3 AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

This chapter is divided into the following sections:

- 3.1 Introduction
- 3.2 Forest Vegetation
- 3.3 Wildlife Resources
- 3.4 Transportation System
- 3.5 Visual Landscape
- 3.6 Recreation
- 3.7 Municipal Watershed
- 3.8 Specifically Required Disclosures

3.1 INTRODUCTION

The contents of Chapter 3 form the scientific and analytical basis of comparison between alternatives. This chapter discloses the existing management situation (affected environment) and environmental consequences that could result from implementation of the alternatives as described in Chapter 2.

The current management situation and probable environmental consequences of implementing each alternative are described by issue topic in this chapter. Figure 6 (Chapter 2) summarizes the effects of each alternative.

The disclosure of information about Alternative A reflects the current management situation and provides a base line for comparing the effects associated with implementing the other alternatives. The analysis of effects focuses on lands within the project area, as well as surrounding lands that may be affected. Environmental consequences account for all components of the alternatives presented in Chapter 2, including applicable design features. Environmental consequences are presented in terms of potential direct, indirect, and cumulative effects. The actions identified in Appendix D – Past, Present, and Reasonably Foreseeable Actions have been specifically considered in the analysis. The disclosure of effects in this chapter represents the total, net effect of implementing each alternative.

The methodology used to analyze each alternative was based on the most current mapped and inventoried resource information for the various resources. Resource reports and information developed for this analysis are available in the project file. The project file is available for review at the Manti-La Sal National Forest, Monticello Ranger District Office in Monticello, Utah.

3.2 FOREST VEGETATION

This section describes the current condition of the vegetation as it relates to the significant issue of Forest Vegetation and the effects of implementing alternatives (Cote 2002).

Issue - Proposed timber harvest and associated treatments, or disturbance from spruce beetle epidemic or fire may impact the composition, structure, disturbance regimes, and patterns of distribution of forest vegetation within the project area.

Indicators:

- *Spruce-fir stands treated (acres)*
- *Spruce-fir regenerated (acres)*
- *Spruce Beetle Risk Rating (low, medium, high)*
- *Aspen treated (acres)*
- *Aspen regenerated (acres)*
- *Structural class distribution by forest type (acres of grass/forbs, seedling/sapling, young forest, mid-age forest, mature forest, and old growth)*
- *Forest type change (acres)*
- *Slash treatment (acres) – fine fuel reduction*
- *Large fuel reduction (acres harvested)*
- *Predicted rates of spread (chains per hour)*
- *Predicted potential for initial attack escape (low, moderate, and high)*

The alternatives were analyzed by the use of existing stand inventory data (1999, 2001), Geographic mapping (Arcview), the Utah variant of the Forest Vegetation Simulator (FVS), and the Stand Visualization System (SVS).

3.2.1 Vegetation Composition and Structure

This section will discuss the effects of the alternatives on stand development, forest composition, and structure.

Normally the aspen/spruce-fir type would be included in the aspen/mixed conifer type. These stands were kept separate because of the potential effects of the spruce beetle on the composition and structure of these stands.

Vegetation structure for Engelmann spruce stands was determined using the Characteristics of Old-Growth Forest in the Intermountain Region (Hamilton 1993) and the Vegetative Structural Stages (VSS 1992). Figure 7 displays a crosswalk between the two documents and the terms and parameters used to determine the structural stages in this document.

Figure 7 – Structural Stages Crosswalk for Engelmann Spruce Vegetation Types.

Terms Used In Document	Vegetative Structural Stage	VSS Class	Average DBH Range (Inches)	Canopy Levels
Early	Grass/Shrub	1	0 – 0.9	1
	Seedling/Sapling	2	1.0 – 4.9	
Young	Young Forest	3	5.0 – 11.9	1 or more
Mid-Aged	Mid-Aged Forest	4	12.0 – 17.9	1 or more
Mature	Mature Forest	5	18.0 - 23.9	2 or more
	Old Growth	6	≥ 24.0	

The younger structural classes are usually separated into grass/forb and seedling/sapling. These two classes were combined into the 'early' structural class.

Old growth or mature stands of spruce-fir (cold/dry environment) are defined as the following: contain at least two canopy layers (6-inch diameter variation); contain (≥) 15 tree per acre (≥) 15-inches in diameter (150 to 180 years of age); and have from (≥) 2 to 14 trees in a state of decline or decadence (Hamilton, 1993). In this document, stands that met this definition will be referred to as mature. No spruce-fir stands have been found on the Manti-La Sal National Forest with mean stand diameters of 24 inches. Approximately 21 acres were found in the project area with a mean stand diameter of greater than 21 inches.

Additional criteria for old growth Engelmann spruce stands are: minimum tree ages range from 150 to 180 years depending on site; two to four standing dead trees at least 10 inches DBH and 15 feet tall; and more than 16 logs (down dead), 8 feet in length with a minimum diameter of 8 inches (Hamilton, 1993).

3.2.1.1 Current Management Situation

Vegetation management in the stands proposed for treatment has been limited. The area is managed primarily as a Municipal Watershed under the Forest Plan. No major vegetation treatments have occurred during this forest planning period except for those areas changed because of water system management. These changes have been small in scope and incremental over the 86 years since the water system was initiated. There were harvests in the Indian Creek drainage during the 1950s that appear to have been a partial removal of conifers. The stands have since regenerated to multistoried stands of mixed conifer and aspen. The road system is still visible

Figure 8 identifies the broad forest vegetative types and acres by structural classes found within the Monticello and Blanding Watershed Improvement Project boundary (field inventories [1999, 2001], geographic mapping [1960, 2001], and field observations [2001]). The dominant tree species was used to determine the broad vegetation types. Map 17 displays the forested vegetation types and Map 18 displays the stand structures.

Figure 8 – Current Vegetation Types and Structure (Acres).

Vegetation Type	Early	Young	Mid-Aged	Mature	Total
Aspen/Mixed Conifer	0	29	3,288	2,500	5,817
Aspen/Spruce-fir	0	0	292	1,937	2,229
Douglas-fir	0	0	32	55	87
Spruce/Subalpine fir	0	0	30	1,558	1,588
Ponderosa Pine	0	0	440	1,025	1,465
Grass/Brush/Woodland	0	0	0	0	9,214
Total	0	29	4,082	6,997	20,400

There are no acres classified as early structural stage due to the lack of natural or man-caused disturbances in the project area.

The spruce beetle (*Dendroctonus rufipennis,* Kirby Engelmann Coleoptera: Scolytidae) is the most important biotic disturbance agent affecting post-fire, spruce-fir forests in the Intermountain Region (Baker and Veblen, 1990, Veblen et all. 1994, Jenkins et al. 1998). Engelmann spruce (*Picea engelmannii* Parry ex. Engelmann) serves as the principle host for spruce beetles. Most of the stands in the project area are uneven-aged with a mature structural class. Average stand age is approximately 200 years. An analysis of the current stand characteristics of basal area and spruce composition show that most spruce-fir (1,588 acres) and aspen/spruce-fir (2,229 acres) stands have a moderate to high risk for a spruce beetle epidemic.

Quaking aspen is widely distributed throughout the Manti-La Sal National Forest. There is strong evidence that some, if not all, clones (vegetatively propagated organism) may be many thousands of years old (Cartwright and Burns, 1994). Southern Utah contains some of the most productive and extensive aspen forests in the western United States. Generally, aspen tree ages vary from 60 to 150 years. Historically, an estimated 160,400 acres of seral (temporary or intermediate stage in forest succession) aspen existed on the Manti-La Sal National Forest (Manti-La Sal National Forest, Draft Properly Functioning Condition Analysis, July 1998). An estimated 104,200 acres of seral aspen remain on the Forest. The lost acres have converted to ponderosa pine, Engelmann spruce/subalpine fir, Douglas fir, or white fir forest types.

Aspen forest communities across the forest declined 34 percent between the timber inventories completed in 1915 and 1965 (Manti-La Sal Forest Plan, page II-12, 1986). A comparison of the 1965 and 1993 timber inventories indicates an additional decline in aspen of 15 percent. This trend is true for the Monticello and Blanding Watershed Project area as indicated by the absence of early and young structural stages (Figure 8 and Map 17).

Almost all of the aspen/mixed conifer stands (5,817 acres) in the project area are in a mid-aged to mature condition, with the remainder (29 acres) in a young structural stage. Conifers are encroaching and crowding the shade-intolerant aspen. Fire exclusion and lack of any alternate regeneration treatment over the past 100 years has caused, in most areas, the decline of these stands and changed the structural distribution.

Fire has been the most important disturbance factor, influencing changes in structural stages (Amundson et al.1996; Brown and Simmerman 1986). Historically, patchy, low-intensity fires at

lower elevations and more extensive stand replacement fires at higher elevations regenerated aspen and kept these structural classes in balance.

Historically, fires burned every 60 to 120 years (Amundson et al. 1996) and prevented conifers from dominating aspen stands. Fire maintained a mosaic of age classes in aspen across the landscape. Fire also maintained the clones in a healthy, vigorous condition. Non-lethal fires (7 to 10 years) at lower elevations and stand-replacing fires (30 to 100 years) at higher elevations historically regenerated this species forming even-aged stands and maintaining a mosaic of structural stages across the landscape (Baker 1925; Chappell et al. 1997). The fire return interval is less frequent today compared to historical averages (Bartos and Campbell, 1998).

3.2.1.2 Direct/Indirect Effects

This section discusses the short and long term effects of the alternatives on the spruce-fir, aspen/spruce, and aspen/mixed conifer stands within the project area.

Alternative A

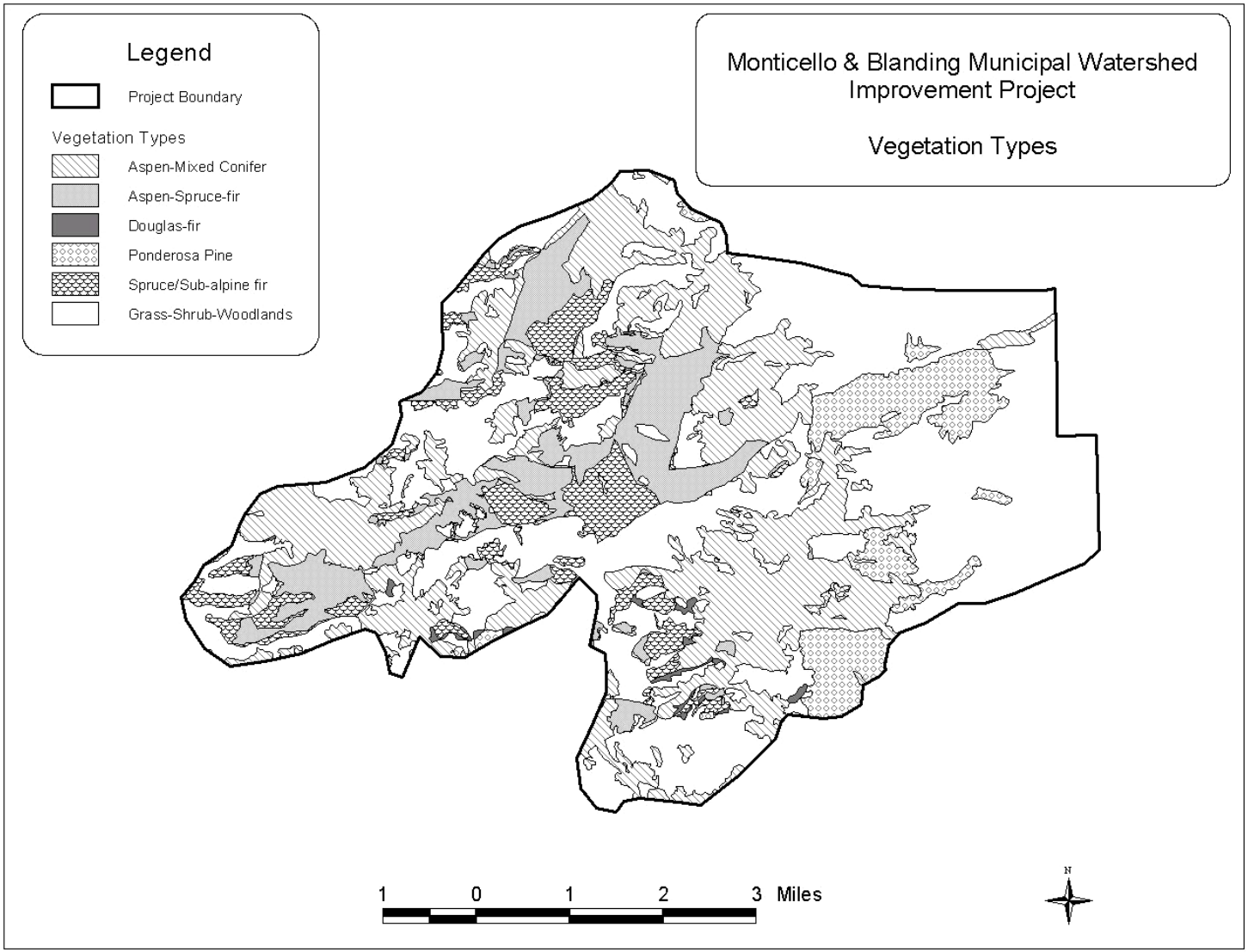
In the short-term, Alternative A would not alter the current vegetation types or structural class distribution within the watershed. Aspen/mixed conifer, aspen/spruce-fir, and spruce-fir stands would not be treated or regenerated (Figure 8). Vegetation type distributions would remain the same.

There is a high risk that aspen in the aspen/mixed conifer types would continue to be lost from lack of disturbance. Without disturbance to remove or kill the conifers in these stands, they would gain dominance over the aspen, eventually overtopping and killing the aspen.

In stands where aspen is associated with conifers, fire has been the most important disturbance factor influencing changes in structural stages and composition, and minimizing dominance by conifer species. Some of the seral aspen stands in the project area contain insufficient conifers to provide the heat necessary to kill aspen trees and stimulate the suckering response. Other seral aspen stands contain too many conifers, which could create heat severe enough to kill the root system, literally killing the aspen clone. In some cases, it would be necessary to physically and mechanically remove conifer trees from within the clone to prevent too much heat from being generated by either prescribed or wildland fire.

Under Alternative A, conifers would eventually replace many aspen stands or clones. Conifers live longer and with their shade can prevent aspen from regenerating. The absence of fire or disturbance, coupled with excessive browsing of young aspen trees by livestock and wildlife, has led to rapid replacement of aspen communities by conifer forests (Bartos, 1998). The decline of aspen results in loss of forage and biodiversity (Bartos and Campbell, 1998a). Figure 9 displays the vegetation types and structures that are currently present (short-term) in the project area and the anticipated changes should a spruce beetle epidemic occur (long-term).

Map 17 - Existing Vegetation Types.



Map 18 - Existing Stand Structures

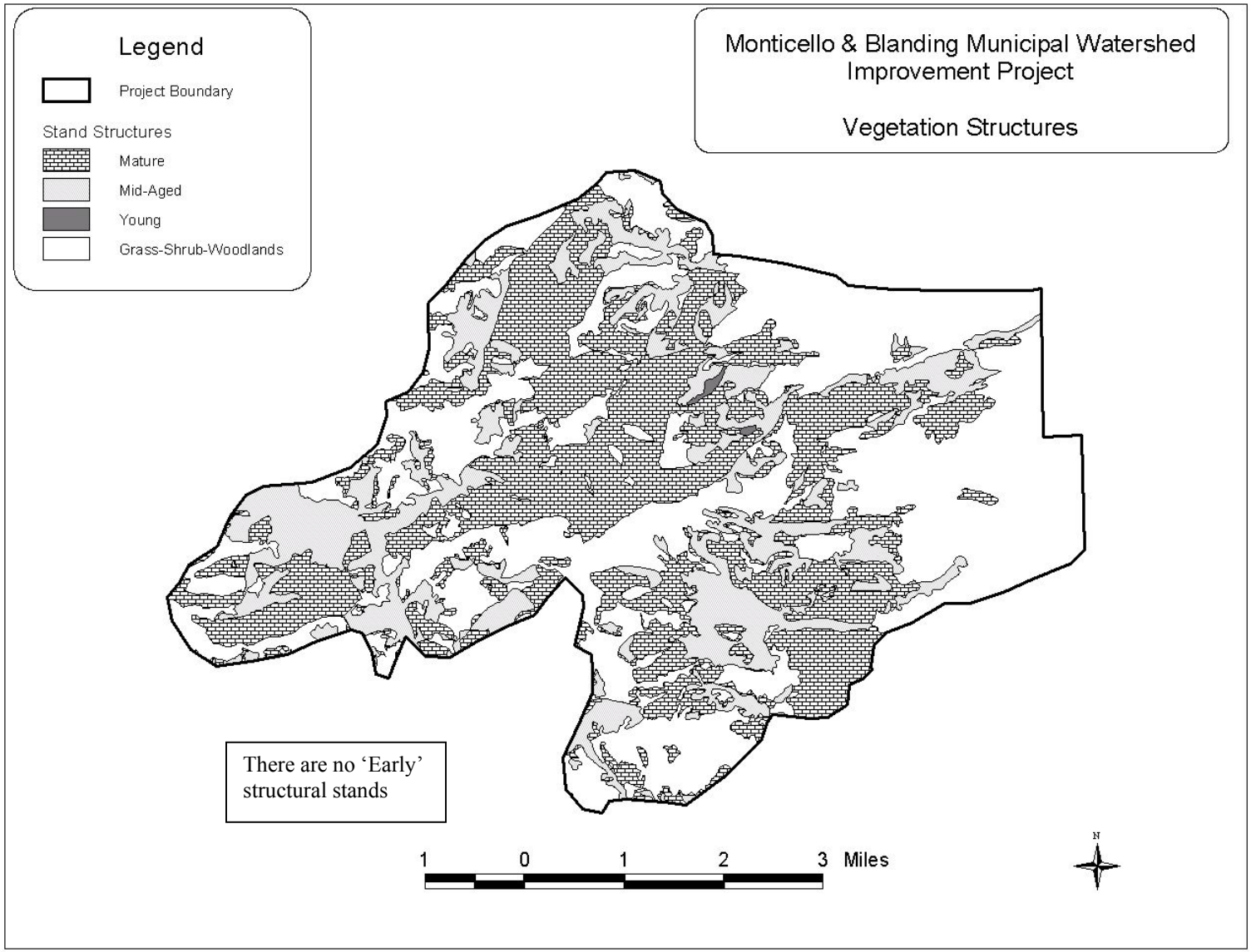


Figure 9 – Direct Effects of the Alternatives on Stand Composition and Structure (Acres) if all Stands are Treated.

Vegetation Type	Structure	Alt. A Short-Term	Alt. B Short-Term	Alt. C Short-Term		Alt. A Long-Term	Alt. B Long-Term	Alt. C Long-Term
Spruce/ Subalpine fir	Early	0	162	139		0	194	415
	Young	0	0	0		397	397	261
	Mid-Aged	30	30	30		1,191	383	400
	Mature	1,558	1,396	1,419		0	614	512
Total Acres		1,588	1,588	1,588		1,588	1,588	1,588
Aspen/Spruce/ Subalpine fir	Early	0	162	91		0	194	273
	Young	0	0	0		582	582	945
	Mid-Aged	292	292	292		1,647	838	674
	Mature	1,934	1,775	1,846		0	615	337
Total Acres		2,229	2,229	2,229		2,229	2,229	2,229
Aspen/Mixed Conifer	Early	0	192	150		0	192	150
	Young	29	29	29		29	29	29
	Mid-Aged	3,288	3,288	3,288		3,288	3,288	3,288
	Mature	2,500	2,308	2,350		2,500	2,308	2,350
Total Acres		5,817	5,817	5,817		5,817	5,817	5,817

Figure 10 – Direct Effects of the Alternatives on Stand Composition and Structure (Acres) if Optional Areas are <u>not</u> Treated.

Vegetation Type	Structure	Alt. A Short-Term	Alt. B Short-Term	Alt. C Short-Term		Alt. A Long-Term	Alt. B Long-Term	Alt. C Long-Term
Spruce/ Subalpine fir	Early	0	131	117		0	157	348
	Young	0	0	0		397	424	303
	Mid-Aged	30	30	30		1,191	507	508
	Mature	1,558	1,427	1,441		0	500	429
Total Acres		1,588	1,588	1,588		1,588	1,588	1,588
Aspen/Spruce/ Subalpine fir	Early	0	138	74		0	166	247
	Young	0	0	0		582	630	976
	Mid-Aged	292	292	292		1,647	906	733
	Mature	1,934	1,799	1,863		0	527	273
Total Acres		2,229	2,229	2,229		2,229	2,229	2,229
Aspen/Mixed Conifer	Early	0	192	150		0	192	150
	Young	29	29	29		29	29	29
	Mid-Aged	3,288	3,288	3,288		3,288	3,288	3,288
	Mature	2,500	2,308	2,350		2,500	2,308	2,350
Total Acres		5,817	5,817	5,817		5,817	5,817	5,817

The effects of a spruce beetle epidemic are assumed to occur within the next 10 years (long-term). Figure 11 is a graphic representation (SVS) of the typical aspen/spruce stands in the project area. The lighter gray conifer trees are subalpine fir and the darker conifers are Engelmann spruce. On the bottom right with the lighter gray stems are the aspen, which are dominated by conifers. This stand, classified as mature, has greater than 70 percent crown closure with at least two canopy levels

Figure 11 – Typical Aspen/Spruce-fir Stand (Short-term).

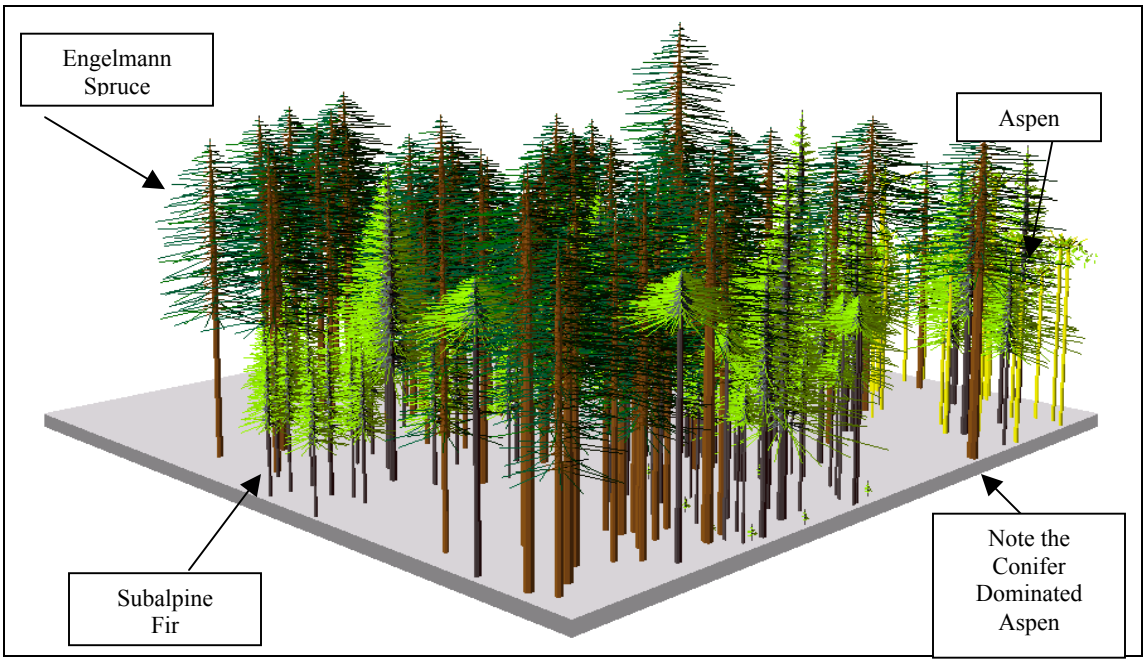
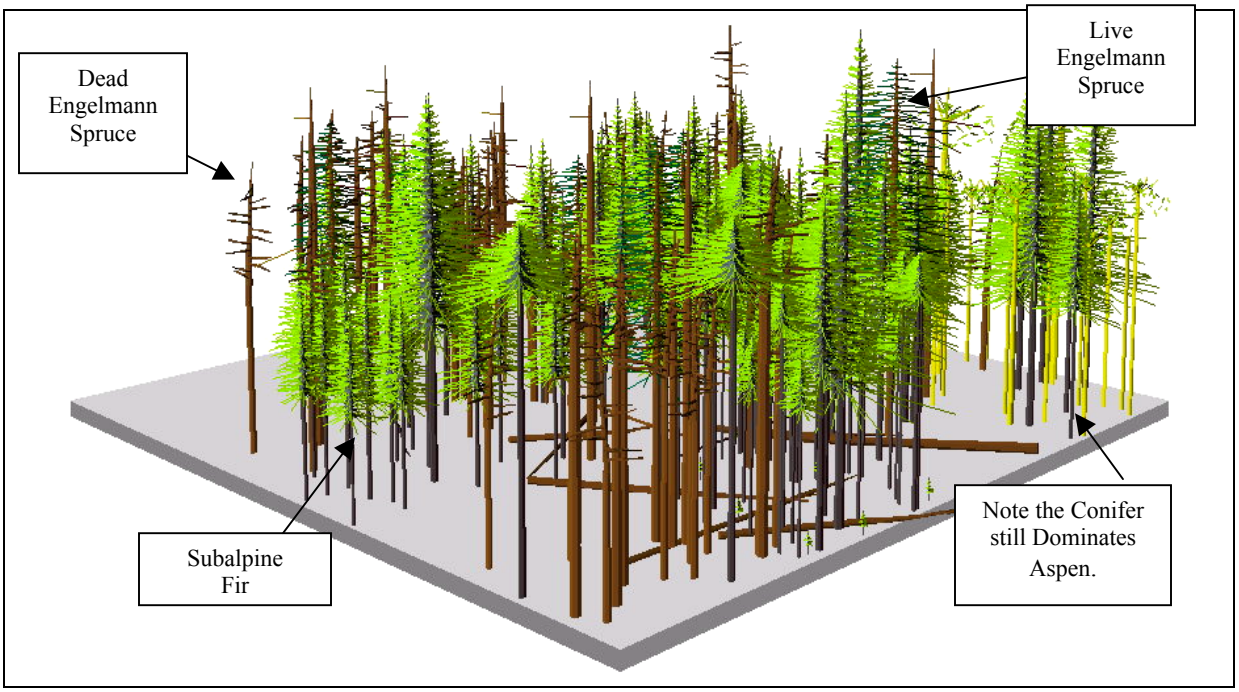


Figure 12 is a graphic representation (SVS) of a typical aspen/spruce stand in the project area following a spruce beetle epidemic (project file). Most of the Engelmann spruce has died from the spruce beetle. Conifers still dominate the aspen patch. Monitoring of the spruce beetle epidemic on the Wasatch Plateau has indicated that 100 percent of spruce greater that 16 inches DBH, 90 percent of the trees between 10 and 16 inches DBH, and 85 percent of the 5 to 10 inches DBH classes would die. This stand, now classified as mid-aged, has 40 percent or less canopy closure with only one canopy level.

Figure 12 – Typical Aspen/Spruce-fir Stand Following a Spruce Beetle Epidemic (Long-term).



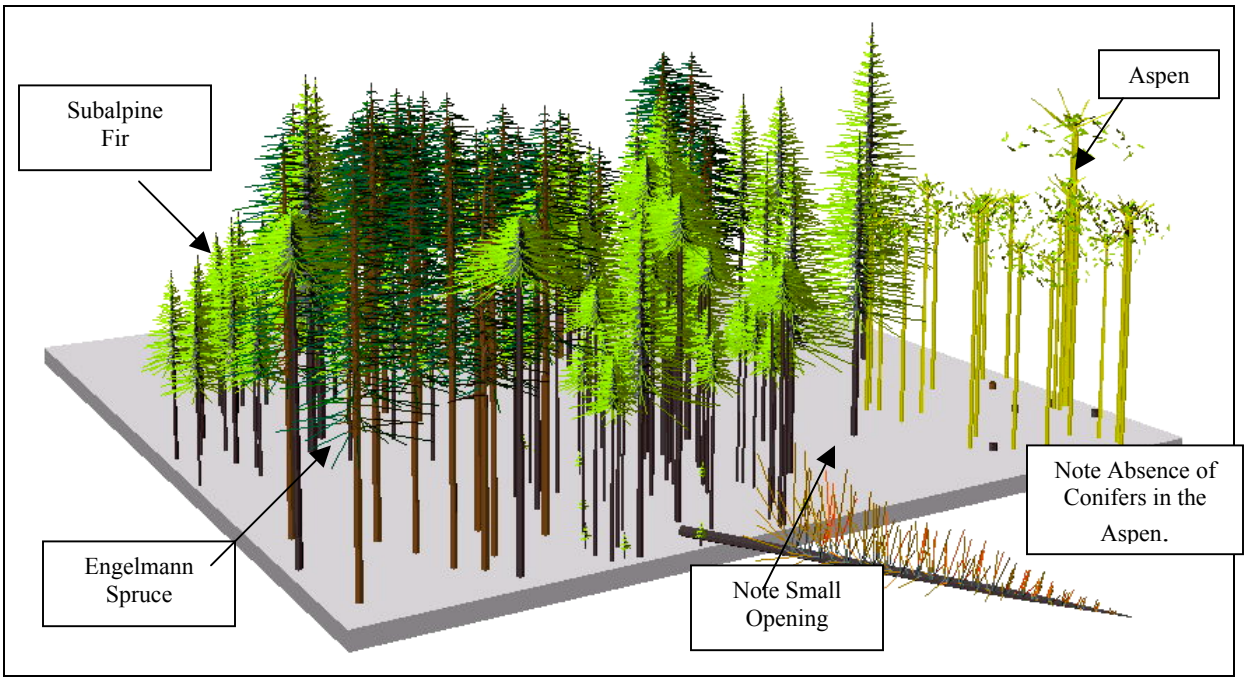
Alternatives B and C

Figure 4 and Maps 7 through 16 (Chapter 2) identify the acreages and areas proposed for treatment. Both action alternatives would alter the current vegetation and structural stages within the project area. Approximately 267 acres in Alternative B and 234 acres in Alternative C have been evaluated as highly expensive to harvest due to helicopter flight distance to access the timber. Depending on the market conditions during the term of a sale contract, these units might or might not be treated.

Alternative B would remove 95 percent of the Engelmann spruce greater than 18 inches DBH, reducing the stand density to an average of 115 square feet of basal area in the uneven-aged managed stands in the spruce-fir type. Openings of 5 acres or less would be evident in 20 percent of the treated acres; the openings would be even-aged management and would change to an early structural class. The aspen/spruce-fir stands would have all conifers removed from the aspen patches and would be uneven-aged management. Approximately 192 acres (17 units) would be treated with even-aged (clearcut) management. The sizes of these treatments range from 3 to 40 acres and average 11 acres in size.

Figure 13 illustrates the application of this prescription on an average aspen/spruce stand.

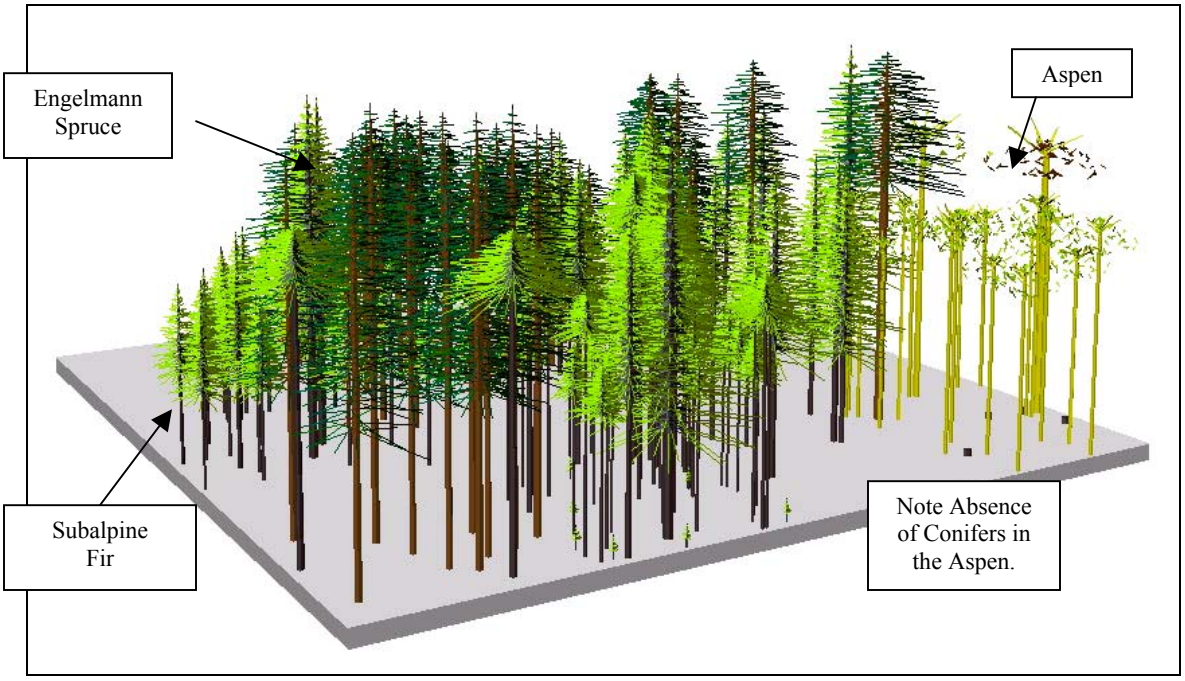
Figure 13 – Example of an Average Aspen/Spruce-fir Stand Following Harvest, Alternative B.



Alternative C would remove 90 percent of the Engelmann spruce greater than 18 inches DBH and reduce stand density to an average of 130 square feet of basal area in the uneven-aged managed stands in the spruce-fir vegetation type. Openings of 4 acres or less would be evident in 15 percent of the treated acres; the openings would be even-aged management and would change to an early structural class. All conifers in the aspen/spruce stands would be removed from the aspen patches and would be uneven-aged. Approximately 164 acres (16 units) would be treated with even-aged (clearcut) management. These treatments range from 3 to 20 acres and average 9 acres in size. Figure 14 illustrates the application of this prescription on an average aspen/spruce stand.

The design features listed in Appendix A (Forest Vegetation issue) detail the activities to be implemented following harvest with Alternatives B and C. The guidelines listed for down woody debris and snags would be followed in both alternatives.

Figure 14 - Example of an Average Aspen/Spruce-fir Stand Following Harvest, Alternative C.



Because of the harvest, the acres of treatment listed for even-aged management under the aspen/mixed conifer and the aspen/spruce-fir vegetation types would be converted to aspen; these acres are expected to regenerate naturally. The acres of treatment listed as even-aged in the spruce-fir stands would not be fully stocked and would need natural or artificial reforestation.

Treatments under both Alternative B and C would be less intense in the Horsehead (Unit 5) due to the visual sensitivity of the stand and the potential for windthrow. Following treatment, target basal area would average between 140 and 160 square feet per acre. Due to the higher basal area, opening sizes would be smaller (<1 acre) and would affect less than 10 to 15 percent of the stand. Trapping and baiting of the spruce beetle would continue, especially in the area near the Horsehead.

Figure 15 compares the acres treated by treatment system for each alternative and vegetation type. Even-aged treatment acres are converted to an early structural class. Twenty percent of the acres treated with uneven-aged management would be converted to an early structural class in Alternative B and fifteen percent in Alternative C. The rest of the uneven-aged treated acres would be stocked with trees with varying structural classes.

Figure 15 – Treatment Acres by Alternative

Vegetation Types	Proposed Treatment	Alternative A	Alternative B	Alternative C
Spruce/ Subalpine fir	Even-aged	0	131 -162	99 - 121
	Uneven-Aged	0	526 - 646	558 - 687
	Spruce Type Regenerated	0	131 - 162	99 - 121
	Total Treatments	0	657 - 808	657 - 808
	Total Untreated Stands	1,588	780 - 931	780 - 931
Aspen/ Spruce-fir	Even-aged	0	256 - 279	201 - 213
	Uneven-aged	0	437 - 530	536 - 607
	Total Treatments	0	693 - 809	737 - 820
	Total Untreated Stands	2,229	1,420 – 1,536	1,409 – 1,492
Aspen/Mixed Conifer	Even-aged	0	75	60
	Aspen Type Regenerated	0	75	60
	Total Untreated Stands	5,817	5,742	5,757
Total Acres Treated		**0**	**1,542 to 1,809**	**1,421 to 1,688**

If the spruce beetle population returns to endemic (low) levels following treatment, the structure of the managed stands would retain the characteristics of a mature structure for both alternatives. Alternative B would have an average of 20 trees per acre greater than 15 inches DBH, with at least two distinct diameter and canopy layers. Alternative C would have an average of 30 trees per acre greater than 15 inches DBH with at least two distinct diameter and canopy layers. These mature structural characteristics meet the old growth characteristics for cold, dry Engelmann spruce for both alternatives (Hamilton 1993).

If the spruce beetle populations stay elevated following treatment or populations continue to build due to project delays, additional mortality of larger diameter spruce would occur. Alternative B would have an additional 5 percent and Alternative C an additional 35 percent decrease of live spruce. Alternative C would have more spruce mortality due to higher average basal area; more large diameter trees (> 18 inches DBH); untreated three-toe woodpecker buffer sites; and more clumps with spruce.

The anticipated changes to forest composition and structure are displayed in Figure 9. This figure also displays the direct and indirect effects of the treatments and a potential spruce beetle epidemic on the composition and structure of the spruce-fir, aspen/spruce-fir, and aspen/mixed conifer stands within the project area.

3.2.1.3 Cumulative Effects

The boundary used to analyze cumulative effects to the vegetative types included almost all the spruce-fir and aspen/spruce type stands in proximity to the project boundary. These stands constitute a major portion of the spruce component on the Monticello Ranger District.

Alternative A

In the absence of disturbance, aspen would continue to be lost from ingrowth and overtopping of conifers. Diversity of stand composition and structure would continue to reduce as the stands evolve toward a high composition of conifers. Average tree size and age would increase since conifers are generally a longer-lived species.

If current trends continue, it is likely that aspen would continue to be dominated by coniferous species (Bartos and Campbell, 1998; Ogle and DuMond, 1997). The ability of aspen to recolonize these sites may be limited or lost by long-term site dominance by conifers. This could affect the resiliency of these areas to disturbance because aspen clones may continue to lose their ability to sprout or would be unable to produce enough sprouts to sustain the clone following fire.

There are approximately 1,079 acres of spruce-fir and 1,140 acres of aspen/spruce immediately adjacent to the project area with similar characteristics to the stands found in the project area (Hebertson, 2001) and a moderate to high risk of spruce beetle attack. In the long-term if a fire occurred at stand replacement intensities, areas that retain an aspen component would regenerate to aspen within three to five years following a fire.

If spruce beetle populations achieve epidemic levels, changes would occur to the structure of the spruce-fir and aspen/spruce stands. The structure of the stands would change as displayed in Figure 16 (based on the data collected from the spruce beetle epidemic on the Wasatch Plateau on the north portion of the Forest [Dymerski, 2000, Cote, 2000]).

Alternatives B and C

If the spruce beetle populations stay elevated following treatment or populations continue to build due to project delays, it is anticipated that additional mortality of larger diameter spruce would occur. The untreated stands outside and inside the project area would change as described in Alternative A.

Alternative B is expected to have an additional 5 percent and Alternative C an additional 35 percent decrease in large trees due to spruce beetle caused mortality. Alternative C is expected to have more spruce mortality because a higher basal area; larger diameter trees (> 18 inches DBH); untreated three-toe woodpecker buffer sites; and more clumps of spruce were left. The resulting anticipated changes to forest composition and structure are displayed in Figure 16 and Figure 17.

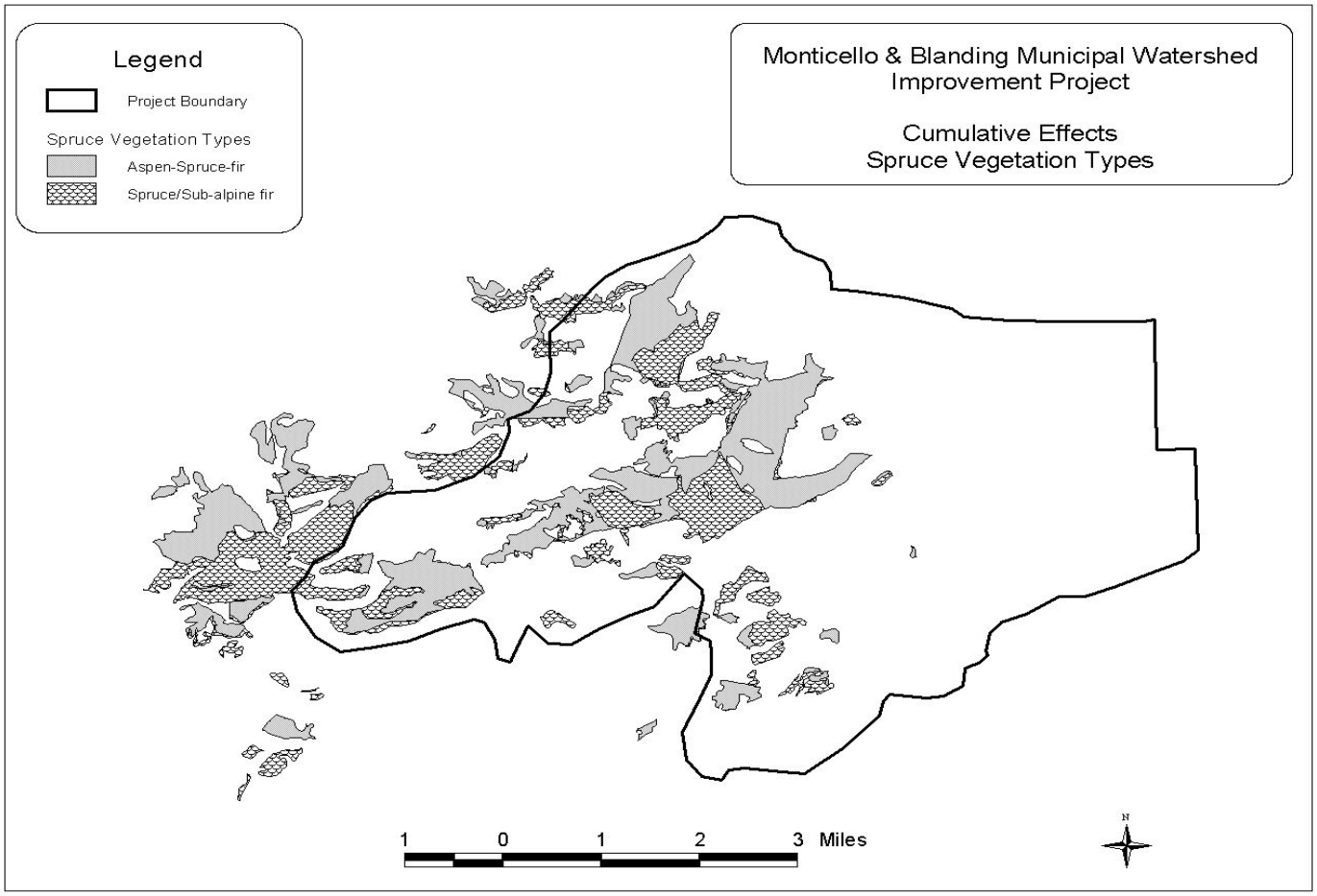
Figure 16 – Cumulative Effects of the Alternatives on Stand Composition and Structure (Acres) if all Stands are Treated

Vegetation Type	Structure	Alt. A Short-Term	Alt. B Short-Term	Alt. C Short-Term		Alt. A Long-Term	Alt. B Long-Term	Alt. C Long-Term
Spruce/ Subalpine fir	Early	0	162	139		0	194	415
	Young	0	0	0		667	667	1,042
	Mid-Aged	51	51	51		2,000	1,187	697
	Mature	2,616	2,454	2,477		0	619	513
Total Acres		2,667	2,667	2,667		2,667	2,667	2,667
Aspen/Spruce/ Subalpine fir	Early	0	162	91		0	194	273
	Young	0	0	0		846	946	1,515
	Mid-Aged	401	401	401		2,523	1,614	1,244
	Mature	2,968	2,806	2,877		0	615	337
Total Acres		3,369	3,369	3,369		3,369	3,369	3,369
Aspen/Mixed Conifer	Early	0	192	150		0	192	150
	Young	176	176	176		176	176	176
	Mid-Aged	9,719	9,719	9,719		9,719	9,719	9,719
	Mature	6,332	6,140	6,182		6,757	6,140	6,182
Total Acres		16,227	16,227	16,227		16,227	16,227	16,227

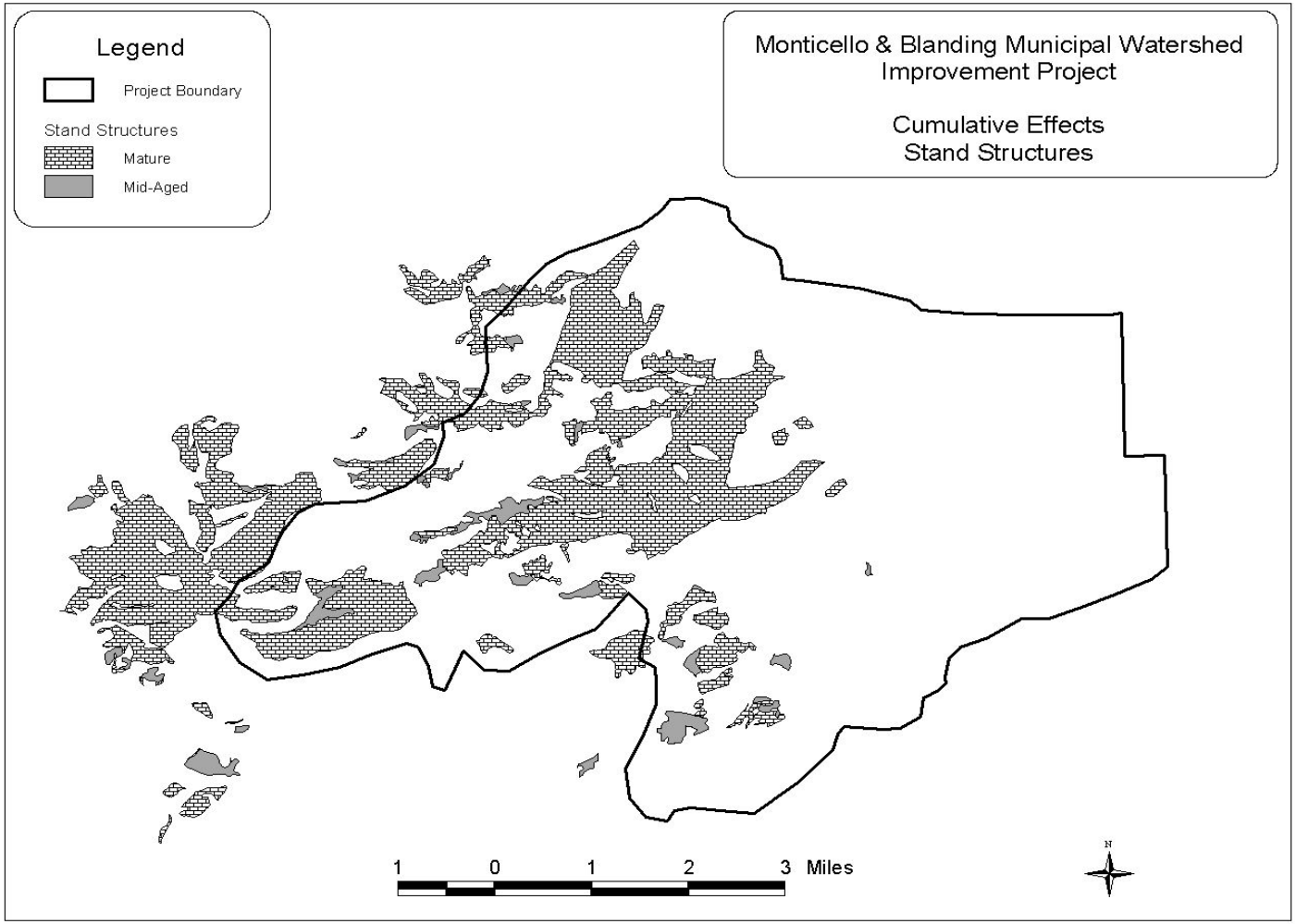
Figure 17 – Cumulative Effects of the Alternatives on Stand Composition and Structure (Acres) if Optional Areas are <u>not</u> Treated.

Vegetation Type	Structure	Alt. A Short-Term	Alt. B Short-Term	Alt. C Short-Term		Alt. A Long-Term	Alt. B Long-Term	Alt. C Long-Term
Spruce/ Subalpine fir	Early	0	131	117		0	157	348
	Young	0	0	0		667	727	1,134
	Mid-Aged	51	51	51		2,000	1,283	756
	Mature	2,616	2,485	2,499		0	500	429
Total Acres		2,667	2,667	2,667		2,667	2,667	2,667
Aspen/Spruce-Subalpine fir	Early	0	138	74		0	166	247
	Young	0	0	0		846	938	1,530
	Mid-Aged	401	401	401		2,523	1,738	1,271
	Mature	2,968	2,806	2,894		0	527	321
Total Acres		3,369	3,369	3,369		3,369	3,369	3,369
Aspen/Mixed Conifer	Early	0	192	150		0	192	150
	Young	176	176	176		176	176	176
	Mid-Aged	9,719	9,719	9,719		9,719	9,719	9,719
	Mature	6,332	6,140	6,182		6,332	6,140	6,182
Total Acres		16,227	16,227	16,227		16,227	16,227	16,227

Map 19 - Spruce-fir and Aspen/Spruce Vegetation Types



Map 20 - Spruce-fir and Aspen/Spruce Stand Structures.



3.2.2 Insects and Disease

This section will discuss the status of insect and disease activities in the project area.

3.2.2.1 Current Management Situation

The spruce beetle is the most important biotic disturbance agent affecting post-fire, spruce-fir forests in the Intermountain Region (Baker and Veblen, 1990; Veblen et. al. 1994; Jenkins et al. 1998). Engelmann spruce serves as the principle host for the spruce beetle.

Spruce beetles attack mature Engelmann spruce in the spruce-fir type in the Central Rockies. Since the late 1800s, populations of this bark beetle have periodically reached outbreak proportions and killed thousands of acres of spruce. Outbreaks often originate because stand disturbances such as windthrow, landslides, and avalanches knock down large diameter green spruce (>16" DBH). Such activities can create a favorable environment conducive to spruce beetle infestation and brood development (Schmid and Frye, 1977). Beetles are more successful at colonizing green downed material because trees no longer produce resins that can pitch out attacking beetles. Beetle survival is also increased in downed material when snow acts as an insulator, preventing low temperatures from killing the brood during winter. Snow also protects the brood from predation by woodpeckers (Schmid, 1981).

The spruce beetle generally has a two-year life cycle (Furniss and Carolin, 1997) but some of the population has a one-year life cycle. In the two-year cycle (most commonly found in Utah), the adults attack weakened or windthrown trees in late spring to early summer. Most of the adult flight occurs over a five to six week period beginning in June and ending sometime in early to mid-August. Adults have been found flying in early to mid-September, but peak flight generally occurs sometime in July. Seasonal temperatures play an important role in the timing and length of beetle development and whether beetles have a one or two-year life cycle. Recent research suggests that depending on fall temperatures as much as one third of the beetle population within a given tree could complete their life cycle in one year (Matt Hansen, personnel communication).

Once the eggs are laid, larvae hatch in 10 to 14 days and begin feeding within the phloem layer of the host tree. The larval stage is the most abundant over-wintering stage during the first year of development, although some eggs and parent adults can be present. In the two-year life cycle, larvae pupate approximately one year following initial adult attack. During the second winter of the two-year life cycle, callow adults (sexually immature) over-winter in their pupal sites or in the base of the infested tree. Sexually mature adults emerge the following spring, attacking recently downed or otherwise susceptible spruce with phloem layers capable of supporting larval development. Standing green spruce may also be attacked as beetle population levels increase In 1998 during an aerial detection survey, Engelmann spruce mortality was detected in North Creek Canyon, just northwest of Abajo Peak. Field visits were conducted during the summer of 1999, and several pockets of spruce mortality caused by the spruce beetle were discovered. A survey of the area was conducted to determine the hazard and risk of stands to spruce beetle attack and the extent of spruce beetle populations (project file).

Eight of the ten stands surveyed in 1999 rated as moderate to high hazard; the other two had moderate hazard (Anhold 2000). This survey, and other site visits, indicated that spruce beetle

populations were increasing and were in the early stages of an outbreak. It is difficult to determine if the current spruce beetle population will escalate to epidemic levels, however, stand conditions within the project area are suitable for further development and spread of spruce beetle.

Because spruce beetle populations were low, intervention measures were used to contain populations until stand management practices could be evaluated. Suppression treatments, including trap trees and pheromone-baited funnel traps, were implemented in 1999 to delay the development of the spruce beetle population until vegetation management treatments could be considered. Trap trees and pheromone treated funnel traps are methods used to capture flying spruce beetle adults. The trap trees were destroyed to kill developing spruce beetle broods. Adult spruce beetles die in the funnel traps and are prevented from infesting host trees and laying eggs.

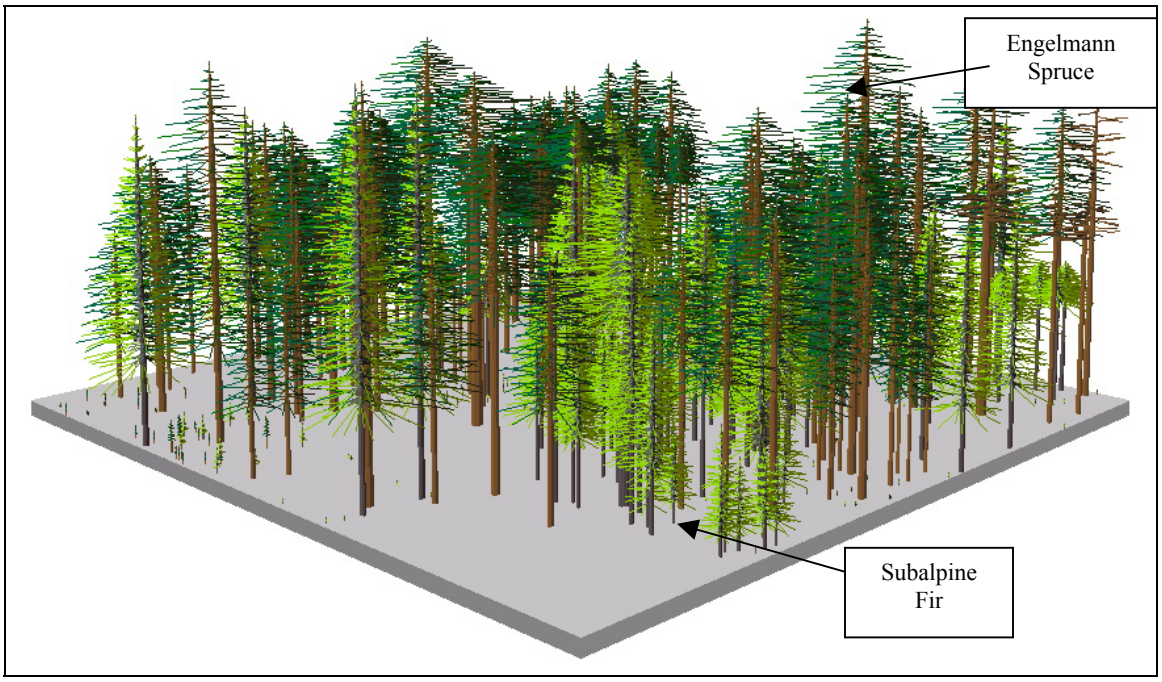
Suppression activities have continued since 1999, but spruce beetle populations in the North Creek, Spring Creek, and Twin Peaks drainages have continued to build (Hebertson, 2002). The development of one-year life cycle beetles during recent drought years may have contributed to this increase. The majority of current spruce beetle activity has been associated with existing mortality centers originally identified in spruce-fir stands located on upper, northwest-facing slopes of Horsehead and Twin Peaks.

In 2001, the spruce and aspen/spruce stands in the Indian Creek drainage were surveyed for spruce beetle populations. The results of the survey indicate that spruce beetle populations in the drainage remain at endemic levels with current attacks limited to a few exceptionally large diameter trees (Hebertson, 2002). The spruce-fir stands in this drainage have a high hazard for spruce beetle attack. The aspen/spruce stands that contain over 50 percent spruce component (mostly larger diameter trees) were rated as moderate to high hazard. The predominantly aspen stands that contain dense clumps of large diameter spruce were rated as moderate hazard.

Although the Indian Creek survey showed spruce beetle populations were at endemic levels, the proximity of locally heavy populations in neighboring drainages indicate a high hazard of infestation does exist. Map 21 shows the stands and groups of trees identified in the annual Pest Detection Survey (1999 through 2001).

Figure 18 is an illustration of a spruce-fir stand within the project area. The stand indicators for spruce beetle risk are site index; average diameter of live spruce (>10 inches DBH); total stand basal area; and proportion of spruce in the canopy. This stand has a low site index; an average DBH of 17.5 inches; a stand basal area of 212 square feet; and approximately 80 percent of the canopy is spruce. This stand currently rates high-moderate and is similar to most of the spruce stands proposed for treatment (project file).

Figure 18 – Typical Spruce/Subalpine fir Stand (Short-term).



3.2.2.2 Direct/Indirect Effects

Alternative A

Alternative A would not reduce spruce beetle populations or stand susceptibility (Figure 22) because characteristics that predispose the stands to attack in the short-term would not be changed. No measures would be taken to effectively reduce spruce beetle populations or stand susceptibility. Suppression activities, including trap tree and funnel trap treatments, would not continue. The suppression treatments would provide only a short-term reduction in the spruce beetle populations and would not continue to be effective if the stand characteristics are not modified by vegetation management treatments.

The spruce-fir stands would continue to have a moderate to high hazard of spruce beetle attack (Anhold, 2000; Hebertson, 2002). Figure 18 displays the short-term appearance of spruce-fir stands in the project area with moderate to high risk ratings. Since the early 1990s, spruce-fir stands with characteristics (composition, structure, and density) similar to those on the Wasatch Plateau and the Fishlake and Dixie National Forests experienced up to 90 percent loss of Engelmann spruce. Should spruce beetle populations reach epidemic levels in the project area, stands with moderate to high hazard of attack could experience up to 90 percent loss of the large diameter spruce (>10 DBH) over the next 5 to 10 years without treatment (Dymerski, 2000). Figure 19 illustrates the appearance of a spruce-fir stand following a spruce beetle epidemic (project file). After a spruce beetle epidemic, the spruce beetle hazard changes to low.

Map 21 – 1999 through 2001 Spruce Beetle Survey

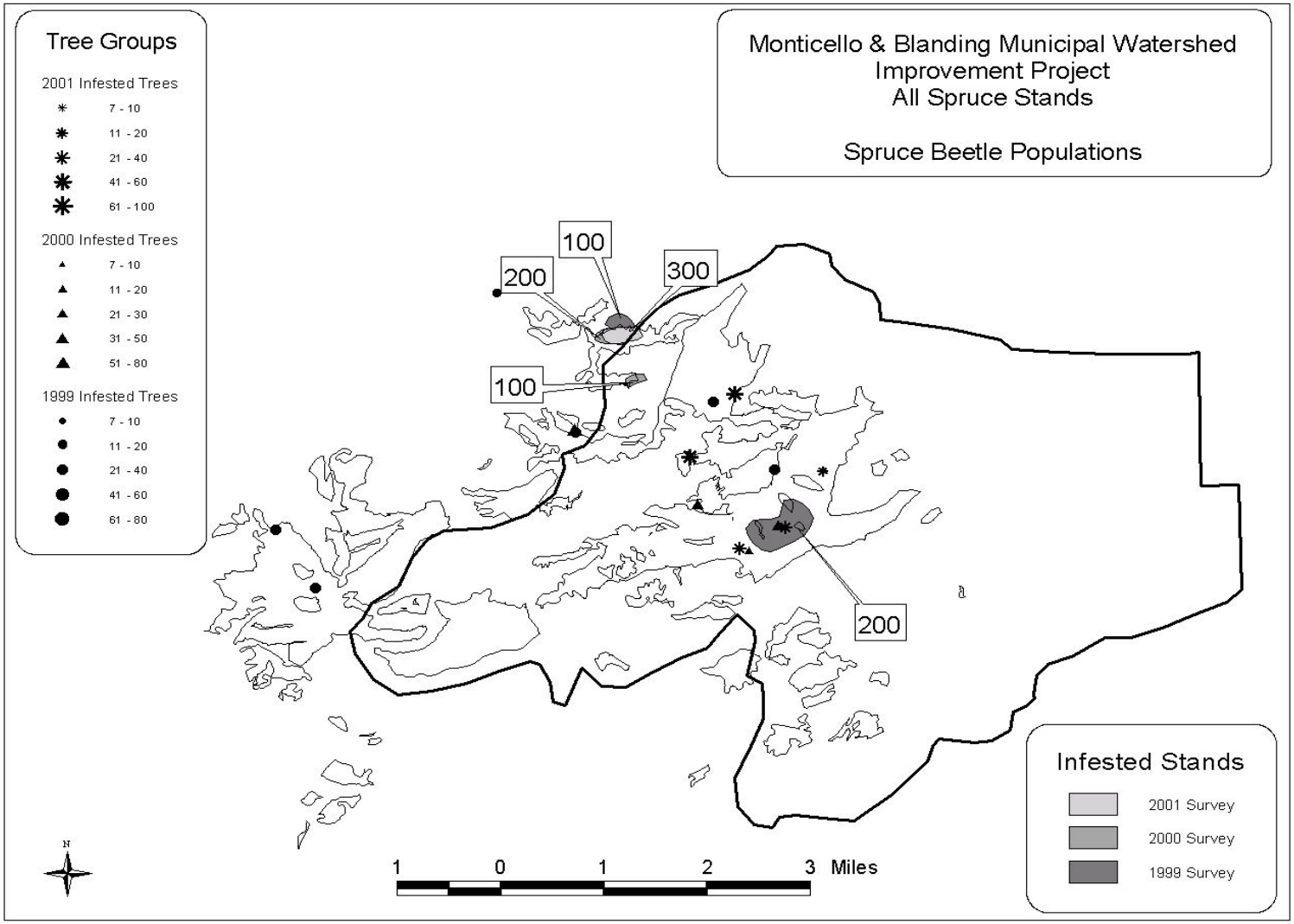
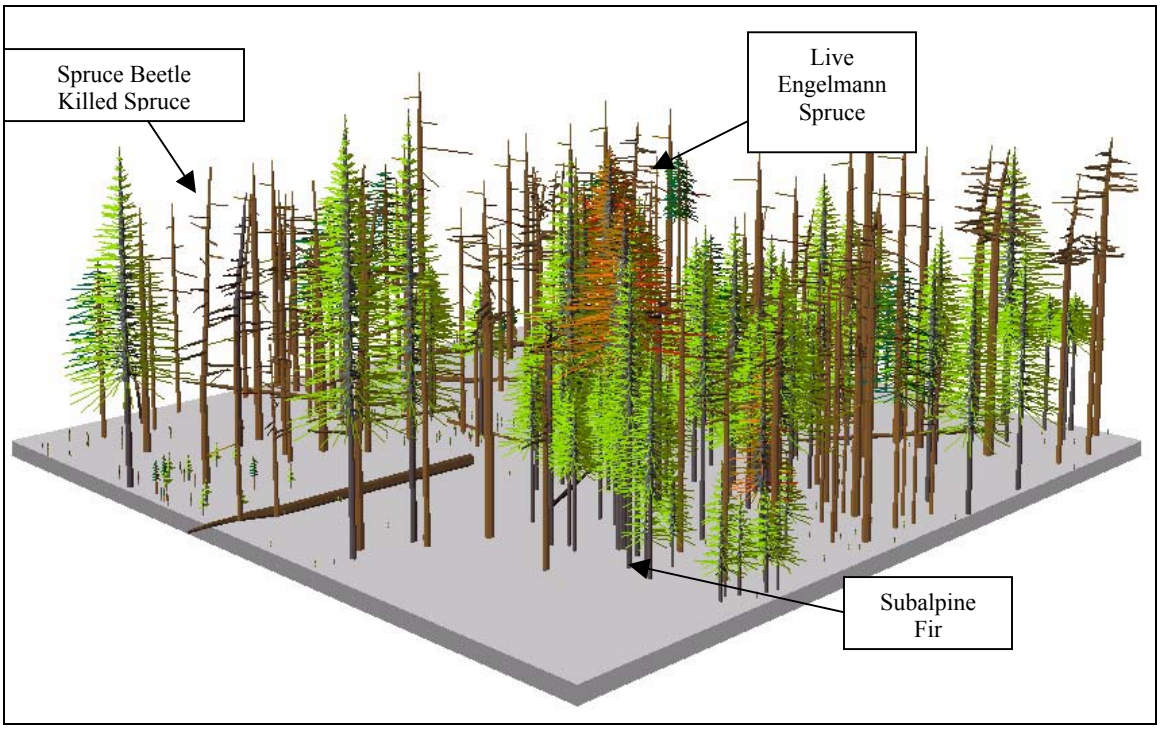


Figure 19 – Typical Spruce/Subalpine fir Stand Following a Spruce Beetle Epidemic (Long-term).



Alternatives B and C

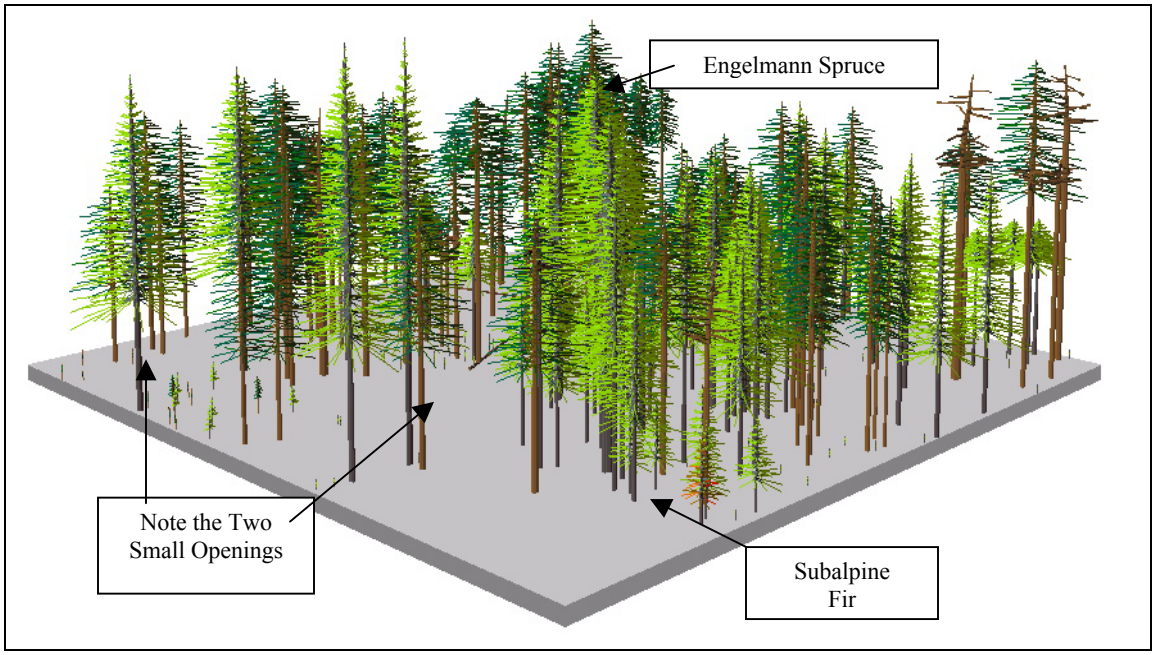
Alternative B would remove all infested and 95 percent of the susceptible spruce trees (≥18 inches DBH) from the treated acres and reduce the residual basal area of stands to between 110 and 120 square feet per acre. Alternative C would remove 90 percent of the susceptible spruce trees (≥18 inches DBH) from the treated acres and reduce the residual basal area of stands to between 125 and 135 square feet per acre.

Clumps of trees (2 to 9) would be limited to non-spruce or the isolated spruce surrounded by other tree species and would cover less than 40 percent of the treated acres. Spruce beetle suppression activities would continue in conjunction with treatments to help reduce spruce beetle populations through the duration of the project, or until spruce beetle attacks on live spruce cease (Appendix A, Issue 1). Additional treatments to suppress spruce beetle broods would include treatment or removal of spruce blowdown as or if it occurs (Appendix A, Issue 1).

Under Alternative B, approximately 20 percent of the treated acres in the spruce-fir and aspen/spruce types would have low hazard for spruce beetle attack as these acres would no longer have any susceptible trees. The spruce-fir stands would have an average rating of moderate following treatment. The aspen/spruce stands would average low to moderate.

Figure 20 is a graphic representation of the appearance of a spruce-fir stand after treatment under Alternative B. There are larger spruce and two small openings apparent in the stand.

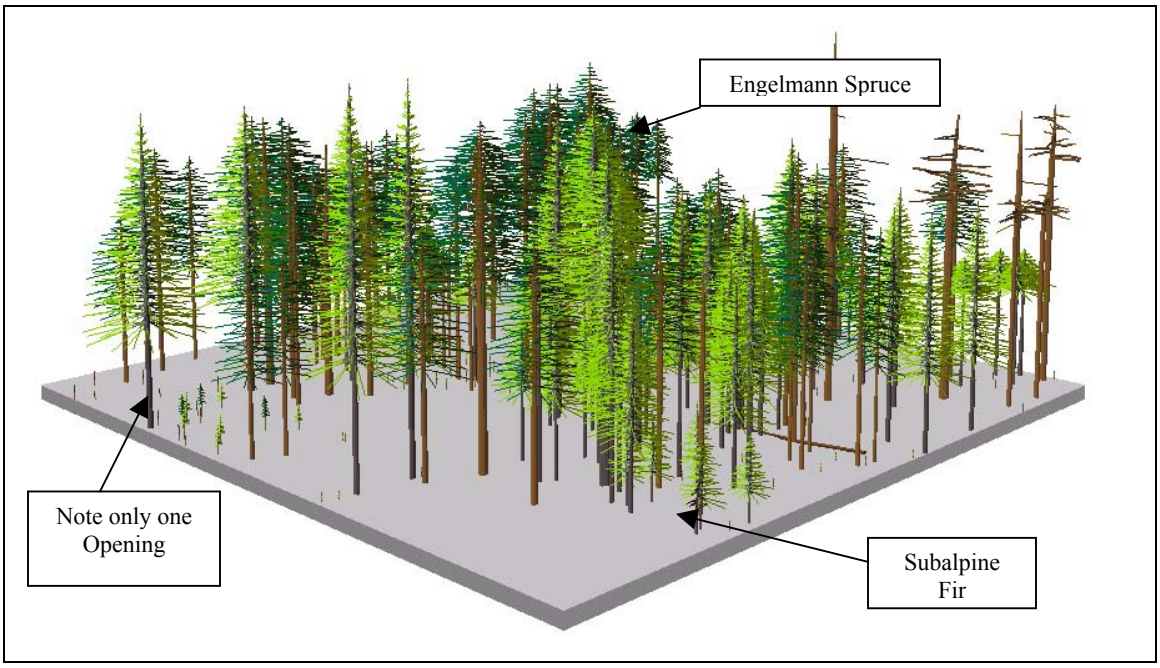
Figure 20 – Spruce/Subalpine fir Stand Following a Treatment under Alternative B (Short-term).



Under Alternative C, approximately 15 percent of the treated acres in the spruce-fir and aspen/spruce types would have low hazard for spruce beetle attack as these acres would no longer have any susceptible trees. The spruce-fir and aspen/spruce stands would have an average rating of moderate following treatment.

Figure 21 is a graphic representation of the appearance of a spruce-fir stand after treatment under Alternative C. There is larger spruce apparent in the stand and only one small opening evident as compared to Figure 20 where there are two small openings.

Figure 21 – Spruce/Subalpine fir Stand Following a Treatment under Alternative C (Short-term).



Treatments under both Alternative B and C would be less intense in the Horsehead (Unit 5) due to the visual sensitivity of the stand and the potential for windthrow. Following treatment, target basal area would range between 140 and 160 square feet per acre.

Post harvest activities would be the same in both Alternative B and C and are described in detail in Appendix A. Figure 22 and Figure 23 summarize the acres of spruce beetle risk depending on the amount of acres treated.

Figure 22 – Spruce Beetle Risk for the Project Area if all Proposed Acres are Treated

Risk Rating	Alternative A Existing	Alternative B Post Treatment	Alternative C Post Treatment
Low	0	442	316
Low-Moderate	0	81	86
Moderate	1,790	2,240	2,411
High-Moderate	2,027	1,054	1,004
Total Acres	3,817	3,817	3,817

Figure23 – Spruce Beetle Risk for the Project Area if all Proposed Acres are not Treated

Risk Rating	Alternative A Existing	Alternative B Post Treatment	Alternative C Post Treatment
Low	0	388	227
Low-Moderate	0	81	86
Moderate	1,790	2,113	2,212
High-Moderate	2,027	1,235	1,242
Total Acres	3,817	3,817	3,817

With the existing conditions in the project area, silvicultural treatments (i.e. thinning, density management) would offer the greatest likelihood of reducing the susceptibility of stands to spruce beetle infestation and minimizing the potential for unacceptable levels of spruce mortality in the future. Empirical data addressing the efficiency of silvicultural treatments for spruce beetle management is limited. However, existing management guidelines are based upon all available research and the experience of professional forest entomologists and foresters (Holsten et al. 1999; Alexander, 1986; Schmidt and Frye, 1977). In infested stands, or those with building spruce beetle populations, sanitation and salvage of susceptible and attacked spruce, combined with the disposal of green cull material is regarded as the most effective silvicultural method (Holsten et al. 1999, Alexander 1986, Schmidt and Frye 1977). To reduce the susceptibility of uninfested stands to spruce beetle, density management, including partial cutting to remove the larger mature trees, decrease basal areas, and release younger age classes is recommended. This would ensure a good stocking of trees in smaller diameter classes to create the structural, species, and age-class diversity necessary for perpetuating spruce and achieving other desired management objectives (Alexander, 1986).

To maximize effectiveness, treatment strategies must be implemented while spruce beetle populations remain low. After an outbreak begins, management options become increasingly limited and delays in treatment greatly reduce opportunities for success (Munson, Anhold, Hebertson, *personal communication*). On the Dixie National Forest, treatments to mitigate spruce beetle impacts were not implemented until populations became epidemic. Even an aggressive program of sanitation and salvage proved ineffective in preventing further mortality with populations from adjacent stands reinfesting treated areas. In addition to losing over 90 percent of large diameter spruce, small trees (<5 inches DBH) were attacked due to intense population pressure thus compromising the regeneration of future spruce-fir stands (Munson, *personal communication).* The dispersal capability of beetles also necessitates treatments occur at landscape scales.

3.2.2.3 Cumulative Effects

The boundary used to analyze the cumulative effects to the vegetative types included almost all the spruce-fir and aspen/spruce type stands in proximity to the project boundary.

Alternatives A, B, and C

The spruce-fir and aspen/spruce-fir stands not treated within the cumulative effects area would continue to have a moderate to high risk of spruce beetle attack (Anhold, 2000; Hebertson, 2002). Should spruce beetle populations reach epidemic levels, stands with moderate to high risk of attack could experience up to 90 percent loss of the large diameter spruce (>10 inches

DBH) over the next 5 to 10 years in the absence of treatment (Dymerski 2000). This mortality would affect not only the spruce-fir (2,667 acres) and aspen/spruce (3,369 acres) stands within the project area but also those within the surrounding area (Figure 24).

Map 22 displays most of the spruce-fir and aspen/spruce fir stands within and near the project boundary. The stands outside the project boundary have similar stand characteristics to those within the boundary and have a moderate to high risk of spruce beetle attack. The stands on the northwest side of the project area would not be treated since they are within an inventoried roadless area and are not available for treatment under current management direction.

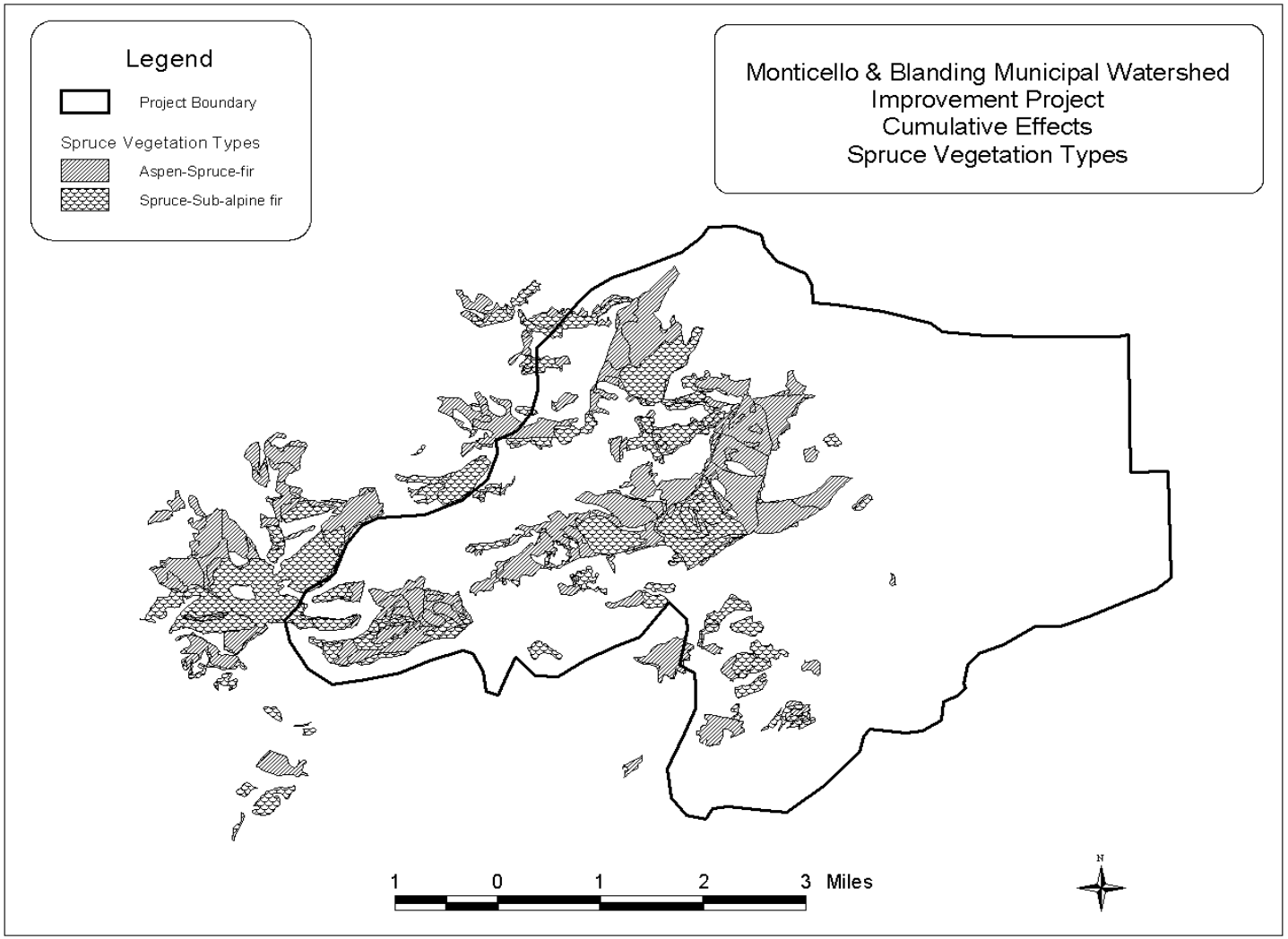
Figure 24 – Summary of Treated and Untreated Acres by Alternative.

Vegetation Types		Alternative A	Alternative B	Alternative C
Spruce/ Subalpine fir	**Treated**	0	657 - 808	657 - 808
	Untreated	2,667	1,859 – 2,010	1,739 – 1,890
Aspen/ Spruce-fir	**Treated**	0	810 - 926	737 - 820
	Untreated	3,369	2,443 - 2,559	2,549 – 2,632
Total Acres		**6,036**	**6,036**	**6,036**

There are no anticipated changes in the composition and structure of the aspen/mixed conifer stands following a spruce beetle epidemic since spruce is not a substantial component of these stands.

The Douglas-fir beetle (*Dendroctonus pseudotsugea* Coleoptera: Scolytidae) is the only other major insect in the project area. Douglas-fir (*Pseudotsuga menzesii*) is the dominant tree species on 87 acres and a minor component (<1 tree per acre) within many of the spruce-fir and aspen/mixed conifer stands.

Map 22 - Spruce Vegetation Types



3.2.3 Fire/Fuels

3.2.3.1 Current Management

Fire History

The Monticello Ranger District encompasses about 369,000 acres. Fire occurrence on the District averages about 20 fires per year. The number and size of fires has varied widely during the past 30 years with as few as 5 and as many as 80 occurring in a single year. The 2002 fire season saw the biggest increase in larger than normal fires with two fires (Hammond and Nizhoni) burning 4,500 and 2,300 acres respectively (project file).

The larger than normal fires in 2002 are attributed to current drought conditions in southern Utah. The Palmer Drought Severity Index (PDSI) is a measure of drought severity based on climate. Figure 25 summarizes the number and size of fires that have occurred during major fire seasons on the Monticello Ranger District along with index ratings. The level of drought experienced in this part of the state since 2000 occurs approximately every 7 - 12 years on average (Palmer Drought Severity Index Cart for Utah Climate Division 7, 1895 – 2001 [project file]).

Figure 25 – Fire Occurrences on the Monticello Ranger District from 1970 to 2002.

Year	Number Of Fires	Total Acres	Largest Fire (Acres)	June Index	July Index	August Index
1970	4	405	404	Normal	Normal	Normal
1971	1	0	0	Moderate	Moderate	Moderate
1972	1	0	0	Severe	Severe	Severe
1973	20	7	5	Extreme Moisture	Extreme Moisture	Extreme Moisture
1974	31	84	80	Moderate	Moderate	Severe
1975	12	1	1	Normal	Moist	Normal
1976	33	28	20	Normal	Normal	Normal
1977	30	34	20	Severe	Severe	Severe
1978	14	16	7	Moist	Moist	Moist
1979	16	1	1	Very Moist	Very Moist	Very Moist
1980	19	1	1	Extreme Moisture	Extreme Moisture	Extreme Moisture
1981	23	2	2	Normal	Normal	Moderate
1982	15	6	3	Normal	Normal	Normal
1983	5	0	0	Very Moist	Very Moist	Very Moist
1984	9	1	1	Moist	Moist	Moist
1985	20	50	43	Moist	Moist	Moist
1986	16	66	60	Normal	Normal	Normal
1987	7	1	1	Normal	Normal	Normal
1988	25	13	2	Very Moist	Normal	Normal
1989	32	58	16	Severe	Severe	Severe
1990	9	2	1	Severe	Severe	Severe
1991	14	12	5	Moderate	Moderate	Moderate

Year	Number Of Fires	Total Acres	Largest Fire (Acres)	June Index	July Index	August Index
1992	12	7	5	Normal	Normal	Normal
1993	10	50	50	Extreme Moisture	Extreme Moisture	Extreme Moisture
1994	56	72	30	Normal	Normal	Moderate
1995	19	38	37	Very Moist	Very Moist	Normal
1996	53	326	200	Severe	Severe	Extreme
1997	23	2	1	Moist	Moist	Moist
1998	15	0	0	Normal	Normal	Normal
1999	8	0	0	Normal	Moderate	Normal
2000	80	132	33	Moderate	Moderate	Moderate
2001	34	21	6	Normal	Normal	Normal
2002	36	6,158	4,500	Extreme	Extreme	Extreme

Utah, specifically southern Utah, characteristically experiences dry conditions, with regular lightning occurring through the season. Large acreages can be burned in years of extreme drought and weather conditions. Depending on rainfall patterns and time of year, fires can burn in any part of the District during the normal fire season regardless of drought conditions. Figure 26 summarizes the number of fires per decade. The number of fires per decade is increasing. So far, there have been 150 fires in the current decade (contains only three seasons of data).

Figure 26 – Number of Fires by Decade on the Monticello Ranger District

Decade	Number Of Fires
1970s	162
1980s	171
1990s	219
2000s (Contains data for only the three seasons)	150

Over the last three decades, there have been 10 fires with an average size of 0.25 acres within the project area. Of those 10 fires, two were person-caused and eight were lightning caused. There have been no substantial fires within the project area in the last 75 to 100 years, but the Nizhoni Fire (2300 acres) was one mile and the Hammond Fire (4500 acres) 14 miles from the project area (project file).

Fire Susceptibility

Historically, severe fire activity in spruce-fir stands has resulted in stand replacement. Normal fire return intervals in this forest type are generally from 250 to 300 years (Jenkins et al 1998). During normal weather conditions, fire does not carry well through existing fuels in spruce-fir stands. Higher fuel moistures result in a lower probability of fire starts. Under extreme burning conditions, fire potential exists during all stages of forest community development in the spruce-fir zone (Bessie and Johnson, 1995). Widespread fires occurred in the Rocky Mountain Region in the last half of the 1800s, when spruce beetle-killed trees were common. The lack of fire since that period suggests that spruce beetle disturbances are a precursor to large fires. However, the situation is complicated by the high frequency of human-caused fires during that time, and it is

difficult to determine whether spruce beetles did or did not increase the susceptibility of these forests to natural fires (Baker and Veblen, 1990).

Large, severe stand replacement fires can occur in spruce-fir stands under the extreme conditions of drought, high winds, high temperatures, and low humidity. The 2002 Sanford Fire was a prescribed burn in a lower elevation vegetation type that escaped the planned burn area due to an unusual wind event (45 mph winds). The fire eventually grew, gained elevation, and burned into spruce-fir stands. In the spruce-fir stands, fuel loadings were high due to spruce beetle mortality (some of the dead spruce had fallen); 1000-hour fuel moistures were below 10 percent; average humidity was below 20 percent; and winds were greater than 40 mph (Sanford Fire, Dixie National Forest, Crawley 2002).

Severe and extreme drought conditions occur 10 percent of the time in southeast Utah (Palmer Drought Severity Index). Coupled with lower than normal fuel moistures, high fuel loadings, high winds, and steep terrain an increase in stand replacement fires could be expected.

Crown fire potential is a key element for stand-replacement wildland fires. Stands within the project area are dominated by mature spruce and subalpine fir and have substantial amounts of fine fuels in the lateral twigs which, when dead, curl against the larger branches or trunk, frequently along the entire length of the tree. This along with any smaller live trees, especially subalpine fir, creates a vertical continuity of fuels commonly called ladder fuels. These ladder fuels create the potential risk of a ground fire transitioning to a crown fire. Dead trees are often closely intermingled with live vegetation and easily spread fire to the overstory crowns during dry weather. The increased threat of crown fire remains until the dead needles and/or the fine branches fall from the tree (General Technical Report INT-287, Fire Ecology of Forests and Woodlands in Utah, 1992).

3.2.3.2 Direct/Indirect Effects

The following parameters were held constant in order to isolate the changes produced by the alternatives: no future ingrowth of trees or additional mortality of trees other than from the spruce beetle, weather, and terrain (slope and aspect). The predicted fire behavior from the BEHAVE model should be used only as a relative value to compare alternatives, not as an actual prediction of fire behavior or occurrence.

The calculated fire size projections assume there is no suppression action within the first two hours after ignition (the approximate time it would take initial attack forces [an engine with three people and a 5-person hand crew] to arrive and begin fire suppression activity).

Alternative A (and Untreated Stands Containing Spruce in the Action Alternatives)

This section will describe the effects of no treatment under Alternative A and is applicable to all untreated spruce-fir and aspen/spruce in Alternatives B and C. There would be no fine fuel or large fuel reductions. Fine and large fuels, predicted fire behavior, size, rates of spread (ROS), and potential of escape from initial attack (IA) resources would change over time due to spruce mortality from the spruce beetle. Figure 24 displays treated versus untreated acres of spruce vegetation type by alternative.

Fuel Loading

Existing fuel loading (Figure 27) in the spruce-fir and aspen/spruce stands is variable, ranging from 32 to 47 tons per acre with an average fuel loading of 35 tons per acre. The average size of the existing ground fuels is generally <3-inches (1,000-hour time lag fuels) in diameter (USDA Forest Service, 2001 – Fuels Inventory). This material usually results in a relatively low rate of spread for ground fires, but with an overall high fireline intensity rating.

The fuels that influence fire behavior are the <3-inch material. This fuel size is composed of the following time lag categories: the 1-hour (0"-0.25"); the 10-hour (0.26"- 1.0"); and the 100-hour (1.1"- 3.0") time lag fuel categories. These time lag categories are combined in the <3-inch materials for fire behavior calculations. Figure 27 summarizes the existing fuel loadings by fuel groups for the spruce-fir and aspen/spruce vegetation types within the project area. Based on the existing fuel loadings and the stand exam data, four representative fuel groups were identified. Stands were stratified into the fuel groups based on vegetation type and average fuel loading.

Figure 27 – Comparisons of Fuel Loadings by Fuel and Vegetation Groups (Short and Long-Term).

Fuel Groups	Existing Condition 2002 (Short-term)			Future Condition 2092 (Long-term)		
	<3 in. tons/acre	>3 in. tons/acre	Total tons/acre	<3 in. tons/acre	>3 in. tons/acre	Total tons/acre
1	2.80	29.20	32.00	9.83	77.21	87.04
2	2.80	29.20	32.00	12.67	87.63	100.30
3	6.10	40.80	46.90	10.82	93.91	104.73
4	6.10	40.80	46.90	10.05	88.53	46.90

Following a spruce beetle epidemic, the fuel loadings in all four fuel groups would change over the 80-year period (Figure 27) (Fuels Report 2002). As the dead spruce trees fall to the ground, the average fuel loading would increase from an average of 35 tons/acre in 2002 to an average of 90 tons/acre by the year 2092. Alternative A would have the greatest amount of dead and down fuel.

Fuels and vegetation are continuous on the north facing slopes of the spruce-fir and aspen/spruce stands. Fuels are broken and non-continuous on the east, west, and south facing slopes, and consist of sage/grass, mountain brush, aspen, and barren rocky areas. If a stand replacement fire occurred in a spruce-fir stand with substantial numbers of spruce beetle killed trees, it would most probably burn that stand and potentially all stands within spotting distance.

Fire Susceptibility

In the event of a spruce beetle epidemic, the average fuel loading of <3-inch material would increase adding more fine fuels over the next 80 years. As the fine fuel loadings increase in each individual stand, the potential for escape from initial attack resources and for larger than normal wildland fires would increase. The addition of fine fuels would increase the rate of spread until those fuels reduce by decomposition and compaction from the snow pack. The higher fine fuel loading, in conjunction with increased exposure to local wind influences from the loss of the live tree canopy, could increase the probability of high intensity, localized fire occurrences in extreme drought years.

Slow decomposition rates and much higher fuel loadings across portions of the landscape are expected to result in larger wildland fires than previously experienced. Untreated stands, during periods of low humidity, high temperatures, and wind, would be unsafe for fire fighters and would be allowed to burn. Suppression forces would use areas with discontinuous fuels (i.e. meadows, aspen stands, rock outcrops) to contain the fire.

Fire Behavior

The potential for initial attack escape is rated as:

- Low - Fire contained in the first four hours by initial attack resources.
- Moderate - Fire barely contained or close to being contained in the first four hours by initial attack resources.
- High - Fire not contained within the first four hours by initial attack resources.

The rate of spread would be approximately six chains (chain = 66 feet) per hour, and the potential for escape from initial attack would be high for all fuel groups (Figure 28). Flame length and intensity would exceed the ability of ground forces to mount a direct attack. Aviation resources and indirect attack tactics would need to be utilized. Due to the high rate of fire spread, vegetation type changes to a lower fuel loading would be required to assist with containment and control.

Figure 28 – Summary of Potential for Initial Attack Escape (Short and Long-Term).

Fuel Groups	Year	Rate of Spread (Chains/Hr)	Status After 4 Hours of Initial Attack	Potential for Initial Attack Escape
Short-term				
1	2002	3.4	No Escape	Low
2	2002	3.4		Low
3	2002	2.9		Low
4	2002	2.9		Low
Long-term				
1	2092	12.6	Escaped Fire	High
2	2092	13.3		High
3	2092	12.8		High
4	2092	12.7		High

Alternatives B and C

The following analysis is for the proposed treatment stands only. Between 4,302 to 4,569 acres (Alternative B) and 4,288 to 4,522 acres (Alternative C) of the spruce-fir and aspen/spruce-fir types would not be treated. The untreated acres would have the same effects as described under Alternative A (Figure 27).

Fuel Loading

Slash from harvest operations would increase the <3-inch loading before the proposed slash treatments. The <3-inch materials, without treatment, need approximately eight to nine years to decay and fall to a manageable level (less than five tons per acre) (project record).

Immediately following harvest, the fine fuel loadings would exceed the five-tons/acre threshold in all four fuel groups (Figure 29). The units would probably be logged over three operating seasons, and slash treatment operations would begin in individual units the year following harvest. By 2092, the fine fuels (<3-inch) numbers would include the unharvested beetle-killed trees which would fall and add to the post harvest fuel loading; slash from the harvest operations would have long since decayed. Figure 29 displays the short-term fine fuel loading and the long-term large fuel loading by alternative.

Figure 29 - Short-term Fine Fuel Loading and Long-term (2092) Large Fuel Loading by Fuel Groups for each Alternative before Fuel Treatment.

Fuel Groups	Short-term Fine Fuel Loading (Before fuel treatment)			Long-term (2092) Large Fuel Loading (Before fuel treatment)		
	Alternative A Fuel Load, < 3 in. Tons/acre	Alternative B Fuel Load, < 3 in. Tons/acre	Alternative C Fuel Load, < 3 in. Tons/acre	Alternative A Fuel Load, > 3 in. Tons/acre	Alternative B Fuel Load, > 3 in. Tons/acre	Alternative C Fuel Load, > 3 in. Tons/acre
1	2.80	17.00	15.45	77.21	31.68	46.13
2	2.80	19.87	25.21	87.63	32.74	45.05
3	6.10	29.86	20.64	93.91	43.35	58.30
4	6.10	19.90	23.06	88.53	44.33	58.88

Fire Behavior

Short Term (Before Slash Treatment)

With the increase in fine fuel loadings following harvest, there would be a short-term risk that a wildland fire would exceed the capabilities of initial attack crews and easily escape in all fuel groups (Figure 30). Initially, fine fuels from the harvest would be green and not an immediate threat. As stands are harvested (during the estimated three years of the contract), they would be released from the contract, and slash treatment work would begin the next field season. This would stagger the short-term risk over an estimated four to five year period until all post harvest slash treatments are completed.

Following harvest and slash treatment, the average total fuel loading would increase from approximately 35 tons/acre in 2002 to 40 tons/acre in 2092. The majority of fuel loading (average of 98 percent) would be in the >3" category and would affect fire and heat duration and the amount of work needed to cut fireline more than rate of spread (Figure 30) thus increasing the potential for fire escape.

Figure 30 – Short-term Fire Behavior by Alternative Before Slash Treatment.

	Alternative A			Alternative B			Alternative C		
Fuel Groups	Rate of Spread (Chains/ Hr)	Status After 4 Hours of Initial Attack	Potential for Initial Attack Escape	Rate of Spread (Chains/ Hr)	Status After 4 Hours of Initial Attack	Potential for Initial Attack Escape	Rate of Spread (Chains/ Hr)	Status After 4 Hours of Initial Attack	Potential for Initial Attack Escape
1	3.4	No Escape	Low	25.5	Fire Escaped	High	28.0	Fire Escaped	High
2	3.4		Low	28.0		High	29.1		High
3	2.9		Low	26.4		High	28.1		High
4	2.9		Low	24.9		High	27.0		High

Post Harvest Slash Treatment

The planned slash treatment would reduce the activity fuel loading and the current natural fuel loading within the treated stands to manageable levels (<5 tons/acre). The treatments would occur in a blocked or checkerboard pattern, reducing the overall rate of spread of a wildland fire. This would slow, stop, and/or redirect a fire's movement through a treatment area reducing the rate of spread and giving initial attack forces time and defensible space to directly attack a wildland fire (Finney 2001). Figure 31 displays the estimated acres proposed for fine fuel reduction (slash treatment) and large fuels treatment (harvest) by alternative.

Figure 31 – Large and Fine Fuels Reductions for each Alternative.

Alternatives	Large Fuel Reduction (Harvest) (Acres)	Fine Fuels Reduction				
		Lop and Scatter (Acres)	Jackpot Unit Burn (Acres)	Jackpot Patch Burn (Acres)	Tractor Piling (Acres)	Total Acres
A	0	0	0	0	0	0
B	1,809	990	408	250	101	1,809
C	1,688	1,026	331	181	168	1,688

Lop and Scatter (all fuel groups)

Lopping cuts the residual material left from the harvest (branches and tops) into smaller pieces so they lie close to the ground. Scattering distributes the lopped material more or less evenly across the ground. Fine fuels would not be reduced, and the average fuel loading may exceed five tons/acre. This material would naturally decay taking approximately five to nine years to return to a manageable loading of less than five tons/acre. This treatment may result in a reduction of time for the material to naturally decompose (Personal communication with Russell T. Graham, Research Silviculturist, RMRS).

Predicted fine fuel and large fuel reductions would be the same as in Figure 31. However, rate of spread and escape potential would be reduced by the checkerboard pattern of treatments previously described.

Jackpot Burn Acres (all fuel groups)

Jackpot or concentration burning is a modified form of broadcast slash burning where only the greater accumulations are ignited, and the scattered nature of these concentrations limits the spread of fire. Stands proposed for jackpot burning would be lopped but not scattered following harvest.

Two types of jackpot burning would be used.

- Jackpot Unit Burn Acres - Stands that are generally clearcuts targeted for aspen regeneration.
- Jackpot Patch Burn Acres - The five-acre or less openings in Alternative B or four-acre or less openings in Alternative C in the spruce-fir or aspen/spruce stands.

Approximately 50 to 60 percent of the acres treated by jackpot burning should have fine fuel loadings reduced to less than 5 tons per acre.

Tractor Piling
The slash (resulting from the harvest) would be piled by mechanized equipment and the piles burned. All areas treated by tractor piling would have fine fuel loadings reduced to less than five tons per acre.

In the long-term (2092), the spruce mortality under Alternatives A and C would pose a greater risk of an escaped fire than Alternative B (Figure 32). However, the planned treatments would create openings in the general overstory canopy, provide access routes, and create fuel breaks of various age groups of trees. Initial attack forces would have access to the area, and time and defensible space from which to control a fire before the end of the four-hour window.

The higher number of acres proposed for treatment under Alternative B would lower the risk of escape should a fire begin in the area or spread from adjacent stands into the project area. Additionally, the efforts to reduce post-activity fuels should increase the effectiveness of control efforts (e.g. less effort required to build fireline in and between former treatment units), even though the potential for escape over the whole area remains moderate to high.

Figure 32 - Fire Behavior for all Alternatives in 2092 (Long-term).

Fuel Loading Groups	Alternative A			Alternative B			Alternative C		
	Rate of Spread (Chains/ Hr)	Status 4 Hours of Initial Attack	Potential for Initial Attack Escape	Rate of Spread (Chains/ Hr)	Status 4 Hours of Initial Attack	Potential for Initial Attack Escape	Rate of Spread (Chains/ Hr)	Status 4 Hours of Initial Attack	Potential for Initial Attack Escape
1	12.6	Fire Escaped	High	1.6	No Escape	Low	9.9	No Escape	Moderate
2	13.3		High	2.6		Low	12.1		High
3	12.8		High	2.1		Low	11.0		High
4	12.7		High	2.6		Low	11.7		High

3.2.3.3 Cumulative Effects

There are no cumulative effects beyond what has been described under direct and indirect effects. No additional slash or harvest treatments have occurred within the project area.

Fuel Loading
Expected fire behavior would generally be confined to the stands containing dead spruce. Hot, intensive wildfires burning in blocks ranging from 100 to 200 acres in size across the project area could occur in the immediate years following an epidemic.

Reducing the natural buildup of fuels by harvesting, implementing slash disposal mitigations, and breaking up the continuous fuels and live overstory canopy within stands would reduce the risk of a large intense fire in each treated stand. The stands would be susceptible to intense wildland fires when low humidity, high temperatures, and wind are present. The probability of these events occurring is low in any given year. However, over time, the probability is increased.

As the harvested areas are opened up, it is presumed they would be colonized in the immediate future by grasses and forbs. This would in turn attract wildlife into the area with a corresponding reduction in fine herbaceous fuel loadings.

The proposed timber management activities in the project area have a potential for reducing both present and future fuel loadings. If the pattern of cutting follows overlapping and staggered placement, the treatments also have the ability to slow both ground and crown fires on these slopes. This would allow time and space to effectively fight a fire during extreme conditions (Forest Science, 2001).

Following harvest, fuel loading would increase (<3 inches) from debris not removed from treatment units. This would result in increased fire risk for the short-term. To bring suppression capabilities in these areas to a safe and manageable level, fuel loading should be reduced to at least five tons/acre (Fuel Model 8)

Without treatment it is expected that it would take between eight to nine years for natural decay to bring fuel loadings to this level, if no new down and dead fuels were added to the site from future tree mortality. However, there would be continued additions to the site from future mortality along with the new developing canopy and its close proximity to the ground fuels due to the younger age of the replacement stand.

Activity fuels should be treated two to five years following harvest through a combination of slash and jackpot burning to help mitigate increased short-term fire risk effects by reducing fuel loading to five tons per acre. Lop and scatter treatments would be used in some areas to break up fuel concentrations and lessen the effects of fire duration on soils where appropriate. Lop and scatter would not affect the fuel loading in those areas and would be expected to follow the five to nine years of decay processes in obtaining five tons per acre.

If no epidemic occurs there is still a potential for larger than normal fires during extreme drought conditions given the current fuel loadings and the steep slopes. Given more time, fuel loading would generally increase to that of a spruce-fir climax type stand with multiple layered canopies and ladder fuels of both live and dead materials (Fuel Model 10). The risk of loss of the municipal water systems and large electronic site to a large fire event would increase over time.

Wildland Fire Behavior

Fuel mitigation treatments of the spruce-fir stands could increase the potential to contain wildland fires. Fires in untreated areas over heavy fuel loads and steep slopes, when weather conditions are extreme, have the potential to tire fire crews, as regular line construction and burnout efforts are less effective. Consequently, under extreme weather conditions, fires in this area would pose a safety threat to hand crews. Suppression efforts would be indirect, as treated stands and areas of noncontiguous fuels would be used to contain large and intense wildland fires. The chance of a 100 to 300 year stand replacement fire could increase in stands with large amounts of spruce beetle-killed down and dead fuels under a live canopy

3.2.4 Relationship Between Short-Term Use and Long-Term Productivity

Alternative A

There would be no change in the relationship between short-term use and long-term productivity. If the spruce beetle achieves epidemic levels, the recovery period to reach fully stocked stands would be approximately 70 years. In the absence of site disturbance, spruce would regenerate slowly and composition would shift to predominantly subalpine fir. The structural stage of the affected stands would shift to either young or mid-aged. The aspen/spruce and the aspen/mixed conifer stands would achieve full stocking in less than 20 years but the recovery of the mature structural component may take over 150 years

An increase in dead and down fuels, mixed with the fuel moisture characteristics described previously, would contribute to an increased fire risk. Without implementation of fuel reduction techniques over time, the dead spruce or normal mortality regimes would contribute to a long-term increase in risk of a large intense wildland fire.

Alternatives B and C

Managed stands grow faster over time than unmanaged stands. Planting trees, stocking control to reduce competition and improve growth of individual trees, and intermediate treatments to maintain health and vigor of stands would maintain the long-term productivity of forest stands. Reforestation would shorten the time to attain a fully stocked stand (five years or less). The proposed treatments should protect the remaining spruce from the spruce beetle, retaining the mature structural component now and through time.

Following harvest there would be a temporary increase in fine fuels that could increase fire risk. Reducing the buildup of activity created fuels by implementing slash disposal requirements and breaking up continuous fuels within designated treatment units would reduce the overall wildland fire risk to manageable levels.

3.2.5 Irreversible/Irretrievable Commitment of Resources

Alternative A

Changes to the vegetation composition and structure of the spruce-fir and aspen/spruce-fir from the mortality of the Engelmann spruce from the spruce beetle are an irreversible effect that cannot be avoided. Historically, similar epidemics have occurred throughout the spruce-fir and aspen/spruce-fir types. Approximately 150 years would be required to bring stand structures back to conditions similar to those that existed before a spruce beetle epidemic.

If a large, intense wildland fire were to occur under the described increase in fuel loading, this would place the lives of firefighters and possibly fire resources at risk. The effects of such a fire would be intensified in the municipal watershed and communications site areas due to the values at risk. If a fire were to occur, the majority of live trees remaining after a spruce beetle epidemic would be lost as well**.**

Alternatives B and C

Timber harvest would change plant succession, stand development, and species composition. If project requirements fail, some irretrievable commitments may include loss of vegetation for wildlife if noxious weeds become established. Some diversity of vegetative composition of the plant community could be lost to noxious weeds. Road construction would irretrievably remove land from production.

3.2.6 Forest Plan Consistency

Alternative A

Alternative A may not be consistent with Forest-wide direction to manage suitable timberlands for harvest; provide for timber stand improvement, reforestation, wildlife habitat improvement; and provide for multiple uses.

Alternative A would not be consistent with the Forest-wide Direction for Insect and Disease Management or Suppression (P35): *"Prevent or suppress epidemic insect and disease populations that threaten forest and/or range land with an Integrated Pest Management (IPM) approach consistent with resource management objectives."*

Alternative A may be consistent with Forest Plan direction since the changes expected to the fuels and escaped wildland fire would be the result of a natural spruce beetle epidemic. It could be debated whether inaction would be consistent with specific vegetation management direction to maintain fuel conditions that permit fire suppression forces to meet protection objectives of the management unit.

Alternatives B and C

Alternatives B and C would be consistent with Forest Plan direction to manage suitable timberlands for harvest, provide for timber stand improvement, reforestation and wildlife habitat improvement, and provide for multiple use.

Both action alternatives comply with the Forest-wide Direction for Insect and Disease Management or Suppression (see Alternative A).

Alternatives B and C would be consistent with Forest Plan direction to provide a level of protection from wildfire that is cost efficient and will meet objectives of the management unit, maintain fuel conditions that permit fire suppression forces to meet protection objectives of the management unit, and use preplanned prescribed fire to accomplish resource management objectives (Fire Planning and Presuppression 01; Fuel Treatment 01; Vegetation Treated by Burning 01).

This project proposes to treat Engelmann spruce to reduce the number of spruce that may die from the spruce beetle or in the event the epidemic continues to reduce the number of spruce in the stand that could add to the fuel loading over time. Both alternatives would treat harvest related fuels to reduce the potential for large wildland fires.

3.3 WILDLIFE RESOURCES

This section describes the current condition of species considered in the Wildlife Resources issues (northern goshawk and three-toed woodpecker – significant issue; deer and elk – key issue) and the effects of alternative implementation (USDA Forest Service, 2002. Musclow, Heather and Smith, Barb).

Issue (Significant) - Implementation of the proposed actions, insect epidemic, or fire occurrence may impact the habitat and behavior of the northern goshawk or three-toed woodpecker (Region 4 designated Sensitive Species).

Indicators:

- *Impact determination for the northern goshawk:*
  Acres of habitat meeting Forest Plan guidelines
- *Impact determination for the three-toed woodpecker:*
  Acres disturbed
  Aspen Regeneration (acres)

Issue (Key) - Implementation of the proposed actions, insect epidemic, or fire occurrence may impact the habitat and behavior of deer and elk (Management Indicator Species – MIS) populations.

Indicators:

- *Deer and Elk Forage Habitat Assessment:*
  Acres of forest canopy opened to allow increased ground vegetation.
  Aspen Regeneration (acres)
- *Deer and Elk Vulnerability Assessment:*
  Road Density (miles/square mile)
  Road Standard Upgrade (miles)

All threatened, endangered, proposed candidate, sensitive, and management indicator wildlife and plant species of concern were analyzed for effects in the Specialist Report and associated biological assessment and evaluation (project file). Of these, four wildlife species represent primary effects due to habitat, species range, and project impacts. Other species either do not occupy the habitat, do not occur within the range of this project area, or impacts were mitigated or covered under the above species. The four species used to measure impacts and evaluate comparisons among alternatives include the northern goshawk, three-toed woodpecker, deer, and elk.

3.3.1 Northern Goshawk

3.3.1.1 Current Management Situation

Life History

Goshawks inhabit mixed deciduous and coniferous forests in temperate and boreal regions, from sea level to tree line. They have large home ranges; a male goshawk may forage over 6,000

acres. Goshawks are adapted to catching prey in a mature forest/open understory environment, but need a diversity of tree age classes to support a diversity of prey species (Reynolds et al. 1992). They have been found in a variety of forest ecosystems including lodgepole pine, ponderosa pine, Douglas fir, mixed spruce/fir, and aspen. Pinyon/juniper forests are not known to be used for nesting in Utah (Graham et al. 1999). In addition, riparian areas are used for both nesting and foraging. Many of the nest sites on the Monticello Ranger District are located in aspen/mixed conifer stringers within small drainages with running water. In winter, radio-tracked goshawks remained on their breeding territories or similar habitat or migrated to pinyon/juniper habitats up to 190 miles away (Graham et al. 1999). Prey species include small mammals and birds such as rabbits, squirrels, chipmunks, grouse, woodpeckers, jays, and robins. Young hatch the first half of June with fledging usually in mid-July. Typically, one to three eggs are laid.

Current Status

A Conservation Strategy and Agreement for the Management of Northern Goshawk Habitat in Utah was developed in 1999 (USDA Forest Service). The Utah Northern Goshawk Forest Plan Amendment was signed on April 14, 2000. This decision amends the goals, objectives, standards, guidelines, and monitoring requirements established in the current land and resource management plans. These documents provide the tools needed to conserve, restore, and protect native processes and disturbance regimes important to northern goshawks.

Extensive surveys over several years have documented goshawk territories on the Monticello Ranger District (project file). Nests have been found in mixed spruce-fir/aspen and ponderosa pine habitats.

The criteria used to evaluate affects on goshawks from each alternative are: (1) acres of habitat meeting guidelines, and (2) impact determination

Only those areas in the project or cumulative effects area being affected are used in the determination. These acres of spruce/subalpine fir, aspen/spruce/subalpine fir, and aspen/mixed conifer are changing from mature to younger age classes (9,634 acres in project area and 22,380 acres in the cumulative effects area).

3.3.1.2 Direct/Indirect Effects

Alternative A

Little change in forest structure is expected to occur in the short-term. In the long-term, loss of mature and large mature spruce trees over nearly 3,500 acres would occur from spruce beetle epidemics, reducing habitat quality for this species by removing nest and roost trees. Forest canopy cover would be reduced to <40 percent. The loss of spruce would allow for some aspen sprouting, sustaining this tree species in the landscape. However, young conifers would remain undamaged by spruce beetles and would quickly out-compete aspen. Large quantities of dead and down trees would result from a massive spruce beetle epidemic increasing the potential for fire hazard and large-scale habitat loss. In the short-term, Alternative A would result in 9,634 acres meeting goshawk guidelines resulting in a No Impact determination. Only 6,142 acres would meet guidelines in the long-term, resulting in a May Impact Individuals determination.

In the short-term, no change in the prey base for goshawks is expected. Direct and indirect impact to prey species used by the goshawk would occur over the long-term. Goshawks in the area are known to prey largely on small mammals and birds such as flickers. Changes in vegetation structure from the spruce beetle epidemic would increase small mammal populations since ground cover is increased when canopy cover is opened. Other prey species such as woodpeckers would be reduced. Overall, little change in prey availability would occur.

Direct/Indirect Effects Common to Alternatives B and C

A primary objective of these alternatives would be to regenerate aspen, which would have short-term impacts on goshawks but long-term benefits. Maintaining aspen habitat into the future is a great concern for this bird, and the action alternatives would aid in achieving this objective.

Timber harvest has a direct and indirect impact to prey species used by the goshawk. Goshawks in the area are known to prey largely on small mammals and birds such as flickers. Timber harvest would likely increase small mammal populations since ground cover is increased when canopy cover is opened. Other prey species such as woodpeckers would be reduced with the change in vegetation structure following harvest. Overall, little impacts to prey availability would be expected.

Perhaps the greatest concern regarding the reconstruction of the pipeline and its many collection points is the potential for dewatering existing streams. These alternatives improve the pipeline system where the diversion of water occurs at the head of the stream as well as several places along the stream where springs usually replenished stream flow. Removing this water can have a substantial impact on the use of the stream corridor by wildlife, including the goshawk. Not only does the water meet a basic need of the bird itself, but of its prey as well. Water also helps to keep the ambient temperature under the canopy lower than if no water were there. The Gold Queen, Dickson Gulch, and Bankhead areas provide some of the best habitat on the District for goshawks, and both drainages could be dewatered from an improved water system.

Noise disturbance from pipeline construction and maintenance, vegetation treatment, and road construction and maintenance during the breeding season (March l –September 30) could cause disturbance. Unlike ground-based logging where noise is relatively localized to the harvest area, the noise from helicopter logging spans a greater area due to the aerial transport of logs from the harvest unit to the landing area. Alternative B would treat 1,265 acres and Alternative C would treat 1,148 acres through helicopter harvest methods.

The primary North Creek road (FR 50079) would be improved (16 miles) and temporary roads constructed (2.3 miles), allowing for increased visitor access. By project completion, 8.5 miles of road would be decommissioned, reducing road density, vehicle access, and associated disturbance. Although the road density within the project area would decrease from 2.3 to 2.0 miles/square mile on National Forest System land when the project is complete, impacts from increased traffic on FR 50079 and increased recreational use would reduce wildlife habitat security.

Alternatives B and C delineate known goshawk territories within the project area and protects them according to management recommendations. A total of 84 acres of vegetation treatment

occurs within goshawk Post-Fledging Areas (PFAs) and would be restricted according to the Forest Plan Amendment. Few restrictions occur in goshawk foraging areas. Alternative B contains 1,420 acres and Alternative C 1,289 acres of foraging area within the vegetation treatment units.

Snag and woody debris would be retained according to goshawk guidelines (Design Features – Appendix A).

Alternative B

Loss of trees from silvicultural treatment and residual spruce beetle infestations would reduce habitat quality for this species, by removing nest and roost trees and changing mature forests to early/young trees on 513 acres in the short-term and 2,455 acres in the long-term. Canopy cover would range from 40-69%, a reduction from current conditions, but higher than expected following a no-action spruce beetle epidemic (<40 percent). The vegetation treatment would result in more trees remaining alive, benefiting this species in the long-term. Goshawk guidelines would be met except for the "clumpiness" in forest structure required by this species. This alternative evenly spaces trees and opens canopy cover to obtain maximum protection from further spruce beetle infestations. In the short-term, 9,121 acres would meet goshawk guidelines and in the long-term, 7,179 acres would meet guidelines. In both cases, the determination would be a "May Impact Individuals."

Alternative C

Loss of trees from silviculture treatment and residual spruce beetle infestation would reduce habitat quality for this species, by removing nest and roost trees and changing mature forests to early/young trees on 377 acres in the short-term and 2,793 acres in the long-term. Timber harvest would leave more trees of higher diameter and in a clumpy pattern than Alternative B, benefiting this species in the short-term. Goshawk guidelines would be met including the "clumpiness" required by this species. This alternative does not evenly spaces trees to obtain maximum protection from further spruce beetle infestations, therefore providing for the immediate needs of the species. This treatment comes with a higher risk of tree loss in the long-term due to spruce beetle infestation (estimated to be an additional 35 percent). In the short-term, 9,634 acres would meet goshawk guidelines having a No Impact determination. In the long-term, 6,841 acres would meet guidelines, resulting in a determination of "May Impact Individuals".

Figure 33 - Northern Goshawk- Direct/Indirect Effects

Northern goshawk- Direct/Indirect Effects (9635 acres)	Alternative A	Alternative B	Alternative C
Acres of habitat meeting Forest Plan guidelines	Short-term: 9,634 Long-term: 6,142	Short-term: 9,121 Long-term: 7,179	Short-term: 9,634 Long-term: 6,841
Impact determination	Short-term: No Impact Long-term: May Impact Individuals	Short and Long-term: May Impact Individuals	Short-term: No Impact Long-term: May Impact Individuals

3.3.1.3 Cumulative Effects

Alternative A

Loss of habitat in the North Creek area would increase habitat loss on the Abajo Mountains from spruce beetle infestation, wildland fire, and conifer encroachment. Eighty-eight percent of the total cumulative effect analysis area (22,380 acres) contains aspen mixed with conifer tree species. These areas could have substantial aspen loss from conifer trees competing for sunlight in the next half-century. The total area impacted is substantial to forest dependent species like the goshawk.

In the long-term, given the level of spruce beetle epidemic within the cumulative effects analysis area, 25 percent of the area (5,584 acres) would be converted from mature to early, young, and mid-age trees. Goshawk guidelines would be met on 16,796 acres. This would reduce the canopy cover from 75-100 percent to <40 percent. It is unlikely that these areas would continue to meet Forest Plan guidelines for goshawk habitat. Where canopy cover is opened, some aspen sprouting may occur, allowing for aspen regeneration until conifers once again out-compete.

No change in the number, kind, or maintenance standard of roads or the pipeline would occur from this alternative. However, continued development of unauthorized roads would increase disturbance and reduce habitat over time for this species.

Alternative B

Goshawk habitat has been reduced across the Monticello Ranger District because of bark beetle infestations and past timber management practices. In addition, the removal of historic fire intervals and intensities ended a natural source of disturbance that sustained healthy forests. The loss of aspen from decadence and conifer encroachment is evidence of this.

In the long-term, given the level of spruce beetle epidemic within the cumulative effects analysis area and after implementation of the vegetation treatment proposed in this alternative, 20 percent of the area (4,542 acres) would be converted from mature to early, young, and mid-age trees. This would reduce the canopy cover from 75-100 percent to 40-69 percent in harvest areas and less than 40 percent where spruce beetles continue to flourish. A total area of 17,838 acres would be left that meets Forest Plan guidelines for goshawks. Since this alternative does not follow goshawk guidelines for the timber sale and residual spruce beetle kill would continue in areas not thinned, the 4,542 acres affected would likely not meet Forest Plan goshawk guidelines.

Reduced road densities outside the project area and in association with this project (as per roads analysis recommendations) would benefit this species over the entire landscape. Reducing motorized roads and trails in the Abajo Mountain area by 32.0 miles would increase wildlife habitat security and reduce conflicts between wildlife and forest visitors.

Alternative C

Cumulative effects are basically the same as Alternative B. However, given the level of spruce beetle epidemic within the cumulative effects analysis area and after implementation of the

vegetation treatment proposed in this alternative, 22 percent of the area (5,016 acres) would be converted from mature to early, young, and mid-age trees. This would reduce the canopy cover from 75-100 percent to 40-69 percent in harvest areas and less than 40 percent where spruce beetles continue to flourish. This alternative does follow goshawk guidelines in the timber sale; for the short-term, approximately 1,617 acres more than Alternative B would meet goshawk guidelines. However, since these acres would be harvested in a "clumpy" pattern (containing tree patches, unevenly spaced), it is anticipated that spruce beetles would eventually reduce this area to an early/young forest age class. In the long-term, only 17,364 acres would meet Forest Plan guidelines for goshawks.

Figure 34 - Northern Goshawk-Cumulative Effects

Northern goshawk-Cumulative Effects (22,300 acres)	Alternative A	Alternative B	Alternative C
Acres of habitat meeting Forest Plan guidelines	Long-term: 16,796	Long-term: 17,838	Long-term: 17,364
Impact determination	Long-term: May Impact Individuals	Long-term: May Impact Individuals-	Long-term: May Impact Individuals-

3.3.2 Three-Toed Woodpecker

3.3.2.1 Current Management Situation

Life History

The three-toed woodpecker, a circumboreal species, inhabits mixed spruce-fir and pine forests in North America. This bird relies on older stage forests, foraging in areas having abundant dead and/or decayed trees infested with wood-boring insects (especially recently burned areas). It nests and winters in coniferous forests generally above 8,000 feet elevation. Three-toed woodpeckers stay on their territories year-round, though insect outbreaks may cause irregular movements. They breed in May-July and both sexes excavate a new nest cavity each year high in a dead or live tree where they incubate an average of four eggs for 11 to 14 days. Young fledge 22 to 26 days later and remain with their parents for another month. Three-toed woodpeckers depend on live and dead trees for both nesting and foraging. They require soft wood for excavation because of morphological adaptations associated with three toes on each foot; therefore, the presence of heart rot is important. Trees with scaly bark remaining on the tree are important to support their forging technique. Three-toed woodpeckers require trees infested with bark- and wood-boring insects for foraging. These woodpeckers have been found to forage heavily on moderately charred spruce trees the first three years after a fire.

Although it has been the goal of managers to remove all standing beetle-infested trees, a large portion of these trees should be left for at least 3-4 years to maintain food resources for woodpeckers (Hill 2000). Although this raises a concern over further spread of beetle infestation, three-toed woodpeckers function as a very efficient biological control against spruce bark beetles, and have been called "one of the most valuable insectivorous birds that inhabit our forests"; few birds are thought to consume more forest pests than the three-toed woodpecker.

Current Status

On the Monticello Ranger District, the three-toed woodpecker has been found in spruce/fir and ponderosa pine/aspen habitat types. Territories have been established in areas where known nesting is occurring. In some cases, nesting has occurred over numerous years in the same location, although new nest sites are excavated each year. A concentration of sightings and/or call responses is used to document a nesting territory, rather than an exact nest tree location, since they are hard to locate and change each year. With the increase in insect outbreaks in both spruce and pine trees, the three-toed woodpecker population is considered abundant and healthy. This can change with food sources decreasing with salvage timber harvests but increasing with fire kills.

For overall viability, management for three-toed woodpeckers in Region 4 (Spahr et al 1991) calls for a landscape-level approach that provides for feeding areas on an ecosystem-wide basis, provides/maintains insect outbreaks, and promotes fire on a level comparable to historic potential of area

Criteria used to evaluate affects from various alternatives in the EIS are as follows: (1) acres disturbed, acres of aspen regeneration, and impact determination

Only those areas in the project or cumulative effects area that are being affected are used in the determination. These acres of spruce/subalpine fir, aspen/spruce/subalpine fir, and aspen/mixed conifer are changing from mature to younger age classes (9635 acres in project area and 22,380 acres in cumulative effects area).

3.3.2.2 Direct/Indirect Effects

Alternative A

This bird tends to move around being opportunistic where insect epidemics occur. Although the project area currently provides an influx of food for this bird, loss of large spruce trees from spruce beetle epidemic over nearly 3,500 acres would reduce habitat quality (foraging and roosting trees) in the long-term. Canopy cover would also be reduced to <40 percent. As prey species (spruce beetle) decline, the density of three-toed woodpeckers would decrease (Koplin 1968). Three-toed woodpeckers would continue to inhabit the area but at much lower populations densities. Studies indicate that outside of large spruce beetle infestations, three-toed woodpeckers maintain low population levels by foraging on beetle infested fallen trees and cull logs and in areas where beetles are present at endemic levels.

Although populations of three-toed woodpeckers can fluctuate according to population levels of spruce beetle, the typical pattern is a flush of woodpeckers (increased reproduction and immigration) during beetle epidemics. If nothing were done to reduce the spruce beetle population, trees would start to die. High populations of woodpeckers would remain for 2-5 years after trees die. Since not all trees would die at the same time, woodpeckers would be sustained over the period of time it took for all spruce beetle-infested trees to die. Even when that has occurred, there would still be some trees that do not die and some that would maintain low numbers of beetles; three-toed woodpeckers could be present, just at a much reduced population level. Therefore, although the population would decline from the peak of the beetle

epidemic, the decline would not be an abrupt crash but prolonged over approximately a 10-year period.

The loss of spruce would allow for some aspen sprouting helping to sustain this tree species used for woodpecker nesting. However, young conifers would remain undamaged by spruce beetles and would quickly out-compete aspen. Large quantities of dead and down trees, as would result from a massive spruce beetle epidemic, may increase the potential for fire hazard. Since spruce beetle populations explode following fire (not low, ground fires), three-toed woodpeckers would benefit in the short-term from the increased food source. Once the food is gone, since roost and nest trees are destroyed, most woodpeckers would move out of the area.

Direct/Indirect Effects Common to Alternatives B and C

Preliminary observations have shown moderate numbers of three-toed woodpeckers were supported one year following harvest if standing trees were left at a minimal density of 12 trees per acre or 100-150 board feet (Hill 2000). Areas cut at this or higher levels contained very few three-toed woodpeckers, except along the periphery of cut areas. If standing trees were left, three-toed woodpeckers would occupy areas heavily infested with bark beetles for at least three years or until the majority of the trees are completely debarked. Territory size for three-toed woodpeckers also varies according to the density of dead or beetle-infested trees. Following harvest, territory sizes increase due to decreased food supply.

A primary objective of Alternatives B and C would be to regenerate aspen, which would have short-term impacts but long-term benefits on three-toed woodpeckers. Three-toed woodpeckers readily nest in mature aspen trees. Maintaining aspen into the future is a great concern, and these alternatives would aid in achieving this objective.

Perhaps the greatest concern regarding the reconstruction of the pipeline and its many collection points is the potential for dewatering existing streams. Alternatives B and C improve the pipeline system where the diversion of water occurs at the head of the stream as well as several places along the stream where springs usually replenished stream flow. Removing this water can have a substantial impact on the use of the stream corridor by wildlife, including three-toed woodpeckers. Not only does the water meet a basic need of the bird itself, but also the water helps to keep the ambient temperature under the canopy lower than if no water were there.

Noise disturbance from pipeline construction and maintenance, vegetation treatment, and road construction and maintenance during the breeding season (May 15-July 1) could cause disturbance. Unlike ground-based logging where noise is relatively localized to the harvest area, the noise from helicopter logging spans a greater area due to the aerial transport of logs from the harvest unit to the landing area. Alternative B would treat 1,265 acres and Alternative C would treat 1,148 acres through helicopter harvest methods. Alternative B does not delineate known three-toed woodpecker territories (83 acres) within the project area and therefore, does not provide short-term protection according to management recommendations. Alternative C has 83 acres removed from vegetation treatment due to three-toed woodpecker territory protection and does protect them in the short-term.

The primary North Creek road (FR 50079) would be improved (16 miles) and temporary roads constructed (2.3 miles), allowing for greater visitor access. By the end of the project, 8.5 miles of roads would be decommissioned, reducing total road density, vehicle access, and associated disturbance. Overall, wildlife habitat security would be reduced from the Alternative A. Although the road density within the project area would decrease from 2.3 to 2.0 miles/square mile when the project is complete, impacts from increased traffic on FR 50079 and increased recreational use in the area would reduce wildlife habitat security.

Snag and woody debris would be retained according to goshawk guidelines that should more than cover the needs of three-toed woodpeckers (Design Features-Appendix A). Intermountain Region guidelines for three-toed woodpeckers (Spahr et al. 1991) recommend leaving 42-52 snags per 100 acres in logged areas and emphasized that snags should be left in clumps rather than isolated patches. These snags should have a high percentage of bark remaining and have diameters of 12-16 inches at breast height.

Alternative B

Little change in current conditions would occur in the short-term with a total of 513 acres changed from mature to young. In the long-term, loss of large trees from silvicultural treatment and residual beetle infestations would reduce habitat quality (foraging and roosting trees) for this species. Alternative B changes 1,809 acres of mature forest into early/young age class trees. Canopy cover is reduced to between 40-69 percent. Their food source would be reduced as spruce beetle numbers are reduced. However, the timber sale should result in more trees remaining alive providing for long-term foraging and nesting opportunities. Goshawk guidelines would be met which would help this species, except for the forest structure termed “clumpiness”. This alternative evenly spaces trees and reduces canopy cover to obtain maximum protection from further insect infestations. This would be to the detriment of three-toed woodpeckers that prefer closed canopies and a continued source of dead trees for feeding.

Alternative C

Little change in current conditions would occur in the short-term. A total of 377 acres would be changed from mature to young. In the long-term, loss of large trees from silviculture treatment and residual spruce beetle infestation would reduce habitat quality (foraging and roosting trees) for this species. Mature forests would be converted to early/young trees on 1,688 acres over the long-term. The food source for three-toed woodpecker would be reduced as spruce beetle numbers are reduced. The timber sale leaves more trees of larger diameter, which would be to the benefit of this species in the short-run. Goshawk guidelines, including the “clumpiness”, would be provided for in this alternative, benefiting three-toed woodpeckers. Alternative C does not evenly space trees to obtain maximum protection from further spruce beetle infestations and provides for the immediate needs of the species. This type of treatment comes with a higher risk of tree loss in the long-term due to spruce beetle infestation (estimated to be an additional 35 percent).

Figure 35 - Three-toed Woodpecker-Direct and Indirect Effects

Three-toed woodpecker-Direct and Indirect Effects (9635 acres)	Alternative A	Alternative B	Alternative C
Acres disturbed	Short-term: 0 Long-term: 3,492	Short-term: 513 Long-term: 2,455	Short-term: 377 Long-term: 2,793
Aspen regeneration	Short & Long-term: 0	Short & Long-term: 192	Short & Long-term: 164
Impact determination	Short-term: Beneficial Long-term: May Impact Individuals	May Impact Individuals.	May Impact Individuals.

3.3.2.3 Cumulative Effects

Alternative A

In the short-term, the North Creek area provides an ample food source for three-toed woodpeckers. In the long-term, however, loss of habitat in the North Creek area would add to additional habitat loss on the Abajo Mountains from spruce beetle infestation, wild fire, conifer encroachment, and subsequent loss of aspen forests. Eighty-eight percent of the total cumulative effect analysis area (22,380 acres) contains aspen mixed with conifer trees. These areas are in danger of complete aspen loss in the next half-century. The total area impacted is substantial to forest dependent species like the three-toed woodpeckers, which often nest in aspen trees.

The loss of mature conifer trees from the spruce beetle epidemic would allow sunlight to hit the ground promoting aspen sprouting. Totaling acres of all mature spruce that would be changed to younger age classes provides the total disturbed acres that could affect three-toed woodpeckers; Alternative A total is 5,584 acres.

No change in the number, kind, or maintenance standard of roads or the pipeline within the project area would occur from this alternative. However, continued development of unauthorized roads would increase disturbance and reduce habitat over time for this species.

Alternatives B and C

Three-toed woodpecker habitat has been reduced across the Monticello Ranger District over the past 15+ years because of bark beetle infestations and associated timber sales. The conditions ultimately leading up to the unhealthy forest resulted from past timber harvest activities (1960s) when the forests were high-graded leaving only small trees. The forests soon grew up to be dense, small diameter and shrubby in nature with stressed conditions promoting bug infestations. In addition, the removal of historic fire intervals removed a natural source of disturbance that kept forests healthy. The loss of aspen from conifer encroachment is evident of this. Although only a small portion of the cumulative effects analysis area (192 acres in Alternative B and 150 acres in Alternative C) is being harvested to promote aspen regeneration, the loss of mature conifer trees elsewhere in the project area should allow sunlight to hit the ground, promoting aspen sprouting. Totaling acres of all mature spruce that would change to younger age classes gives us the greatest number of acres that may promote aspen sprouting from spruce beetle disturbance. This total is 4,542 acres in Alternative B and 5,016 acres in Alternative C.

The cumulative effect of reduced road densities outside the project area and in association with this project (as per roads analysis recommendations) would benefit this species over the entire landscape. Reducing motorized roads and trails in the Abajo Mountain area by 29 miles increases wildlife habitat security and reduces conflicts between wildlife and forest visitors.

Figure 36 - Three-toed Woodpecker-Cumulative Effects

Three-toed woodpecker-Cumulative Effects (22,380 acres)	Alternative A	Alternative B	Alternative C
Acres disturbed	5,5840	4,542	5,016
Aspen regeneration	0	192	164
Impact determination	Short-term: Beneficial Long-term: May Impact Individuals	May Impact Individuals	May Impact Individuals

3.3.3 Deer and Elk

3.3.3.1 Current Management Situation

Because deer and elk are very important to the analysis area ecologically and economically, they serve as Forest Management Indicator Species (MIS). They represent overall health of several habitat types including aspen, oak, and sagebrush/grasslands. By extension, they also represent habitat quality for other wildlife species occupying the same vegetation types.

Summer range is a limiting factor for deer and elk for the Monticello Ranger District. Forest Plan direction for deer and elk is to maintain adequate hiding cover around fawning/calving areas. Recommendations describe optimum habitat as 25 percent hiding cover, 15 percent thermal cover, 10 percent hiding or thermal cover, and 50 percent foraging area. Hiding cover is generally any vegetation used by elk and deer for security or escape from danger; therefore, hiding cover is vegetation that is between the ground and 6 feet in height. Thermal cover is vegetative structure that shields the animal from the effects of weather. For deer, this may include sapling trees, shrubs, or trees at least 5 feet tall with 75 percent crown closure. For elk, this involves trees 40 feet or more in height with 70 percent or more crown closure. Foraging areas are all areas such as natural openings, burns, or harvested areas that provide an adequate level of browse and non-woody plants for food. Forage areas may also include hiding/thermal cover but would also include openings with grass/shrub ground cover (Thomas 1979). The habitat mix in the project area is considered to be at risk because of a lack of aspen regeneration. Aspen stands require regeneration in order to fulfill long-term calving and fawning habitat needs. The loss of aspen and resulting conifer stands also reduces foraging areas, providing an unequal balance towards cover.

The current status of deer and elk populations in southeast Utah is determined through pellet counts (droppings), herd composition counts (i.e. buck:doe or doe:fawn ratios), harvest records, and winter aerial surveys.

Mule deer (*Odocoileus hemionus*) populations are below management objective levels. Factors affecting deer populations include predators (mountain lions, coyotes, bears); competition among big-game species and with livestock, roads, noxious weeds; and vegetation change (fire

exclusion, pinyon/juniper encroachment, loss of aspen). The 2002 data shows a post season fawns per 100 does ratio of 26:100.

Figure 37 - Post-hunting Season Status of the San Juan Herd (2002)*

	OBJECTIVE	CURRENT STATUS
Deer Population	20,500	9,850
Buck:Doe Ratio	40:100	20:100

**From the Utah Division of Wildlife Resources Deer Herd Management Plan.*

Drought alternating with heavy winter snows has probably played a major factor in the low deer population. Buck to doe ratios have dropped to an all time low of 7:100. Fawn production is chronically low, suggesting a population crash, which we are probably starting to realize. Deer permits for the southeastern region have been reduced by 20 percent because of these concerns. The unit has been reduced to a 5-day hunting season.

Rocky Mountain elk (*Cervus canadensis*) populations are increasing, which may increase competition with other ungulates. There are currently 22 bull elk permits issued for the San Juan limited entry bull hunt, with anticipation for more in future years.

Figure 38 - Post-hunting Season Status of the San Juan Herd (2001)*

	OBJECTIVE	CURRENT STATUS
Elk Population	1,200*	1,200**
Bull:Cow Ratio	35:100	65:100

**From the Utah Division of Wildlife Resources Elk Herd Management Plan and most recent winter counts.*
***Based on a recorded 900 individual elk during survey plus estimated 20% missed animals.*

The elk population seems to be healthy with additional antlerless permits issued to maintain the population at the objective level.

There is no deer/elk winter range identified in the project area, although use does occur, particularly during years with low snow levels. Portions of conifer/aspen and aspen stands that are near water are especially important for deer and elk fawning and calving. Road densities and road condition also play a part in the security of wildlife habitat. Increased vulnerability leads to fewer and younger bucks and bulls, and lower male to female ratios in the herds. The greater the road density and/or the higher the road standard, the less habitat security exists for wildlife. This is based on studies showing big game avoidance of roads depending on the type of road, location, and degree of use. Studies have shown (Lyon 1979) that big game will avoid areas up to .50 mile wide on each side of a road. It has been determined (Thomas 1979) that 1.0 mile of road/square mile equates to a 43 percent loss of wildlife habitat security for roads that are described as “main roads”(1.5 lanes wide, improved, good condition, main route of travel). For “secondary roads” (1.5 lanes, somewhat improved, good to fair condition, irregular use), 1.0 mile of road/square mile equates to a 26 percent loss of wildlife habitat security.

Criteria used to evaluate effects on deer and elk from the various alternatives are: (1) acres of forest canopy opened allowing increased ground vegetation. (2) acres of aspen regeneration, (3) forage to cover ratio, and road density and changes in road standards to determine percent habitat security.

3.3.3.2 Direct/Indirect Effects

Alternative A

Little change in forest structure would occur in the short-term. Long-term loss of large trees from the spruce beetle epidemic would open the forest floor and allow for shrubs, forbs, and grasses to increase on approximately 3,500 acres. This would improve forge availability while reducing cover. The ratio of forage to cover, however, would be improved since currently it is primarily cover. Deer and elk can benefit from the loss of canopy cover from beetle activity because forage production increases (Schmid and Frye 1977). However, such a benefit is important only in areas, and at times, when forage is limiting. Keeping in mind the preferred forage to cover ratio of 50%:50%, and the current condition ratio of 42:58, calculations show that given the predicted number of spruce beetle killed trees, the long-term result of Alternative A would be a forage to cover ratio of 45%:55%. Large quantities of dead and down trees are expected from a massive beetle epidemic that would increase the potential for fire hazard. An extensive fire would result in improved forage approximately one year following the fire (depending on moisture and fire intensity).

The existing pipeline is old and rusted, leaking in several locations. These areas provide water and in some cases, support small wetlands that can be important to deer, elk, and other wildlife. Maintenance of the existing pipeline would continue under Alternative A, improving the efficiency of the system, ultimately drying up some small seeps. Given existing road densities and standards, there is currently a 61 percent loss in wildlife habitat security within the project area.

Direct/Indirect Effects Common to Alternatives B and C

Pipeline construction would open a pathway through the forest for its alignment. Since trees would remain cleared from this corridor, forage species would replace cover.

Improvement of the main North Creek road (FR 50079) and construction of temporary roads could increase visitor use, extend the season of use, and increase travel speed. The North Creek road, however, is planned for seasonal closure, and closed signs would be posted on temporary roads. These practices would reduce some of these potential impacts. Road densities would increase during the life of the project with the construction of temporary roads during the vegetation treatment. This would be short-term; road closures at project completion would reduce road densities. When calculating wildlife habitat security, impacts from improving FR 50079 outweigh benefits from reduced road densities. Given road densities and standards, there would be a 72 percent loss in wildlife habitat security during project implementation and a 65 percent loss following project completion.

Perhaps the greatest concern regarding the reconstruction of the pipeline and its many collection points is the potential for dewatering existing streams. These alternatives improve the pipeline system where the diversion of water occurs at the head of the stream as well as several places along the stream where springs usually replenished stream flow. Removing this water can have a substantial impact on the use of the stream corridor by wildlife, including deer and elk. Not only does the water meet a basic need of the animal itself, but also the water helps to keep the ambient temperature under the canopy lower than if no water were there.

Noise disturbance during project implementation could disrupt animal movements and disturb calving/fawning (May 15-July 5). Activities would be suspended during calving/fawning times unless authorized (Design Features-Appendix A). An area may be surveyed before fawning/calving and if no animals are located, the District Ranger can authorize operations to proceed. This may however, affect animals that would otherwise move into the area. Unlike ground-based logging where noise is relatively localized to the harvest area, the noise from helicopter logging spans a greater area due to the aerial transport of logs from the harvest unit to the landing area. Alternative B would treat 1,265 acres and Alternative C would treat 1,148 through helicopter harvest methods.

Alternative B

Loss of large trees from silvicultural treatment and residual beetle epidemic on 1,663 acres would open the forest floor and allow for shrubs, forbs, and grass to encroach. This would improve forge availability while reducing high-level canopy cover. The ratio of forage to cover, however, would be improved since there is currently only thermal cover. Keeping in mind the preferred forage to cover ratio of 50%:50%, calculations show that given the predicted beetle kill of trees, the long-term result of Alternative B would be a forage to cover ratio of 47%:53%.

Aspen regeneration treatments on 354 acres would reduce the current quality of the area for deer and elk by disturbing cover and ground forage temporarily, but would help to assure future habitat is maintained for these animals. The aspen vegetation community provides calving/fawning habitat, forage, and cooling cover (shade) during summer months.

Alternative C

Loss of large trees from silvicultural treatment and residual beetle epidemic on 2,146 acres would open the forest floor and allow for shrubs, forbs, and grass to encroach. This would improve forge availability while reducing high-level canopy cover. The ratio of forage to cover, however, would be improved since it is primarily only canopy cover now. Keeping in mind the preferred forage to cover ratio of 50%:50%, calculations show that given the predicted beetle kill of trees, the long-term result of Alternative C would be a forage to cover ratio of 49%:51%. This alternative results in a “clumpy” forest structure that better meets cover needs. Because patches of trees are left close together, canopy cover is maintained in forest pockets but only in the short-term, as residual beetle activity would likely target these areas eventually killing the trees.

Aspen regeneration treatments on 241 acres would reduce the current quality of the area for deer and elk by disturbing cover and ground forage temporarily, but would help to assure future habitat is maintained for these animals. This vegetation community provides calving/fawning habitat, forage, and cooling cover (shade) during summer months.

Figure 39 - Deer and Elk-Direct/Indirect Effects

Deer and Elk Indicators (9,635 acres-habitat & 31.9 square miles [project area])	Alternative A	Alternative B	Alternative C
Forest canopy opened to allow increased ground vegetation (acres) *Same as acres disturbed in other analyses	Short-term: 0 Long-term: 3,492	Short-term: 513 Long-term: 2,455	Short-term: 377 Long-term: 2,793
Aspen regeneration (acres)	Short & Long-term: 0	Short & Long-term: 192	Short & Long-term: 164
Forage habitat assessment (Seeking Forage:Cover Ratio of 50%:50%)	Currently- 42:58% Long-term: 45%:55%	Long-Term: 47%:53%	Long-term: 49%:51%
Road Density (miles per square mile)	Short & Long-term: 2.3	Short-term: 2.4 Long-term: 2.1	Short-term: 2.4 Long-term: 2.1
Changes in road standard (miles)	0	16 miles road improved	16 miles road improved
Vulnerability assessment (as related to road density)	Less Vulnerable 61.2 % loss of habitat effectiveness	More Vulnerable Short-term: 72% loss of habitat effectiveness Long-term: 65.0% loss of habitat effectiveness	More Vulnerable Short-term: 72% loss of habitat effectiveness Long-term: 65.0% loss of habitat effectiveness

3.3.3.3 Cumulative Effects

As beetle epidemics and associated timber harvests continue, there would continue to be a major shift in vegetation from late to early successional species, increasing forage and reducing cover for these animals.

Alternative A

Calculating the change in acres from mature forest to younger age classes shows there is potentially 5,159 acres that could result in open canopies and increased ground cover. Since elk/deer use the mountain mostly as summer range, cover for hiding and shade are more important than thermal cover, and forage is more important than an over-abundance of cover. Within the cumulative effects analysis area, this alternative would result in a forage to cover ratio of 46%:54%.

The loss of mature conifer trees from the spruce beetle epidemic would allow sunlight to hit the ground and promote aspen sprouting. Totaling acres of all mature or large/mature spruce where aspen trees are still present within the cumulative effects analysis area would give us the greatest number of acres that may promote aspen sprouting from spruce beetle disturbance; Alternative A total is 1,513 acres.

High tree mortality and/or harvest results in habitat fragmentation and/or disruption of migration corridors may occur on a localized basis for those animals dependent on continuous dense mature forests. Since the watershed area provides a large continuous expanse of dense mature forest, however, opening the canopy in areas may also add habitat diversity, which would benefit many species, while still providing for the safe travel corridors.

The current motorized road and trail density within the cumulative effects analysis area is 2.3 miles of road per square mile. This equates to an approximate 58 percent loss in wildlife habitat security.

Alternative B

As beetle epidemics and associated timber harvests continue, there would continue to be a major shift in vegetation from late to early successional species, increasing forage, and reducing cover for these animals. Calculating the change in acres from mature forest to younger age classes, shows there is potentially 4,542 acres that could result in open canopies and increased ground cover. Reduced cover increases visibility between animal and forest visitor, elevating disturbance or vulnerability to hunting. Although the elk herd has reached the herd objective for the Abajo Mountains, deer herds are substantially below desired numbers. Impacts to the deer herd include drought, increased hunter access, predators, possible competition with other big game animals, and mortality from vehicle collisions. Deer herd numbers are low enough at this point that any single factor affecting their survival can be important. Over the cumulative effects analysis area, this Alternative B would result in a forage to cover ratio of 47%:53%.

Although only a small portion of the cumulative effects analysis area (354 acres) is being harvested to regenerate aspen, the loss of mature conifer trees elsewhere in the project area would allow sunlight to hit the ground promoting aspen sprouting. Totaling acres of all mature or large/mature spruce where aspen trees are still present within the cumulative effects analysis area would give us the greatest number of acres that may promote aspen sprouting from spruce beetle disturbance. Alternative B total is 2,193 acres.

The current motorized road and trail density within the cumulative effects analysis area is 2.3 miles of road per square mile. Recommendations from the ongoing roads analysis would reduce that number to 1.6 miles of road per square mile. This equates to an approximate 42 percent loss in wildlife habitat security. This would increase wildlife habitat security over the 46 square mile cumulative effects analysis area.

Alternative C

Cumulative effects are basically the same as Alternative B. However, given the level of spruce beetle epidemic within the cumulative effects analysis area and after implementation of the vegetation treatment proposed in this alternative, 21 percent of the area (4,884 acres) would be converted from mature to early, young, and mid-age trees. This would reduce the canopy cover from >75 percent to between 40-69 percent in harvest areas and less than 40 percent where beetles continue to flourish. Forage would increase in areas where forest canopy is opened up and sunlight reaches the floor. Over the cumulative effects analysis area, Alternative C would result in a forage to cover ratio of 49%:51%.

Although only a small portion of the cumulative effects analysis area (241 acres) is being harvested to regenerate aspen, the loss of mature conifer trees elsewhere in the project area would allow sunlight to hit the ground promoting aspen sprouting. Totaling acres of all mature or large/mature spruce where aspen trees are still present within the cumulative effects analysis area will give us the greatest number of acres that may promote aspen sprouting from spruce beetle disturbance. Alternative C total is 3,369 acres.

Figure 40 - Deer and Elk Cumulative Effects

Deer and Elk- Indicators	Alternative A	Alternative B	Alternative C
Forest canopy opened to allow increased ground vegetation (acres)	5,159	4,542	4,884
Aspen regeneration (acres)	0	192	164
Forage habitat assessment (seeking 50%:50%)	Forage:cover ratio-46%:54%	Forage:cover ratio-47%:53%	Forage:cover ratio-49%:51%
Road Density (miles per square mile)	2.4	2.1	2.1
Changes in road standard (miles)	0	16 miles road improved	16 miles road improved
Vulnerability assessment (as related to road density)	58% loss of habitat effectiveness	More Vulnerable 42% loss of habitat effectiveness-	More Vulnerable 42% loss of habitat effectiveness

3.3.4 Relationship Between Short-Term Use and Long-Term Productivity

The relationship between short-term use and long-term productivity from all alternatives is described in the Direct/Indirect Effects section for goshawks, three-toed woodpeckers, and deer/elk.

3.3.5 Irreversible/Irretrievable Commitment of Resources

No irreversible commitment of resources would occur from implementation of any alternative. The loss or modification of habitat for certain wildlife species is an irretrievable commitment of resources. As vegetation recovers, this habitat would recover. Irretrievable commitments would occur when the annual productivity of the species involved is reduced. The time it takes to recover may vary according to the treatment, the vegetation type, and the species involved, but eventually it is expected to recover.

3.3.6 Forest Plan Consistency

3.3.6.1 Goshawks

The direction direction provided by the Forest Plan would keep goshawks from becoming Federally listed and maintain and/or improve habitat and habitat diversity for minimum viable populations (Wildlife and Fish Resource management 04, 05, Amendment to the Forest Plan dated April 14, 2000). Alternatives B and C have been analyzed relative to the standards and guidelines in the Forest Plan Amendment (project file).

Alternatives A, B, and C water system improvements would not comply with Management Activity (C01)04, Standard X of the Conservation Strategy and Agreement for the Management of Northern Goshawk (page CC-63) and would require a site-specific, non-significant amendment to the Forest Plan. The greatest threat to goshawk habitat in both the short and long-term would result from dewatering streams in the Gold Queen/Dickson Gulch and Bankhead areas. Water troughs, guzzlers, overflow valves, and line meters to monitor collection volumes would be used to mitigate dewatering in reconstruction of the City of Monticello's water collection and conveyance system as described in Alternatives B and C, although these design

features may not be sufficient to ensure an offset of the loss. Under Alternative A, existing water troughs are used to mitigate dewatering during maintenance of the City of Monticello's water collection and conveyance system, although these design features are not sufficient to ensure an offset of the loss.

Alternative A

Alternative A would not comply with Forest-wide direction to manage habitat for goshawks. Allowing the spruce beetle epidemic to go unmanaged would likely not lead to the Federal listing of goshawks. This alternative may impact individuals or habitat, but would not likely contribute to a loss of population viability of sensitive wildlife species.

Alternative B

Alternative B vegetation treatments would comply with Forest-wide standards to manage goshawk habitat. It would not comply with the guideline specifying "clumpy" forest structure. Additionally, goshawks would be protected by following the Conservation Strategy and Agreement for the Management of Northern Goshawk, except for the forest structure providing for clumps of trees with interlocking crowns. Despite the deviation from Forest Plan and Conservation Strategy direction, this alternative may impact individuals or habitat, but would not likely contribute to a loss of population viability of sensitive wildlife species.

Alternative C

Alternative C vegetation treatments would comply with Forest-wide direction to manage habitat of goshawks. A "clumpy" forest structure would be maintained in the short-term, however, the guideline may not be met in the long-term due to increased tree mortality in the dense clumps. Additionally following the Conservation Strategy and Agreement for the Management of Northern Goshawk would protect this sensitive species. This alternative may impact individuals or habitat, but would not likely contribute to a loss of population viability of sensitive wildlife species.

Figure 41 - Acres Meeting Goshawk Standards and Guidelines

Time Period	Alternative A Acres	**Alternative B Acres**	**Alternative C Acres**
Short-term	9,634	9,121	9,634
Long-term	6,142	7,179	6,841
Cumulative	16,796	17,838	17,364

3.3.6.2 Three-toed Woodpeckers

No specific guidelines for this species are included in the Forest Plan. The direction provided by the Forest Plan through goshawk guidelines would keep three-toed woodpeckers from becoming Federally listed, and maintain and/or improve habitat and habitat diversity for minimum viable populations (Wildlife and Fish Resource management 04, 05, Amendment to the Forest Plan dated April 14, 2002).

Alternative A

Alternative A would comply with Forest-wide direction to manage habitat for sensitive species. This alternative may impact individuals or habitat, but would not likely contribute to a loss of population viability of sensitive wildlife species.

Alternative B

Alternative B does not delineate known three-toed woodpecker territories and place buffers around them for protection, like Alternative C. Otherwise, this alternative would comply with Forest-wide direction to manage habitat of sensitive species, in general. This alternative may impact individuals or habitat, but would not likely contribute to a loss of population viability of sensitive wildlife species.

Alternative C

Alternative C does delineate known three-toed woodpecker territories and places a buffer around them for protection. This alternative would comply with Forest-wide direction to manage habitat of sensitive species, in general with the added protection of territory buffers. This alternative may impact individuals or habitat, but would not likely contribute to a loss of population viability of sensitive wildlife species.

Figure 42 - Acres Disturbed (Mature→Younger)

Time Period	Alternative A Acres	Alternative B Acres.	Alternative C Acres
Short-term	0	513	377
Long-term	3,492	2,455	2,793
Cumulative	5,584	4,542	5,016

3.3.6.4 Deer and Elk

All alternatives would comply with Forest-wide direction to provide habitat needs, as appropriate, for management indicator species; manage down timber to provide habitat for wildlife; maintain or improve habitat capability; and use commercial and non-commercial practices to accomplish wildlife habitat objectives (Wildlife and Fish Resource Management 01, 07; Wildlife Habitat Improvement and Maintenance 01, 04). Several project requirements demonstrate consistency: maintaining adequate cover in calving areas; promoting aspen clones where they exist in treated areas; precluding harvest during calving and fawning periods; restricting harvest activities during the hunting season; closing temporary project roads to the public; maintaining appropriate forage to cover ratios; and meeting specified log, slash, and woody debris requirements.

3.4 TRANSPORTATION SYSTEM

This section describes the current condition and effects of alternative implementation as related to the key Transportation System issue.

Issue: Implementation of the proposed or no action alternatives may impact public access and safety.

Indicators:

- *Miles of road reconstructed/maintained*
- *Miles of motorized trail*
- *Forest Road standard achieved*
- *Safety analysis (high, moderate, or low rating)*

3.4.1 Public Access and Safety

3.4.1.1 Current Management Situation

The Monticello and Blanding Watershed Improvement Project area contains about 41 miles of classified Forest Roads (FR) and Forest Highway (FH), 17.2 miles of unclassified routes, 13.3 miles of motorized classified trails, and 1.9 miles of non-motorized classified trails within the 30.2 square mile project area. The classified transportation system consists of both collector and local roads. Two collectors are within the project area, Forest Highway 49 (FH 49) and Forest Road 50079 (FR 50079). San Juan County has jurisdiction of FH 49, which is 17.6 miles in length (5.1 miles are within the project boundary). FH 49 provides the primary access from the City of Monticello to National Forest System lands. FR 50079 is a collector 17.8 miles in length (about 10 miles are within the project area). FR 50079 provides the principal access through the project area and connects FH 49 on the north and FR 50095 on the south. In addition to the collectors, there are approximately 26 miles of local roads within the project boundary.

In addition to the FH 49, there are currently 2.1 miles of roads maintained for travel by a prudent driver in a passenger car (operational maintenance level 3 [ML3]), 32.0 miles of roads maintained for high clearance vehicles (ML2), and 1.8 miles of road closed to vehicular traffic and receiving basic custodial maintenance (ML1). Of the 35.9 miles of classified Forest Roads, 2.1 miles are gravel surfaced. Figure 43 compares existing condition and alternatives.

Figure 43 - Existing and Projected Transportation System- Project Area

Transportation System	Alternative A	Alternatives B and C
Total Forest Roads (miles)	35.9	37.5
Total Forest Highway (paved) (miles)	5.1	5.1
Unclassified Roads	17.2	17.2
Open Forest Roads (miles)	39.2	39.7
Motorized Trails (miles)	13.3	11.8
Non-Motorized Trails (miles)	1.9	2.6
Total Motorized (open FR + FH + unclassified + motorized trail) (miles)	69.7	59.4
Roads Reconstructed (miles)	0	16.3
Forest Roads Decommissioned (miles)	0	0.4
Unclassified Roads Decommissioned	0	7.6
Classified as Forest Road (miles)	0	0.9
Temporary Road Construction (miles)	0	2.3
Pre-haul Maintenance (miles)	0	1.7
Safety Analysis (low, moderate, high)	Moderate	Moderate
Design Standard* (FR 50079)	ML 2/TSL D	ML 3/TSL C

*ML: Operational Maintenance Level / TSL: Traffic Service Level

Road Density

Total road density (includes all classified Forest roads, classified motorized trails, and unclassified routes) is 2.4 miles per square mile. Open road density (excludes Level 1 closed roads) is 2.3 miles per square mile.

Existing Aggregate Sources and Use Status

An aggregate source exists east of FR 50079 directly across from the Jackson Ridge Road. This rock is diorite porphyry and is comprised of very few fines. There is also an aggregate source located approximately 2.0 miles north of Monticello Lake, currently under permit to San Juan County. An additional site for binder rock (if needed) has been identified near Dry Wash Reservoir, on the west side of the intersections with FR 50079 and FR 50095.

Traffic Uses and Access

The classified transportation system provides access to various Forest Management Units, including municipal water supply, range, water protection and improvement, and wood fiber production and utilization. Common uses include access to permitted water improvements and grazing allotments.

Recreational use includes hiking, hunting, camping at designated campsites, and sightseeing. Dalton Springs and Buckboard Campgrounds are located in the project area.

Average daily traffic (ADT) is estimated at less than 15 on FR 50079 and less than 8 on local Forest Roads within the project area, except campground access roads.

FR 50079 provides access between FH 49 and FR 50095. San Juan County maintains FR 50079 and FR 50095 under the terms of a Forest Road Agreement. FR 50079 is currently maintained for high clearance vehicles (ML2) with a Traffic Service Level of D, where flow is slow or may be blocked by an activity. The road surface is rough and irregular; travel with low clearance vehicles is difficult.

Visitor Safety

The majority of roads within the project area are maintained for high clearance vehicles (Traffic Service Level D). Traffic is light and speeds are low along such roads. Traffic volumes are associated with a single purpose, and roads are not designed for mixed vehicle types. There is currently a moderate level of safety on roads within the project area. The need for protection is minimized by the low speeds and strict traffic controls.

3.4.1.2 Direct/Indirect Effects

Alternative A

Traffic Uses and Access

Road reconstruction would not occur under Alternative A. Access would remain as currently described. However, Forest roads within the project area would continue to receive maintenance consistent with the operational maintenance level and functional class. FR 50079 would continue to accommodate high clearance vehicles. Flows would remain slow or possibly blocked by an activity. The road surface would remain rough and irregular, and travel with low clearance vehicles would remain difficult.

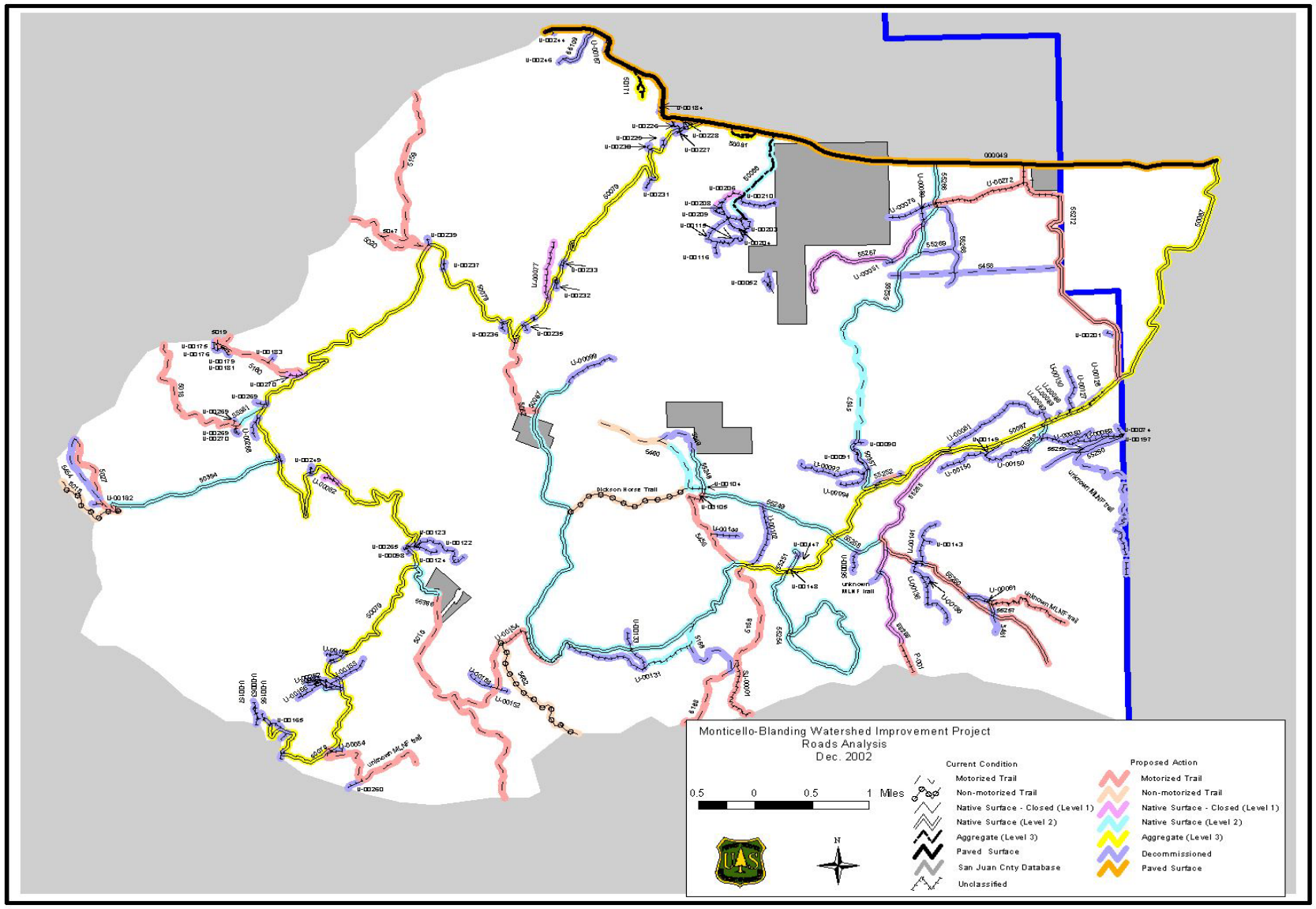
Visitor Safety

It is anticipated that recreation use would continue to increase within the project area. Without road improvements, increased traffic volumes would be limited to high clearance vehicles and all-terrain vehicles. The current design standards can accommodate ATV use, though user conflicts may be the result of interactions between disproportionate vehicle types. For the most part, the level of safety on roads within the project area would remain unchanged.

Alternatives B and C

Both action alternatives involve reconstruction of approximately 16 miles of classified roads. Improvements on the Indian Creek Road (FR 50079) would accommodate log truck travel for vegetation treatments, along with truck traffic related to construction and water system improvements. Reconstruction of FR 50079 would occur from milepost 2 (at the southern end) to milepost 17.7 (intersection with FH 49). The Traffic Service Level would be increased from D to C and the operational maintenance level from 2 to 3, which would accommodate passenger and commercial vehicles. Improvements would include removal of hazard trees and clearing along the road corridor, turnout construction, culvert replacement, realignment of curves/switchbacks, roadbed widening, and gravel surfacing. Curves would be realigned to a 40-foot minimum radius to accommodate truck traffic along the existing road for permitted uses and to accommodate hauling of up to 32 foot logs for vegetation treatments. The finished road surface would be 14 feet wide, plus necessary curve widening, with vegetation clearing (trees and brush) of at least an additional four feet either side of the road surface. Road improvements would be completed within the first five years.

Map 23 - Roads Analysis Current and Proposed Transportation System



Improvements to classified Forest Roads 50354 and 55381 are needed for access to vegetation treatments. Pre-haul maintenance is needed on approximately 1.7 miles of FR 50354. Spot reconstruction along FR 50354 (approximately 0.3 miles) would include realignment of the approach at the intersection with FR 50079 and additional spot restoration needed to accommodate cable machinery and swing yarders. Upon completion of the sale, some of the landings would be converted to turnouts. FR 55381 is needed to access vegetative treatment Unit 25a. Minor restoration and pre-haul maintenance on FR 55381 would be required to accommodate log trucks.

A short portion of classified motorized trail #160 (0.1 mile) would be converted to a road and reconstructed to accommodate passenger cars (maintenance level 3). Trailhead parking would be constructed at its northern termini after completion of the timber sale.

As mitigation for the increased use, which is anticipated to result from road improvements on FR 50079 and FR 50354, unneeded routes have been identified for decommissioning. Alternatives B and C would decommission both unclassified and classified routes (Map 7). FR 55109 (0.4 miles) would be decommissioned after the timber sale. The unclassified routes were identified from field inventories and from aerial photos. Of the 17.2 miles of unclassified routes within the project boundary, 7.6 miles along FR 50079 and the water system have been identified for decommissioning (Monticello-Blanding Watershed Improvement Project Roads Analysis, project file).

Both action alternatives would add 0.9 miles of unclassified routes as Forest roads with restricted access (ML 1) and 0.6 miles of unclassified routes as private road to be maintained by the water system permittees under special use permit. Access along these routes would be authorized for permitted water improvements and maintenance only. One of these routes (U-00206, 0.3 miles) provides access to the existing Monticello municipal water system pipeline. As part of the timber sale, this route would be realigned to share a common approach (approximately 0.1 mile) with the temporary road constructed to access vegetative treatment Unit 3. The existing alignment of the approach of this route (0.1 mile) would be decommissioned. The unclassified road (U-00270, 0.1 mile) provides access to the north end of the Blanding Municipal tunnel. The unclassified road (U-00062, 0.2 mile) provides access to the south end of the Blanding Municipal tunnel. These unclassified routes are currently passable by high clearance vehicles; basic custodial maintenance may be required. The remaining 7.9 miles of unclassified roads would remain in status quo until addressed in future environmental documents.

Both action alternatives would involve constructing 1.3 miles of temporary roads and reconstructing approximately 1 mile of various existing, unclassified routes as temporary access roads. With the completion of the timber sale, these temporary roads would be decommissioned and restored to resource production, as they are not needed for long-term resource management. Approximately 0.1 mile of the temporary road needed to access vegetative treatment Unit 3 would remain on the classified road system (ML1) to provide access to the Monticello municipal water system pipeline.

An aggregate source exists east of FR 50079 directly across from the Jackson Ridge Road. Spruce surrounding this site would be protected from damage and provide a visual buffer for

travelers in the vicinity. Crushing equipment would be located at this site and provide minimized gravel haul distances for improvements along FR 50079 and on other classified Forest Roads receiving pre-haul maintenance and spot reconstruction, as needed. On completion of road reconstruction, rock sources would be reclaimed as per the operating plan, FSM 2853.22 (Appendix A, Design Features).

Road Density

Because of road decommissioning, road density (includes classified Forest Roads, classified motorized trails, and unclassified routes) would decrease slightly. Total road density would be 2.1 miles per square mile. Open road density (excludes Level 1 closed roads) is 2.0 miles per square mile.

Acres of Disturbance

Disturbance would result from reconstruction activities such as widening curves, widening road sub-grades to accommodate aggregate surfacing, constructing additional turnouts, and widening road widths to accommodate cable machinery. Approximately 9.5 acres of disturbance would result from road reconstruction and improvement along FR 50079. Approximately 2.8 acres of disturbance would result from removal of rock at aggregate source sites. Potentially an additional 0.6 acres of disturbance would result if binder is needed from the source near Dry Wash Reservoir.

Traffic Uses and Access

Because unclassified routes would be added to the classified transportation system as closed roads (maintenance level 1) and all newly constructed temporary roads would be restricted to permitted use only and decommissioned following completion of the timber sale, no additional access would be provided to the general public. However, increased recreational use is expected along FR 50079, because of road improvements and ease of travel.

Road restrictions, including restriction of public use would be implemented on Forest Roads that access vegetation treatment units, pipeline construction, or roads being reconstructed or improved. The Forest Supervisor has authority to restrict access on specified days and at specified times, as describe per 36 CFR 212. It is anticipated that public use restrictions along FR 50079 would occur during the normal operating season (July – October), weekdays from 7:00 a.m. to 5:00 p.m. (Appendix A, D-5, Recreation). There may also be additional restrictions on FRs 55109, 55381, 50354, and 50086.

Visitor Safety

Road improvements consisting of graveled surfaces, flattened curves, additional turnouts, and increased clearing for sighting distances would not only generate more traffic, but would allow a greater mix of vehicle types. The flows may be interrupted by limited passing facilities, or slowed by the road condition. The increase in traffic volume, mixed vehicle types, and increased speed, are offset by road improvements; it is anticipated that safety levels would remain moderate. With increased driver expectations, additional signing would be needed to ensure driver safety.

Current uses of the transportation system for recreational activities such as hunting, camping, fuel wood collection, and site-seeing along with access for grazing permittees, would be augmented by the additional commercial traffic, including timber hauling and construction traffic related to road improvements and the Monticello water system upgrade. Increased traffic volumes in and around the project area could potentially lead to traffic accidents. Warning signs would be installed on National Forest System roads entering the project area for reconstruction projects and timber haul, as well as at locations where logging activities would occur along roads open for public use. If necessary, traffic controllers (flaggers) would be used. Short-term impacts during project implementation may require road restrictions, additional signing, and travel management measures, which may impede travel.

3.4.1.3 Cumulative Effects

Alternative A

Roads Analysis

The Monticello-Blanding Watershed Improvement Project Roads Analysis recommends additional access changes. The project boundary for the roads analysis assessment extends beyond the project area boundary (Map 1). The roads analysis boundary comprises 46 square miles of National Forest System lands. Implementation of roads analysis recommendations would affect travel opportunities within the project area. Figure 44 displays road analysis recommendations. Implementation of Alternative A would delay proposed changes in the existing road and trail system until additional NEPA analysis could be completed for all roads analysis proposals. Proposed changes in FR 50079 may not occur in the short or long-term.

Figure 44 - Roads Analysis Recommendations

Transportation System	Alternatives B and C
Total Forest Roads (miles)	48.9
Total Forest Highway (paved) (miles)	6.5
Unclassified Roads	0.0
Open Forest Roads (miles)	50.3
Motorized Trails (miles)	23.5
Non-Motorized Trails (miles)	3.9
Total Motorized (open FR + FH + unclassified + motorized trail) (miles)	73.8
Decommissioned (classified & unclassified) (miles)	29.0
Total Road Density (miles per square mile)	1.7
Open Road Density (motorized) (miles per square mile)	1.6

*ML: Operational Maintenance Level / TSL: Traffic Service Level

Blanding Tunnel

Future work by the City of Blanding on the Blanding Tunnel through Jackson Ridge is expected to occur. Additional traffic may result from maintenance and restoration activities on FR 50079.

Alternatives B and C

Roads Analysis

Cumulative effects would be the same as for Alternative A except that road and trail changes identified for Alternatives B and C (including those for FR 50079) would be implemented immediately.

3.4.2 Relationship Between Short-Term Use and Long-Term Productivity

Alternative A

No differences are anticipated between short-term use and long-term productivity under the No-Action Alternative.

Alternatives B and C

In the short-term, traffic flow would be interrupted by limited passing facilities, slowed by the road condition and volume of traffic, or temporarily halted for construction activities. This holds true for the long-term as well; however, the effects are reduced due to a reduction in timber and construction related vehicles traveling the roads. The transportation system would have a short-term increase in road density, due to the construction of temporary roads. The long-term effect would be decreased road densities resulting from the decommissioning of unneeded roads. Long-term travel delays would decrease due to road improvement and maintenance.

3.4.3 Irreversible/Irretrievable Commitment of Resources

Alternative A

No irreversible/irretrievable commitment of resources is anticipated.

Alternatives B and C

Road reconstruction and road widening would take approximately 9.5 acres of land out of resource production. Removal of gravel at the specified sources takes approximately 2.8 acres of land out of production and is an irretrievable commitment. Removal of the gravel is also an irreversible commitment.

3.4.4 Forest Plan Consistency

Alternative A

Because no improvement would occur on FR 50079, the desired future condition for collector roads would not be met (Forest Plan, III-41).

Alternatives B and C

Alternatives B and C would be consistent with Forest Plan direction. Both action alternatives would comply with Forest-wide direction to decommission newly constructed temporary roads after project use; allow permitted use of Forest Roads under specific requirements; close or restrict use on Forest Roads when unacceptable damage is occurring; reconstruct collector roads to meet multiple uses; reconstruct local roads specific to project uses; construct temporary roads for specific timber sale use; and maintain Forest Roads consistent with the operational maintenance level.

3.5 VISUAL LANDSCAPE

This section describes the current condition and the effects of alternative implementation as related to the key issue of Visual Landscape (USDA Forest Service, 2002. Hanchett, Brent).

Issue - Proposed timber harvest treatments and associated temporary roads, landings, and skid trails, water system construction corridors, insects, or fire may impact the visual character of the area and the Horsehead.

Indicators:

- *Visual Quality Objective (VQO) changes (acres affected)*
- *Scenery Management changes (acres affected)*
- *Horsehead Appearance – Will this feature retain a distinctive appearance/shape (yes/no)?*

3.5.1 Visual Character

3.5.1.1 Current Management Situation

The Abajo Mountains, located within the project area provide the scenic backdrop for Monticello and the surrounding area. They include most of the major peaks and mountains of the area, including Horsehead Peak, North Peak, Twin Peaks, Jackson Ridge, Abajo Peak, and South Peak. Formed by a geologic upheaval, they range between 10,000 and 11,000 feet in elevation and appear to rise out of the valley floor. Just five miles to the east, Monticello is 7,000 feet in elevation.

The Blue Mountain Ski Area, five miles west of Monticello, was developed several years ago, and is not currently in operation. The lineal clearings for the ski lift and ski runs are visible from US Highway 191, north of Monticello. Without maintenance for many years, the clearings are beginning to re-establish young tree growth. They are, however, still visible during winter months when snow conditions show a definite edge contrast. This condition is expected to persist for the next several years, until the young trees mature.

Past watershed treatments called “contouring,” were performed on some of the steep slopes within the project area during the 1950s and 1960s. The work was intended to reduce soil erosion and retain moisture on the mountain later into the summer season. Although vegetation has covered the cut and fill banks, these horizontal dozer lines on the hillsides stand out visually and do not conform to the natural lines and formations of the landscape.

Timber sales have occurred in the past within the project area. These old sales have healed over with new growth; old stumps remain.

Figure 45 - Horsehead Peak

The Horsehead is a prominent natural vegetative feature in the image of a horse's head. Comprised of a spruce and aspen stand, it can be seen from Monticello and surrounding areas. Located on Horsehead Peak, it is of regional significance and has a great scenic importance to the people of Monticello and adjacent communities.

The Monticello water system is an extensive network of water pipelines and collection boxes within the area. Most of these features were originally installed underground and vegetation has grown back. There are presently no major visual concerns.

The road system is described in the Transportation System Section 3.4. The visual aspects include FH 49, which is a paved highway extending west of Monticello and connecting with FR 50079. The straight-line effect from layout and construction is readily visible from Monticello and points along US Highway 191. It would rate as meeting the Modification Visual Quality Objective (VQO).

Other roads, including FR 50079 and FR 50354, are windy and graded and have existed for many decades. They are used by the recreating public for viewing of scenery and to gain access to other favorite recreational opportunities. The cuts and fills have established vegetation. Although the ribbons of roadway surface are visible from some points along the roadways, they meet Partial Retention VQOs. Several lower standard roads that take off from the main collectors are not readily visible.

Landscape Character

The characteristic landscape consists of two basic land type associations: The Abajo Mountains and the Abajo Mountain Slopes (which surround the Abajo Mountains).

The Abajo peaks reach over 11,000 feet in elevation and rise over 4,000 feet from surrounding communities. There are long barren grassy ridgelines and steep side slopes, which form narrow deep canyons. Vegetation consists of large patches of spruce and fir in the upper elevations, mainly on the north facing aspects. Large aspen patches are generally situated in the lower canyons and draws with a mixture of spruce and fir on the mid to upper slopes.

The slopes surrounding the Abajo Mountains are a mixture of ponderosa pine, oak, brush, pinyon, juniper, and sage, which add to the visual diversity of the area. The entire project area is 20,400 acres, of which 11,086 acres, or 54 percent is forested. The remaining area is non-forested and consists of grasses, forbs, and brush.

Form consists of the huge mountainous peaks with the long sloping ridgelines and blocky outlines of spruce-fir stands on the hillsides. Line is reflected in the diagonal sloping ridges, cultural effects of horizontal terracing on some slopes, and in the vertical lines of the snow

chutes found on some ridges. Color is reflected in the contrast between the lighter barren grassy slopes and the dark green timbered stands of spruce-fir. Texture is found in the fineness of the grassy slopes and in the coarseness of the spruce-fir foliage.

Under the Scenery Management System (SMS, Forest Service, Agriculture Handbook No. 701, December 1995, page 1-2), the existing landscape character is summarized as "Natural Appearing" with some areas as "Cultural", which include terraced areas; Dalton Springs and Buckboard Campgrounds; Blue Mountain Ski area; FH 49; and FRs 50079, 50354, and 50087. For the purpose of this analysis, an area of 10 acres of "Cultural" landscape character has been assigned to surround the campgrounds and ski area, and an area of 1/16 mile has been assigned to adjoin each side of the particular roadways.

Scenic Attractiveness

The scenic attractiveness for the Abajo Mountains is rated as Distinctive due to the boldness of the mountains rising out of the valley floor, high mountain peaks, long ridgelines, and the bold aspen and coniferous vegetative patterns.

The rating for the Abajo Mountain Slopes is Common or Typical, because of the gentle slopes.

Existing Scenic Integrity

The scenic integrity is fairly intact in the area, with some apparent manmade features, which include terracing of the 1950s on some bare mountain slopes, ski trails, trails, Forest development roads, low standard roads, community water developments, and power lines. Although these features exist in the area, they do not dominate the landscape view and remain as minor features. The visitor's eye is drawn beyond to the natural scenic beauty of the area.

The area, consisting of the slopes around South Creek, Pole Creek, Bankhead Creek, and within the foreground of the North Creek Road would have an existing Scenic Integrity Level Rating of Moderate (Slightly Altered).

Landscape Visibility

The proposed water system and roadway improvements in the North Creek drainage are within the foreground view zone of FR 50079. The proposed water system improvements near South Fork Creek, Pole Creek, and Bankhead Creek are within the foreground and middleground view zone of FR 50087 and FH 49. The developments are also within the middleground and background views of Monticello and surrounding area.

Vegetative treatment areas within the project area are viewed from Monticello, FH 49, FR 50087, FR 50174, FR 50079, FR 50354, and other small spur roads also designated as Forest development roads.

The Sensitivity Level (concern for scenic quality) on FH 49, FR 50087, FR 50174, and FR 50079 is rated as (1) High in the Forest Plan. Other travel routes within the project area are not rated.

Concern Levels
Concern Level ratings (from a scale of 1 through 3) for the project area are Class 1 (high) for the Abajo Mountains, and Class 2 (moderate) for the Abajo Slopes.

Visual Quality Objectives
The Manti-La Sal National Forest Plan identifies specific Visual Quality Objectives (VQO) for projects on National Forest System lands. These VQOs are a result of Forest Service management decisions and the Visual Management System (VMS, Forest Service, Agriculture Handbook Number 462, April, 1974.) They are specified in the Forest Plan (Map 24). Recent Forest Service direction (December 1995) allows for the implementation of the Scenery Management System (SMS, Forest Service, Agriculture Handbook No. 701, December 1995).

Forest Plan direction calls for activities to meet the Partial Retention VQO. A few minor draws near lower Pole Creek and South Creek are Modification VQO (USDA Forest Service, 1986).

Visual Quality Objective breakdown of acres for the project area is:

- Partial Retention 18,819 Acres
- Modification 541 Acres
- Private Land 1,040 Acres

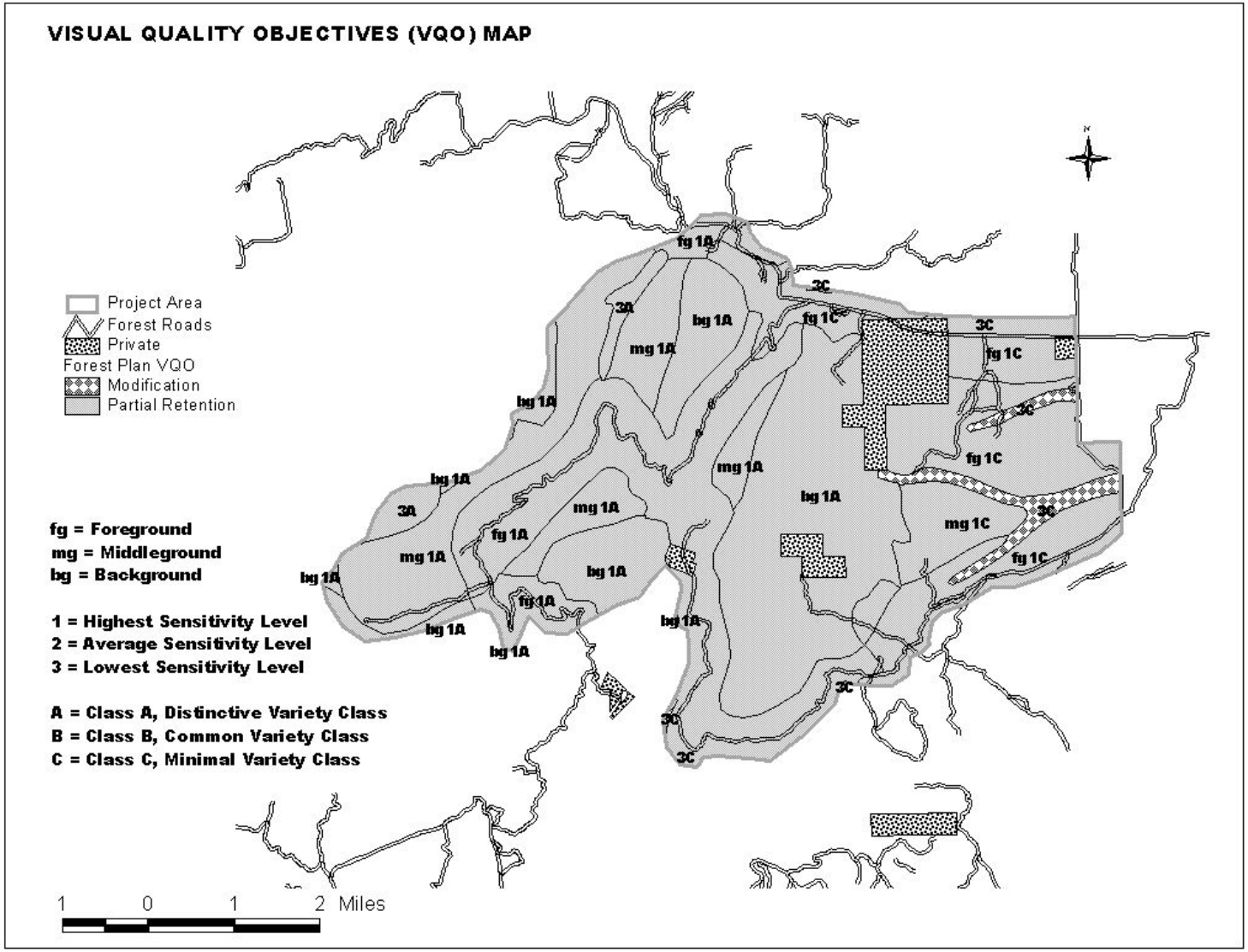
3.5.1.2 Direct/Indirect Effects

Alternative A

Under Alternative A, water system maintenance would continue but water system reconstruction and road improvement/reconstruction would not occur. There would be change from existing visual condition.

Vegetation Treatments
With the anticipated activity of the spruce beetle, all spruce trees over 16" DBH would die (Cote, 2000). As experienced with similar conditions elsewhere on the Manti-La Sal National Forest and other national forests in southern Utah, the dead trees would turn red for a few years, lose their needles, turn gray, and stand for an estimated 30-60 years before falling over. Approximately 40 percent of the green spruce and fir canopy consisting of smaller diameter trees would remain resulting in gray/green coloration. In approximately 30-60 years, the residual green canopy would replace the dead trees.

Map 24 - Forest Plan VQO And Condition Inventory



Although all spruce are not expected to die, the distinct gray coloring of the dead trees would be patchy and last for several years. This would include the Horsehead. The general recreating public's expectations of a scenic forest setting would not be met. The public would notice the change in coloration, and their experience for seeking an outstanding view would diminish (Figure 46).

Figure 46 - Horsehead Peak Simulation (Alternative A)

Alternatives B and C

Water System Reconstruction

New waterlines to be located alongside existing roadways would blend with the contours of the right-of-way clearings and would meet Partial Retention VQO. Water system structures would be placed underground and buried, and the surface of excavations would be restored to natural conditions.

Reconstruction activities along existing waterlines would open the vegetative canopy, which has grown in over the past several decades. The 25-foot waterline clearing along the existing easement running down the slope would be located around clumps of trees, where possible, with angular alignments to help blend with the terrain so it would not be seen from Monticello and other areas. This 2.0 mile waterline segment extends across the Blue Mountain Ski Area, which is private land. The two segments on National Forest System lands consist of approximately 0.25 mile on each end of the line and would blend with the environment because of layout, terrain, and slope conditions.

The location of waterline clearings in the Gold Queen Basin and Bankhead Creek areas are in irregular terrain with diverse tree patterns and would not be readily seen. Partial Retention VQO would be met.

Road Improvement/Reconstruction

Roadway improvements on FR 50079 would generate new cut and fill banks. The roadway would be built to a higher standard with wider lanes and larger turning radii. Disturbed areas would be restored with new vegetation. The surface would be visible from points along FR 50079 further up and down the travel route.

Road reconstruction would occur from milepost 2 to milepost 17.7 on FR 50079. The existing surface is estimated at 12 feet wide, which approximates 23 acres. FR 50079 would be widened by approximately 2 feet, for a finished travel surface of 14 feet with turnouts. The amount of new road surface would equal 6 acres for a total surface of 29 acres. Cut and fill slopes would overlay existing slopes. New slopes would be flatter where possible and approximate more natural conditions by contouring and establishing new vegetation, which would take about two years. Retaining walls would be installed to avoid extremely steep cut and fill banks. Although the new construction would be greater in magnitude, the difference in visual impact from the existing road would be slight. Partial Retention VQO would be met.

Vegetation Treatments

***Aspen*:** There would be four aspen treatment units within the project area, consisting of 75 acres under Alternative B and 60 acres with Alternative C. All of the units are located within the foreground and middleground view zones of FH 50079. Unit size would range from 11 to 35 acres (Alternative B) and 11 to 20 acres (Alternative C). Where feasible, all merchantable aspen, spruce, and fir would be removed to allow aspen to regenerate.

Within the helicopter logging method units, large diameter spruce and fir would be removed and residual aspen cut down in order to encourage aspen regeneration. Slash would be burned and scattered. Stump cuts would be 6 inches within view of 100 feet from the road. The casual Forest visitor would notice the treatment, at least for the first few years, until new regeneration is established. Expected recovery duration is three years. After the first few years within predominant aspen units, and as soon as residual slash material and stumps are covered or hidden by new growth, the treated areas would not be noticeable by the casual Forest visitor. Partial Retention VQO would be met within two to three years after treatment.

Figure 47 - Aspen Treatment with Adjacent Spruce-fir Treatment Simulation

***Spruce-fir and aspen/spruce*:** Under Alternative B, there would be 17 spruce-fir and 26 aspen/spruce treatment units within the project area (1,734 acres). Approximately 117 acres of the aspen/spruce stands would be managed as described above. Unit size ranges from 3 to 24 acres. Within the uneven-aged managed stands, opening sizes would range from 1 to 5 acres.

Under Alternative C, there would be 18 spruce-fir and 22 aspen/spruce treatment units within the project area (1,626 acres). Approximately 90 acres of the aspen/spruce stands would be managed as described under the aspen section. Unit size ranges from 3 to 18 acres. Within the uneven-aged managed stands, opening sizes would range from 1 to 4 acres.

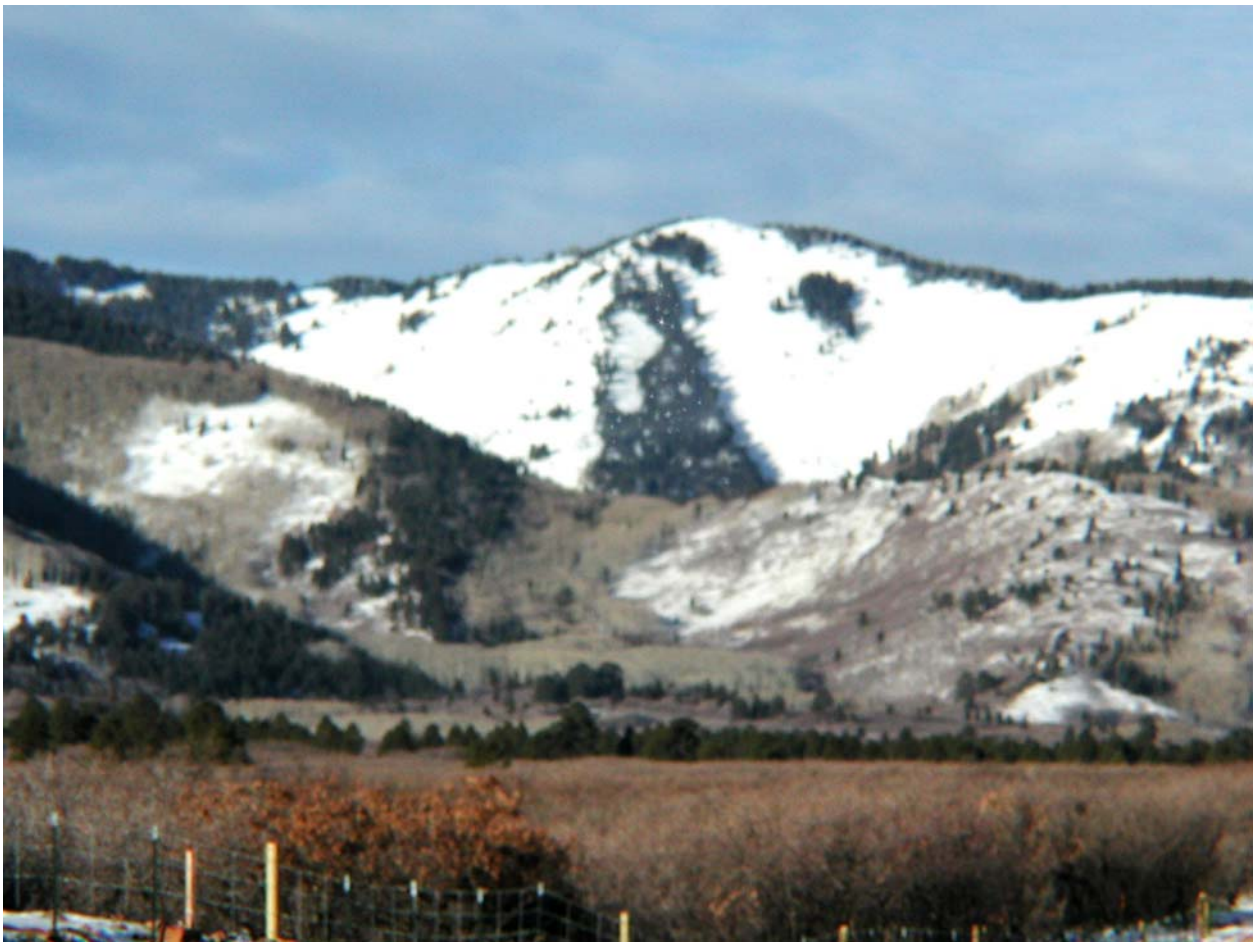
Most of the units are within the foreground and middleground view zones of FH 49, FR 50087, FR 50174, and FR 50079. The Horsehead and units near Bankhead Creek and Abajo Peak are viewed as background from Monticello. Due to terrain and aspect of view from FR 50079, most units at Jackson Ridge are not visible from major travel routes. Unit size would range from 1 to 165 acres, with an average of 36 acres. All spruce trees over 18 inches DBH would be removed. After treatment, residual crown closure would be about 55 percent with a target basal area of 115 with Alternative B and 130 with Alternative C. This would result in patches within the canopy of up to five acres in size. Mid-ranged residual trees within the units would be left unless

damaged by cutting and skidding operations. Expected recovery duration for the aspen and aspen/spruce stands is two to three years. Within the spruce-fir, there would be a visible "thinning" effect with patches of openings; however, it would remain subordinate to the characteristic landscape as a stand of conifers. Slash would be treated by burning in concentrated areas and scattering where possible. Stump cuts would be 6 inches within 100 feet of the road.

Landings would be located near or alongside existing roadways. They would be approximately one to two acres each and heavily used by logging activities. Following logging they would be restored to natural conditions, covered with slash similar to surrounding areas, or used for turnouts as part of the road system.

Partial Retention VQO would be met. Under the Scenery Management System, the final condition would remain as "Natural Appearing."

Figure 48 - Horsehead Peak Simulation (Alternatives B and C)



3.5.1.3 Cumulative Effects

Alternative A

The project area covers 20,400 acres, of which 1,588 acres is spruce-fir and 2,229 acres are classified as aspen/spruce (50 percent spruce by composition). Unchecked, the spruce beetle would affect not only the compared acreages under Alternatives B and C, but also the entire component. Dead trees and changes in coloration would be the primary visual issue. Loss of type diversity would occur as the aspen component disappears from invading conifers. Partial Retention VQO would be maintained.

Alternatives B and C

Water System Reconstruction and Road Improvement/Reconstruction
There would be no cumulative visual effects within the project boundary.

Vegetation Treatments
With the anticipated activity of the spruce beetle, Alternatives B and C would be consistent with Forest Plan direction that Forest uses meet the adopted Visual Quality Objectives. The pertinent areas would meet VQOs of the project area with removal of dead and dying trees, reforestation, road reclamation, and design features.

3.5.2 Relationship Between Short-Term Use and Long-Term Productivity

Alternative A

Short-term effects would be same as long-term productivity, at least for several decades. Spruce and fir would turn gray and appear as a dead forest.

Alternatives B and C

Water System Reconstruction
There would be short-term visual disturbance of new water line and features construction. The disturbance would be restored within one to two years of construction.

Road Improvement/Reconstruction
There would be short-term visual disturbance of cuts and fills from road widening and curve development. The disturbance would be restored within one to two years of construction. Increased recreational use, including driving for pleasure and viewing scenery, would be a long-term benefit.

Vegetation Treatments
There would be short-term effects from slash disposal in the Foreground. Disturbed areas would heal within a few years. In the long-term, the short-term effect would be offset with a variety of form, line, color, and texture added to the landscape.

3.5.3 Irreversible/Irretrievable Commitment of Resources

Alternative A

Under Alternative A spruce beetle activity would continue, possibly affecting the entire spruce component, causing a temporary change in coloration (30-60 years) and dead trees. This loss would be an irretrievable commitment of resources and would affect the viewing experience of forest visitors for generations.

Alternatives B and C

Water System Reconstruction

Water system development would result in vegetative clearings and temporary impacts on the ground. These would not impose an irreversible/irretrievable commitment of the resource.

Road Improvement/Reconstruction

Cut and fill construction would be imposed over existing cut and fill banks and would be shaped to blend as best possible with the existing environment; however, they would never be reclaimed to wholly appear as natural.

Vegetation Treatments

Changes in the existing appearance of the landscape would occur from the vegetative treatments. These changes are reversible as regeneration would recover within the treated areas and along disturbed areas.

3.5.4 Forest Plan Consistency

Alternative A

Partial Retention VQO would be met, as seen from major roadways and viewpoints within the project area. Many people would indicate that a "natural process" is in effect. The general recreating public would notice a definite change in the color transition from green, to red, to gray in the landscape.

Under the Scenery Management System, the existing "Natural Appearing," and "Cultural," designations would remain the same

Alternatives B and C

Proposed features in these alternatives would be consistent with Forest Plan direction. Alternatives B and C would comply with Forest-wide direction to meet the adopted Visual Quality Objective; to design and implement management activities to blend with the natural landscape; and to achieve landscape enhancement through addition, deletion, or alteration of landscape elements. (Visual Resource Management (A04). 01, 02, 04. p. III-17.)

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3.6 RECREATION

This section describes the current condition and the effects of alternative implementation as related to the key issue of Recreation (USDA Forest Service, 2002. Hanchett, Brent).

Issue - Implementation of proposed activities may affect recreation settings, opportunities, and uses within the area.

Indicator:

- *Recreation Opportunity Spectrum (ROS) met*

3.6.1 Recreation Settings, Opportunities, and Uses

3.6.1.1 Current Management Situation

The project area is used mainly for day-use recreational activities. Overnight use is restricted due to management of municipal watersheds for Monticello and Blanding. Activities include driving for pleasure, sightseeing, picnicking, watching wildlife, hiking, horseback riding, mountain biking, ATV driving, and hunting. Dispersed camping is popular outside the watershed areas. Dispersed camping, although restricted within the watershed area, does occur in favorite areas. Winter activities include trapping, cross country skiing, and snowmobiling. Group activities include mountain biking tours, family reunions and church youth summer camps.

Much of the recreational use in the area is from local residents who live within a 50-100 mile radius; however, because of popular nearby national parks, monuments, and wildernesses, the roads in this area get additional recreational use from the regional level. The Blue Mountain Ski Area, formerly a special use area, does not operate and is not expected to open in the near future to the general public.

Forest Highway 49 (FH 49), commonly called the Hart's Draw Road, begins at Monticello and extends westerly along the northern edge of the project area, past Horsehead Peak and northerly down Hart's Draw to Newspaper Rock State Park. The loop is completed by returning to Highway 191 and then back to Monticello.

The Abajo Loop Scenic Backway (FR 50079) begins west of Monticello at the junction with FH 49 and FR 50079 (Utah Scenic Byways 2002, page 79). It leads up North Creek, through the middle of the project area, past Jackson Ridge, and ends at Blanding. This road forms a popular loop drive between the communities of Blanding and Monticello. Use of trailers or long recreation vehicles up North Creek is not advised because of short sight distances and tight switchbacks, which are difficult to negotiate.

Several other roads, either classified or unclassified, are discussed under Transportation System, Section 3.4. These roads are used throughout the summer and fall seasons for pleasure driving, hunting, and other activities. ATV use is popular throughout the area, especially on the lower

standard roads and trails in the South Creek, Pole Creek, and Bankhead Creek areas. ATV use is permitted on FR 50079.

Average daily traffic (ADT) is estimated at less than 15 on FR 50079 and less than 8 on local Forest Roads within the project area, except campground access roads.

Two developed campgrounds located along FH 49, within the project area, are Dalton Springs and Buckboard Campgrounds. Both campgrounds are located near the north edge of the project area and outside of the municipal watershed. They are popular during the summer and fall recreation season. Numerous other dispersed campsites are found beyond the municipal watershed.

Several trails are located along the western side of the project area between Horsehead Peak and Jackson Ridge. Some of these trails are suitable for motorcycles and mountain bikes during the summer season.

A road and dispersed recreation field/photo inventory was made for many of the roads, dispersed camping areas, trails and other resource related conditions within the project area (project record).

Recreation Use Trends

Average Daily Traffic data was collected by Utah Department of Transportation (www.dot.utah.gov/progdev/traffic/utah00.pdf) at points on highways around Monticello during the years of 1998 and 2000. This information is used to show area trends. Selected collection points outside of Monticello show trends in traffic through the area and not general traffic patterns within town.

One collection point was north of Monticello on Highway 191 (Survey Point 1), one south of Monticello on Highway 191 (Survey Point 2), and one east of Monticello on Highway 666 (Survey Point 3). Another point was on Highway 211 (Survey Point 4), which leads past Newspaper Rock State Park and Canyonlands National Park and is near the junction with FH 49 (Figure 49). It is understood that all traffic on Highways 191 and 666 is not recreation use, however much of it is, due to the proximity of several national parks and monuments in the Four Corners area. Highway 211 provides direct access to a state park and national park, with little other use.

Annual highway traffic flowing through the area is constant, with less than 1 percent increase in use per year, however the local recreational traffic leading into Canyonlands National Park and Newspaper Rock State Park is remarkably high, with an increase of 33.7 percent per year. This highway is directly connected to FH 49.

Figure 49 - Average Daily Traffic (ADT)

Survey Point	Point 1 Highway 191	Point 2 Highway 191	Point 3 Highway 666	Point 4 Highway 211
2000 AD	3,125	2,947	2,115	360
1998 ADT	3,380	2,544	2,130	215
Annual % of Change	-3.8%	+7.9%	-0.4%	+33.7%

Dalton Springs and Buckboard Campgrounds (CG) are both situated west of Monticello along FH 49. They are managed by United Land Management (ULM), through a contract with the Manti-La Sal National Forest. Dalton Springs CG has 14 single-family units and 2 double family units, with an operational season of approximately 110 days. Buckboard CG has 11 single-family units and 2 group units, with an operational season of approximately 137 days.

Although total use during 2001 was relatively light for both campgrounds, at 10 to 20 percent of total seasonal capacity, campsites were heavily used during peak weekends such as Memorial Day, July 4, July 24, and Labor Day. The group campsites at Buckboard CG are popular for family reunions and church gatherings.

Recreation Opportunity Spectrum (ROS)

The Recreation Opportunity Spectrum provides a framework for defining six types of outdoor recreation opportunities the public may desire. They range from Primitive to Urban. The inventoried ROS class breakdown for the project area is shown in Figure 50 and Map 25.

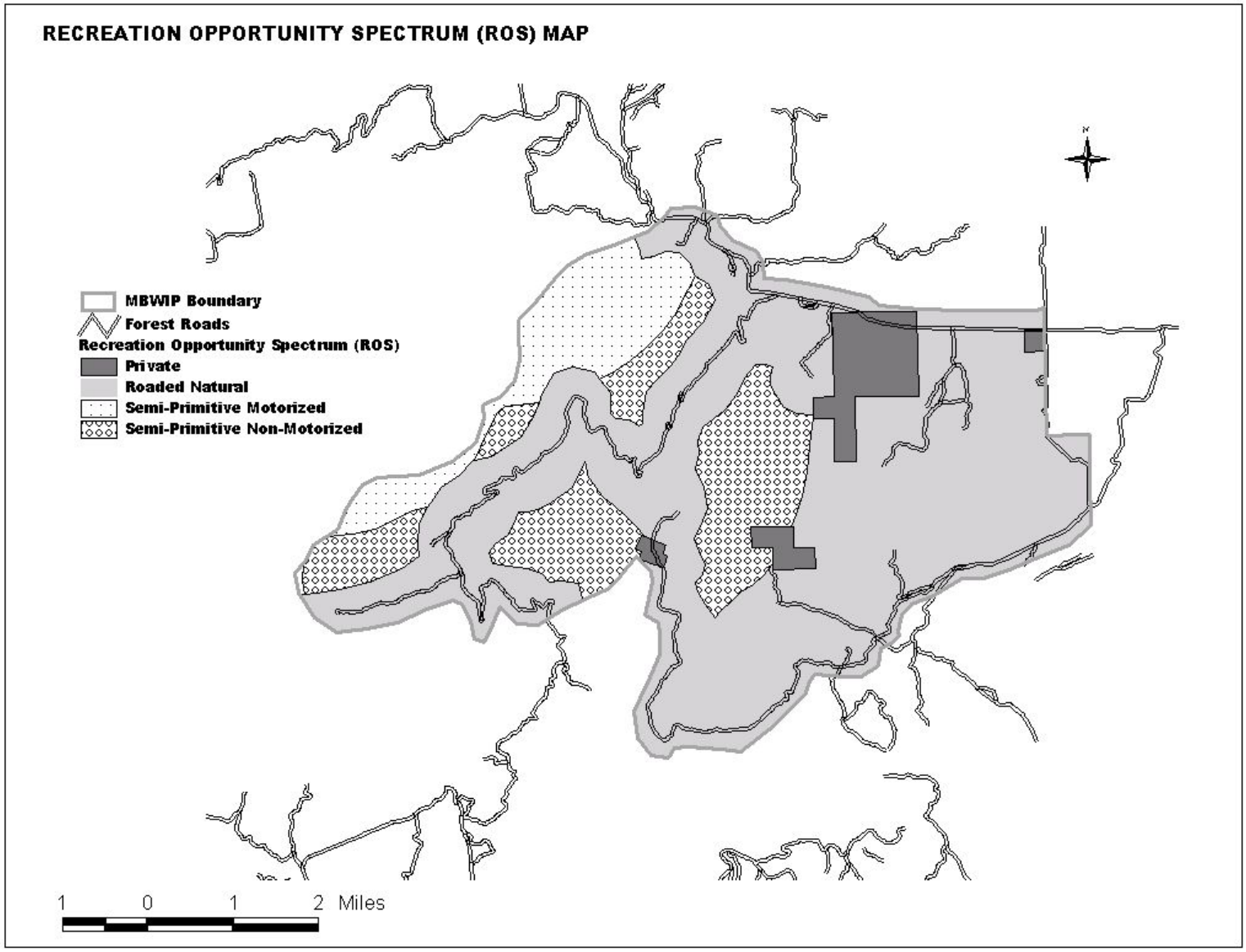
Figure 50 - Recreation Opportunity Spectrum

ROS Category	Acres
Private Land	1,040
Roaded Natural	13,810
Semi Primitive Motorized	1,962
Semi Primitive Non-Motorized	3,588
Grand Total	**20,400**

Inventoried Roadless Area (IRA)

Inventoried Roadless Areas are 5,000 acres or more without maintained roads and substantially natural. They have varying degrees of wilderness characteristics. The eastern edge of the Blue Mountain IRA overlaps along the western edge of the project area. No project activity is proposed within the IRA.

Map 25 - Recreation Opportunity Spectrum (ROS)



3.6.1.2 Direct/Indirect Effects

Alternative A

Although water system maintenance would continue, there would be no water system reconstruction or road improvement/reconstruction with Alternative A. Existing conditions would remain the same.

Vegetation treatments would not take place. People driving the roads for pleasure would notice a difference in the landscape as discussed under the Visual Landscape Section. The public does not like to see a dead and dying appearance in the forest setting. Their recreation experience would be reduced. There would be an increased opportunity for firewood cutting and removal.

Alternatives B and C

Water System Reconstruction

There would be a loss of recreational opportunity along waterline clearings and access roads that would be closed to public access and ATV use near Bankhead Creek, South Creek, and other areas. This would include activities such as driving for pleasure, sightseeing, picnicking, watching wildlife, and hunting.

Road Improvement/Reconstruction

Long-term improvement of FR 50079 roadway and turning radii would allow for increased recreational traffic to the project area and points beyond which connect with the Scenic Backway and loop road. Gravel improvements to the roadway surface would allow for additional day use by sedans.

There would be a short-term inconvenience for recreation users on FR 50079 during the construction phase. Recreation use would increase on FR 50079 with the improved access for vehicles pulling trailers and recreation vehicles. Much of the increased use would be by people seeking an extended overnight stay at destinations beyond North Creek, because of the camping restrictions in the watershed areas.

Roads, classified and unclassified, to be closed and decommissioned (Transportation System, Section 3.4) would result in a loss of recreational use and opportunity on those roads including activities such as driving for pleasure, sightseeing, picnicking, watching wildlife, hunting and ATV use.

Vegetation Treatments

There would be short-term inconvenience of recreation use on FR 50079 during timber haul timeframes by mixing recreational vehicles with logging trucks. If the road were closed to the public to allow for timber haul, then a temporary loss of recreation use would occur in that area during the closure. A conflict would occur between ATVs, large logging trucks, and other vehicles on FR 50079, because the low profile ATVs would be difficult to see.

A short-term opportunity for recreation activity would be watching helicopter harvest activities near specified units. Additional big game hunting activity would occur because of the vegetative thinning and openings created by treatment.

There would be increased safety for recreation travel by converting landings to turnouts on Forest roads. One landing would be converted to a trailhead on Jackson Ridge Road after timber operation is complete.

There would be an increased opportunity for firewood cutting and removal.

Recreation Opportunity Spectrum
There would be no change in ROS designation.

Inventoried Roadless Areas
No activities would occur within the IRA.

3.6.1.3 Cumulative Effects

Alternative A

Under Alternative A, water system maintenance would continue, but there would be no water system reconstruction or road improvement/reconstruction. Existing conditions would remain the same.

Vegetation Treatments
Without treatment, the entire spruce and fir components would be affected. Dead trees and visual impacts from changes in coloration would be the impact to recreationists.

Alternatives B and C

No cumulative effects are anticipated from water system reconstruction and vegetation treatments. There would be no change in ROS designations or to inventoried roadless areas.

Road Improvement/Reconstruction
There would be greater opportunity to gain access to Blanding and other areas from FR 50079 because of road surfacing and radii improvements.

3.6.2 Relationship Between Short-Term Use and Long-Term Productivity

Alternative A

There would be no water system reconstruction or road improvement/reconstruction. There would be no change in ROS designations.

Vegetation Treatments
There would be no vegetation treatments. Short-term decisions to not treat would affect long-term recreation opportunities within the spruce and fir components. People would find it difficult to walk through the forest setting, because of dead and fallen trees. Travelways, both from foot and vehicular means, would be difficult to maintain and use because of fallen trees.

People who are picnicking would find additional safety hazards from windblown and falling dead trees.

Alternatives B and C

Water System Reconstruction

Road closures to the public along waterlines would preclude public recreation opportunities for the long-term.

Road Improvement/Reconstruction

The improvement and reconstruction of FR 50079 would provide long-term recreation opportunities including driving for pleasure, sightseeing, picnicking, watching wildlife, hunting, and ATV use. Road closures and decommissioning would preclude public recreation opportunities for the long-term.

Vegetation Treatments

The opportunity to walk through treated areas without encountering a mass of fallen trees would be a long-term benefit. Treated areas would appear as a "green forest." There would be increased hunting opportunity in openings created by vegetative treatments.

Recreation Opportunity Spectrum

There would be no change in ROS designations.

3.6.3 Irreversible/Irretrievable Commitment of Resources

There would be no irreversible/irretrievable commitment of resources anticipated from any alternative.

3.6.4 Forest Plan Consistency

There would be no change in ROS designations with any alternative. All alternatives are consistent with Forest Plan direction.

3.7 MUNICIPAL WATERSHED

This section describes the current condition and the effects of alternative implementation as related to the key issue of Municipal Watershed (USDA Forest Service, 2002. Foster, Katherine).

Issue - The municipal water supply may be impacted by proposed vegetation treatments and associated disturbances, water system construction, increased recreation from reconstruction of FR 50079, spruce beetle induced tree mortality, or fire.

Indicators:

- *Soil erosion hazard - acres of ground disturbance (at project completion and 10 years following)*
- *Degree meets State Support of Beneficial Uses (full, partial, or not)*
- *Meets State Antidegradation Policy (yes/no)*
- *Resilience of the watershed (high, medium, low)*

For this EIS, the watershed analysis area includes the Indian Creek, Spring Creek, and North Creek watersheds delineated as 6th level hydrologic units (HUC6) by the USGS. North and South Creeks and their tributaries and springs in the North Creek watershed are the sole source of drinking water for the City of Monticello. There are several proposals to expand Monticello's water system into the Spring Creek watershed. The headwaters of Indian and Johnson Creeks are the sole source of City of Blanding's drinking water. This analysis is limited to the National Forest portion of the watershed because that is the extent of our data. The project area is that portion of the watershed analysis area where activities are proposed (Map 26).

Some potential direct and indirect effects are avoided by requirements in the design features that prohibit activities entirely or prohibit them in specified, sensitive areas. These requirements would include:

- Camping and overnight storage of hazardous materials would not be permitted in the Municipal Water Supply (MWS) areas identified in the Forest Plan unless otherwise approved.
- Porta-potties would be required at work gathering locations within the MWS area.

The soil and water conservation practices (SWCPs), best management practices (BMPs), and other requirements that would be used to protect beneficial uses, water quality, and soil quality are described in detail in Appendix A. These requirements would be applied to the proposed activities in both action alternatives. Full and adequate implementation of SWCPs, BMPs, and other requirements is assumed in evaluating the consequences of the alternatives.

3.7.1 Soil Erosion Hazard

3.7.1.1 Current Management Situation

Soil units for the National Forest portion of the watershed analysis area were classified into levels of concern (LOC) based on their erosion hazard and other information such as severe

gullying, eroding outcrops, or unstable soils. There are four LOC categories ranging from very high to low. Figure 51 displays the distribution of acres among the soil levels of concern for the National Forest portion of each watershed. Figure 52 displays the acres of existing roads, trails, water pipeline, and recent wildland fire activity by soil level of concern.

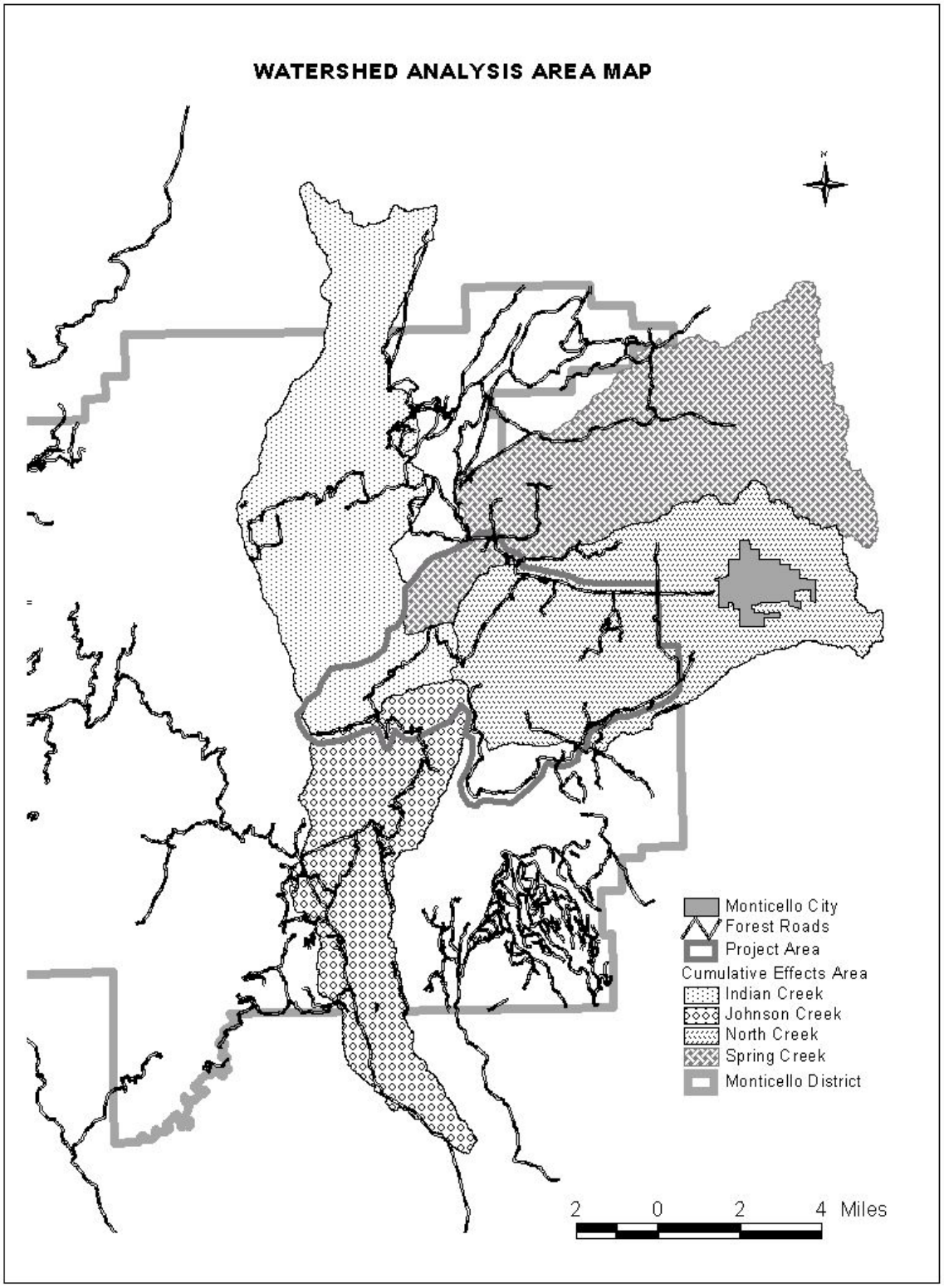
Figure 51 - Soil Erosion Hazard as Levels of Concern (LOC)

	Total Acreage by Level of Concern				Watershed Acreage Within NF Boundary
Watershed	**Very High**		**Moderate**	**Low**	
Indian	1,137	6,789	1,972	9,787	19,685
Spring	32	1,932	0	3,812	5,776
North	18	4,858	0	8,884	13,760
Johnson	1,600	2,131	2,021	6,761	12,513

Figure 52 - Existing Roads, Trails, Pipeline, and Soil Levels of Concern

	Watershed	Total Acreage of Activity	Soil Levels of Concern (Acres and Percent of Total)							
			Very High		High		Moderate		Low	
			Acres	%	Acres	%	Acres	%	Acres	%
Roads and Trails	**Indian Creek**	142	7	0.6	32	0.4	17	0.8	86	0.9
	Spring Creek	106	0	0	28	1.4	0	0	78	2.0
	North Creek	206	1	5.5	35	0.7	0	0	170	1.9
	Johnson Creek	123	4	0.2	14	0.6	48	2.3	57	0.8
Water Pipeline	**North Creek**	44	0	0	17	0.3	0	0	27	0.3
Nizhoni Fire	**Johnson Creek**	2,198	527	33	0	0	84	4	1,587	23.0

Map 26 – Watershed Analysis Area



3.7.1.2 Direct/Indirect Effects

Alternative A

The acreage of existing activities in the various soil LOCs would remain as previously described. Completion of deferred maintenance on FR50079 would remedy localized areas of erosion with spot graveling and improved cross-drainage.

Alternatives B and C

The following tables use Alternative A as a baseline and show the changes in disturbed acres immediately following implementation of the alternatives and ten years following implementation. The number in the first column under each soil LOC is the total acres in the National Forest portion of each watershed for that category. The acres associated with Alternatives B and C include the incremental changes immediately following implementation and the expected disturbed acres approximately 10 years thereafter. This is to display estimated recovery following disturbances. The principle long-term difference between Alternative A and Alternatives B and C is the increased acreage associated with the reconstruction of FR 50079.

Figure 53 - Indian Creek Soil Levels of Concern and Activity Acres

	Existing Disturbed Acres	**Disturbed Acres Following Implementation Of Action Alternatives**		**Disturbed Acres After Ten Years**	
Soil LOC	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative B**	**Alternative C**
Very high (1137 acres)	7 acres (7 roads/trails)	0	0	7 acres (7 roads/trails)	
High (6789 acres)	34 acres (32 roads/trails 2 Blanding water diversions)	107 acres (+33 ground-based harvest landings, skid/forwarder trails +3 helicopter landings +7 temporary road construction +37 reconstruction of FR 50079, 50354 (includes additional disturbance of some acres shown in Alternative A) -7 temporary road decommissioning)	103 acres (+29 ground-based harvest landings, skid/forwarder trails +3 helicopter landings +7 temporary road construction +37 reconstruction of FR 50079, 50354 (includes additional disturbance of some acres shown in Alternative A) -7 temporary road decommissioning)	46 acres (44 roads/trails [some landings retained as road turnouts] 2 Blanding water diversions)	
Moderate (1972 acres)	17 acres (17 roads/trails)	0	0	17 acres (17 roads/trails)	
Low (9787 acres)	86 acres (86 roads/trails)	113 acres (+27 reconstruction of FR 50079)		104 acres (104 roads/trails -road widening and turnouts, slow recovery cut/fill slopes)	

Figure 54 - Spring Creek Soil Levels of Concern and Activity Acres

	Existing Disturbed Acres	Additional Disturbed Acres Following Implementation		Disturbed Acres After Ten Years	
Soil LOC	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative B**	**Alternative C**
Very high (32 acres)	0	0		0	
High (1932 acres)	28 acres (28 roads/trails)	30 acres (+2 helicopter landings)		28 acres (28 roads/trails)	
Moderate (0 acres)	0	0		0	
Low (3812 acres)	78 acres (78 roads/trails)	0		78 acres (78 roads/trails)	

Figure 55 - North Creek Soil Levels of Concern and Activity Acres

	Existing Disturbed Acres	Additional Disturbed Acres Following Implementation		Disturbed Acres After Ten Years	
Soil LOC	**Alternative A**	**Alternative B**	**Alternative C**	**Alterative B**	**Alternative C**
Very high (18 acres)	1 acre (1 roads/trails)	0		1 acre (1 roads/trails)	
High (4858 acres)	59 acres (35 roads/trails 14 existing water pipeline 10 existing water diversion structures)	168 acres (+15 ground-based harvest landings, skid/forwarder trails +5 helicopter landings +1 temporary road construction +14 pipeline reconstruction (redisturbance of acres shown in Alternative A) +15 reconstruction of water diversion structures (redisturbance of acres shown in Alternative A) +60 reconstruction of FR 50079 (includes additional disturbance of some acres shown in Alternative A) -1 temporary road construction)		79 acres (55 road/trails (road widening & turnouts, slow recovery cut/fill slopes) 14 water pipeline 10 water diversion structures)	
Moderate (0 acres)	0	0		0	
Low (8884 acres)	218 acres (178 roads/trails 30 existing water pipeline 10 existing water diversion structures)	291 acres (+1 temporary road construction +27 reconstruction of FR 50079 +1 temporary road construction +30 pipeline reconstruction (redisturbance of acres shown in Alternative A) +15 reconstruction of water diversion structures (redisturbance of acres shown in Alternative A) -1 temporary road construction)		224 acres (187 roads/trails (road widening & turnouts, slow recovery cut/fill slopes) 27 water pipeline 10 water diversion structures)	

Figure 56 - Johnson Creek Soil Levels of Concern and Activity Acres

	Existing Disturbed Acres	Additional Disturbed Acres Following Implementation		Disturbed Acres After Ten Years	
Soil LOC	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative B**	**Alternative C**
Very high (1600 acres)	531 acres (4 roads/trails 527 Nizhoni Fire)	539 acres (+8 reconstruction of FR 50079 (includes additional disturbance of some acres shown in Alternative A))		112 acres (7 roads/trails (road widening & turnouts, slow recovery cut/fill slopes) 105 Nizhoni Fire)	
High (2131 acres)	14 acres (14 roads/trails)	46 acres (+32 reconstruction of FR 50079 (includes additional disturbance of some acres shown in Alternative A))		24 acres (24 roads/trails (road widening & turnouts, slow recovery cut/fill slopes))	
Moderate (2021 acres)	133 acres (48 roads/trails 85 Nizhoni Fire)	143 acres (+9 reconstruction of FR 50079 (includes additional disturbance of some acres shown in Alternative A))		51 acres (51 roads/trails (road widening & turnouts, slow recovery cut/fill slopes))	
Low (6761 acres)	1644 acres (57 roads/trails 1587 Nizhoni Fire)	1690 acres (+46 reconstruction of FR 50079 (includes additional disturbance of some acres shown in Alternative A))		72 acres (72 roads/trails (road widening & turnouts, slow recovery cut/fill slopes))	

Gully and sheet erosion are the erosion mechanisms of concern (Cirrus 2001). The implementation of the following soil and water conservation practices (SWCPs) would minimize the possible effects of activities occurring on soils at all levels of concern:

13.02 Slope limitations for tractor operations;
13.04 Revegetation of surface disturbed areas;
13.06 Soil moisture limitation for tractor operation;
14.04 Limiting the operation period of timber sales;
14.08 Tractor skidding design;
14.09 Suspended log yarding in timber harvesting;
14.11 Log landing erosion prevention and control;
14.15 Erosion control on skid trails;
14.18 Erosion control structure maintenance;
14.19 Acceptance of timber sale erosion control measures before sale closure;
15.06 Mitigation of surface erosion and stabilization of slopes;
15.10 Control of road construction, excavation, and side-cast material;
15.22 Road surface treatment to prevent loss of materials;
15.23 Traffic control during wet periods;
15.25 Obliteration of temporary roads;
18.03 Protection of soil and water from prescribed burning effects.

These SWCPs are described in detail in Appendix A-2. When these practices are fully and properly implemented, they are very effective in minimizing on-site erosion and off-site sedimentation. Implementation is typically good for timber sale operation and road and pipeline

reconstruction. Inspection by timber sale administrators, engineering representatives, and other technical specialists is important in ensuring proper implementation. Implementation of either Alternative B or C would not increase soil erosion or adversely affect soil resources in the long-term. The proposed activities meet the Region 4 Soil Quality guidelines.

3.7.1.3 Cumulative Effects

Soil Erosion Hazard And Land Disturbing Activities

Alternative A

No cumulative effects are expected with this alternative. In the Johnson Creek watershed, portions of the 2002 Nizhoni Fire with very high LOC that burned at high intensity may be slow to fully recover. However, these areas were aerially seeded in January 2003 to limit the expansion of cheatgrass into the burned area and to accelerate the recovery of vegetative ground cover.

Alternatives B and C

Over the long-term, implementation of Alternative B or C would increase the number of disturbed acres in every watershed. Figure 57 summarizes Figure 53 through Figure 56. The majority of the increase shown is associated with the reconstruction of FR 50079 and the additional road width and turnouts plus the larger cut and fill slopes. Even with implementation of SWCPs and use of the best available methods to achieve revegetation, the acreages with high and very high levels of concern would be difficult to revegetate and may not be fully vegetated within ten years.

Figure 57 Disturbed Acres Ten Years Following Implementation

	Estimated Disturbed Acres after Ten Years				
	Watershed Acreage Within NF Boundary	Alternative A		Alternatives B and C	
		Total Acres	Acres with High and Very High LOC	Total Acres	Acres with High and Very High LOC
Indian Creek	19,685	144 (0.7% of watershed)	41	165 (0.8% of watershed)	53
Spring Creek	5,776	106 (1.8% of watershed)	28	106 (1.8% of watershed)	28
North Creek	13,760	278 (2.0% of watershed)	60	304 (2.2% of watershed)	80
Johnson Creek	12513	228 (1.8% of watershed)	123	259 (2% of watershed)	136

3.7.2 Support of Beneficial Uses of Water

Utah's Beneficial Use Classification

It is the responsibility of each state to assign beneficial-use designations to all streams and lakes. The water quality standards associated with each use are designed to ensure the long-term protection of those beneficial uses. The State of Utah's classifications include:

- 1C – protected for use as a raw water source for domestic water systems with prior treatment by treatment processes as required by the Utah Division of Drinking Water;
- 2B – protected for secondary-contact recreation, such as boating, wading, or similar uses;
- 3A – protected for cold-water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain;
- 4 - protected for agricultural uses, including irrigation of crops and stock watering.

All of the streams in the watershed analysis area are classified as 2B, 3A, and 4. Johnson, North, South, and Indian Creeks are also designated as 1C (UT DEQ/DWQ, 2000a).

Safe Drinking Water Act

The 1996 amendment to the Safe Drinking Water Act required the States "to conduct an assessment of its sources of drinking water (rivers, lakes, reservoirs, springs, and ground water wells) to identify potential sources of contamination and to determine how susceptible the sources are to these threats" (EPA 1999). The State of Utah's Rule R309-605 requires the operators of public water systems to develop a Drinking Water Source Protection Plan. Both Monticello and Blanding are working on plans, but have not yet completed them. These plans may necessitate additional or more restrictive mitigation measures for activities with the potential to affect drinking water quality.

On National Forest System lands, the areas serving as drinking water source areas for the cities of Monticello and Blanding are managed under the basic authorities of the Organic Act, historic precedent plus long and short-term cooperative agreements and memorandums of understanding, and the management prescription associated with MWS in the 1986 Forest Plan. Management emphasis is on producing water for municipal uses. Some limited land uses or activities that do not degrade the water quality or disrupt the watershed or source areas may occur (Forest Plan, 1986).

3.7.2.1 Current Management

The State of Utah has completed an intensive sampling and assessment of water quality for Southeast Utah. Sampling was completed in 1998 and the assessment published in 2000. PH values exceeded the standards on Johnson, Indian, and North Creeks. These streams are listed as partially supporting aquatic life beneficial uses. The causes of the elevated pH values have not been determined, although a systematic field equipment error is suspected (T.Toole 2001). Indian Creek also has elevated levels of phosphorus and is listed by the State as needing further evaluation (UT DEQ/DWQ, 2000b). Probable sources have not been identified. All other streams in the watershed analysis area fully support their beneficial uses. The water diverted for drinking water is suitable for that purpose; however, treatment is required before the water is delivered to users.

3.7.2.2 Direct/Indirect Effects

Support Of Beneficial Uses Of Water

PH values in Johnson, Indian, and North Creeks did not meet State standards in 1998. The State Division of Water Quality will resample these and other sites in southeast Utah in 2002; the data will be available in 2003. If the non-compliant pH was due to instrument error, the values should meet standards in the resampling. If the pH values are still high following the 2002 sampling, additional investigation will be needed to locate the alkalinity source(s). The activities proposed in the alternatives are not likely to affect pH. Following wildfire, ash deposition into stream courses may change the pH. However, the review of current literature in Drinking Water From Forests and Grasslands found that pH was affected little by wildfire (Dissmeyer, 2000). Phosphorus is not considered a threat to human health; there are no standards associated with the 1C beneficial use (Dissmeyer, 2000; UT-DWQ R317-2-14). The State of Utah uses total phosphorus as a pollution indicator. "Soluble phosphorus concentration are essentially unaffected by timer harvesting activities. Total phosphorus concentrations are closely linked to sediment concentrations (Dissmeyer, 2000)." Following wildfire, ash deposition may also be a source of phosphorus. However, phosphorus is volatized at high burning temperature and any reaching perennial waters may be used by aquatic organisms (Dissmeyer, 2000).

Alternative A

Although Alternative A would allow for maintenance, it would not allow for total reconstruction of the City of Monticello's water system. This would perpetuate the loss of water through undetected leaks or future breakage in the system. As the pipeline and collection facilities continue to deteriorate, the potential for contamination increases.

Alternatives B and C

Implementation of the design features and SWCPs would protect the designated beneficial uses. As described above, there should be little on-site erosion and no off-site sedimentation associated with timber harvest operations. Storage of fuel and overnight camping are prohibited in MWS areas. Specific measures are included for pipeline and road reconstruction to control sediment and to minimize impacts on streamside riparian areas and wetlands.

Reconstruction of the pipeline and diversion facilities would increase the net quantity of water available for use through the elimination of leaks and the restoration of diversion efficiency. During construction, there is increased possibility of contaminants entering the water system. After construction, there would be better protection from surface contaminants.

3.7.2.3 Cumulative Effects

The source of elevated pH for several streams in the watershed analysis area is unknown. The Forest Service and State Division of Water Quality will review sampling data collected in 2002 and determine what, if any, follow-up investigations will be needed.

3.7.3 Compliance with Utah's Antidegradation Policy

Utah's Antidegradation Policy and Forest's Role As A Water Quality Management Agency

In additional to the beneficial use classifications, all surface waters, irrespective of ownership, that are geographically located within the outer boundary of a National Forest are designated as High Quality Waters – Category 1 (UT DEQ/DWQ, 2000a). Best management practices must be designed to maintain the current, high level of water quality (UT DEQ, 2000). The Forest Service is the designated Water Quality Management Agency for National Forest System lands in Utah. A 1993 memorandum of understanding (MOU) between the Forest Service and the Utah Division of Water Quality defines the roles and responsibilities of each agency relative to water quality management on National Forest System lands (MOU, 1993; UT NPS, 1998).

To comply with the antidegradation policy and State water quality standards, the Forest Service must implement or ensure the implementation of practices that maintain the current, high level of water quality. These include State best management practices; practices in the Soil And Water Conservation Handbook; or specialized, site-specific practices. All these types of practices are designed to fully protect and maintain water-related beneficial uses, and to prevent or minimize nonpoint source pollution (UT NPS, 1998).

3.7.3.1 Current Management

Utah's antidegradation policy focuses on best management practices to limit or minimize the effects of human-caused activities on existing water quality. In the analysis area, current activities include use and maintenance of the road network, recreation, livestock grazing, and use and maintenance of the water diversion facilities. Although wildfire can affect water quality, it is not considered a human-caused activity relative to the antidegradation policy. In 2001, Cirrus Ecological Solutions did a reconnaissance of the project area. They identified several portions of FR 50079 and recent maintenance of the Blanding canal as minor sediment sources to Indian and North Creeks (Cirrus, 2001). Recreation use is restricted and livestock grazing is prohibited in the MWS portion of the watershed analysis area.

Benthic Macroinvertebrates As Management Indicator Species and Additional Indicators Of The Support Of Beneficial Uses

The Forest Plan references three indices: DAT, BCI, and standing crop.

- DAT is a diversity index developed by the Aquatic Ecosystem Analysis Laboratory in Provo, Utah. It is calculated from the number of distinct taxa and their relative abundance in a single sample during the initial processing of the sample. When there is a wide diversity of aquatic macroinvertebrate taxa, the DAT is a higher number. Disturbed stream systems with lots of fine sediment tend to support only a narrow range of organisms, and DAT tends to be lower. Processing procedures at the National Aquatic Monitoring Center have changed and this index is no longer calculated. DAT values are available only for samples collected through 1997. The Forest Plan Standard is 11–17, or greater. The index values are interpreted as follows: 0-5, poor diversity; 6-10, fair diversity; 11-17, good diversity; 18-26, very good diversity.

- BCI is the biotic condition index. It was developed by the Aquatic Ecosystem Analysis Laboratory in Provo, Utah, to assess overall aquatic-ecosystem health. It is a measure of a stream against its own potential, not against another stream. It is independent of sample size and is based on tolerances of benthic invertebrate taxa. The Forest Plan Standard is 75 or greater. The index values are interpreted at follows: less than 72, representing poor conditions; 72-79, fair conditions; 80-90, good conditions; and greater than 90, excellent conditions.

- The Forest Plan also includes a standard for macroinvertebrate standing crop. This index is simply a measure of the abundance or weight of organisms per unit area (grams/m2), and is an indicator of aquatic production and fish food abundance. Standing crop values were not used in this analysis for three reasons. First, a single large organism captured in a sample can affect the total weight of the sample (Mark Vincent, National Aquatic Monitoring Center, personal communication, 2001). Second, nutrient enrichment from a variety of sources and/or increases in sunlight from loss of riparian shrubs and trees, can increase stream production and macroinvertebrate biomass (Tait et al., 1994). Third, the standing crop value for a sample of taxa indicative of good water quality could be the same as one made up of taxa indicative of poor water quality. High standing crop values could suggest that water quality is good, when the opposite could also be true.

Macroinvertebrate samples have been collected at several locations on Indian Creek and Johnson Creek. Due to the inconsistencies in sampling locations, there is not enough data at any one location to evaluate trend. Therefore, the data will be compared to the Plan standards for DAT and BCI.

Indian Creek
There are eight samples collected from 1982 to 1994. DAT values range from 6.3 to 18.3; four meet the Forest Plan standard. BCI values range from 63 to 94; three meet the Forest Plan standard. Note that these samples are not all from the same locations.

Johnson Creek
There are four samples collected in 1987 and 1993. DAT values range from 9.4 to 14.6; one meets the Forest Plan standard. BCI values range from 77 to 94; all meet the Forest Plan standard. Note that these samples were not all collected in the same location.

Spring Creek, North Creek
No macroinvertebrate samples have been collected in these watersheds.

3.7.3.2 Direct/Indirect Effects

Alternative A

Completion of deferred road maintenance would include some additional cross-drainage and spot surfacing of the roadway with gravel. Following the short-term disturbance associated with construction, this would reduce the hydrologic connection between the road and drainage network and reduce sediment delivery.

Alternatives B and C

The reconstruction of FR 50079 includes additional cross-drainage, culvert replacement and surfacing of the majority of the roadway with gravel. In the long-term, these measures would reduce the hydrologic connection between the roadway and the drainage network and sediment delivery from the roadway.

Strychnine would be used to control gophers in selected harvest areas. Herbicides would be used to control noxious weeds. Application directions and SWCPs would be followed during application complying with the antidegradation policy.

The design features and SWCPs required with all alternatives meet the requirement of the antidegradation policy to use BMPs to ensure maintenance of the quality of water in the analysis area.

Benthic Macroinvertebrates As Management Indicator Species and Additional Indicators Of The Support Of Beneficial Uses

Given the scarcity of data, the wide range of values for both DAT and BCI, and the lack of discernable pattern in the existing data, there is no basis for projecting any probable changes or whether future DAT and BCI values will meet Plan standards with the implementation of any of the alternatives.

Alternative A

There is no trend or pattern in the data for Indian and Johnson Creeks. The three synoptic samples collected in 1994 from Indian Creek between the Forest boundary and FR 50104 (the Shay Mountain Road) suggest improving quality going upstream.

Alternatives B and C

Sediment is the parameter most likely to affect macroinvertebrate communities. Implementation of SWCPs would minimize on-site erosion. SWCPs and other requirements would minimize the effects associated with culvert replacement and pipeline and water diversion reconstruction directly in the stream channels; the sediment from these activities would be short-term and of limited extent. The proposed activities should have little to no effect on macroinvertebrate communities or populations.

3.7.3.3 Cumulative Effects

Alternatives A, B, and C

With the exception of the road network (classified and unclassified), field investigations (Cirrus, 2001) did not identify any residual or cumulative effects from past activities.

The road analysis recommendations can be implemented independently of the decisions to be made in this EIS. The recommendations for decommissioning coupled with the actions described in Direct and Indirect Effects would cumulatively benefit water quality and meet the intent of the antidegradation policy. The reasonably foreseeable actions described in Appendix D that would occur on National Forest System lands would have design features and SWCPs to maintain high quality waters.

Benthic Macroinvertebrates As Additional Indicators Of The Support Of Beneficial Uses And Compliance With The Antidegradation Policy

Alternative A

The Division of Wildlife Resources (DWR) has identified sediment as a concern in the lower reach of Indian Creek and suggests livestock grazing as the probable source (Berg, 2002). Some type of stream health reconnaissance and/or more intensive monitoring would be necessary to determine and evaluate DWR's concern.

Alternatives B and C

As described in the Direct Effects portion of this section, short-term sedimentation would be associated with culvert replacement during the reconstruction of FR 50079; this short-term effect should not exacerbate conditions downstream.

3.7.4 Watershed Resilience

Resilience is defined as the ability to recover from disturbance. This indicator was developed to address concerns about the combined effects of the proposed activities and a large, uncharacteristic fire similar to ones that occurred in southern and eastern Utah in 2002. For this analysis, resilience will be assessed using the possibility of a large, uncharacteristic fire, the proximity of current and proposed activities to the stream network, and the recovery potential of the stream network following disturbance.

The fire history for the watershed analysis area is relatively short compared to the regionally typical fire history for spruce forests in the Intermountain and Rocky Mountain areas. The possibility of a large, uncharacteristic fire in the forested stands proposed for treatment has been discussed in the Vegetation Section and will be further evaluated at a project area and watershed scale in this section. The possibility of continued or larger scale spruce mortality due to spruce beetle has been discussed in the Vegetation Section.

An activity's distance from a stream channel is an indicator of its possible effects on the channel itself and on water quality, primarily sediment. Figure 58 summarizes the acreage of roads, trails, and the existing water pipeline by distance from the stream network. Activities greater than 300 feet from a stream channel are assumed to have no direct effect on the channel itself and a reduced likelihood of sediment delivery.

Figure 58 - Summary of Road and Trail Acreages Adjacent to the Stream Network

		Distance Zones (ft)			
	Watershed	Less than 100	100-200	200-300	Greater than 300
Roads and Trails	Indian Creek	26	30	19	115
	Spring Creek	22	28	27	182
	North Creek	22	21	22	361
	Johnson Creek	22	21	22	109
Water Pipeline	North Creek	19	6	4	0
Monticello Diversions	North Creek	20	0	0	0
Blanding Diversions	Indian Creek	2	0	0	0
	Johnson Creek	2	0	0	0

Streams in the project area were evaluated using the methods in *Applied River Morphology* (Rosgen, 1996) at representative sections downstream of proposed activities (Cirrus 2001). Figure 59 summarizes several characteristics associated with each stream type at these representative sections.

Figure 59 - Sensitivity to Disturbance at Representative Stream Locations

Location	Stream Type (a)	Stream Bank Erodibility (a)	Channel Stability (a)	Sensitivity to Disturbance (b)	Recovery Potential (b)
Western headwaters of Indian Creek	B3	Low	Good	Low	Excellent
Eastern headwaters of Indian Creek	B6	Moderate	Good	Moderate	Excellent
Indian Creek below the confluence of the west and east headwater streams	B3	Low	Good	Low	Excellent
Spring Creek above FH 049	B3	Moderate to High	Fair	Low	Good
Bankhead Creek near Blue Mountain Ski Area (currently closed)	G6	Low	Good	Very high	Poor
Upper North Creek near FH 049	B4	Moderate	Good	Moderate	Excellent
Pole Creek	B4	Moderate	Good	Moderate	Excellent

(a) Cirrus, 2001 (b) Rosgen, 1996

3.7.3.4 Current Management

A large, uncharacteristic fire could occur if the following conditions combine: severe or extreme drought, high winds, low fuel moistures and high fuel loadings, and steep terrain. Based on the 2002 fires on the District, this type of fire would be expected to burn a relatively large acreage with moderate to high intensity and severity in forested and brush vegetation types. There would probably be hydrophobic conditions on the soil surface where there were accumulations of leaves and needles. Depending on post-fire weather patterns, ash transported by summer

thunderstorms could affect surface water system intakes. There could be flash floods or debris torrents from the combination of hydrophobic conditions and intense thunderstorms. Drinking water source areas would be aggressively treated under the emergency burned area rehabilitation program. Vegetative recovery sufficient for watershed protection following such a fire could take three to eight years.

Possibility of a Large, Uncharacteristic Fire

The Vegetation Section describes the effects of the proposed treatments in the treated stands and adjacent areas and summarizes whether a fire in the treated and adjacent stands would escape after four hours of initial firefighting. For the purposes of this section, two zones of influence were created around the stands proposed for treatment, and the status after four hours of initial attack (Figure 30 and Figure 32) was assigned to the inner zone for each alternative. If the status of the inner zone was no escape, the second, outer zone was assigned a rating of possible escape. Acreages for the two zones and remaining area outside the zones of influence were calculated using GIS analysis. The effects in the project area are discussed here; the effects at a watershed scale will be evaluated in the cumulative effects portion of this section.

3.7.3.5 Direct/Indirect Effects

Alternative A

There are 20,400 acres in the project area. In the short-term (Figure 30), 100 percent of the area is assigned a rating of no escape. In the long-term (Figure 32), 100 percent of the project area is assigned a rating of escape.

Alternatives B and C

Due to the similarity of the acreages treated, the zones of influence are very similar and would not be described separately. In the short-term, immediately following harvest but before treatment of post harvest slash, 58 percent of the project area has a rating of escape. In the longer term following slash treatment and thereafter, 20 percent of the area has an escape rating, and 22 percent has a possible escape rating.

Proximity of Activities to the Stream Network

Alternative A

Depending on where it was needed, maintenance of the water system by the City of Monticello could result in disturbance in or adjacent to the stream channel.

Alternatives B and C

Figure 60 summarizes the acreage of proposed activities adjacent to the stream network. Activities over 300 feet from a stream channel are unlikely to affect the morphology, streamside vegetation, or water quality.

Figure 60 - Additional Disturbed Acres and Distance from the Stream Network

		Distance Zones (ft)		
		Less than 100	100-200	200-300
Reconstruction of FR 50079	Indian Creek	5	15	12
	North Creek	5	7	6
	Johnson Creek	7	15	12
Reconstruction of water pipeline	North Creek	18	7	3
Reconstruction of water diversions	North Creek	20	0	0
Ground-based timber harvest	Indian Creek	21	21	23
	North Creek	29	30	28
Helicopter landings	Indian Creek	0	0	3
	North Creek	0	0	6

The following SWCPs would minimize the possible effects of activities proposed in the action alternatives adjacent to all stream segments:

14.03 Use of sale area map for designating soil and water protection needs, including stream course protection;
14.06 Riparian area designation;
14.08 Tractor skidding design;
14.10 Log landing location and design;
14.17 Stream channel protection;
15.03 Road and trail erosion control plan;
15.04 Timing of construction activities;
15.07 Control of permanent road drainage;
15.12 Control of construction in riparian areas;
15.13 Controlling in-channel excavation;
1515 Stream crossings on temporary roads;
15.16 Bridge and culvert installation;
15.19 Stream bank protection.

These SWCPs are described in Appendix A. Some of the practices prohibit activities within a specified distance of the stream channel; avoidance is very effective. The practices controlling operations adjacent to the stream network are effective in minimizing disturbance when fully and properly implemented. Implementation is typically good for timber sale operations and road and pipeline reconstruction. Reconstruction of FR 50079 and the City of Monticello's water facilities would necessitate approximately 20 acres of construction activities in the stream network at approximately 20 locations. Effectiveness of practices to minimize the effects of this type of disturbance is fair to good, and the effects should be short-term and of limited extent. Inspection by timber sale administrators, engineering representatives, and other technical specialists is important in ensuring proper implementation.

Recovery Potential of the Stream Network Following Disturbance

Bankhead Creek is very sensitive to disturbance and has a poor recovery potential; the east fork of Indian Creek, the upper part of North Creek, and Pole Creek are moderately sensitive to

disturbance but have excellent recovery potential (Figure 59). Additional specifications would be applied to the pipeline construction and reconstruction of FR 50079 to minimize effects on these and others segments of stream.

The direct effects of the proposed action alternatives would be minimized using SWCPs and other requirements that prevent or control direct stream channel disturbance. In addition to disturbances in or adjacent to the stream network, the indirect effect of altered watershed hydrology due to changes in vegetation was evaluated for small watersheds delineated around the proposed harvest activities. The detailed analysis is documented in the project file.

The indirect effects of possible changes in the hydrology of the small watersheds due to vegetation removal or mortality cannot be mitigated. Overall, the stream network in or immediately downstream of the small watersheds in the spruce zone has low to moderate sensitivity to disturbance, excellent recovery potential, and good stream channel stability. Stream bank erosion should be of limited extent and is most likely in a short segment in the headwaters of the east fork of Indian Creek. There would be no expected short-term changes in hydrology should Alternative A be implemented. In the event of a spruce beetle epidemic in the next 10 years, detectable increases in stream flows during spring runoff are likely. In the short-term, implementation of Alternative B would change the hydrology in some, but not all, of the small watersheds. Alternative B would have less effect on small watershed hydrology than Alternative C. The long-term effects of continued spruce mortality are similar among all the alternatives; most of the small watersheds would be affected.

Watershed Resilience Rating for the Project Area and the Small Watersheds Potentially Affected by the Proposed Treatments or Continued Spruce Mortality

The following table summarizes the factors considered in developing the resilience rating and displays the rating.

Figure 61 – Water Resiliency Ratings (Short and Long-Term)

	Short-Term – Following logging and before slash treatment						Long-Term					
	Alternative A			Alternatives B & C			Alternative A			Alternatives B & C		
Escape	No			58%			100%			20% with 22% possible		
Disturbance adjacent to stream network (acres)	Within 100’	100’-200’	200’-300’	Within 100’	100’-200’	200’-300’	Within 100’	100’-200’	200’-300’	Within 100’	100’-200’	200’-300’
	135	241	94	240	326	187	135	241	94	152	268	124
Stream recovery potential	Excellent						Excellent					
Resilience	High			Moderate			Low			Moderate to high		

3.7.3.6 Cumulative Effects

Possibility of a Large, Uncharacteristic Fire

The analysis described previously in the Direct Effects portion of this section was applied to the larger watersheds of the watershed analysis area.

Alternative A

In the short-term, 100 percent of the area in each watershed is assigned a rating of no escape. In the long-term, 100 percent of the watershed area is assigned a rating of escape.

Alternative B and C

Due to the similarity of the acreages treated, the zones of influence are very similar and will not be described separately. Figure 62 displays the wildland fire escape rating by watershed.

Figure 62 – Wildland fire escape rating (percentage of watershed area)

Watershed	Short-term (Immediately following harvest)	Long-term (Following slash treatment)	
	Escape Rating (Percentage of watershed area)	Escape Rating (Percentage of watershed area)	Possible Escape Rating (Percentage of watershed area)
Indian Creek	17	72	11
Spring Creek	8	86	6
North Creek	17	72	11
Johnson Creek	18	65	17

Proximity of Activities to the Stream Network

The direct effects of disturbance in or adjacent to stream channels would be managed through avoidance and/or the implementation of SWCPs and other requirements. No cumulative effects are anticipated.

Recovery Potential of the Stream Network Following Disturbance

The possible cumulative effect of altered hydrology was evaluated at selected downstream points. The watersheds at these downstream points are still relatively small, with acreages ranging from approximately 1,500 to 2,900 acres.

Alternative A

In the short-term, there are no expected changes in hydrology. Detectable downstream increases in stream flow are expected due to continued spruce mortality at an epidemic level.

Alternatives B and C

In the short-term, detectable increases in stream flow are possible but not likely in Indian and North Creek. The downstream segments of these streams have low to moderate sensitivity to disturbance, low to moderate stream bank erosion potential, and good channel stability. If there is additional stream bank erosion, it would likely be an extension of areas already eroding. The long-term effects would be similar to those described in Alternative A. In North Creek, the

possible long-term increase in stream flow must be incorporated into the design for reconstruction of FR 50079 adjacent to North Creek.

Figure 63 - Stream Flow Changes Downstream in the Project Area

					Comparison of Alternative and Alternative Scenarios Using Alternative A as the Baseline				
Downstream Points	**Stream Type**	**Recovery Potential**	**Bank Erosion Potential**	**Stream Channel Stability**	**A vs. B**	**A vs. C**	**A vs. A with continued spruce mortality**	**A vs. B with continued spruce mortality**	**A vs. C with continued spruce mortality**
East fork Indian Creek (small watersheds 3-6 and 999)	B6	excellent	moderate	good	no detectable change	detectable increase possible	detectable increase likely	detectable increase likely	detectable increase likely
Confluence east & west forks Indian Creek (small watersheds 1-6 and 999 downstream of Blanding Canal)	B3	excellent	low	good	no detectable change	detectable increase possible	detectable increase likely	detectable increase likely	detectable increase likely
Spring Creek near Blue Mtn Hwy (small watersheds 7-9)	B3	good	moderate	fair	no detectable change	no detectable change	detectable increase likely	detectable increase possible	detectable increase likely
North Creek near Blue Mtn Hwy (small watersheds 10-11)	B4	excellent	moderate	good	no detectable change	detectable increase possible	detectable increase likely	detectable increase likely	detectable increase likely

Watershed Resilience Rating

The following table summarizes the factors considered in developing the resilience rating and the rating by watershed.

Figure 64 - Watershed Resilience Rating Summary

	Short-Term – Following logging and before slash treatment		Long-Term	
	Alternative A	**Alternatives B and C**	**Alternative A**	**Alternatives B and C**
Indian Creek	High	High	Low	Low overall; moderate in headwaters
Spring Creek	High	High	Low	Low
North Creek	High	Moderate	Low	Moderate
Johnson Creek	High	High	Low	Moderate

When wildland fires over 300 acres occur, a Burned Area Emergency Rehabilitation (BAER) team evaluates the condition of the burned area, determines whether emergency treatments are necessary to protect values at risk, and makes recommendations for long-term restoration of the area.

Aspen, with its quick recovery after disturbance, would decrease as a watershed component in Alternative A. The treatments proposed in Alternatives B and C would increase the acreage of aspen; however, the acreages are small relative to the watersheds. Although the proposed vegetation treatments positively affect the resilience rating in the project area, on the watershed scale the effects are limited.

3.7.5 Relationship Between Short-Term Use and Long-Term Productivity

In areas where roads are widened and turnouts are constructed, the underlying soil would be taken out of production. Road decommissioning would return some roadways to productivity. SWCPs for timber operations would minimize on-site soil erosion and compaction.

Road and pipeline reconstruction would produce sediment during in-channel construction; SWCP and BMP requirements would ensure that the effects are short-term and of limited extent.

3.7.6 Irreversible/Irretrievable Commitment of Resources

Widening of FR 50079 is likely an irretrievable loss because it is unlikely that this collector road would be decommissioned.

The anticipated changes in hydrology are not irreversible; however, they are long-term. No changes in downstream channel morphology are anticipated. Increases in water yield would be undetectable downstream at the Forest boundary and beyond.

Diversion of an additional increment of water from the North Creek watershed by improving the diversion structures is likely irreversible and is irretrievable.

3.7.7 Forest Plan Consistency

The activities proposed in all alternatives are consistent with the direction, standards, and guidelines for MWS (Municipal Water Supply) and WPE (Watershed Protection/Improvement) in the Forest Plan.

3.8 SPECIFICALLY REQUIRED DISCLOSURES

This section contains disclosures or effects that are specifically required by federal law, regulations, or policy.

3.8.1 Threatened and Endangered Species

Current policy as stated in the Forest Service Manual (FSM 2670.32) regarding Threatened and Endangered species includes the following (USFS 1991): Assist states in achieving their goals for conservation of endemic species. As part of the National Environmental Policy Act process, review programs and activities through a biological assessment/evaluation to determine their potential effect on sensitive species.

Avoid or minimize impacts to species whose viability has been identified as a concern. If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and/or the species as a whole. Establish management objectives in cooperation with the states when projects on National Forest System lands may have significant effect on sensitive species population numbers or distributions. Establish objectives for Federal candidate species, in cooperation with the U.S. Fish and Wildlife Service (FWS) and the states.

Further direction as outlined in the Land and Resource Management Plan for the Manti-La Sal National Forest states (USFS 1986), "Manage habitat for recovery of endangered and threatened species. Where activities or uses may impact T&E species or their habitat, initiate consultation procedures. Include the results of consultation in determining the viability of the activity or use. Manage habitat of sensitive species to keep them from becoming threatened or endangered" (Page III-21).

On April 30, 2001, the U.S. Fish and Wildlife Service provided the Manti-La Sal National Forest with a list of Threatened, Endangered, and Candidate species that may occur within the area of influence of the proposed action (USDI Fish and Wildlife Serve 2001. Letter – response to announcement of intent to prepare an Environmental Impact Statement, April 30). Several listed species were dropped from further analysis based on the results of the Biological Assessment and Evaluation. A summary of these species is as follows with a brief description as to why they are not being carried through the analysis. More in-depth discussions and references are available in the project record (USDA Forest Service 2003. Musclow, Heather and Barbara Smith. *M-B Watershed Specialist's Report – Wildlife & Plants.* January).

3.8.1.1 Mexican Spotted Owl - Threatened

The Mexican Spotted owl (MSO) currently occupies a broad geographic area, but does not occur uniformly throughout its range. The MSO is found in mature mixed conifer forests of dense, uneven-aged stand structure. Breeding owls in southern Utah primarily utilize deep, steep-walled canyons with mature coniferous or deciduous trees in the bottoms. Nest sites are generally found on cliff ledges in Douglas-fir and to a lesser extent ponderosa pine and Gambel oak.

Critical habitat for the MSO was designated in July 1995 and again in February 2001. This designation includes the western half of the Monticello District. Most habitats deemed appropriate for the Mexican Spotted Owl have been surveyed on the Moab/Monticello Ranger District. To date, all nests located have been within canyon country, and PACs (Protected Activity Centers) have been designated. Surveys for MSO were conducted in 1990 and 1991 within the project boundary from Buckboard campground, over North Creek pass to Red Bluffs Campground. No Mexican spotted owls were found.

Habitat within the project area is not suitable for Mexican Spotted Owls. These birds have been located on the western portion of the Monticello District in canyons with associated large trees at the bottom of the canyons. The eastern portion of the District does not contain the canyon landscape suitable for MSO nesting.

3.8.1.2 Bald Eagle - Threatened

The bald eagle is a large raptor classified as a sea or fish eagle. During the breeding season, bald eagles are closely associated with water, feeding mainly on fish along coasts, lakeshores, or riverbanks. They are very opportunistic predators, especially during the winter. They will eat whatever is available including fish, waterfowl, small mammals, and carrion. In winter, they tend to concentrate wherever food is available, roosting in forested stands that provide protection from harsh weather. During winter, eagles generally move south to open water. They can be found in almost every state in North America for all or part of the year. During the winter, they tend to concentrate wherever food is available. It is not unusual to find several bald eagles feeding on the carcass of a large animal in southeast Utah in the winter. They commonly roost in large groups during the winter as well.

Nests are generally built in trees although cliffs are also used. Nests are usually located within two miles of water. There are no breeding or nesting pairs known or suspected on the Moab/Monticello District. Bald eagles are migratory in the area. Nesting is unlikely except around large bodies of water where they have ample fish for food. The closest known nesting pair of bald eagles is along the Colorado River. Isolated sightings of bald eagles have occurred near Buckeye Reservoir on the Colorado side of the Moab portion of the district.

No nests have been located within the vicinity of the Monticello District. The largest body of water is near the project area where fish may be available for food for bald eagles is Foy Lake. No bald eagles have been sighted near this lake.

3.8.1.3 California Condor – Endangered

Prior to the arrival of pioneers, the condor's range extended from British Columbia south through Baja California. Its most immediate range was limited to the coastal ranges of southern California with nesting occurring primarily in the chaparral-covered mountains and foraging in the grasslands. The Condor does not kill prey but feeds on animals that are already dead. Nesting takes place in caves, potholes, and sheltered rock outcrops.

As part of a captive breeding and reintroduction program, California condors were released into the wild at the Vermilion Cliffs near the Grand Canyon in 1997. Condors from this release site have been observed near Moab in 1997 and Grand Junction, Colorado, and Flaming Gorge

Reservoir in 1998. These sightings appear to be isolated incidents, and the birds returned to the Vermilion Cliffs. These individuals are part of a non-essential, experimental population and are not subject to the same level of protection as naturally occurring populations of threatened and endangered species. While condors have the potential to occur within the District, this species is not known to nest or roost here and occurs on a transient basis.

3.8.1.4 Colorado Pikeminnow, Razorback Sucker, Bonytail Chub and Humpback Chub - Endangered

The *Colorado pikeminnow* eats other fish and some insects and invertebrates. The species spawns during the spring and summer over riffle areas with gravel or cobble substrate. Eggs are randomly broadcast onto the bottom and usually hatch in less than one week. They prefer medium to large rivers where they can find a variety of habitats ranging from deep turbid rapids to flooded lowlands. The Colorado pikeminnow rarely reach more than one foot in length, although historically they reached up to 6 feet.

Razorback suckers eat algae, zooplankton, and other aquatic invertebrates. They prefer slow backwater habitats and impoundments. Their current range is the Colorado River and Gila River basins. This species spawns from February to June depositing over 100,000 eggs during spawning.

Bonytail chub feed on insects with the larger fish eating terrestrial insects such as beetles, grasshoppers and ants. They prefer swift water in larger channels of the Colorado River System. Females produce between 1,000-17,000 eggs that begin hatching about 9 hours after fertilization. Survival rate of young is 17-38%.

Humpback chub feed on aquatic arthropods, smaller fishes, and algae. They are spring and summer spawners, preferring river discharges near seasonal highs. Spawning takes place at cobble or gravel bars in the river. They are native to the upper Colorado River system originally thriving in fast, deep, white-water areas of the Colorado River and its major tributaries. Flow alterations that have changed the turbidity, volume, current speed and water temperature have had negative impacts on the species.

These are large fish native to the Colorado River system. Due to flow regulations, habitat loss, migration barriers, and the introduction of nonnative fishes, the current range and numbers of these fish have diminished. They now exist only in small portions of the Colorado River System. A recovery program agreement was signed in 1988 for these fish species.
This project would maintain Best Management Practices and therefore will not cause measurable changes in water flow or sediment yields to the Colorado River. The closest the project area would be to the Colorado River is at least 35 miles away. The distance to the San Juan River, which flows into the Colorado River, is even farther. See the section on Macroinvertebrates for more specific reasons as to why there would be no impact to Colorado River fishes. .

3.8.1.5 Black-footed Ferret - Endangered

The black-footed ferret has been considered the most endangered mammal in North America for many years. Although probably never abundant, it historically occurred throughout the Great

Plains in 12 states and 2 Canadian provinces. The range of the black-footed ferret coincides with that of three species of prairie dogs on which the ferret depends for food and habitat.

The black-footed ferret was given federal legal protection as an endangered species in 1967. Since the captive-breeding program began, more than 3000 ferrets have been raised. Starting in 1991, ferrets have been released at nine sites in six western states, including northwestern Colorado and northeastern Utah. There are occasional unconfirmed sightings from Grand and San Juan counties and other areas of the state, and they may have historically occupied areas near the Manti-La Sal National Forest. Remaining ferret habitat is now fragmented and extremely limited.

The project area does not contain appropriate habitat for black-footed ferrets and has no known prairie dog colonies, required by this animal for food and burrowing.

3.8.1.6 Southwestern Willow Flycatcher - Endangered

The southwestern willow flycatcher (SWWF) occurs in New Mexico, Arizona, southern California, and southern Utah and Colorado. It is a riparian obligate species, nesting in dense clumps of willow, or shrubs with similar structure (alder and some tamarisk) along low-gradient streams, wetlands, beaver ponds, wet meadows, and rivers. They are also found in brushy margins of fields. They prefer areas of high shrub density interspersed with openings or meadows. The shrub component is almost exclusively deciduous and includes willow, alders, cottonwoods, aspens, chokecherry, hawthorn, sumac, and wild rose. Thickets of trees and shrubs approximately 4 – 7 meters tall, with a high percentage of canopy cover and dense foliage from 0 – 4 meters of the ground form preferred nest sites.

The southwestern willow flycatcher was listed in 1995. It is endangered by extensive loss of habitat, brood parasitism, and lack of appropriate protective regulations.

Surveys to date have not located southwestern willow flycatcher on the Moab/Monticello District. A survey in 1991 showed that potential habitat does exist in Vega, Indian, and Johnson Creeks on the Monticello District. A survey by Utah Division of Wildlife Resources occurred on five sites on Moab District and two sites on Monticello District in 1998. Of the sites surveyed, three on the La Sal Mountains were considered to have potential habitat with a recommendation for future surveys (UDWR, Howe, Frank, 1998). Suitable and potential habitat as described by the US Fish and Wildlife Service does occur on the District, in willow patches along waterways or near small lakes or wet meadows. Some conflict exists as to whether the range of this subspecies extends farther than 20 miles into Utah. Until resolved, we must assume that any willow flycatcher found on the District may be a southwestern willow flycatcher. Accordingly, standard operating procedures have been established for the Monticello District, based on a 10//2001 letter from the U.S. Fish and Wildlife Service. These procedures include:

- Inventory areas of suitable habitat following USFWS protocol. For record, map areas where suitable habitat occurs (stream reaches or wet meadows with willows or willow-like shrubs). If SWWF are found, proceed according to USFWS protocol and follow mitigation measures for known territories.
- To protect and/or enhance areas of suitable potential habitat, follow riparian guidelines for forage utilization, browse use, and soil disturbance as outlined in Manti-La Sal

National Forest Land and Resource Management Plan (1986). Maintain and/or enhance willow habitat, and monitor its condition and regeneration. Monitor for PNC (Potential Natural Community) and use PNC as a reference point.

- Known SWWF habitat and areas with potential to support more robust willow patches may require fencing to protect the willow component and allow regeneration.
- Monitoring of riparian habitat and all monitoring proposals include set time limits, beyond which decisions will be made whether or not to continue, modify, or end the existing grazing and if restoration is needed.
- Fencing should be required when impacts approach, but are not allowed to exceed, set thresholds to such factors as willow regeneration, bank erosion, depauperate or altered macroinvertebrate populations, and invasive species.

The existing pipeline and catchments are old and rusted, leaking in several locations. These areas provide water and in some cases support small wetlands and can be important to wildlife. Based on survey results, little to no developed willow patches were located in association with pooled water caused by pipeline leaking. Continued water seepage from the old water pipe would help maintain SWWF habitat of small pools if willows were present. Surveys show little wetland/riparian development at any of the sites, and certainly not well-developed willow patches. In most of these cases, the stream gradient and vegetation would not support SWWFs.

3.8.1.7 Gunnison Sage Grouse – Candidate

Historically, Gunnison sage grouse were found throughout the southwestern portion of Colorado and southeastern Utah. Now they are thought to occur in six to seven counties in Colorado and only one county in Utah. Their known historic habitat consisted of sagebrush communities below 6000 feet elevation in both Grand and San Juan counties in Utah. They prefer large sagebrush expanses with a diversity of grasses, forbs, and healthy riparian ecosystems.

The Gunnison sage grouse was petitioned as a new species in 1995, recognized as such by the American Ornithological Union in 2000, and designated a Candidate species by the USFWS in 2000.

No sagebrush openings are expected to occur in the location of proposed vegetation treatment. Portions of the pipeline runs through sagebrush complexes with black sagebrush, mixed shrubs such as mahogany and oak. A total of 65 acres of sagebrush occur where pipeline construction may take place. The largest continuous area is 21 acres. The elevation of the sagebrush openings is approximately 8,000 feet, which is at least 2,000 feet higher in elevation than where Gunnison sage grouse occurs. The project will not disturb habitat suitable for Gunnison sage-grouse occupancy.

3.8.1.8 Western Yellow-billed Cuckoo - Candidate

The yellow-billed cuckoo is a riparian obligate bird that feeds in cottonwood groves and nests in willow thickets. It migrates to South America for the winter and is a late arriver to the United States where it is the only cuckoo to nest in this country. It arrives in the US in late June or early July and migrates south in August. It nests in open-cup structures that are small, flat, shallow and flimsy made of twigs, vines and rootlets. Nest sites have been correlated with large and relatively large willow-cottonwood patches, dense understories, high local humidity, low local

temperature, and in proximity to slow or standing water. Their habitat requirements include low dense understories with branches 3 - 5 meters (9-15 feet) above the ground, typically willow. They are rarely found in forest patches less than 24 ha (59 acres) in size.

Since 1990 there have been several casual observations of yellow-billed cuckoos in Utah, including documented breeding in Moab in 1991 (Center for Biological Diversity 1998) and birds located along the San Juan River (Personal Communication, UDWR). No large expanses of cottonwood trees would be affected by this project.

3.8.1.9 Jones Cycladenia – Threatened

This plant is restricted to the canyon lands of the Colorado Plateau in Utah and in adjacent to Coconino County in Arizona. It is a rhizomatous herb with round, somewhat succulent leaves and rosy-pink hairy flowers that bloom from mid April to early June. Jones' cycladenia grows in gypsiferous soils that are derived from the Summerville, Cutler and Chinle formations. These soils are shallow, fine textured and intermixed with rock fragments. Other plants that associate with Jones' cycladenia are eriogonum and ephedra, pinyon, juniper and other mixed desert shrub communities at elevations ranging from 3,500-6,000 feet elevation. This plant has not been located on the Moab/Monticello Ranger District. Its closest known location is adjacent to the forest on the northwest side of the La Sals. The projects in question will not disturb individual plants or suitable habitat for Jones' Cycladenia occupancy.

3.8.1.10 Navajo Sedge – Threatened

This species was listed with critical habitat in 1985. It is a member of the sedge family, a grass-like plant. It reaches a height of 2.5-4 cm. It grows in a clumped form since stems grow from a rhizome. It is located in seeps and springs on vertical cliffs of pink-red Navajo sandstone at elevations between 5,000 and 5,900 feet. Other plants inhabiting the vertical seeps include monkey flower and weed orchid. Originally, this plant was only known from sites in northern Arizona but has recently been located in extreme southeast Utah. Its rarity is a result of its limited geographic range, narrow habitat specificity, and small populations. An approved recovery plan has been written.

There is no critical habitat or known populations on the Moab/Monticello Ranger District or the project area. The projects in question will not disturb individual plants or suitable habitat of Navajo sedge.

3.8.2 Cultural and Historic Resources

Cultural resource surveys have been completed for the proposed projects. Design features for the management and protection of cultural resources have been included in the alternatives (see Appendix A). Eligible sites would be avoided during timber harvest and road construction activities; therefore, there would be no effect to these sites. The State Historical Preservation Office (SHPO) has been consulted and has concurred with the determination of "No Historic Properties Affected" for these activities.

The existing water system was recorded as a Historic District, but was determined to be ineligible for inclusion to the National Historic Register. SHPO consultation has been completed and concurrence with the determination of "No Historic Properties Affected" obtained. Historic

and prehistoric resources would not be affected by the proposed action. Inventory and SHPO consultation records are available in the project record (USDA Forest Service, 2003. Donald C. Irwin, *Summary of Monticello City Water Improvement Project – Cultural Resources*, 16 January).

3.8.3 Wetlands and Floodplains

There are wetlands, riparian areas, and floodplains in the project area. Management activities designed to protect these resources conform to the direction for floodplains (Executive Order 11988) and wetlands (Executive Order 11990).

3.8.3.1 Wetlands

The Forest does not have a comprehensive inventory of wetlands in the project area or watershed analysis area, but a hydrologic reconnaissance of the project area was completed in 2001 for this analysis. Wet areas were identified in and adjacent to proposed timber harvest and water collection and conveyance system reconstruction areas.

Reconstruction of the water system would necessitate some disturbance in wet areas. There are wet areas that are supported by springs and by leaks in the water system. The reconnaissance report suggests reconstruction of spring boxes is unlikely to divert all water at specific locations and these areas of wetland/riparian vegetation would remain; minimal wetland vegetation would be lost. Repair of the pipeline will eliminate leaks, which would affect small wet areas that are dependent upon them. The extent of this is unknown because these areas may also receive water from seeps, stream flow, or shallow ground water.

Ground-based timber harvest operations (tractor, forwarder, cable) would avoid wetlands and wet areas. Construction of temporary roads to support timber harvest would affect wet areas and/or wetlands in the Jackson Ridge/west fork of Indian Creek area and in the headwaters of North Creek. Unclassified road utilized for harvest or pipeline access would be decommissioned as identified in Alternative descriptions when work is completed. Decommissioning would include effective closure to vehicles and reshaping of portions of the travel way to restore water flow paths through the riparian/wetland area.

Soil and Water Conservation Practices (SWCPs) would be implemented to mitigate and are described in Appendix A. Some of the practices prohibit activities in or adjacent to wetlands and wet areas; avoidance is very effective. The practices controlling adjacent operations are effective in minimizing disturbance when fully and properly implemented. Implementation is typically good for timber sale operation and road and pipeline reconstruction. Inspection by timber sale administrators, engineering representations, and other technical specialists is important in ensuring proper implementation. These wetlands should not evidence extensive adverse effects from proposed timber harvest, road construction, or pipeline activities.

3.8.3.2 Floodplains

There are flood-prone areas adjacent to all the perennial drainages; however, detailed floodplain mapping has not been done in the project area.

FR 50079 encroaches on the flood-prone area where the road closely parallels North and Indian Creeks. Reconstruction of FR 50097 would not increase the areas of encroachment in flood-prone areas.

Some of the water collection facilities and portions of the pipeline are located in the stream channel and flood-prone areas; relocation is not practicable. Applicable design features, SWCPs, and other requirements would be used to minimize adverse effects due to occupancy in the flood-prone area and to ensure appropriate design for public health during high water events.

Ground-based timber harvest would not affect flood-prone areas. SWCPs have been identified that would minimize effects adjacent to the stream channel network.

The floodplains would not receive measurable impact by upstream influences.

More in-depth discussions and references regarding wetlands and floodplains are available in the project record (USDA Forest Service 2003. Foster, Katherine. *Wetlands and Floodplains Specialist's Report.* 29 January). A detailed analysis of affects to watershed resources and references is available in section 3.7 Watershed Resources.

3.8.4 Environmental Justice

The alternatives were assessed to determine whether they would disproportionately impact minority or low-income populations, in accordance with Executive Order 12898. No local minority or low-income populations should be disproportionately impacted by implementation of any alternatives.

3.8.5 Effects of Alternatives on Social Groups

There would be no overall differences between alternatives in effects on minorities, Native American Indians, women, or civil liberties of any American citizen.

3.8.6 Prime Farm Land, Rangeland and Forest Land

All alternatives are in accordance with the Secretary of Agriculture Memorandum 1827 for prime farm land, rangeland, and forest land. "Prime" forestland is a term used only for non-federal land, which would not be affected by proposed alternatives. Regardless of the alternative selected, National Forest System lands would be managed with sensitivity to adjacent private and public lands.

3.8.7 Energy Requirements and Conservation Potential

Alternatives requiring the most roadwork and logging have the least potential for conserving energy. In terms of petroleum products, the energy required to implement any of the action alternatives is inconsequential when viewed in light of production costs and the effects on the national and worldwide petroleum reserves.

3.8.8 Effects on the Human Environment

The civil rights of any American citizen, including women and minorities, are not differentially affected by implementation of any alternative, including the No-Action Alternative.

3.8.9 Conflicts with Other Agency Goals and Objectives

Public involvement with other Federal and State agencies indicate there are no other major conflicts between the provisions of the proposed action and the goals and objectives developed for other governmental entities.