas mature and become shaded. However, such effects are not expected to result in loss of viable populations or trends toward federal listing because disturbed habitats are provided on other National Forest System lands and private lands across the Forest.

Alternative 2 – Proposed Action - Direct/Indirect Effects

The proposed action would regenerate 1,269 acres using the clearcut with reserves and 88 acres using the shelterwood methods of regeneration. Thinning would be done in 53 acres in the

project area. There would also be approximately 24 helicopter landing constructed; after being used for this project, these areas would remain as wildlife openings and may be used again in the future for landings. Approximately 4.5 miles of road is proposed for construction, 0.5 miles of reconstruction, 20 miles of maintenance, and 0.9 miles of road decommissioning. Fencing may be used to prevent deer browsing of desirable regeneration in approximately 104 acres of regeneration units. The 805 acres of timber stand improvement (chemical and manual) would increase black cherry and red oak mast supply. Several waterholes will be constructed where possible.

Of the activities identified in this alternative, approximately 2,140 feet of road activity will occur within riparian habitat.

Riparian Species: There are no harvest units planned within riparian areas. All units are designed to leave no cut zones along streamside areas to prevent injury to riparian characteristics. Species using riparian areas will be protected through these no-harvest buffers left along perennial, intermittent, and ephemeral streams. Therefore, there will be no direct impacts on riparian species due to timber harvest activities. Road activities are proposed and do involve crossing several streams and riparian zones. Indirect effects of road activity may include increased stream siltation, thereby decreasing prey availability for Southern water shrew and rock vole if they occur in these areas. If road activities are completed as designed, these effects should be short-term and will not lead to the loss of viability of riparian species.

Herbicide treatments pose little direct risk to riparian species as they are targeted on specific individual trees. 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 and guidelines). The use of herbicides is not anticipated to affect, directly or indirectly, any of the riparian species, and thus viable populations would be maintained.

Riparian Habitat: Soil disturbing activities can have direct, indirect, and cumulative effects on aquatic and riparian resources, and these effects can be variable in terms of the extent and duration. Activities that disturb soils can increase stream sedimentation and lead to various forms of aquatic habitat degradation. Soil disturbing activities associated with Alternative 2 include reconstruction, maintenance, and use of roads (system, temporary, and skid roads) and landings (log and helicopter landing sites), and to a limited extent, timber harvests.

Roads within riparian areas and floodplains can inhibit stream and floodplain function and physically occupy riparian habitat. Roads that cross stream channels can disconnect aquatic habitat, change stream channel dynamics in the vicinity of the crossing, and contribute to channel instability. All these effects can alter the quality of habitat for many terrestrial and aquatic species that inhabit these areas.

Timber harvesting can affect watershed processes that are important to maintaining the health of many aquatic and riparian dependent communities. Extensive timber harvesting and associated activity throughout a watershed can affect stream flow conditions, particularly storm flow and peak flow characteristics during the growing season.

There are no conventional or helicopter landings proposed in riparian areas. Several existing wildlife openings are located within riparian zones along several streams. There are six wildlife openings located along Twelvemile and Tanner Runs, four to five openings along Wolf Run, and eight openings along Horseshoe Run. The majority of these openings were at one time mowed;

however, access problems have deemed the majority of these openings nonmowable. Plans to mow opening will continue as long as possible dependant on access, personnel status, and budget. This activity will not affect the R9 RFSS riparian species.

These existing areas provide habitat for many species and represent areas that could naturally have been open along stream sides. These wildlife openings are vegetated and are not contributing sediment into streams. New landing construction may contribute some sediment until the areas are seeded and vegetation becomes established.

Mature Forest Habitat: The proposed action would regenerate 1,269 acres using the clearcut with reserves and 88 acres using the shelterwood methods of regeneration. The proposed action would decrease the amount of mature forest by 10 percent. The remaining forested area in National Forest ownership would continue to exhibit characteristics associated with mature timber stands. Thinning on approximately 53 acres would not change mature forest habitat into early successional habitat.

Potential indirect effects to mature forest habitats primarily come from timber harvests which change the forest stand age, forest structure, open up the forest canopy, increase light to the forest floor, changes the microclimate of the area, and create soil disturbance.

Mature Forest Species: Direct effects due to timber harvest and road management activities on Diana fritillary, green salamander, timber rattlesnake, eastern small-footed bat, southern rock vole, water shrew, red-headed woodpecker, and noctuid moth include directly crushing individuals, collisions with vehicles and purposeful killing of individuals (timber rattlesnake in particular). Timber harvesting from April thru October would have the greatest probability of directly affecting rattlesnakes. During timber harvesting, falling trees may crush rattlesnakes. There would also be increased probability of threat to snakes due to increased human activity in the area while harvesting. Timber harvesters do not generally tolerate rattlesnakes in the area where they are working.

Indirectly, timber harvests may improve eastern small-footed bat foraging areas as the canopy opens and allows the bats to forage more easily. Additionally, this would create more edge habitat suitable for summer foraging. Red-headed woodpeckers would benefit from selective thinning which makes maneuvering while hunting easier and may create additional snags from residual trees. Indirectly, timber harvesting may benefit rattlesnakes by increasing food resources. Small mammal populations are higher in open wooded areas with an abundance of forest floor vegetation. In addition, increases in coarse woody debris on the forest floor provide good habitat for both timber rattlesnake and their prey species. Any woodrats in the area would not benefit from timber harvests that remove mature oak trees as acorns are a primary food source. Indirect effects on Diana fritillary and green salamander would be similar. Timber harvesting would remove canopy, potentially changing forest floor microclimate. Decreasing soil moisture may deem those harvest units unsuitable to these species.

Road construction/reconstruction requires some timber removal; however this activity would have no direct effect on eastern small-footed bats. These bats roost in rock crevices and caves during daylight hours when road construction and road use take place. Indirectly, roads within the project areas provide travel corridors and the increased edge provides foraging areas for bats. Bats would also take advantage of standing water found in road ruts.

Road management activities may have both adverse and beneficial affects to area rattlesnakes. Reconstruction activities may directly affect individuals if they are present during heavy equipment use. Effects may be due to equipment or equipment operators directly killing a snake if they see it. On the other hand, roads act as travel lanes for small mammals, providing snakes with additional hunting areas. Snakes may also use roads to sun themselves during the day. Vehicular traffic would be limited on Forest Service roads; however road improvement allows more traffic into the area, even if it is only administrative. Therefore the possibility of timber rattlesnake mortality from vehicle collisions is possible.

Indirectly, road management may benefit Diana fritillary as they tend 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.

Herbicide treatment would have no direct affect to individual terrestrial species, as this is a specific "hack and squirt" method only directly affecting those tree species injected. Indirectly, herbicide treatment may temporarily remove foliage and temporarily decrease soil moisture. These affects would be very localized and negligible. Indirectly, removal of striped maple, beech sucker sprouts, and grapevines would be beneficial as these species interfere with the successful development of desired tree species such as oaks, ash, or cherry, which in turn provides increased forest diversity, increased or stable mast production, and a stable prey base.

Landings/Wildlife opening creation would have the same effect on snakes as timber harvesting. There may be negative effects to snakes while activity is taking place, however there may be beneficial effects by increasing small mammal habitat, therefore increasing prey base for the snake.

Overall, the effects of the action Alternatives 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. The action alternatives may impact individuals but are not likely to cause a trend toward federal listing or a loss of viability for the sensitive species inhabiting mature habitat.

Rocky Habitat: This habitat is not extensive in the project area. It mostly consists of areas riddled with surface rock. Timber harvesting 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.

Rocky Habitat Species: Direct effects due to timber harvest activity and road management activities on Allegheny woodrat, timber rattlesnake, and green salamander include crushing of individuals, collisions with vehicles, and purposeful killing. Rock voles spend much of their time in subterranean burrows in rocky areas; crushing voles thru timber activity 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 thinning by encouraging understory growth and improving foraging habitat.

During timber harvesting, Allegheny woodrats may be crushed by falling trees. However, this species is highly nocturnal, and spends much of the timber in deep rock crevices; therefore this

negative effect is discountable. Thinning may create gaps in the canopy that allow more sunlight to penetrate to the forest floor, encouraging understory growth and thereby increasing food availability for this species. On the other hand, timber harvest reduces the amount of hard mast in an area, and by not creating a gap in the canopy, would not increase the amount of soft mast in the understory, thereby forcing Allegheny woodrats to increase their foraging distances (Castleberry 2000b).

Shelterwood harvesting, like thinning, would create gaps in the canopy that allow more sunlight to penetrate to the forest floor, encouraging understory growth and thereby increasing soft mast for this species. Allegheny woodrats are known to forage in young clearcuts (Castleberry 2000b); therefore shelterwood harvests should not inhibit woodrat movements. In addition, any silvicultural practice that encourages oak species would benefit the Allegheny woodrat (Malcom and Yahner 1996).

Vehicular traffic on new and reconstructed roads would be limited; therefore the possibility of Allegheny woodrat mortality from vehicle collisions is discountable. The early success ional habitat bordering roads may provide an excellent source of green vegetation and soft mast for Allegheny woodrats.

Grapevine and herbicide treatments would have no direct, indirect, or cumulative effects to southern rock voles or Allegheny woodrats.

None of the action Alternatives will result in loss of viability for any species associated with rocky habitat types.

Savannah/Grassland Habitat: National Forest System land within Hogback analysis area does not provide characteristics suitable for this habitat type. It is mentioned in this analysis only so far as to say that private lands within the analysis boundary may provide savannah/grassland habitat required for the species identified below.

Savannah/Grassland Species: Henslow's sparrow, Vesper sparrow, and migrant loggerhead shrike all require large expanses of grassland area. There are no activities proposed to create the habitat required for this species and there are no areas on National Forest System lands that currently provide suitable habitat for these species within the Hogback area.

Early Successional Habitat: The Hogback area currently has 661 acres of early successional habitat (habitat 0 to 25 years of age).

Early Successional Species: The proposed action would regenerate 1,269 acres using the clearcut with reserves and 88 acres using the shelterwood methods of regeneration; this would result in a 400 percent increase in early successional habitat. Timber harvest would not occur in early successional habitat, but will create it. Timber rattlesnake may be affected by harvest activity, mostly through killing of the snake if it is found by operators. Indirectly, timber harvesting would remove canopy, creating temporary early successional habitat. This habitat usually lasts about 20 years until the canopy is closed and forest litter and vegetation cover exposed soils. Post timber harvest, early successional species may use this habitat until it once again becomes unsuitable due to growth over time. Several existing wildlife openings are scheduled to be used as timber landings. This activity involves ground disturbance and essentially would be the only activity that could affect this habitat.

Road activity will occur in this habitat (mostly using existing wildlife openings as landings and truck traffic associated with that activity), however, this is predicted to be such a low mileage, it would essentially have no affect to early successional dependant species or habitat.

Herbicide treatment would have no direct or indirect effect on early successional habitat species. Herbicide treatments are proposed in timber harvest units and would be localized.

Under Alternative 2, viable populations of early successional species would be maintained, and may even increase due to harvest activities. This action alternative will not result in loss of viability for any species associated with early successional habitat types.

Alternative 3 - Direct/Indirect Effects

Approximately 150 acres less regeneration harvesting would occur in Alternative 3 than in the proposed action. The difference between the two alternatives is the logging system used. Fifty percent less ground-based logging would occur in Alternative 3 than in the proposed action. Road construction and reconstruction would be reduced; however, road decommissioning miles would increase. Differences to the habitats between Alternatives 2 and 3 are so small as to be discountable.

Riparian Species: While effects due to timber harvesting under Alternative 3 would be similar to those under Alternative 2, the magnitude of the effects would be less due to the lower volume of timber to be removed. Viable populations of riparian species would be maintained, and effects would not contribute to a trend toward federal listing.

Mature Forest Species: While effects due to timber harvesting under Alternative 3 would be similar to those under Alternative 2, the magnitude of the effects would be less due to the lower volume of timber to be removed. Viable populations of mature forest species would be maintained, and effects would not contribute to a trend toward federal listing.

Rocky Habitat Species: Alternative 3 effects to this habitat would be slightly less than Alternative 2 based on the lower amount of planned harvest, less road related activities, and more helicopter logging.

Savannah/Grassland Habitat Species: Alternative 3 would not create savannah or grassland habitat.

Early Successional Habitat Species: Alternative 3 would create less early successional habitat than Alternative 2. Viable populations of early successional habitat species would be maintained, and effects would not contribute to a trend toward federal listing.

Cumulative Impacts - Alternative 1 – No Action

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 benefiting from the large volume of mast produced within the watershed. However, mast production is probably not sustainable at its current level. As the trees within the watershed continue to age, their mast production would eventually decrease. A balanced age class distribution in the project area would ensure that some stands in the project area are at their peak mast production years at all times so that the watershed would provide a sustainable supply of mast for wildlife. Alternatives 2 and 3 would help to balance age classes in the analysis area. If no new stands are regenerated, as would be the case with Alternative 1, mast

levels would probably 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.

Under the no action alterative, the forest would retain a high proportion of mature sawtimber. Early successional forest habitat would continue to decline on national forest land. This, coupled with the lack of regeneration harvest on private land, would lead 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 or private lands, mixed oak and cove hardwood forest types would decrease and be replaced with more shade-tolerant species like red maple and beech.

Cumulative Impacts - Alternative 2 – Proposed Action

By the end of the project, 1,269 acres would be regenerated. The direct cumulative effect would be improvement in age class distribution. The proposed action would also have the long-term effect of restoring 90 acres of oak-pine forest type, a forest type that was once common in the area. Approximately 975 acres of the harvest units would be treated with herbicides; this would result in a reduction of fern, striped maple, beech brush, and grass and a cumulative increase in tree seedlings and other herbaceous understory species. Herbicide treatment of the understories will have no long-term adverse effects on species diversity. None of the herbicides proposed for use in the project bioaccumulate. The herbicide treatments will have no cumulative effects. The direct cumulative effect of fencing will be the establishment of plants species that are preferred deer browse. Fencing will have the indirect cumulative effect of maintaining forest types that are presently in the project area. The proposed action would also construct and improve more roads which would have the long-term impact of increasing access for future vegetative treatments.

Soil disturbing activity can have direct, indirect, and cumulative effects on aquatic and riparian resources and these effects can be variable in terms of extent and duration. Activities that disturb soils can increase stream sedimentation and lead to various forms of aquatic habitat degradation. Soil disturbing activities associated with the Action Alternatives include road reconstruction, maintenance, construction and decommissioning and use of roads (system, temporary, and skid roads) and landings (log and helicopter landing sites) and to a limited extent, timber harvests.

Roads within riparian areas and floodplains can inhibit stream and floodplain function and physically occupy riparian habitat. Roads that cross stream channels can disconnect aquatic habitat, change stream channel dynamics in the vicinity of the crossing, and contribute toward channel instability. Roads on steep slopes, erodible soils or stream crossings have the greatest potential for increased sediment effects. Prolonged sediment input will decrease invertebrate production, reducing the available food supply for riparian species

Timber harvesting activities including felling, extracting, sorting, and loading have the potential to impact riparian resources. Herbicide applications related to timber stand improvement will not occur within riparian zones

Several landing/wildlife openings will exist in riparian areas. These openings will be maintained as long as access and funding is available. These areas are vegetated and are not contributing sediment into streams; therefore will not indirectly affect riparian species or habitat.

Currently, a large percentage of the forest in the project area is at the age where the trees typically reach their peak mast production. Wildlife species that use mast and mature second-

growth forest are benefiting from the large volume of mast produced within the watershed. However, mast production is probably not sustainable at its current level. As the trees within the watershed continue to age, their mast production would eventually decrease. A balanced age class distribution in the project area would ensure that some stands in the project area are at their peak mast production years at all times so that the watershed would provide a sustainable supply of mast for wildlife. Alternative 2 and 3 would work toward balancing the age classes in this area. If no new stands are regenerated, as would be the case with Alternative 1, mast levels would probably 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.

Regeneration harvests would contribute to cumulative effects until the regenerated canopy closes in about 20 years, whereas the contribution of the thinning harvests would last about 5-10 years until canopy closure. The contribution of roads and landings to cumulative effects would last as long as the facilities are maintained.

There are currently no Forest Service "grassland" acres within the Hogback project area and currently there are no plans to create large areas (greater than 30 acres) of grassland on Forest service land. There is always a possibility that the Forest Service could acquire grassland areas in the future based on available funding and opportunities. If this were the case, it would be beneficial for the Forest Service to maintain this land in a grassland state and manage it to enhance grassland productivity. Activities such as mowing, burning, and grazing would be encouraged, but activity should not occur from mid-May through August to prevent mortality or injury to ground nesting birds.

Cumulative Impacts - Alternative 3

Alternative 3 would have cumulative effects similar to the proposed action in regards to mature habitat, early successional habitat, rocky habitat, and early successional habitat. Overall, only 153 acres less harvest would occur between Alternative 2 and 3. Essentially, this small difference is discountable when discussing cumulative effects.

Effects to riparian habitat would be slightly less than what was discussed in Alternative 2 due to the reduced number of road activities and the small changes in timber harvest methods.

Therefore, Alternative 3 would be unlikely to make a measurable contribution to the cumulative effects of past, present, and reasonably foreseeable future actions on any Region 9 sensitive terrestrial species.

Irreversible or Irretrievable Commitment of Resources

There are no actions identified in either alternative that would be considered irreversible or irretrievable. It is possible that if a species (flora or fauna) is eliminated from an area (due to human actions or natural causes), there may be a vegetative type conversion or permanent removal of a species due to habitat change. Specifically, this may occur if there were outbreaks of invasive species that removed the hemlock or beech component, or some other species that is unforeseen; however, our actions should not lead to irreversible or irretrievable commitment of resources. Harvested areas would eventually grow back to mature forest, and roads and landings could be abandoned and returned to disturbed, riparian, or mature forest habitat.

Consistency with the Forest Plan

All alternatives would be consistent with Forest Plan standards and guidelines. The Proposed Action and Alternative 3 are consistent with the management prescription for 3.0 areas. Both 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.

3.3.6 Terrestrial Management Indicator Species (MIS)

Resource Impacts Addressed

This section of the document discusses how the Hogback project implementation may affect local terrestrial wildlife and habitat. Public comments did not include specific terrestrial wildlife or habitat concerns, but were directed at issues that may indirectly affect terrestrial wildlife or habitat within Hogback project area. Public comments included: pro-hunting and identifying deer densities as too high; protection of habitat and structures from fire; conifer planting; no herbicide use; and providing motorized public access into the Hogback area.

Terrestrial Management Indicator Species (MIS)

The Monongahela National Forest Land Management Plan (Forest Plan) contains a list of MIS for use in monitoring because their population changes are believed to indicate the effects of management activities on habitats. Table D-1 found in Appendix D of the Forest Plan (2006) provides a list of MIS; Table D-2 provides a 'disposition of MIS from the 1986 Forest Plan'. The following are Forest-wide Management Indicator species: Wild (naturally reproducing) brook trout, *Salvelinus fontinalis*; cerulean warbler, *Dendroica cerulea*; wild turkey, *Meleagris gallopavo*; and West Virginia northern flying squirrel (WVNFS), *Glaucomys sabrinus fuscus*. Potential impacts to brook trout are analyzed in the specialist report for "Aquatic Resources". The WVNFS is not analyzed due to lack of habitat in this project area. Table 3.22 summarizes the Forest-wide habitat objectives for MIS considered within this section (cerulean warbler and wild turkey).

Table 3.22. Forest-wide Management Indicator Species pertinent to this analysis

Species	Reasons for Selection	Habitat Objective
Cerulean warbler	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.	Maintain at least 50,000 acres of mid-late and late successional (>80 years old) mixed mesophytic and cove forest to meet habitat needs for cerulean warbler.
Wild turkey	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.	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.

Habitat and population trends on the Forest and in the project area are discussed where

information is available. Wildlife monitoring data collected, including changes in available habitat, are summarized in annual Forest and Fish and Wildlife Monitoring Reports. Information from these published reports, as well as on-going or unpublished monitoring data, is incorporated here by reference.

Scope of the Analysis

The area considered for direct and indirect effects to terrestrial MIS is the Hogback project area. This area is located in the most north western section of the Forest and encompasses 45,068 acres. Approximately 13,446 acres of National Forest System lands and about 31,622 acres of private lands are contained within the project boundary. Spatial boundaries for this project area were chosen based on timber compartments, private versus National Forest boundaries, and existing road systems. Cumulative effects are discussed at a larger scale, more in line with the Forest boundary. As far as cerulean warbler and turkey, the spatial boundary of the project area does not represent either animal's home range, existing population, or habitat specific for either species. The project boundary was determined to be an adequate approach for turkey, as they are considered wide ranging and found throughout the entire Forest. The project boundary is adequate to determine direct/indirect effects to Cerulean warblers; however, they tend to be more habitat specific, needing blocks of mature, mesophytic forests larger than what is available in the Hogback project area.

Direct effects to either wildlife resource are not expected to last beyond the actual time to complete the activity. Whether the activity is timber harvesting, road building, or herbicide application, direct effects would occur. Indirect effects on habitat will last much longer than the actual activity. The temporal boundary used to assess cumulative impacts is generally about 25 years; however the amount of time when cumulative effects are felt is more activity dependent. For example, regeneration harvests reset succession and can affect certain habitat characteristics (e.g., mast production) for a century or more.

Methodology

The effects analysis is based on the following: 1) species specific literature as cited; 2) internal agency information (e.g., ArcGIS information); and 3) field reviews. ArcGIS information is a compilation of wildlife survey and sightings. Field visits were conducted by the Wildlife Biologist and/or by Technicians from the spring of 2006 through 2007.

Consistency with the Forest Plan

All alternatives are consistent with Forest-wide standards and guidelines for wildlife (Forest Plan, p. II-29); Threatened, Endangered, and proposed species (Forest Plan, p. II-22); and with wildlife standards and guidelines in management prescription 3.0 (Forest Plan, pp. II-29).

Existing habitat conditions for MIS within the Hogback area.

Cerulean warbler *(Dendroica cerulea)* – 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 WV, 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 TN and MO, suggesting that management activity such as

silviculture can create or improve habitat (Hamel et al. 2004). There have been no point count surveys or breeding bird surveys completed in the Hogback area.

Wild turkey *(Meleagris gallopavo)* – Good turkey habitat requres mature mixed hardwood stands, conifer stands, open understories, scattered openings, well distributed water, and areas removed from disturbance. Eastern wild turkey and their young use grass/forb habitat to forage for insects in the late spring and summer months. Insects, herbaceous material, and grass seed dominate the summer diet. Important fall and winter foods are the fruits, seeds, and acorns or nuts from wild grape, oaks, beech, dogwood, yellow poplar, and black cherry.

See Table 1.3 in Chapter 1 for acres of different forest types by age class for National Forest land in the Hogback project area. All forest types with the exception of "open" provide hard and soft mast in the form of acorns, hickory nuts, beechnuts, and black cherry, buds, stems and soft fruits. Rhododendron, laurel, and hemlock thickets along drainages provide shelter and security cover during hunting seasons. The project area also contains some conifers that provide roost cover during severe winter weather.

Turkeys need a daily water source and water is available throughout the project area in the form of seeps, springs, streams, and created waterholes. Grassy openings are found in Hogback in the form of private agriculture fields, maintained openings, and grass covered roads and utility rights-of-way. There are approximately 120 acres of open land on NFS lands within the project area.

The WVDNR tracks spring and fall turkey harvest numbers by county and National Forest wildlife management area, and reports those figures in their annual Big Game Bulletins. Population estimates are based on the premise that the number of spring gobblers harvested represents 10 percent of the turkey population in an area. The Hogback Project Area (45,068 acres or 70.4 square miles) is located in the northern portion of the Blackwater Wildlife Management Area (BWMA) (58,978 acres or 92.2 square miles). Estimated turkey populations, based on harvest numbers (and with the assumption that turkeys are evenly distributed across the WMA), are shown in Table 3.23 below.

Table 3.23. Estimated turkey populations in BWMA

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Spring Gobbler	63	58	65	62	103	27	22	12	40	25
Est. population BWMA	630	580	650	620	1,030	270	220	120	400	250

Effects

Direct/Indirect Effects to MIS; Alternative 1 – No Action

In this alternative, no trees would be harvested; no roads or landings would be constructed, reconstructed, improved, or decommissioned. Affects on turkey and cerulean warbler populations from human activities in the project area would remain static. Wildlife would not experience increased disturbance or other effects from equipment use, road compaction, soil disturbance, human presence, or vehicle traffic since this alternative would not include those activities. Access and use of the area would remain at current levels with no expectation of any increased use of the area. It is expected that turkey populations in the Hogback area would continue to thrive, as adjacent private lands would provide open areas for brood rearing.

Existing Cerulean warbler habitat would not change as no timber activity would occur to alter age class distribution.

Little early successional habitat would occur other than in openings created by natural disturbances, such as fire, windthrow, severe ice damage, and insect damage. This could create a small amount of early successional habitat used by turkey broods.

Direct/Indirect effects to MIS Common to both Action Alternatives

Alternative 2 would regenerate 1,269 acres using the clearcut with reserves and 88 acres using the shelterwood methods of regeneration resulting in a 400 percent increase in early successional habitat. Alternative 3 reduces regeneration cuts to 1,119 acres and 66 acres of shelterwood cuts. Overstory removal and thinning harvest areas are essentially the same for both alternatives. Both action alternatives involve 55 acres of thinning in the same units (4 acres in C11 and 50 acres in C12) to remove lower quality trees and release existing mast producing trees such as oak. There is very little difference (175 acres) in the number of acres identified for timber harvest between Alternative 2 and 3. The major difference between the two alternatives is the logging system used. Fifty percent less ground-based logging would occur in Alternative 3 than the proposed action. Helicopter logging would not affect nesting cerulean warbler and turkey if harvesting trees occurs during the winter months when ceruleans are not present and turkeys are not nesting. The absence of over-ground skidding would eliminate potential nest destruction for both species.

Female turkey nest on the ground from late March through early May. Nests are usually close to a water source and well concealed by ground vegetation. Eggs are laid on average of 2 every 3 days with a typical clutch of 10 to 14. Incubation requires about 28 days. During nesting, both the eggs and the female turkey are susceptible to predation and disturbance. Any ground disturbing activity (timber harvesting, road construction/reconstruction) occurring during nesting may lead to crushing of eggs. Along with the actual direct affects of harvesting, increased human activity in an area can cause turkey to abandon the nest making eggs or young vulnerable to predation. Nesting and care of young are the most vulnerable time as far as affects from project work.

Even aged regeneration harvesting in predominantly oak forest types eliminates mast producing species for approximately 40 years until regenerated oaks start producing hard mast. Indirectly, timber harvest would remove existing mast from the areas harvested, reducing feeding areas for resident turkey populations. Because turkeys range hundreds of acres, units harvested should not adversely affect populations due to lack of mast. Over time, regeneration harvesting has the potential to promote oak regeneration that otherwise might be replaced by shade-tolerant trees. Post harvest usually creates favorable environment for soft-mast shrubs (blackberry, poke berry).

Road activities (construction, reconstruction, and decommissioning) remove a small amount of forested acres, but provides edge environment that allows for suitable soft mast vegetation growth, bugging areas, and linear openings used by local turkey populations. Roads that are scheduled for permanent or seasonal opening could affect turkey populations due to increased disturbance and increased hunting pressure. Roads usually take up a small proportion of the landscape, so the amount of habitat loss at the project boundary scale is not likely to be substantial.

Cerulean warblers arrive in WV around the last week of April. Three to four eggs are laid in May/June and females nest for 11 to 13 days and young birds usually fledge after 14 days.

Usually only one brood is raised per season. Depending upon what time of year timber is harvested, any nests would be vulnerable to destruction. Even-aged regeneration harvesting in mid-late and late successional mixed mesophytic and cove forest (approximately 6,859 acres in Hogback would be considered mesophytic/cove forest) eliminates optimum cerulean warbler habitat in the regenerated areas for approximately 80 years.

If nests are located in areas adjacent to harvest activities, increased noise and human activities should not affect nesting cerulean warblers as nests are usually located high in the upper reaches of the tree.

Fencing may be used to prevent deer browsing of desirable regeneration in both alternatives. The small difference of 104 acres versus 81 acres would not change effects to either species. There would be no direct effect to warblers or turkey from the fencing project proposed. There may be slight amounts of human disturbance to both species during the time of installation; however this would be short-term and not consequential.

Understory control activities are the same for both action alternatives. Stands identified for this action have dense understories of beech, fern, striped maple, and mountain laurel. A total of 232 acres would be treated with herbicides to control the undesirable vegetation. Effects to turkey due to this activity are dependent upon the time of year the activity takes place. Disturbance during the nesting period would have the most effect to local turkey populations. This activity would also remove a small amount of available nesting habitat from the area, as turkey prefer to nest in areas surrounded by ground cover. Cerulean warblers are tree nesting birds, so this activity would not affect nesting warblers.

Mechanical and chemical Timber Stand Improvement would remain the same for both action alternatives. A total of 770 acres would be treated to release high value, sapling sized hardwoods to increase growth and vigor. Depending on the unit, either chainsaw felling or herbicides would be used to release the crop trees. All vines would also be cut in the stands. Affects to turkey due to this activity is dependent upon the time of year the activity takes place. Disturbance during the nesting period would have the most effect to local turkey populations. This activity may slightly reduce the amount of available mast, however most saplings do not produce a large amount of mast.

Vertical vegetation structure is very important for cerulean warblers. TSI work would create spacing between trees in the stand, along with potentially opening spaces within the canopy, which improves the broadcast characteristics of their songs (Hamel 2006). Ceruleans nest high in the tree canopy, so TSI work will not affect nesting areas.

Both action alternatives require the construction of helicopter and conventional log landings to remove harvested timber. Approximately 42 to 52 acres of landings would remain as wildlife openings and may be used again in the future for landings. Once again, the primary direct effect is disturbance during construction and also when the landings are being utilized as such. When timber harvesting is complete, these landings would be seeded to native grasses and would provide excellent brood rearing habitat for local turkey populations. These areas would not benefit cerulean warbler, however the amount of land converted to these openings is not consequential in the realm of the entire project area.

Cumulative Effects to MIS; Alternative 1

No trees currently producing mast would be removed; however, no mast trees would be regenerated for future sustainable yields. Cherry, oak, and hickory would not regenerate over wide areas unless there were a natural disturbance in the area, such as fire, windthrow, or insect damage. Mast production of black cherry, oak, and hickory could decrease in perhaps 40 to 50 years when existing mast trees begin to decline in mast production and are not replaced by younger trees. Over the long-term, local turkey and other wildlife populations that have small home ranges and depend on mast could be adversely affected by the reduction in mast production across the project area. However, some mast production likely would continue, and any wildlife population declines would not likely be noticeably on a Forest-wide basis.

Mast producing shrubs would remain in the understory, but would not produce as much mast as in a managed forest where light conditions in the understory would be increased by management actions such as thinning and two-age harvests. Natural breaks in the canopy due to overstory tree mortality would allow additional sunlight to reach mast-producing shrubs, however.

Cumulative Effects to MIS; Action Alternatives

When considering the effects to turkey and cerulean warbler over time, and based on past and anticipated future disturbances within the project area, the primary factors of change include activities such as timber harvests on National Forest and private land, wildlife habitat improvements such as new permanent openings and waterholes, maintenance of existing Forest and State roads, development, maintenance and operation of existing gas wells and pipelines, and possible residential and agricultural developments.

In general, these activities tend to maintain or create permanent openings, early successional forest habitat, and edge habitat, and tend to reduce and fragment mature forest habitat. As described previously, even-aged partial harvest treatments result in short-term effects to wildlife habitat and use, and for this reason, partial harvest activities are not included in the cumulative effects analysis. Since there have been no major naturally-occurring disturbances or changes within the project area within the last 10 years, potential cumulative effects were identified by looking at the predominant, human-caused disturbances which have occurred within the project area over time. For the purpose of this analysis, the geographic scope or cumulative effects analysis boundary used to evaluate effects to the wildlife resource, includes all private and National Forest System lands within the Hogback project area. The following rationale was used to identify the cumulative effects analysis area for wildlife. The planning area is characteristic of the surrounding landscape, in that the area is predominantly forested and surrounding lands are similarly forested.

The regeneration and road reconstruction proposed in the action alternatives would contribute to the cumulative effects of other actions that replace mature forest habitat with early successional forests, permanent openings, and edge.

The regeneration harvests would also contribute to the long-term maintenance of mast production in future mature forest habitat, assuming regeneration of mast producing species is successful.

The thinning harvests included in both alternatives would not remove the forest canopy, and thus would not contribute to cumulative effects related to openings. However, thinning would stimulate understory growth and would make a very short-term contribution to some components

of early successional and edge habitats. The action alternatives contribution to cumulative effects would last about 5 to 10 years, at which time canopy closure of the regeneration harvest units would return these areas to forest habitat. However, road reconstruction contributions would persist indefinitely as long as they are maintained. The contribution to sustainable mast production would begin when the regenerated trees reach optimal mast production several decades after the harvest, and would continue until the trees begin to senesce around a century after the harvest.

Cerulean warblers in the project area could experience population declines due to these cumulative effects. However, despite these effects, mature forests and the species that inhabit them are expected to continue to dominate the majority of the project area. The action Alternatives would not adversely affect maintenance of species viability at the Forest-wide scale.

Fencing would have the effect of ensuring the successful regeneration of the current species mix. This would indirectly benefit turkey by assuring mast producing timber species into the next planning cycle.

The 770 acres of timber stand improvement in both action alternatives would increase future stand values and mast supply in the future. Black cherry and red oak would be two of the main species released. This would indirectly benefit turkey by assuring mast producing timber species into the next planning cycle.

3.3.7 Terrestrial Wildlife

A challenge in managing for multiple wildlife species is to maintain sufficient habitat for species that need mature forest while providing for the needs of desired species requiring edge and early successional habitat. Management Prescription 3.0 direction seeks to maintain canopied stands of a sufficient size, interspersed with younger stands throughout the landscape, which would provide habitats for a variety of wildlife species requiring different successional stages and habitat types. The proposed Hogback alternatives would serve as a means of attaining diverse forest stands, early successional stages/openings, and open understory conditions, which have been noted to provide benefits for many species (Bailey and Rinell 1968; Miller 1975; Rieffenberger et al. 1981; Wunz 1989; Wunz 1990).

Scope of the Analysis

The area considered for direct, indirect, and cumulative effects to terrestrial wildlife is the Hogback project area. Spatial boundaries for this project were chosen based on timber compartments, private versus National Forest boundaries, and existing road systems. As far as terrestrial wildlife uses in the area, the spatial boundary does not represent specific animals' home ranges, known populations, or specific habitats. This was determined to be an adequate approach because in general, all species are considered either wide ranging or habitat specialists. For wide-ranging species, the project area is adequate for this analysis because the project area makes up a relatively small part of the species range. For habitat specialists, determining suitable habitat in the project area is adequate to disclose potential impacts to those species.

Direct and indirect effects to wildlife resources are not expected to last beyond the actual time to complete the activity, whether the activity is timber harvesting, road building, or herbicide application. The temporal boundary used to assess cumulative impacts is generally about 25 years, however time length is more dependent on the activity you are discussing. For example,

regeneration harvests reset succession and can affect certain habitat characteristics (e.g., mast production) for a century or more.

Methodology

The effects analysis was based on review of literature and scientific knowledge concerning the effects of timber harvest and road construction on habitat structure, mast production, and disturbance of wildlife. A wildlife biologist visited the project area to assess wildlife habitat conditions and evidence of species present in the harvest units.

Environmental Consequences

Environmental Consequences to terrestrial wildlife species common to all action alternatives

Wildlife species requiring closed canopy forests may be adversely affected by clearcut harvests in the short-term, as this activity creates openings in the forest canopy. These gaps may allow understory vegetation to flourish from increased sunlight reaching the forest floor. Deer, bear, shrub-nesting birds and other species could benefit from new understory vegetation growth and increased edge habitat which would provide additional food, cover, and nest sites provided by tree seedlings and saplings, forbs, grasses, blackberries, etc. in even-aged regeneration areas (Robinson and Bolen 1984). This vegetation would provide increased structural diversity that could attract songbirds such as hooded and Kentucky warblers (Smith 1988) and nesting wild turkeys. Hawks, owls, and other predators that prefer a more open understory may have reduced hunting success in the dense understory vegetation. Some mast-producing trees would be removed, but residual mast producing species of trees and shrubs would experience less competition and probably would produce more mast. Harvest activities would affect mature forest to some extent, which could affect species like the wood thrush, a forest interior species that requires larger areas of mature forest. Robbins (1979) estimates that 250 acres is the minimum forest area required to sustain viable breeding populations of this thrush.

Direct effects of all timber harvest activities on birds, gray squirrels, and other tree-nesting species could result from loss of eggs, young, and/or adults during tree felling and skidding, primarily if these activities are conducted during the nesting season. Indirect effects could include loss of nests, nest cavity sites, and roosting sites. Bats roost under shredding bark of old trees and snags, so they could also experience loss of roosting sites and mortality during felling operations. Other cavity users, such as mice, squirrels, and raccoons, could be adversely affected by loss of cavities. Such effects could occur due to harvest activities in both action alternatives. These effects would be minimized by standards and guidelines in the Forest Plan that call for the retention of snags and den trees in cutting units (Forest Plan, TE24).

Salamanders could experience local population declines in all harvest units under both alternatives. Pauley (1997) noted that in sections of clearcuts where sunlight reaches the soil, the surface is hardened and prevents salamanders from reaching the surface to feed. Where slash and surface litter is left and soils retain moisture, salamanders are still able to reach the surface. Effects would be limited by leaving tree tops and other slash scattered through harvest units. Pauley (1997) has noted that in West Virginia, red-backed salamanders would return to pre-clearcut populations within 22 years. Populations of mountain dusky salamanders would return and would be abundant, but would not equal pre-clearcut populations as quickly as the red-backed salamanders.

The skid roads needed to remove timber from the conventional harvest units may provide travel lanes for some species, such as deer and bear, however these same skid roads may temporarily isolate some small species such as salamanders that are associated with leaf litter and other forest floor organic matter, since their movements may be restricted by areas of bare soil.

Both action alternatives include over 30 miles of road maintenance, decommissioning, construction, and reconstruction. In general, the reconstruction of existing roads would have minor effects on wildlife. Road reconstruction would result in the removal of vines, tree limbs, brush, and other vegetation that have encroached onto the roadways in the last several years. The reestablishment of the road corridor may benefit certain bat species that forage in linear openings. Road reconstruction would also remove any herbaceous vegetation that has grown on the road surface. Species such as deer, turkeys, grouse, cottontails, and songbirds would lose the clover and other preferred plant species that may occur on the roadway. However, these resources should still be available to a lesser extent on the roadsides and in other open areas. Effects of log landing construction would be similar, since most landings would be constructed in existing openings that are dominated by herbaceous plants. Effects due to log landings would be temporary since the landings would be revegetated after use.

The new road construction and the sections of road reconstruction that would occur outside of the existing road beds would result in the removal of linear strips of trees, other woody and herbaceous vegetation, topsoil, leaf litter and other organic material use by wildlife. Soil and ground disturbance from road construction could directly affect ground-nesting species by destroying ground nests and burrows, with possible loss of adults and young (salamanders, rabbits, mice, chipmunks, and ground-nesting birds such as juncos and ovenbirds). Soil compaction on roads, skid roads, and log landings would be detrimental for burrowing animals on those specific sites, but adjacent to the roads and landings would be largely unaffected by soil compaction. Road abandonment would offset the new road construction somewhat. In time, the abandoned road section would be reclaimed by nature and provide some of the habitat features removed by the new road sections. By creating new edge habitat, road construction may benefit species like deer and eastern towhees (*Pipilo erythrophthalmus*).

Most species in the gray squirrel and deer species associations are considered to be tolerant of human disturbance to some degree. However, some species such as bears and turkeys are believed to be sensitive to disturbance during critical life stages like nesting and denning. Short-term direct and indirect disturbance to wildlife may occur during project implementation from 1) physical harm or mortality of individual animals from equipment use, tree felling, and skidding; 2) disturbance or destruction of nesting and roosting sites, cover vegetation, or food sources; 3) noise disturbance from equipment use and vehicle traffic; 4) visual disturbance from increased human activities in the area; and 5) soil disturbance and compaction during road construction and skidding. Some animals may become road kill victims due to the increase in log truck and other vehicle traffic in the project area during project activities.

Long-term disturbance could occur after project completion if new roads or road improvements facilitate human access into the area

Noise from equipment and human activity could cause some species, such as bears, bobcats, and turkeys, to change their normal activity patterns to avoid some locations. Helicopter yarding operations likely would be conducted during winter. This timing would avoid disturbance to

nesting and brooding turkeys, but could cause disturbance of denning bears if any are present in the harvest units during harvest.

Direct/Indirect Consequences Alternative 1– No Action

In this alternative, no trees would be commercially harvested, no roads or landings would be constructed, reconstructed, improved, or abandoned, no new maintained wildlife openings would be created, no additional water holes developed and no herbicide use or site prep work would occur. Little early successional habitat would occur other than in openings created by natural disturbances, such as fire, windthrow, severe ice damage, and insect damage. Early successional habitat in the project area likely would decline as early successional forest in previously harvested areas matures. If large-scale natural disturbances occur, they could offset this trend, but the timing and duration of natural disturbances cannot be predicted. Timber harvest on private land is not likely to provide much early successional habitat because such harvest typically is selection or diameter limit cutting. Early successional species would find habitat located in small patches scattered throughout the area. Some species that are limited to this habitat or require it as a component of their habitat would probably decline as the previously harvested units continue to mature. Woodpeckers and cavity nesters would be maintained at current levels or possibly increase as more snags and dying trees become available. Availability of den trees for bears may increase as trees grow larger and become more susceptible to diseases and injuries that create hollows. Species requiring larger expanses of mature forest would be maintained at current levels or possibly increase as existing early successional forest matures, unless natural catastrophic events affect large areas.

With no habitat management to enhance browse or mast availability, management activities would not impact deer populations in the short-term. However, over the long-term, lack of management actions on National Forest System lands in the project area may result in less browse being available to deer populations, which could affect their populations.

No trees currently producing mast would be removed; however, no mast trees would be regenerated for future sustainable yields. Cherry, oak, and hickory would not regenerate over wide areas unless there were a natural disturbance in the area, such as fire, wind- throw, or insect damage. Mast production of black cherry, oak, and hickory could decrease in perhaps 40 to 50 years when existing mast trees begin to decline in mast production and are not replaced by younger trees. Over the long term, squirrel, deer, turkey, bear, and other wildlife populations that depend on mast could be adversely affected by the reduction in mast production across the area. However, some mast production likely would continue, and any population declines would not noticeably affect Forest-wide species viability.

Mast producing shrubs would remain in the understory but would not produce as much mast as in a managed forest where light conditions in the understory would be increased by management actions such as thinning and two-age harvests. Natural breaks in the canopy due to overstory tree mortality would allow additional sunlight to reach mast producing shrubs, however.

Affects on wildlife from human activities in the project area would remain static. Wildlife would not experience increased disturbance or other effects from equipment use, road compaction, soil disturbance, human presence, or vehicle traffic since this alternative would not include those activities. Access and use of the area would remain at current levels with no expectation of any increased use of the area.

Direct/Indirect Consequences Alternative 2 – Proposed Action

The Proposed Action would create about 1,269 acres of early successional habitat (the amount of which is currently below Forest Plan objectives for MP 3.0) by dispersing fifty separate harvesting units ranging from 3 to 40 acres in size. This would result in a 400 percent increase in acres of early successional habitat and reduce the amount of mature forest by 10 percent.

Regeneration harvests would remove closed-canopy habitat needed by some wildlife species, resulting in local population declines in the harvested stands. However, most of the project area and surrounding lands would continue to be dominated by mature, closed-canopy forest, and Forest-wide species viability would be maintained. Some mature oaks and other species would be retained in each of the 50 regeneration units for mast production and to provide additional structural diversity and wildlife habitat. The residual trees remaining after the timber harvests likely would experience an increase in mast production on a per-tree basis, but the overall mast production of the affected stands would be reduced for several decades. However, assuming regeneration of desired mast-producing species is successful; the regenerated stands would help sustain mast production in the future when some of the adjacent older stands may be declining in mast production.

The harvests would result in a flush of understory vegetation available for browse, nesting, cover and habitat for species needing young stand characteristics. During the initial 10 to 15 years following harvesting, these sites would provide a varied food base of blackberry, forbs, woody vegetation, and grasses for a variety of animals, such as bears, turkeys, grouse, foxes, raccoons (*Procyon lotor*), chipmunks (*Tamias striatus*), deer, mice, and songbirds. The open canopy conditions would last approximately 20 years, which is about the time it takes for trees to reach 1/3 the height of the surrounding stands.

The proposed action would have only minor effect on forest type. Most of the stands proposed for regeneration are typed as mixed oak and cove hardwoods; the future desired condition of the regeneration stands is mixed upland hardwood.

In the proposed action fencing may be used to prevent deer browsing of desirable regeneration in approximately 104 acres of regeneration units. Fencing would have the effect of insuring the successful regeneration of the current species mix. Fencing would also increase species diversity by preventing the selective browsing of woody and herbaceous plants.

The 770 acres of timber stand improvement in the proposed action would have the effect of increase future stand values and mast supply in the future. Black cherry and red oak would be two of the main species released; they both have high timber and wildlife value. The timber stand improvement activities would also have the short-term effect of increasing the amount of herbaceous vegetation by increasing the amount of light reaching the forest floor.

Under Alternative 2, herbicide may be applied on up to 947 acres of regeneration harvest units. The EPA approved herbicides triclopyr or glyphosate would be applied to individual trees by using either a backpack sprayer or a hatchet and squirt bottle.

A risk assessment prepared for the Forest Service indicated that triclopyr, when applied at a typical forestry application rate of 1 lb/acre, is not likely to cause acute (short-term) toxic effects in terrestrial mammals and invertebrates (SERA 2003). At the upper range of plausible exposures in forestry applications, birds that consume contaminated vegetation could experience adverse acute effects. However, there is no habitat for large grazing birds (e.g., Canada geese

[*Branta canadensis*]) in the areas to be treated. Therefore, the proposed use of triclopyr in Alternative 2 is not expected to cause acute toxicity to terrestrial wildlife. At the highest exposure scenario considered, the risk assessment identified the potential for adverse chronic (long-term) effects to large mammals and large birds that consume contaminated vegetation. However, the modeled scenario assumed that contaminated vegetation made up 10 to 100 percent of the animal's diet for a 90-day period. For Alternative 2, such an exposure scenario is extremely unlikely because 1) triclopyr has a foliar half-life of three to ten days (SERA 2003), and 2) because treated vegetation would be damaged or killed, thereby limiting opportunities for consumption. Exposure for a 90-day period would require repeated re-application in the same area. For these reasons, use of triclopyr as proposed is not expected to cause chronic toxicity to wildlife.

SERA (2003) conducted a similar risk assessment for glyphosate. At a typical application rate of 2 lbs/acre, none of the modeled exposure scenarios indicated a risk of adverse acute or chronic effects for terrestrial organisms. Therefore, no acute or chronic toxicity to terrestrial wildlife is anticipated.

Direct/Indirect Consequences Alternative 3

Approximately 150 fewer acres of regeneration harvesting would occur in Alternative 3 than in the proposed action. The major difference between the two alternatives is the logging system used. Fifty percent less ground-based logging would occur in Alternative 3 than the proposed action. The same amount of thinning would be done in Alternative 3 as in the proposed action.

Effects from thinning, overstory removal and shelterwood harvests would be negligible between Alternative 2 and Alternative 3 on wildlife populations due to the low number of acres planned. Of course any Forest disturbance may affect individual species inhabiting the exact impact site.

Cumulative Impacts - Alternative 1 – No Action

Alternative 1 would not involve any management activity in addition to ongoing activities and maintenance. Therefore, Alternative 1 would not contribute to the cumulative effects of past, present, and reasonably foreseeable future actions.

Cumulative Impacts - Alternative 2 – Proposed Action

The current condition of the project area reflects the integrated effects of past and present federal and non-federal activities that are listed at the beginning of Chapter 3. Reasonably foreseeable future actions that can affect wildlife habitat in the Hogback project area include activities such as timber harvests on Forest Service and private land, wildlife habitat improvements such as new permanent openings and waterholes, maintenance of existing Forest and State roads, maintenance and operation of existing gas wells and pipelines, construction of new gas wells, and possible residential and agricultural developments (see Table 3.1 at the beginning of Chapter 3). In general, these activities tend to maintain or create permanent openings, early successional forest habitat, and edge habitat. These activities tend to reduce and fragment mature forest habitat. However, future timber harvests may help sustain mast production over the long-term by maintaining shade-intolerant tree species as a component of future mature forests.

The regeneration harvests and new road construction proposed in Alternative 2 would contribute to the cumulative effects of other actions that replace mature forest habitat with early successional forests, permanent openings, and edge. Timber harvests would also contribute to

the long-term maintenance of mast production in future mature forest habitat, assuming regeneration of mast producing species is successful. The thinning harvests included in this alternative would not remove the forest canopy, and thus would not contribute to cumulative effects related to openings. However, thinning would stimulate understory growth and would make a very short-term contribution to some components of early successional and edge habitats. Most of this alternative's contribution to cumulative effects would last about 35 years, at which time canopy closure of the regeneration harvest units would return these areas to forest habitat. However, the contribution of the new roads would persist indefinitely as long as they are maintained. The contribution to sustainable mast production would begin when the regenerated trees reach optimal mast production several decades after the harvest, and would continue until the trees begin to senesce around a century after the harvest.

Species in the project area limited to mature forests, such as wood thrush and some salamander species, would experience population declines due to these cumulative effects. However, despite these effects, mature forests and the species that inhabit them are expected to continue to dominate the majority of the project area. Alternative 2 would not adversely affect maintenance of species viability at the Forest-wide scale.

Cumulative effects would be beneficial to species that use openings, edge, and early successional habitats for all or a portion of their habitat. Examples of such species include white-tailed deer, wild turkey, and ruffed grouse. Over the long-term, assuming timber harvests achieve regeneration of hard mast species, cumulative effects would benefit mast-using species such as black bear, wild turkey, and gray squirrel.

Cumulative Effects - Alternative 3

Alternative 3 cumulative effects would be the same as those identified for Alternative 2 as the two actions are so similar.

Irreversible or Irretrievable Commitment of Resources

Alternative 1 does not involve new action, thus it would not contribute any irreversible or irretrievable commit any wildlife resources. The early successional habitat that would be lost gradually under Alternative 1 is retrievable through future management actions. Alternative 2 would result in the irretrievable conversion of 1,269 versus 1,119 acres of mature forest habitat to early successional habitat. In the units to be thinned, Alternatives 2 and 3 would cause the irretrievable conversion of 53 acres of closed-canopy mature forest into broken-canopy forest. These commitments of habitat resources would not be irreversible because the harvested areas eventually would return to mature, closed-canopy forests. Alternatives 2 and 3 would cause an irretrievable commitment of forested and herbaceous habitat associated with the construction and reconstruction of roads and landings. These commitments also are not irreversible because the roads and landings could be decommissioned and revegetated.

3.3.8 Birds Of Conservation Concern (BCC)

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 for the Appalachian Mountain Bird Conservation Region (USFWS 2002). This section addresses the impacts of the proposed action and alternatives on birds of conservation concern.

Affected Environment

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 birds of conservation concern for the Appalachian Mountain Bird Conservation Region.

To simplify a discussion of the effects of the alternatives, 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 birds of conservation concern 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.

Species Using Forested Habitat

- Kentucky Warbler – dense understory of mature, humid deciduous forest, wooded ravines, oak-pine or northern hardwood forest. Possible breeding in Tucker County.
- Louisiana Waterthrush – along streams flowing though heavily wooded valleys, deciduous forest, some hemlock, northern hardwoods. Possible breeding in Project area, Tucker County.
- Swainson's Warbler – 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. No Records from northern half of West Virginia
- Worm-eating Warbler – mature deciduous woodland that lacks dense ground cover, mature beech-maple or oak-pine forest. Possible breeding in Tucker County. Pine planting scheduled in Alternative 2 may create more suitable habitat for this species.
- Cerulean Warbler – mature forest, mixed mesophytic and oak forest below 600 meters in elevation, common in the west part of the state, sparse in the mountains. Probable breeding in Tucker County.
- Wood Thrush – mature or near mature deciduous forest, prefers dense shade on forest floor. Confirmed breeding in Tucker County.
- Acadian Flycatcher – 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. Confirmed breeding in Tucker County.
- Yellow–bellied Sapsucker (breeding populations only) – upland black cherry forest, cut over mature hardwoods, spruce-hardwoods. No observations in Tucker County
- Whip-poor-will – mixed deciduous woods, upland oak-hickory forest, not in spruce, hardwood-pine or hardwood-hemlock, few in northern hardwoods, rare in dense forest. Potential habitat could occur. Possible breeding in Tucker County.

- Northern Saw-whet owl (breeding populations only) – spruce and mixed spruce-hardwoods, swampy areas in coniferous forest, high elevations. Confirmed breeding in Tucker County.
- Black-billed Cuckoo – northern hardwoods, cove hardwoods, oak-hickory forest. Possible breeding in Tucker County.
- Prothonotary Warbler – swamps (wooded wetlands) and large streams, not in the highlands. No observations in Tucker County.
- Red-headed Woodpecker – open oak groves with little understory, groves of oaks and grazing lands, Ohio River valley and low elevations in the Allegheny Mountains. No observations in Tucker County.

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

- Sedge Wren – wet grass and sedge meadows, nests near surface of water, needs wetlands, grassy marshes. No Observations in Tucker County

Species Using Young Forest/Brushy Habitat

- Olive-sided Flycatcher – 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. No observations in Tucker County.
- Bachman's Sparrow – brushy overgrown fields, abandoned pastures growing up in shrubs, often in erosion gullies in steep hill sides, much un-used habitat remains. No observations in Tucker County.
- Bewick's Wren – dry open country in valleys east of the mountains, in small clearings in spruce at high elevations, brushy thickets, favors old farm buildings, old farmsteads, very local or extirpated. Unlikely to occur in the project area as it is nearing extirpation in the region. No observations in Tucker County.
- Prairie Warbler – young pine forests and brushy scrub, young second growth hardwoods, overgrown pastures, Christmas tree plantations. Probable breeding in Tucker County.
- Golden-winged Warbler – low, brushy second growth forest and open woodland, especially powerline rights of way, higher elevations, not in spruce. Refer to Sensitive species section for analysis. Confirmed breeding in Tucker County.

Species Using Both Forest and Non-forest Habitat

- Peregrine Falcon – 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 (southern Appalachian populations only) – not applicable to WV or the MNF
- Black-capped Chickadee (southern Blue Ridge populations only) – not applicable to WV or the MNF

- Chuck-will's-widow – 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 – grass, old field habitat, grassy mountain tops and reclaimed surface mines, pastures, airports, golf courses. No records from the Monongahela
- Buff-breasted Sandpiper – 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 – extensive open grassland, meadows, prairies, plains, marshes, dunes, tundra, not listed in the WV breeding bird atlas.
- Henslow's Sparrow – grassy, weed filled fields, fields of broom sedge and weeds, early years of plant succession. Discussed in Sensitive species analysis. There are no observations for Henslow's sparrow on the Monongahela National Forest

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 Birds of Conservation Concern 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 expected harvest periods. Once the harvest is complete, it is anticipated the species discussed would remain in the suitable habitat near harvest units in the project area. The temporal boundary used to assess **cumulative** impacts was about 20 years because it is anticipated that the harvest units would regenerate and trend toward maturity and start producing mast by that time.

Methodology

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). The atlas, breeding bird point count data from the project area, and habitat preferences were used to determine which species occur or could occur in the project area. Information on habitat preferences was used to assess the likely effects of management activities on the species in each habitat group.

Environmental Consequences

Environmental Consequences Common to All Action Alternatives Species Using Forested Habitat

Some individuals could be subject to direct mortality during harvest operations, particularly if harvesting occurs during the nesting season (generally May through August for these species). The nature of such mortality would be similar in both action alternatives, but would be greater in Alternative 2 due to the slightly larger volume of timber to be harvested. Road related activities (construction, reconstruction and decommissioning) would remove forested habitat in both alternatives. This effect would persist as long as the road is maintained. The thinning harvests included in both action alternatives 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. Thinning might provide a short-term benefit to red-headed woodpecker and whip-poor-will, which prefer a semi-open canopy.

Species Using Non-forested Habitat
Species using non-forest habitats are unlikely to be affected by either action alternative. They are not known to occur in the project area now, and the non-forest habitats created by the new road construction 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 timber harvesting activities in either alternative because these species likely would not be present in mature forested areas when harvesting would occur. Thinning harvests are unlikely to affect these species indirectly because thinning would not create the type of open-canopy brushy habitat that these species prefer. Edge habitat created along the new road could have a small beneficial effect. These benefits would persist as long as the road is maintained.

Direct/Indirect Environmental Consequences

Alternative 1 – No Action

Under Alternative 1, no timber harvest or road construction/reconstruction would occur, so Alternative 1 would have no direct effects on Birds of Conservation Concern. 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 decline as young forests in previously harvested areas mature. However, some young forest/brushy habitat would likely be provided by natural disturbances.

Alternative 2 – Proposed Action

Species Using Forested Habitat: In the short term, timber harvests in Alternative 2 would temporarily remove or adversely alter approximately 1473 acres of habitat for species that use forested habitats. Some of these species would cease to use the harvested areas, while others would persist at lower densities due to available forested habitats adjacent to the harvest areas. Two of the species that use forested habitats, red-headed woodpecker and whip-poor-will, prefer open forests and could benefit from the broken-canopy conditions provided by the thinning harvests. These effects would persist for a period of about 20 years until the canopy closes.

Species Using Non-forested Habitat: Effects are discussed previously under Environmental Consequences Common to All Action Alternatives.

Species Using Young Forest/Brushy Habitat: Indirectly, these species would benefit from the brushy habitat created by the regeneration harvest and the edge conditions created along the new road. These effects would persist for about 20 years until the forest canopy closes again and shades out the brushy habitat.

Alternative 3

Effects are discussed above under Environmental Consequences Common to All Action Alternatives and Alternative 2.

Cumulative Impacts

Alternative 1 – No Action

Lack of management under Alternative 1 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 past, present, and reasonably foreseeable future actions tend to remove or alter forested habitat. The direct and indirect effects of the timber harvesting (particularly the regeneration harvesting) and new road activities included in Alternative 2 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 thinning harvest 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 a few years until the canopy closes again (5 to 10 years). Most of the proposed project's contribution to these effects would cease when the harvest units 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 somewhat over time.

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: Effects from the timber harvests and road activities would contribute to the cumulative effects of creation of temporary and permanent young forest/brushy habitat due to past, present, and reasonably foreseeable future actions. Most of the proposed project's contribution to these effects would cease when the harvest units achieve canopy closure (~20 years). Minimal cumulative effects due to the road activities would persist as long as they are maintained. Cumulative effects of all of these actions could result in larger populations of these species in the project area.

Alternative 3

Species Using Forested Habitat: The direct and indirect effects of the thinning and road activities 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 a few years until the canopy closes again (5 to 10 years). Minimal cumulative effects due to 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. While populations of species that use forested habitat are likely to decline somewhat over time, these effects are not expected to extirpate any species from the project area because the project area will remain forested with little increase in fragmentation.

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: Edge habitat created along the new roads could make a very small contribution to the cumulative effects of creation of temporary and permanent young forest/brushy habitat due to past, present, and reasonably foreseeable future actions. The contribution to these effects would persist as long as the roads are maintained. Cumulative effects of these actions could result in larger populations of these species in the project area.

Irreversible or Irretrievable Commitment of Resources

Alternative 2 regeneration cuts would result in the irretrievable conversion of approximately 1,473 acres of forested habitat to young forest/brushy habitat. In Alternatives 2 and 3, additional minor amounts of forest habitat would be irretrievably converted to new roads. None of these commitments of resources would be irreversible, however. Harvested areas would eventually grow back to forest, and the road could be abandoned and returned to forest habitat.

Consistency with the Forest Plan

The Forest Plan does not contain specific direction for migratory birds.

3.4 Social Resources

3.4.1 Economics

Resource Impacts or Issues Addressed

This report addresses the economic impacts the Hogback project would have on the surrounding area.

Scope of the Analysis

Tucker and Preston Counties are the areas 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 Randolph, Grant, Pocahontas, Upshur, Barbour, and Pendleton Counties. Labor for this project may come from people living in surrounding counties.

Methodology

The economic analysis was done by obtaining costs and prices from various sources. Cost figures for the Monongahela National Forest developed from previous timber sales were used for this project when available. Private consultant foresters provided herbicide and fencing cost information. Stumpage prices (amount paid for standing timber) were used to determine average quarterly stumpage reports for average stumpage prices. It was estimated that a total of 10,479 bf/ac (board feet per acre) would be removed in the clearcut with reserve units. In the thinning units, a total of 3,000 bf/ac would be removed. In the shelterwood units, it was estimated that 3,000 bf/ac would be removed in the first entry and 7,000 bf/ac in the final harvest. The economic software QuickSilver (version 5.004.45, November, 2001) was used for analysis of the cost and benefits. Long-term and short-term economic projections were made for the alternatives.

Table 3.24. Cost of actions in the Hogback project, by mile or acre

Item	Cost - Conventional	Cost - Helicopter
Road/Maintenance	$ 39,927/mile	$ 69,787/mile
Road/Construction/Reconstruction	$ 109,273/mile	$ 207,618/mile
Road/Decommission	$ 26,000/mile	$ 26,000/mile
Herbicide/Site Preparation	$ 330/acre	$ 480/acre
Herbicide/Cut-Stump Treatment	$ 75/acre	$ 75/acre
Fence Construction	$ 900/acre	----------
Fence Maintenance	$ 50/acre/year	----------
Fence Removal	$ 450/acre	----------
Sale Administration	$ 170/acre	$ 134/acre
Site Preparation-Other	$ 100/acre	$ 250/acre
TSI-mechanical	$ 100/acre	$ 100/acre
TSI-chemical	$ 120/acre	$ 120/acre
TSI-grapevine	$ 55/acre	$ 55/acre
Understory control	$ 125/acre	$ 125/acre
Sale Preparation/Regeneration	$ 155/acre	$ 185/acre
Sale Preparation/Thinning	$ 150/acre	$ 180/acre
Contract Preparation	$ 25/acre	$ 25/acre
Stocking Surveys	$ 15/acre	$ 20/acre
Wildlife Openings	$ 1,900/acre	$ 1,900/acre

Table 3.25. Stumpage prices used for the Hogback project

Species	Value	Percent of Total Volume Per Acre
Black cherry	$ 896/mbf	2
Red Oak	$ 219/mbf	30
Chestnut Oak/White Oak	$ 158/mbf	19
Maple	$ 286/mbf	19
Yellow-poplar	$ 121/mbf	19
Mixed Hardwoods	$ 28/mbf	11

Table 3.26. Revenue generated by logging system, per acre

Item	Revenue per acre		
	Conventional	Cable	Helicopter
Clearcut with Reserves	$ 2,033.54	$ 1,933.54	$ 1,783.54
Shelterwood-First Cut	$ 589.73	---------	---------
Shelterwood- Final cut	$ 1,443.81	---------	---------
Thinning	$ 589.73	---------	---------

Environmental Consequences

Environmental Consequences Common To All Action Alternatives

In all of the action alternatives timber harvesting would take place. Revenue would be generated from the timber harvests. All the action alternatives also have road improvement, site preparation, and wildlife improvement work that would provide jobs to private companies in the area.

Helicopter logging was estimated to cost $450/mbf (thousand board feet), which in turn reduces stumpage prices about $1,783.50 (Table 3.26). This project has an abundance of lower value species such as yellow-poplar, white ash, and chestnut oak, which cannot support helicopter logging. At the present time, stumpage prices are depressed, especially for red oak – which is the most common sawtimber species (Table 3.25). Due to safety issues with helicopter logging, logging must be done when the leaves are off. This means that logging would take place in the winter and that the roads used to access helicopter landings would have to be up-graded to four-season roads. Road costs for four-season roads are approximately double three-season road costs (Table 3.24). Helicopter logging also raises other costs such as sale administration, sale preparation, and follow-up management treatments. Increased costs for helicopter logging are due to the speed at which the helicopter contractors work. This requires timber sale administrators to be on-site more frequently to mark damaged timber. Since there are no roads constructed to the helicopter units, access to the harvested areas is poor, making it more costly to do follow-up treatments after the sale. These factors make the economic analysis show deficit sales for Alternatives 2 and 3.

Direct/Indirect Environmental Consequences By Alternative

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.

One cost not analyzed in this report is the loss of timber value in the project area due to death, disease, and windthrow. Most of the valuable timber species in the area, are at or nearing the end of their life expectancies.

Alternative 2

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 2.5 million dollars. The proposed action would cost 2.8 million dollars over a 5 to 7 year period, with road cost being the largest cost accounting for 60 percent of total cost.

Alternative 3

Under this alternative few acres are harvested and the use of helicopter logging increases. These factors reduce total cost, but also reduce total revenue resulting in a larger deficit sale (Table 3.27).

Table 3.27. Timber sale costs and revenues, by alternative

	Alternative 1	Alternative 2	Alternative 3
Road Costs			
Maintenance	0	$1,336,702	$166,094
Construction	0	$366,064	$1,435,240
Total	0	$1,702,766	$1,601,334
Timber Cost			
Contract Preparation	0	$36,825	$32,450
Sale Administration	0	$221,312	$195,676
Sale Preparation	0	$242,840	$228,010
Total	0	$500,977	$456,136
Reforestation Cost			
Fencing	0	$180,250	$141,750
Mechanical Site Preparation	0	$225,700	$294,300
Herbicide Site Preparation	0	$169,200	$143,600
Herbicide Cut-stump Treatment	0	$24,000	$16,750
Stocking Surveys	0	$48,180	$45,880
Total	0	$647,330	$642,280
Total Cost	0	$2,851,073	$2,699,750
Stumpage Value	0	$2,504,333	$2,190,681

Cumulative Impacts

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 Monongahela National Forest most wood products industries obtain timber from private land. It would have the long-term impact of on the current value of the forest in the project area. As the stands age, the higher value timber would 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 Monongahela National Forest. The No Action alternative would add to this problem and would have an adverse cumulative impact on the timber value of the forest.

Proposed Action and Alternative 3

There would be no cumulative economic impacts as a result of the Proposed Action or Alternative 3. The Monongahela National Forest does not produce enough timber to have a large long-term influence on the local and statewide economy.

Irreversible or Irretrievable Commitment of Resources

Expenditure of funds to prepare, administer, and implement the selected activities would be an irretrievable commitment of resources.

Consistency With the Forest Plan

There are no Forest Plan standards and guidelines concerning economics.

Consistency With Laws, Regulations, and Handbooks

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

3.4.2 Environmental Justice

Resource Impacts Addressed

This section describes the results of the analysis the Forest completed to assess the impacts of proposed activities on minority and low income populations per Executive Order 12898.

Affected Environment

There are no known community-identified environmental justice related issues. Recent data indicate that Preston and Tucker Counties, in which the Hogback project area is located, do not demonstrate ethnic populations or income percentages greater than two times that of the State average (US Census).

Scope of the Analysis

The communities in Preston and Tucker Counties were considered in the scope of the analysis. The timeframe for the proposed Hogback projects is 10 years.

Methodology

All documents and notices related to this proposed project were readily available to all segments of the public. Public involvement is described in Chapter 2. The project record contains a list of individuals, organizations, companies, and government entities contacted about this proposed project (approximately 250). Notices were also placed in the *Parsons Advocate*, the paper of record for this project.

Based on information available in 2007, statistics for the counties within the Hogback project area are as follows:

Table 3.28. County population and income statistics

County	Total Acres	% MNF	Population	% Minority	% Population Below Poverty Level	Per Capita Income
Preston	418,483	0.9	30,384	1.4 %	18.3 %	$13,596
Tucker	269,869	37.6	6,856	1.1 %	18.1 %	$16,349

Environmental Consequences

Public comments, Interdisciplinary Team evaluation, and available information did not identify any issues or disproportionately high or adverse human health or environmental effects on minority populations and low-income populations. The two action alternatives could have a

minor improvement in the economic conditions for the surrounding populations by providing jobs from timber harvesting, reforestation, and associated activities. No civil rights issues associated with the project have been identified.

Cumulative Impacts

The Hogback alternatives, when combined with past, present, or future actions identified in Table 3.1, are not expected to contribute to cumulative disproportionately high or adverse impacts on minority or low income populations.

Irreversible or Irretrievable Commitment of Resources

None of the Hogback alternatives would result in irreversible or irretrievable commitments of resources as they relate to environmental justice.

Consistency with the Forest Plan

No inconsistencies with the Forest Plan were identnified.

3.4.3 Heritage Resources

Cultural Description: Prehistory and History

The physical and environmental conditions that prevailed in this area's past are integral to understanding the prehistoric and historic human adaptation. Studies of pollen and spore analyses from the region and comparative data (e.g., Carbone 1976; Davis 1983; Wilkins 1977) indicate that a southward displacement of boreal floral and faunal species followed the terminal glacial retreat. Pockets of taiga vegetation, dominated by spruce, fir and pine, extended from the north into the uplands region of the Appalachian range between 25,000 and 15,000 BP (before present). The transition to more modern flora begins between 12,500 BP and 10,000 BP with an increase in deciduous forest, with species including oak and ironwood present. This period coincided with the first probable human use of the region. This epoch also saw the extinction of many faunal species including elephants, camel, mastodon, giant bison, giant peccary, giant beaver, ground sloth, and woodland musk ox. By 10,000 BP the transition to a mixed coniferous-deciduous forest had begun.

By 7,500 BP mixed hardwood forests are present on the Allegheny Plateau, with the expansion of birch, oak and hickory communities. Continued warming trends led to mixed hardwood forests at higher elevations. Around 5,000 BP spruce forests experienced a resurgence in Pennsylvania and West Virginia, probably indicating the spread of diverse open forest canopies and bog settings (e.g. the growth of *Picea rubens*). Modern climatic conditions were probably in place by around 3,000 BP, although various peaks-and-valleys in temperature and moisture regimes continued to the present. This affected both the vegetation mixes and fish/wildlife species and, by direct extension, subsistence patterns for people.

Human use of the landscape during the Paleo-Indian and Early/Middle Archaic sequences (ca. 11,000 to 6,000 BP) was largely restricted to hunting/gathering/fishing, and establishment of domestic sites. The bedrock types in the study area may have encouraged quarrying for raw material to make stone tools.

The implications of the early prehistoric period on the reference condition of the project area are minimal. Some modification of plant communities occurred through harvest and selective

protection; some animal populations were controlled through hunting and trapping; and the use of fire as a habitat management tool may have occurred. However, by and large, human populations are perceived to have been too small during the early periods (Paleo-Indian and Early/Middle Archaic) to cause significant effects on the environment.

In contrast, Late Archaic and Woodland Period societies (ca. 6,000 BP to 1600+ AD, including early European colonization/Contact Period) had increasingly noticeable impacts on the environment. Larger populations, new technologies, an evolving subsistence strategy, and associated increases in the size and duration of occupation of villages, all led to deeper and more widespread human impacts. The major activities that changed the environment were: the intentional encouragement and protection of plant communities; burning to open up the understory and enhance game habitat, targeting berry and mast species, and contributing to an oak presence; the adoption of horticulture and agriculture over the last 2,000 years, requiring cleared gardens and fields, many near streams and rivers; and biodegradation of local environments associated with, for example, long-term village locations.

In summary, subsistence activities and residential sites would have had an effect on the health and diversity of the forest community, size and behavior of wildlife species, and fragmentation of the forest. It also increased sedimentation rates in the streams near villages. The Native American population was displaced through disease and war, starting in the 17th century. The effect of smallpox on the Native American population was enormous: by some estimates more than half the pre-European population was killed by smallpox before they had even laid their eyes upon a wagon. Thus, the pre-Contact patterns of their lifestyle are now known only through archaeology, oral history and a handful of early settlers' or explorers' accounts.

The European presence on the landscape changed everything. Colonization of the region began in earnest after more than a century of socio-economic disruption, demographic decline, disease, and three wars involving Indians and Europeans. The earliest settlers to what is now Tucker County entered the area by way of Horseshoe Run. The first to come is believed to have been James Parsons who passed through the area around 1762. He laid claim to land at Horseshoe Bend, a big loop in the Cheat River at the mouth of Horseshoe Run. In 1774 John Minear, a German immigrant, came to Tucker County with about forty settlers and established a permanent settlement two miles north of Horseshoe Bend at what would become St. George. In addition to a fort, the community had the first water powered saw mill west of the Alleghenies. Minear Fort came under Indian attack in the years 1780 to 1781 (Reed 2004). These attacks, however, were the last in the area, and in the years that followed settlement increased and spread into the upland valleys and plateaus.

The shingle industry came to the Horseshoe Run area in 1866, when the Rowlesburg Lumber & Iron Company erected a shingle mill at Leadmine (Fansler 1962). Two additional shingle mills were later constructed below Leadmine at the mouth of Hile and Mike Runs. The late 1880s and 1890s promised growth and prosperity through the exploitation of timber and coal. The West Virginia Central and Pittsburgh Railroad made a huge impact on the county by opening the area to timber and coal interests. Following the turn of the 20th Century, the Preston Railroad came down Horseshoe Run from Hutton, Maryland, to the mouth of Maxwell Run (Fansler 1962). It had branch lines extending up Maxwell and Hile Runs; the one on Hile Run required two switchbacks to reach Location Ridge just above the Fairview School. Its business was largely confined to hauling logs to the Kendell Lumber Company at Crellin, Maryland. Individual trees in this forest often grew to great dimensions. The largest known tree to have ever been cut by

West Virginia lumbermen was a White Oak cut in 1913 near Leadmine, measuring thirteen feet in diameter sixteen feet from the base (Clarkson 1964).

The next three decades witnessed greater changes to the landscape and impacts on the environment than the cumulative impact of 12,000 years of Native American land-use. By some estimates, upwards of thirty billion board feet of timber were cut in West Virginia between 1870 and 1920 (Clarkson 1964). The area was also subjected to slash fires and was more severely flooded as a result of increased surface runoff. Recognizing the devastation brought about by unregulated logging, President Wilson declared the boundaries of the Monongahela National Forest in 1920. Subsequently, significant reforestation was accomplished through the efforts of the Civilian Conservation Corps (CCC) in the 1930s and 1940s. Under the stewardship of the National Forest, the area is once again thriving, albeit with significantly altered floral, faunal, sediment, and hydrological regimes.

Exhaustion of the forests, coupled with the Great Depression, brought about a precipitous economic and social decline in the region. Many towns and small communities were abandoned. Within the project area, the infrastructure aspects of this settlement/industrial system (i.e., homes, farms, schools, mill sites, transportation systems, etc.) should tend to cluster around major transportation arteries. Within National Forest System lands, much of this infrastructure now exists only as archaeological sites and some cultural landscapes.

Previous Survey Information

A total of thirty-three heritage resources surveys have been conducted either wholly or partially within the current analysis area between 1980 and 2007. These surveys provided coverage for the area of the watershed planned to be affected by all the alternative actions. Information on these surveys is shown in Table 1 in the Heritage Resource Specialist Report in the Project File.

Cultural Resources Site Data

A total of twenty-eight heritage resources have been previously recorded in the Hogback Project Area. Of these, nine represent the remains of prehistoric resource exploitation and/or habitation, while nineteen represent Euro-American historic period activities; one represents a multi-component prehistoric/early 20th century deposit. Table 2 in the Heritage Resource Specialist Report in the Project File presents information on each of these sites. Sites are presented numerically without reference to specific physical locations. Such locations would be made available to Forest personnel as part of planning for specific management actions.

Prehistoric and Historic Patterns

The project area holds a moderate to high probability for containing prehistoric resources owing, in part, to its location within and adjacent to deposits of Greenbrier limestone in which high-quality chert is often found. The waterways of Horseshoe Run and its tributaries provided for the easiest routes of travel between the Cheat River Valley and upland resources. Data gathered in the project area indicates predominantly Early to Late Archaic utilization of the upland resources in the area. The results of previous archaeological surveys identified nine prehistoric sites of which eight are classified as lithic scatters and one as a residential village site.

The results of archaeological surveys indicate that historic period activity in the area was predominantly focused on agricultural or domestic activities, as seen in the preponderance of home sites, cabins, mills, and unidentified structures. Of the nineteen historic period sites or

components, nine are typed as homesites, one cabin, one cemetery, six unidentified structures, one industrial mill, and one Civil War Era battlefield in Parsons. The historic period occupation of the immediate area was, and continues to be, focused on the area along Horseshoe Run.

The vast majority of the project area has felt the impact of human use. Forest species age and diversity, wildlife populations, stream profiles, soils, viewsheds, fragmentation/openings ratios, and the demographic profile of the area (Indian-to-colonial; low-to-moderate population density) all changed between the 18th and early 20th centuries. Some of these changes were dramatic.

There are numerous sites and features left on the landscape; they are the correlates to the standing architecture and functional outbuildings of the historic economy. We would therefore expect the remains of communities, houses, barns, outbuildings, mills, blacksmith shops, schools, logging camps, mining structures, etc. Also, the footprints of transportation systems, and vegetative "artifacts" in the form of complete and partial cultural landscapes (apple orchards, pine plantations, sugar bushes, openings, and more) will likely be located. Their distribution is heavily biased toward the main transportation arteries

2006 and 2007 Cultural Resources Survey

The cultural resource survey of the Hogback Project area was conducted by USDA Forest Service archaeological staff between May 21st and August 20th 2006 and May 10th and July 12th 2007. Survey covered all those specific areas of the Hogback Project area being considered for potential management actions. Survey was conducted on all areas potentially impacted by actions considered in all the alternatives. The 2006 survey covered 1,995 acres and the 2007 survey covered 919 acres; completed total survey coverage includes 2,914 acres. This survey effort resulted in the identification of twenty new prehistoric sites, two new historic sites, and the addition of a prehistoric component to a previously recorded historic site (Table 3 in Heritage Resources Specialist Report in Project Record).

National Register Eligibility: Status and Protection

Thirteen of the thirty prehistoric sites or components located in the project area have been evaluated for their eligibility for inclusion in the National Register of Historic Places. Each of these has been found not to retain sufficient integrity and research potential to provide important information regarding the prehistoric occupation of the area. They are therefore not eligible for placement on the National Register and do not need to be protected during project implementation. The remaining seventeen have not been evaluated and, until such time as they are evaluated, should be managed as though they are eligible.

Of the twenty-one historic period sites or components located in the project area, four have been evaluated for eligibility for inclusion in the National Register of Historic Places. One of these has been determined to be eligible for inclusion in the National Register and should be protected during project implementation. The remaining three evaluated historic resources have been found to be not eligible for inclusion in the National Register and therefore do not require protection. The remaining seventeen historic resources, however, since they remain unevaluated and their status is unknown, may at a later date be determined eligible. Until such time as they are evaluated, these sites should be treated as if they were eligible and should be protected during project implementation.

ALTERNATIVES 1, 2, and 3: POTENTIAL EFFECTS AND MITIGATION MEASURES

Potential Effects to Heritage Resources: Alternatives 1, 2, and-3

Effects to heritage resource from all the alternatives were identified employing ArcMap GIS mapping. Base maps showing the project area and potential actions for each alternative were overlain on site location and survey maps.

No Action (Alternative 1)

From the perspective of Heritage Resources protection, the No Action alternative would provide protection to cultural resources, as no additional erosion or soil disturbance from logging, road construction/alteration, and other project-related activities would occur.

Alternatives 2 and 3

An examination of the two remaining alternative management treatments to the Hogback Project Area reveals that minimal project impacts would occur in all alternatives. Alternative 3, in particular, has the least negative impacts to heritage resources. Potential negative direct effects to heritage resources can derive from ground disturbance due to tree felling and skidding, and activities associated with new road construction, road storage, and road abandonment (grading, cutting, pulling culverts, culvert construction, etc). Skidding damage would not occur in helicopter logging. Negative indirect effects to cultural heritage resources can derive from increased erosion associated with road construction, skidding, and regeneration cutting.

Effects Common to All Alternative Actions

No single effect is common to all actions.

Cumulative Effects

The foreseeable effects of carrying out all of the action Alternatives are approximately equal. Management of the project area for timber and wildlife purposes would lead to heavier pedestrian and vehicular use of the landscape. Consequently, more individuals would become aware of site locations, thereby exposing them to potential vandalism and loss of scientific information.

Forest Plan and Statutory Consistency

Forest Goal HR01 provides for the identification and management of cultural resources on the Forest, as does direction in Heritage Resources Standards HR04, HR05. Executive Order 11593, promulgated in 1971, instructs that all archaeological resources on Federal land are to be evaluated, while the 1988 amendment to the Archaeological Resources Protection Act (16 USC 470 mm) instructs federal land-managing agencies to develop and implement a plan for archaeological survey and evaluation. Provided that National Register eligible sites are avoided or mitigated, and unevaluated sites are avoided or evaluated and appropriate management taken, then any of the Alternatives is consistent with the Forest Plan and legal statute.

Relevant Laws, Regulations, and Authorities

- Antiquities Act of 1906 (16 USC 431-433)
- Historic Sites Act of 1935 (16 USC 461-467)
- National Historic Preservation Act of 1966 (16 USC 470)
- National Environmental Policy Act (42 USC 4321-4347)

- Archaeological Resources Protection Act of 1979 (16 USC 470)
- Archaeological and Historical Conservation Act of 1974 (16 USC 469)
- Executive Order 11593
- FSM 2361

3.4.4 Recreation

Resource Impacts or Issue Addressed

This section describes the existing condition of the recreation, wilderness, and trails resources that may be affected by activities proposed in this analysis area.

Recreation opportunities within the Hogback Project Area consist primarily of dispersed recreation activities including; hunting, fishing, hiking, site seeing, and some dispersed camping. A majority of the recreation use within the area is focused on the hunting and fishing. Recreation use within the area is generally low with the exception of hunting and fishing seasons.

Management Plan Implications

All proposed actions for the Hogback project area are located in Management Prescription (MP) 3.0 which is managed for a primarily motorized recreation environment. Non motorized recreation also occurs. Feature roaded natural ROS class recreation opportunities.

Roads and trails provide abundant opportunities for motorized recreation, including driving for pleasure, forest product gathering, hunting, fishing, and wildlife viewing. All of the area is managed for a Roaded Natural Recreation Opportunity Spectrum setting. Selected areas, trails, or roads may be closed, where appropriate, to motorized vehicles during specific periods to protect resources, provide for public safety, or reduce user conflict.

The road system should be adequate to manage the area for administrative and management purposes and for intensive timber operations.

Integrate resource protection and user safety into recreation management and facilities.

New road construction should not cause road density within the prescription area unit to exceed 1.0 mile per square mile for collector roads, or 4.0 miles per square mile for any combination of collector and local roads.

Road densities should average within 1.0 to 2.0 miles per square mile. Open road densities should average 0.5 to 1.0 miles per square mile.

Developed Sites

There are no Forest Service developed campgrounds, picnic areas, or swimming areas located within the analysis area.

The Horseshoe YMCA organizational camp and the Horseshoe campground lie just outside the analysis area along Horseshoe Run.

General Forest Areas (Dispersed)

Dispersed camping within the analysis area is generally low. There are at least 2 concentrated use areas located off of the State Route along Twelve Mile Run. The primary recreation activities include hunting and fishing with minimal associated dispersed camping.

Illegal motorized use that has resulted in soil compaction, loss of cover, ruts, and mud near the intersection of State Road 9 (Hile Run) and State Road 7 (Horseshoe Run) is occurring.

Public Access Roads

The analysis area is accessed by the following state roads:

1, 5, 7, 7/5, 9, 12/1, 14/3, 16, 25, 25/4, 31, 112, 112/1, 9, 112/4, 118, 118/1, 118/3, Stemple Ridge church road, Accident school road, 219, 219/4, Sugarland church road, State road that leads to 929A, and Roaring Run road near Mackeyville.

The following closed Forest Service Roads (FRs) are located in the project area:

119, 119A, 119C, 121,225, 226, 407, 751, 902, 903, 905, part of 929, 929A, 929B, 929C, 929D, and 940.

Part of FR 929 is open to the public year round.

1.1 miles of FR 935 is seasonally open to the public from October 8th to February 28 yearly.

Recreation Special Uses

The OH/WV YMCA Organization Camp has a rifle range Special Use Permit within the project area across the state road from the organization camp.

Just outside the project area boundary two special use permits are issued to the OH/WV YMCA. One is for the Horseshoe Organization (YMCA) Camp and the other is for a US Forest Service campground concession management permit for Horseshoe Campground.

Wild and Scenic River Study

The Wild and Scenic River Study completed by the Monongahela National Forest in 1995 did not identify any eligible segments of any rivers for potential designation as a wild and scenic river.

Wilderness

There are no federally designated wildernesses within or near the Hogback Analysis Area.

Trails

The Allegheny Trail (701) runs through the analysis area from Stemple Ridge, through Twelvemile Run, through Shafer and Leadmine, and up the former Trail 154 to the Close Mountain Road and to State Route 219.

There are no other system trails located within the analysis area. Trails 154 and 157 that are shown on some maps were dropped from the system several years ago.

Losh Run and Two Camp trails are located just outside the analysis area near Horseshoe Recreation Area and Hile Run.

Issues/ Concerns Addressed

The following recreation related issues and concerns were identified during the scoping process for the Hogback Project Area. These issues/ concerns will be addressed, as appropriate, in the recreation effects section for this project.

- Would activities impact recreation visitors to the area?
- How would activities affect motorized recreational use?

In addition to the above specific comments the effects to developed and dispersed recreation, wilderness, and trails will also be analyzed.

Scope of the Analysis

This section describes the area of analysis for direct and indirect effects and the area evaluated for cumulative affects.

The scope of the analysis will include the recreation resources within the Hogback Analysis Area. Because the Forest provides a wide range of recreation opportunities, there are no recreation activities limited or specific to the Hogback Project Area. Therefore, any analysis beyond that described above will not be necessary.

The spatial boundary used to evaluate direct and indirect consequences and cumulative impacts is the Hogback Project Area. This area was used because it will adequately address any affects related to vegetative management and road construction on the recreation resources.

Methodology

This section describes the process that will be used to describe how the alternatives would affect the resources and the units of measures used to measure change.

The following materials were used to evaluate the affects of alternatives on the recreation resources within the Hogback analysis area:

- The Monongahela National Forest Land and Resource Management Plan, USDA Forest Service, September 2006
- ROS (Recreation Opportunity Spectrum) Users Guide, USDA Forest Service
- Monongahela National Forest Wild and Scenic River Study Report
- The National Wild and Scenic Rivers Act of 1968.
- The Wilderness Act, Public Law 88-577, September 3, 1964
- The Eastern Wilderness Act of January 3, 1975 (Dolly Sods and Otter Creek Wilderness areas and the Cranberry Wilderness Study Area).
- Monongahela National Forest West Virginia Land Designations, Public Law 97-466, January 13, 1983 (Cranberry Wilderness, Laurel Fork North and South Wilderness Areas)

The units of measure which are used to analyze change are as follows:

Table 3.29. Units of measure for changes to recreation resources

Recreation Resource	Unit of Measure
Developed and Dispersed Sites	# of sites affected
Public Access Roads	# of miles/ or roads affected
Recreation Special uses	# of recreation special uses affected
Wild and Scenic Study River	Yes/ No Consistent or not consistent with Wild and Scenic Rivers Act and FLMP
Wilderness	Yes/ No Consistent or not consistent with Wilderness Act and FLMP
Trails affected by adjacent harvesting	Number/ linear feet

Environmental Consequences Common to All Action Alternatives

The direct and indirect affects on the recreation resources for Alternative 2 –Proposed Action and Alternative 3 are similar and are as follows:

Developed Recreation

US Forest Service Horseshoe Campground and the OH-WV YMCA Organizational Camp are located just outside the project area and are not directly affected by vegetation management. The closest vegetation units are 1101, 1203, and 1205 where thinning would occur on approximately 54 acres. Helicopter landings and conventional landings are located near the Campground and Organizational camp and some disturbance from timber hauling/helicopter work is expected in the short-term when timber harvest is occurring. There are no herbicide treatments near the Organizational Camp or the US Forest Service Horseshoe Campground.

General Forest Areas (Dispersed Recreation)

There is no vegetative management units proposed within existing concentrated use areas in the Twelve Mile run area, therefore, no direct effects have been identified under any of the alternatives.

Units 202 and 301 are located near the concentrated use areas and some indirect disturbance from timber hauling/helicopter work is expected in the short-term when harvesting is occurring. Neither unit is close to herbicide treatments.

Timber harvesting activities identified in all of the action alternatives may enhance wildlife viewing and hunting opportunities within the project area.

Potential public exposure from herbicide treatments in the project area is limited. People hunting and fishing are the primary public users in the project area. The risk of herbicide exposure for hunters is low because most of the treatments would occur in the outside of hunting season and people fishing would run a low risk due to the large untreated buffers left around streams. (See effects of herbicide report in project file for additional information).

Public Access Roads

Part of FR 929 would be open year round to the public.

Recreation Special Uses

OH-WV YMCA Organization camp rifle range is located within the project and no effects have been identified.

Wild and Scenic Rivers

The Wild and Scenic River Study completed by the Monongahela National Forest in 1995 did not identify any eligible segments of any rivers for potential designation as a wild and scenic river within the project area as a result there are no effects to Wild and Scenic Rivers.

Wilderness

No wilderness areas are located in or adjacent to the Hogback project area, therefore no effect to the wilderness resource is expected.

Trails

The Allegheny Trail (Trail 701) is a state-wide trail that runs along State Roads 112/1, 7, the old 154 Forest Service Trail between State Route 7 and State Route 16, then along State Route 25 to US 219.

The following units are located near this trail: 201, 202, 203, 1101, and 1203. Most impacts to trail users would be short-term impacts from harvest operations. Timber hauling along the road portions of this trail may occur and are appropriate use of roads.

The Allegheny Trail (701) runs though the project area, but does not go through any areas being treated with herbicide.

If the helicopter service landing south and west of unit 1203 is used, a closure order should be considered for this trail as the trail connects directly with the landing.

An unofficial trail crosses the 87M tract and leads to the highest point in Maryland, even though this is not a Forest Service system trail, it is used to access this important feature in Maryland. Unit 504 would result in short-term impacts from harvest operations, timber hauling and herbicide treatments and impacts should be mitigated similar to a system trail. 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. If a trail is temporarily used as a road, relocate the trail for the duration of the project. Log skidding and road construction should not cross trail corridors except as designated crossing sites or unless the trail is already on a road.

Forest Trails 153, 155, and 111 are located outside the project area. Forest Trail 153 may have timber hauling along the road portion of it, if the helicopter landings are used in that area.

Vegetation management and road building would have no significant effect on system trails because of the mitigations proposed.

Other

Hile Run Watershed Improvement Project – this project would result in the restoration of approximately 1 acre of area where illegal motorized vehicles are damaging the resources. In addition to watershed restoration activities (soil de-compaction and restoration of vegetative cover) and further vehicle damage would be prevented with the addition of rock barriers along Hile Run.

Direct/Indirect Environmental Consequences and Cumulative Impacts by Alternative

Alternative 1 – No Action

Based on the methodology described above, there would be no effects to the developed recreation resource, public road access, recreation special use permits, potential wild and scenic river values, wilderness resources or trails.

This alternative would maintain the status quo. Although there would be no effects to current recreation and trails, there is also no opportunity to implement vegetative management activities to:

1. Enhance habitat for white tail deer, wild turkey and ruffed grouse populations that would increase the opportunity wildlife viewers and hunters to see wildlife.

2. Implement vegetative management activities that would continue to provide diversity in the landscape, including scattered openings that are either temporary or permanent and a variety of vegetative age classes.

In addition, the public motorized access would not change from the current and watershed rehabilitation project in the Hile Run area would not be implemented.

Seasonal public motorized access, in the form of licensed, registered, and highway legal vehicles would be allowed on the first 1.1 miles of FR 935.

Class Q hunter road access would be allowed on FR 929A for those people with Class Q permits.

FR 751 from County Route 112/4 to unit 304 would not change.

Alternative 2 – Proposed Action

Alternative 2, the proposed action includes 1,256 acres of clearcuts with residuals, 88 acres of shelterwood harvests, 63 acres of overstory removal, and 53 acres of commercial thinning. In total, approximately, 1,460 acres would have vegetative management actions within the project area.

Understory control of vegetation would occur on 232 acres. Mechanical Timber Stand Improvement would occur on 391 acres and chemical Timber Stand Improvement would occur on approximately 414 acres. In addition, NNIS control would occur before and after timber treatments on approximately 99 acres.

Wildlife openings and waterhole construction would also occur in some landings.

A total of 4.58 miles of road would be constructed, 0.50 miles reconstructed, 20.27 miles of Forest Service Road maintained, and 0.94 miles of road decommissioned.

Seasonal public motorized access, in the form of licensed, registered, and highway legal vehicles would be allowed on the first 1.1 miles of FR 935 from October 8 to February 28 yearly.

Class Q hunter road access would be allowed on FR 929A for those people with Class Q permits.

FR 751 from County Route 112/4 to Unit 304 would remain, while the 0.9 miles of road in the drainage below would be decommissioned.

Alternative 3

Alternative 3 includes 1,117 acres of clearcuts with residuals, 66 acres of shelterwood harvests, 60 acres of overstory removal, and 53 acres of commercial thinning. In total, approximately 1,296 acres would have vegetative management actions within the project area.

Understory control of vegetation would occur on 232 acres. Mechanical Timber Stand Improvement would occur on 391 acres and chemical Timber Stand Improvement would occur on approximately 414. In addition, NNIS control would occur before and after timber treatments on approximately 86 acres.

Wildlife openings and waterhole construction would also occur in landings.

A total of 3.26 miles of road will be constructed, 0.50 miles reconstructed, 20.27 miles of Forest Service Road maintained, and 1.44 miles of road decommissioned.

Seasonal public motorized access, in the form of licensed, registered, and highway legal vehicles, would be increased from 1.1 miles to 2.6 miles on FR 935.

Class Q hunter road access would change from FR 929A to the first 1.3 miles of FR 905 for those people with Class Q permits.

FR 751 from County route 112/4 would be decommissioned in its entirety.

Cumulative Impacts

Table 3.1 of the Hogback Environmental assessment lists the activities that have occurred, are occurring, and will continue to occur in the near future. The project area has a 3.0 management prescription which is conducive to heavily managed areas. The mixed ownership pattern of private land and federal land lends itself to an environment that is far from pure forest. The state-wide Allegheny Trail travels along state roads that are traveled by log, oil, gas, propane, electrical and other commercial trucks. Farms, homes, businesses, fire departments, windmills, gas wells, and other developments exist along state roads throughout the project area. As a result, there are no significant impacts when the current proposed actions are combined with past, present and foreseeable future actions within the project area.

Irreversible or Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitment to the recreation and trails resources within or adjacent to the project area.

Consistency with the Forest Plan

All alternatives are consistent with the 2006 Monongahela National Forest Land and Resource Management Plan for recreation management.

Consistency with Laws, Regulations, and Handbooks

There are no conflicts between this alternative and the Federal, regional, State, and local laws, land use plans, policies, and controls for the recreation and trails resources.

3.4.5 Visuals

Existing Condition - Resource Impacts or Issue Addressed

This section describes the existing condition of the scenic resources that may be affected by activities proposed in this analysis area.

Recreation opportunities within the Hogback Area consist primarily of dispersed recreation activities, including hunting, fishing, and some dispersed camping. Recreation use within the area is generally low and occurs primarily during spring and fall hunting and fishing seasons. Primary viewpoints within and near the analysis area include State Routes 7, 25, and 9, US 219 and the US 219 overlook, the Allegheny Trail (TR 701), and the Horseshoe Recreation Area/OH-WV YMCA Organization Camp.

Scenery/ Visual Quality Management

The Hogback assessment area lies primarily within the Red Oak/Sugar Maple and Northern Hardwood Land Type Associations of the Monongahela National Forest. The landforms of the red oak/sugar maple zone vary from gently rolling, highly dissected low hills to steep sided and massive mountains. Valleys are narrow to very narrow and winding. Visitors encounter enclosed landscapes with foreground detail views. Views of the near middle ground are common, but background vistas are rare. In the northern portion of the forest, the red oak/sugar maple zone is generally found on the mid to lower slopes. Mixed mesophytic vegetation is interspersed with northern hardwoods. Oaks are present. This zone contains the most productive sites on the forest. Valleys are often in open farm or pasture. High altitude openings are rare. Temporary openings, of less than 25 acres, due to timber harvests are common, as are changes in texture where partial harvests have been implemented. The overall appearance is of an even textured forest with scattered openings, either permanent or temporary. Streams have steep gradients and are swift flowing over rock beds within this zone. Natural rock forms are relatively visually unimportant. The scattered ownership pattern of intermingled private and public lands reduces the opportunity for the visitor to sense an undisturbed expanse of forested land. Valued cultural features include pastures and woodlots in the valleys and lower slopes.

Landforms in the northern hardwood zone are rolling to steeply sloped mountains with narrow, winding valleys. Northern hardwood forests are the rule across the zone; pastures are also common throughout. Temporary openings of less than 25 acres, due to timber harvests are common, as are changes in vegetative texture brought about by partial harvests (two-age management). Mountainsides within the zone typically have an even-textured appearance, often punctuated by temporary openings. The line introduced by road construction on mountainsides is most evident during leaf-off periods. Streams in the zone have steep gradients, are swift flowing, clear, and normally have horizontally fractured, dark brown rock beds.

The views of travelers on State Roads 7, 25, and 9 include the foreground, middle-ground and background. The landscape visibility within the assessment area is primarily middle-ground 3 and seldom seen areas with scattered areas of middle-ground 1, background 2 and foreground 1 (SEE Map 1 – Landscape Visibility – in project record). The Scenic Attractiveness is primarily typical with some distinctiveness along the Horseshoe Run corridor. The existing Scenic Integrity is moderate with some high integrity along the Horseshoe Run corridor (See Map 2 – Scenic Attractiveness and Scenic Integrity – in project record). The Scenic Condition varies from high to low within the assessment area (see Map 3 – Scenic Condition – in the project record).

All proposed actions for the Hogback project are located in Management Prescription (MP) 3.0. The desired future condition of this MP is a diverse visual landscape and considerable human activity resulting from a variety of uses. Roads and trails provide abundant opportunities for

motorized recreation, including driving for pleasure, forest product gathering, hunting, fishing, and wildlife viewing.

The SMS should be used to consider landscape character, scenic integrity levels, constituent information, and landscape visibility when inventorying or analyzing effects to the scenery and landscape aesthetics proposed by other management activities. Use the ROS and SIO matrix to provide a compatibility comparison of the SIO and ROS classifications. The existing Recreational Opportunity Spectrum classes within the proposed project area include Roaded Natural, Rural, and Semi-primitive Motorized ROS settings. The Forest Plan identifies a secondary management objective for 3.0 Management Prescription (MP) as Roaded Natural ROS setting (see Map 4 – Recreation Opportunity Spectrum – in the project record).

High scenic integrity is maintained along visually sensitive viewpoints and travel ways.

Management activities are consistent with the Scenery Management System (SMS) and ROS, while meeting other resource needs.

Issues/ Concerns Addressed

The following scenery related issues and concerns were identified during the internal scoping process for the Hogback Project Area. Public scoping issues will be addressed as received. These issues/ concerns will be addressed, as appropriate, in the visual effects section for this project.

* Would activities impact scenery values?

Scope of the Analysis

This section describes the area of analysis for direct and indirect effects and the area evaluated for cumulative affects.

The scope of the analysis will include the scenic resources within the Hogback Project Analysis Area and potential visual quality affects from primary roads within and adjacent to the area and near the Horseshoe Recreation Area. Because the Forest provides a wide range of recreation opportunities and scenic landscapes, there are no scenery resources or recreation activities limited or specific to the Hogback Project Area. Therefore, any analysis beyond that described above will not be necessary.

The spatial boundary used to evaluate direct and indirect consequences and cumulative impacts is the Hogback assessment area including State Route 7, 25, and 9, US 219 and the US219 overlook, the Allegheny Trail (TR 701) and the Horseshoe Recreation Area. This area was used because it will adequately address any affects related to vegetative management and road construction on the recreation and scenery resources.

Methodology

This section describes the process that will be used to describe how the alternatives would affect the resources and the units of measures used to measure change.

The following materials were used to evaluate the affects of alternatives on the scenery resources within the Hogback analysis area:

- The Monongahela National Forest Land and Resource Management Plan, USDA Forest Service, September 2006

- Landscape Aesthetics, A Handbook for Scenery Management, USDA Forest Service, Agriculture Handbook, Number 701.
- ROS (Recreation Opportunity Spectrum) Users Guide, USDA Forest Service

The units of measure which are used to analyze change are as follows:

Table 3.30. Units of measure for changes to visual resources

Visual Resource	Unit of Measure
Landscape Visibility – Accessibility of the landscape to viewers, referring to one's ability to see and perceive landscapes.	1. # units potentially not consistent with the Visual Quality Objectives. 2. # units/ acres not consistent with Visual Quality Objectives.
Scenic Integrity –State of naturalness or conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character in a national forest.	1. # units/ acres potentially not consistent with Scenic Integrity Objectives. 2. # units/ acres not consistent with Scenic Integrity Objectives.
Scenic Attractiveness – The scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. It is classified as: A-Distinctive, B-Typical or Common, C-undistinguished.	1. # units/ acres which could potentially change the scenic attractiveness of the area. 2. # units/acres which would change the scenic attractiveness of the area.

Environmental Consequences

Environmental Consequences Common to All Action Alternatives

The landscape character within the analysis area varies from gently rolling, highly dissected low hills to steep sided and massive mountains. Valleys are narrow to very narrow and winding. Visitors encounter enclosed landscapes with foreground detail views. Views of the near middle ground are common, but background vistas are rare. Timber openings of less than 25 acres are common. Intermingled private and public land reduces opportunities for the visitor to sense an undisturbed expanse of forested land. Small communities are found within the river valley and views of communities and openings created from harvests can add welcome scenic variety for travelers passing through the mountains. Newly created openings are passed quickly on public roads with speeds of 25 to 55 miles per hour.

The primary viewpoints that were used to evaluate the effects of action alternatives on the scenic/ visual quality resources of the project area include: State Routes 7, 25, and 9; US 219 and US 219 Overlook; the Allegheny Trail; and the Horseshoe Recreation area.

The majority of the area lies within the Middleground 3 and not seen areas. Some Background and Middleground 1 are present, as well as Background 2. Middleground 1 is located primarily in the south and western part of the analysis area. Some Foreground 1 is located near the Horseshoe Recreation area; however, no vegetative units are located in those areas. Foreground vegetation may screen many areas from view within this area.

In general, the existing Scenic Integrity is moderate with some high integrity along the Horseshoe Run corridor. High integrity along the Horseshoe Run corridor means that the valued landscape character "appears' intact. Deviations may be present, but should not be evident.

Vegetation Units 202, 1101, 1203, and 1205 fall within this high integrity zone. However, Vegetative Unit 202, a 37 acre clearcut, can hardly be seen at all from the Allegheny Trail.

Travelers along State Route 7, State Route 9, and the Allegheny Trail will see short-term effects of harvesting and other forms of vegetation management as they pass vegetation thinning Units 1101, 1203, and 1205. These thinning units will not break the form, line, color, texture, and pattern common to the landscape character.

The Scenic Integrity levels for Roaded Natural, Semi-primitive Motorized, and Rural are all normal or fully compatible with Scenic Integrity objectives matrix located in the Forest-wide Management Direction, page II-36, of the Forest Plan.

The Recreation Opportunity Spectrum (ROS) setting of each unit is listed in Table 1 in the Visuals Specialist Report (in the project record).

The Scenic Condition of vegetative units range from having high public value (Class 1) to low public value (Class 7). The Scenic Condition Class of each unit is also listed in Table 1 in the Visuals Specialist Report (in the project record).

Vegetation Units 202, 1101, 1203, and 1205 fall within the Distinctive Scenic Attractiveness Classification. This means that they are more distinctive than the typical scenery. Vegetative Unit 202, a 37 acre clearcut, can hardly be seen at all from the Allegheny Trail. But if seen, hikers may see short-term effects of harvesting and other forms of vegetation management. Units 1101, 1203, and 1205 are all thinning units with limited effects of harvesting/vegetation management. Thinning will not change the scenic attractiveness classification.

Travelers along the Allegheny Trail may also see short-term effects of harvesting and other forms of vegetation management in the 32 acre Unit 203. This unit falls within the Partial Retention Scenic Integrity and Typical Scenic Attractiveness Classification. Unit 203, like Unit 202, is mainly on the back side of the mountain and there will be limited views of this unit.

Travelers along US 219 will see short-term effects of harvesting in the 40 acre shelterwood, Unit 506, vegetation unit that falls within the Partial Retention Scenic Integrity and Typical Scenic Attractiveness Classification. However, travelers along US 219 will be traveling at a high rate of speed, so views will be short-term and very limited.

Hikers along the High Point of Maryland Trail will see short-term impacts from vegetative management.

Hile Run Watershed Improvement Project – this project is located between Hile Run road (State Route 9) and Horseshoe Run and would result in the restoration of approximately 1 acre of area where motorized vehicles are damaging the resources. In additional to watershed restoration activities, further vehicle damage would be prevented with the addition of rock barriers along Hile Run Road.

Wildlife openings and waterhole construction would occur in already disturbed areas and therefore result in no additional impacts to the visual resource.

Direct/Indirect Environmental Consequences and Cumulative Impacts by Alternative

Alternative 1 – No Action

Based on the methodology described above. There are no effects to the scenic quality/ visual management objectives.

This alternative maintains the status quo. Although there would be no effects to scenic/ visual resources there is also no opportunity to develop a mosaic of age classes which would diversify the age and structure, which includes scattered openings and a variety of landscapes, within the assessment area over time.

Alternative 2 – Proposed Action

Vegetation Units 303 and 304 fall within the Distinctive Scenic Attractiveness Classification and the Retention Scenic Integrity levels. Units 303 and 304 are clearcuts that are not seen from primary travel ways or viewpoints.

Alternative 3

Vegetation Units 303 and 304 fall within the Distinctive Scenic Attractiveness Classification and the Retention Scenic Integrity levels. Units 303 and 304 would not be harvested, and therefore, there would be no potential effects to the scenery management.

Cumulative Impacts

Table 3.1 in the Hogback Environmental Assessment lists the activities that have occurred, are occurring, and will continue to occur in the near future. The project area has a 3.0 management prescription which is conducive to heavily managed areas. The mixed ownership pattern of private land and federal land lends itself to an environment that is far from pure forest. The state-wide Allegheny Trail travels along state roads that are traveled by log, oil, gas, propane, electrical, and other commercial trucks. Farms, homes, businesses, fire departments, windmills, gas wells, and other developments exist along state roads throughout the project area. As a result, there are no significant impacts when the current proposed actions are combined with past, present, and foreseeable future actions within the project area.

Irreversible or Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitment to the scenery resources within or adjacent to the project area.

Consistency with the Forest Plan

All alternatives are consistent with the 2006 Monongahela National Forest Land and Resource Management Plan for scenery management.

Consistency with Laws, Regulations, and Handbooks

There are no conflicts between this alternative and the Federal, Regional, State, and local laws, land use plans, policies, and controls for the visual resources. The following were considered during this analysis:

Monongahela National Forest Land and Resource Management Plan, USDA Forest Service, September 2006.

Landscape Aesthetics, A Handbook for Scenery Management, USDA Forest Service, Agriculture Handbook Number 701. December 1995.

ROS (Recreation Opportunity Spectrum) Users Guide, USDA Forest Service

3.4.6 Minerals

Resource Impacts or Issue Addressed

This section discloses how minerals authorized within the Hogback Project Area would be affected by proposed activities.

Affected Environment

Ongoing mineral activities and facilities currently exist and are authorized to be constructed within the project area, and mineral activities may be affected by proposed activities. Additionally, there are numerous federal oil and gas leases throughout the proposed sale area and it is entirely reasonable to expect field development throughout the project area within the next few years.

Scope of the Analysis

The spatial boundary used to evaluate direct and indirect consequences was the project area boundary. This boundary was used because effects of proposed activities are not anticipated to extend beyond the project area. Effects are not expected to last beyond the completion of the sales (about five years from the date a timber sale is awarded) because implementation of the timber harvest would be the only time minerals facilities may be affected. This temporal boundary was used because effects could occur anytime during the life of the proposed timber sale, but are not expected to extend beyond the close of the sale.

Methodology

The extent of impacts to minerals was assessed by utilizing knowledge of existing conditions, as well as overlaying the private minerals lease map with the Hogback project alternative maps and considering the uses that would affect it.

Environmental Consequences

Direct/Indirect Consequences by Alternative

Alternative 1 (No Action)

No action would be implemented, thus there would be no effect to existing minerals activity in the area.

Alternatives 2 and 3

Action alternative activities may improve the condition of existing roads, which is expected to result in improved driving conditions for MegaEnergy Operating, Inc., Horseshoe Run, LLC, and their contractors on some access roads. During actual construction and maintenance, these operators may experience temporary delays (such as when culverts are replaced). The gas company requires access to both gas wells and pipelines (Smith A-1, Nichols Pipeline, and likely the proposed Nine Pipeline). Well-tenders, as well as contractors, may have scheduled or emergency field visits to gas facilities on Forest, and off-Forest that are accessed by Forest Roads. In the interest of safety and potential gas-related emergencies, any delays in re-opening roads after closures for road work and/or public safety should be minimized to the greatest extent possible to provide for the most access possible.

Herbicide application should not affect minerals facilities.

Proposed harvest units, skid roads, and landings located adjacent to gas wells or pipelines may affect minerals facilities. Heavy equipment crossing the pipeline may damage the pipeline, resulting in not only property/facility damage, but also injury to personnel.

It is imperative to protect the gas line, not only to protect the facilities from damage, but given the nature of the facilities (the Nichols and proposed Nine Pipelines are expected to hold natural gas under pressure at 1,100 psi), it is in the interest of health and safety for personnel operating on-site during the timber sales and gas company personnel operating in the area following the sales to protect facilities.

Preliminary mapping has identified the following units as locations where proposed Hogback activities may impact gas lines and facilities: Units 702, 709, 605, and 607. See Table 2.15 for the proposed mitigation measures – avoiding overlap with the pipeline and facility right of ways when the units, skid roads, and landings are developed. If this is not reasonable on the ground, other potential mitigation measures are contained in the Minerals Specialist Report in the project record.

Cumulative Effects

Alternative 1 (No Action)

Since Alternative 1 would not cause direct or indirect effects, it would not contribute to cumulative effects.

Alternative 2 (Proposed Action)

Direct effects could occur anytime during the life of the proposed timber sale, but no cumulative effects are expected to extend beyond the close of the sale, due to lack of direct impacts to facilities or personnel.

Alternative 3

Direct effects could occur anytime during the life of the proposed timber sale, but no cumulative effects are expected to extend beyond the close of the sale, due to lack of direct impacts to facilities or personnel.

Irreversible or Irretrievable Commitment of Resources

None of the alternatives are expected to result in irreversible or irretrievable commitments of minerals resources in the project area.

Consistency with the Forest Plan

The Forest Plan has been reviewed and no inconsistencies were identified.

Consistency with Laws, Regulations, and Handbooks

There are no conflicts between the proposed alternatives and Federal, regional, State, and local laws, land use plans, and policies which regulate the Forest Minerals Resources.

3.4.7 Herbicides

Resource Impacts or Issues Addressed

Herbicide use is preferred in some situations over other vegetative management methods such as prescribed burning and mechanical treatments. Prescribed burning is not recommended because of short windows of opportunities to conduct prescribed burning, the fragmented National Forest land base in the project area, and the lack of fire resistance of many of the hardwood species such as black cherry, red maple, and yellow-poplar. Mechanical treatments are not preferred because of their lack of effectiveness. 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. One measure of toxicity is lethal dose 50 (LD50) which means the amount of chemical it takes to kill 50 percent of a population. For example, imazapyr has an LD50 above 5,000 mg/kg (milligrams per kilogram), making it practically non-toxic. The reason for this is that imazapyr works on amino acid pathways that are specific to plants and not found in animals (McKnapp 1997).

Table 3.31 Chemical hazard ratings for some common chemicals and herbicides used in Hogback project

Category	Signal Word Required on Label	Acute Toxicity Oral LD50 mg/kg	Common Chemicals and Herbicides
Highly toxic	Danger	0-50	Laundry Beach Kerosene
Moderately toxic	Warning	50-500	Rubber cement Nicotine Gasoline Caffeine DDT
Slightly toxic	Caution	500-5000	Alcohol Aspirin Table salt Triclopyr
Relatively nontoxic	Caution	>5000	Glyphosate Sulfometuron methyl Imazapyr Baby lotion

Herbicides are used infrequently to accomplish forest management objectives. Herbicides would only be applied a few times to a forest stand during an 80 to 100 year rotation. The following summaries about the four herbicides are from McNabb (1996).

Imazapyr

Formulations: Arsenal AC, 54 percent soluble liquid
Mode of Action: Inhibits the synthesis of specific amino acids
Selectivity: Generally non-selective, conifers show good resistance
Volatility: Negligible
Photodecomposition: Can be significant 1 to 2 days

Soil Activity:	Yes
Mobility in soil:	Generally adsorbed by soil, remains in the top few inches.
Half-life:	25 to 142 days
Toxicity:	LD50- >5000 mg/kg LC50- 100 ppm NOEL- 25 mg/kg/d

Imazapyr is the active ingredient used in Arsenal AC. Imazapyr is non-selective herbicide meaning it controls both broadleaf and grass species. Imazapyr is labeled for control of maple species, beech, and grass. Imazapyr is more effective controlling these species than other herbicides like glyphosate and sulfometuron methyl (Horsley 1988; Horsley 2004). Imazapyr is often added to tank mixtures of glyphosate and sulfometuron methyl to provide increased control of striped maple and grass in the understories of northern hardwood stands (Horsley 2004).

Sulfometuron methyl

Formulation:	Oust, water-dispersible granule 75 percent a.i.
Mode of action:	Inhibits branched-chain amino acids
Selectively:	Conifers and other woody perennials resistant. Highly effective at controlling herbaceous weeds.
Volatility:	Negligible
Photodecomposition:	Negligible
Soil Activity:	Yes
Mobility in Soil:	Generally greater at higher soil pH and low organic matter content
Half-life:	20 to 28 days
Toxicity:	LD50- >5000mg/kg LC50- 125 ppm NOEL- 300mg/kg/d

Sulfometuron methyl is the active ingredient in Oust. Sulfometuron methyl is a sulfonyl urea family of herbicides and used for the control of herbaceous weeds. Sulfometuron methyl has been shown to be effective at controlling grass and fern in Allegheny hardwood stands (Horsley 2004). When sulfometuron methyl was applied to the understories of Allegheny hardwood stands, fern was completely controlled. Sedges and grass were not completely controlled by sulfometuron methyl, but it did reduce the emergence of sedge and grass from the seed bank by 2/3 to 3/4 (Horsley 2004). Sulfometuron methyl does not control striped maple and beech (Horsley 1988).

Triclopyr

Formulation:	Garlon 4, ester formulation uses oil as carrier 4 a.i.
Mode of Action:	Not completely understood, but interferes with cell division within plants
Selectivity:	Most grasses resistant
Volatility:	Can be a problem with ester formulations, but not when applied As basal spray
Photodecomposition:	Rapidly degraded
Soil Activity:	No
Mobility in Soil:	Not readily leached
Half-life:	30 days
Toxicity:	LD50- 713 mg/kg

LC50- 117 ppm
NOEL- 3 mg/kg/d

Triclopyr is the active ingredient in Garlon 4. Garlon 4 is an ester formulation of triclopyr meaning that it is mixed with oil to form a solution. Hygrade EC would be used as the carrier. This formulation of triclopyr is widely used as a basal bark spray, spraying the lower 15 inches of the stem to control woody stems. Basal spraying has been proven an effective means of controlling beech stems less than 6 inches in diameter (Kochenderfer et al. 2004).

Glyphosate

Formulation:	Accord, soluble liquid 53 percent active ingredient (5.4 a.i. lbs./gal)
Mode of Action:	Amino-acid inhibitor, inhibits EPSP synthase
Selectivity:	Non-selective
Volatility:	Negligible
Photodecomposition:	Negligible
Soil Activity:	No
Mobility in soil:	None
Half-life:	47 days
Toxicity:	LD_{50}- 5600 mg/kg
	LC_{50}- 86 ppm
	NOEL- 30 mg/kg/d

Glyphosate is a commonly used nonselective herbicide and the active ingredient in several amine formulas such as Glypro, Glypro Plus, Accord, Roundup, and others. Glyphosate has been used extensively in Allegheny hardwood forest. Several studies have shown that glyphosate effectively controls beech using cut-surface treatment (Kochenderfer et al. 2001). Injecting a 50 percent solution of glyphosate with water controlled nearly 100 percent of beech stems one inch dbh and larger (Kochenderfer et al. 2004).

Cutting beech trees without herbicide application would result in a 50 percent increase in the number of beech root suckers (Kochenderfer 2004). Foliar sprays of glyphosate have also been effective in controlling beech, fern, and grass (Horsley 1982). But glyphosate has no effect on ungerminated seed, which leads to the reappearance of grass and fern shortly after spraying (Horsley 1981). Red maple and striped maple are also hard to control with glyphosate; poor crown control or top-kill with prolific basal sprouting are typical results of treatment (Horsley 2004).

Inert Ingredients

Inert ingredients are chemicals used with the active ingredient in preparing herbicide formulations. They act as a carrier for the active ingredient to facilitate the effective application of the herbicide. Inert ingredients are not intended to increase the efficacy or toxicity of herbicide formulations. The EPA classifies inert ingredients into four lists based on their toxicity:

- List 1 - Inerts that have been shown to be carcinogens, developmental toxicants, neurotoxins, or potential ecological hazards and that merit the highest priority for regulatory action.

- List 2 - Inerts with high priority for testing because toxicity data are suggestive, but not conclusive, of possible chronic health effects or because they have structures similar to chemicals on List 1.
- List 3 - Inerts with lower priority because no evidence from toxicity data or from a review of their chemical structure would now support a concern for toxicity or risk.
- List 4 - Inerts that are generally recognized as safe.

Because the EPA classifies inert ingredients as "confidential Business Information" the actual chemicals are not shown. The table below shows the inert listing for the herbicides used in this project.

Table 3.32. Percent of inert ingredients and EPA listing of herbicides

Herbicide	% Inert Ingredients	% of Inert Ingredients that are Water	* EPA Classification for Inert Ingredients
Glyphosate	59 %	100 %	4
Triclopyr	38.4 %	0 %	3 and 4
Sulfometuron methyl	25 %	0 %	4
Imazapyr	46.9 %	45 %	4

* EPA classification: 1 to 4, with 4 being the least toxic and 1 being the most toxic

Surfactant

A nonionic surfactant would be used to increase penetration of the herbicides into the plants for the foliar spray treatment. A nonionic surfactant would be added to the tank mixture at the rate of 2 to 3 ounces per acre, to enhance adsorption of foliar applied herbicides.

Description of Herbicide Treatments

Understory Control

Basal spray - Basal spray of a 5 percent solution of triclopyr mixed with oil, would treat large woody interference (striped maple, birch, beech, mountain laurel etc.) would be applied to units where no harvestings would be done, approximately 232 acres would received this treatment.

Timber Stand Improvement

Cut surface – In old regeneration harvest between 15 to 35 years old, a cut surface treatment of 50 percent solution of triclopyr would be used to control competing trees. Approximately 414 acres would receive this treatment.

SCOPE OF THE ANALYSIS

The 45,068-acre Hogback project area is located in Tucker and Preston counties. Vegetation treatments would occur within compartments 2, 3, 4, 5, 6, 7, 12, 13, and 21. Herbicides would be applied on 942 acres of regeneration harvest. Approximately 3 percent of the project area would receive treatment.

METHODOLOGY

All the units were evaluated using the standards and guidelines set for prescribing silvicultural treatments in Allegheny hardwood stands (Marquis et al. 1992). Other resource professionals from inside and outside the Forest Service were consulted.

A risk assessment was done for the herbicides purposed 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 affects 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 quotient are numbers above or below 1.0. Below 1.0 indicates a negligible risk.

Environmental Consequences

Environmental Consequences Common To All Action Alternatives

Timber harvesting and herbicide applications would take place in all of the action alternatives.

Direct/Indirect Environmental Consequences By Alternative

Alternative 1 - No Action

Human Health Risk

Under the No Action alternative no herbicides would be applied in the project area. No direct or indirect consequences to human health would occur in this alternative.

Alternative 2 and Alternative 3

Both action alternatives would use herbicides, but not as many acres would be treated in Alternative 3 as in Alternative 2, so the public would have a reduced risk for herbicide exposure with Alternative 2.

Human Health Risk: Public Risk

The term public includes hikers, campers, hunters, fuelwood gatherers, gas well and pipeline operators, and other forest users. It basically includes all people who use or work in the project area except those who work with the herbicide treatments.

Potential public exposure from herbicide treatments in the project area is limited. The Allegheny Trail (701) runs though the project area, but does not go through any areas being treated with herbicide. There are also two concentrated camping areas in the Twelve Mile Run area; neither are close to treated areas. People hunting and fishing are the primary public users in the project area. The risk of herbicide exposure for hunters is low because most of the treatments would occur outside of hunting season and people fishing would run a low risk due to the large untreated buffers left around streams. Horseshoe Campground and the YMCA camp are adjacent to the project area, but there are no herbicide treatments near either one.

Results of the public health portion of the risk assessments done for the herbicides used in this project are show below; these represent accidental contamination of a member of the public.

Table 3.33. Summary of the hazard quotients for the general public for the Hogback Project

Herbicide	Category	Typical	Maximum
Glyphosate	Public		
	**Dermal		
	----Onsite	0.02	0.1
	**Dietary		
	----Water	0.002	0.06
	----Fish	0.1	0.2
Triclopyr	Public		
	**Dermal		
	----Onsite	14.0	57.0
	**Dietary		
	----Water	3.0	10.0
	----Fish	0.005	0.01
Sulfometuron methyl	Public		
	**Dermal		
	----Onsite	0.00004	0.0002
	**Dietary		
	----Water	0.03	0.06
	----Fish	0.003	0.004
Imazapyr	Public		
	**Dermal		
	----Onsite	0.002	0.01
	**Dietary		
	----Water	0.3	1.0
	----Fish	0.005	0.01

Represented in the table is worst case scenarios for any of the given herbicides used. For example, 8.1 pounds active ingredient (AI) per acre was used for glyphosate, this represents two separate treatments, cut surface and foliar spray. 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.

Human Health Risk: Worker Risk

The term 'workers' includes all personnel involved in applying the herbicide.

Results of the risk assessment for the project show the typical exposure rates for a worker are not a concern, except for the use of gloves contaminated with triclopyr for more than one hour. 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 1.0 for worker exposure

Cumulative Impacts

Alternative 1 - No Action

No cumulative impact would result from the no action alternative. Since no herbicides would be applied the same stand conditions that presently in project area would persist.

Table 3.34. Summary of the hazard quotients for workers for the Hogback Project

Herbicides	Category	Typical	Maximum
Glyphosate	Accidental Exposure		
	----Spill on Worker	0.02	0.08
	----Contaminated Gloves	0.003	0.02
	Normal Exposure		
	----Mechanical ground Spray	0.03	0.2
	----Manual Ground Spray	0.02	0.1
Triclopyr	Accidental Exposure		
	----Spill on Worker	0.5	1.9
	----Contaminated Gloves	5.0	22.0
	Normal Exposure		
	----Mechanical ground Spray	0.5	3
	----Manual Ground Spray	0.9	6
Sulfometuron methyl	Accidental Exposure		
	----Spill on Worker	0.00003	0.0002
	----Contaminated Gloves	0.00003	0.0001
	Normal Exposure		
	----Mechanical ground Spray	0.1	0.8
	----Manual Ground Spray	0.06	0.4
Imazapyr	Accidental Exposure		
	----Spill on Worker	0.002	0.008
	----Contaminated Gloves	0.004	0.02
	Normal Exposure		
	----Mechanical ground Spray	0.003	0.008
	----Manual Ground Spray	0.0007	0.004

Proposed Action and Alternative 3

Human Health Risk

Cumulative effects to human health are not likely to occur because none of the herbicides are persistent in the environment or in the human body. None of the herbicides in this project bioaccumulate in animal tissue, so there is no threat of human exposure by eating animals that have come into contact with the herbicides.

Irreversible or Irretrievable Commitment of Resources

Since applying herbicides to these areas would have no effect on human health, no irreversible or irretrievable commitments of resources would occur from this project.

Consistency With The Forest Plan

Alternative 1 - No Action

Since no herbicides would be applied, Alternative 1 is consistent with the Forest Plan (Forest Plan, p. II-20).

Alternatives 2 and 3

The application techniques are consistent with the standards and guidelines laid out in the Forest Plan (Forest Plan, p. II-20).

Consistency With Laws, Regulations, and Handbooks

All the alternatives are consistent with the following laws and regulations:

- Federal Insecticide, Fungicide, and Rodenticide Act
- West Virginia Pesticide Control Act of 1990
- Forest Service Handbook 2109.14 Chapters 10, 20, and 30

3.5 Consistency with Laws and Executive Orders

None of the alternatives threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. As documented in this EA or in the project file, alternatives would be consistent with the following applicable laws and Executive Orders:

American Indian Religious Freedom Act of 1978 John

Antiquities Act of 1906 (16 USC 431-433)

Archaeological and Historical Conservation Act of 1974 (16 USC 469)

Archaeological Resources Protection Act of 1979 (16 USC 470)

Cave Resource Protection Act of 1988

Clean Air Act of 1977 (as amended)

Clean Water Act of 1977 (as amended)

Endangered Species Act (ESA) of 1973 (as amended)

Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)

Historic Sites Act of 1935 (16 USC 461-467)

Multiple Use Sustained Yield Act of 1960

National Environmental Policy Act of 1969, (as amended) (42 USC 4321-4347)

National Forest Management Act (NFMA) of 1976 (as amended)

National Historic Preservation Act of 1966 (16 USC 470)

Organic Act 1897

Prime Farmland Protection Act

Wild and Scenic Rivers Act of 1968, amended 1986

Forest Service Manuals such as 2361, 2520, 2670, 2620, 2760

Executive Order 11593 (cultural resources)

Executive Order 11988 (floodplains)

Executive Order 11990 (wetlands)

Executive Order 12898 (environmental justice)

Executive Order 12962 (aquatic systems and recreational fisheries)

Executive Order 13112 (NNIS)