

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter discloses the environmental consequences of implementing the alternatives described in *Chapter 2 - Alternatives*. The analysis discloses the physical and biological impacts to resources that are potentially affected by activities proposed by the alternatives and provides the scientific and analytical basis for the comparison of alternatives.

Impacts to the environment are considered in terms of their direct, indirect, and cumulative effects. Definitions for these effects are as follows (40 CFR 1508.7 and 1508.8):

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- ❖ Direct effects - **Effects caused by the action and occurring at the same time and place.**
 - ❖ Indirect effects - **Effects caused by the action but occurring later in time or further removed in place.**
 - ❖ Cumulative effects - **Effects that result from the incremental impact of the action when added to other past, present and reasonably foreseeable actions.**
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CUMULATIVE EFFECTS

The cumulative effects analyses includes the effects of future or concurrent activities that have been identified in the area. The cumulative effects area for analysis varies depending on the resource and the issue. Therefore, the activities included in each cumulative effects analysis also varies. The sizes and definitions of the areas for which cumulative effects were analyzed was based on two factors: the spatial scale at which the effects of an alternative on a given resource are known; and the spatial scale at which the effects of an alternative on a given resource are significant.

VEGETATION

INTRODUCTION

This section describes the effects of the proposed actions and alternatives on the forest structure and wildfire potential. The current structure of the Project Area's forest is homogenous and does not reflect historical landscape patterns (see *Chapter 3 – Affected Environment*). The proposed restoration projects would change the structure of the forest both at the stand level and landscape level.

Because of the current stand conditions in the area, much of the assessment area is at risk for large wildfires (Foster Wheeler, 1999). Sixty percent of the area within the Horse Creek, Waterton/Deckers and Buffalo watersheds is ranked as high fire hazard. The proposed vegetation treatments and prescribed burning would alter the amount and arrangement of available forest fuels, influencing the potential for future wildfire in the area.

MANAGEMENT DIRECTION – FOREST VEGETATION

The Forest Plan provides guidance for the management of forested area on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. A detailed list of these can be found in the Forest Plan. The standards and guidelines that apply to the proposed actions are given below.

Forest-Wide Direction

FOREST-WIDE GOALS

- ❖ **Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool**
- ❖ **Provide to increased production and productive use of wood fiber while maintaining or improving other resources**
- ❖ **Improve age class and species distribution of tree stands forest-wide**
- ❖ **Improve the health and vigor of all vegetation types**



FOREST-WIDE STANDARDS AND GUIDELINES

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- ❖ **Apply a variety of silvicultural systems and harvest methods which best meet resource management objectives. For ponderosa pine stands these methods include shelterwood, clearcut, seedtree, group selection, and single tree selection methods.**
 - ❖ **Assure that all evenaged stands scheduled to be harvested during the planning period will generally have reached the mean annual increment of growth**
 - ❖ **The maximum size of openings created by the application of evenaged silviculture will be 40 acres regardless of forest cover types**
 - ❖ **Establish a satisfactory stand on cutover areas, emphasizing natural regeneration, within five years after final harvest except: for permanent openings that serve specific management objectives; when other resource objectives dictate a different period.**
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Management Area Direction

MANAGEMENT AREAS 2A, 2B, 7A & 7D DIRECTIONS (95 PERCENT OF VEGETATION TREATMENT AREA)

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- ❖ **Manage forest cover types using shelterwood in interior ponderosa pine**
 - ❖ **Apply intermediate treatments to maintain growing stock level standards**
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MANAGEMENT AREA 4B DIRECTION (4 PERCENT OF VEGETATION TREATMENT AREA)

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- ❖ **Manage forest cover types to provide variety in stand sizes, shape, crown closure, edge contrast, age structure and interspersion**
 - ❖ **Manage forest cover types using shelterwood in interior ponderosa pine**
 - ❖ **Use selection harvest method where the objective is to perpetuate unevenaged stand structure, use clearcut method in evenaged stands located on north and east aspects or in evenaged stands with above average windfall risk**
 - ❖ **Apply intermediate treatments to maintain growing stock level standards**
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MANAGEMENT AREA 5B DIRECTION (1 PERCENT OF VEGETATION TREATMENT AREA)

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- ❖ **Manage forest cover types to achieve and maintain desired thermal and hiding cover**
 - ❖ **Manage forest cover types using shelterwood in interior ponderosa pine**
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MANAGEMENT DIRECTION – FUELS

Forest-Wide Direction

FOREST-WIDE GOALS

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- ❖ **Provide a cost-effective level of fire protection to minimize the combined costs of protection and damages and to prevent loss of human life**
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FOREST-WIDE STANDARDS AND GUIDELINES

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- ❖ **Provide a level of protection from wildfire that is cost efficient and that will meet management objectives for the area.**
 - ❖ **Maintain fuel conditions that permit fire suppression forces to meet fire protection objectives for the area.**
 - ❖ **Use prescribed fire to accomplish resource objectives such as reducing fuel load buildup, wildlife habitat improvement, etc.**
 - ❖ **Limit use of prescribed fires on areas adjacent to riparian areas to protect riparian and aquatic values.**
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Management Area Direction

MANAGEMENT AREAS 2A, 2B, 7A & 7D DIRECTIONS (95 PERCENT OF VEGETATION TREATMENT AREA)

There is no specific management area direction for these MAs.

MANAGEMENT AREAS 4B, 5B DIRECTION (5 PERCENT OF VEGETATION TREATMENT AREA)

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- ❖ **Maintain fuel conditions which permit fire suppression and prescribed fire to maintain habitat needed for selected species or species population levels.**
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EVALUATION CRITERIA

Future or on-going Actions for Cumulative Effects Analysis

There are several future foreseeable, or on-going, activities that could create cumulative effects for forest structure and wildfire potential when combined with the proposed actions. These include the on-going and proposed harvesting and prescribed burning on adjacent lands owned by Denver Water, and on-going prescribed burning in stands affected by the Douglas-fir Tussock Moth on National Forest land. *Chapter 2 – Alternatives* provides a general description of the activities for these projects. On Denver Water's lands, 55 acres have been harvested to-date and are planned for prescribed burning. An additional 190 acres have been prepared for harvest in the near future. Vegetation management plans have been developed for an additional 2,000 acres. These lands could be treated in the next 5 to 10 years. In areas affected by the Douglas-fir Tussock Moth, approximately 11,000 acres of prescribed burning remains to be completed in the Project Area. Approximately 1,000 acres would be completed outside the Project Area, to the north and east.

Approximately half of the 11,000 acre Lower Elk Creek Management Unit is being considered for treatment to reduce fire risk. These lands are a mixture of private and State owned lands. At this time it is unknown how many of the private landowners would elect to have the proposed treatments completed. Although the exact acreage of treatment is not yet determined, it is likely that there would be a reduction in the area of high fire risk across this Unit due to the proposed management activities such as thinning and created fire breaks.

Forest Structure

DIRECT AND INDIRECT EFFECTS

The change in forest structure is evaluated by assessing the change in habitat structural stages and crown closures of the existing forest and comparing that with post-treatment conditions. This is done at both the individual forest stand level and across the landscape. The post-treatment conditions are also compared to the historical forest structure and landscape vegetation patterns. The evaluation also describes how the change in structure may influence the disturbance regimes within the individual stands and across the landscape.

CUMULATIVE EFFECTS

The analysis of cumulative effects compares the cumulative area of proposed vegetation treatments and prescribed burning on all lands within the three watersheds in the Project Area. This evaluation includes examining the cumulative change in landscape patterns and disturbance regimes that may result from these activities.

Wildfire Potential

DIRECT AND INDIRECT EFFECTS

The proposed actions that would have the greatest effect on wildfire potential are the effects of the tree cutting and prescribed burning. The proposed road reclamation would not change access for fire fighters

and therefore, would have no effect on the potential for spread of wildfire. The roads proposed for reclamation are mostly short spur roads that were created for temporary access associated with timber harvest, mineral exploration, or are of unknown origin. These are unclassified roads that are closed to the public and in poor condition. Other system roads access these same areas and can be used for fire suppression. The proposed revegetation of the Buffalo Creek burn area and the Gill Trail improvements would have little direct effect on wildfire potential and are therefore, discussed only briefly in general terms.

The wildfire potential is evaluated both in the short-term and long-term. Short-term effects are evaluated by comparing the amount of area that may have increased fire danger following tree cutting and prior to prescribed burning. In areas that are harvested, there would be an increase in ground fuels due to woody debris or slash created by the activity. Prior to prescribed burning, these ground fuels could increase fire risk for a period of one to two years.

Another short-term effect on wildfire potential is the risk of escape during prescribed burning. A detailed burn plan is required prior to prescribed burning on National Forest land. These plans outline specific requirements for carrying out the burning operations. Included in these plans are the specific weather conditions under which the burning maybe conducted, the personnel and equipment requirements for lighting and containing the burns, and the type of fire lines and fuel breaks needed to contain the fire. These types of plans are intended to reduce the risk of escape as well as insure the desired burn results are achieved. However, there are factors that influence the risk of escape that cannot be predicted with absolute certainty. There would always be some degree of risk of escape. The risk of escape for each alternative is evaluated by comparing the total area of prescribed burning and estimated amount of fuels to be burned.

Long-term effects on wildfire potential are evaluated by comparing the area and arrangement of high wildfire hazard following silviculture treatment and prescribed burning. The arrangement of fuels and stand conditions across the landscape influences the potential for wildfires. Large, inaccessible areas of continuous high hazard conditions have a higher potential for large wildfires than isolated, but easily accessed pockets of heavy fuels.

CUMULATIVE EFFECTS

The cumulative effects are evaluated by qualitatively evaluating the overall change in wildfire potential due to harvests and prescribed burning on all lands based on estimated post treatment conditions.

ALTERNATIVE COMPARISON

Alternative A

FOREST STRUCTURE

Direct and Indirect Effects

Alternative A would have no direct short-term effect on the structure of the forest stands in the Project Area. However, there would be indirect and long-term effects. The existing trend away from the historical forest structure as discussed in *Chapter 3 – Vegetation*, would continue. As stands in the



Project Area continue to mature, trees in those stands would become increasingly susceptible to attack by insect and disease. This would increase the potential for an epidemic and large areas of tree mortality. This type of disturbance, especially when combined with the fire risk created by large homogeneous areas of closely spaced trees, would increase the likelihood of a large hot fire developing in the Project Area.

This kind of disturbance regime, where large areas of forest are disturbed by high intensity and large scale events, is not typical of the historical pattern in the ponderosa pine stands of the area (Brown et al., 1999). This type of disturbance regime creates contiguous blocks of land in the same habitat structural stage, rather than a mosaic of stand ages and structures that existed prior to European settlement.

Although, historically, insects played a role in the ponderosa pine stands, fire appears to have been the dominant disturbance agent. By maintaining the current stand conditions and suppressing wildfire, insects and disease may become the major disturbance agent in the Project Area. A long-term effect of Alternative A would be to perpetuate a trend towards a “boom and bust” cycle of disturbance between insects and disease and fire in the ponderosa pine and Douglas-fir forests. This kind of disturbance regime and the resulting landscape pattern is much different from the historical landscape.

Cumulative Effects

The forest structure in the Project Area would be altered by prescribed burning in stands affected by the Douglas-fir tussock moth, and by timber harvest on adjacent lands owned by Denver Water. There are 10,870 acres of prescribed underburning planned over the next 5 to 6 years. The objective of these burns is to reduce ground fuels in the burned stands. While some understory seedlings and saplings would be killed during the burning, many of the stands would retain a well-developed understory. The burns would not create new openings and most of the larger trees would remain. Although the burning would reduce ground fuels, most of the stands would still have higher stand densities and fewer openings that existing prior to European settlement. Approximately 7 percent of the total land area and about 9 percent of the Douglas-fir and ponderosa pine forest would be burned in the Project Area.

Activities planned on the Denver Water lands could include 2,000 acres of thinning followed by prescribed burns. These activities would be completed over the next 5 to 10 years. The objective of these treatments would be to create stand conditions that resemble historic conditions and to reduce wildfire hazard.

The cumulative area treated by these projects would be approximately 12,870 acres, or about 9 percent of the Project Area. As discussed above, the burning in Douglas-fir Tussock Moth stands would only minimally change the affected stand’s structural characteristics. The thinning and burning on Denver Water lands would significantly change the structure of the treated stands, but would only treat 2 percent of the montane forest in the Project Area. Therefore, this alternative would not provide a significant cumulative change in the structure or disturbance regimes in the Douglas-fir and Ponderosa pine forests of the area.

WILDFIRE POTENTIAL

Direct and Indirect Effects

Alternative A would have no direct effect on the wildfire potential in the Project Area. An indirect long-term effect would be an continual increase in wildfire hazard. Currently, the wildfire hazard of many of the stands in the area is high, even though ground fuels are generally low. However, the standing green fuels are plentiful and the existing stand structures create a high risk of crown fires. Overtime, as ground fuels accumulate from natural mortality due to stand maturity or insect and disease, the risk of a wildfire

increases. Because of the dense stand structures, should a fire ignite, the risk of a large catastrophic crown fire also increases.

Cumulative Effects

This alternative does not propose actions to reduce the wildfire potential in any of the forest stands in the Project Area. However, the cumulative effects from prescribed burning on 10,870 acres of National Forest land and timber harvest and burning on 2,000 acres of Denver Water land would slightly reduce wildfire risk in the Project Area. The prescribed burning on the Tussock Moth areas would reduce the smaller ground fuels in these stands, reducing the chance of a wildfire igniting. However, most of the larger ground fuels and standing green fuels would remain on these sites. Some areas would be more open with a greater proportion of ponderosa pine in the overstory but most areas would still have ladder fuels (smaller understory trees). The prescribed burns would reduce the fire hazard in these stands from a high to a moderate hazard. Because many ladder fuels would remain and stand densities would not be significantly reduced, the hazards of a crown fire, if a fire ignites, would remain.

The actions expected on Denver Water Lands would significantly reduce wildfire hazard on the treated areas. These treatments would reduce stand densities, remove the ladder fuels and burn the created ground fuels. These activities would reduce both the possibilities of a fire igniting and the development of a crown fire should a fire ignite. The hazard rating of these stands would be low following treatment.

The cumulative effect of these foreseeable future actions would be a slight reduction in the wildfire hazard on 10,870 acres and a significant reduction in wildfire hazard on 2,000 acres. However, 80 percent of the high and the moderately high wildfire hazard areas would remain in the Project Area.

Treatment of high fire risk area in the Elk Creek Management Unit would further reduce the risk of wildfire in the larger area. The Elk Creek Management Unit is outside of the Project Area, but its proximity is such that a fire that ignites in the Unit could easily spread to the Project Area. This was seen in the Hi Meadow fire which burned a small portion of both the Elk Creek Management Unit (135 acres) and 55 acres in the Project Area. The exact number of acres of risk reduction is unknown at this time because of uncertainty as to which landowners would chose to treat their lands. The amount of treatment could be approximately half of the 11,000 acre unit. The overall cumulative effect of this and other actions would be a further reduction in the wildfire risk across the combined Project Area and the Elk Creek Management Unit.

The Hi Meadow fire burned approximately 55 acres of the Project Area. On the burned areas, the risk of wildfire is now very low. However, less than half a percent of the 140,000 acre Project Area was burned and the resulting reduction in overall wildfire risk would be considered negligible. However, the fire did burn 10,700 acres in the immediate vicinity of the Project Area. This fire would reduce the risk of subsequent wildfire across the larger area, although not within the Project Area.

Alternative B

FOREST STRUCTURE

Direct and Indirect Effects

Alternative B would treat 12 percent of the Project Area, changing the structure of many forest stands. The proposed actions would reduce canopy closures from a range of 40 to 80 percent to an average of 25 percent in the 13,000 acres of thinned forest. Openings from 1 to 40 acres would be dispersed among the thinned areas and would convert a total of 4,400 acres of forest to openings.



In the thinned areas, smaller understory trees would generally be selected for removal, leaving larger more dominant trees. The exception would be in stands where there are only younger/smaller trees or stands with an overstory infected with mistletoe. In these stands, some of the healthier young trees would be left. The resulting stands would be composed primarily of mature trees with patches of immature trees scattered throughout the area, as well as many large openings. In the forested areas, canopy closure would average 25 to 30 percent. Prescribed burning, which would follow the tree cutting, would remove some of the smaller trees as well as reduce woody fuels. The proposed treatments would create patches of different structural stages in a mosaic pattern across the treated areas.

Table 4-1 presents the change in structural stages for the treated stands. Prior to treatment, almost 69 percent of the area is covered by mature stands with closed canopies. Only 1 percent is in the grass-forb stage. Following treatment, 25 percent of the area would be grass-forb (openings) and there would not be any closed mature or sapling-pole stands. The treated areas would be converted to open mature and sapling-pole forest interspersed with openings. The ponderosa pine and Douglas-fir forests in these stands would begin to resemble those that historically existing in the area. The open stand conditions in thinned stands would encourage the development of understory grasses and shrubs. Overtime, this type of understory, combined with the thinned conditions, would create light ground fuels and a stand structure that could carry a low intensity fire with only occasional torching of individual crowns. If ground fires were allowed to burn through these stands over time, the more open environment could be maintained by discouraging the establishment of understory trees. However, if fire is suppressed and no other means is used to maintain open conditions, stands would eventually grow back to the denser more uniform conditions that exist today.

Table 4-1. Change in Structural Stages in the Treated Stands

Structural Stage	Area before treatment (%)	Area after treatment (%)
Grass-forb	1	25
Seedling-Sapling	1	1
Open Sapling-Pole	5	13
Closed Sapling-Pole	8	0
Open Mature	14	59
Closed Mature	69	0
Old Growth	2	2

Over in the long term, trees in the thinned stands would be under less competitive stress and therefore, less susceptible to attack by insects and disease. Insect and disease mortality would likely be limited in extent by the mosaic of structural stages on the landscape and the increased vigor of the trees due to lower stand densities. In the short-term, however, there would be an increased risk of insect attack in the residual trees after the thinning and prescribed burning is completed. The ground disturbance from the thinning and the heat from the burning can put the trees that remain on-site under stress and more susceptible to bark beetle attack. This effect can last up to two years.

Through opening up the stands, creating a mosaic of structural stages across the treated stands and removing much of the existing woody fuels, historical disturbance regimes would be re-introduced into the area. The changes presented in Table 4-1, above, represent changes in treated stands only, not the structural change across the Project Area. Table 4-2 displays the change in structural stage on National Forest Lands in the Waterton-Deckers and Horse Creek watersheds. These watersheds are used because the majority of the mature montane forest in the Project Area can be found in these two watersheds.

Table 4-2 shows the changes of the proposed vegetation treatments on a broader, landscape scale. The proportion of closed mature forest across these two watersheds would be reduced from 66 percent of the area to 54 percent. The amount of the grass-forb stage would increase by 4 percent. While the changes in forest structure would be significant in the treatment areas. However, the majority of the landscape would still be dominated by closed mature forest stands.

This alternative proposes revegetation with ponderosa pine seedlings of 1,000 acres in the Buffalo Creek burn area. Riparian areas would also be revegetated using native species. Across the Project Area, this would increase the amount of area in the shrub-seedling structural stage by less than one percent. However, locally, this would add to the structural stage diversity within this part of the Project Area.

Reclaiming existing unclassified roads would slightly increase the area of the grass-forb structural stage (50 acres). However, the result would be narrow ribbons of grass cutting through a variety of habitat types and would result in little change in the overall forest structure.



Table 4-2. Change in the Habitat Structural Stages in the Waterton-Deckers and Horse Creek Watersheds.

Structural Stage	Area before treatment (%)	Area after treatment (%)
Grass-forb	2	6
Seedling-Sapling	1	1
Open Sapling-Pole	4	5
Closed Sapling-Pole	8	7
Open Mature	16	24
Closed Mature	66	54
Old Growth	3	3

Cumulative Effects

The cumulative effect includes the effects resulting from actions proposed by this alternative, prescribed burning in Tussock moth defoliated stands and thinning and burning on Denver Water lands. Alternative 1 provides a discussion of the individual effects of the future foreseeable actions. The cumulative effects of these combined actions would be a change of forest structure on 22 percent of the total Analysis Area and 28 percent of the Douglas-fir and ponderosa pine forest types. The combined effect would be a further reduction of the chance in crown fires and insect and disease epidemics in these stands and adjacent areas. However, more than 60 percent of the area's montane forest would remain unchanged and at risk for crown fires and insect and disease attack.

WILDFIRE POTENTIAL**Direct and Indirect Effects**

The slash that is created by thinning would increase ground fuels in the affected areas and would, therefore, increase the short-term wildfire potential. The logging slash left on-site would remain for a period of one to three years. On 11,600 acres the, trees larger than 5 inches in diameter would be removed from the site, leaving only smaller slash. On the remaining 5,800 acres, none of the cut trees or slash would be removed. In both areas the potential for ignition of a fire would increase until prescribed burning could be completed. However, the thinning would be scheduled over several years so that a large, contiguous block of slash and high fuels would not be created.

The amount of fine fuels created in areas of tree removal and those without would be similar. Because these fuels are at the highest risk of ignition, the risk of wildfire ignition would be similar in both areas. However, in the areas where trees are left on-site, the larger available ground fuels would generate more heat and burn longer, increasing the risk that a fire, once ignited, could spread into a larger area. For all areas, a variety of methods would be used to keep the created slash close to the ground and away from the crowns of the remaining trees. The woody fuels would also be arranged to minimize the risk of a crown fire.

Harvested trees would be left on-site in areas with poor access, steep slopes, or small (unmerchantable) tree size. Areas with poorer access and steeper slopes, combined with higher fuels would have an increased risk of escape when these areas are burned. This analysis assumes that control measures to prevent escape are effective.

This alternative would have beneficial long-term effects on the risk of wildfire in the Project Area. Wildfire potential would be decreased by reducing the density of many stands and removing the fuels. Nearly 13,000 acres, or 15 percent, of the high hazard stands in the Project Area would be treated. This treatment would break up the contiguous high hazard blocks and create some fire breaks throughout the area. An additional 4,400 acres of medium and low wildfire hazard areas would be treated and be rated at low hazard following treatment and prescribed burning. The combined treatment areas would reduce the risk of wildfire in the Project Area and on adjacent lands by limiting the extent of wildfires that might develop in the area.

As stands in the vegetation treatment areas continue to grow, stand densities would again increase and woody fuels would accumulate. This would, overtime, diminish the effects of the actions unless fire or silvicultural methods were used to maintain the open stand conditions.

Cumulative Effects

The cumulative effect within the Project Area resulting from actions proposed by this alternative, prescribed burning in Tussock moth defoliated stands, and thinning and burning on Denver Water land would be a reduction of the high wildfire hazard area of about 32 percent, or 27,800 acres. The risk of wildfire across a larger area would be further reduced due to actions in the Lower Elk Creek Management Unit. The Hi Meadow fire has also reduced wildfire risk across the larger area. Alternative 1 provides a discussion of the individual effects of the future foreseeable actions.

Alternative C

FOREST STRUCTURE

Direct and Indirect Effects

The effects on forest structure for this alternative would be very similar to those discussed for Alternative B. In this alternative, trees would be left on-site for a greater proportion of the treated areas. Approximately 8,400 acres would not have the larger fuels removed prior to burning, an increase of 2,600 acres from Alternative B. The incidence of heat related stress would be higher in stands where fuels are not removed so the overall potential for stress and bark beetle attack would be greater in this alternative. This would not be expected to be a large impact on the long-term forest structure and disturbance regimes.

This alternative would not use biosolids for revegetation in the Buffalo Creek burn area. This could indirectly affect forest structure by reducing the area that is successfully regenerated over Alternative B. However, in areas where revegetation is successfully accomplished, the result as compared to the No Action alternative would be the same as discussed for Alternative B.

Except for the differences discussed above, the effects of this alternative would be the same as those discussed for Alternative B.



Cumulative Effects

The cumulative effects on forest structure for this alternative would be the same as the effects of Alternative B.

WILDFIRE POTENTIAL

Direct and Indirect Effects

Alternative C would have the same effects on wildfire potential as discussed for Alternative B except as discussed below.

In this alternative, trees would be left on-site for a greater proportion of the treated areas. Approximately 8,400 acres would not have the larger fuels removed prior to burning, an increase of 2,600 acres from Alternative B. This would increase the risk of escape during prescribed burning and increase the potential for fire in the short-term over Alternative B. Poor access, steeper slopes and a higher fuel loading in these areas would increase the difficulty of control.

Like Alternative B, this alternative would have the net effect of a short-term increase in wildfire potential but a decrease in the long-term potential. The long-term effects would be the same for both alternatives.

Cumulative Effects

The cumulative effects on forest structure for this alternative would be the same as the effects of Alternative B.

Forest Plan Compliance

The Forest Plan Goals, Standards and Guidelines and Management Area direction would not necessarily be followed by the action alternatives. As discussed in Chapter 1, this EA presents a proposal that was not anticipated at the time of the Forest Plan (1984). The concept of this project is landscape restoration and wildfire risk reduction rather than maximization of timber production, which was the focus of the Forest Plan. The types of activities proposed are not guided by the management prescriptions designed at the time of the Forest Plan. The following direction of the Forest Plan would not be followed by the action alternatives.

FOREST VEGETATION

Forest Plan Goals

The first two goals for managing vegetation on forest lands are:

- ❖ Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool
- ❖ Provide to increased production and productive use of wood fiber while maintaining or improving other resources
- ❖ Improve age class and species distribution of tree stands forest-wide

The proposed project's objectives are not oriented towards increased production of wood fiber. The intent is not to maximize the yield from the treated areas, therefore, the above goals are not part of the proposal. The structural stage diversity would improve (see Table 4-1) but species diversity would be reduced by selective harvesting for ponderosa pine in most areas. The intent of the selective harvest would be to emulate historical forest conditions.

The final goal,

- ❖ Improve the health and vigor of all vegetation types

would be followed in the stands that are thinned, as thinning can improve the vigor of the remaining trees. Across the Project Area, the actions would reduce fire risk, which indirectly would improve the long-term health and vigor of the area.

Forest-wide Standards and Guidelines

The following Standards and Guidelines would not be followed by the action alternatives because of the specific resource objectives of this project.

- ❖ Apply a variety of silvicultural systems and harvest methods which best meet resource management objectives. For ponderosa pine stands these methods include shelterwood, clearcut, seedtree, group selection, and single tree selection methods.

Thinning is the dominant vegetation treatment proposed by the action alternatives and is not a selected method for harvest in ponderosa pine stands according to the Forest Plan.

- ❖ Assure that all evenaged stands scheduled to be harvested during the planning period will generally have reached the mean annual increment of growth.

The stands were selected for treatment primarily due to fire risk rather than their maturity for timber production.

These standards are oriented towards timber production and maximizing yield across the forest. As discussed above, this is not the goal of the proposed actions and thinning combined with created openings are the methods best suited to the restoration objectives.

Management Area Direction

The following management area directions would not necessarily be followed by the action alternatives.

Management Areas 2A, 2B, 4B, 7A & 7D Directions (99 percent of Vegetation treatment Area)

- ❖ Manage forest cover types using shelterwood in interior ponderosa pine
- ❖ Apply intermediate treatments to maintain growing stock level standards

Management Area 5B Direction (1 percent of vegetation treatment area)

- ❖ Manage forest cover types using shelterwood in interior ponderosa pine

As discussed above for the Forest Standards and Guidelines, these direction are primarily oriented towards timber production. The alternatives do not propose the use of shelterwood harvesting because this type of harvest does not meet the restoration objectives.

FUELS

The action alternatives meet the forest-wide goals, standards and guidelines, and the management area direction, for fuels as outlined above under Management Area Direction. Alternatives B and C do the most to meet the following forest-wide standards and guidelines by reducing fire risk in the Project Area.

- ❖ **Maintain fuel conditions which permit fire suppression forces to meet fire protection objectives for the area.**



- ❖ **Use prescribed fire to accomplish resource objectives such as reducing fuel load buildup, wildlife habitat improvement, etc.**



SOILS

METHODOLOGY

The environmental consequences of the proposed actions will be evaluated based upon the erosion risks and hazards associated with each activity.

REGULATIONS AND POLICY

Pike-San Isabel Forest Plan

The Pike-San Isabel National Forest Management Plan has general standards and guidelines regarding soils and erosion. The general direction involves the maintenance of soil productivity, reduction in human-caused soil erosion, and maintenance of the integrity of associated ecosystems. The standards and guidelines include:

- ❖ **Limit intensive ground disturbing activities on unstable slopes and highly erodible sites.**
- ❖ **Apply guidelines in Packer's guides in FBH 7709.11, "Access Road Requirements for Oil and Gas Exploration and Development on National Forest lands", and Region 2 1982 design for cross-drain spacing and buffers.**

Road maintenance is as follows:

- ❖ **All arterial and open collectors-Level 3 maintenance**
- ❖ **All open local roads-Level 2 maintenance**
- ❖ **All closed roads- Level 1 includes the upkeep of drainage structures and vegetation necessary to prevent erosion.**

Region 2 Standards and Guidelines

Region 2 of the National Forest System, which includes the Pike-San Isabel National Forest, has soil quality monitoring guidelines and soil quality standards. Soil quality standards exist for detrimental compaction, displacement, erosion that includes sheet erosion and rills and gullies, effective ground cover, and soil puddling related to management activities. The soil quality standards state that no more

than 15 percent of any activity area would be left in a detrimentally compacted, displaced, puddles, severely burned, and/or eroded condition. This does not include roads. In addition, there is a required minimum effective ground cover for the first and second year after disturbance (Table 4-3):

Table 4-3. Region 2 Ground Cover Requirements

Erosion Hazard Class	1st Year (%)	2nd Year (%)
Very High	30	50
High	30	50
Moderate	40	60
Low	50	70

These soil standards apply to cumulative effects of management over time. If a standard is exceeded in an initial entry, future entries must have no additional detrimental effect unless mitigative measures have been applied or natural recovery has taken place between entries.

Project plans which propose to exceed Regional standards for detrimental compaction, displacement, puddling, severe burning, and erosion should contain justification and planned mitigation, and be approved by the Forest Supervisor (U.S. Forest Service, 1992).

DIRECT AND INDIRECT EFFECTS

Alternative A

VEGETATION TREATMENT

Under Alternative A, there would be no prescribed vegetation treatment. The greatest erosion risk (over 80 percent of the watershed with high to extreme erosion risk) occurs in the Bear Gulch and Cottonwood Gulch subwatersheds of the Waterton-Deckers watershed. In the Upper South Platte Watershed Landscape Assessment (Foster Wheeler, 1999), fifty-percent of the Waterton Deckers watershed, 56 percent of the Horse Creek watershed, and 42 percent of the Buffalo Creek watershed were determined to have a high to extreme susceptibility to soil loss following wildfire. Because of the large fire risk, the potential for erosion and subsequent delivery to streams in the short-to-long term is very high.

TRAIL ACCESS

The primary soil type on the Gill Trail is the Sphinx-outcrop soil mapping unit. This soil has a severe erosion potential and a severe recreational development limitation. The soil is unfavorable for recreation and that limitation can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures. Currently, erosion is a major problem on the Gill Trail and would continue under this alternative.

BUFFALO CREEK BURN AREA REVEGETATION

Under Alternative A, there would be no stream restoration activities along Buffalo Creek. Natural processes such as bank sloughing from peak flows and channel migration would destabilize the streambanks. The higher flows would route sediment movement downstream. However, vegetation would become reestablished on the banks naturally and eventually stabilize the streambanks.

In the short-term, there is a higher risk of bank erosion and sediment deposition into Buffalo Creek. Over the long-term it is expected that banks would be stabilized and the system would have reached equilibrium of sediment movement with anticipated flows. Currently, the lower gradient reaches of Buffalo Creek are storing excessive amounts of sediment from the 1996 floods that would eventually move downstream when higher flows occur.

ROAD RECLAMATION

Under Alternative A, the 25 miles of closed road proposed for reclamation would be maintained as Level 1 road maintenance. Level 1 road maintenance requires the maintenance of road drainage structures and vegetation as necessary to control erosion. Because these 25 miles of road have yet to be identified, the current conditions of these roads cannot be addressed.

Alternative B

VEGETATION TREATMENT

Under Alternative B, approximately 33 and 42 percent of vegetated treatment areas have a severe to extreme erosion hazard in the Waterton/Deckers and Horse Creek watersheds, respectively. The subwatersheds of the Waterton/Deckers watershed with greater than 35 percent of the vegetated areas with a severe to extreme erosion rating include Lower Basin, Pine Creek, Upper Basin, Stevens Gulch, and Sugar Creek. The removal of trees would involve timber harvest ground-disturbing activities that increase the risk of management-related erosion. These activities would be required to have minimum effective ground cover following disturbance. Minimum effective ground cover includes all living and dead herbaceous and woody materials in contact with the ground and all rocks greater than ¾ inch in diameter (U.S. Forest Service, 1992). There would be a minimum of 30 and 50 percent effective ground cover the first and second years after ground disturbance. In the short-term (5-years), there is still a moderate risk of soil erosion from those sites that are not mitigated. However, the risk is reduced because treatment would not occur on slopes greater than 30 percent. However, in the long-term the erosion risk would be substantially reduced because of the reduction in fire prone areas as a result of the treatment. The vegetation removal would reduce the fire hazard in these areas, the susceptibility of the soils to form hydrophobic layers, and subsequent post-wildfire erosion.

The application of biosolids would also reduce the erosion potential in the short-term depending upon the slope steepness of the application area. The beneficial effects of biosolid applications were recently reported by Meyer (2000). Soil moisture holding capacity and nitrogen availability were enhanced two years after the application of biosolids for soils within the Buffalo Creek Drainage. The author also reported increases in canopy cover and biomass of grasses with little response from forbs within the same treatments. The application of biosolids did not affect total runoff during simulated rainfall events. Sediment concentrations, however, were significantly less on biosolid plots, with 80 Mg/ha rate showing the lowest level. Runoff concentrations of NO₃-N and NH₄-N showed no response in biosolid versus non biosolid plots suggesting rapid uptake of available nitrogen. Some increases in metal concentrations of runoff were observed but were below drinking water standards for live stock.



Biosolid application may be a suitable alternative for restoration of severely burned areas, and road reclamation or restoration. Application rates would need to be determined based on sub-watershed hydrological conditions. There would likely be few restrictions for the use of biosolids regarding soil types because most soils are coarse textured.

BUFFALO CREEK BURN AREA REVEGETATION

Alternative B would reestablish 60 acres of riparian areas along Buffalo Creek and 1,000 acres of forest communities within the Buffalo Creek Burn Area with vegetation. The stabilization of banks with vegetation may reduce streambank erosion in the short-term. However, excessive sediment is being stored in the lower reaches of Buffalo Creek. Streambank stabilization may reduce bank erosion but may increase channel incision if the banks are unable to slump. Plantings in the burn area would reduce erosion in those areas where vegetation becomes reestablished. However, if the soils are still hydrophobic, as noted in Jarrett and Browning (1999), the vegetation may not reduce erosion in these areas.

ROAD RECLAMATION

Under Alternative B, 25 miles of unnecessary closed roads would be obliterated by removing culverts, creating self-maintaining drainage, removing subsoil to reduce compaction, seeding for erosion control, and the application of biosolids to increase soil fertility and reduce surface erosion. The removal of the roads would reduce road surface erosion and potential road failures. There is a potential for short-term erosion if the road reclamation occurs on steep slopes (greater than 30 percent). The road reclamation would achieve the greatest resource benefit if all 25 miles are reclaimed in the same subwatershed.

TRAIL ACCESS

Under Alternative B, the upgrades of the original Gill Trail to safer and sustainable conditions, and the construction of a new trail between the end of the Gill Trail and Cheesman Dam, would reduce the risk of erosion depending upon trail design, location, and maintenance plan of the trail. The trail upgrades would reduce erosion and the potential for sediment delivery to streams, specifically the South Platte River. In addition, the construction of the new trail below Cheesman dam would reduce surface erosion because it would reduce the number of unmaintained trails. Barriers would be constructed on the downslope portions of erosion areas to prevent delivery of sediment downstream .

Alternative C

VEGETATION TREATMENT

The short-term effects would be similar to Alternative B; however, there would be a reduced risk of short-term surface erosion from ground disturbance because 5,414 acres of roadless area that would not be treated. As a result, there is a decrease in the percentage of the vegetated treated areas that have a high to severe erosion hazard. Approximately 12 and 21 percent of vegetated treatment areas have a severe to extreme erosion hazard in the Waterton/Deckers and Horse Creek watersheds, respectively. The subwatersheds of the Waterton/Deckers watershed with greater than 35 percent of the vegetated areas with a severe to extreme erosion rating include Gunbarrel Creek, Lower Basin, Upper Basin, Pine Creek, and Sugar Creek. Because biosolid application would not occur, other erosion control agents (i.e., effective groundcover) would need to be applied in the disturbed areas.

In the long-term, there may be a greater risk of fire hazard in these watersheds and potential of erosion following wildfires. The greater risk of fires in these areas increase the potential of increasing hydrophobicity of soils in affected areas and potential for severe surface erosion following a post-wildfire storm event.

BUFFALO CREEK BURN AREA REVEGETATION

The effects would be the same as Alternative B.

ROAD RECLAMATION

Under Alternative C, the effects would be similar to Alternative B. However, biosolids would not be used to increase soil fertility or reduce surface erosion.

TRAIL ACCESS

The effects would be the same as under Alternative B.

CUMULATIVE EFFECTS

Alternative A

Under Alternative A, vegetation management plans on Denver Water lands would reduce the potential for a catastrophic fire to start on Denver Water lands. However, the risk of surface erosion following a catastrophic fire would remain severe in those watersheds with the greatest fire hazard; The greatest fire hazard (over 80 percent of the watershed area with a high hazard) occur in the Horse Creek watershed, and Pine Creek, Stevens Gulch, Sugar Creek, and Upper Basin subwatersheds of the Waterton-Deckers watershed.

Alternative B

Under Alternative B, vegetation treatment on Denver water lands and the proposed vegetation treatment on National Forest lands would further reduce the wildfire risk and the subsequent potential for major surface erosion following a post-wildfire storm event. The treatments on Denver water lands may be susceptible to short-term erosion similar to that of the treatment on National Forest System lands. If any delivery of sediment occurs on Denver water lands, there could be adverse cumulative effects of management –related surface erosion on National Forest lands deliver to the stream system.

Alternative C

Under Alternative C, approximately 5,414 acres would not be treated on National Forest lands. However, the treatment on Denver water lands and National Forest lands would reduce the risk of catastrophic wildfires in the Waterton/Deckers watershed. The reduction in wildfire risk reduces the risk of major surface erosion that may result from post-wildfire storm events.



CONSISTENCY WITH FOREST PLAN

The proposed actions under Alternatives B and C are consistent with the Forest Plan for soils. The actions should in the long-term maintain or increase soil productivity, reduce in human-caused soil erosion, and maintain the integrity of associated ecosystems.



HYDROLOGY

METHODOLOGY

Background

The Proposed Action is designed to create a more “sustainable” forest condition. The forest condition that would be created is much more open and would resemble the historic condition as described in the Upper South Platte Landscape Assessment (Foster Wheeler, 1999). Most, if not all, analytical techniques for evaluating impacts of forest management activities on water resources assume that the forest’s current state is close to the “natural” condition and functions well. This assumption is not true for the Upper South Platte Project Area. A more “natural” condition is what would be created by the Proposed Action.

Water Yield and Floodplains

Alternatives B and C would likely increase water yield, due to the reduction of evapotranspiration and subsequent increase in available water. Consequently, peak flows may increase which could result in impacts to floodplains. For this analysis, water yield and floods will not be addressed because they are issues that have been addressed at the Forest Plan level (36 CFR 219.23 and FEIS for the Forest Plan). The effects of forest management on these issues are disclosed in that EIS.

Peak Flow

Peak flows may increase as a result of the proposed actions. Reduction of tree density would reduce evapotranspiration that would result in higher soil moisture content. The higher soil moisture may result in more runoff during runoff events. Higher peak flows could result in changes in channel dynamic equilibrium. If the channel is moved out of dynamic equilibrium, the integrity of pools and riffles may be compromised and fish habitat could decrease. Increases in peak flows by themselves do not constitute an adverse impact. However, when they adversely impact the beneficial uses of a stream they would be considered a violation of the Forest Plan.

Sediment Yield

The primary source of sediment from forest management activities in the western United States is the roads required to access the forested stands rather than the forest harvesting practices (Megan and Kidd, 1972; Ice, 1985; Swanson et al., 1987). Buffer strips are especially important below forest roads in areas of granitic soils because of their high erodibility (Megahan and Ketcheson, 1996). The road reclamation proposed in this EA would result in lower road density that would reduce the sediment yield from roads. The focus of the sediment yield assessment will be on applying appropriate best management practices (BMPs) to minimize the sediment yield increase potential of the harvesting activities. Increases in

sediment yield by themselves do not constitute an adverse impact. However, when they adversely impact the beneficial uses of a stream they would be considered a violation of the Forest Plan.

REGULATIONS AND POLICIES

The Forest Plan has some specific goals, and standards and guidelines that are directed at water resources.

Forest Plan

GOALS

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- ❖ **Maintain or improve water quality to meet Federal and State standards and increase the average annual water yield.**
 - ❖ **Increase water yield through land treatment measures consistent with other resource and water quality standards.**
 - ❖ **Protect riparian areas and wetlands from degradation.**
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GENERAL DIRECTION, STANDARDS AND GUIDELINES

Water Resource Improvement and Maintenance (F05, 06)

- 01 Maintain instream flows and protect public property and resources
- 02 Improve or maintain water quality to meet State and Federal water quality standards. However, where the natural background water pollutants cause degradation, it is not necessary to implement improvement actions. Short-term or temporary failure to meet some parameters of the State standard, such as increased sediment from road crossing construction or water resource development may be permitted in special cases.
- 03 Develop a schedule of water yield treatments within fourth-order watersheds which attains desired water yield increases while maintaining stream channel stability.
 - a. Provide mitigation measures necessary to prevent increased sediment yields from exceeding “threshold limits” (as determined by “State of the Art” modeling [HYSED] or actual measurements) identified for each (fourth-order) watershed.
- 04 Rehabilitate disturbed areas that are contributing sediment directly to perennial streams as a result of management activities to maintain water quality and re-establish vegetation cover.

SPECIFIC MANAGEMENT AREA 3A DIRECTION

1. Permanent openings may be employed to enhance water production

OTHER REGULATIONS

WATERSHED CONSERVATION PRACTICES HANDBOOK

The Rocky Mountain Region (R2) has a Watershed Conservation Practices Handbook (FSH 2509.25) that provides standards for activities on the Pike National Forest. Best Management Practices (BMP's) or "Watershed Conservation Practices" (WCP's) are intended to control non-point source pollutants. The specific practices are presented in Appendix A. The following are the standards that are applicable to this project.

FP Standard: In watersheds containing aquatic TES species, allow activities and uses within 300 feet or the top of the inner gorge (whichever is greatest), of the perennial and intermittent streams, wetlands, lakes (over 1 acre) only if onsite analysis shows that long-term hydrologic function, channel stability, and stream health will be maintained or improved.

11.1 Standard (1) - Manage land treatments to conserve site moisture and to protect long-term stream health from damage by increased runoff.

11.2 Standard (2) - Manage land treatments to maintain enough organic ground cover in each land unit to prevent harmful increased runoff.

12.1 Standard (3) - In the water influence zone next to perennial and intermittent streams, lakes and wetlands, allow only those land treatments that maintain or improve long-term stream health and riparian ecosystem condition.

12.2 Standard (4) - Design and construct all stream crossings and other instream structures to provide for passage of flow and sediment, withstand expected flood flows, and allow free movement of resident aquatic life.

12.3 Standard (5) - Conduct actions so that stream pattern, geometry, and habitats are maintained or improved toward robust stream health.

12.4 Standard (6) - Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological function, per 404 regulation..

12.5 Standard (7) - Maintain enough water in perennial streams to sustain existing stream health. Return some water to dewatered perennial streams when needed and feasible.

13.4 Standard (12) – Reclaim roads and other disturbed sites when use ends, as needed to prevent resource damage.

14.1 Standard (13) - Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to no more than 15% of any land unit (FSH 2509.18)

14.2 Standard (14) - Maintain or improve long-term levels of organic matter and nutrients on all lands.

EXECUTIVE ORDERS

Executive orders 11988 and 11990 direct federal agencies to avoid impacts to floodplains and wetlands, respectively. Agencies are directed to avoid construction and development in floodplains and wetlands whenever there are feasible alternatives.



CLEAN WATER ACT

The Clean Water Act's goal is to maintain the chemical, physical and biological integrity of the nation's waters. Compliance with state and federal pollution control measures is required. It contains an antidegradation clause, and control of nonpoint pollution through the use of best management practices.

FOREST SERVICE MANUAL

The Forest Service Manual (FSM) 2500 series provides regulations and guidance for watershed management on National Forest lands.

ALTERNATIVE A

Direct and Indirect Effects

Alternative A (no-action) would have no direct or indirect effects because no actions would be taken. In the short-term peak flow and sediment yield would continue at the present level. In the long-term, the increased fire risk could result in another catastrophic wildfire such as the Buffalo Creek fire. The effects of the Buffalo Creek fire were dramatic on water resources, including basically covering segments of both Buffalo and Spring Creeks with extensive sediment deposits. Similar effects may result in other portions of the Project Area if a wildfire would occur. Stream bank stabilization and restoration of Buffalo Creek would not occur. Sections of the Gill Trail and access trails to the South Platte River near Deckers would continue to generate sediment to the river. The roads that would be reclaimed in the action alternatives would continue to generate increased sediment yield.

Cumulative Effects

Denver Water Board and the Colorado State Forest's activities on 2,845 acres would reduce the fire risk within the Waterton/Deckers watershed. The Douglas-fir/Tussock moth EA project has reduced fire risk on about 1,000 acres and will use prescribed burns to reduce fuel loads on another 13,000 acres in the Waterton/Deckers and Horse Creek watersheds. The Elk Creek Management Unit project will complete vegetation treatments similar to the proposed action for this EA on over 1,000 acres. The Elk Creek Management Unit is outside of the Project Area. All of the projects mentioned above have and/or will reduce the fire risk in the Project Area or adjacent to it. Total treated area is about 4,000 acres with another 14,000 scheduled for treatment in the future. Table 4-4 shows a comparison of cumulative actions in the Project Area. The cumulative effect of Alternative A would be almost 18,000 acres of land treated in the Project Area. This alternative would have the highest long-term fire risk of the alternatives, and the lowest short-term sediment yield.

Table 4-4. Project Area Cumulative Effects Comparison

	Current Vegetation Treatment (acres)	Future Vegetation Treatment (acres)	Current Prescribed Burns (acres)	Future Prescribed Burns (acres)	Total Future Treated Area (acres)
Alternative A	2,845	1,000	1,000	13,000	17,845
Alternatives B&C	2,845	18,400	1,000	30,400	35,245

ALTERNATIVE B

Direct and Indirect Effects

Alternative B (proposed action) may cause some minor sediment yield increases at road crossings or where road reclamation work occurs near streams. The indirect effects would include short-term sediment yield increases due to ground disturbance and prescribed fires. The areas that would be the most sensitive to increases in sediment are highly erodible soils within sediment source zones. Sediment source zones are approximately 10 percent of the treatment areas (Table 4-5). The sediment source zones that contain sensitive soils would be the most important areas to implement BMPs. Riparian buffer zones as specified in the WCP (Appendix A) would minimize sediment from entering the streams. The vegetation treatments are addressing the most sensitive areas by targeting areas below 7,500 feet, sediment source zones and high erosion soils (Table 4-5). These areas would have the highest sediment yield following a catastrophic wildfire. The treated areas would have a lower risk of sustaining a hot burn and would have a lower risk of catastrophic sediment yield events such as the one that followed the Buffalo Creek fire.

Long-term sediment yield would decrease from the 25 miles of roads that would be reclaimed, the riparian planting in Buffalo Creek and the sections of the Gill Trail and South Platte River access that are currently contributing sediment to the river (Table 4-6). The overall sediment yield effects would be a tradeoff of some short-term sediment yield increases for a reduction of risk of a catastrophic sediment yield event.

Peak flow increases would be most important below 7,500 feet because of the potential for large rainstorm generated peakflows. The average annual peak flows may increase as a result of Alternative B, however the effect of the vegetation treatment would have a minor effect on peak flows from larger events. The less frequent peak flows are less influenced by forest management than more frequent peak flows (Beschta, 2000). This alternative has over 60 percent of the treated area below 7,500 feet.

The biosolids proposed in this alternative do contain nutrients that could potentially increase nutrient loading to streams. However, as described in the *Soils* section, recent applications in Buffalo Creek showed no increase in nutrients in runoff from treated areas. It is likely that the nutrients would be utilized very quickly in this relatively nutrient poor environment. Special care would be needed in the use of biosolids in the riparian rehabilitation efforts in Buffalo Creek. Appropriate mitigation measures are described in the *Soils* section.



Table 4-5. Sensitive Areas Associated with the Vegetation Treatment Areas

Watershed Name	Vegetation Treatment Area (acres)	Area below 7500 feet (acres)	Sediment Source Zones (acres)	High Erosion Soils (acres)
Buffalo Creek	0	0	0	0
Bear Gulch	0	0	0	0
Cottonwood Gulch	0	0	0	0
Mill Gulch	147	147	35	39
Stevens Gulch	373	373	135	232
Sugar Creek	615	260	108	214
Bear Creek	653	269	123	216
Spring Creek	814	83	30	63
Wigwam Creek	888	266	134	277
Horse Creek	1,505	1,505	143	632
Lower Basin	2,198	1,578	215	770
Gunbarrel Creek	2,461	1,033	140	565
Pine Creek	2,590	1,302	106	945
Upper Basin	4,809	3,628	612	1,750
Total	17,053	10,444	1,781	5,703

Table 4-6. Alternative B Sediment Yield Trends

Proposed Action	Short-term Sediment Yield Trend	Long-term Sediment Yield Trend
Vegetation Treatment	↑	↓
Road Reclamation	-	↓
Buffalo Creek Rehabilitation	↑	↓
Trail Projects	↓	↓

Cumulative Effects

The cumulative effects of Alternative B would result in more than 35,000 acres of high fire risk forest treated in the Project Area. The cumulative effect of these actions would be to reduce the fire risk in the Project Area. There may be some sediment yield and peak flow increases associated with activities on private land and the other Forest Service projects in the Project Area, however all of the cumulative

effects would generate positive effects similar to Alternative B. The potential sediment yield and peak flow increases from the connected actions combined with the proposed action would not cause streams to move out of dynamic equilibrium or not fully support their beneficial uses. This conclusion is based upon the direct and indirect effects discussed above, the use of BMPs, the evaluation of the magnitude and locations of the actions and professional judgement. This alternative would have the lowest long-term fire risk of the alternatives, and the highest short-term sediment yield.

ALTERNATIVE C

Direct and Indirect Effects

Alternative C (roadless) would have similar effects to Alternative B.

Cumulative Effects

Alternative C would have similar cumulative effects to Alternative B. This alternative would have a slightly higher long-term fire risk than Alternative B because of the fuels left in the roadless areas, however it would have a lower short-term sediment yield than Alternative B because the logs would not be removed from the roadless areas.

CONSISTENCY WITH FOREST PLAN

Alternatives B and C would be consistent with the Forest Plan. Alternative A would not be consistent with the guideline of “Rehabilitate disturbed areas that are contributing sediment directly to perennial streams as a result of management activities to maintain water quality and re-establish vegetation cover”.



FISHERIES

INTRODUCTION

The primary concern for fisheries is the risk of a large-scale fire, consequential flooding and erosion, and extreme sediment loading in stream habitat. Proposed restoration activities may slightly accelerate erosion and sediment transport, but the potential impacts on fisheries would be minor compared to another major fire in the Project Area. Vegetation treatments could increase erosion potential and remain elevated until natural processes gradually stabilize sediments in the treated area.

The negative effects of suspended sediments on fish as well as other aquatic biota have been well documented. Newcombe and Macdonald (1991) documented that the degree of impact on fish communities due to suspended sediments varies greatly depending on concentrations, time of exposure, and species. Even short-term pulses of suspended sediments have been found to inhibit feeding and social behavior of salmonids at certain life-stages (Berg and Northcote 1985). In general, 200 mg/l causes physiological stress, reduced feeding and growth, and avoidance; chronic exposure to 1,000 mg/l or acute exposure to 10,000 mg/l is lethal. In addition to turbid water effects on fish, increased bedload sediments can change stream bottom habitat. Increased sediment loading could cause shifting fine and coarse material to be more prominent over much of the stream substrate. Increased deposition of fine material on the river bottom would increase egg mortality because of burying and less intra-gravel flows resulting in low dissolved oxygen. Adult and juvenile fish would be affected by reduced prey (macroinvertebrates) and by the filling of pools and areas between cobble and boulders that provide important cover habitat for fish. These impacts can occur far downstream from the sediment source.

Despite evidence of adverse effects from high concentrations of suspended sediment, fish often thrive in naturally turbid environments. Some of the largest salmonid-producing rivers in North America have very high sediment yields. For example, the South Platte River within the Project Area is an abundant producer of trout and considered a Gold medal fisheries, yet has very high natural sediment concentrations during high runoff periods.

Two species of fish that are considered MIS have been reported within the Project Area. They include the greenback cutthroat trout, and brook trout. Cutthroat trout have been reported from the headwaters of Wigwam Creek, however there is no current evidence or genetic testing to indicate that greenback cutthroat trout still exists within the Project Area. Brook trout populations are established in headwater areas or high elevation reaches of most tributaries in the Project Area. Few brook trout occur at the lower elevations that may be influenced by project activities. Activities from the proposed project are not likely to have a measurable affect on brook trout populations.

REGULATIONS AND POLICIES

The Forest Plan has some specific goals, and standards and guidelines that are directed at fisheries. They include the following that apply to fisheries.

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- ❖ **Improve fish habitat on suitable streams and low elevation ponds and lakes**
 - ❖ **Protect riparian areas and wetlands from degradation.**
 - ❖ **Manage fish habitat, which is providing a fishery at or near its potential, to maintain fish populations at existing levels. Manage fish habitat that is determined to be limiting a fish population to a level below its potential to improve habitat conditions that may be limiting.**
 - ❖ **Maintain habitat for viable populations of all existing vertebrate wildlife species.**
-
-

ALTERNATIVE A

Direct and Indirect Effects

Under the no action alternative, the vegetation treatment areas would not be changed. The current risk of catastrophic fire and consequential erosion would remain high throughout much of the Project Area. Fish populations in the study area could be devastated as a result of an erosion event that may result after a major fire. The severe reduction in aquatic habitat and fish populations in Buffalo Creek provides an example of this exact chain of events. Currently, fish populations in much of the Project Area are at high risk from catastrophic fire and consequential erosion.

Under Alternative A only natural revegetation processes would occur in the Buffalo Creek Burn Area. The highly erosive conditions that currently exist in much of this area would likely continue for several years while the natural revegetation process gradually increases sediment stability. The aquatic habitat in Buffalo Creek is currently degraded due to erosion of the burned area. Until the revegetation process is complete, aquatic life in Buffalo Creek would continue to be impaired by sedimentation caused by soil erosion. This sediment would continue to degrade aquatic habitat and reduce natural fish production.

Alternative A would not complete road reclamation. Aquatic systems associated with the 25 miles of permanently closed, low standard roads would continue to be impacted by road-related erosion. Currently, the area proposed for road reclamation is a contributor of sediments to associated reaches of streams in the Project Area. The accumulation of fine sediments in these stream reaches is responsible for habitat loss and general reduction in fish populations.

Alternative A would not include trail improvements, upgrades or expansion. Currently, the Gill Trail represents a relatively minor source for sediments entering the South Platte River.



Cumulative Effects

The effects of this alternative combined with past activities and the future foreseeable actions would not have any negative cumulative effects on fisheries. Fire risk would remain high and some minor inputs of fine sediment may occur, but the population viability of fish in the Project Area would not be affected.

Consistency with Forest Plan

This alternative would be consistent with the population viability standard and the goal of maintaining fish populations at or near its potential, as outlined in the Forest Plan. However, it would not be consistent with the goal of improving habitat conditions that may be limiting or improving fish habitat in suitable streams because it does not propose to improve fish habitat in Buffalo Creek. Therefore, this alternative would be consistent with the standards in the Forest Plan but inconsistent with some of the specific goals.

ALTERNATIVE B

Direct and Indirect Effects

Vegetation treatments planned under Alternative B include thinning, and burning of 17,400 acres of densely forested area (including 5,414 acres of roadless area) in this watershed. Treatment activities could cause minor short-term increases in sediment in the small tributaries including Pine Creek, Sugar Creek, Gunbarrel Creek, Horse Creek, and several other small or intermittent streams. Fish habitat in these streams is marginal because of low flows, steep gradients, and high sediment loads. Therefore, the proposed action would likely have little observable effect on the already degraded aquatic conditions and fish populations in these streams.

The effects of this alternative would likely be a short-term increase in sediment (see Hydrology). This increase would be relatively small due to the riparian buffers proposed, no new road construction, and the use of forwarders to minimize soil disturbance. The stream systems have evolved with these types of minor disturbances. The long-term effects would be positive due to fire risk reduction, and the corresponding reduction in the risk of catastrophic sedimentation that may result from a major fire. An increase in sediment deposits in associated stream reaches could cause loss of habitat, egg mortality or physiological stress to fish communities depending on rain events and the extent of disturbance.

The Buffalo Creek Burn Area Revegetation includes planting vegetation, strategic placement of woody debris and boulders, reshaping sediments using conventional equipment, and using biosolids to amend soils and enhance vegetative growth. These procedures could cause minor short-term stress on the aquatic environment. The use of conventional equipment may disturb surface soils and increase erosion. Additionally, the reshaping of sediment deposits using conventional equipment would likely cause a short-term increase in the erosion potential. However, This would rapidly decrease as the revegetation process increases soil stability.

The use of biosolids would accelerate revegetation resulting in less erosion/sediment loading, however, they may provide a possible source of impact to the associated aquatic habitats because of the nutrients (nitrogen or phosphorus) they contain. A precipitation event that occurred shortly after the application of biosolids could result in runoff from treated areas containing concentrations of nitrogen that approach

toxic levels for some aquatic life forms (R. Brobst Pers. Comm., 2000). High concentrations of nitrogen would only present a threat near the source of runoff from the treated areas. Runoff with high concentrations of nitrogen would be diluted downstream of the source. There are several measures that may be taken to reduce the risk of nitrogen runoff in treated areas near drainages. Some of these measures include; using mulch in treated areas, hand-placing biosolids, and placing logs parallel to contours to slow erosion. Areas proposed for treatment should be evaluated for slope and proximity to a stream before application because areas of high gradient have a greater risk of impacting aquatic environments.

An addition to the Buffalo Creek subproject may include the use of a suction dredge as part of the monitoring program to remove some of the fine sediments that have accumulated at specific locations in the stream. It is likely that this operation would produce only short-term impacts at specific locations. Large sediment deposits that indirectly resulted from a fire currently degrade habitat in Buffalo Creek. The source of these sediments includes a vast area of the Buffalo Creek drainage that has a high potential for erosion due to the lack of vegetation. Although the system is degraded it maintains an equilibrium with the available hydrological dynamics and physical features of that watershed. Removing sediments could result in local scour, degradation and aggradation (Simons and Senturk 1977). If the fine sediment could be removed without causing a negative impact to the existing stream conditions, it is likely that there would be some localized impact to macroinvertebrates and possibly fish. The minor impacts caused by the limited use of suction dredging as part of a monitoring program should have only a minor effect on fish habitat.

Proposed road reclamation work potentially affecting the aquatic environment includes surface tilling and applying biosolids. Road tilling would cause a short-term increase in erosion potential that may increase sediment nearby streams. Erosion potential would gradually decrease as the revegetation process increases soil stability. The biosolids used to amend the soils could impact fish if used in close to streams. Impacts to fish would be very unlikely, but could consist of stress and egg mortality from sedimentation and/or mortality due to toxic concentrations of nitrogen.

The river access trail improvement activities may cause minor erosion and consequent sediment input to the South Platte River during the construction process. Over the long-term, revegetating eroding soil trails within riparian areas, and improving trail alignment and drainage would reduce stream sediment input. Improved riparian conditions and reduced sediment would have a beneficial effect on fish or other aquatic life.

Cumulative Effects

The effects of this alternative combined with past activities and the future foreseeable actions would not have any negative cumulative effects on fisheries. Fire risk would be reduced and some inputs of sediment may occur but the overall population viability of fish communities in the Project Area would not be affected. The proposed action plus the Colorado State Forest Service and Denver Water efforts to reduce fire risks would reduce the erosion risks and therefore have a beneficial cumulative effect on fish habitat

Consistency with Forest Plan

This alternative would be consistent with the Forest Plan goals and standards listed above.



ALTERNATIVE C

Alternative C is similar to the proposed action except that there would be no heavy off-road equipment used to remove logs from roadless areas. Felled trees in off-road areas would be allowed to degrade for one to two years and then burned. The risk of excessive erosion resulting from this operation is the primary concern of Alternative C, however, the threat of erosion in roadless areas would be decreased temporarily. The process of burning degraded trees in roadless areas may result in an increased risk of erosion at that time. Potential negative impacts to aquatic environments would be similar to those described for Alternative B. Areas that may initially receive less sediment under Alternative C include Horse Creek, Saloon Gulch and the South Platte River. The current risk of catastrophic fire and consequential erosion would remain high in roadless areas until the felled trees are burned or removed. At that time the threat of erosion and sedimentation in the associated streams would increase until the soils are stabilized by vegetation.

The Buffalo Creek Burn Area Revegetation would be similar to Alternative B except that reshaping of sediments would be conducted using hand tools only, and biosolids would not be used to enhance vegetative growth. The use of conventional equipment during any portions of this subproject may result in disturbance of surface soils causing an increase in erosion potential. The reshaping of sediment deposits using hand tools would not eliminate the threat of erosion, however the potential would be less than what could be caused by conventional equipment. The potential for erosion would decrease as the revegetation process increases soil stability.

The road reclamation would be the same as Alternative A, but no biosolids would be used. The impacts would be similar to alternative A, except that the revegetation process would be slower and erosion potential last longer, and there would be no potential for nitrogen entering streams. The South Platte River Access Trail Improvements include the same actions as Alternative B. Risks to the aquatic environment for Alternative C are the same as Alternative B.

WILDLIFE

METHODODOLOGY

The effects of the alternatives on wildlife were based in part on expected changes in habitat. Some specific criteria are contained in the Forest Plan for the Pike and San Isabel National Forests (USFS, 1994a). Where those criteria are applicable they were used to assess compliance with the Forest Plan. Table 4-7 lists the Management Indicator Species for the Pike National Forest. These species are evaluated in this section of the EA. Other wildlife species are addressed in the Biological Assessment and Biological Evaluation (see Appendices B and C).

Table 4-7. Pike National Forest Management Indicator Species (MIS)

Common Name	Scientific Name	Other Special Status
Mammals		
Abert's Squirrel	<i>Sciurus aberti</i>	
Beaver	<i>Castor canadensis</i>	
Bighorn sheep	<i>Ovis canadensis</i>	
Elk	<i>Cervus elaphus</i>	
Mule deer	<i>Odocoileus hemionus</i>	
American marten	<i>Martes americanus</i>	Region 2 Sensitive Species
Birds		
Black-throated gray warbler	<i>Dendroica nigrescens</i>	
Lewis' woodpecker	<i>Melanerpes lewis</i>	Region 2 Sensitive Species
Mallard	<i>Anas platyrhynchos</i>	
Mountain bluebird	<i>Sialia currocoides</i>	
Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>	
Three-toed woodpecker	<i>Picoides tridactylus</i>	Region 2 Sensitive Species
Virginia's warbler	<i>Vermivora virginiae</i>	
Water pipit	<i>Anthus spinoletts</i>	
Wild turkey	<i>Meleagris gallopavo merriami</i>	
Wilson's warbler	<i>Wilsonia pusilla</i>	

REGULATIONS AND POLICIES

The Forest Plan identifies goals for wildlife. These goals include the following:

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- ❖ **Increase diversity for wildlife and habitat improvement**
 - ❖ **Increase winter range habitat capability for deer and elk**
 - ❖ **Protect riparian areas and wetlands from degradation.**
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The Forest Plan also established general management direction including;

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- ❖ **Provide for the habitat needs of management indicator species on the National Forest**
 - ❖ **Manage and provide habitat for recovery of endangered and threatened species**
 - ❖ **Maintain habitat for viable populations of all existing vertebrate wildlife species**
 - ❖ **Establish elk, bighorn sheep and threatened and endangered species on sites that can supply the habitat needs of the species and the population levels and distribution agreed to with the States**
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Additionally specific criteria are contained under the general direction and under specific Management Area direction. These criteria are discussed and evaluated where they apply in the analysis.

ALTERNATIVE A

Direct and Indirect Effects

This alternative would have no direct effects to general wildlife. The mixed conifer forest habitat would continue the current trend of increasing crown density. Douglas-fir would continue to increase. Habitat quality in the Buffalo Creek burn area would gradually increase as natural revegetation occurs. In forested areas that would become more dense, the current level of understory that exists would continue or decrease. The lack of understory would reduce the availability of cover types required by wildlife to use for escape, hiding, feeding, nesting, and warmth. The potential for a catastrophic fire event would continue to increase due to the increasing fuel load. A wildfire of the intensity of the 1996 Buffalo Creek wildfire could effectively remove vegetation, degrade watershed conditions, and result in altered streambeds and increased sediment input to streams.

The habitat capability for the Pike National Forest Management Indicator Species (MIS) would stay at the current level in this alternative in the short-term. Under the current conditions, the mountain bluebird, bighorn sheep (summer and winter habitat), mule deer (summer and winter habitat), elk (summer and

winter habitat), red-naped sapsucker, Abert's squirrel (summer and winter habitat), and Merriam's turkey (summer habitat) meet the habitat capability goals required by the Forest Plan for the entire Project Area. The Abert's squirrel, red-naped sapsucker, and the winter habitat for Merriam's turkey may possibly increase in this alternative. However, many of these species do not meet habitat capability goals for specific Management Areas on the Pike National Forest.

Cumulative Effects

Denver Water Board and the Colorado State Forest's activities on 2,845 acres would reduce the fire risk within the Waterton/Deckers watershed. The Douglas-fir/Tussock moth EA project has reduced fire risk on about 1,000 acres and would use prescribed burns to reduce fuel loads on another 13,000 acres in the Waterton/Deckers and Horse Creek watersheds. The Elk Creek Management Unit project would complete vegetation treatments similar to the proposed action for this EA on over 1,000 acres. The Elk Creek Management Unit is outside of the Project Area. All of the projects mentioned above have and/or would reduce the catastrophic fire risk in the Project Area or adjacent to it. Total treated area is about 4,000 acres with another 14,000 scheduled for treatment in the future.

This alternative would have no additional cumulative effect when considered with the current and future projects in the Project Area. This alternative would have the greatest long-term catastrophic fire risk of all of the alternatives. Bighorn sheep (both summer and winter), elk (winter in Management Area 7a) and mountain bluebird (Management Area 7d) habitat capability would continue to be below the Forest Plan standard. However, for Alternative A, Abert's squirrel would remain above its habitat capability standard in the Forest Plan.

ALTERNATIVE B

Direct and Indirect Effects

VEGETATION TREATMENTS

Direct impacts from the Proposed Action include immediate loss of cover, forage, nests and possibly some young birds. Indirectly, noise from equipment could impact wildlife, especially birds. Logging activities and prescribed fires also could create opportunities for noxious plants to invade the Treatment Areas.

A short-term direct negative impact of the Proposed Action is temporary displacement of wildlife while the Proposed Action is being implemented. Larger, more mobile wildlife, such as deer and coyotes, would be temporarily displaced by the equipment used to start and control the fire, by the fire itself, by human presence within the Project Area, and by logging activities. The length of their displacement would vary depending on the species. Shy species such as mountain lions may remain out of the area for an extended period of time, whereas more social species, such as the coyote, may return after a relatively short time. Wildlife could also be killed during the prescribed fire, by smoke inhalation, or by vehicles used to haul equipment and personnel into the Project Area. Spring burns could impact birds, especially ground nesters. Animals with limited mobility living above ground appear to be the most vulnerable to fire-caused injury and mortality (USDA Forest Service, 2000). Small mammals and reptiles, that are unable to avoid the prescribed fire or vehicles, may be killed by the prescribed action. However, fire



effects on habitat, such as forage loss, may influence a species' population much more dramatically than direct mortality (USDA Forest Service, 2000).

There would be a long-term positive effect on wildlife that benefit from more open forest conditions due to the increase and improvement of habitat. The Proposed Action would have the desired effect of reducing tree density, allowing for increased understory. Habitat improvements from prescribed fires on fire dependent vegetation communities are increased browse and forage, increased habitat diversity, and a continuation of natural vegetation community development. Prescribed fires can renew plant growth and increase natural biological diversity as vegetation composition and structure are improved.

In the Management Areas of the Project Area, the habitat capability of the beaver, mountain bluebird, bighorn sheep, mule deer, elk, green-tailed towhee, turkey, and Virginia's warbler all either show an increase or no-change due to this alternative (Table 4-8). The only MIS that shows a downward trend in habitat capability due to this alternative are the red-naped sapsucker, Abert's squirrel (summer and winter habitat), and the turkey (winter habitat). The decrease of the habitat capability of these MIS is because closed canopy habitats provide more of the habitat needs of those species. Many of these MIS still do not meet or exceed the habitat capability requirements for the specific Management Areas, but this alternative does bring these MIS closer to the requirements. In the case of the bighorn sheep (summer and winter habitat) and elk (winter habitat) in Management Area 7a, and the mountain bluebird and turkey (summer habitat) in Management Area 7b all would exceed the corresponding habitat capability requirements due to this alternative. The HABCAP results do not account for the 25 miles of reclaimed roads, the riparian rehabilitation and upland planting in Buffalo Creek or the trail access subprojects which would all improve wildlife habitat.

Alternative B would impact areas classified as elk and mule deer habitat (Map 4-1). Of the elk habitat in the Project Area, this alternative would impact approximately 110 acres of winter concentration area; 4,500 acres of winter range; and 16,000 acres of summer range. Of the mule deer habitat in the Project Area, this alternative would impact approximately 120 acres of winter concentration area; 17,000 acres of winter range; and 7,400 acres of severe winter range. Summer range for the mule deer encompasses all of the Treatment Areas. Alternative B would not impact any bighorn sheep habitat.

The Forest Plan requires that approximately 60—70 percent of areas along openings, streams, and roads be hiding cover for elk and mule deer. The current database used for analyses does not allow for this specific type of analysis. Even if hiding cover would decline, forage areas would increase due to this alternative. This would provide more feeding opportunities for elk and mule deer that could possibly offset the loss of hiding cover. The Colorado Division of Wildlife (CDOW) has determined summer and winter range for elk and deer in the Project Area.

Table 4-8. Habitat Capability (HABCAP) Trend Predictions by Management Area

Common Name	Overall	Management Areas					
		2a	2b	4b	5b	7a	7d
Abert's Squirrel	↓	↓	↓	↓	↓	↓	↓
Beaver	-	-	-	-	-	-	-
Bighorn sheep	↑	↑	↑	↑	↑	↑	↑
Elk	↑	↑	↑	↑	↑	↑	↑
Lewis' woodpecker	↓	↓	↓	↑	-	↓	↑
Mallard	↑	↑	↑	↑	↑	↑	↑
Mountain bluebird	↑	↑	↑	↑	↑	↑	↑
Mule deer – summer	↑	↑	↑	↑	↑	↑	↑
Mule deer – winter	↑	-	↑	↑	↑	↑	↑
Pine marten	↓	-	↓	↓	↓	↓	↓
Red-naped sapsucker	↓	↓	↓	↓	↓	↓	↓
Three-toed woodpecker	↓	↓	↓	↓	↓	↓	↓
Virginia's warbler	-	-	-	-	-	-	-
Water pipit	-	-	-	-	-	-	-
Wild turkey – summer	↑	↑	↑	↑	↑	↑	↑
Wild turkey – winter	↓	↓	↓	↓	↓	↓	↓
Wilson's warbler	↑	↑	↑	↑	↑	↑	↑

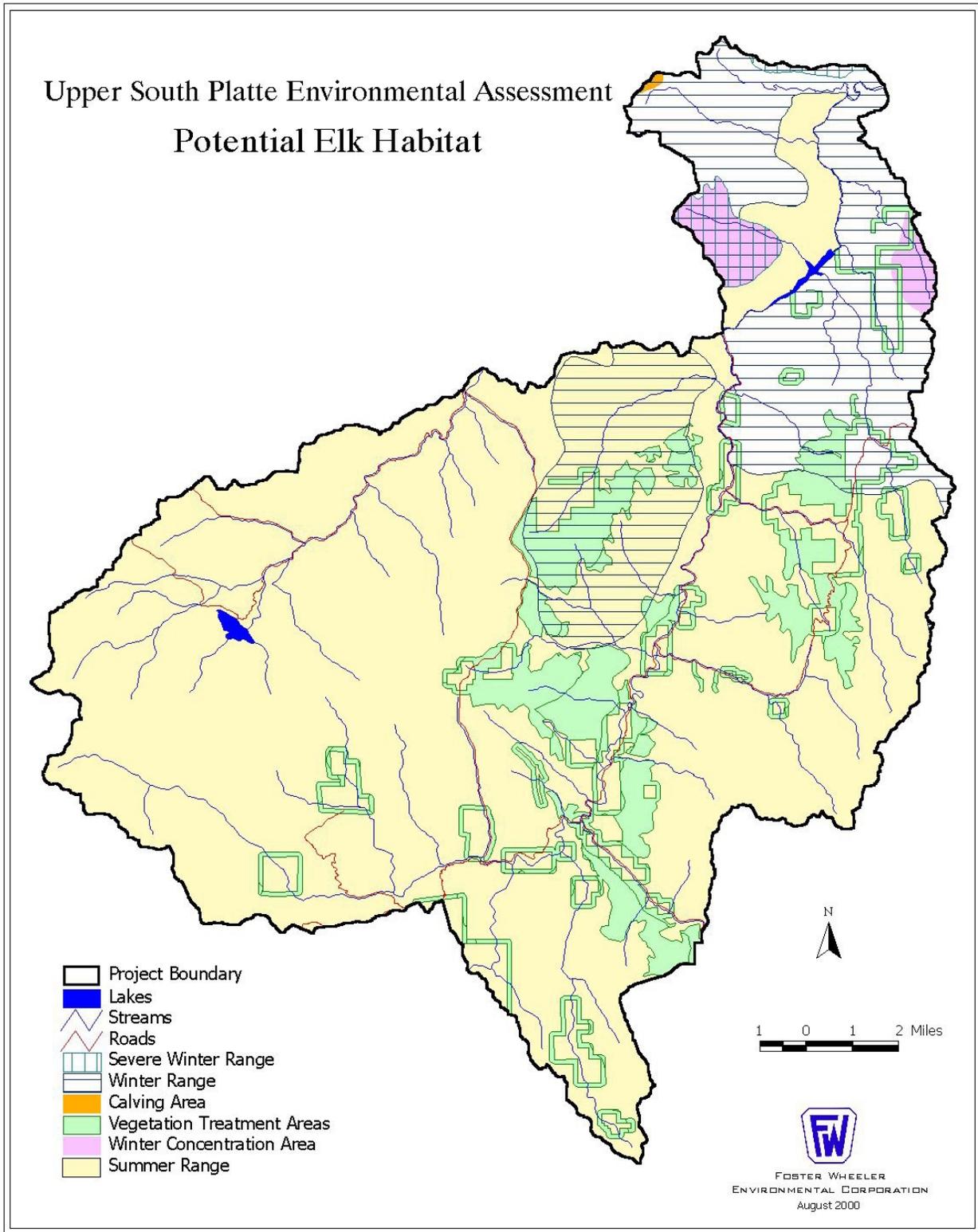
↑ upward trend as predicted by the HABCAP model

↓ downward trend as predicted by the HABCAP model

- level trend as predicted by the HABCAP model

The Forest Plan requires that 20 percent of the forest remain as thermal cover for elk and mule deer. Thermal cover is generally defined as 70 percent or greater crown closure (Hoover and Wills 1987). This provides adequate protection for winter habitat for these species. At current conditions, thermal cover in the winter range of these species in the Project Area ranges from 5.4 to 7.7 percent for mule deer and elk, respectively. The proposed action would decrease the amount of thermal cover in the winter ranges of these species to 4.6 to 6.8 percent for mule deer and elk, respectively. To remove excess elk and mule deer, the CDOW intensely manages these species by issuing hunting permits. Therefore, the level of thermal cover reduction due to the proposed actions does not indicate a significant reduction of population. In addition, the capacity of the RIS database to accurately reflect thermal cover conditions in the Project Area is questionable. It is probable that the amount of thermal cover that actually is present is underestimated in the RIS database and presented above. This is due to the fact that when information was gathered for the database, small pockets of thermal cover that occur within a larger area of less dense stands were grouped with the less dense stands. Therefore, the thermal cover for elk and mule deer is likely noticeably higher than the above percentages indicate. The habitat capability calculated by the HABCAP model shows an increase in elk and mule deer winter habitat capability.





Map 4-1. Elk Habitat in the Project Area.



ROAD RECLAMATION

The road reclamation work would have a short-term negative impact from the noise and disturbance associated with the use of a bulldozer ripping and seeding the roads. However, the road reclamation project would have positive effects on wildlife habitat in the Project Area. The reclaimed roads would reduce habitat fragmentation for some species and provide additional habitat for others. These roads are currently closed but it is likely that some human use occurs. Travel on these roads would be difficult to impossible following reclamation, therefore human disturbance would decrease.

BUFFALO CREEK BURN AREA RESTORATION

The upland planting in the Buffalo Creek burn area would ultimately provide additional forested habitat where regeneration was not occurring naturally. The additional forest habitat would be a positive impact to wildlife habitat in the Project Area. The riparian rehabilitation work would provide additional riparian habitat and increase stability of stream banks. This would provide additional riparian habitat for those species that rely on riparian habitats.

TRAIL ACCESS

The trail access projects would have minimal to no negative effects to wildlife and would have minimal positive impacts. If the projects are successful in discouraging use of social trails then some small amounts of riparian habitat would be improved habitat compared to the current condition.

Cumulative Effects

The current and future actions considered in this cumulative effects analysis are discussed in Alternative A. This alternative would have the cumulative effect of creating substantial areas of open ponderosa pine forest when considered with the current and future projects in the Project Area. This alternative would create habitat trends for MIS that would be very positive for the majority of the species and negative for others. This alternative would lower the long-term catastrophic fire risk.

Bighorn sheep (both summer and winter), elk (winter in Management Area 7a) and mountain bluebird (Management Area 7d) habitat capability would move from below to above the Forest Plan standard. However, Abert's squirrel and American marten (Management Area 7d) would move from above to below the Forest Plan standard. There would still be large areas of dense forest in the Project Area and throughout the Pike National Forest that would provide habitat for American marten and Abert's squirrel.



Mitigation

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- ❖ **Protect elk and mule deer calving and fawning concentration areas from habitat modification and disturbance from May 15 – June 30.**
 - ❖ **Insert contract clauses for noxious weed clean vehicles for all contractors.**
 - ❖ **Encourage aspen regeneration where possible.**
 - ❖ **Retain snags for habitat for cavity-dependent wildlife at a rate of 3-5 snags/acre of varying and larger diameter tree classes.**
 - ❖ **Noise control devices should be employed to reduce ambient noise levels during logging activities. Sound boards, mufflers, and other engineering devices can limit noise and reduce it to acceptable levels, which is generally below 60 dba.**
 - ❖ **A pre-treatment raptor survey would be conducted, specifically for northern goshawk and the flammulated owl. The survey would identify any active nest sites within the treatment areas. If an active northern goshawk nest is identified, then the Forest Service Biologist would be notified immediately. Work in the area of the nest would stop until the Forest Service Biologist has made a determination of the impacts to the nest. The Forest Service Biologist would apply a 30 acre buffer around the active goshawk nest area. No activity in this area is recommended. A larger, post-fledgling-family area, buffer may also be applied to the original buffer. The size of this buffer is approximately 420 acres from the active nest. Timing restrictions would also take place in the post-fledgling-family area. Activity can take place in this area from October through February.**
 - ❖ **If, during the pre-treatment raptor survey, an active flammulated owl nest is discovered, the Forest Service Biologist would be contacted immediately. As with the mitigation measures taken for the Northern goshawk, work would stop until a determination of impacts is made by the Forest Service Biologist.**
 - ❖ **If a large stand of aspen is discovered a Forest Service Botanist would do a survey for the Great-spurred violet or Webers' monkey-flower in spruce-fir forests above 8,500 feet.**
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ALTERNATIVE C

Direct and Indirect Effects

Under Alternative C, direct and indirect impacts to wildlife in areas where thinning and removing trees and prescribed fires would occur are similar to those discussed for Alternative B (Proposed Action). The only important difference would be that there would be an increase in short-term fire risk for the areas in roadless areas that would not have tree removal. Some of these areas would have tree removal in Alternative B. The effects of the road reclamation, trail access and Buffalo Creek burn area rehabilitation projects would be the same as those described for Alternative B.

Cumulative Effects

The Roadless Alternative would have a cumulative effect on wildlife similar to those discussed for Alternative B (Proposed Action).

Mitigation

Mitigation measures for this alternative would be similar to those identified for Alternative B.

CONSISTENCY WITH FOREST PLAN

Alternative A

Alternative A would not be consistent with the goal of increasing diversity of wildlife and wildlife habitats. However, it would not violate any Forest Plan standards and guidelines, where current conditions meet those standards and guidelines. Several species are currently below their habitat capability and other standards.

Alternative B

Alternative B would be consistent with most of the goals of the Forest Plan described above. This alternative would increase the diversity of wildlife and wildlife habitats. It is not consistent with a Forest Plan standard if habitat capability (as determined by the HABCAP model) is below the standard and decreases or if it is above the standard and drops below. Aberts squirrel (summer and winter), Turkey (winter) are below Forest Plan standards and would decrease under this alternative. American marten is below the standard and would decrease in all but one Management Area, for Management Area 7d it is currently above and would decrease below the standard. For several Management Areas Northern three-toed woodpecker and Lewis' woodpecker are below the standard and would decrease.

The current condition for thermal cover for both elk and mule deer does not meet the Forest Plan standard of 20 percent. This alternative would decrease thermal cover further below the standard, where thermal cover is defined as canopy closure greater than 70 percent.

POPULATION VIABILITY

The population viability for MIS that have a positive or level habitat capability trend as predicted by the HABCAP model would have the same or improved population viability compared to the current condition. The following discussions on population viability are presented only for those species that have negative habitat capability trends as predicted by the HABCAP model.

Abert's Squirrel

The principal habitat of Abert's squirrel is ponderosa pine woodlands, but may range into other forest types (Armstrong, 1987). Currently, about 27 percent of the entire Upper South Platte Landscape (640,000 acres) is suitable habitat for the Abert's squirrel. The action alternatives would decrease the amount of ponderosa pine woodlands within the Project Area. Although the Abert's squirrel's principal habitat is this forest type, the population viability would not be dramatically affected by these actions.



The percentage of suitable habitat within the vegetation treatment areas is approximately 6 percent of the suitable habitat in the Upper South Platte Landscape. This means that the Abert's squirrel population would have adequate suitable habitat during and after the action alternatives.

Lewis' woodpecker

Lewis' woodpecker is a year-round resident of the foothills of southern Colorado and occurs in lowland and foothill riparian areas, agricultural areas and urban areas with tall deciduous trees. It sometimes avoids riparian forests because of competition with the red-headed woodpecker. It is known to occur in the Wet Mountains and Custer and Pueblo Counties (USFS, 1994). Based on the known locations of Lewis' woodpecker, it is not expected to occur within the Project Areas. Therefore, the populations of Lewis' woodpecker is not anticipated to be affected by the action alternatives. In addition, although the HABCAP model shows a downward trend, the anticipated future condition does not bring the result below the Forest-wide standard of 40 percent.

American marten

The American marten's range of habitats in Colorado is fairly broad, including tundra rockpiles and talus slopes as well as montane woodland (Armstrong, 1987). In Colorado, American martens occur at elevations of 8,000 to 13,000 ft. They are associated with spruce-fir and lodgepole vegetation types with mature to old growth structural stages. They prefer moderate to high canopy cover (USFS, 1994c). Currently, about 69 percent of the Upper South Platte Landscape (640,000 acres) is potential habitat for the American marten. No populations of this mammal are known to occur within the Project Area. However, suitable habitat for the animal does occur within the Project Area. The percentage of suitable habitat within the Project Area is approximately 0.4 percent of the suitable habitat in the Upper South Platte Landscape. If an American marten population was present in the Project Area, it would have adequate suitable habitat during and after the action alternatives.

Red-naped sapsucker

The red-naped sapsucker (*Sphyrapicus nuchalis*) is a Forest Management Indicator Species for Pike and San Isabel National Forests. The red-naped sapsucker was previously considered a subspecies of the yellow-bellied sapsucker (*S. varius*), but is now considered a separate species (CBBA, 1998; Peterson 1990). They are most common in aspen or deciduous forests and can be spotted in Colorado during the summer. They do not venture far from the typical aspen groves that they nest in (*Field Guide to the Birds of North America*, 1983). Currently, about 0.44 percent of the Upper South Platte Landscape is suitable habitat for the red-naped sapsucker. Although the HABCAP model shows that the habitat for the red-naped sapsucker is in a downward trend, this is possibly due to the lack of aspen groves naturally occurring in the Project Area. The action alternatives do allow for the regeneration of aspen groves. In addition, the HABCAP model does show a downward trend, but the anticipated future condition does not bring the result below the Forest-wide standard of 40 percent. Currently there is no suitable habitat for the red-naped sapsucker within the Project Area, therefore the population is not anticipated to have adverse effects due to the action alternatives.

Three-toed woodpecker

The three-toed woodpecker primarily occurs in spruce-fir forests. At all seasons and elevations, this species is most common in years and areas where trees have high insect populations due to disease or fire. Where insect populations are high it may also occur in ponderosa pine, Douglas-fir and lodgepole pine forest (Andrews et al., 1992). Currently, about 59 percent of the Upper South Platte Landscape is suitable habitat for the three-toed woodpecker. Although the action alternatives would decrease the

chance of catastrophic fire, smaller fires would inherently be present, which would allow for an insect preybase to exist. Additionally, the suitable habitat within the Project Area is approximately 0.3 percent of the suitable habitat in the Upper South Platte Landscape. The three-toed woodpecker population would have adequate suitable habitat during and after the action alternatives.

Alternative C

Alternative C would be similar to Alternative B in compliance with the Forest Plan.



RECREATION

MANAGEMENT DIRECTION

The Forest Plan provides guidance for the management of forested areas on the Pike and San Isabel National Forests through its stated goals and objectives, and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. A detailed list of these can be found in the Forest Plan. The standards and guidelines for recreation that apply to the proposed actions are given below. A list of the management area objectives can be found in the Forest Plan.

Forest-Wide Direction

FOREST-WIDE GOALS

- ❖ **Provide a broad spectrum of developed and dispersed recreation opportunities in accordance with identified needs and demands.**
- ❖ **Maintain approximately the current ratio of Recreation Opportunity Spectrum classes for dispersed recreation.**

FOREST-WIDE STANDARDS AND GUIDELINES

- ❖ **Provide a broad spectrum of dispersed recreation opportunities in accordance with the established Recreation Opportunity Spectrum classification for the management area.**
- ❖ **Close or rehabilitate dispersed sites where unacceptable environmental damage is occurring.**
- ❖ **Manage dispersed recreation activities to not exceed the established ROS PAOT/acre capacity.**
- ❖ **Manage use of trails in dispersed areas to not exceed the established PAOT/mile of trail guidelines.**

EVALUATION CRITERIA

Future or on-going Actions for Cumulative Effects Analysis

Several of the future foreseeable actions discussed in *Chapter 2 – Alternatives* have the potential to affect the Recreational Resource. Within the Project Area, vegetation treatments on Denver Water lands and prescribed burning in Tussock Moth stands are considered. The Rampart Range motorized trail plan would also be an improvement to recreation that would provide beneficial cumulative effects. The activities in the Lower Elk Management Unit would be unlikely to directly affect recreation because the activities would be primarily on private lands and not around existing recreational facilities or resources.

Direct, Indirect and Cumulative Effects

The effects of the alternatives are compared by evaluating the change in the recreational experience by forest visitors both in the short and long-term. This is a qualitative analysis based on expected changes in the environment. The effect of the proposed activities on the designated ROS settings is also discussed.

ALTERNATIVE COMPARISON

Alternative A – No Action

DIRECT AND INDIRECT EFFECTS

Alternative A would not have any direct effects on the recreational resource. An indirect effect of the alternative would be a continuation of the trend towards increasing forest fuel loads and fire risk. This alternative would have the greatest potential for a large, catastrophic fire that could substantially damage recreational resources in the Project Area (see *Chapter 4 – Forest Vegetation*). The Buffalo Creek fire and floods damaged some recreational facilities such as trails and campgrounds, and destroyed others. Recreational use of these areas has been banned or restricted, reducing the recreational opportunities in the Project Area. The Hi Meadow fire burned only 55 acres of the Project Area, but caused major damage in other areas. If another major fire were to occur in the Project Area, it could further reduce the recreational use of the area, depending on the size and location of such an event.

A major fire in the Project Area could result in the temporary or permanent loss of recreational facilities. This area is heavily used for recreation and individuals who use the area could be displaced to other facilities in other locations. Because the Project Area is so close to the Denver metropolitan area, it can be assumed that recreationists would go to other similar facilities close to Denver to recreate. This would put additional pressures on other facilities. However, the Project Area offers a unique combination of recreation opportunities close to a major metropolitan area and replacement recreational opportunities may not exist for some. Recreationists might return to the Project Area if facilities impacted by a fire had been rebuilt and the nearby landscape was beginning to revegetate.



Alternative A does not propose improvements for recreational access along sections of the South Platte River. Recreationists using these areas who wander off the main trails onto the various social trails would continue to disturb riparian areas, erode stream banks and hillslopes, potentially degrading water quality and fish habitat. Over time, the increasingly degraded conditions would negatively affect the recreation experience and, due to an uncontrolled and dangerous undeveloped access trail, could put some recreationists in danger of injury.

Alternative A does not propose to reclaim roads or revegetate parts of the Buffalo Creek burn area. These proposals would have only a minor effect on recreation as discussed for Alternatives B and C.

CUMULATIVE EFFECTS

Future foreseeable actions in the Project Area include vegetation treatment on Denver Water lands and prescribed burning in stands with defoliation from a Tussock Moth infestation. These activities would primarily affect recreation by increasing management activity in the Project Area and by creating smoke, which could negatively affect the recreation experience. These effects are minor and short-term.

CONCLUSION

This alternative (no action) would not have any direct effects on recreation. Indirectly, the alternative would continue the trend toward increasing fire risk and potential damage to recreational resources. Resource damage due to a dispersed trail system would continue.

Alternative B

Alternative B proposes to thin the forest and create openings in the treatment areas. A number of these treatment areas surround, or are in the vicinity of, recreation facilities or areas where recreation occurs. The trail improvements that are proposed by this alternative would directly affect, and improve, recreational resources. The proposed road reclamation, and revegetation of Buffalo Creek would have only a minor affect on recreation.

DIRECT AND INDIRECT EFFECTS

Effects of Vegetation Treatment on Recreation

The proposed vegetation treatments would have the greatest long-term, direct effect on recreation by changing the character of portions of the Project Area in which recreation takes place. When the project is completed, the appearance of the treatment areas would be different from the appearance of the existing forest. However, the treatment areas would still have a natural appearance, but the forest would be less dense and there would be numerous created openings. *Chapter 4 - Visuals* discusses the visual changes associated with Alternative B.

Effects on ROS Settings

The actions proposed by Alternative B would not change the ROS settings of the Project Area. No new roads would be constructed and the vegetation treatments would not change the long-term recreational use (see below for a discussion on the effects of road reclamation). Alternative B would use forwarders or skidders to access 3,000 acres in areas without existing roads, which would prevent the opening of unroaded areas to roaded access. This activity would not change the ROS settings. However, it would be obvious to many recreationists that forwarders had been used. In some areas, the forwarders would leave

a “path” of disturbed ground (and vegetation). The paths would remain noticeable until they reverted to pre-treatment conditions.

Effects on Recreation Resource Areas

The following discussion presents the likely effects that vegetation treatment would have on areas in the project areas that support high concentrations of recreational facilities and activity.

State Highway 126 Corridor Several vegetation treatment areas are proposed along the State Highway 126 corridor. Facilities along the corridor that could be affected include the trailhead for the Colorado Trail (and part of the trail), the Long Scraggy Scenic Overlook, the Kelsey Creek Campground and the Wigwam Campground. These areas are near an existing road and therefore easily accessible. The forest near these facilities that are within treatment areas would be thinned to leave a 25 percent canopy.

Short-term effects of the harvest activity would include noise, visual activity, smells, and smoke that could affect the experience of people using these facilities. Traffic associated with the harvest and prescribed burning would also affect recreationists along this corridor. The primary effect of the increase in traffic would be noise heard at nearby recreational facilities. Prior to the subscribed burning, logging slash would be noticeable to visitors. Although these effects would be considered minor, some recreationists may chose to avoid the affected areas while harvest activities are being conducted.

Prescribed burning would be a short-term effect in the treatment areas. The burning of individual areas would take one to two days to complete. During this time, recreationists would likely avoid the areas being burned because of smoke. This would temporarily reduce the use of these facilities. However, the duration of the effect is short and therefore the overall effect of the burning would be considered minor.

The primary long-term effect to visitors of these facilities would be visual (see *Chapter 4 – Visual Resources*). Areas where the forest has been thinned would have a different visual character than the existing, dense forest. The effect of this change would depend upon the sensitivity of the individual. The overall difference in appearance would be a change to a more open condition, which would more closely emulate the historic forest conditions. The treated areas would retain a natural character. The change in appearance of the treated areas may be noticeable but would not cause an adverse effect to recreationists.

South Platte River Corridor Much of the South Platte River Corridor is located between proposed vegetation treatment areas. The Lone Rock Campground, the Platte River Campground, the Scraggy View Picnic Area, the Ouzel Campground, and the Osprey Campground are located very close to vegetation treatment areas. Because of this close proximity, it is likely that these facilities would be temporarily closed during harvest and prescribed burn activities. Closing these campgrounds would likely cause some displacement of recreationists to other facilities. This could increase crowding in other areas, potentially negatively affecting the recreation experience at other facilities. However, the closures would be temporary and result in only minor, short-term effects.

Other short and long-term effects to these facilities would be similar to those discussed above for State Highway 126.

Buffalo Creek This alternative does not propose thinning or creation of openings in the Buffalo Creek area. Therefore, there would be no affect on recreation due to vegetation treatments.

The Colorado Trail The Colorado Trail would not pass through any treatment areas. The closest it would come to a treatment area would be near the State Highway 126 trailhead, where the treatment area would be on the east (and opposite) side of the highway. Recreationists might notice some of the treatment areas from the trail, depending on the sensitivity of the individual. The overall difference in appearance of the treatment areas would be a change to a more open condition. The appearance would more closely



emulate the historic forest conditions and would retain a natural character. Therefore, this change in appearance of the area may be noticeable but would not be an adverse effect to recreationists. In the short-term, recreationists may notice the harvest activities and, prior to the prescribed burning, they may also notice slash in the treated areas. This may create some minor, short-term adverse effects.

The Rampart Area Several of the treatment areas would be located in the Rampart Area, primarily affecting motorized trails. Some of the most popular of these trails, including the Cabin Ridge, Flat Rock, Noodle, and Russell Gulch trails, would pass through treatment areas. During treatment, trails would probably be closed for varying periods of time. After treatment, ATV and ORV riders using the portions of trails that pass through treatment areas would observe a more open forest. The treatments would not affect their ability to use the trails or adversely affect their recreational experience (see above for a discussion of the change in visual character).

Developed facilities in the area such as the Flat Rocks and Indian Creek Campgrounds are not located near proposed treatment areas. The only effects to these facilities would be noise related to the increased traffic from logging trucks and treatment activities, and possibly smoke from the prescribed burns.

Other Recreational Resources If the owners of The Flying G Ranch choose to participate in vegetative treatments around their property, a strip of land as wide as 500 feet could be treated around the ranch. Trails leading from the ranch to the Lost Creek Wilderness and other areas would pass through the treated strip. Recreationists, including the Girl Scouts, who use this area, would notice a change in the forest conditions. The effect would be the same as discussed for the Colorado Trail.

There are no treatment areas proposed near the Lost Creek Wilderness. The wilderness would not be directly affected by Alternative B.

Other Effects

An indirect effect of the vegetation treatments would be the reduction in the potential for damage to recreational resources due to a catastrophic fire. As discussed in *Chapter 4 – Forest Vegetation*, there would be a short-term increase in fire risk prior to prescribed burning. However, once the burning is completed, the thinned forest and created openings would reduce the potential for a large fire in the Project Area as compared to the No Action alternative (see Alternative A – No Action discussion, above, for a discussion of effects to recreation from a large fire). This alternative would have a lesser short-term increase in fire risk as compared to Alternative C.

Effects of Trail Improvements

The improvements on the South Platte River Access Trails and the Gill Trail would have a positive effect on the recreational resource. The safety for hikers would be improved and the trail system would be more adequately maintained. Additionally, the measures would provide protection to the local environment from resource damage. There could be some short-term disruption for recreationists while the work is being completed. These disruptions would include noise, traffic, and rehabilitation activities on the trails and at parking areas. These disruptions would be considered minor. Details of the proposed improvements are discussed below.

South Platte River Corridor Access Trails Alternative B would develop and improve access trails on five sections of the South Platte River. The five sections are on National Forest lands and total 7.5 miles. The improvements would involve upgrading existing trails, improving dispersed trails, providing stairs where necessary, improving trail safety, and restoring dispersed trails and areas damaged by overuse.

All sections proposed for improvements have networks of informal or “social” trails, which provide access to and along the river. Overuse has damaged riparian vegetation, caused erosion and damaged



aquatic habitat. The new access stairs and trails will direct and control the flow of recreationists and allow safer access. In addition to providing new and safer access, many of the existing informal trails will be blocked to discourage use and allow vegetation to become reestablished. The new access system will help reduce erosion and damage to riparian and aquatic habitat.

Gill Trail Improvements to the Gill Trail are proposed by this alternative including; a new trailhead parking area, a new trail route from the trailhead to the current trail route to avoid following the road to Cheesman Reservoir, rehabilitation of trail sections in Cheesman Canyon, and a new route from Cheesman Canyon to the parking area near Cheesman Reservoir. The new expanded trailhead parking area near the Wigwam Campground would permit the closure of a number of unauthorized and dangerous parking spaces next to roads, improving safety.

The new trail routes would improve hiker safety by moving the existing trail from the road. This would also improve the hiking experience. Closure and revegetation of dispersed trails would prevent resource damage and also improve safety. In Cheesman Canyon, new trails, steps and established routes to the river would also improve safety and prevent further resource damage. Closures and revegetation of dispersed trails, rock retaining walls and drainage improvements would not only prevent further damage but help rehabilitate areas that have been damaged by overuse.

Effects of Road Reclamation

Alternative B would reclaim 25 miles of road in the Project Area. Specific roads for this action have not been identified at this time. However, some general assumptions and conclusions can be made to estimate the effects on recreation. None of the roads that would be reclaimed are currently designated for motorized or non-motorized recreational use. Therefore, there would not be a loss of designated recreational opportunities for motorized and non-motorized recreationists in the Project Area.

Reducing these roads would not change the ROS settings as the roads that would be closed are not currently available for motorized use and are rough non-system roads, some of which have no known origin. The reclamation could affect any individuals who may use the roads for hiking or mountain biking but there are many other opportunities in the area for these activities so the effect would be minor.

Effects of Buffalo Creek Burn Area Revegetation

The proposed revegetation of riparian and upland areas in the Buffalo Creek burn area would have no short-term effects on recreational use of the area. Prior to the fire, portions of the burn area were used by recreationists. However, facilities in this area such as campgrounds and trails, have been closed and there are no plans to reopen them. Given the limited use of the area, the revegetation activities would not be likely to impact recreationists.

The restoration activities would have a positive long-term effect on recreation by improving the visual environment and accelerating the return of recreation to the burn area. If some of the revegetated areas are visible from roads that lead to recreational facilities, drivers would have a more appealing drive to those facilities. If revegetation efforts occur near any of the recreational facilities that were destroyed by the fire, it may be possible to reopen those facilities when the surroundings are more attractive and stable.

Additional Indirect Effects of the Proposed Actions

An additional indirect effect of the proposed activities would be the possible temporary displacement of recreationists while the activities are completed. Recreationists using facilities both within and out of the Project Area that are not affected by this alternative could notice more use, which could negatively affect their recreation experience. This type of displacement could occur during harvest activity, rehabilitation



efforts and prescribed burning. However, the effect would be minor as all of the activities would be scheduled over a number of years, which would dilute the displacement effect.

CUMULATIVE EFFECTS

Vegetation treatments on Denver Water lands and prescribed burning in stands with Tussock moth infestation combined with the proposed actions would result in a cumulative increase in management activity in the Project Area. For a period when activities are concurrent, the cumulative effect may increase the feeling of crowding and negatively affect the recreation experience. This effect would be short term while activities are completed. The long-term cumulative effect of these combined actions would be a reduction in fire risk and therefore, a reduction in the potential for adverse effects to recreational resources due to a large catastrophic fire.

The Rampart Range Motorized trail plan would combine with proposed trail improvements to benefit the long-term recreational trail resources in the Project Area. These combined actions would provide substantial improvements to a heavily used trail resource.

CONCLUSION

Alternative B would have only minor, short-term adverse effects due to the proposed activities. These effects would primarily be due to the actual harvest activities and prescribed burning.

In the long-term, the recreational resources would be improved by this alternative. The harvest treatments would reduce the long-term fire risk which would reduce the potential for damage of recreational resources due to a large, catastrophic fire. Alternative B would improve the safety and aesthetics of the trail system in the Project Area, prevent further resource damage due to a dispersed trail system, and rehabilitate some of the areas already damaged by overuse.

This alternative is consistent with the Forest Plan direction for management of recreational resources.

Alternative C

DIRECT AND INDIRECT EFFECTS

Alternative C would have the same direct and indirect effects on recreation as Alternative B except as discussed below.

Alternative C proposes to leave harvested trees on-site across 5,414 acres in the roadless areas. Instead, the cut trees would be left in place and burned. This would result in an increase in the amount of smoke produced from these sites. However, these areas would still be subject to prescribed burning in Alternative B, and the additional smoke produced from the downed trees may not be noticeable to most visitors.

Alternative C does not use forwarders or skidders as extensively in the Project Area as compared to Alternative B. Therefore, the potential effect of recreationists observing the machines or “paths” or hearing them, would be less with Alternative C.

An indirect effect of this alternative is the short and long-term effects on recreation due to the change in wildfire risk. Because of the increased woody debris and trees left on the ground, this alternative would have a greater increase in short-term fire risk as compared to Alternative B. The long-term reduction in fire risk would be the same for both alternatives.

CUMULATIVE EFFECTS

The cumulative effects on forest structure for this alternative would be the same as the effects of Alternative B.

Recommendations

It is recommended that to improve recreationists' understanding of the change in the character of the forest in treated areas, that signs be posted along trails, in campgrounds and at highway overlooks explaining the harvest activities and the projects main goals. It is also recommended that in areas where dispersed trails are to be closed, signs be posted to request that hikers not use the old trails and explaining the purpose of the new trail systems, including safety features, and resource protection measures.



AIR QUALITY

INTRODUCTION

This section evaluates the direct, indirect and cumulative effects of the alternatives on air quality. Smoke from proposed prescribed burning, dust from vehicle traffic on unpaved roads and silvicultural treatment operations could all affect air quality. Smoke generated from the proposed prescribed burning could reduce visibility and negatively affect air quality in the Project Area and nearby airsheds. However, in the long-term, the combination of harvest and prescribed burns would reduce the potential for larger wildfires, which would likely create more significant air quality impairment than prescribed burning.

The Project Area is in a federally designated non-attainment area for particulate matter less than 10 micrometers (PM-10). Therefore, the amount of smoke and PM-10 emissions generated from burning operations is a concern.

MANAGEMENT DIRECTION

Regulations and Policies

As discussed in *Chapter 3 – Air Quality*, the National Forests in the State of Colorado have signed a Smoke Management Memorandum of Understanding (MOU) with the Air Pollution Control Division and other federal and state land managers in Colorado. Under the current smoke management program, permits are issued by the Colorado Air Pollution Control Commission for prescribed burning projects on forest and rangelands. Signatories of the MOU are responsible for ensuring proper smoke management for any prescribed fires they conduct and obtaining a permit from the State before initiating prescribed burning (CAPCD, 2000). This program makes it possible for the State to predict the amount of smoke produced in each airshed and to control the amount of burning conducted. When there is a concern that air quality problems will develop, burning operations that would cause impacts can be shut down.

USFS Forest-Wide Direction

The Forest Plan provides guidance for the management of forested areas on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. The standards and guidelines that apply to the proposed actions for air quality are given below.

FOREST-WIDE GOALS

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-
- ❖ **Maintain air quality compatible with State and Federal laws.**
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FOREST-WIDE STANDARDS AND GUIDELINES

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-
- ❖ **In Wilderness Areas – Protect air quality related values from adverse effects from air pollution.**
 - ❖ **Comply with State and Federal air quality standards.**
-
-

Management Area Directions

There are no specific management area directions that apply to this resource.

EVALUATION CRITERIA

Direct and Indirect Effects

The direct and indirect effects of the alternatives are estimated using two criteria. The first is an estimate of the emissions produced by the burning. The second is a more qualitative analysis of the effect of the burning on local communities and smoke sensitive areas.

EMISSIONS FROM BURNING

The potential effect of each alternative on air quality was assessed by estimating the amount of total suspended particulates (TSP) and PM-10 emitted from the proposed prescribed burning on an annual basis. Estimated emissions are then compared with the de minimis level for PM-10 non-attainment areas (see *Chapter 3 – Air Quality*). The de minimis level for Colorado PM-10 non-attainment areas is 100 tons per year. The SASEM computer model (USDI-BLM, 1991) was used to estimate emissions from the proposed prescribed burning (see Scotford, 2000).

For alternative A, an estimate of emissions from potential wildfires is included in the analysis. This estimate is based on average emissions factors for wildfire in forests (Hardy, et al, 1992) and estimates of fuel consumed by wildfires in the Rocky Mountain Region published by the EPA. Potential emissions should wildfire occur in Alternatives B and C are compared to these emission levels.

SMOKE SENSITIVE RECEPTORS

One of the potential effects of the prescribed burning is reduced visibility in smoke sensitive areas. The degree to which these effects are noticeable would depend on atmospheric conditions at the time and other activities in the airshed. These factors cannot be predicted at this time. However, it is assumed that higher emissions would mean more smoky days and a greater chance that smoke sensitive areas would be affected.



The Mount Evans Wilderness lies to the northwest of the Project Area and the Lost Creek Wilderness is just to the west. These are both Class II wilderness areas for air quality (see *Chapter 3 – Air Quality*). In general, areas to the south and west of the proposed burning would not receive much of the generated smoke because the prevailing winds tends to blow smoke away from these areas. The analysis assumes that these wilderness areas would not be affected by the proposed burning.

Several small communities within the project area could be affected by smoke during prescribed burning. These include the communities of Deckers, Trumbull, Oxyoke, Nighthawk, and Sprucewood. The analysis focuses on the potential effects of on these local communities.

Cumulative Effects

Impacts on the local air quality are not usually evident once the emission source is removed due to dispersion. The cumulative effects from past emissions would be negligible. This is also true for future emissions released after emissions from the proposed actions have dispersed. The greatest cumulative effects would be from activities that releasing emissions at the same time as the proposed actions or from sources that continually emit PM-10 into the local airshed. Activities that could have a cumulative effect on air quality include other prescribed burning scheduled for the same time period. These future foreseeable activities include proposed prescribed burning on adjacent lands owned by Denver Water and ongoing prescribed burning within stands affected by Douglas-fir Tussock Moth (DFTM) on National Forest land.

The procedures and burning restrictions imposed by the State’s smoke management program would limit any cumulative impacts of the action alternatives and any foreseeable future actions. Since the analysis area is in a non-attainment area for PM-10, there are stricter limits set for emissions of PM-10 and the amount of burning that can be conducted in the area. The ultimate cumulative effects of a greater amount of burning within the area would be a delay in burning and an increased chance of natural ignition of wildland fuels prior to prescribed burning.

The cumulative effects on air quality are assessed by comparing the estimated emissions produced under each alternative and the total area of future foreseeable burning across the analysis area. The more emissions released, the greater the demand for burning during “good burning” weather. This increase in demand for “air space” could result in delays in fuel treatment operations. In addition the total area proposed for prescribed burning within the analysis area over the next ten years could affect the scheduling of burns and possible delays. The possible cumulative effects of the alternatives are qualitatively assessed in relation to the potential demand for airspace.

ALTERNATIVE COMPARISON

Alternative A

DIRECT AND INDIRECT EFFECTS

Emissions from Burning

This alternative would have no direct adverse effect on air quality. However, this alternative has the highest risk of a large wildfire occurring in the area (see *Chapter 4 – Forest Vegetation*). This type of fire

could release large quantities of emissions due to an abundance of fuels in the area. As stands continue to mature and produce additional ground fuels, the potential for a wildfire would increase. A large wildfire has the potential to emit large amounts of smoke that could remain in the local airsheds for a few days to several weeks depending on the size and intensity of the fire.

Fires similar to the Buffalo Creek and Hi Meadows burns could develop in the area. This burn covered 12,000 acres of forest. A wildfire of this size could release 5,400 tons of PM-10 over a period of a few days. This is 54 times the annual de minimis level for PM-10 in Colorado non-attainment areas.

Smoke Sensitive Receptors

There would be no direct effects to local communities. However, many of the small communities in and around the Project Area would be affected by smoke generated by a wildfire. Depending on the size of the fire, the Denver Metro Area could also be adversely affected. Unlike prescribed burning, wildfires can occur when weather conditions are not good for dispersal. Smoke could be caught in an inversion layer along the Upper South Platte River, reducing visibility in the area. Depending on the size of the fire and weather conditions, these effects could last anywhere from one night to several weeks.

Smoke from the recent Hi Meadow fire in the South Platte watershed affected not only the local communities but the Denver metro Area as well. Although emissions data is not yet available for this fire, warnings were given in Denver for people with respiratory conditions to stay indoors to avoid the particulates. Many of the small communities in the area were evacuated for over a week.

CUMULATIVE EFFECTS

Since no prescribed burning is proposed by this alternative, there would not be a cumulative increase in the demand for airspace when combined with other projects. Alternative A would have no effect on the scheduling of the prescribed burns on Denver Water and National Forest lands. The future foreseeable prescribed burning would include 2,000 acres on Denver Water lands and 13,000 acres on National Forest land. The burning on National Forest land is in the implementation stage and will likely be completed over the next 5 to 7 years. On Denver Water lands 15 acres of piles are ready to be burned and an additional 175 acres are being harvested. These areas will probably be burned in a couple of years. The remaining area is only in the preliminary planning stages. If these areas were burned, burning would most likely take place in 4 to 8 years.

Alternative B

DIRECT AND INDIRECT EFFECTS

Emissions from Burning

The prescribed burning that is proposed by Alternative B would have a direct, short-term effect on air quality in the Analysis Area. Modeling results estimate that 1,300 tons of TSP and 1,050 tons PM-10 could be released from the burning. If these burns were conducted over a 12-year period, an average of 87 tons per year of PM-10 would be released. The de minimis level is 100 tons per year. The estimates for emissions are based on the conservative assumption that all areas proposed for silvicultural treatment will be under-burned and that ground fuels are continuous across the area burned. In reality, there would be natural openings in some areas, other areas with lighter fuels. Actual emissions would likely be less than these estimates because there are natural openings, areas of light fuels, and areas that will not be burned.



By conducting the burning over a 11 to 12-year period and burning outside the high pollution period (November 1st to the end of February), this alternative would meet the guidelines and standards for PM-10 non-attainment areas in Colorado. Since the amount of burning conducted in any one airshed is monitored and controlled by the State, this alternative would not be expected to result in violations of air quality standards.

An indirect effect of Alternative B is a reduction in the emissions that would be released should a wildfire occur in the area. Crown fires tend to release high amounts of PM-10 because of the amount of live fuel that can burn. As discussed *Chapter 4 – Forest Vegetation*, this alternative reduces the risk of a crown fire by changing the stand structure. Should a crown fire still occur, there would be less green fuel available to burn due to the thinning treatments, and its ability to spread could be limited by created openings. The stands that are proposed for thinning are spread out in several blocks throughout the Deckers-Waterton and Horse Creek watersheds. Following treatment, these areas would act as fuels breaks and help to limit the extent of wildfires that may develop. The created openings would also reduce the emissions produced during a wildfire by removing fuels.

As discussed above, the areas of prescribed burning would produce 87 tons per year of PM-10 emissions. If the same areas were to burn in a wildfire, 7,830 tons of PM-10 could be released over a period of a few days.

Smoke Sensitive Receptors

The prescribed burning proposed by this alternative would increase the number of smoky days in the local area, affecting several of the local communities including Deckers, Trumbull, Oxyoke, Nighthawk, and Sprucewood. Smoke would stay in the local airshed a relatively short time (a few hours to several days depending on the weather). Generally, areas to the west and south of the burns would not be affected due to the prevailing winds that would blow smoke away from these areas. However, there could be some smoke settling into the river valley along the Upper South Platte River during the evenings. Smoke trapped in low-lying areas would be expected to dissipate once morning temperatures rose and the nighttime inversion lifted. Prescribed burning would be conducted when weather conditions are predicted to be good to excellent for smoke dispersal. Under these conditions, the smoke would rise up and be taken aloft out of the local airshed.

CUMULATIVE EFFECTS

This alternative proposes over 17,000 acres of prescribed burning. In addition, future foreseeable prescribed burning includes 2,000 acres on Denver Water lands and 13,000 acres on National Forest land. The combined activity would be 32,400 acres that could be prescribed burned over the next 15 years. The activities proposed by this alternative may cause delays in burning due to the increased demand for air space.

The burning on National Forest land is in the implementation stage and will likely be completed over the next 5 to 7 years. On Denver Water lands 15 acres of piles are ready to be burned and an additional 175 acres are being harvested. These areas will probably be burned in a couple of years. The remaining area is only in the preliminary planning stages. If these areas were burned, burning would most likely take place in 4 to 6 years. The burning proposed by Alternative B would not begin for 2 to 3 years after the first areas have been thinned. Since it would take a year or more to prepare the sites for cutting and at least one more year for the thinning operations to begin, the earliest the burning could take place would be in four years. During this time much of the burning on the DFTM areas and the 190 acres of Denver Water lands will have been burned. However, in about 5 to 6 years when the proposed burning would be taking place there could be some delays as a result of the demand for “air space”. During this period

there could be some overlap of the areas left to burn in the DFTM units, new areas harvested on Denver Water lands and the areas created from the proposed project. The cumulative effect of these burns would be an increased chance of delay in burning and an increase in the chance of natural ignition of the fuels prior to prescribed burning.

Alternative C

DIRECT AND INDIRECT EFFECTS

Alternative C would have the largest direct effect on air quality in the analysis area. Under this alternative an estimated 1,500 tons of TSP and 1,200 tons PM-10 could be released as a result prescribed burning operations. If these burns were conducted over a 12-year period an average of 100 tons of PM-10 would be released annually over this period. Estimated emissions are higher for alternative C than alternative B because of the greater amounts of fuels burned. Under this alternative a greater proportion of the thinned area would not have the logs removed. Without log removal, the amount of fuels to be burned in these stands would be higher. The higher emissions are a reflection of this higher fuel loading. The effects on air quality would be short-term because once the smoke has dispersed, the emissions are diluted and removed from the local airshed.

Based on the SASEM computer model outputs for this alternative, the amount of total suspended particulate (TSP) and PM-10 emitted yearly will be at de minimis levels. The de minimis level is 100 tons per year. The predicted annual emissions for PM-10 for this alternative are 100 tons. Like alternative B, these estimates represent the high end of the potential emissions released under this alternative because of the assumptions used in the analysis. By conducting the burning over a 12-year period and burning outside the high pollution period (November 1st to the end of February), this alternative would be within conformity guidelines and standards for PM-10 non-attainment areas in Colorado. Since the amount of burning conducted within any one airshed is monitored and controlled by the State, this alternative would not be expected to result in violations of air quality standards. However, because there would be higher emissions under this alternative fewer acres could be burned on an annual basis. In order not to exceed de minimis levels set for the area, the burning under alternative C would probably have to be conducted over a greater number of years than under alternative B.

Smoke Sensitive Receptors

As with alternative B, several small communities within the project area could be affected by smoke during prescribed burning proposed under alternative C. Since a greater amount of smoke and emissions would be produced under this alternative, these effects would be greater. Burning would be conducted over a greater number of days under this alternative. This would increase the number of smoky days in the local area. Because more days would be needed to burn these fuels, there would be an increased chance of smoke getting caught within an inversion layer and residing within the low lying areas overnight.

Like alternative B, an indirect effect of alternative C is a reduction in the emissions that would be released from wildfires in the area. This alternative would treat the same areas as alternative B, and similar stand structures would result from this alternative. Because of the change in stand structure, the potential of a crown fire developing within these stands would be reduced. The post treatment stand structures and the location of these stands across the landscape would result in a decreased potential for crown fires and help to reduce the extent of wildfires in the area. These reductions in intensity and extent of wildfires would also result in a reduction in the amount of PM-10 released if a wildfire developed.



CUMULATIVE EFFECTS

The cumulative area that may be burned in the analysis over the next 15 years under this alternative would be 32,400 acres. This is the same area as under alternative B. However, the cumulative effects on the scheduling of burns and the possibility for delays would be greater under alternative C. Since more fuels would be burned under this alternative and the emissions released greater, a greater number of days would be needed to conduct the burning so as not to exceed air quality standards. This could result in creating more burning delays as a result of the demand for burning within the area. This would most likely happen in about 5 or 6 six years when there would still be some of the DFTM areas left to burn, possibly some burning scheduled on Denver Water lands and the initial proposed thinning areas under alternative C would be ready for prescribed burning. This increased chance of delay in burning would also increase in the chance of natural ignition of the fuels prior to prescribed burning.

SUMMARY OF EFFECTS

DIRECT AND INDIRECT EFFECTS

Alternative A would have no direct adverse effect on air quality. Without the silvicultural treatments and associated prescribed burning, no new emissions would be created in the short-term under this alternative. In the long-term, large quantities of emissions could be released if a large wildfire developed due to an abundance of fuels in the area. A large wildfire has the potential to emit large amounts of smoke that could remain in the local airsheds for a few days to several weeks depending on the size and intensity of the fire.

Alternatives B and C would both have a direct, short-term effect on air quality in the analysis area. Under these alternatives PM-10 would be released as a result of prescribed burning operations. Under these two alternatives 17,400 acres would be burned. However, alternative C would result in a greater short-term effect on air quality because a greater amount of fuel would be burned under this alternative and a greater amount of pollutants would be released.

The amount of burning conducted in any one airshed is monitored and controlled by the Colorado Air Pollution Control Commission. Therefore, none of the alternatives would be expected to result in a violation of air quality standards. Based on the SASEM computer model outputs for the alternatives, the amount of total suspended particulate (TSP) and PM-10 emitted yearly would be below de minimis levels. By burning outside the high pollution period (November 1st to the end of February) and with emission rates below de minimis all of the alternatives would be within conformity guidelines and standards for PM-10 non-attainment areas in Colorado.

Indirect effects of alternatives B and C include a potential reduction in the amount of PM-10 released from wildfires in the area. These two alternatives would reduce the amount of standing live fuels as well as ground fuels in the area. In addition, the arrangement of thinned stands across the landscape following treatment would create natural fuels breaks. This would reduce the amount of fuel that could be burned during a wildfire and limit the extent of wildfires in the area. These effects would result in reducing the amount of emissions from wildfires in the area.

CUMULATIVE EFFECTS

Since no prescribed burning is proposed under alternative A, this alternative would not result in any delays in burning as a result of increased demand for “air space.” The cumulative area that may be burned in the analysis over the next 15 years under alternatives B and C would be 32,400 acres. Both of these alternatives would result in an increase in demand for “air space” in 5 or 6 years. This demand for burning could result in delays in burning and an increased amount of time during which natural and activities fuels would remain on the ground prior to being burned. This delay would increase the chance for natural ignition of these fuels. These effects would be greatest under alternative C because a greater amount of fuel would be burned under this alternative. The increased emissions released under alternative C would increase the demand for “air space” under this alternative.



VISUAL QUALITY

INTRODUCTION

Visual effects are caused by physical alterations that show up visually as contrasts between the natural forest landscape and modifications to the land by harvest related activities. The types of activities that cause visual effects include road building and removal of mature trees. “Contrast,” in visual terms, means changes in the major visual elements; form, line, color, and texture. Visual contrast may be seen in modification of landforms, vegetative patterns and structures.

The visual resource is addressed in this document in terms of how the project alternatives would affect the scenic quality of the area.

MANAGEMENT DIRECTION

The Forest Plan provides guidance for the management of forested area on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. A detailed list of these can be found in the Forest Plan. The standards and guidelines for recreation that apply to the proposed actions are given below.

Forest-Wide Direction

FOREST-WIDE GOALS

- ❖ **Manage the visual resource to a desired condition that allows for acceptable alteration of the landscape.**
- ❖ **Enhance or preserve scenic values along heavily traveled roads, use areas, and trails through management activities.**

FOREST-WIDE STANDARDS AND GUIDELINES

- ❖ **Apply the Visual Management System to all National Forest System lands.**
- ❖ **Achieve enhancement of landscapes through addition, subtraction or alteration of elements of the landscape such as vegetation, rockform, water features or structures.**

- ❖ **Plan, design, and locate vegetation manipulation in a scale that retains the color and texture of the characteristic landscape, borrowing directional emphasis of form and line from natural elements.**
 - ❖ **Blend soil disturbance into natural topography to achieve a natural appearance, reduce erosion and rehabilitate ground cover.**
 - ❖ **Revegetate disturbed soils.**
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Management Area Direction

MANAGEMENT AREA 2A DIRECTION (2 PERCENT OF VEGETATION TREATMENT AREA)

The management emphasis for this MA is for semiprimitive motorized recreation opportunities. Visual resources are managed so that management activities are not evident or remain visually subordinate. Landscape rehabilitation is used to restore landscapes to a desirable visual quality. Enhancement aimed at increasing positive elements in the landscape to improve visual variety is also used.

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- ❖ **Design and implement management activities to provide a visually appealing landscape. Enhance or provide more viewing opportunities and increase vegetation diversity in selected areas.**
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MANAGEMENT AREA 2B DIRECTION (66 PERCENT OF VEGETATION TREATMENT AREA)

The management emphasis for this MA is for rural and roaded-natural recreation opportunities. Visual resources are managed so that management activities maintain or improve the quality of recreation opportunities. Management activities are not evident, remain visually subordinate, or may dominate, but harmonize and blend with the natural setting.. Landscape rehabilitation is used to restore landscapes to a desirable visual quality. Enhancement aimed at increasing positive elements in the landscape to improve visual variety is also used.

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- ❖ **Design and implement management activities to provide a visually appealing landscape. Enhance or provide more viewing opportunities and increase vegetation diversity in selected areas.**
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MANAGEMENT AREA 4B DIRECTION (4 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on habitat for management indicator species. Management activities may dominate in foreground and middleground but harmonize and blend with the natural setting.

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- ❖ **Design and implement management activities to blend with the natural setting.**
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MANAGEMENT AREA 5B DIRECTION (1 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on forage and cover on winter range. Management activities are not evident, remain visually subordinate, or dominate in the foreground and middleground but harmonize and blend with the natural setting.



❖ Design and implement management activities to blend with the natural setting.

MANAGEMENT AREAS 7A DIRECTIONS (24 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on wood-fiber production and utilization. Management activities are not evident or remain visually subordinate along Forest arterial and collector roads and primary trails. In other portions of the area, management activities may dominate in foreground and middleground, but harmonize and blend with the natural setting.

❖ **Meet stated visual quality objectives.**

MANAGEMENT AREAS 7D DIRECTIONS (4 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on wood-fiber production and utilization for products other than sawtimber. Management activities, although they may be visually dominant harmonize and blend with the natural setting.

❖ **Meet stated visual quality objectives**

EVALUATION CRITERIA

Discussion of Visual Quality and Harvest Activities

The effects of timber harvest or vegetation treatment on visual quality are seen primarily in vegetation and, to a lesser extent, in landform or topographic changes. Form contrast is commonly seen as modifications to the natural vegetative patterns caused by removal of trees in geometric units. Line contrast may smoothly curvilinear, or sharp, straight edges of harvest units, introduced in contrast to the more irregular natural linear features such as ridge lines, streams and meadow edges. Color contrast often accentuates form and line contrasts. For example, a geometrically shaped harvest unit may demonstrate moderate to strong visual contrast when ground cover is medium green grass in contrast to deep bluegreen forest surrounding the unit. The contrast becomes much stronger in the winter when white snowcover contrasts with the dark forest color. These visual elements, form, line, and color contrasts, are important considerations for the visual effects of created openings in visually sensitive areas.

The element of landscape texture can be affected by intermediate harvest prescriptions that remove a percentage of trees. These harvests show up visually as a pattern of individual trees or tree clusters rather than as a uniform “carpet” of forest. Texture is commonly, although not always, a lesser concern in timber harvest visual effects than the other elements. Texture will, however, be one of the major changes to the existing visual environment because of the homogeneous nature of the existing forest and the proposal to thin, or reduce canopy cover to 25 percent, over large areas.

Evaluation Criteria

Chapter 3 – *Visual Quality* presents photos of the historical condition of the forest and the current condition. These photos provide an illustration of the types of conditions that the proposed actions are striving to create and the difference from the existing homogeneous nature of much of the forest. Most analysis tools for visual effects rely on the Visual Quality Objectives for an area. These objectives assume that the desired condition is the existing characteristic landscape. The degree of allowable alterations to the landscape depends on the type of VQO as described below.

Table 4-9. Descriptions of the Visual Quality Objective Classifications

Classification	Description
Preservation	Only ecological change is allowed
Retention	Management activities that are not visually evident to the casual forest visitor are allowed.
Partial Retention	Management activities may be evident but must remain subordinate to the characteristic landscape and appear as a natural occurrence.
Modification	Management activities may dominate the characteristic landscape but must utilize naturally established form, line, color and texture. The modification should appear as a natural occurrence when viewed in foreground or middleground distances.
Maximum Modification	Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

The desired future condition for the appearance of the forest is not the characteristic landscape that currently exists. Therefore, it is part of the project's objectives to change the characteristic landscape, which is somewhat contrary to the tools traditionally used for analysis. However, it is an objective of the project for the changes to appear natural and blend into the existing landscape character. Management activities and changes to the character of the forest may be evident to a visitor who has come to the area frequently and is familiar with its current appearance. However, the landscape changes and management activities may not be evident to a visitor who is new to the area. Therefore, the evaluation criteria for this EA will examine how those two types of visitors would perceive the changes.

In all areas of vegetative treatment, the characteristic landscape would be changed. It is not likely, nor necessarily desired, that these changes be subordinate to the characteristic landscape. However, it is desirable that the landscape alterations meet the VQOs in terms of a natural appearance. Other management activities such as the appearance of the units prior to prescribed burning are also a concern. The discussion will use VQOs as a measure of the project's effect on the natural appearance of the area and the importance of that effect.

The U.S. Forest Service's database does not provide VQO mapping of the Project Area. However, a combination of the Management Area direction and the assumed sensitivity of specific areas can be used to assume VQOs for sensitive viewing locations and routes. Table 4-10 provides the general guidelines for the VQOs for the Management Areas where vegetation treatments are proposed.



Table 4-10. Management Area Visual Quality Objective Guidelines

Management Area	Management Emphasis	VQO Guidelines
2A	Semiprimitive motorized recreation	Partial retention
2B	Rural and roaded-natural recreation	Partial retention and modification
4B	Management Indicator Species	Modification
5B	Big game winter range	Partial retention and modification
7A & 7D	Wood fiber production and utilization	Retention and partial retention along Forest arterial and collector roads and primary trails. In other areas, modification

The Partial Retention VQO applies to most of the sensitive viewing areas used for this analysis and will be the primary focus for evaluation of alternative effects.

The management area direction provides only general guidelines within the MA for VQOs. To provide greater specificity for analysis, some assumptions were made. The North Fork of the South Platte and South Platte Rivers Environmental Impact Statement (SPSPR EIS) was consulted as an example of the kinds of assumptions that can be made to assign VQOs when that information is not available. That EIS identified the South Platte River corridor as visually sensitive and requiring VQOs of retention and partial retention. These VQOs are adopted for this project as well, and extended to the entire river corridor. These VQOs are also assumed to be valid for other visually sensitive areas such as the State Highway 126 Corridor and the Colorado Trail. The retention VQO is assumed for the foreground distance (up to 0.25 miles away from viewers). Partial retention would apply for the middleground distance, from 0.25 miles away from the viewer to the nearest ridgetop that encloses the view, or a distance of approximately 5 miles.

ALTERNATIVE COMPARISON

Alternative A

Alternative A would continue current forest management with no actions taken to reduce fire risks, improve South Platte River access, reclaim roads, or revegetate parts of the Buffalo Creek burn area.

DIRECT AND INDIRECT EFFECTS

For this alternative, the existing vegetation patterns found across the Analysis Area would be maintained in the short term. The appearance of the forest landscape would remain the same until events such as a fire, insects or disease would occur, changing the existing vegetative patterns. The scale of the change would depend on the extent of the disturbance. This alternative has the highest likelihood of a catastrophic fire, and therefore, the highest likelihood of a dramatic change of vegetation patterns. The Buffalo Creek and recent Hi Meadows fires serve as models for the effect on visual quality of a large, hot fire.

Changes caused by insect and disease would be more gradual and less noticeable. Only if a severe epidemic were to occur would there likely be large-scale changes to the visual environment. An epidemic could cause hillslopes with standing dead trees, which often appear reddish brown. Endemic insect population may cause pockets of standing dead trees. Endemic populations could even add visual variety to the landscape as the pockets of dead trees revegetate.

Should a catastrophic fire occur, public and private recreational facilities that offer views of the Analysis Area could be destroyed or damaged by fire. This could displace recreationists to other areas both within and outside of the Analysis Area to enjoy the landscape. The additional people could increase feelings of crowding in these areas.

Alternative A does not propose improvements to recreational access along the South Platte River. Therefore, there would be no change to existing visual conditions along the river. Riparian areas, which are currently disturbed as a result of uncontrolled use, would continue to degrade. These conditions would increasingly negatively affect the visual experience of recreationists using the river and adjacent areas.

Over the long-term, the Project Area would likely be subject to fires such as the Buffalo Creek and Hi Meadows fires. If large fires were to occur, the resulting changes in the appearance of the Project Area would likely be similar to that of the other areas where fires occurred. It can be assumed that these areas are not considered to be aesthetically pleasing by most viewers, so, should such fires occur, there would be a cumulative decrease in the visual quality of the affected areas.

If over the long term, wildfires are suppressed or do not occur in the Project Area, and if insects or disease do not rise to epidemic levels, the tree canopy and underbrush of the forest would continue to increase in density. The resulting forest in the Project Area would continue to have much different visual characteristics than the historic, pre-fire suppression forests.

CUMULATIVE EFFECTS

Activities planned on the Denver Water lands in the Project Area could include 2,000 acres of thinning followed by prescribed burns. These activities would be completed over the next 5 to 10 years. The objective of these treatments would be to create stand conditions that resemble historic conditions and to reduce wildfire hazard. There would also be thinning and created openings in the Lower Elk Creek Management Unit, which is outside of but adjacent to the Project Area. These activities would alter the visual environment in the treated areas, moving the combined treatment areas toward the historical landscape visual conditions. Only a small portion of the Project Area would be visually affected and the cumulative visual effects would be minor.

Prescribed burning in stands affected by the Douglas-fir tussock moth would only result in minor visual changes. While some understory seedlings and saplings will be killed during the burning, many of the stands will retain a well-developed understory. The burns will not create new openings and most of the larger trees would remain.



Alternative B

DIRECT AND INDIRECT EFFECTS

Vegetation Treatments

General Effects

The actions proposed by Alternative B would have relatively minor effects on visual resources given the site specific planning for treatment areas that would be visible from primary viewing locations and routes. The use of forwarders to access timber in roadless areas could have minor short-term effects on visual quality in a few locations.

Some people may find the more open and less dense forest in the Analysis Area that would result from the implementation of Alternative B less aesthetically appealing than the current condition. These people may choose to stay away from the area and go to other areas. Other people may find the more open forest attractive and may visit the area more frequently. Others may be attracted to the Analysis Area to observe treatment operations and to see how the area changes over the years.

Short-term visual effects would include slash remaining from harvest and smoke from prescribed burns. The visual effect of the slash would last from 1 to 2 years, until the area would be burned. The burned area may be visually unappealing for a short time until the underbrush is reestablished. Smoke from the prescribed burns would be a short-term effect lasting for only a couple of days. Other short-term visual effects would be apparent harvest equipment in the treatment units and paths created by forwarders, which would dissipate over time. These effects are unavoidable but short-term.

Alternative A discusses the visual effects of a large wildfire or epidemic insect populations. This alternative decreases the risk of adverse visual effects due to these types of events. However, fires and insect and disease epidemics could still occur and alter the visual quality of the area.

Visual Quality Objectives

Alternative B proposes thinning to reduce the canopy cover from approximately 50 percent to approximately 25 percent. As discussed in *Evaluation Criteria*, this treatment would change the characteristic landscape from a dense forest to a more open condition. However, based on observations of another similar harvest treatment near the Project Area, the changes can appear natural and blend with the landscape so that a visitor new to the area may not notice the change once harvest has been completed. It is part of the restoration project to change the appearance of the forest, therefore, as long as the change appears natural and blends with the denser adjacent forest, the thinning itself would not create VQO violations. The thinned areas would be blended with the adjacent forest by using different intensities of thinning, particularly along the edge of the treatment area. This would prevent an abrupt change in texture of the forest and would avoid creating artificial looking lines.

In visually sensitive areas, particularly those defined as retention, possible visual problems could be created by the slash that is left on the ground and remaining tree stumps. In retention areas, all trees within the first 300 feet of the road, trail, river or facility, would be removed using a feller, which cuts the trees at the ground level. The slash would be a short-term effect, lasting from 1 to 2 years, until the area could be prescribed burned.

Alternative B also would create openings within the thinned areas that would range in size from 1 to 40 acres. In retention areas, these openings would generally be prohibited unless creating the opening could enhance a view by opening up a scenic vista. In partial retention areas, specific design criteria (discussed

below) would be employed to make the openings appear natural. As in areas that are thinned, visitors who frequent the area may notice the changes in the landscape, but a new visitor would find a natural appearing forest. In some areas, openings along with thinning could be used to improve the visual interest of the forest by adding variability to the texture and form. When selecting areas for openings, natural features such as rock outcroppings that are hidden by dense canopy cover may be found. Creating an opening around such a feature could add interest and color to the existing homogenous landscape.

Throughout the treated areas, the created openings should be designed to mimic natural openings and blend with the environment. Special attention would be given to those areas identified as retention or partial retention. Openings created in partial retention would be designed to have a clearcut like opening at the center, except for replacement trees for wildlife, transitioning to full forest or to the thinned areas along jagged and irregular edges. Replacement trees should be left in clusters rather than scattered uniformly (and artificially looking) throughout the stand. The irregular edges should be shaped so that in places the more open areas intrude deeper, like fingers, into the forest canopy. The boundaries of the openings should not be geometric or linear in appearance. The objective is to avoid any sharp contrasts of form, line or texture. Color contrasts should vary and appear like a natural meadow.

Viewing Locations and Routes

Chapter 3 – Visual Quality describes the primary locations and routes from which treatment areas could be viewed. The following analysis qualitatively describes how implementation of Alternative B would change the landscape near the locations and routes. It also discusses the likelihood of Alternative B meeting VQOs.

State Highway 126 Corridor

Several treatment areas would be located along the State Highway 126 Corridor. The MA for the corridor is 2B, which emphasizes rural and roaded-natural recreation. The VQO guideline for this MA is primarily Partial Retention (see Table 4-2). As discussed in *Evaluation Criteria*, the foreground areas along this corridor (0.25 miles from the highway) are assumed to have a Retention VQO, unless they have already been physically disturbed by human activity. Viewers driving along the corridor would pass through and adjacent to several treated areas. They would notice a much more open forest than exists today due to the thinning operations. They may also notice visual changes from the untreated to the treated areas. This may actually provide visual interest. The strip of retention along the highway would only be thinned and no openings would be created, unless a created opening could improve a view by opening a scenic vista. These measures would limit the visual changes that would be readily apparent to the casual forest visitor. A visitor new to the area would notice that the forest in the treatment area has a different character than other areas that had been seen. This may actually add interest to the drive and to the views. Opening the forest may also provide better viewing opportunities.

Viewers would also notice slash and other debris from treatment. This would be a short-term effect (see Visual Quality Objective discussion, above)

Several of the developed facilities along the corridor would be in or near the treatment areas including the trailhead for the Colorado Trail (and part of the trail), the Little Scraggy Scenic Overlook, the Kelsey Creek Campground, and the Wigwam Campground and Picnic Area. People visiting the trail, campgrounds, and picnic areas would have close views of the treatment areas and careful planning would be required to meet the VQO of Retention that is assumed for the immediate vicinity around these areas. Viewers would notice a difference from the existing conditions because the forest would be more open and less brushy. However, these changes would not be detrimental to the visual quality. Openings would be avoided in these retention areas, unless an opening would provide an enhanced view of a vista. In



these areas, the first 300 feet from the trail, overlook, campground or picnic areas would be harvested using a leveler to avoid the obvious appearance of remaining tree stumps.

Viewers from the Little Scraggy Scenic Overlook would have distant views of treatment areas located across the South Platte River valley to the Rampart Range. These distant treatment areas would not be particularly noticeable to most viewers because of the many rock outcroppings and other natural openings in the forest visible from the viewpoint. In these areas, it would be easier to create larger openings that blend with the existing environment and meet the partial retention VQO. The overlook would also provide a close-up view of an adjacent treatment area. In this area, openings would be carefully designed to blend with the thinned area and be natural in appearance (see design criteria in Visual Quality Objective discussion).

South Platte River Corridor

The South Platte Corridor would pass through a number of vegetation treatment areas. Residences and facilities such as the Lone Rock Campground, the Platte River Campground, the Scraggy View Picnic Area, the Ouzel Campground, and the Osprey Campground are located very close to proposed vegetation treatment areas. Treatment areas within 0.25 miles of these facilities would be considered to be located in a retention VQO. As in the preceding State Highway 126 corridor, openings would not be created in this VQO unless the opening would provide an enhanced viewing opportunity. Other effects would be the same as discussed for the facilities located along Highway 126.

Some treatment areas on the hillsides above the river corridor would be visible. Depending upon their distance from the river or road, the treatment areas would be required to meet VQOs of Retention (within 0.25 miles of the river or road) or Partial Retention (beyond 0.25 miles, extending to the nearest ridgetop or five miles). As long as the design criteria provisions for openings in retention and partial retention are met, there would not be any long-term visual effects. As previously discussed, whether or not the changes are evident would depend on the sensitivity of the forest visitor. Slash and stumps would not be as visible in these units.

The Colorado Trail

The Colorado Trail does not pass through any of the proposed treatment areas. At the State Highway 126 trailhead, it would be possible to observe some of the treatment areas. The effects are as discussed above in the State Highway Corridor discussion

Other Visual Resources

If the owners of The Flying G Ranch choose to participate in vegetative treatments of areas around their property, the fire break could be visible from the Wigwam Trail.

There would be no treatment areas near the Lost Creek Wilderness. As a result, the wilderness would not be directly affected by Alternative B. However, it may be possible to observe the firebreaks that could surround two private parcels (one of which is the Flying G Ranch) located near the wilderness.

Trail Improvements

The proposed trail improvements would enhance the visual environment by reducing the evidence of resource damage from numerous social trails and by reducing the existing and potential future erosion from hillslopes to the river.

Road Reclamation

The road reclamation would provide visual improvements by restoring the reclaimed roads to a more natural appearing environment.

Buffalo Creek Revegetation

The proposed actions in the Buffalo Creek area are limited to riparian and upland revegetation. These actions would improve the visual quality of the portion of the Buffalo Creek area that was damaged by fire. The revegetation would accelerate visual recovery of the area.

CUMULATIVE EFFECTS

The combination of this alternative with activities being completed on Denver Water lands would further move the Project Area towards a more open, historical forest condition. It is expected that in the larger area of the Landscape Assessment, several more projects similar to this one will be completed. These projects along with the activities in the Lower Elk Creek Management Unit will result in a forest that is gradually being modified from a closed, homogenous condition, to a more open canopy interspersed with numerous openings. The photos in *Chapter 3 – Visual Quality* provide an example of the changes that would be expected in much of this area.

COMPLIANCE WITH THE FOREST PLAN

Although this alternative would change the character of the existing landscape, the changes would not be considered violations of the Forest Plan because the changes would not be visually detrimental. The proposed treatments would alter the forest from one type of natural appearing environment to a different and possibly more visually interesting, natural environment.

Alternative C

DIRECT AND INDIRECT EFFECTS

Alternative C would essentially have the same direct effects on visual resources as Alternative B. With Alternative C, logs would not be removed in 5,414 acres of roadless areas. There may be an increase in the amount of smoke produced due to burning larger trees in these areas. Forwarders would not be used as extensively in this alternative. Therefore, the potential effect of recreationists observing the forwarders or “paths” made by the forwarders or hearing the forwarders, would be less with Alternative C.

CUMULATIVE EFFECTS

The cumulative effects would be the same as discussed for Alternative B.

COMPLIANCE WITH THE FOREST PLAN

Compliance with the Forest Plan would be the same as discussed for Alternative B.



HERITAGE RESOURCES

INTRODUCTION

This section describes the effects of the proposed actions and alternatives on historic properties that have already been identified on the forest floor, as well as properties that remain undiscovered. The Forest Service proposes to implement mitigation measures to eliminate adverse effects to potentially significant resources.

MANAGEMENT DIRECTION

National Historic Preservation Act

The National Historic Preservation Act (NHPA) requires Federal agencies, prior to taking action to implement an undertaking, to take into account the effects of their undertaking on historic properties and to afford the ACHP a reasonable opportunity to comment regarding the undertaking.

The first step in the process is to inventory all heritage resources within the Project Area. This is followed by an evaluation of the potential for the project to affect historic and a resolution of these effects. The 1992 NHPA amendments specify that properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian may meet the criteria for listing on the National Register. A Federal agency is required to consult with any Indian tribe that attaches religious and cultural significance to these properties. Regulations also establishes special measures for consultation with Indian tribes and other interested parties regarding potential impacts to historic properties.

The Forest Service is fulfilling its NHPA responsibilities concurrently with its NEPA responsibilities. Project review under NHPA is likely to continue beyond the NEPA process. Inventories of the proposed actions (vegetation treatment, trail improvement, road reclamation) are currently underway. The surveys would be completed, recorded sites evaluated, and any necessary avoidance or mitigation measures developed before the projects are implemented.

Other Regulations

Besides the NHPA, a number of additional legislative and executive orders direct consideration of the cultural environment on National Forest System lands and are relevant to the present project. These are discussed in the Specialist report for this project and would be followed as required.

USFS Forest-Wide Direction

The Forest Plan provides guidance for the management of forested areas on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. The standards and guidelines that apply to the proposed actions for cultural or heritage resources are given below.

FOREST-WIDE GOALS

- ❖ **Evaluate, protect and enhance cultural resources on the National Forests for future education and enjoyment.**

FOREST-WIDE STANDARDS AND GUIDELINES

- ❖ **Protect, find an adaptive use for, or interpret all cultural resources on National Forest System lands which are listed on the National Register of Historic Places, the National Register of Historic Landmarks, or have been determined to be eligible for the National Registers.**
- ❖ **Protect and foster public use and enjoyment of cultural resources**
- ❖ **Complete cultural resource surveys prior to any ground-disturbing project;**
 - **Avoid disturbance of known cultural resources until evaluated and determined not significant;**
 - **Collect and record information from sites where there is no other way to protect the properties;**
 - **Issue antiquities permits to qualifying academic institutions or other organizations for the study and research of sites.**

USFS Management Area Directions

There are no specific management area directions that apply to this resource.

EVALUATION CRITERIA

Future or on-going Actions for Cumulative Effects Analysis

For the cumulative effects analysis it is assumed that for all projects on Federal lands that the surveys have been or will be completed and appropriate mitigation applied to cultural resources that would result in no effect. There are no requirements for cultural surveys or mitigation on private land.

Direct, Indirect and Cumulative Effects

The potential for direct and indirect effects are primarily evaluated by examining the potential for physical damage due to activity in the area, the amount of ground disturbing activities and the risk of damage from fire.



ALTERNATIVE COMPARISON

Alternative A

DIRECT AND INDIRECT EFFECTS

Vegetation Treatment

Direct effects to historic properties are not anticipated. However, this alternative has the greatest risk of a large, hot, destructive fire (see *Chapter 4 – Forest Vegetation*). Therefore, indirect effects would include potential destruction or damage of archaeological sites and historically significant buildings and structures within the Project Area and surrounding areas. Such a fire could damage or destroy combustible materials found in historic-era archaeological sites and historic buildings in the Wigwam, Deckers, Trumbull, Nighthawk and South Platte settlement areas. Other effects of such a fire could include erosion of archaeological deposits on slopes destabilized by the loss of vegetation.

Buffalo Creek Revegetation

In this alternative, natural revegetation processes would take longer to occur than the other alternatives. Upland slopes and streambanks that were denuded and destabilized by the Buffalo Creek burn would erode at a higher rate than vegetated areas, potentially disturbing prehistoric and historic archaeological sites and exposing such sites to natural weathering processes and to human vandalism and inadvertent disturbance.

South Platte River Access Trail Improvements

Informal social trails that access the South Platte River have created a situation where recreational users are weaving throughout the forest and in the process, possibly unknowingly trampling archaeological sites and promoting erosion in areas where archaeological may exist. This situation would continue and is likely to worsen under this alternative.

Road Reclamation

Runoff and erosion from existing roads has the potential to impact archaeological sites by exposing or displacing these sites. However, it is not known whether roads that would be reclaimed are having such an effect.

Alternative B

DIRECT AND INDIRECT EFFECTS

To meet its responsibilities under Section 106 of the NHPA, the Forest Service would complete archaeological surveys within the Project Area and would complete formal National Register eligibility evaluations for all previously recorded and newly recorded archaeological sites that could potentially be adversely affected by the proposed actions. . These sites would be flagged and fenced to protect them from direct impacts. Mechanical equipment and workers would be kept out of the protected areas. Alternatively, the Forest Service may chose to avoid the need for formal eligibility evaluations of all recorded sites by avoiding adverse effects to these sites. Under this option, the Forest Service would

delineate the horizontal boundaries of these sites and would establish a fenced protective 100-foot buffer around the sites. These actions would prevent direct effects.

The project could also be staffed with a qualified archaeological monitor during ground disturbing activities. Additional protection could be achieved by training all construction workers in archaeological site indicators, in the importance of and laws protecting heritage resources on National Forest lands, and in procedures to follow in the event that archaeological resources are encountered during project work.

Some direct impacts to heritage resources that do not meet the National Register criteria could result from the proposed activities; however, because these sites are not significant, the impacts would be considered less than significant.

Vegetation Treatment

The proposed actions for vegetation treatments require that trees be felled and then removed, which have potential to cause direct effects to cultural resources. Felling of trees would have a minimal effect on historic properties. Known historic properties can be flagged and/or fenced and trees can be felled in a direction away from any known resources. Additional archaeological reconnaissance in areas slated for tree felling and removal could insure that unrecorded surface resources will not be impacted. With minimal ground disturbance, felling is not likely to impact unknown subsurface archaeological deposits, which may be additionally protected from the falling trees by some forest undergrowth and duff accumulation.

The removal of downed trees using conventional logging systems has the greatest potential for ground disturbance and therefore the greatest potential to impact unknown, buried archaeological deposits. Known sites would be protected as discussed above.

As discussed in *Chapter 4 – Forest Vegetation*, the proposed activities would affect the short-term and long-term risk of fire in the Project Area. The risk of fire represents potential indirect effects to cultural resources. Short-term risks are due to accumulations of harvest slash and downed logs, which would increase the ground fuels until they are prescribed burned or removed. The prescribed burning of these fuels carries with it a small risk of escape. This risk would be minimized by strict adherence to all precautions and policies for prescribed burns, however, the risk cannot be eliminated. It is unlikely that prescribed burning would have any impact on prehistoric archaeological sites. Prehistoric sites within the Project Area have already been subjected to a cycle of numerous natural fires over the thousands of years represented by these sites.

Prescribed burning has the potential to affect historic archaeological sites, which may contain intact combustible materials. To date, the only historic archaeological site in the Project Area that meets the criteria for listing on the National Register is the Corbin Cabin/Ranch House, which includes standing structures.

The long-term risk of wildfire, especially a large, intense crown fire, would be reduced by the proposed actions. Although the risk of such a fire is not eliminated, it would be lessened by the vegetation treatments and firebreaks created by openings. It would be more likely that fires started in the Project Area would burn less intensely and be more limited in extent. There would be less likelihood that historic sites would be burned or could not be protected by fire fighting efforts. Fires that burn at a lower intensity are also less likely to create the types of erosion that could damage archaeological deposits on destabilized slopes.



Buffalo Creek Revegetation

The proposed revegetation would accelerate the stabilization of slopes and streambanks, providing greater protection for surface and subsurface archaeological sites than No Action. The planting and use of biosolids would involve minimal ground disturbance and would not adversely affect historic properties. Reshaping of sediment deposits using conventional equipment would involve a greater degree of ground disturbance and has the potential to disturb recorded historic properties and potentially significant subsurface archaeological deposits that have not been recorded. Impacts to recorded historic properties can be easily protected as discussed above (*Direct and Indirect Effects*). Impacts to potentially significant unrecorded archaeological deposits could be avoided by additional archaeological surveys and shovel probing, as needed, in areas where sediment reshaping would occur, as well as taking measures discussed above.

South Platte River Access Trail Improvements

Trail construction and improvements would involve little ground disturbance and are unlikely to impact archaeological sites. The work would occur in areas that have already been substantially disturbed by recreational users. Construction of stairs would involve the greatest levels of ground disturbance and this would take place on the steepest trail sections where archaeological sites are least likely to exist. To date, no historic properties have been identified along the proposed trail improvement corridors. The Forest Service will complete archaeological surveys and any necessary evaluations of sites for National Register eligibility before trail work begins.

Although no historic properties have been identified in the Project Area, the Proposed Action may be beneficial to archaeological sites. Trail improvements and reclamation of informal trails should reduce the use of random travel routes through the forest, reducing the likelihood of inadvertently damaging or destroying archaeological sites. Known sites along formal trails can be studied and interpretive information could possibly be placed along the trail to educate the public on sites in the area and on the role of the Forest Service and general public in protecting cultural heritage sites.

Road Reclamation

In general, road reclamation projects would occur in areas that have already been disturbed by road construction, use, and maintenance. Additional impacts to historic properties are not likely. Once specific locations are identified, the Forest Service would inventory these areas for archaeological resources, including conducting additional ground surveys, as needed. Further measures would be taken as discussed above (*Direct and Indirect Effects*). If erosion from existing roads are impacting archaeological sites, reclamation of these roads would have a beneficial effect.

Alternative C

DIRECT AND INDIRECT EFFECTS

The effects of this alternative would be the same as discussed for Alternative B, except as discussed below.

Vegetation Treatment

As discussed for Alternative B, the removal of felled trees has the greatest potential for ground disturbance and therefore the greatest potential to impact buried archaeological deposits. The exclusion of the roadless area from tree removal activities would reduce the total area potentially impacted by ground disturbance by approximately 2,600 acres. At this time, specific areas in which trees would be left

in place have not been identified. Impacts to archaeological sites are site-specific, and since archaeological site inventories and evaluations within the Project Area are not complete, quantitative comparisons between impacts under Alternatives B and C are not possible at this time. However, the roadless areas are some of the least probable areas for archaeological sites (i.e., areas furthest from transportation corridors and areas with slopes greater than 30 percent). Therefore, effects of tree removal under this alternative are likely to be very similar to effects under Alternative B.

The difference in tree removal also affects the risk of wildfire. This alternative would have a higher short-term risk because larger ground fuels would be increased over a greater area where trees are left on site until they are prescribed burned. The risk of escape would also be higher as opposed to Alternative B (see *Chapter 4 – Forest Vegetation*). Therefore, in the short-term, this alternative would have a greater risk of damage to historic resources due to fire than Alternative B. The effects of the reduction in the long-term risk of wildfire would be the same as discussed for Alternative B.

Buffalo Creek Revegetation

In this alternative, sediments would be reshaped with hand tools only. This would reduce potential for accidental mechanical disturbance of archaeological deposits. Monitoring may not be necessary, as long as workers are provided with cultural resource sensitivity and response training and a qualified archaeologist is kept on call in the event that archaeological resources are encountered during project work.

South Platte River Access Trail Improvements

Effects for this alternative would be the same as Alternative B.

Road Reclamation

Effects for this alternative would be the same as Alternative B.

Forest Plan Compliance

All alternatives would meet the Forest Plan Goals, Standards and Guidelines, as stated above.



SOCIOECONOMICS

METHODOLOGY

The following analysis addresses direct, indirect, and cumulative effects on the social and economic environment. Projected effects are compared with the baseline conditions established in the affected environment section. The methods and assumptions employed to assess project effects are discussed by impact area in the following sections.

REGULATIONS AND POLICIES

The environmental justice effects of the proposed alternatives are assessed in accordance with Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.

ALTERNATIVE A

Alternative A is the baseline for this analysis. Current forest management practices would continue under this alternative with no different actions taken to reduce fire risks or stream sedimentation. Vegetation treatments would be deferred except for ongoing actions such as Christmas tree cutting and prescribed fire in Tussock moth mortality areas. Current forest conditions combined with greater human encroachment into the forest have dramatically increased the potential risk of loss of life and property from wildfires. The 1996 Buffalo Creek and June 2000 Hi Meadow fires clearly demonstrated the potential devastation that another large-scale fire could cause. Another fire of this magnitude is more likely to occur under this alternative than under Alternatives B or C. Social and economic effects associated with this type of fire would likely be similar to those experienced during and following the Buffalo Creek and Hi Meadow fires. These fires had significant effects on surrounding communities including property damage and, in the case of the Buffalo Creek Fire, human fatalities.

The Buffalo Creek Fire burned approximately 12,000 acres in 1996, resulting in the loss of several homes and essential forest cover on highly erodible soils. Heavy rainfall and floods following the fire resulted in two fatalities and caused substantial erosion and sedimentation. These events also had severe effects on downstream reservoirs that supply water to the Denver metropolitan area. Denver Water has, as a result, spent nearly \$1 million on water quality cleanup and dredging operations and anticipates spending an additional \$8 million on Buffalo Creek Fire-related activities.

The June 2000 Hi Meadow Fire burned nearly 11,000 acres and destroyed 58 structures, including 51 homes. Approximately 750 Forest Service fire fighters were called in from across the country to help suppress the Hi Meadow Fire, which lasted about six days. Local emergency services were also involved. All 26 volunteer personnel in the North Fork Fire District, as well as all of the District's equipment, were, for example, involved at one time. Twenty personnel were involved full-time for the duration of the fire. This type of extended response effort strains local resources and affects their ability to respond to other emergencies.

The South Platte River access trail improvements proposed under Alternatives B and C would also not take place under Alternative A. Some sections of the Gill Trail are currently unsafe to the point of being considered dangerous. Local emergency services typically rescue several injured people from the Gill Trail each year. Last year three people also had to be rescued from Cheesman Canyon via the Gill Trail. These risks to human health and the associated rescue costs would continue under this alternative.

ALTERNATIVE B

Direct and Indirect Effects

TRANSPORTATION

Truck Traffic

The project life under this alternative is expected to be four to five years. The Forest Service anticipates that approximately 2,000 acres of vegetation would be treated in the first year, with 5,000 to 6,000 acres treated in the following two years. The remaining acres would be treated in year 4 and/or year 5. The Forest Service would require the material to be felled under contract.

Assuming that the average volume of material treated and removed is 2,500 board feet/acre (2.5 mbf/acre), a total of 29,000 mbf would be removed over the life of the project under this alternative. Approximately half of this material would likely consist of non-saw logs, the majority of which would be used for wood chips. If treatment was undertaken by three, three-person crews at a rate of one acre per person-day, treating 2,000 acres in project year one would take 222 days or about 45 work weeks. Assuming an average truck capacity of 5 mbf per truck, this work would generate an average of approximately 4 to 5 truck trips per day. Using these same basic assumptions, eight, three-person crews treating up to 6,000 acres in years 2 or 3 would take 250 days or 50 work weeks and generate an average of 12 roundtrip truck trips per day. These estimates assume that material would be removed from all of the acres treated in the first three project years, with no material removed from the areas treated in project years 4 and 5. If material were removed at a constant rate throughout the life of the project, treatment activities in the first year would generate an average of 2 to 3 truck trips a day. Material would be removed at an average rate of 45 mbf per day in project years 2 or 3, generating an average of 9 truck trips a day.

Alternative B, then, could generate an average of 2 to 5 round trips a day, 5 days a week, for most of the first year of the project. This number could increase to an average ranging from 9 to 12 round trips a day in project years 2 or 3. Unloaded return trips would be significantly lighter than loaded trips. The rear axles of the trucks would likely be hoisted, reducing the overall length of the vehicle, as well as increasing the truck's mobility and safe operating speed.



Assuming that most of the removed material would be transported to western Colorado, the majority of the truck trips would likely take Jefferson County Road 126 (CR 126) north through the towns of Buffalo Creek, Pine, and Pine Junction to US 285. Truck traffic would also be generated on Douglas County Roads 67 and 97 (CRs 67 and 97). Trucks may also head north and then east from the Project Area along SH 67 to Sedalia. If a new facility were established near Woodland Park, truck traffic would be generated on State Highway 67 south from Deckers to Woodland Park. Available traffic count data for these roads are summarized in Table 3-13.

Although trucks regularly travel along Project Area roads, the introduction of project-related logging truck traffic would be noticeable to local residents, as well as people traveling through the Project Area. There has been very little logging activity and associated truck traffic in the Pike National Forest in recent years. The addition of a maximum of 12 round truck trips a day would represent a relatively large addition to traffic volumes on some of the less-traveled Project Area roads. Potential impacts would be greater for the loaded trips.

Logging truck traffic would likely slow some traffic on steep slopes. Average uphill speed for a loaded truck is typically in the range of 30 to 35 miles per hour (mph). The speed limit on many of the Project Area roads is 50 mph. In most cases, these are two lane roads with no passing lanes. Faster moving traffic traveling behind a loaded logging truck would be forced to reduce speed in these areas. One exception to this would be the three-lane stretch of CR 126 that extends north from Wigwam to Kelsey Campground. Truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor traffic is less.

Increased truck traffic would also contribute to wear on local roads, particularly those designed to handle relatively low volumes of traffic. Truck traffic on CR 97 and Sugar Creek Road, both of which have unpaved, gravel surfaces, would generate dust. There would, however, be a minimal amount of truck traffic on gravel and dirt roads near occupied residences. Efforts would be made to reduce the local transportation effects of logging and other site activities through use of appropriate signals and/or warnings to alert oncoming vehicles to the presence of a work site with trucks entering and leaving. Efficient operation procedures would be employed by contractors to prevent vehicles from blocking access points to the extent possible.

The two main bridges on CR 126, which span Buffalo Creek and the North Fork of the South Platte River, would not be affected by the projected truck traffic. Increased truck traffic may, however, cause new fill material placed on the approaches to the Buffalo Creek Bridge to settle. Information is not available for nine smaller structures along this road. Three steel bridges along the stretch of CR 67 that extends north from Deckers to Sugar Creek do not meet full legal loading capacity. The addition of logging truck traffic would likely cause premature wear on the bridge decks and asphalt surfaces and result in additional maintenance expenses. Information is not available for four crossings on the stretch of CR 67 between Sugar Creek and Sprucewood. There are also 10 crossings between the town of South Platte and Highway 285 that no information is available for. The bridge at the town of South Platte would also not be affected by increased truck traffic.

Passenger Vehicles

Passenger vehicle traffic would be generated by work crews traveling to and from the work sites proposed under Alternative B. Assuming that these workers would all reside outside the Project Area and travel to work alone in personal vehicles, the proposed actions would on average generate a maximum of 15 round trips a day in project year 1 and a maximum of up to 24 round trips a day in project years 2 and 3. These trips would be concentrated at the beginning and end of the workday. It is not known exactly

where this labor force would reside or the routes they would take into the proposed Project Area. The addition of up to 34 passenger vehicles is unlikely to affect existing local traffic flows.

NOISE

Project-related activities would generate noise. Sound is typically described using the decibel (dB) scale, a logarithmic rating system that accounts for large differences in audible sound intensities. Studies addressing the effects of noise on people need to consider the frequency response of the human ear. Sound measuring instruments are, therefore, often designed to respond to or ignore certain frequencies. The frequency-weighting most often used to evaluate environmental noise is A-weighting. Measurements from instruments using this system are reported in "A-weighted decibels" or dBA. This scale accounts for the human perception of a doubling of loudness as an increase of 10-dBA. A 70-dBA sound level, for example, sounds twice as loud as a 60-dBA sound level. Factors affecting potential noise impacts include distance from the source, frequency of the sound, absorbency of the ground, the presence of obstructions, and the duration of the sound.

Traffic is the primary source of human noise presently generated in the Project Area. Light automobile traffic at 100 feet has a typical sound level of 50 dBA. A heavy truck at 50 feet has a typical sound level of 90 dBA. Because the dB scale used to describe noise is logarithmic, a doubling of a traffic noise source (i.e., twice as much traffic on a road) produces a 3-dBA-increase average roadway noise. Average sound levels due to line sources such as traffic decrease with distance from the road at a rate of 3 to 4.5 dBA per doubling of distance from the road. Vegetation attenuates noise if it is dense and deep enough. Intervening vegetation may also create a soft surface over which the noise would travel and would be expected to absorb sound energy.

Project-related logging truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor populations are less. Each truck would likely represent a discrete rather than a cumulative addition from a noise perspective and would be comparable to the sound level presently generated by other trucks using Project Area roads.

Vegetation treatment and revegetation activities would also generate noise. Possible vegetation treatment noise sources include chain saws and loaders. A chain saw has a specific event sound level of 110 dBA and the Forest Service requires that chain saw operators wear earplugs. A front-end loader going through various cycles has a typical hourly average sound of 75 dBA at 100 feet. Average sound levels due to discrete point sources, such as chainsaws, decrease at a rate of 6 dB per doubling of distance from the source. Intervening vegetation would be expected to absorb some sound energy.

The majority of the proposed treatment acres are located away from occupied residences. Treatment in these areas would be noticeable to visitors recreating in close proximity. Some visitors would likely avoid work areas in the short-term but there would be no long-term effects. Vegetation treatment activities in the buffer areas surrounding private inholdings would be noticeable to some local residents. Noise effects would, however, be limited because treatment activities would only occur with cooperation from affected property owners and would be of limited duration as the buffer areas are typically 500 feet in width. All vegetation treatment activities would take place during the day.

POPULATION, EMPLOYMENT, AND INCOME

The actions proposed under Alternative B would likely generate approximately 15 jobs during project year one. Six of these anticipated jobs would be associated with the proposed road and trail improvements, last from one to four months, and most likely be contracted locally. The other nine anticipated jobs would be associated with the vegetation treatment action. The limited logging capacity



along the Front Range suggests that these workers would need to relocate to the area from elsewhere, most likely western Colorado. This portion of the project labor force would increase in project years 2 and 3, with a maximum of up to 24 workers relocating to the area. This number may, however, be less if the selected logging contractor decided to hire and train local employees.

Assuming an average family size of 3.18, which was the average U.S. family size in 1998, population in and around the Project Area would increase by about 76 people if all 24 workers and their families relocated to the general area (U.S. Census Bureau, 1998). This possible increase in population would represent a small proportion of the population growth already projected for the area and would be unlikely to have any noticeable effect on local services or housing availability.

Average annual wages in the lumber and wood products sector were \$28,090 in the Denver metropolitan area in 1998. Twenty-four full-time jobs would generate about \$674,160 in total annual income in project years two and three. Total personal income in Jefferson and Douglas counties in 1994 was about \$11.6 billion and \$2.5 billion, respectively (U.S. Census Bureau, 2000). Local spending associated with the projected project-related income would, as a result, be unlikely to have any noticeable effect on the local or regional economy.

The proposed action consists of four sub-projects. The cost of carrying out these four sub-projects is estimated to be approximately \$5.3 million over the five-year life of the project. The majority of project expenditures would be on labor, rather than goods and supplies and is not expected to have any noticeable effect on local business sales.

The mechanical vegetation treatment sub-project is estimated to cost approximately \$250 per acre with a total cost of about \$4.35 million. This sub-project is designed to reduce the risk of wildfire. Previous wildfires in the Project Area have resulted in significant human and economic costs. The cost of suppressing the June 2000 Hi Meadow Fire, for example, was nearly \$5 million. Future seeding and erosion control work on the fire damaged lands is estimated to cost an additional \$2.5 million. This works out at about \$700 per acre burned and does not include the costs associated with the 58 structures that were destroyed, the evacuation of local residents, the strain on local emergency services, and the social cost to those directly affected.

This sub-project would reduce the risk of future wildfires. This could result in significant cost savings for the Federal government, reduce the strain placed on local emergency services, and benefit local homeowners and residents. Nearly 200 structures are located in the small communities located in the vicinity of the proposed treatment areas.

The trail improvement sub-project would also benefit recreationists and local emergency services by reducing the risk of injury on the Gill Trail, as well as improving access to Cheesman Canyon for recreationists and rescue crews.

ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires each federal agency to make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. The Order further stipulates that the agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin.

Vegetation treatment and other measures designed to improve water quality by stabilizing stream channels and reducing road- and trail-related sediment would not disproportionately affect minority or low income communities. While local communities would be affected by the proposed actions in the short-run, these actions are intended to reduce the risk of large scale fires and potential damage to property and human health of the type experienced during and following the 1996 Buffalo Creek and June 2000 Hi Meadow fires. Proposed vegetation treatment areas adjacent to private property would only be treated in cooperation with affected property owners. The Forest Service is holding a series of public meetings in the local area to get input from the public and identify local concerns with the proposed actions and alternatives.

Cumulative Effects

Ongoing or foreseeable future actions within or near the Project Area that could add to the effects of the proposed actions include ongoing and proposed Colorado State Forest Service projects, as well as ongoing and proposed U.S. Forest Service projects.

The Colorado State Forest Service is presently working on a number of demonstration projects on Denver Water lands within and near the Project Area. These projects, which include a 90-acre fuel break restoration thinning project along the entrance road to Cheesman Reservoir, as well as an additional 60-acre restoration thinning project located near Trumbull, have the potential to generate additional logging truck traffic. To date, these programs have generated at most one of two logging truck trips a day.

Continuation of the South Platte Ranger District's efforts to limit sediment entering Sugar Creek from CR 67 could temporarily affect traffic flow along this road. Although potential effects might be increased with the addition of logging truck traffic, possible disruptions would be temporary and short-term.

Other ongoing and proposed projects, such as Christmas tree cutting and prescribed fire in Tussock moth mortality areas, also have the potential to affect local population, employment, and income. Potential associated cumulative effects are, however, unlikely to have any noticeable effect on local services, the availability of housing, or the local or regional economy.

ALTERNATIVE C

Direct and Indirect Effects

TRANSPORTATION

Truck Traffic

The maximum truck traffic effects under Alternative C would be the same as those identified for Alternative B. Average daily truck traffic generated under Alternative C would, however, likely be less because logs are being removed from fewer acres. The introduction of project-related logging truck traffic would still be noticeable to local residents, as well as people traveling through the Project Area. Logging truck traffic would likely slow some traffic on steep slopes. Truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor traffic is less.



Increased truck traffic under Alternative C would also contribute to wear on local roads, particularly those designed to handle relatively low volumes of traffic. There would, however, be a minimal amount of truck traffic on gravel and dirt roads near occupied residences. Efforts would be made to reduce the local transportation effects of logging activities through use of appropriate signals and/or warnings to alert oncoming vehicles to the presence of a work site with trucks entering and leaving. Efficient operation procedures would be employed by contractors to prevent vehicles from blocking access points to the extent possible.

Potential impacts to local road surfaces and bridges would be similar to those identified for Alternative B.

Passenger Vehicles

Project-related passenger vehicle traffic would generally be the same under alternatives B and C. As discussed for Alternative B, the addition of up to 24 passenger vehicles is unlikely to affect existing local traffic flows.

NOISE

Noise effects would be similar to those discussed for Alternative B. There would, however, be fewer truck trips associated with Alternative C because logs would not be removed from roadless areas.

POPULATION, EMPLOYMENT, AND INCOME

Potential direct and indirect effects on population, employment, and income would be generally the same as those discussed for Alternative B.

ENVIRONMENTAL JUSTICE

Vegetation treatment and other measures designed to improve water quality by stabilizing stream channels and reducing road- and trail-related sediment would not disproportionately affect minority or low income communities. While local communities would be affected by the proposed actions in the short-run, these actions are intended to reduce the risk of large scale fires and potential damage to property and human health of the type experienced during and following the 1996 Buffalo Creek and June 2000 Hi Meadow fires. Proposed vegetation treatment areas adjacent to private property would only be treated in cooperation with affected property owners. The Forest Service is holding a series of public meetings in the local area to get input from the public and identify local concerns with the proposed actions and alternatives.

Cumulative Effects

Potential cumulative effects under this alternative would be the same as those identified for Alternative B.

CONSISTENCY WITH THE FOREST PLAN

The proposed actions are consistent with the Forest Plan goals that relate to social and economic issues. These goals include the following:

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- ❖ **Provide for increased production and productive use of wood fiber while maintaining or improving other resource values.**
 - ❖ **Provide for local community stability when allocating resource uses.**
 - ❖ **Provide the opportunity for economic growth of industries and communities dependent upon Forest outputs.**
 - ❖ **Provide the opportunity for community stability and cohesion within the Human Resource Units to remain in productive harmony with National Forest activities.**
 - ❖ **Provide a cost-effective level of fire protection to minimize the combined costs of protection and damages, and prevent loss of human life.**
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SHORT-TERM USE & LONG-TERM PRODUCTIVITY

Vegetation

The short-term use would be for some timber production from the Project Area. The long-term productivity of the forest would be enhanced because the proposed action would reduce the risk of catastrophic fire.

Soil Productivity

The soil resource is a key ingredient for maintaining the long-term productive potential for an area. Accelerated erosion and effects detrimental to the soil resource will be minimized through use of careful design and BMPs. Soil protection measures in the Forest Standards and Guidelines will maintain critical soil parameters and nutrients, ensuring long-term productivity.

Hydrology

Short-term effects of the activity proposed on National Forest land could include a minor increase in peak flows and total sediment yields. These effects are negligible and would not affect long-term productivity. None of the activities proposed on National Forest land would adversely affect channel stability. Beneficial uses would not be adversely affected.

Fisheries

The activities proposed on National Forest land would not adversely affect fish habitat. The proposed action would reduce the risk of a catastrophic fire thereby enhancing the long-term productivity for fish bearing streams.

Wildlife

Implementation of Alternatives B and C would increase openings and reduce forest density. This change in forested habitats would favor wildlife species preferring more open habitats or a mosaic of open and forested habitats. Populations of these species would be expected to increase with increased availability of preferred habitats. A concurrent reduction in species associated with more closed forested habitats would also occur.

Over the long-term, vegetation treatment in these areas would create a greater mixture of multi-aged timber stands that would result in increased habitat diversity. The forest would have a lower risk of catastrophic fire and subsequent loss of forested habitats.

Fire and Fuels

Fire exclusion has created unnatural closed canopy conditions, increasing the risk of crown fires. Prescribed fire could reduce fuel loadings due to slash and ladder fuels, reducing the consequences of a wildfire. This would enhance the long-term productivity of timber by reducing the potential for severely burned soil and loss of forested habitats.

Air Quality

The temporary impacts of smoke from prescribed burning would have minor effects on the short-term use of forest resources including recreation sites, visual resources, and roadless areas. The long-term benefits of fire would more than outweigh the short-term impact to air quality.

Recreation/Visual Quality

The long-term recreational use of the area would be only slightly affected by the action alternatives. Noise and the feeling of increased human presence would be a short-term effect of the vegetation treatment activities.

The visual effects vary in duration and intensity depending on the location. Initially, the appearance of harvested areas would interrupt the natural appearance of the landscape. Following implementation of all of the vegetation treatments and the foreseeable activities the more open forest would appear more natural. Long-term reduction of wildfire risk would be a benefit to visual quality in the area.



IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources results from a decision to use or modify resources that are not renewable, or are renewable only over a long period of time. The commitment is irretrievable if the use of a renewable resource is lost due to land allocation decisions or conflicts in scheduling activities. In this case, the opportunities are foregone for a given time period.

Vegetation

Timber production would be lost from land converted to openings. These areas would no longer be capable of producing timber volume due to the commitment of these lands to other uses.

Soils

Any soil lost to erosion would be considered an irreversible and irretrievable commitment of the soil resource. Best Management Practices would be used to minimize soil productivity losses from vegetation treatment. There would be a short-term irretrievable loss of productivity in landings, skid trails, and slash piles.

Hydrology

None of the activities proposed on National Forest land, by themselves, would result in irretrievable effects.

Fisheries

There would be no irretrievable impacts due to proposed activities on National Forest land.

Wildlife

Loss or conversion of forest habitat would not be irretrievable or irreversible, but would be long-term due to management direction.

Recreation/Visual Quality

Effects to recreation and visual quality would not result in irreversible modification of the environment.

Cultural Resources

Any activity that would disturb a cultural resource is an irreversible commitment. No disturbance of cultural resources is predicted in any alternative.

UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The effects of the alternatives would be minimized by adhering to all the mitigation measures and alternative design features. Some impacts, however, still cannot be avoided.

Soils

There may be some decrease in long-term soil productivity due to topsoil disturbance during logging operations. There would also be a slight decrease in soil quality due to erosion.

Hydrology

None of the activities proposed on National Forest land would result in an adverse impact on water quality.

Wildlife

The proposed action would change some forested habitat into openings and some closed stands into a more open structure. This would be an adverse impact to those wildlife species that depend on the more closed structure habitats.

Fire and Fuels

Some adverse impacts would be caused by the use of prescribed fire. Some large woody debris and soil organic matter would be consumed. The severity of these impacts would depend on the intensity and duration of the prescribed fire.

Air Quality

Temporary, seasonal impacts to air quality would be unavoidable in the implementation of the activity proposed on National Forest land. Prescribed fire is an integral part of the vegetation treatments.

Recreation/Visual Quality

Recreationists and forest visitors would notice some disturbance to the landscape. This is an unavoidable effect of vegetation treatment activities. The degree of disturbance would vary by alternative.

Timber harvesting and road building activities may temporarily disrupt the normal recreational uses of the area. Impacts would include noise, dust, wood debris, smoke and disturbance of understory vegetation.



Cultural Resources

There is no assurance that every cultural resource site would be located in advance of all planned management activities. Some ground-disturbing activity could unavoidably affect an undiscovered historic or prehistoric site. Sites discovered in this manner would be immediately protected from further disturbance with a site specific management plan. Some sites could be inadvertently destroyed or damaged.

POTENTIAL CONFLICTS WITH PLANS, POLICIES, AND OBJECTIVES OF OTHER JURISDICTIONS

This section describes the potential conflicts between the activities proposed by the U.S. Forest Service and the plans, policies and objectives of other federal, state, regional, and local agencies.

Wildlife

The U.S. Forest Service and the U. S. Fish and Wildlife Service (USFWS) share responsibility for the recovery of threatened and endangered species on National Forest lands. The vegetation treatment would occur in occupied Pawnee montane skipper habitat, along with other listed species. These are addressed in the Biological Assessment (Appendix C). The Colorado Division of Wildlife (CDOW) manages populations of elk and mule deer. The proposed action reduces elk winter range which may present a conflict with CDOW management objectives.

Hydrology

The Federal Clean Water Act requires federal agencies to comply with all federal, state and interstate and local authorities in the control and abatement of water pollution. All activity proposed on National Forest land would comply with these authorities.

Fisheries

The U.S. Forest Service manages the habitats within the National Forests while the CDOW manages the fish and wildlife resources of the State. Therefore, there is substantial potential for overlapping polices and programs for both agencies that impact the fisheries resources. Generally, there is a strong mutual support for programs that benefit fish and wildlife resources.

Air Quality

All prescribed burning operations would be conducted according to Colorado air quality laws and guidelines. Potential conflicts could exist if other agencies were also to schedule open burning for the same period. This could result in the rescheduling of burning operations and a delay of site preparation and reforestation efforts to keep smoke emissions within the limits set by State Standards.

Cultural Resources

The laws and policies that govern cultural resource work on federal lands are coordinated and consistent with those of the State of Colorado and State Historic Preservation Office. Cultural resources have been inventoried in the Project Area and are known to exist. They would be avoided, protected or mitigated according to the National Historic Preservation Act.

